

UK space policy

Research Paper 95/43

30 March 1995



In October 1995, the European Space Agency is due to hold a Ministerial Council to review the future direction of European space policy. This paper reviews UK space activities at both the European and national level.

William Lea
Science and Environment Section

House of Commons Library

CONTENTS

	Page
I. Introduction	1
II. European Space Agency	2
A. General structure and funding	2
B. Policy and Ministerial Councils	4
1. The Hague	4
2. Munich	6
3. Grenada	7
4. Recent developments	9
C. Juste Retour	11
D. European Union	12
III. Government policy and the BNSC	14
IV. Space activities	21
A. Science	21
1. Horizon 2000	21
2. UK contributions and funding	22
3. Horizon 2000 plus	24
B. Earth observation	25
C. Space transportation	26
V. Bibliography	29

I. Introduction

In recent years, there has been a growing realisation within the world space community that funding cannot remain immune to pressures affecting all aspects of governments' expenditure^{1,2}. In October 1993, the Director General of the European Space Agency (ESA) made the following comments in a lecture on *Space Policy-Where is the European Vision?*³:

"Everybody realises that we have arrived at an important juncture for European space co-operation. The present situation is characterised by the fact that space has slipped downwards in the priorities and, as a result, budgets for space activities in our member states cannot be expected to grow substantially in the next few years, and also by the new opportunities for global partnerships which are opening up.

"...In this austere environment most governments need to reassess their priorities for space. There is a general tendency to shift money away from the larger infrastructure programmes towards reinforcing the programmes such as science, earth observation, telecommunications, and to maintaining the capability to compete effectively in the launcher market. This has led to reduced emphasis on programmes aiming to develop enhanced operational capabilities by gaining early access to manned capabilities in low Earth orbit."

ESA has already adapted to these changes, to some extent, and its policies and programmes will be open to review at the Ministerial Conference due to be held in October 1995. Further information on ESA policies and activities can be found in Section II.

UK Government spending on civil space activities amounts to £177 million in the current financial year (1994/5) of which £115 million goes to ESA. Policy as a whole is co-ordinated by the British National Space Centre (BNSC) which, although sponsored by a number of Government Departments, is based within the Department of Trade and Industry (DTI). The DTI contributes the largest share of total expenditure on civil space activities, currently spending £87 million and is followed by the Particle Physics and Astronomy Research Council (PPARC) which spends £49 million. Further details of overall Government policy on space can be found in Section III.

Funding for civil space activities focuses on four main areas:

- Scientific research - including astronomy, microgravity
- Earth observation - use of satellites for studying the atmosphere, oceans and land use
- Space transportation - satellite launchers, space planes
- Telecommunications satellites

¹ "The future of Space Activities" *Spaceflight* April 1994 p.110

² "Government Spending on Space: Is the Glass Half Full or Half Empty" *Spaceflight* February 1994 p.44

³ "Space Policy-Where is the European Vision?" *Technology, Innovation and Society* Spring 1994 p.15

Within ESA, space transportation is the largest programme, but the UK does not consider that such work is of a high priority and contributes less than 1% to the programme's funds. The UK concentrates its funding on Earth observation and science. Further details on ESA's and the UK's support for these different activities can be found in Section IV.

II. European Space Agency

A. General structure and funding

ESA was established in 1975 and now has 14 Member States⁴ and one co-operating state (Canada). Its total budget for 1994 was ECU 2.5 billion, approximately £2 billion, and it has 2080 permanent staff⁵. Its activities can be divided into nine main areas or programmes:

- Space transportation
- Space station and platforms
- Earth observation
- Telecommunications
- Science
- Microgravity
- Technology and other projects
- Third party programmes
- General budget

Both the General and Science budgets are mandatory for all Member states: their contributions to these programmes are calculated on the basis of their GDP. All the other programmes are optional. Details of the funding for the different programmes and the ones to which the UK contributes are shown in Table 1 overleaf:

⁴ All EU countries excluding Greece, Luxembourg and Portugal plus Norway and Switzerland.

⁵ Ed. A. Wilson *Jane's Space Directory 1994-95* May 1994

Programme	Total funding £ million*	UK funding/ £ million	UK funding as percentage of total
Space transportation	985	} 1.6	0.1%
Space station and platforms	291		
Earth observation	253	45.7	17.8%
Telecommunications	237	15.6	6.8%
Science	233	} 30.0	10.5%
Microgravity	53		
Technology + other projects	18	-	-
General budget	215	15.9	7.4%
Third party programmes	67	-	-
Total	2,652	108.9	4.1%

*At the rate ECU 1m = £0.780 m

Source: *ESA Annual Report '93*, BNSC

In 1992/93, 42% of UK funding went to mandatory programmes and 58% to optical programmes⁶. These funds for ESA came from the DTI and PPARC (formerly the Science and Engineering Research Council - SERC). The contributions from these two bodies in recent years are shown in Table 2 below:

Department	1990/91	1991/92	1992/93	1993/94	1994/95	1995/96 plans	1996/97 plans
DTI	61	76	76	80.8	77.9	80.0	80.5
PPARC/SERC	27	24	30	28.1	36.5	39.3	39.6
Total	88	100	106	108.9	114.9	119.8	120.6

Source: BNSC

For optional programmes, ESA operates a policy of "juste retour" whereby individual countries receive contracts for work on these programmes in direct proportion to the contributions they make. Consequently, if the UK does not participate in a particular programme, UK companies are ineligible to bid for contracts awarded within that programme. This policy is examined further in Section II.C below.

⁶ NAO *Department of Trade and Industry: Support for Earth Observation Space Technology* 15 December 1993 HC 76 1993/94

B. Policy and Ministerial Councils

In recent years ESA's space policy has been mapped out by a series of Ministerial Conferences: The Hague in November 1987⁷; Munich in November 1991⁸; and Grenada in November 1992⁹. The next ministerial Council is currently due to be held in October 1995 at Toulouse.

1. The Hague

At the Hague meeting, European space ministers adopted a Long-Term Space Plan for 1988-2000¹⁰. The highlights of the plan were the development of the Columbus programme - Europe's contribution to the planned international space station- and the development of new space transportation systems- the Hermes spaceplane and the Ariane 5 rocket.

The **Columbus Programme** had four main elements:-

Attached Pressure Module (APM) - a permanently manned laboratory connected to the planned international space station.

Polar Platform (PPF)-an orbiting platform, larger than a satellite, carrying a large range of instruments principally for Earth Observation.

Man-tended Free Flyer (MTFF) - a self contained and automatic laboratory for a variety of experiments including materials processing, fluid physics and life sciences. It would be serviced at six month intervals by the Hermes spaceplane.

Eureca- a self contained carrier for space science experiments to be serviced on the ground.

The **Hermes Spaceplane** was designed to be Europe's equivalent of America's space shuttle. It would be launched by the Ariane 5 rocket capable of carrying a crew of three and equipment into low earth orbit.

⁷ HC Deb 12 November 1987 c.571

⁸ HC Deb 21 November 1991 c.271W, PQ from Sir Michael Marshall MP

⁹ HC Deb 26 November 1992 c.822W, PQ from Anthony Coombs MP

¹⁰ESA *European Space on course for the 21st century* 1987

The **Ariane 5 rocket** was designed to be a multi-purpose launcher capable of placing satellites into geostationary transfer orbit, launching the Hermes spaceplane into low earth orbit, and transporting the PPF and MTF of the Columbus programme into various low earth orbits.

