

PART 6

CONFIDENTIAL FILING

Moratorium on Applications for
Support and Innovation

INDUSTRIAL POLICY

Research and Development

PT1: November 1989

[In attached folders: ESRC Refut: Research Proposal Form
Not present in the research grant scheme.]

PT6: January 1989

Referred to	Date	Referred to	Date	Referred to	Date	Referred to	Date
17.1.89							
12.11.89							
11.6.89							
4.8.89							
7/9/89							
PART ENDS							

PREM 19/2737

● PART 6 ends:-

PA 15 LDP 7/9/89

PART 7 begins:-

for Sec 15 PM 10/9/89.

SW2AZJ

CHARLES ✓

EC R&D FRAMEWORK PROGRAMME

Paul
think you - I
will certainly
you in put
round
CD? 7/9.

There was some discussion at Robin Butler's Deputy Secretaries meeting yesterday of latest developments on, and handling of, the EC R&D framework programme.

The Commission have now come forward with proposals for additional spending of 7.7 billion écu over five years, which will clearly have a major impact on the UK's contribution - perhaps the order of £1 billion spread over five years. It was agreed that following the initial discussion in OD(E) a minute should be put to the Prime Minister giving initial reactions; and that we then might plan to have a discussion in E(ST) in October. This latter step would follow the first Council meeting later this month to discuss the Commission's proposals; but everyone seems confident nothing much will happen at that.

All of this will tie in quite closely with discussions in this year's Survey for quite a number of departments, and I should be grateful if you could keep me in touch if the papers come to you.

Paul

(PAUL GRAY)

7 September 1989



Ministry of Agriculture, Fisheries and Food
Whitehall Place, London SW1A 2HH
01-270 8709/8667

From the Minister's Private Office

Mr Andrew Turnbull
Principal Private Secretary
to the Prime Minister
10 Downing Street
LONDON SW1A 2AA

10 August 1989

NBL

*File
10/8*

Dear Andrew,

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

I refer to your letter of 17 July ¹⁹⁸⁹ to Tom Jeffery (DES) and Dominic Morris' letter of 2 August to Brian Hawtin (MOD).

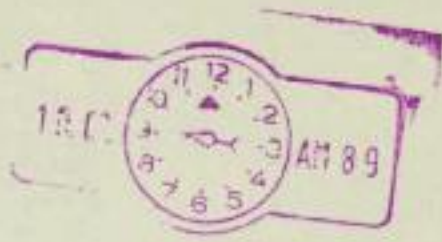
I can confirm that we have no reservations about publication of the report in full. However, we do have some comments on the substance of the report and would wish to contribute to the formulation of the Government response.

I am copying this letter to Neil Thornton (Department of Trade and Industry), Roger Bright (Department of the Environment), Brian Hawtin (Ministry of Defence), Stephen Crowne (Department of Education and Science), Carys Evans (Chief Secretary's Office), John McCann (Minister of State for Employment's office) and to John Fairclough (Cabinet Office).

J. Stagg

SHIRLEY STAGG (MRS)
PRINCIPAL PRIVATE SECRETARY

Ind Bd - Supp & Inv



CONFIDENTIAL

copy



DEPARTMENT OF THE ENVIRONMENT
2 MARSHAM STREET LONDON SW1P 3EB
01-276 3000

My ref:
Your ref:

10 August 1989

*NBM
Race
10/8*

Dear Mr Turnbull,

file with PG

OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

In response to your letter of 17 July 1989 to Tom Jefferey on the above, seeking an indication of any difficulties that might arise in making public the ACOST report recommendation, I note that the only recommendation that would have a direct effect on the Department would be recommendation 3, namely, for Government Departments and agencies to give special consideration to smaller firms when letting R and D contracts to meet mission needs. The mission needs of the Property Services Agency are relevant here; while these are very modest and reducing, the recommendation could create some conflict of purpose within PSA's current practice and this would need to be examined if the recommendation were accepted as it stands. I am only wishing to note here that the Department has some doubts on how the recommendation would work out in practice. These doubts are not seen as grounds for objecting to the recommendation being made public.

Similarly, while the other recommendations are primarily for DTI and the Department of Employment, from the DOE's standpoint no difficulties are foreseen in their publication.

I am copying this letter to the copyees of your letter.

Yours sincerely

Mark Barnett

Mark Barnett
Private Secretary

Andrew Turnbull Esq



CONFIDENTIAL

Ind Ref = ST 1 with pg



FR PG
1

CABINET OFFICE

70 Whitehall London SW1A 2AS Telephone 01-270 0391

CONFIDENTIAL

Our ref: Qe 0045
File ref: ST 140/3

9 August 1989

To: E(ST)(O) Members

Dear Colleague

**PUBLICATION OF 'R&D ASSESSMENT, A GUIDE FOR
CUSTOMERS AND MANAGERS OF RESEARCH AND DEVELOPMENT'**

At its meeting on 13 July 1988, the Committee invited the Assessment Office to proceed with publication of its guide to R&D assessment (E(ST)(O) 3rd Meeting, Minute 5).

