

PRIME MINISTER

MEETING WITH SIR FRANCIS TOMBS

You are meeting Sir Francis at his request, essentially to talk about ACARD's comments on the 1986 Annual Review of Government Funded R&D which has now been completed (Sir Robert Armstrong seeks your permission to publish this - Flag D). Sir Francis succeeded Sir Henry Chilver as Chairman of ACARD in November of last year. He is due to appear before the Lord's Committee on Science and Technology, and was particularly keen to see you beforehand. This will be the first occasion on which you have discussed ACARD's comments on the Annual Review with their Chairman. John Fairclough will also be at the meeting.

We have only been able to find three-quarters of an hour in the diary, and there is a good deal you can talk to Sir Francis about. It would probably be better as John Wybrew suggests (Flag E) to address a number of key general issues rather than to get too bogged down with the ^{details of the} ACARD Report and the Annual Review.

The key issues seem to be:-

- (i) how can industry be encouraged to invest more in R&D?
- (ii) how can limited Government funds for R&D best be targeted?
- (iii) how can we get more spin off from the funds allocated to military R&D?

Voluminous briefing from the Scientific Secretariat in the Cabinet Office is attached. You only need to look at a small proportion of this.

- Flag A Letter from Sir Francis Tombs covering ACARD's comments (which you do not need to look at in detail).
- Flag B A short and useful note from John Fairclough summarising the key points.
- Flag C Detailed briefing from the Secretariat. (You do not need to look at this though you may wish to note that ACARD in the past three months has published the results of three recent studies: an exploitable area of science, software and medical equipment.)
- Flag D Note from Sir Robert Armstrong seeking your permission to publish the Annual Review together with a useful executive summary.
- Flag E A note from John Wybrew which identifies a number of discussion points.
- Flag F A note from DTI explaining that Mr Channon is about to rule against the Engineering Council on a dispute they are having with the Society of Industrial Artists and Designers about a change of name for the latter.

MEN

Mark Addison

24 July 1986

Ref. A086/2157

PRIME MINISTER

Re Minutes:

Agree to the
publication of
the review?

ON 24/7

Annual Review of Government-funded Research and Development

The fourth in the series of annual reviews of Government-funded research and development (R and D) expenditure instituted by Cmnd 8591 (Government observations on the report on "Science and Government" from the House of Lords Select Committee on Science and Technology) has now been completed, and I attach a copy, together with a summary ("Executive Summary"). The review has been prepared by the Science and Technology Secretariat in the Cabinet Office, working under the guidance of the sub-committee of Chief Scientists chaired by Mr John Fairclough.

2. The review is in three parts broadly following the format established in previous years. Part I contains a summary of past and projected Government R and D expenditure for the period 1983-84 to 1988-89 and a factual commentary thereon which summarises the R and D programmes by purpose and type. Other chapters in Part I summarise the R and D activities of the nationalised industries and the R and D expenditure of the private sector. Chart 5 of the Executive Summary shows in particular that the private sector are funding only just over one third of the R and D taking place in the United Kingdom. This rightly causes the Chief Scientific Adviser some concern, and is an item which he will be focusing upon in next year's review. Of special interest this year is the chapter describing manpower, the evaluation of R and D programmes and technology transfer, topics upon which Departments and Research Councils were requested by the Secretariat to provide detailed descriptions. Evaluation is something which the newly established "Science and

Technology Assessment Office" and the Chief Scientific Adviser may well wish to examine during the coming year. Finally, in Part I of the review are some international comparisons.

3. Part II of the review contains detailed information on the R and D programmes of the Departments and Research Councils which supplements the summary information in Part I. Part III contains various annexes relating to definitions and sources of data.

4. Under cover of his letter to you of 17 July Sir Francis Tombs, Chairman of the Advisory Council for Applied Research and Development (ACARD), sent you comments on this year's review; he requested a formal response to ACARD and Mr Fairclough's minute of 22 July gave you separate advice about this. You are meeting Sir Francis at 11.30 am on 25 July with Mr Fairclough.

5. ACARD's main concern continues to be the need for Government R and D programmes to contribute to wealth creation. This is the main focus of the work of the Ministerial Sub-Committee on Research and Development. Officials will be preparing a report for the Sub-Committee.

6. Previous annual reviews have been published and received a warm welcome from industrialists, the press and academics and others interested in the field. Favourable comments have also been received from both sides of the House. I suggest once again that it would be appropriate for the review to be published. If you agree, I will make arrangements for publication as soon as possible.

RA

ROBERT ARMSTRONG

23 July 1986



CONTROL

1986 ANNUAL REVIEW OF GOVERNMENT FUNDED R & D

EXECUTIVE SUMMARY

1. The 1986 Annual Review of Government Funded Research and Development is the fourth review prepared in accordance with the Government's statement in 1982 (Cmnd 8951).

Government R & D Expenditure

2. Total central Government expenditure on research and development in 1984/85 was £4.3 billion, which represents about 3% of total central Government expenditure.

3. Chart 1 shows the distribution of R & D expenditure by the different sectors of Government. The Ministry of Defence with 51% has by the largest expenditure on Research and Development, most of which is on development work.

4. In 1984/85 constant prices, expenditure on R & D is expected to decline in the period up to 1988/89 to a little over £4.1 billion. This is shown illustratively in Chart 2, where the decline in the civil departments R & D is quite noticeable. The detail in the Annual Review reveals that this is due in large part to a decline in DTI expenditure on R & D.

5. In the period up to 1988/89, the Ministry of Defence share of the total R & D expenditure gradually increases to 54% whilst the Research Councils and the UGC are expected to retain their proportional level (at approximately 12 and 15% respectively). Civil Departments' expenditure on R&D falls from 22% of the total in 1984/85 to 19% in 1988/89.

6. The primary purposes underlying Government expenditure on R & D are shown in Chart 3. Support for procurement (mainly by the MOD) is clearly the largest segment.

7. UK Government expenditure on R & D is about 1.3% of GDP in 1984/85.

Civil Expenditure on R & D

8. The results of the 1985 DTI survey of industrial R & D will be available in early 1987. The latest data therefore refer to 1983. The expenditure on R & D by industrial sector is shown pictorially in Chart 4, where the predominance of the electronics industry is clear.