In addition to these high profile programmes, Ministers also reached agreement on continuing programmes for science, Earth observation and telecommunications. Because of the costs and risks involved the Ariane 5 and Hermes programmes were only agreed on the basis of there being initial 3 year development phases after which there would have to be reviews before further work could take place.

At the meeting the UK abstained on the resolution on the European Long-Term Space Plan, but voted in favour of a resolution on the Space-Station Programme. In a statement on the outcome of the meeting, the then Chancellor of the Duchy of Lancaster, Kenneth Clarke MP, commented:¹¹

"... I could not endorse the grandiose ambitions of the Hermes programme to put man in space by the year 2000. At enormous expense this would only achieve capabilities which the United States had achieved 20 years previously ...

"On the Columbus space station programme, there has been no satisfactory conclusion yet to negotiations with the Americans ... I declined to agree to proposals that Europe should in any event go ahead with a separate and autonomous version of the Columbus programme if agreement with the United States could not be reached. I said we would consider further the proposal for a polar platform ...

"My approach to the Ariane 5 launcher proposal was that emphasis would be given to ensuring that the European Space Agency has a fully commercial launch capability- for satellites, in particular ... Again, however, I had to question the increase that some other members wanted solely in order for Ariane 5 to be man-rated, and to enable it to launch spaceships as well as satellites."

¹¹HC Deb 12 November 1987 c.571

2. Munich

In November 1991, at the Munich meeting Ministers adopted a *European Long-Term Space Plan* for 1992-2005¹². This allowed work on the Hermes and Columbus development programmes to continue but taking into account "the changes in Europe and the new financial constraints within the Member States" it was agreed that the programmes would be subject to further reviews in the following year (1992)[*ibid*].

The Council also adopted a *Resolution on Programmes for Observation of the Earth and its Environment* [*ibid*].

This provided for the development on phase 1 of the polar platform element of the Columbus programme- known as POEM-1 (Polar Orbit Earth Observation Mission). This programme was strongly supported by the UK:

"The main achievement of the European Space Agency-ESA- council meeting at ministerial level, held in Munich, was to initiate a new ESA programme for the observation of the Earth and its environment from polar orbit, known as the first polar mission ..

"The new Earth observation programme will develop advanced instruments in support of climate research and the monitoring of global climate. It will also support the flight of operations meteorological instruments and will carry forward radar-based remote sensing using synthetic apparatus radar. In addition, the programme will address the necessary facilities for data reception and distribution on the ground.

The instruments are scheduled to be flown in 1998 on the polar platform, which is under development within ESA's Columbus programme. The United Kingdom played a prominent role at the council in urging ESA member states to give a decisive impetus to this new Earth observation and environment programme. The programme represents a positive European contribution to worldwide efforts to understand the global environment ..."

Overall, the failure to agree on the future of Hermes, Columbus and other programmes at the meeting was seen to be a set back for ESA and a turning point in its history¹³. Decisions to proceed with phase two of these projects should have been made in 1990 but were delayed because no ministerial meeting took place that year. Since 1987, the budget for Hermes had risen by 40% and that for Columbus by 14%. Germany was unable to commit itself to these large budget increases, and so decisions on these programmes had to be deferred.

¹² ESA *Annual Report '91* 1992 pp 213-219

¹³ "European Plans hit by costs" *Spaceflight* January 1992 p.2

An article in the journal *Spaceflight* reported that [ibid]

"The Munich meeting is being seen as a turning point in the history of the space agency.

"There was an air of unreality leading up to the meeting' said one Council delegate. 'I think the bubble has been punctured by Munich. People now realise unless they can find a sensible way forward next year these major programmes are insupportable.'

"The French regard Munich as a huge defeat. The Germans, however, believe that have got the major review of the programmes they were looking for."

3. Grenada

Ministers at the Grenada meeting adopted a *Resolution on the Implementation of the European Long-Term Space Plan and Programmes*¹⁴. This provided for the continuation of the POEM-1 programme, and adopted two elements for the Polar Platform:

Envisat 1 Planned for launch in 1998 to provide data on understanding and monitoring the environment and radar data to continue that provided by the ERS-2 satellite (see p.25)

Metop-1 Planned for launch in 2000 to provide meteorological data.

However, the Hermes programme was cut back and replaced by a three year "reorientation period" to study possible options for international cooperation particularly with Russia, for the development of a "future crewed transportation system". As far as the Columbus programme was concerned, the attached pressure module (APM) for the international space station was agreed, but the Man-tended Free Flyer (MTFF) was abandoned¹⁵. Agreement was also reached on the continuation of the Science programme and the development of the Ariane 5 launcher. Details of the total budgets agreed for the main programmes and the UK share of these are set out in table 3 overleaf:

¹⁴ ESA *Annual report '92* 1993 pp 99-112

¹⁵ "The UK and ESA -A plan for the years 1993-2000" *Spaceflight* p2-3

Programme	Budget £m	% UK Share
POEM1: Envisat	800	21-25
METOP 1 prep	30	14.6
Data Relay Satellite	665	1
Columbus Polar Platform	490	22.6
Columbus Attached Module	1800	1
Hermes Reorientation	400	Nil

Source: *Spaceflight* January 1993

The adopted Resolution also invited "The Member States to pursue their efforts to define the Future European Space Transportation Investigation Programme (FESTIP) so that a decision on its start-up "could be taken as soon as possible." FESTIP was aimed at examining the technology for the future reusable launchers including such concepts as the air breathing HOTOL space plane (see page 27).

The outcome of the meeting was welcomed but the then Minister for Space, Edward Leigh¹⁶:

"I am pleased to report that Ministers at the European Space Agency meeting at Granada adopted a new, well-balanced, long-term plan which states the course of European space activities until the end of this century.

"The main achievement for the UK was an agreement to proceed with full development of a major new Earth observation mission, known as Envisat-1. This mission will be flown on the British-led polar platform in 1998 and will carry the British-development advanced synthetic aperture radar and a variety of environmental research instruments...

The result of this conference is a space programme with a much better balance between the applications of space and infrastructure programmes and with a greater emphasis on international collaboration. The United Kingdom welcomes ESA's drive to achieve effective collaboration both within Europe and its international partners, including the USA and Russia."

¹⁶ HC Deb 26 November 1992 c.822w

He also welcomed the FESTIP programme¹⁷:

"Among future programmes envisaged at Granada, one I have found inspiring is the Future European Transportation Investigation Programme, FESTIP. Britain, with its HOTOL reusable launcher technologies has much to offer the programme. I shall be keeping a close watch on FESTIP."

4. Recent developments

In February 1994, ESA's Council decided to reorient the Hermes Programme as the Manned Space Transportation Programme (MSTP)¹⁸. The concept of a winged re-entry vehicle, similar to the space shuttle, was withdrawn. The revised programme now consists of¹⁹:

- non-winged crew transport vehicle
- automated transfer vehicle
- extra vehicular activity (EVA) space suit
- remote manipulator

In spring 1993, plans for the Columbus Attached Laboratory had to be revised to take into account major modifications made to the planned international space station as a result of US budget cuts. The size of the laboratory has been reduced and so now it should be able to be launched by Ariane 5 (in 2002).