Following further consultation with Departments, the guide has now been published (ISBN 0-11-430036-4) and copies have been provided to assessment contacts in Departments.

Yours sincerely

IAN DIXON

CONFIDENTIAL



cel. h
mbh
Price
e/p

Treasury Chambers, Parliament Street, SW1P 3AG

4 August 1989

Andrew Turnbull
No 10 Downing Street
LONDON
SW1A 2AA

Dear Andrew,

Top
OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

Thank you for copying Carys Evans your letter to Tom Jeffery of 17 July, together with ACOST's report on Overcoming Barriers to Growth in Smaller Firms. I can confirm that, although there are some points in the Report which we would not necessarily endorse, none of them present us with any particular difficulties. We have no objection, therefore, to the Report's recommendations being published.

I am copying this letter to Neil Thornton (DTI), Roger Bright (DOE), Brian Hawtin (MOD), Shirley Stagg (MAFF), John McCann (DE) and to John Fairclough (Cabinet Office).

Yours,

Peter

PETER WANLESS



10 DOWNING STREET

LONDON SW1A 2AA

2 August 1989

From the Private Secretary

See Sina

ACOST REPORT: OVERCOMING BARRIERS
TO GROWTH IN SMALL FIRMS

We spoke this morning about your letter of 21 July to Andrew Turnbull.

I can confirm that the intention of Sir Francis Tomb's letter to the Prime Minister of 17 July was to seek approval for publishing the whole report. We agreed that it would be helpful to have sight of any substantial comments and reservations which the MoD have about publication of the whole report, so that the Prime Minister can consider this in the round. It would be helpful to have these within the next two to three days.

I am copying this letter to the Private Secretaries to the members of E(ST).

Yours sincerely,
Dominic Morris
DOMINIC MORRIS

Brian Hawtin, Esq.,
Ministry of Defence

CONFIDENTIAL

to



CABINET OFFICE

70 Whitehall London SW1A 2AS Telephone 01-270 0391

CONFIDENTIAL

Our ref: Qe 0041

File ref: ST 140/1

31 July 1989

Mr Gray
10 Downing Street
London
SW1

Dear Mr Gray,

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALL FIRMS

at hand
Your note of 26 July to Mr Fairclough asks for clarification on whether the whole of this Report should be published or only the recommendations.

The ACOST Secretariat have confirmed that Sir Francis Tomb's letter to the Prime Minister of 17 July should be read as seeking agreement to publish the whole report. The S&T Secretariat advice is to agree to this. To limit publication to the recommendations would be an unnecessary departure from previous practice.

Mr Turnbull's letter of 17 July to Mr Jeffrey, copied to Private Offices will need supplementing if No 10 decides to publish the whole Report.

Yours sincerely

IAN DIXON

Int'l Pol: Research +
Development
A6



CONFIDENTIAL



me pm

10 DOWNING STREET

LONDON SW1A 2AA

From the Private Secretary

MR. FAIRCLOUGH
CABINET OFFICE

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALL FIRMS

I think there is a danger of some confusion developing over the handling of this report. You will have seen from Brian Hawtin's letter to Andrew Turnbull of 21 July that the MOD are concerned about the possibility of the whole of the report being published. I now confess to some uncertainty about whether or not that is the intention; certainly Francis Tomb's letter to the Prime Minister of 17 July could be read as seeking agreement to publish the whole report.

Could I ask the S&T Secretariat to let me know where we stand please?

pm.

PAUL GRAY

26 July 1989

pm

CONFIDENTIAL



Department of Employment
Caxton House, Tothill Street, London SW1H 9NF

Telephone 01-273 5804/5
Telex 915564 Fax 01-273 5821

Minister of State
The Rt Hon John Cope MP

Andrew Turnbull Esq
Principal Private Secretary
10 Downing Street
London
SW1A 2AA

24 July, 1989

Dear Mr Turnbull,

OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

Your letter of 17 July referred to the report prepared by the Study Group of the Advisory Council on Science and Technology (ACOST) and requested advice on the implications of its recommendations being made public.

The report deals with an important subject and although the feasibility of some of its recommendations is not really clear we see no reason to delay publication.

I am copying this letter to the recipients of yours.

Yours sincerely,
John McCann

JOHN McCANN
PRIVATE SECRETARY




~~MR WILSON~~

Mr. G. I. you.

BJ 25/7

I am sure that No 10 should be aware of Departmental opposition to the review, and should not commit the Prime Minister to supporting it before she knows the reaction of other Ministers. The purpose of Mr Fairclough's paragraph 5 is of course to get such a commitment. I suggest that the reply could be along the lines: "The Prime Minister has no objection to your making such a proposal, but she will not reach a view on it until she has seen the reactions of other Ministers."