Total Expenditure on R & D

9. Total expenditure in the UK on R & D amounted to £6.6 billion in 1983, approximately half was funded by the Government. Private industry, nationalised industries and monies from overseas financed the other half (illustrated in Chart 5).

International comparisons

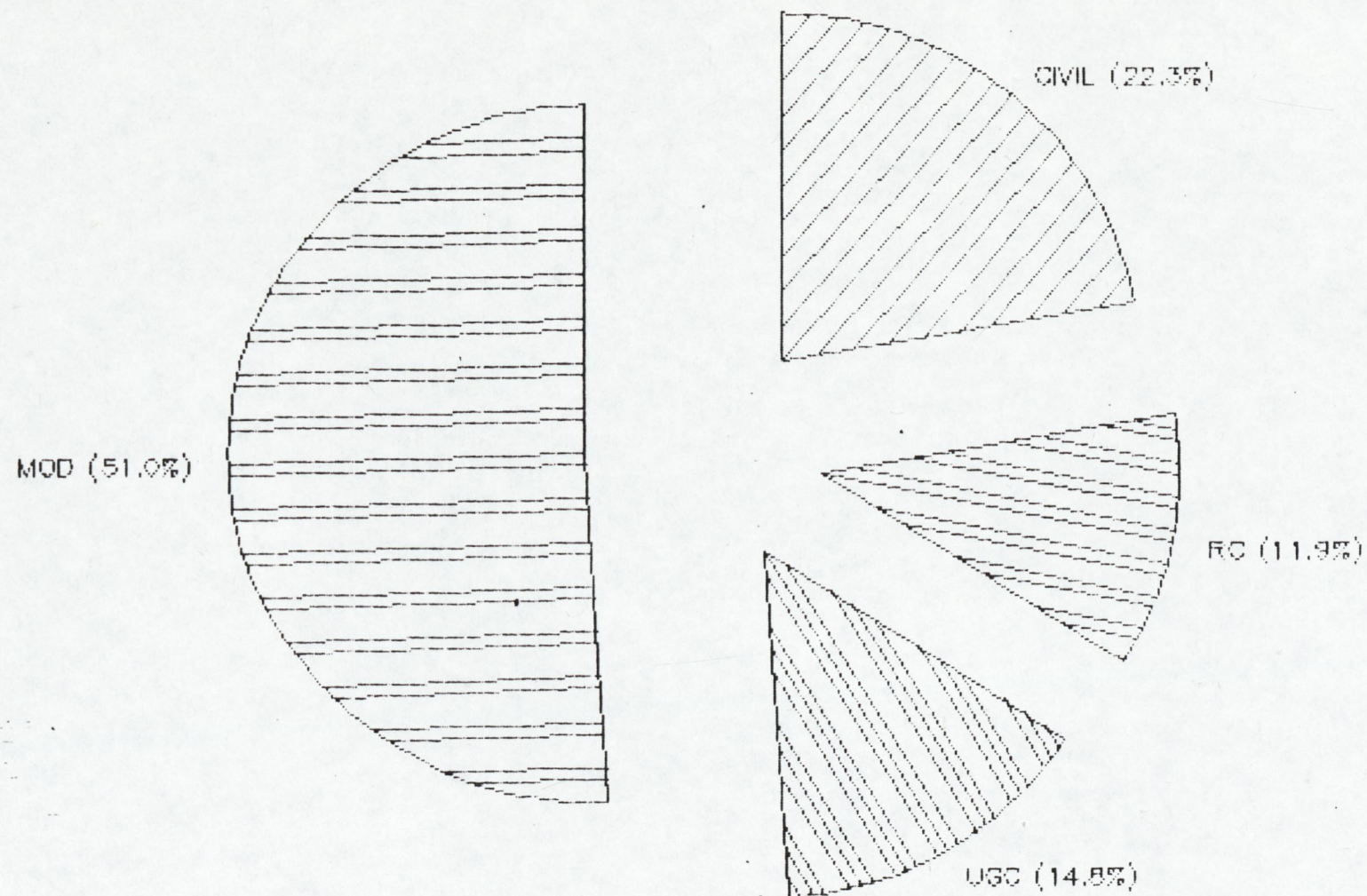
10. Chart 6 shows total Government R & D financing as a percentage of GDP. The UK, France and the FRG are all above 1%. OECD data show the USA Government to spend a similar proportional amount, but Japan with only 0.5% of GDP spends proportionately less than the UK.

11. The USA, France and the UK all spend a significant amount of R & D in the defence field. As a percentage of GDP, the UK Government spends 0.7% on civil R & D which is similar to Italy, more than Japan (0.5%) and USA (0.4%), but less than FRG and France (both 1%).

12. In terms of total expenditure on civil R & D (that is both Government and private), the available data show that the FRG and Japan both spend about 2.5% of GDP, whereas USA, France and the UK all spend less than 2%.