Recently, the journal *Science* has reported that ESA "is coming under increasing pressure from some of its cash-strapped member states to throttle back its future commitments to the US-led international space station²⁰:

"In a letter this month to ESA Director Jean-Marie Luton, Germany's Education, Science and Research Minister, Jürgen Rüttgers, complained that the cost of implementing ESA's current space station plan is "well beyond the financial capabilities of ESA member states." Rüttgers said he and his French counterpart opposed ESA's most recent proposal to spend \$4.5 billion on its crewed-space efforts from 1995 to 2003, most of which would pay for Europe's share of the space station programme.

¹⁷ "Future ESA Space Plan Agreed" *Spaceflight* December 1992 p376

¹⁸ Ed. A. Wilson *Jane's Space Directory 1994-95* May 1994 p.127

¹⁹ *ESA Annual Report '93* p.59

²⁰ "ESA Members Balk at Space Station Cost" *Science* 17 February 1995 p.955

Research Paper 95/43

"Instead, Rüttgers suggested a "realistic framework" for reducing ESA's crewed space flight programme to \$2.5 billion from 1996 to 2000. This figure includes Europe's "in-kind" contributions to the space station-hardware developed and built in Europe-rather than money paid directly to the international effort, together with a 20% pool of funds for unforeseen costs...

"In his recent letter to ESA, Rüttgers said Germany and France feel strongly that ESA should remain a partner in the international space station project, so long as that partnership reflects strict cost ceilings and a "realistic concept". He also urges other European nations to contribute "substantially" to the crewed space effort.

"Harald Müller, chief spokesperson for the German research ministry in Bonn, says Rüttger's letters simply reflect current financial and political realities. "Germany and France cannot bear all the costs alone," said Müller, noting the Italians' shrinking commitment. "To be realistic, Europe's contribution must be reduced, and that contribution must be shared more among ESA member states," Müller insists."

In September 1994 the Minister responsible for Space, Ian Taylor MP, opened the Space Pavilion at the Farnborough Air Show and commented on ESA's future²¹:

"...towards the end of next year there will be a ministerial meeting of the European Space Agency which will give us the chance to look forward and review where we are going next in terms of our space activities, as well as re-examining our priorities.

"I don't think there is any doubt about the enormous challenges ahead. Some of them we face are very obvious. The whole challenge that lies ahead in terms of the effort, involvement and cost means that there will have to be a restructuring of industry, and that is possibly best shown by the recent merger of BAe Space Systems into Matra Marconi Space. It is certainly one that I welcome, making it the largest space company in Europe. If we can build this sort of company - and Matra Marconi Space will be very much of an equal balance between French and British interests both in terms of activity and employment - I think we will be able to go into the next generation of space research from a strong European base.

"The role of the British National Space Centre is important and I certainly regard it as one of my own high priorities as a minister to ensure there is wider recognition of the work of the BNSC.

"One of my tasks as a minister is to persuade people how relevant the activities and work in space are to them. It is so often forgotten how many things that we now take for granted can only be so because of the efforts of ESA and the BNSC. Making the public aware of what we are doing is a very important stage in under-pinning our space effort."

²¹ "UK Minister Opens Space Pavilion" *Spaceflight* November 1994 pp 362-3

In a speech to industrialists, at the same event, the Director-General of ESA, Jean-Marie Luton, said :

"You all know the space sector is currently going through an evolutionary phase. In Europe we are having to come to terms with a new political situation and the harsh economic realities. Priorities have also changed, particularly in respect of manned space programmes. Cooperation is now very important. What we have done within ESA over recent years is to adapt to meet new situations...

"It is up to us as Europeans to show our determination to remain a strong and credible space power. Britain and its industry has been one of the major players in European space activities. I hope it will remain one of the driving forces behind development."

C. **Juste Retour**

Since its formation in 1975, ESA has operated a policy of "juste retour" for its external contracts. This means that the value of contracts awarded to companies in each member state under a particular programme are in direct proportion to the funds those states have contributed to that programme. In December 1993 in a report on the DTI's support for Earth observation, the National Audit Office made the following comments about the policy of "juste retour"²²:

"Juste Retour" is designed to ensure that industry from a member state receive contracts and sub contracts in approximately the same proportion as their Government's level of contributions. The Agency produce quarterly reports for each programme showing, by member state, the value of contracts let compared to the theoretical entitlement under 'juste retour' derived from their level of contributions. The contracts are weighed according to the technological value of the work. A full return based on the theoretical entitlement equates to a coefficient of 1.00. The United Kingdom's overall return at 31 March was 1.07: one of the highest for any member state. The return from Earth observation programmes was 1.05.

"The 'juste retour' calculations only cover external expenditure by the Agency with industry. Internal Agency expenditure such as staff and establishment operational costs do not enter into the assessment. Thus member states' overall cash contributions always exceed the value of contracts placed by the Agency. The Agency do not calculate the proportion of total costs accounted for by internal costs but the Centre estimate that it is about 30 per cent....

"In response to the National Audit Office's questionnaire, nearly all firms were critical of the 'juste retour' system, a view shared by the two principal trade associations representing the space industry. It was seen as being inefficient and it led to instances where the best firm to do the work was not selected. However, it was generally accepted as a political necessity. Where 'juste retour' had been less rigidly applied in practice and thus more open competition has taken place, for example in the Technology Research Programme, United Kingdom firms have done well. The National Audit Office consider that value for money would be enhanced

²² NAO *Department of Trade and Industry: Support for Earth Observation Space Technology* 15 December 1993 HC 76 1993/94

Research Paper 95/43

by greater competition. Whilst acknowledging the efforts already made by the Centre to support the Agency's industrial policy, they believed the Centre should nevertheless continue to press further for the maximum possible level of competition in the letting of all Agency contracts."

The Minister with responsibility for Space, Ian Taylor, has recently commented that ²³:

"... It is important for the European Space Agency to devise much more efficient programmes because it currently depends too much on juste retour. If we could get a much more efficient system of allocating contracts, I am sure that British industry would do even better."

ESA officials, however, have defended the principal of juste retour on the grounds that many member states are in favour of it. An article in *The Observer* reported that²⁴:

"In Paris, at the headquarters of ESA, attitudes are very different, however. Officials, although reluctant to speak on the record, respond with a resigned, heard-it-before attitude.

"In fact, rather than slacking the rules of juste retour, member nations have consistently voted to toughen them in recent years,' said one. 'I cannot see them changing direction despite the sword waving.'

"Nor is it easy to see smaller countries changing direction. Their MPs constantly ask why a little nation should be spending money on space,' added another official. They will accept an answer that says the investment is helping to develop a new industry, and that their commitment to ESA is returned through contracts. However, they would not allow this money to be used to fund aerospace industries of Britain or France, even if it did produce better value for money'.

"In other words if you replace juste retour with full competitive bidding, in which the strongest nations would do best, funds from most ESA nations would dry up.

"It is a point reinforced by Sir Geoffrey Pattie, former UK Technology Minister, and chairman of GEC-Marconi. 'I am reluctant to back juste retour, it is so protectionist. But I cannot see any alternative. It is not as if other space manufacturers-like those in the US- are open and competitive. They survive on fat government defence contracts.'"