G W MONGER

Economic Secretariat
July 25, 1989

CONFIDENTIAL

F0472

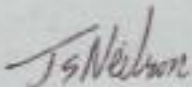
MR MONGER

PROPOSED REVIEW OF THE BOUNDARY BETWEEN R&D FUNDED BY DEPARTMENTS
AND BY RESEARCH COUNCILS

You suggested it might be useful to let the Prime Minister's Office have some background to the proposal for a review contained in paragraph 4 of Mr Fairclough's minute to Mr Gray of 19 July.

2. At E(ST)(O) on 13 July Mr Fairclough proposed that departments should undertake reviews of the far market and public good research which they commissioned. These reviews would be intended to parallel the reviews of near market research completed last year. Mr Fairclough's proposal was strongly resisted by all the departments who would have to carry out such reviews, although it received some support from the Treasury. Departments suggested that the proposal was ill-defined and potentially wide-ranging. Many departments pointed to recent or current work which would duplicate any further review. Overall the strong impression was given that departments tended to be over-burdened with reviews and allowed insufficient time to consider scientific issues. Whilst such a reaction from departments was not surprising, the force with which it was given went well beyond ritual complaints about limited resources.

3. Mr Fairclough's proposal of 19 July for a review of the respective roles of Research Councils and policy Departments in relation to research is a development of his E(ST)(O) proposal. Nevertheless the review could still be extremely wide-ranging and will not be at all welcome to departments. The Prime Minister may therefore wish to consider departmental reactions to Mr Fairclough's proposal before taking a decision on whether to support it. If any review were to proceed, it would be desirable for it to have clear and limited terms of reference. It might also be sensible for Mr Fairclough's own staff to undertake the review, to avoid adding to the burdens placed on departments.



J S NEILSON

25 July 1989

CONFIDENTIAL



FILE KE

be P.U.

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

MR. KEVIN THOMAS
CABINET OFFICE

1989 ANNUAL REVIEW OF GOVERNMENT FUNDED R&D

Thank you for your minute of 20 July covering the draft of the 1989 Review. The Prime Minister has seen this and is content for you to proceed to publication.

I am copying this minute to Mr. Fairclough, Mr. Brown, Mr. Quigley and Mr. Woolley (Cabinet Office).

PAUL GRAY
24 July 1989

2



MO 30L

MINISTRY OF DEFENCE
 MAIN BUILDING WHITEHALL LONDON SW1A 2HB

Telephones 01-218 2111/3

21 July 1989

Dear Andrew,

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

Thank you for a copy of your letter of 17th July 1989 to Tom Jeffrey, seeking confirmation that Departments would have no objections to the recommendations of the report being published.

Recommendation 3 is the only one of direct concern to the Ministry of Defence; it proposes that 1.25% of the R&D expenditure of Government bodies should be set aside for small firms. This is, of course, a subject we have looked at on a number of occasions; our view remains that such set-aside forms an obstacle to the achievement of value-for-money, and that it is preferable to evaluate all bids on an equal basis.

Although we would not wish to accept this recommendation, we would not object to its publication: the case for our current policy is strong. It would, however, be better to make that case available at the same time as the report is published; indeed, would it not be appropriate to follow the precedent of the recent ACOST report on Defence R&D, and to publish a government response at the same time as the report?

You also mention that ACOST wish to publish only the recommendations and our comments reflect that wish. But I should mention that, if there is any question of publishing the body of the report as well, there are a number of other points on which we would wish to comment.

I am sending a copy of this letter to the recipients of yours.

Yours sincerely

(B R HAWTIN)
 Private Secretary

Andrew Turnbull Esq
 10 Downing Street

dti

the department for Enterprise

cel.u

RESTRICTED

The Rt. Hon. Lord Young of Graffham
Secretary of State for Trade and Industry

Andrew Turnbull Esq
10 Downing Street
LONDON
SW1A 2AA

**Department of
Trade and Industry**

1-19 Victoria Street
London SW1H 0ET

Enquiries
01-215 5000

Telex 8811074/5 DTHQ G
Fax 01-222 2629

Direct line 215 5422
Our ref PB6AQB
Your ref
Date 21 July 1989

See Andrew

file with PG

OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

Thank you for copying to my Secretary of State the ACOST report on Barriers to Growth. You asked for an early response: I think it likely that we will see no reason to oppose early publication of the report.

We will be in touch again on Monday if, and only if, our view changes.

Yours ever

In Sincerity

18 GARETH JONES
Private Secretary

**the
Enterprise
Initiative**



Recycled Paper

CONFIDENTIAL



mpm

gll

*RAIG
24/7*

SECRETARY OF STATE FOR ENERGY
THAMES HOUSE SOUTH
MILLBANK LONDON SW1P 4QJ
01 238 2290

Paul Gray Esq
Private Secretary to
The Prime Minister
10 Downing Street
LONDON
SW1A 2AA

2/July 1989

Lead Paul

INTERNATIONAL R&D PROGRAMMES

My Secretary of State has seen the minute which the Chief Scientific Adviser addressed to the Prime Minister on 11 July and the attached report.

He is content with the proposed guidelines for the negotiation of UK participation in future international R&D collaborations. He is also content that a discussion in E(ST) of the recommendations on individual programmes should be prepared as Mr Fairclough suggests.