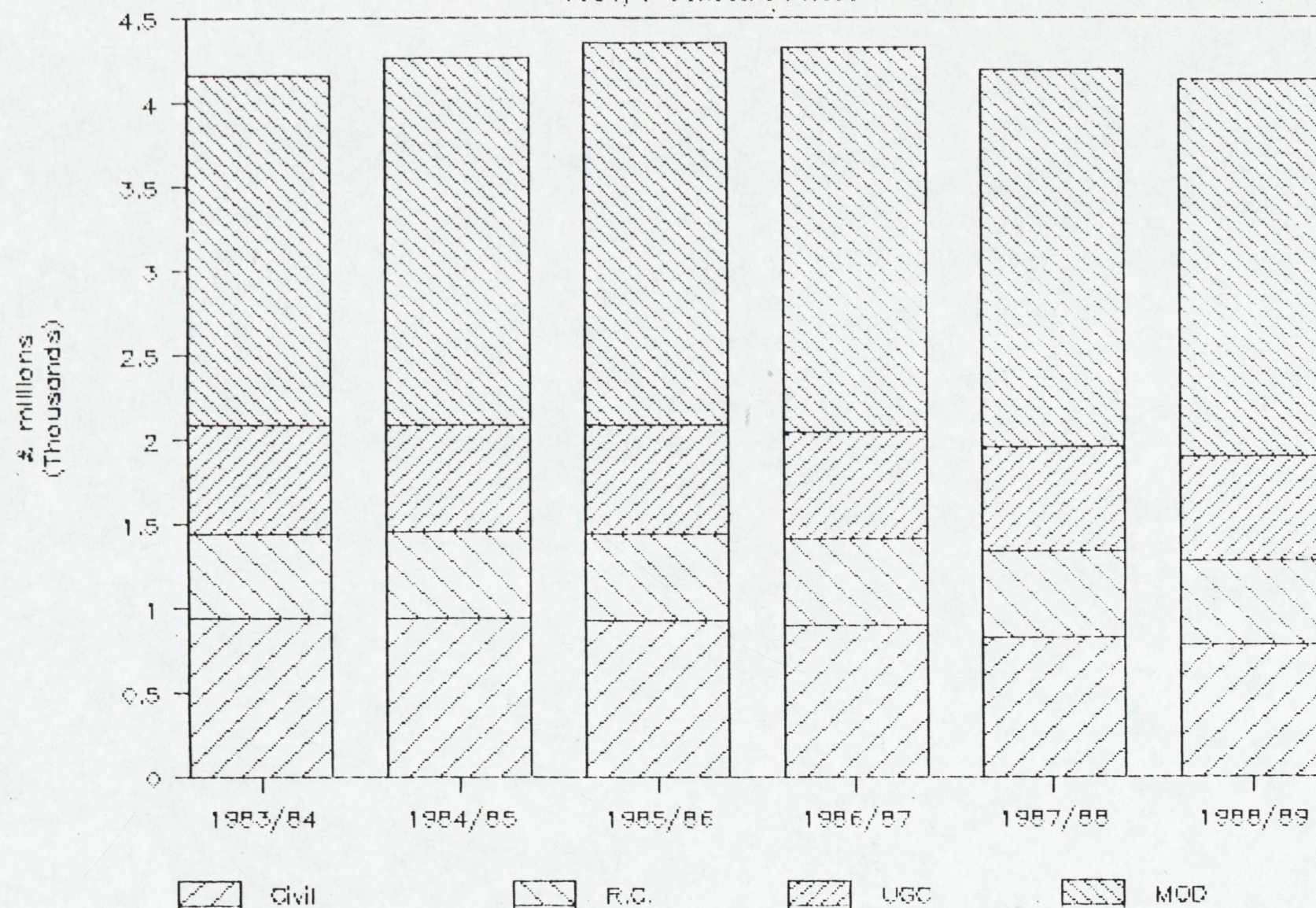
Total R&D Expenditure 1984/85

Chart 1.