D. European Union

In the past ESA, rather than the European Union has coordinated European activities in space. The EU has really only been involved as a customer for Earth observation data and in the regulatory aspects of satellite communications.

²³ HC Deb 8 March 1995 c.336

²⁴ "Europe calls for mission control" *The Observer* 23 October 1994 Business Section p.7

In October 1992, the European Commission published a report on *The European Community and Space: challenges, opportunities and new actions*²⁵. The Executive Summary of the report made the following comments about the EU's role in space:

"The European Community already plays a role in the European space effort since its competences and policies have a bearing on space activities. Decisions taken at Community level relating to the internal market and industrial affairs, trade aspects, environmental policy, telecommunications policy, audio-visual policy, and research and technological development (R&TD), for example, will increasingly impact on Europe's space effort.

"At the same time, space is making its impact felt on the implementation of Community policies. The use of space-derived information will grow, particularly in areas such as environmental research and monitoring, aid to developing countries, agricultural monitoring and the development of the Community's less-favoured regions.

"The Community's international role has also increased, with global implications for Europe's space activities. This includes multilateral and bilateral trade relations, scientific and technological cooperation, international collaboration on environmental protection and global policies relating to sustainable economic development.

The report stated that the time had been reached where "there is both an opportunity and a need for the Community to contribute more towards the successful further development of the European space effort in particular in the definition and implementation of a European space policy". It said that the Community's contribution to space would aim at five objectives:

- a) To encourage and support the optimal development and exploitation of Earth observation applications, particularly by initiatives contributing to the establishment of a European operations system for the study and monitoring of the environment: to increase and intensify the use of satellite data within this framework of various Community policies.
- b) To ensure the appropriate regulatory conditions allowing the development of new markets for satellite communication services.
- c) To develop the complementarity and synergy between Community R&TD programmes and the space programmes of ESA and Member States in order to reach a greater efficiency in European R&TD efforts.
- d) To encourage the consolidation and growth of a competitive space industry and to promote its interests at international level, within the framework of Community industrial and commercial policies.

²⁵ EC Cons Doc 9599/92, COM (92) 360 final

e) To encourage the widening of balanced international cooperation, particularly taking into account the new opportunities for cooperation with the former Soviet republics and the countries of Central and Eastern Europe.

The Select Committee on European Legislation produced a short report on the document in November 1992²⁶. It made the following comments about the DTI's views:

"The Department's Explanatory Memorandum (EM) agrees with the Communication's promotion of a strong European space industry, with the objective of liberalising European and international markets and with the importance of earth observation. The EM notes, however, that any proposal for Community activity will require careful examination, while there is a need to avoid duplicating the work of the ESA.

The Committee concluded that "the document raises questions of political importance, but makes no recommendations for its further considerations".

The Commission have not published any further proposals about the EU's role in space, but it did hold a meeting with ESA and European industry to discuss the issue last year. According to press reports, the meeting "came to no firm policy directions, but it is clear that the EU will expand from its present peripheral roles²⁷".

III. Government policy and the BNSC

Government policy on space is very much directed towards Earth observation and science programmes. This is clearly apparent from its funding for ESA programmes: at recent Ministerial Councils it has made significant commitments to development of a polar platform and Earth observation satellites but only nominal or nil contributions to the Hermes, Columbus and Ariane 5 programmes. This is a long standing policy which was last set out in detail in October 1988 in response to a report from the House of Lords Science and Technology Committee^{28,29} (see Box).

²⁶ HC 79-viii 1992/93 p.xiii 4 November 1992

²⁷ "EU Carves Broader Role in Space Policy" *Space News* 31 October 1994 p.1

²⁸ Select Committee on Science and Technology *United Kingdom Space Policy: Government Response* 11 October 1988 HL 105 1987/88

²⁹ Select Committee on Science and Technology *United Kingdom Space Policy* 17 December 1987 HL 41-I 1987/88

Government statement on UK space policy, October 1988

In its civil space activities the Government will seek to encourage industry and the scientific community to exploit opportunities in space based on a realistic appraisal of costs and of scientific, technological, commercial and other benefits that may be secured. Space activities cannot occupy a privileged place in the Government's public expenditure plans. Space projects will be examined as rigorously as scientific research and R&D proposals from other industrial sectors. Subject to this appraisal and the quality of proposed projects that emerge, the Government expect to maintain expenditure on civil space at broadly the existing level which, since our entry into the Columbus space station programme, has increased to approximately £130 million per annum.

Space activities are well suited to international collaboration, by their nature as well as because of their cost. The Government will therefore continue to carry out a major part of its civil space activities on a collaborative basis, in particular through the European Space Agency (ESA). At the same time, international collaboration inevitably brings some additional administrative costs. We shall work with our European partners to ensure that, by good management, these costs are kept to a minimum.

At the same time, the Government recognise the importance of encouraging a national programme which will allow British companies to develop the technologies and expertise to enable them to exploit successfully UK investment in ESA programmes.

So long as ESA's science programmes maintain satisfactory standards of management, they should continue to provide the foundation of the United Kingdom's space science activities, complemented by a few targeted national or bilateral projects, within available resources.

The main focus of the United Kingdom's space activities over the last decade and more has been space communications. This concentration of effort has been well-judged in that a substantial market has developed in which British companies compete successfully. The Government have, however, concluded that the time has come when decisions can, and should, be made predominantly on a commercial basis by companies operating in the now largely established market, and that there should be a decisive switch of Government efforts and resources to other fields.

There is a large measure of agreement that the next area of space activity likely to yield substantial industrial and commercial benefits is earth observation.

The United Kingdom is already participating in ESA's ERS-1 satellite project. The Government have also decided to participate in ESA's Columbus programme, concentrating on the polar platform element of that programme. This will give the United Kingdom a substantial role in developing the means of acquiring earth observation data.

In addition, the Government are setting up an Earth Observation Data Centre at the National Remote Sensing Complex at the Royal Aerospace Establishment, Farnborough. This is intended to provide a catalyst for the progressive development of a new service industry operating on a global scale, that uses data obtained from space as its raw material. To be successful, the Data Centre will need a strongly commercial orientation. The Government hope that industry will quickly assume operational and financial responsibility for the data centre, as a major element in the full commercialisation of earth observation.

The Government recognise that many of the benefits that will result from earth observation from space are dependent on applications development and demonstration. The BNSC will work with industry and users to maximise the benefits that will accrue from the investments made in data acquisition and processing. The UK will continue to support the acquisition from space of observations required for operational meteorology particularly through the European consortium Eumetsat.

The United Kingdom civil space programme will continue to be implemented through the British National Space Centre. The role of the Centre will be to carry through the programmes and projects on which the Government has embarked, and to advise Government on new programme proposals as they arise. The Centre will act as a focus for the civil space interests of the Department of Trade and Industry, The Ministry of Defence, the Foreign and Commonwealth Office and the Department of Education and Science (through the Science and Engineering Research Council and the Natural Environment Research Council). Responsibility for funding will remain with the constituent Departments according to their particular responsibilities, but the Centre will provide overall coherence and significant added value because of the links which can be developed between individual programmes on the one hand and advances in associated sectors of science and technology on the other. These arrangements will be kept under review.