I am sending copies to the Private Secretaries for the other members of E(ST), Sir Robin Butler and to Mr Fairclough.

*Yours
David*

D A MURPHY
Private Secretary

PS Abak message 'phoned through earlier

CONFIDENTIAL

CC 80
not draft

Qc 0077

File ref: ST 134/2

20 July 1989

Prime Minister

MR GRAY

- cc Mr Fairclough
- Mr Brown
- Mr Quigley
- Mr Woolley (with copy of draft)

A routine document. I have not started the despatched document. It may not be given it to the attached summary and tables.

1989 ANNUAL REVIEW OF GOVERNMENT FUNDED R&D

Content for publication?

Ref. Yes/no

RACE
u/7

1. Subsequent to your minute of 26 May 1988 it was agreed that the Prime Minister would continue to be given an opportunity to see the document before it enters the publishing process. I attach a draft of the 1989 Review which, as last year, is in its final form apart from some outstanding artwork. We plan to publish during August, I will inform you of the date once it is confirmed.

2. As last year there will be no press conference but we will offer a factual briefing to journalists if they want to be taken through the detailed figures.

X 3. I would be grateful to know by 27 July if the Prime Minister is content for us to proceed to publication.

KEVIN THOMAS

Ind PR.



R-D PR 6.

Contents

Page

Introduction

Part One

- 1.1 Government funding for R&D
- 1.2 R&D performed in UK industry in 1987
- 1.3 R&D manpower
- 1.4 Gross domestic expenditure on R&D
- 1.5 European Community R&D
- 1.6 International comparisons of R&D
- 1.7 Statistical tables

Part Two Departmental details

Ministry of Agriculture, Fisheries and Food

Ministry of Defence

Department of Education and Science

Agriculture and Food Research Council

Economic and Social Research Council

Medical Research Council

Natural Environment Research Council

Science and Engineering Research Council

University Grants Committee

Department of Energy

Department of the Environment

Department of Health and Social Security

Health and Safety Commission

Home Office

Overseas Development Administration

Department of Trade and Industry

Department of Transport

Northern Ireland Departments

Scottish Departments

Welsh Office

Department of Employment

Training Agency

Other Departments and bodies

Annexes

- A. Background to the Annual Review
- B. Terms used in the Annual Review
- C. The primary purposes of Government S&T

Introduction

1. The Annual Review of Government Funded R&D was established following the publication of the Government response (Cmnd 8591) (ref. 1) to the House of Lords Select Committee on Science and Technology report Science and Government (ref. 2). Annex A reproduces the relevant paragraphs.
2. In 1987 the Government announced (in Cm 185) (ref. 3) that the central structure for considering science and technology (S&T) priorities had been strengthened: first by collective ministerial consideration (under the Prime Minister's leadership) of S&T priorities; and secondly by the establishment of the Advisory Council on Science and Technology (ACOST).
3. The outcome of the annual consideration of S&T priorities is now announced as part of the Chancellor's Autumn Statement and in more detail in the subsequent Public Expenditure White Paper (PEWP). The supplementary analyses chapter (Chapter 21, Cm 621) of the 1989 PEWP (ref. 4) contains a summary table giving figures, by department, of outturn and planned expenditure on S&T, that is R&D plus certain other expenditure, mainly technology transfer programmes. The Annual Review presents a more detailed breakdown of the departmental outturn and planned expenditure on S&T than has already been summarised by the PEWP, together with information on a range of other S&T topics as outlined in paragraph 5.

Coverage of the Annual Review: R&D and S&T

4. The definition of R&D adopted in the Annual Review relies heavily upon the work of the Organisation for Economic Co-operation and Development (OECD). The detailed description of the coverage of R&D which the OECD prepared in the 'Frascati manual' (ref. 5) forms the basis of the definitions which are set out in Annex B. The Annual Review also covers S&T activities and categorises R&D and S&T expenditure according to primary purpose (pp). There are nine primary purposes (defined in Annex C) of which seven cover the R&D defined by Frascati and two cover those other non-Frascati activities that fall within the coverage of S&T.

Structure of the Annual Review

5. The Annual Review is in two parts. Part One is an overview of UK and international R&D and S&T, while Part Two gives a detailed view of R&D and S&T programmes of individual government departments and agencies. Part One of the Annual Review contains seven sections:

1. Government funding for R&D and S&T

This provides a summary of Government expenditure (outturn and planned) on R&D and S&T broken down by department,

primary purpose (such as advancement of knowledge, support of policy/procurement and improvement of technology) and type of research (basic, strategic and specific applied, and experimental development).

2. R&D performed in UK industry in 1987

This presents the results of the latest survey of R&D performed in industry in the UK.

3. S&T manpower in the UK

This section, which has been expanded compared with previous

Reviews, presents details of the R&D manpower employed by both Government and industry. Also included are data on those qualifying with first degrees in science and engineering (QSEs) in Great Britain and, for 1987, their first destination. The number of QSEs employed within higher education is also shown.