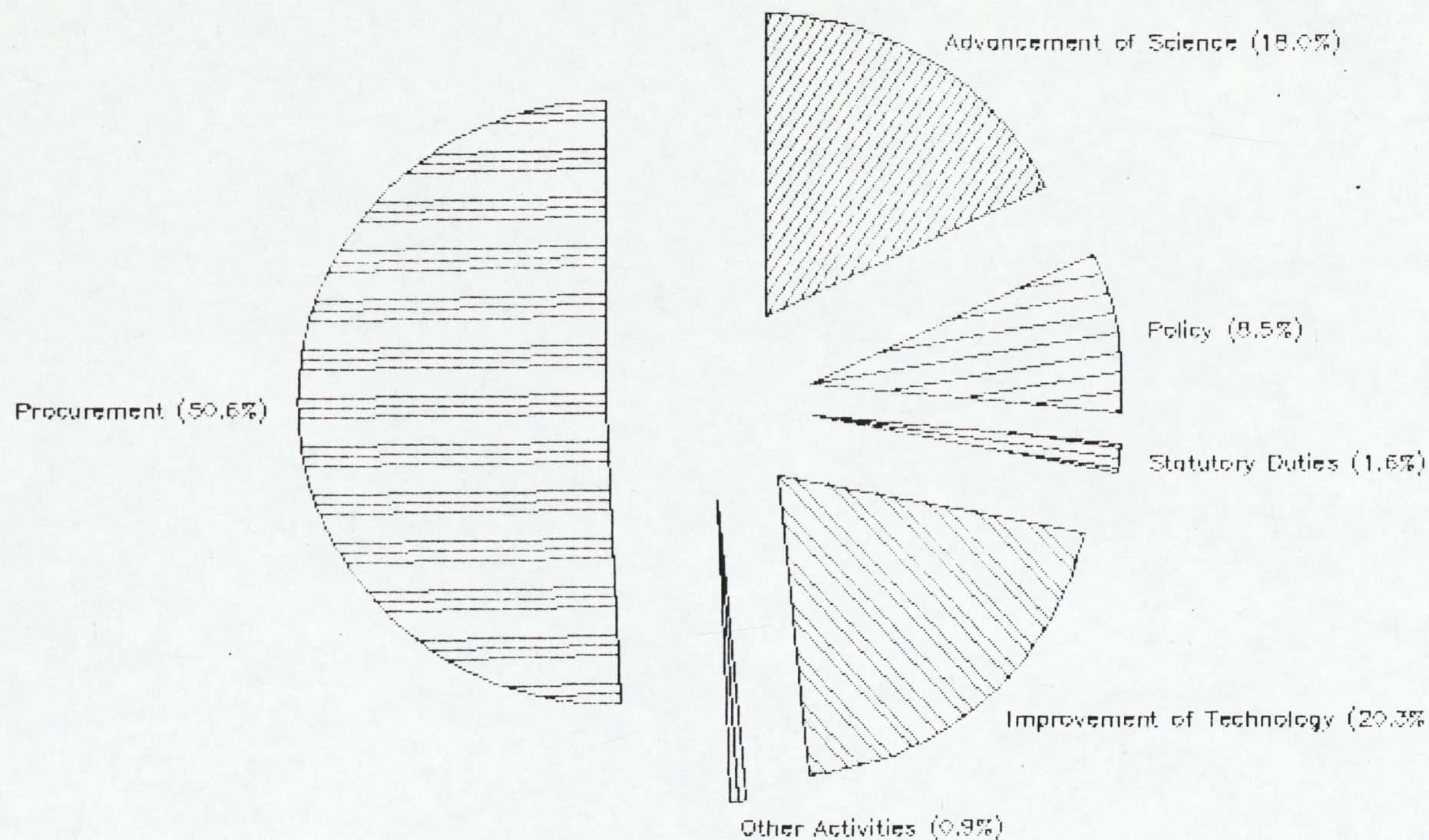
Total R&D Expenditure

1984/5 Constant Prices



PRIMARY PURPOSE OF GOVERNMENT R&D

1984/85



INDUSTRIAL R&D BY SECTOR 1983

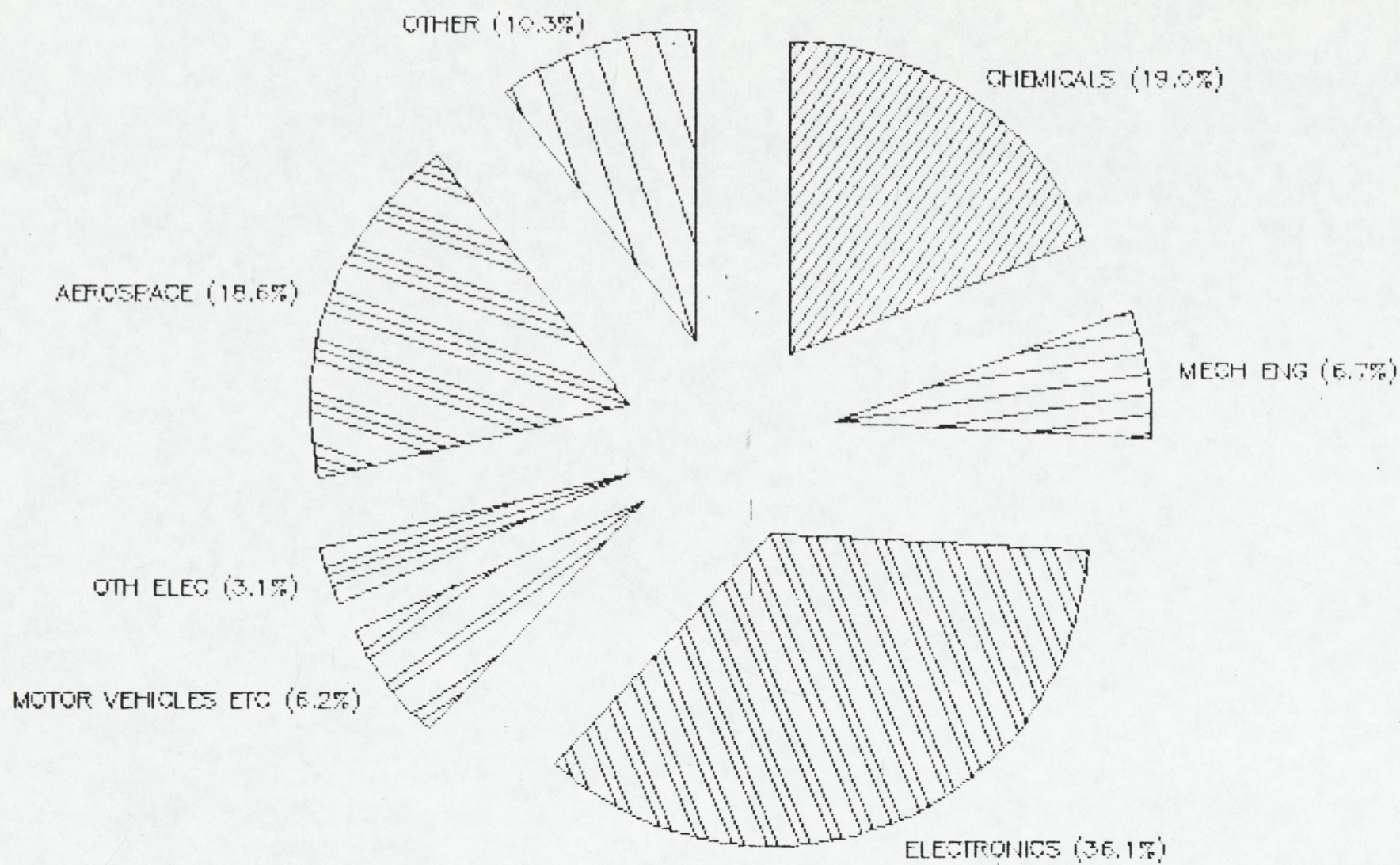
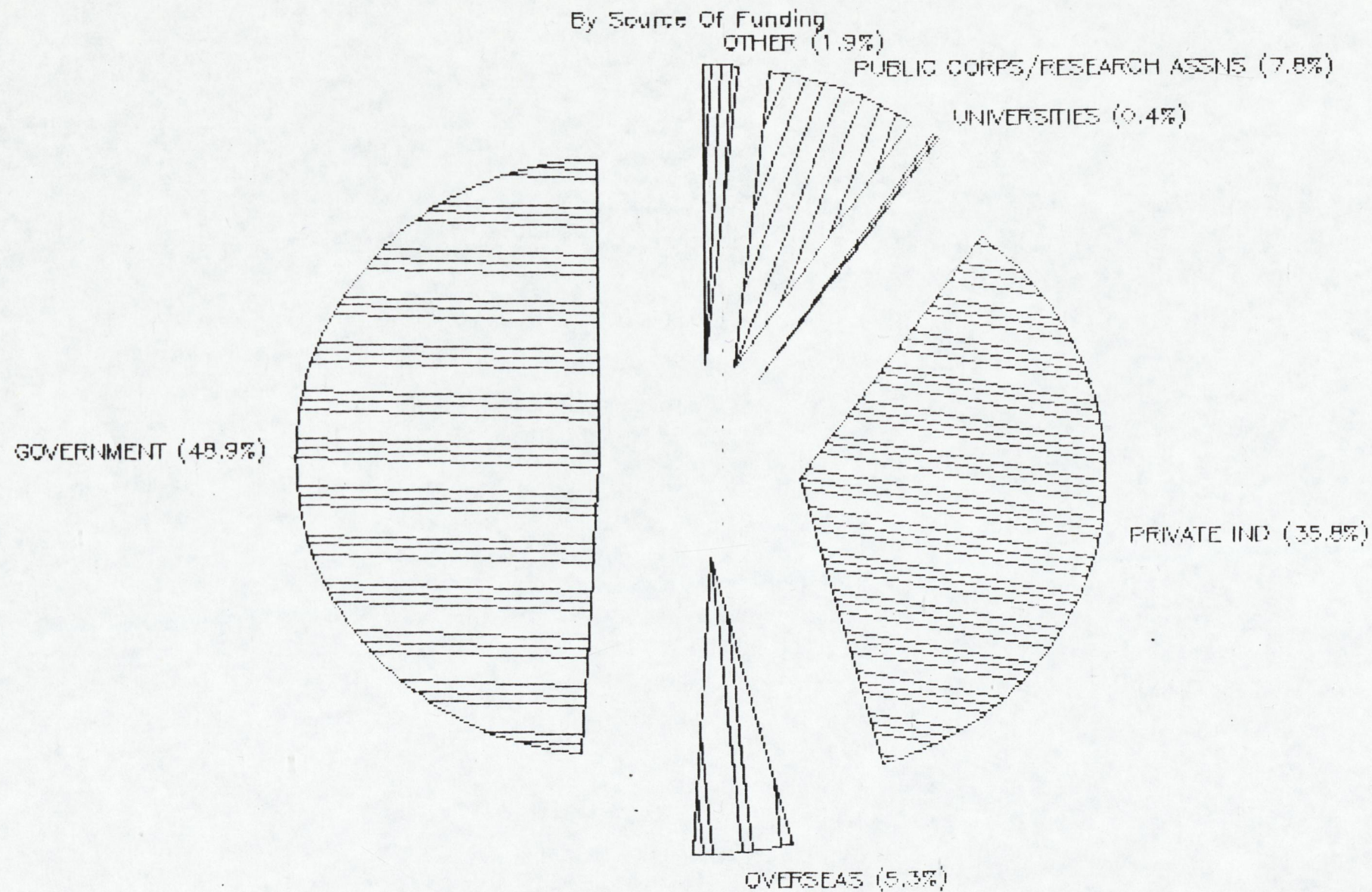