In an adjournment debate last year, the Minister with responsibility for space, Ian Taylor MP, confirmed that the Government still adhered to the policies set out in 1988³⁰:

"The government set out their civil policy in a statement to the house in 1988, to which we have firmly adhered. Its key elements have been, and continue to be, to develop and introduce work space technologies. That is carried out principally by selective and cost-effective use of ESA programmes. Additionally, our national programme is aimed at achieving further exploitation of our investment in ESA, alongside necessary investment by industry.

"The priority objective of our policy have [sic] been, first, the development of Earth observation for environmental and long-term purposes. Again, my hon. Friend mentioned that. The second objective is to help industry to take advantage of past investment to make a commercial success of satellite communications and, where appropriate, to foster development of specialised telecommunications technologies for niche markets. The third objective is the maintenance of a sound space science base."

In the UK, space policy is co-ordinated by the British National Space Centre. It acts as the focus for the civil space interests of its member Departments and Research Councils: the DTI, the Foreign and Commonwealth Office, the Office of Science and Technology, the Ministry of Defence, the Department of the Environment, the Meteorological Office, the Particle Physics and Astronomy Research Council (PPARC) (formerly the Science and Engineering Research Council -SERC), and the Natural Environment Research Council (NERC).

In addition to co-ordinating the UK's input to ESA programmes it also coordinates the Government's National Space Programme. Funding for this programme reflects Government space policy as a whole, and so, as can be seen from table 4 below, the majority of expenditure is focused on Earth observation.

³⁰ HC Deb 21 July 1994 c.586

Table 4: Total Government expenditure on National space programme							£ million
	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Earth observation	23	25	30	35	35	45	41.1
Science/microgravity	9	11	12	14	14	14	14.9
Satcoms	2	2	2	1	1	1	0.8
Technology	7	9	11	8	8	4	5.2
Other							0.5
Total	41	47	55	58	58	64	62.4

Source: BNSC

The Government's emphasis on funding space applications, such as Earth observation, as opposed to space infrastructure, such as space transportation systems, has been criticised by some commentators. In an article in *Spaceflight* in August 1992, Mark Hempzell, a lecturer at Bristol University, commented that:

"It is one of those twists of irony occasionally thrown up by life that, in the designated 'British Industry in Space Year', we should be witnessing the worst collapse of the British space industry ever. While it may be too soon to actually pronounce death, UK space activity is clearly very ill and getting worse, with no sign of treatment, remedy or cure."

He went on to say that although Government spending on space as a whole has risen in recent years, it has not been spread evenly across all space activities:

"The major difference between Britain and other nation lies in the fact that, while other nations typically spend 50% to 80% of their budgets on infrastructure and major technology programmes, Britain tires[sic] to spend nothing. In 1991, launch vehicles accounted for around £2 million (1.4% of UK civil budget). A figure which is to be reduced still further. The British Government has a conscious policy of not being involved in such programmes and this is the sole reason for the large differences in total space expenditure.

"So, the only people who have a legitimate complaint against the government are those who are interested in astronautics as whole; that is, in the development of the space infrastructure and basic space technology. Our complaint is not that expenditure levels are *lower* than other nations but that the government is, as a matter of policy,deliberately trying to invest *no money at all*.

"The UK 'space' budget has, in practice, degenerated until it is not really a space budget at all. It is a space users' budget, and that is not the same thing. We have the logical equivalent of the Department of Transport spending money on the development of pizzas on the grounds that pizza delivery is a blooming business which uses the roads.

"Consider the current trends in Earth Observation. I do not think anybody would argue that the investment in Earth Observations satellites, such as the Polar Platform, is unwise. Given the growing problems in the global environment, they are clearly essential. It is certainly true

the biggest problem in fully exploiting the potential of these systems is the management and analysis of the massive amounts of data they produce. Therefore, money spent on improving Britain's capability in this area is clearly justified. It will also be a bonanza for the image processing, data analysis, and other specialist software industries. However, it does nothing for the space industry from whose budget the money for this development activity is coming."

The emphasis on Earth Observation is set to continue as can be seen from the future expenditure plans of Government departments on the National programme in table 5.

Department	1990/91	1991/92	1992/93	1993/94	1994/95 estimated	1995/96 plans	1996/97 plans
DTI, of which:	19.8	20.4	20.4	14.7	9.2	6.4	6.3
Earth observation	14.5	16.0	17.1	12.3	7.3	5.9	5.8
Other	5.3	4.4	3.3	2.4	1.9	0.5	0.5
PPARC/SERC	19	21	23	23.0	12.3	13.6	12.9
MoD	10	8	5	7.5	6.8	6.6	6.5
Met Office	8	9	15	15.8*	22.4	20.6	23.2
NERC	1	1	1	1.5	8.1	9.2	10.9
DoE				3.3	4.0	1.9	1.6
Total	58	58	64	65.8	63.8	58.8	61.8

* Reported as £12.9 million in *UK Space Activities 1993-94*

Source: BNSC, DTI

The majority of the DTI's expenditure on the National space programme is directed at Earth Observation. As its total spending on the National Programme falls over the coming years from £20 million to just over £6 million, the proportion of it spent on Earth observation will increase to 92%. From 1995/96 the amount available for non-Earth observation activities will be £0.5 million.

It has been suggested by some that there is no need for a National space programme given that the UK supports ESA. Last September, the journal *Spaceflight* reported ³¹:

Cost cutting proposals on UK government spending could spell the end to British involvement with European space programmes and the death-knell for a thriving industry.

³¹"Future as a Space Nation Under Threat" *Spaceflight* September 1994 p.290

"A Cabinet confrontation over industrial and spending policies entered the public domain with the publication of a private letter from former treasury Chief Secretary Michael Portillo to his Cabinet colleague Michael Heseltine, Head of the Department of Trade and Industry, calling for more cuts in public spending. It singled out space as an activity that could not only be cut, but abolished altogether.

"Space is a good example where a European programme makes a UK one unnecessary and area where we can be bold. Given, moreover, that it appears to lack a market failure of competitiveness rationale, I do not see why you do not move straight to abolition. You should also reconsider ESA membership as soon as current commitments permit', wrote Mr Portillo."

However, others would argue that the UK's role in ESA should be strengthened. In her adjournment debate on the space industry in July 1994, Cheryl Gillan MP commented that³²:

"Due to our perceived attitude to space, the United Kingdom has lost much of its influence, not only in ESA, but in all parts of the world. That does not affect only the British national space centre; the effect inevitably rubs off on British industry, too. More to the point, the fact that we have placed a ceiling on expenditure, which is committed for the next few years, means that we cannot join new programmes, however meretricious, except, possibly, at a derisory level. That is bound to be damaging to our industries and is hardly likely to leave us in an influential position of forming new ESA policies, if we cannot participate.

"I shall mention just three cases in point. We cannot join the new ESA communications technology programme even though our industries are prepared to contribute 50% of the funding themselves - unique in Europe. We are offering a very small contribution to the ESA share of the second generation meteorological satellite, which will damage our industries, chance of taking part in the operational programme, for which satellites will be needed for the next 20 years. ESA is starting to examine the next century's generation of launchers, in the FESTIP programme, in which our ideas on the horizontal take-off and landing launcher or alternative systems have been world leaders. A share in that would be of major benefit to our capabilities in the areas of advanced materials, avionics, software and to all markets in which we presently have some eminence. If we cannot participate in all those programmes, we shall severely damage our competitiveness and, perhaps, the existence of the many capabilities which our ESA contributions have helped us to create over the years."