4. R&D in the UK

This section shows the total expenditure on R&D in the UK - gross domestic expenditure on R&D (GERD). This is derived from the information on Government R&D expenditure and expenditure on R&D performed in industry.

5. European Community (EC) R&D

This new section provides some background to the EC funded Framework Programme.

6. International comparisons

This section sets out UK R&D activity within the context of the EC and OECD countries.

7. Statistical tables

The text in Sections 1 to 6 is amplified by the use of figures. This section contains all the detailed statistical tables upon which the text and figures are based. Expenditure tables are given in both cash and real terms. Real terms at 1987-88 price levels have been obtained by applying the GDP deflator assumptions given in the Financial Statement and Budget Report, 1989-90 (ref. 6).

6. Part Two gives details of the planned R&D and S&T expenditure of each Government department or agency to 1991-92, that is the period covered in the January 1989 PEWP. Both statistics and an accompanying text are provided; the statistics each contain at least two basic tables. The first is a detailed breakdown of summary figures that were used in Part One and shows the subject

areas of interest to the department (or other body) analysed by primary purpose for the R&D. The second table provides the summary of where the R&D is spent. Where appropriate there are also statistics and text for the non-Frascati activities - mainly technology transfer programmes - that fall within the coverage of S&T.

References

1. Science and government: government observations on the first report of the House of Lords Select Committee on Science and Technology, session 1981-82 Cmnd 8591
HMSO
1982
0 10 185910 4
2. Science and government: Vol 1. Report HL(20-I)
Science and government: Vol 2. Evidence HL(20-II)
First report of the House of Lords Select Committee on Science and Technology, session 1981-82
HMSO
1981
0 10 440182 6/0 10 440282 2
3. Civil research and development: government response to the the first report of the House of Lords Select Committee on Science and Technology, 1986-87 session Cm 185
HMSO
1987
0 10 101852 5
4. The government's expenditure plans 1989-90 to 1991-92 - Chapter 21: Supplementary analyses and index Cm 621
HM Treasury
1989
0 10 106212 5
5. The measurement of scientific and technical activities: proposed standard practice for surveys of research and experimental development 'Frascati manual', 4th ed.
Paris: OECD
1980
92 64 12201 X
6. Financial statement and budget report 1989-90
HMSO
1989
0 10 223589 9

1. Government funding for R&D

Overview of Government R&D expenditure

1.1. This section of Part One of the Annual Review provides a consolidation and analysis of the individual departmental details that are given in Part Two. The tables cover the period 1986-87 to 1991-92. The data for 1986-87 and 1987-88 are outturns while 1988-89 is the estimated outturn, 1989-90 is the provision and 1990-91 and 1991-92 show the plans for these two years.

1.2. The total Government expenditure on R&D in 1987-88 was £4.6 bn, this represents 4.2 per cent of total Central Government expenditure. Figure 1.1 shows the distribution of this expenditure between the Ministry of Defence (MOD), civil departments and the combined total for the Research Councils and University Grants Committee (UGC).

Figure 1.1 Distribution of 1987-88 R&D expenditure

1.3. The distribution of the civil department expenditure given in Figure 1.1 is shown in more detail in Figure 1.2. The distribution of expenditure of the Research Councils and UGC is shown in Figure 1.3. The main civil departments are Department of Trade and Industry (DTI), Department of Energy (DEn) and Ministry of Agriculture, Fisheries and Food (MAFF). The detailed breakdown of Government expenditure by spending bodies is given in Tables 1.1 to 1.4 of Section 7.

Figure 1.2 Civil departments' expenditure 1987-88

Figure 1.3 Research Council and UGC expenditure 1987-88

1.4. The total spending in 1987-88 was little changed from 1986-87. Figure 1.4, derived from Table 1.1 in Section 7, shows the currently planned R&D expenditure in cash terms. Total Government expenditure on R&D is expected to increase by 12.4 per cent over the period 1987-88 to 1991-92. Within this total, the component devoted to civil R&D shows a significant change in balance. Expenditure by the Research Councils is planned to increase while that of the main Central Government departments decreases. This reflects the Government's acknowledged responsibility for the support of the underlying science and technology which, in future years, industry itself will be able to exploit. R&D expenditure by departments is carefully directed to support the needs of Government in its formulation and implementation of policy, its setting of standards far from market collaborative programmes and its own procurement requirements.

Figure 1.4 Trends in planned expenditure 1987-88 to 1991-92

1.5. Government expenditure is planned in cash terms. Figures 1.5 and 1.6, however, show the trends in expenditure in real terms. These figures show that the defence R&D share remains almost unchanged but that within the civil R&D expenditure there is a real change in balance. Over the period shown there is a real increase in expenditure by the Research Councils compared to their 1987-88 levels. These figures were derived from Tables 1.2 and 1.4 of Section 7, which show expenditure in real terms and percentage changes with a base year of 1987-88. These statistics were obtained by using the gross domestic product deflator in the Financial Statement and Budget Report, 1989-90 (ref. 1). They are shown at the bottom of Table 1.2.