Chart 5

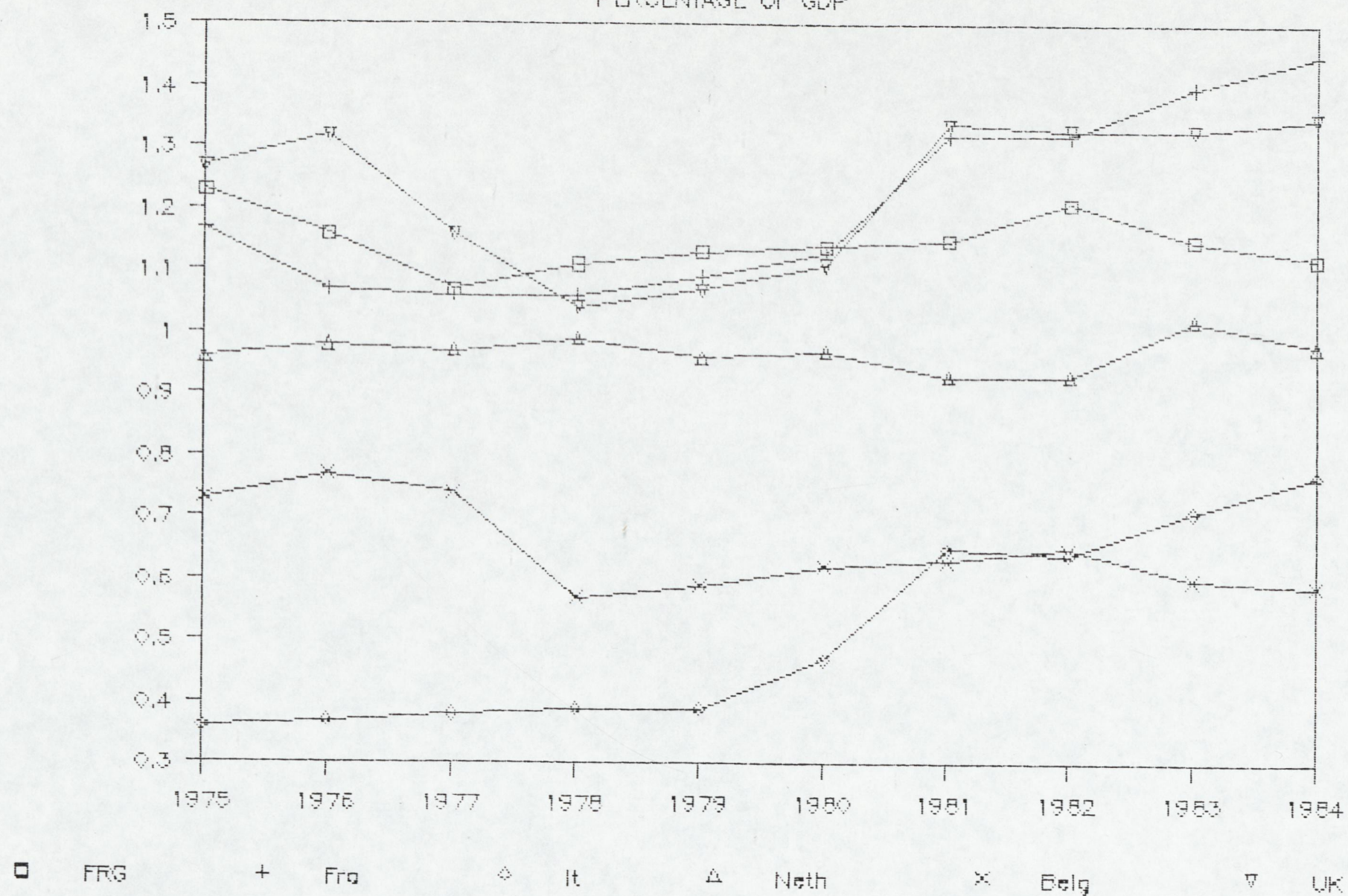
TOTAL R&D EXPENDITURE 1983

By Source Of Funding



GOVERNMENT R&D FINANCING

PERCENTAGE OF GDP



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PRIME MINISTER

22 July 1986

BRIEF FOR THE MEETING WITH SIR FRANCIS TOMBS (CHAIRMAN OF ACARD)
ON 25 JULY AT 11.30.