In replying to this speech, the Minister, Ian Taylor MP, made a number of points including the following comment:

"Increased Government expenditure on research and development would have little direct effect. In these circumstances, we must be driven by British industry. Action by Government to create fair open markets, and by European industry to increase competitiveness, can have a decisive influence.

"However, ESA programmes continue to provide real opportunities to develop scientific instruments, technology, components and applications relevant to telecommunications and European markets. We contribute to a number of aimed development programmes which are consistent with our overall policy."

³² HC Deb 21 July 1994 cc574-585

Research Paper 95/43

At the end of last year the BNSC published its annual report on *UK Space Activities 1993-94*. In a forward to the report, Derek Davis, the Centre's Director General said:

"Britain's commitment to space has already put UK industry at the forefront of the European satellite communications sector, and won its scientists an international reputation in space research. Today, we are among the leaders in the use of data products and services from Earth-observing satellites.

"Building on these foundations, BNSC's priority is to act vigorously in the space marketplace especially to stimulate and promote satellite data applications.

"The space sector has much to contribute to Government's aim of sharpening UK industry's competitiveness, both directly and by raising awareness of the sector's management expertise, from handling multidisciplinary, international work teams through to space technology transfer across industry.

"To understand our changing world and compete successfully in it, we have much to learn and much to achieve. Space is the key to that learning and achievement. BNSC is Britain's key to space."

The report was summarized in an article in *Spaceflight* which began with the following paragraph³³:

"The UK space programme is constrained by a ceiling on expenditure and this in turn inhibits new initiatives. One year's annual UK space report therefore inevitably reads like that of a previous year, particularly in its detailing of space projects which by their nature continue over many years. The UK report for 1993-94, which has recently been issued by the British National Space Centre (BNSC) in the form of a 20-page pictorial brochure, does however, have identifiable changes from that for 1992-1993 (*Spaceflight*, October 1993, p.342) apart from its revised format. It is seen, for instance, that as well as international 'space collaboration', that of 'space competitiveness', has gained recognition. Also receiving a worthy mention is 'Technology Transfer' - the diffusion of know-how and innovation across industry and society".

The article concluded:

"Since ESA's current policy directions were agreed in 1992, the UK has continued as a long-standing and closely-integrated partner of European space activities. During the last two years, however, geopolitical events have been such that European thinking on its future space role has been, and still is, undergoing critical re-assessment. At the next ESA ministers' meeting in September 1995, new policy directions may well be introduced. Until that time, and so long as the Government's ceiling on space expenditure remains, there will be uncertainty within the UK space industry regarding the type of future it can expect.

³³ "UK Space Activities 1993-94 *Spaceflight* November 1994 p.364

IV. Space activities

A. Science

The UK funds space science activities through ESA's mandatory science programme and the Particle Physics and Advisory Research Council's contributions to the National space programme.

1. Horizon 2000

ESA's space science programme is based on its Horizon 2000 plan. This consists of four "cornerstone" missions interspersed with a number of smaller, "medium missions". In the past, ESA has funded such missions as the Giotto cometary probe which flew past Halley's Comet in 1986 and the Grigg-Skjellerup comet in 1992, and contributed 15% to Hubble Space Telescope.

The four cornerstone programmes of the Horizon 2000 plan are:

CI - Solar/Terrestrial- This consists of two missions, SOHO and Cluster, both of which are designed to study interactions between the Earth and the Sun. SOHO, originally due for launch in July 1995, will be an observatory placed between the Earth and the Sun at the point where the two bodies' gravitational attraction are equal. Cluster is composed of four identical spacecraft which will measure magnetic and electrical data.

C2 - X-Ray Astronomy -This cornerstone is based on the X-ray Multi-Mirror (XMM) mission. This was due for launch in 1999 and will be an observatory imaging emissions of X-rays from quasars, neutron stars and black holes.

C3 - Primordial bodies- This is based on the Rosetta mission and was selected as the third cornerstone mission in November 1993. Due for launch in 2003, Rosetta is a cometary probe currently aimed at intercepting the Comet Schwassmann-Wachmann 3 in 2008, and also asteroid Britain.

C4 - Sub-millimetre astronomy- The Far Infrared and sub-millimetre Space Telescope (FIRST) forms the basis of the fourth cornerstone. This is due for launch in 2006 and will provide useful information on the formation and evolution of stars, planets, galaxies and the universe.

Four medium mission are planned as part of Horizon 2000, so far two have been selected, and six possible missions have been identified as candidates for the third.

M1-Huygens is part of a joint mission with NASA to investigate Saturn and its largest moon Titan. NASA will supply Cassini, the Saturn orbiter, while ESA will contribute Huygen- a probe which will descend down thorough Titan's atmosphere. The mission is due for launch in 1997.

M2-Integral is a gamma-ray telescope [International Gamma Ray Astrophysics Laboratory] due for launch in 2001. It is designed to observe the Universe's most energetic features such as supernova.

2. UK contributions and funding

It has recently been suggested that the UK's involvement in the Integral and Rosetta missions may have to be scrapped because of lack of funds. In October 1994 *Physics World* reported that³⁴:-

"The UK may have to scrap its involvement in the European Space Agency's gamma-ray astronomy mission, Integral. A programme review last month by the UK's Particle Physics and Astronomy Research Council revealed that without additional funds from the government, only a fraction of the £15 m needed for payload projects would be available. Involvement in the subsequent cometary mission, Rosetta, is also threatened.

"This would be the first time since ESA was founded that the UK was not able to play a full part in the space programme and thus exploit its subscription', said PPARC's chief executive, Ken Pounds. 'On current funding we might be able to make a small contribution, but many of us feel strongly that higher priority should go to getting the most out of our investments in past and current missions.

"Many of the UK's major space astronomy groups have an interest in Integral's gamma-ray, X-ray and optical detectors. The deadline for bids for payload instrumentation is the end of this year, with a launch due in 2001."

The journal *Nature* reported at the time that³⁵:

"Britain's subscription to ESA has been rising because, although both the overall budget of the agency and that of the PPARC are nominally being kept level in 'real' terms, the former is being adjusted for a higher rate of inflation than the latter. One result is that the UK's subscription (like that to CERN, the European Laboratory for Particle Physics) is consuming an increasing proportion of PPARC's budget. 'It is like being elected a member of a golf club, buy having nothing left to buy balls and a club after paying your subscription,' says Ken Pounds, professor of physics at the University of Leicester and chief executive of the PPARC...

"Roger Bonnet, head of ESA's science programme, admits that the agency is 'very concerned' at the conclusions of PPARC's council, and accepts that a British withdrawal from INTEGRAL

³⁴ "UK to miss ESA missions?" *Physics World* October 1994 p.5

³⁵ "UK warns short-fall over future space missions" *Nature* 13 October 1994 p.546

and Rosetta would have wide implications. 'It would be a tremendous setback', says Bonnet, adding that he is already exploring ways of avoiding such a move."

More recently, *Nature* reported that British astronomers had been told that funds will not be available for the Integral programme³⁶:

"British astronomers have been told that they will not be provided with funds they need to play a leading part in the construction and exploitation of a new ECU322-million (US\$396-million) gamma-ray satellite, Integral, initially proposed by Britain, which is planned for launch by the European Space Agency (ESA).