Figure 1.5 Trends in planned expenditure 1986-87 to 1990-91
(base year 1987-88)

Figure 1.6 Trends in planned civil R&D expenditure
(real terms, base year 1987-88)

Types of activity

1.6. The R&D expenditure can also be broken down into types of activity based on those of the Frascati manual. These are basic research, applied research and experimental development. The UK divides the applied research into strategic and specific categories. Further definitions of these terms appear in Annex B.

1.7. Figure 1.7 shows the distribution of Government funded R&D in 1987-88. MOD accounted for the largest share of expenditure on experimental development (88 per cent). Of the basic research, over 95 per cent was accounted for by the Research

Councils and UGC. Figure 1.8 gives more detail on the breakdown of civil departments' R&D while Figure 1.9 covers the Research Councils and the UGC. Tables 1.5 and 1.6, which are for 1987-88 and 1988-89 respectively, give an analysis by activity for each department's R&D.

Figure 1.7 Distribution of Government R&D by activity

Figure 1.8 Distribution of civil R&D by activity

Figure 1.9 Distribution of Research Councils' and UGC R&D BY activity

Primary purpose

1.8 In reporting upon their Government funded R&D spending bodies are required to identify the primary purpose (pp) of the work. The primary purpose classification provides a convenient and practical analysis of R&D across all departments. The primary purpose is a statement on why the R&D was carried out rather than the nature of the R&D itself. The primary purpose attribution is made once there is a clear indication of the R&D that is to be carried out. Thus as a 'retrospective' classification it is not a mechanism by which Government expenditure is determined or driven - planned expenditure shown against these categories can only be indicative. For example work originally in support of policy (pp 2) could at some point in the future becoming work in support of standards (pp 5) as the policy results in a requirement for a standard. A distinction worth noting is that Government is a direct customer for the R&D under pps 2, 4 and 5 but is acting as a proxy customer in the case of pps 1 and 3.

1.9. The definitions of the primary purposes used in this review are given in Annex C. Figure 1.6 shows the distribution of spending in 1987-88 by primary purpose. Tables 1.7 and 1.8 of Section 7 are summaries of the distribution of R&D by seven primary purposes, in cash and real terms (base year 1987-88) respectively. The majority of expenditure under pp 4, support for procurement decisions, is attributable to the MOD.

Figure 1.10 R&D expenditure by primary purpose in 1987-88

1.10. Figure 1.11 shows the breakdown of primary purpose for the civil departments while figure 1.12 shows that for the Research Councils and UGC. Table 1.9 of Section 7 contains the detailed statistics from which these figures are derived.

Figure 1.11 Civil departments' primary purpose 1987-88

Figure 1.12 Research Councils' and UGC's primary purpose 1987-88

1.11. The complete set of statistics relating to primary purpose

is given in Tables 1.10 to 1.23. These show the total for each primary purpose analysed by departments. The 14 tables are grouped into seven sets of two for each primary purpose, one in cash terms, the other at constant prices using the GDP deflator

Destination of R&D expenditure

1.12. Figure 1.13, derived from Table 1.24 of Section 7, shows the classes of recipients of Government R&D funding in 1987-88. The largest portion (40 per cent) went to industry, including public corporations and research associations. Intramural expenditure is that made by a department or other body in its own R&D facilities. This will include, for example, a Research Council's expenditure in one of its own institutes. Expenditure shown against other government departments and Research Councils is where departments and other bodies fund R&D in Government R&D facilities other than their own. Part Two of the Review shows the distribution of funding, by recipient, for each department.

Figure 1.13 Destination of R&D expenditure 1987-88

Other S&T expenditure

1.13. The supplementary analyses chapter (Chapter 21, Cm 621) of the 1989 PEWP contains a summary table of S&T expenditure. Science and technology is composed of Frascati R&D plus certain other items, mainly technology transfer. In previous years the Annual Review has concentrated on R&D. This year, however, sees the introduction of two additional primary purposes representing those non-Frascati S&T activities. Pp 8 covers technology transfer programmes. Pp 9 covers the remaining non-Frascati activities such as restructuring costs that do not form part of the normal management of R&D and taught course awards. Full definitions of these additional primary purposes are given in Annex C.

1.14. The total expenditure on these non-Frascati activities in 1987-88 was £157 m. Figure 1.14 shows the distribution of this expenditure. The major elements of this expenditure are, for civil departments, the various technology transfer programmes of the DTI, MAFF and DEu. Most of the Research Councils allocate funds to taught courses and restructuring costs, as well as to the maintenance of technology transfer programmes. Details of

the expenditure on other science and technology programmes are given in Part Two.

Figure 1.14 Non-Frascati expenditure 1987-88

1.15. The sum of expenditure on all the primary purposes 1 to 9 represents the total expenditure on S&T. The outturn S&T expenditure in 1987-88 as determined by the Annual Review's survey was £4.8 bn. This final outturn figure compares with the estimated outturn figure of £5.1bn in the 1989 PEWP.