LINE TO TAKE

You will wish to thank Sir Francis for sending ACARD's comments on the 1986 Annual Review of Government Funded R&D and welcome this opportunity for discussing the points made in his covering letter.

BACKGROUND

Over the last four years the Advisory Council for Applied Research and Development (ACARD) has submitted its advice on the Annual Review of Government Funded R&D (further details of ACARD are at Annex A). The advice on the 1986 Review was sent to the Prime Minister by Sir Francis on 17 July 1986 with a covering letter noting the points which he will wish to discuss (this is attached at Annex B).

1. ACARD's concerns on enhancing the wealth creation potential of Government Expenditure on R&D

LINE TO TAKE

Although ACARD's advice on the Annual Reviews has not been the only influence on Government it has been an important influence. Government is vitally concerned to ensure that the R&D programmes undertaken by Departments are efficient and enhance the innovative capacity of the economy and ministers are now meeting regularly to review the priorities of Government sponsored R&D programmes - the wealth creation potential of these programmes is a major factor in assessing such priorities.

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The total amount of money spent by Government on R&D is enormous and there does need to be some redistribution of this spending which will feed through to sectors in line with their potential contributions to GDP.

So you see that ACARD's advice is taken seriously and we are grateful for the considerable amount of work members put in to produce Council's Comments on the Annual Review.

BACKGROUND

Command 8591 which set up the Annual Review process also stated that Government would look to ACARD for independent annual advice on Departments' research programmes and budgets. In accordance with this ACARD has reviewed the 1983, 1984 and 1985 and now the 1986 Reviews and made detailed comments on the last three of these.

In 1985 the main thrust of ACARD's comments on the Annual Review was that Departments' R&D programmes should be assessed against their relevance to wealth creation.

In July 1985 E(A)18th Meeting had a discussion on the issue of R&D priorities across Government (E(A)(85)19) and resulting from this MISC 119 was set up to: review the R&D programmes of Government Departments, to assess the relative priorities of the different programmes, to consider the scope for change in the size, content and objectives of those programmes which could contribute to improving the efficiency, competitiveness and innovative capacity of the UK economy. MISC 119 reported to E(A) in February 1986 6th meeting and E(RD) and its related official committee E(RD)(O) were formed (E(A)(86)2). E(RD) has met three times and the Chairman - the Secretary of State for Trade and Industry is due to submit his first progress report to you.

ACARD has been informed in general terms about this machinery set up to conduct the reviews of R&D priorities across Government.

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The Science and Technology Assessment Office (the establishment of which was announced on 2 July) situated in the Cabinet Office and responsible to the Chief Scientific Adviser, will have as one of its tasks the evaluation of Departments' R&D programmes in terms of the contribution they make to the competitiveness and innovative capacity for the UK economy.

2. ACARD's concerns on the levels of expenditure by Government on civil and defence R&D

LINE TO TAKE

Expenditure on civil R&D

The statistics in the 1986 Annual Review show Government spends in total roughly the same proportion of GDP on R&D as France and more than the US and Japan. The total level of expenditure on civil R&D in the UK as a proportion of GDP is comparable with that of France.

I cannot accept that simply increasing Government expenditure on civil R&D will necessarily act as a motor to stimulate the competitiveness of UK industry.

The reasons for the relative decline in the UK's ability to bring new innovative products to the market place are complex and not well understood.

Industry itself must decide on the research it needs and be prepared to invest accordingly. The evidence shows that industry generally in the UK is not prepared to give R&D the same level of priority as industries in our competitor nations. I am pleased that ACARD will be advising on measures that could be taken to encourage the private sector to sponsor more R&D. I am sure that ACARD's report will make a useful contribution.

Expenditure on defence R&D

The question of the levels of Government expenditure on defence related R&D is a complex matter. The statistics in the latest Annual Review show that the greatest part of this expenditure is on development rather than on research and the equipment that the armed forces need is of course determined by the tasks

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placed on them and these are becoming increasingly severe. I appreciate ACARD's concern about the level of expenditure on defence R&D.

It is right to see whether we can obtain defence equipment with less R&D investment by Government and in ways which offer better commercial returns both in defence exports and in civil products. The recent initiatives taken by MOD - in particular the Defence Technology Enterprises Company - will encourage the spin-off of technology from defence R&D to the civil sector.

BACKGROUND

In 1985 ACARD contested the statement made in Command 8591 that the level of UK's R&D expenditure as a proportion of GDP was sufficient. They urged that action be taken to secure an increase in the total investment in civil R&D from both Government and private sector sources. This year, ACARD urges Government to consider whether expenditure on civil R&D by Government should be given a higher priority (1986 Comments paras 1.5 and 2.1).

France and the FRG each spend about 1.0% of GDP on Government support for civil R&D; like Italy the UK Government spends about 0.7% of GDP on civil R&D; the USA and Japan each spend about 0.5%. (Ref Annual Review Table F1a).

OECD data shows that in the UK 60% of the expenditure on private sector R&D comes from industry itself whereas in France, US, FRG and Japan the figures are higher, ranging from 70% to 98%. (Annual Review Table F2)

ACARD has been requested to advise Government on measures that could be taken to improve the flow of private capital to pre-competitive R&D and to innovation (ARD(86)16).