"The lack of funds is a direct result of decisions by the Office of Science and Technology to put pressure on ESA to reduce its space budget, and not to provide the Particle Physics and Astronomy Research Council (PPARC) with funding for any new domestic scientific projects in the financial year 1995-96.

"Anticipating such a squeeze on its funding, PPARC had already asked ESA to delay any decision about allocating contracts for the payload for Integral, adopted in 1993 as ESA's next 'medium-scale' mission, until after a meeting of the space ministers of the agency's member states, planned for next November ...

"But Britain's request has been angrily rejected by Roger Bonnet, director of ESA's scientific programme. He says that, even if Britain is unable to contribute to the payload costs of Integral (the satellite itself will come out of ESA's central funds), the mission will still proceed, but on a reduced basis. Italy has already offered to take over some of Britain planned role."

It would appear that arguments surrounding UK funding of Integral have become tied up with larger arguments over the size of the ESA science budget. An ESA council meeting at the end of last year failed to vote on funding for the Horizon 2000 programme for 1996-2000 following opposition for the UK, Germany and Spain³⁷.

The journal *Nature* reported that [ibid]:

"Last week, Roger Bonnet, the head of ESA's science programme, warned that ESA may have to postpone or cancel some of these missions if the United Kingdom insisted on a reduction in the programmes' overall costs. He was speaking after ESA's council had failed to agree on proposed future funding levels for the programme.

"British officials say their main concern is to increase the cost-effectiveness with which the £37 million (US\$58 million) Britain pays each year towards ESA's space science programmes is used.

³⁶ "Cuts force UK astronomers to drop key role in gamma-ray satellite" *Nature* 9 February 1995 p.459

³⁷ "Britain leads bid to cut costs of Europe's space science projects" *Nature* 22/29 December 1994 p.712

Research Paper 95/43

"But Bonnet, who is not prone to making rash public statements, claims that Britain wants a '20 to 50 %' cut in funding of space science over the long-term, and that this will inevitably lead to programme cuts.

"British Officials have been quick to reject Bonnet's claims. 'We are not seeking a reduced science programme,' says Ian Corbett, director of science at the UK Particle Physics and Astronomy Research Council (PPARC), and the British representative on the ESA council.

"But Corbett argues that ESA could cut 25% of the costs of its science missions within five years, without reducing their scientific value, by making them more cost effective. He admits that Bonnet has a well managed programme; 'we're giving him 9 out of 10', says Corbett. 'But saying that, you still have a bit to go'.

"PPARC's current difficulties stem from the fact that its budget for space science is being held level, while its subscription to ESA is increasing, leaving it with 'less and less money' to spend on instruments or on exploiting the results of missions.....

"The question of how much funding Horizon 2000 will receive in its next five-year funding period will be considered by the space ministers of ESA member states at a meeting next autumn, which is also scheduled to decide on Europe's contribution to the planned international space station."

3. Horizon 2000 plus

In addition to discussing the funding of the Horizon 2000 science plans, the ministers at the October Council will be discussing plans for Horizon 2000 plus- a programme to take ESA's science research up to 2016³⁸. The plans include proposals for exploration of Mercury, the provision of an orbiting observatory using the technique of stellar interferometry to produce images possibly 1000 times better than the Hubble Space Telescope, and a mission to search for gravity waves which were predicted by Einstein's General Theory of Relativity. The committee drawing up the plans has proposed that ESA's science budget should be held at its 1994 level until 2000 and then increased by 4-5% a year for the following 4-5 years to help pay for these projects. Whether such additional funds will be approved by the forthcoming ministerial council remains to be seen.

One possibility which has been suggested to increase the cost effectiveness of ESA's science programme is the development of a number of small missions³⁹:

"ESA's existing and planned space missions fall into two categories; the so-called cornerstone missions, four of which form the foundation of its science programme Horizon 2000, and a series of medium-sized missions. The former cost a maximum of ECU600 million (US\$750 million) each, and the latter ECU345 million.

³⁸ "ESA Plans for the early 21st century *Science* 21 October 1994 p.359

³⁹ "ESA eye the attractions of small space missions *Nature* 16 February 1995 p.548

"While acknowledging that large amounts of money are needed for major projects such as planetary missions, some scientists are concerned that they inevitably lock researchers into related fields of study-reducing prospects for the pursuit of other scientific goals. Another concern is that budget constraints restrict the frequency of large and medium missions.

"One suggestion ... to compensate for both factors was that the European agency should consider launching a series of small missions costing around ECU50 million, perhaps launching one every two years over a 20-year period....

"A workshop on small missions, involving scientists, industrial representatives and members of ESA's science programme committee is due to be held in the spring, with its conclusions being forwarded to the ESA council. Firm proposals are expected to be put to the ministerial meeting in October.

B. Earth observation

ESA's Earth observation activities are currently centred on the ERS-1&2 satellites and the Envisat 1 polar platform:

ERS-1- This satellite was launched in July 1991 to provide all-weather information on the global environment. It comprises four main sensors⁴⁰:

Active Microwave Instrument

This consists of two instruments. The first, a Synthetic Aperture Radar, operates either to collect all-weather images over the oceans, polar regions and land, or produces sea state images for the derivation of the length and direction of ocean waves. The second instrument supplements this by measuring sea-surface wind speed and direction.

Radar Altimeter

This instrument provides measurement to within two centimetres of the satellites height above the ocean, ice and land surfaces and is being used to determine sea-surface elevation, significant wave heights and sea-surface wind speeds. It is also measuring various parameters over land and ice.

Along-Track Scanning Radiometer

This comprises an infrared scanning radiometer to allow precise measurement of sea-surface temperatures, and a passive radiometer to determine the water-vapour content of the Earth's atmosphere.

Precise Range and Range-Rate Equipment

This is used for accurate determination of the satellite's position

ERS-2- This is due for launch later this year and is a replacement for ERS-1. It should provide for continuity of data from ERS-1 and also have a new capability of global ozone monitoring. If funds are available then there is the possibility of running ERS1 and -2 in tandem for a period to provide further scientific information though the technique of interferometry⁴¹.

⁴⁰ NAO *The Department of Trade and Industry: Support for Earth Observation Space Technology* December 1993

⁴¹ "Europe weighs bid to extend life of sensing satellite" *Nature* August 1994 p.317; "ESA agrees to extra year for ERS-1" *Nature* 27 October 1994 p.730

Research Paper 95/43

Envistat-1 and the polar platform- Envistat-1 will use the Polar Platform originally designed as part of the Columbus programme to provide Earth observation capabilities to replace those of ERS-2. It is due for launch in 1998 and will be capable of carrying a payload three times greater than that of the ERS satellites. The extra payload will enable it to carry instruments for monitoring the composition and chemistry of key gases in the atmosphere. It should also monitor both the biological and chemical health of the Earth's oceans⁴².

In addition to these environment orientated satellites, ESA is also collaborating on the current Meteosat series of meteorological satellites. A second generation of Meteosat satellites is currently being developed with Eutnetsat-the European Meteorological Satellite organisation. Eutnetsat is also collaborating with ESA on the development of a second polar platform devoted to meteorology and the climate, called METOP. It is due for launch in 2000.

Further details of Earth Observation can be found in a National Audit Office report *The Department of Trade and Industry: Support for Earth Observation Space Technology*, ESA's *Annual Report '93* and a POST note on *Observing Planet Earth* published in February 1994.