References

1. Financial statement and budget report 1989-90 HC 235
HMSO
1989
0 10 2234899

2. R&D performed in UK industry in 1987

2.1. Estimates for expenditure and employment on R&D performed in UK industry are made annually through surveys carried out by the Department of Trade and Industry. Full surveys are taken every fourth year to provide a benchmark; sample surveys are carried out in intervening years. The last bench-mark enquiry was for R&D performed in UK industry in 1985. This was carried out in 1986 and the results published in Business Monitor MO 14 in December 1988 (ref. 1). The figures shown in this year's Annual Review are drawn from a sample survey carried out last year. This sample included 74 enterprises accounting for about 75 per cent of industrial R&D activity in 1985. The results were published in British Business on 3 February 1989 (ref. 2).

2.2. The industrial survey collects statistics of R&D carried out within the responding organisation (intramural R&D) irrespective of the source of funding. They are also asked to give information on the funding of that R&D by the Government, from overseas, and by the firm itself and other sources. This method of collecting intramural R&D expenditure avoids double counting and is the approach adopted by other OECD countries. The approach does however lead to certain apparent differences when the figures which industry produces for R&D performed by them and funded by Government are compared with the contrasting statistics from the Government Survey for R&D funded by Government but performed in industry. The reasons for the differences include:

- the industrial survey is directed to enterprises with 200 or more employees but there is no lower limit in the data collected in the Government survey;
- a company sub-contracting from another company may not recognise the Government as the ultimate source of funds;
- a company sub-contracting from another company may not appreciate that the work it is carrying out is an essential element of the contracting company's R&D programme and may not therefore classify it as R&D in the industry survey;
- the returns from industry and Government are treated differently in respect of profit related elements. The Government expenditure figures include the profit element of any R&D contract placed with industry. The industry figures, however, exclude profit.

2.3. There is a discontinuity in the series of industrial R&D data in the tables shown in Section 7. The increase shown in Table 2.1 for industrially performed R&D in the non-manufactured sector between 1985 and 1986 is overstated as a result of the inclusion of the R&D performed by the United Kingdom Atomic

Energy Authority (UKAEA) for the first time in 1986 when it became a public corporation. Previously its R&D activities were included in the Government Survey figures.

2.4. In current-year terms the total value of R&D performed in industry in 1987 was £6.3bn, an increase of about 6 per cent on 1986's figure of £6 bn. Figure 2.1 below and table 2.1 in Section 7 show the changes over the period 1981-87 at constant 1985 prices. The contributions made by manufacturing and non-manufacturing industry are separately identified.

Figure 2.1 R&D performed in industry

2.5. Figure 2.2 and Table 2.1 show R&D performed by broad product groups of manufacturing industry. It shows the steady growth in R&D in the chemical sector. Motor vehicles also show strong growth albeit from a relatively low base. R&D in the electronics and other electrical engineering sector declined in real terms between 1986 and 1987.

Figure 2.2 R&D performed in manufacturing industry

2.6 As indicated above in paragraph 2.2, the sample survey collects aggregate information on the source of funds for industrially performed R&D. Figure 2.3 shows the source of funds over the period 1981-87 for all product groups. Figure 2.3 shows that the industrially performed R&D funded by industry itself and sources other than Government rose from 77 per cent in 1986 to 80 per cent in 1987. In the longer term a feature has been the increased proportion of funds from overseas.

Figure 2.3 Source of funds for industrially performed R&D

2.7. Table 2.3 in Section 7 distinguishes industry's intramural R&D expenditure as between capital and current items. Details are also set out on the manpower employed by industry on R&D are also given in Section 7. The manpower data is discussed in more detail in Section 3.

References

1. Survey of scientific research and development carried out within the UK (1985)
Business Monitor MO14
DTI 1988
available from BSO Library, Government Buildings, Cardiff Road, Newport, Gwent NP9 1XG
2. Industrial R&D expenditure
British Business
Vol 32, No. 5. pp24-25
DTI 3 February 1989
0143-9111

3. R&D manpower

Summary

3.1. This section summarises some of the main statistics on the production and deployment of manpower in R&D. The data are drawn both from the Government and industrial R&D surveys and also from other published information on qualified scientists and engineers (QSEs)

Government R&D manpower

3.2. Over a quarter of Government funded R&D is carried out intramurally. Figure 3.1 shows the number of degree level, or equivalent, employees deployed on R&D in 1987-88. Figure 3.2 shows the total employment on R&D in Government. The proportion of total manpower accounted for by MOD is large as it includes the support staff needed to maintain and operate facilities such as ranges, wind tunnels and test chambers together with the research establishment staff who manage MOD's large extramural programme. Most of the employees engaged on R&D for civil departments are at research establishments.

Figure 3.1 Degree level employees 1987-88

Figure 3.2 Total number of employees 1987-88

3.3. Tables 3.1 to 3.5, from which these figures are derived, also provides an indication of manpower trends. From 1988-89

onwards the main emphasis in the control and planning of central government departments' use of resources will be their cash provision for running costs. Forward estimates of manpower, therefore, should be regarded as indicative planning totals and not control limits.