In 1984 ACARD expressed concern at 'the opportunity costs associated with current and projected levels of defence R&D'. These comments contributed to the decision to set up the Official Committee on Defence Research and

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Development (MISC 110), as a result of whose work E(A) decided in July 1986 that defence R&D should be restrained to the declining profile given in the 1985 Long Term Costings. MISC 110 has submitted its second report to E(RD) (E(RD)(86)6). This report makes recommendations for increasing the economic benefits from defence R&D, including changes in R&D practices, procurement practices and the planning of the UK's approach to international collaboration. The recommendations were accepted by E(RD), and Departments will report to E(RD) on the follow up work. THIS IS NOT KNOWN TO ACARD

In 1986 ACARD is emphasising the need for methods to be found to ensure that technologies developed for defence are fully exploited in the civil sector (1986 Comments para 1.6). MOD have taken a number of recent initiatives designed to increase the civil spin-off from defence R&D: a joint initiative between MOD and a consortium of eight companies has led to the formation of Defence Technology Enterprises plc (DTE), a private sector company formed to transfer technology from MOD research establishments to civil industry; industrialists have also been invited to be members of the Controller Establishments Research and Nuclear (CERN) board with the express aim of enhancing liaison between MOD research and industry generally.

Mr P Levene - Chief of Procurement, MOD attended the Council's meeting on 1 May 1986 to discuss the influence of MOD sponsored R&D on UK industries generally (ARD(86)20).

Sir Francis Tombs and some members of ACARD had an informal evening meeting with Mr Younger on 10 June 1986 at which some of the above matters were discussed.

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3. ACARD's concerns on the level of technology transfer from Government R&D

LINE TO TAKE

I would agree with ACARD that the wider economic benefits of R&D undertaken by Departments can be enhanced by appropriate technology transfer machinery being in place and used to advantage. Many departments are aware of this and have taken measures to promote technology transfer: DTI spends 14% of its budget on such activities and finds this a cost-effective means of promoting the beneficial uptake of technology by UK industry.

The level of technology transfer will of course be one of the factors used by the new Science and Technology Assessment Office when it evaluates the outputs from Government supported R&D programmes.

It is appropriate for Departments to review their approaches to technology transfer and I will ask chief scientists to consider and respond to ACARD's recommendation that a senior member of each Department be assigned responsibility for technology activities.

BACKGROUND

For the 1986 Annual Review, Departments were asked to provide more information on their technology transfer activities and ACARD has reviewed and made comments on their submissions.

ACARD's view is that Departments' efforts to encourage the transfer of technology from their programmes are rather narrow. (Comments para 3.8) They make recommendations that Government must give emphasis to technology transfer into manufacturing which will lead to enhanced international competitiveness (Comments para 3.9). They recommend that technology transfer must become a major issue for Government R&D and that responsibility for technology transfer should be assigned to a senior member of each Department (Comments para 3.11).

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4. ACARD's recommendations concerning Government procurement practices

LINE TO TAKE

I agree that when Government is a dominant or major customer it should not lose sight of the need to help rather than hinder the supplying industries in becoming and remaining internationally competitive. It is essential that we obtain the goods and services we need at the cheapest possible price but not at the cost of having companies so geared to satisfying government customers that they are unable to meet the demands of larger, international markets. It is a difficult balance to achieve and one on which I welcome ACARD's advice.

BACKGROUND

ACARD in its Comments on the 1986 Annual Review recommends that public purchasing policies be modified to ensure more stimulus for technological advance. (Comments para 6.5)

In particular they say that DOE and DTp should ensure that their procurement practices stimulate the construction industries (Comments paras 4.13, 4.16).

Similar recommendations are made by ACARD's recent reports on the Medical Equipment and Software Industries.

The Government machinery which has been set up to review R&D expenditure and priorities will be examining the programmes of DOE and DTp as one of their first tasks and will be looking in general at the procurement issues addressed by ACARD.

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5. ACARD's recommendation to stimulate cross-departmental work

LINE TO TAKE

I agree that it is important that Departmental boundaries should not get in the way of effective research and development but I believe that the measures we are already taking will help to prevent this and I am confident that Mr Fairclough will give this matter high priority.

BACKGROUND

ACARD has expressed a concern on what it sees as deficiencies in the mechanisms in place to initiative, control and co-ordinate programmes of R&D which involve or are of concern to more than one Department (Paras 1.4 and 3.5).

The Assessment Office will be in a position to do the type of work suggested by ACARD and should be able to assist ACARD with its own studies.

Cabinet Office

22 July 1986

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ANNEX A

GENERAL BACKGROUND TO ACARD

The Advisory Council for Applied Research and Development (ACARD) was established in 1976.

It was given new terms of reference in 1982. These are as follows:

'To advise the Government and publish reports as necessary on -

- i. applied research, design, and development in the United Kingdom;
- ii. the application of research and technology, developed in the United Kingdom and elsewhere, for the benefit of both the public and private sectors in accordance with national economic needs;
- iii. the co-ordination, in collaboration with the Advisory Board for Research Councils, of these activities, with research supported through the Department of Education and Science;
- iv. the role of the United Kingdom in international collaboration in the fields of applied research, design and development related to technology.'

Sir Francis Tombs (Chairman of Rolls Royce) succeeded Sir Henry Chilver as chairman of ACARD in November 1985. In April of this year the activities of the Information Technology Advisory Panel (ITAP) were subsumed into ACARD. ITAP's future work programme is to be taken forward within the Council.

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ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT

70 Whitehall, London SW1A 2AS Telephone: 01-233 7140

The Rt Hon Margaret Thatcher MP
Prime Minister
10 Downing Street
London SW1

17 July 1986

Dear Prime Minister,

The Advisory Council for Applied Research and Development has considered the 1986 Review of Government Funded R & D and their comments are enclosed.

I welcome the opportunity which I will have this year to discuss these comments with you.

The comments made by ACARD in 1984 and 1985 emphasised the need for the maximum contribution towards wealth creation to be gained from the full range of Government funded R & D programmes ACARD is very pleased to learn that Ministers are giving serious consideration to this matter and that the establishment of the Science and Technology Assessment Office reporting to your Chief Scientific Adviser, will strengthen their ability to assess the economic return to R & D. We hope that this process will lead to a reallocation of expenditure to maximise this return.