In its most recent statement on space funding, the Government has announced⁴³

"...additional Government funding of £2.612 million for the European Space Agency GNSS satellite navigation programme, £1.5 million for the ESA ARTES4 telecommunications technology programme and £1 million to cover the cost of delay to the launch of ESA's ERS2 remote sensing satellite."

C. Space transportation

Although the UK has not participated in ESA's manned spaceflight programmes such as Hermes or the development of the Ariane-5 launcher, at the time of the Grenada Ministerial Council it was thought that the Government was keen to take part in studies of designs for future spaceplanes, under FESTIP [Future European Space Transportation Investigation Programme]. FESTIP was discussed at a meeting of the UK Parliamentary Space Committee shortly after the council meeting by ESA's Director General Jean-Marie Luton in December 1992. The journal *Spaceflight* report the following comments about the programme⁴⁴

"On advanced launch capability outside of the Ariane programme the Director General indicated that he was enthusiastic about the FESTIP programme and that he recognised the foundations laid down in this area by activities in the HOTOL and SANGER projects. This now required building upon as there was much to be gained from the advanced propulsion

⁴² ESA *Annual report '93* 1994

⁴³ HC Deb 27 March 1995 c.409w

⁴⁴ "ESA Chief meets MPs" *Spaceflight* January 1993 p.2

work, however, he cautioned that this needs to be handled in a planned and controlled manner as not all member states were as supportive as the UK in this area."

The HOTOL- Horizontal Take-Off and Landing - spaceplane concept was developed by British Aerospace in the early 1980s. It relied on revolutionary air breathing engines which would allow the craft to be fully reusable thereby drastically reducing launch costs. The DTI jointly funded a £4 million study of the concept in 1985-87, but declined to fund a future 3 year feasibility study believing HOTOL development would cost about £4.5 billion⁴⁵. Rolls Royce bought the patent for the revolutionary engines from their inventor Alan Bond in April 1988, but did not continue research once Government funding ended. British Aerospace continued work on HOTOL and in 1990-91 developed the concept of Interim HOTOL launched from the back of an Antonov An-225 aircraft with the Russians. Meanwhile Alan Bond set up his own company, Reaction Engines, to develop his spaceplane concept, Skylon.

Both British Aerospace and Reaction Engines hoped to benefit from the UK's involvement in FESTIP. However, last year the BNSC announced that the Government did not have sufficient resources to fund the UK's involvement in the programme⁴⁶.

The total cost of FESTIP was expected to be around £30 million spread over 3 years, so a modest involvement of 4-7% would have cost around £0.5 million a year. The Government's decision not to fund any UK involvement attracted widespread criticism [ibid]. In a letter to *The Times* published on 18 May 1994, Bruce Smith, the then chairman of the UK Industrial Space Committee (UK ISC) commented:

"Your report (May 13) on Alan Bond's concern about the lack of British support for FESTIP.... raises the wider question of UK strategy for the space industry and high technology generally.

"As the emphasis moves from the exploration to the exploitation of space what is already emerging in the UK is an efficient and competitive industry which increasingly seeks to provide technical solutions to meet identified customer requirements. It is an industry in which some 400 private companies and other institutions regularly operate, employing some 6,000 staff. The UK space industry is a strategic asset and the future direction of it is a matter of national concern. In the present climate of economic stringency it is necessary to be very clear about objectives. I have no argument therefore with the broad thrust of current UK space policy, emphasising as it does Earth observation and satellite communications and navigation areas which provide opportunities for wealth creation and meet social and economic needs. Nevertheless, it calls for long-term strategic thinking.

"In an increasingly uncertain world Europe needs to retain an independent launch capability. At the same time the UK needs to ensure that the development of new launcher technology

⁴⁵ ED. A.Wilson *Jane's Space Directory 1994-95* May 1994 p.246

⁴⁶ "Cash cut forces Britain to abandon space project" *The Times* 13 May 1994; "Fury over funds for spaceplane" *New Scientist* 21 May 1994 p.7.

Research Paper 95/43

emphasises the importance of achieving access to space at minimum cost. The UK needs to participate in FESTIP and I would urge that we look again at ways of finding the modest entrance fee to this important area.

"It is vital that the analysis of market and technological opportunities and priorities should look far enough ahead, and especially to areas where a relatively small investment early on could secure for the UK potentially significant opportunities for the future. FESTIP is such a case."

The *New Scientist* reported that

"The BNSC says that the budget cuts have been forced upon it by the DTI, and that Davis [BNSC's Director General] has been forced to take tough decisions. 'We have been looking around for ways to get companies involved in FESTIP' says a spokesman. 'Everybody is screwed to the wall financially all around Europe. We have commitments to other projects that are already running, such as the Earth Observation Satellite.'

"On the criticism of Davis, the spokesman says 'Derek Davis has an awareness of science-he has expertise in energy- and I don't think a scientist could do any better in his post.'"

Since the UK is not contributing to the programme, under the principal of 'juste retour', it is not expected that UK companies will receive any funding for work on FESTIP. For instance, the team which worked on Interim Hotol and related concepts at British Aerospace Space Systems is now part of Matna Marconi Space (MMS) Space Systems, following a takeover last year and it is receiving no external funding for work on FESTIP type activities⁴⁷.

Last October, *Flight International* carried an interview with the Chairman of UKISC⁴⁸, Denis Cummings, on the UK space industry and Government policy in the issue of space transportation. The journal reported⁴⁹:

"The UKISC is aware that the one bad decision in 1987-not to participate in the Ariane 5 programme - will mean that much component work on launchers will be lost. It is anxious, therefore, to be a major part of ESA's new launcher programme. 'We must get into launchers,' says Cummings. 'ESA has some problems, Cummings admits. 'We have to make it reflect the market more, to help industry become more competitive.' Instead, the Government has pulled out of funding for the future European launcher programme called FESTIP

"A lower budget and a resulting lower participation in ESA is the last thing the UK space industry needs now. The UK space industry has been built on Government partnership. 'We've done our bit to show that we are making space work,' says Cummings, 'but in a field where 75% of activities and budgets still remain under the direction of governments, we cannot prosper without Government partnership and investment."

⁴⁷ Source;MMS Space Systems

⁴⁸ UKISC -United Kingdom Industrial Space Committee is the trade association of the British space industry. It has 23 member companies representing 75% of the industry.

⁴⁹ "Under threat" *Flight International* 26 October 1994 p.31

BIBLIOGRAPHY

ESA *European Space on course for the 21st century* 1987

"European Plans hit by costs" *Spaceflight* January 1992

"The UK and ESA -A plan for the years 1993-2000" *Spaceflight*

"Future ESA Space Plan Agreed" *Spaceflight* December 1992 *ESA Annual Report '93*

"Europe calls for mission control" *The Observer* 23 October 1994 EC Cons Doc 9599/92, COM (92) 360 final

Select Committee on Science and Technology *United Kingdom Space Policy: Government Response* 11 October 1988 HL 105 1987/88

Select Committee on Science and Technology *United Kingdom Space Policy* 17 December 1987 HL 41-I 1987/88

ED. A.Wilson *Jane's Space Directory 1994-95* May 1994

"Under threat" *Flight International* 26 October 1994