ACARD's principal comments on the 1986 Review concern the decline in civil R & D expenditure whilst that for defence continues to rise, (this concern applies particularly to DTI, DOE and DTp as sponsors and customers for industry); the lack of effective cooperation between Departments; the need to increase technology transfer activity and to make better use of the procurement 'muscle' of Departments to improve our international competitiveness.

ACARD believes that a modest central fund would enable primary investigations of R & D matters to be undertaken in order to stimulate more cross-departmental work. This is one of the aims of studies undertaken by ACARD and we would hope to underpin these on occasions with more detailed work.

I look forward to discussing these issues and others contained within the attached comments with you when we meet on 25 July.

Yours sincerely

Francis Tombs

SIR FRANCIS TOMBS

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ANNEX C

ACARD REPORTS

In the past three months ACARD has published the results of its three most recent studies into:

1. **Exploitable Areas of Science** (May 1986) - which considered how research could be organised in the UK to give greater economic returns. The report makes the point that in contrast with some other industrial competitor nations (notably US, Japan, France) the UK does not have a visible process for holding debates - involving industry, academia and Government - on the most appropriate directions for our national scientific effort.

ACARD concluded that such a process should be established in the UK. The process would take account of the potential market exploitation of branches of science and technology and recommend priorities.

A firm of consultants has been appointed to advise ACARD how this process could be established in the UK. These consultants will be reporting early in 1987. It is expected that ACARD will then put forward proposals on how the process can be set up, where it is to be located and the funding provisions that are necessary.

2. **Software** (June 1986) The ACARD report on Software was published on 16 June with the approval of the Prime Minister. It draws attention to the possibility that the UK was failing to win its expected share of world markets and that industry generally was failing to develop and apply software sufficiently rapidly and widely.

The main recommendations of the report for Government are that by appropriate co-operation Departments should use their public purchasing power to stimulate

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new applications and development methods and that more attention should be given to technology transfer in the IT industries by the formation of an organisation whose aim would be to provide advice nationally on software applications, marketing, training and technology transfer. The Minister of State for Industry and Information Technology is co-ordinating the Government's response to this report of ACARD. The report and its recommendations were amongst the topics discussed at an informal meeting in March between the Minister, Sir Francis Tombs and other ACARD members.

This report has proved to be controversial with the software industry. Many companies have had a rapid rate of growth and have been very innovative but they have not made any inroads into world markets and show few signs of adopting trading strategies which will make them effective exporters.

3. Medical Equipment Report: (July 1986) The ACARD report on Medical Equipment was published on 10 July, with the Prime Minister's agreement. Its main recommendations are concerned with using the power of the NHS purchasing budget more effectively to encourage the UK industry to develop products which will be competitive internationally. There are also recommendations on primary health care services, Government R&D support, opening up the European market, and collaboration between industry and the health care professions, amongst other topics. The general thrust of the report is consistent with the policies of the Government, though some individual recommendations may prove difficult to accept. The Secretary of State for Health and Social Security is coordinating the Government response. Sir Francis Tombs and other ACARD members had a useful and positive meeting with him in June to discuss the report.

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Research and Development in the UK

Key Facts and Figures

1. Government funded R & D was valued at **£4.3 billion** in 1984/5.
2. Of this **£2.2 billion** (51%) is attributed to the Ministry of Defence.
3. Largest expenditure by Civil Department is DTI - **£346.7m** in 1984/5. This is projected to decline to **£252.1m** in 1988/89 in current prices.
4. In 1983 (latest year for which full detail available) total expenditure in the UK on R & D was about **£6.6 billion** - of which about **half** was funded by Government. The combined expenditure of Private industry, Nationalised Industries, and monies from Overseas account for the other **half**.
5. UK Government spending on R & D represents about **3%** of Government budget.
6. UK Government spending on R & D is about **1.3% of GDP** in 1984/5.
7. Government employs at present (1984/5) about **57,000** people on R & D. Approximately **17,500** are degree level and **8,500** technicians (all figures include UKAEA).



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PRIME MINISTER

22 July 1986

ANNUAL REVIEW OF GOVERNMENT FUNDED R & D
COMMENTS FROM ACARD

You have agreed to see Sir Francis Tombs on 25 July to discuss with him ACARD's comments on the 1986 Annual Review of Government Funded R & D. This is the fourth such Review and the third on which ACARD has commented.

2. The Review, which was established by my predecessor, Sir Robin Nicholson, is proving to be a useful document in prompting discussion within Government on the balance of R & D expenditure and whether that balance might not be altered in a way which will create greater wealth, increased efficiency, innovation and competition.

3. The new machinery for Ministers to discuss Research and Development regularly, supported by an Official Group and the Science and Technology Assessment Office can be seen as logical developments stemming from the Annual Review process.

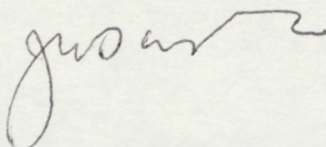
4. ACARD's role in this development has been important. In 1984 and 1985 ACARD's comments, which are confidential to Government, emphasised most of the main themes which Ministers are now addressing - namely the need

- to improve the contribution of Government funded R & D to wealth generating technology
- to press for greater spin-off from defence to civil industry and to question the balance between defence civil R & D
- to highlight the relative lack of funding for industrial R & D from industry itself
- to make Government expenditure on R & D more responsive to new market opportunities and technological advances.

5. The same themes arise in ACARD's comments this year but having already registered these as matters of general concern ACARD is beginning to look each year at particular Departments and areas of research in more detail. ACARD members undertake a considerable amount of work and it is their detailed work and questioning of Departments as much as the comments themselves which have led to greater appreciation of the need to establish clear objectives, rigorous monitoring of progress towards those objectives and a greater drive towards wealth generation.

6. ACARD have not so far received any formal response from Government to their comments. Sir Francis has now requested that they should and I am prepared, with your agreement, to arrange for this to be done through the Committee of Chief Scientists. In my view it is important to provide some feedback to maintain the energy and momentum of ACARD's work.

7. I hope you will feel able to welcome ACARD's comments and assure Sir Francis of their value.



JOHN W FAIRCLOUGH
Chief Scientific Adviser