Industrial employment on R&D

3.4. The industry survey reported in Section 2 also collected data on R&D employment. The composition of total employment is shown in Figure 3.3. The increase between 1985 and 1986 is largely due to UKAEA which became a public corporation in 1986. The most noticeable feature over the period 1981-87 is the increasing proportion of qualified scientists and engineers in the total R&D employment. This data is given in full in Table 3.6 of Section 7.

Figure 3.3 Industrial R&D employment 1981-7

Other manpower data

Universities

3.5. Universities have an important role in the R&D carried out in the UK. Many of the staff involved in research have teaching duties but there is no published analysis showing research separately from teaching. The total full-time academic staff in universities in Great Britain employed in science and engineering is summarised in Figure 3.4; the details are given in Table 3.7.

Figure 3.4 University academic staff 1983-84 to 1987-88

First degree graduates

3.6. The historic and projected supply of graduates was given in the Department of Education and Science chapter, (Chapter 12, Cm 612) of the 1989 PEWP (ref. 1). Figure 3.5 summarises the figures for first degree graduates in engineering and science, and mathematics for graduates from home and abroad awarded UK university, CNNA, Open University and university validated degrees. This information is also given in Table 3.8.

Figure 3.5 First degree graduates 1983-84 to 1991-92

3.7. Surveys are conducted of the first destination of first degree graduates in Great Britain. Table 3.9 gives a summary of the 1987 graduate destinations which was published in the DES's first destination Statistics Bulletin, 6/89 (March 1989) (ref. 2). It covers all those graduating in 1987 with a first degree in science and engineering but excludes graduates from the Open University and from part-time courses at polytechnics and colleges. It shows the first known destination at 31 December 1987. Figures 3.6 and 3.7 show the type of work entered by engineering and science graduates. Only about a quarter of science graduates entered scientific employment with the largest

numbers entering administration/management services. Engineers, however, were much more likely to be employed as engineers/scientists with nearly three-quarters having this as their first type of work.

Figure 3.6 First destination of engineering graduates 1987

Figure 3.7 First destination of scientist graduates 1987

References

1. The government's expenditure plans 1989-90 to 1991-92 -
Chapter 12: Department of Education and Science Cm 612
HM Treasury
HMSO
1989
0 10 1061226
2. First known destination of first degree graduates 1983-87
Statistical Bulletin 6/89
DES Statistics Branch
March 1989
0142-5013

4. Gross domestic expenditure on R&D

4.1. The Review follows the definition of gross domestic expenditure on R&D (GERD) adopted by the OECD and set out in the Frascati manual namely:

GERD is the sum of expenditure on R&D performed intramurally.

This is on the basis that the most reliable estimates of R&D are those which organisations report they have performed in-house.

4.2. The total GERD for 1987 of £9.5 bn is an increase of about six per cent in cash terms over the 1986 level. Figure 4.1 shows the source of funding and the performer of R&D in a simplified form. Three sources of funding are shown: Government, overseas and UK non-Government which is mainly accounted for by industry. The performers of R&D are also shown in simplified form: Government, which includes higher education, and UK non-Government which is mainly industry. There is also a small expenditure on R&D performed overseas. The full details are given in Table 4.1 of Section 7.

Figure 4.1 Total R&D performed in the UK

5. European Community R&D : Framework programmes

5.1. The first R&D programmes undertaken by the European Community were concerned with the coal and steel industries, agriculture and nuclear energy. Subsequently the scope has been widened, most recently by the Single European Act (SEA). The express objective of the SEA is to strengthen, mainly by collaborative programmes, the underlying scientific and technological basis of European industry and to encourage it to become more competitive at the international level.

5.2. The main means through which the Community implements its R&D activities is a series of framework programmes. These provide a strategy for research which is subsequently implemented in the form of individual programmes (known as specific programmes) in agreed areas of science and technology. Within the framework programme the Commission has three mechanisms for supporting R&D described as shared cost programmes, direct actions and concerted actions. Shared cost programmes account for the largest expenditure; in most cases the Commission contributes at most 50 per cent of the costs of research contracts (the balance coming from another source). Direct action is research conducted in the Community's own institutions.

Concerted action is a mechanism for bringing together in collaboration national programmes in certain areas. The Commission's own budget to support the framework programme is itself derived, by agreement, from the public revenues of Member States. Community expenditures on R&D are additional to the UK government department and Research Council expenditure described elsewhere in this report.

5.3. The current framework programme is a five-year programme (1987-91) covering eight areas of research: quality of life, information technology and telecommunications, industry, biological resources, energy, S&T for development, marine resources and European S&T co-operation. Within these eight areas, over 35 specific programmes have been agreed, each with its own objectives, resources and management arrangements. The resources associated with these eight areas and their agreed activities are shown in Figure 5.1. At present exchange rates the overall total of 5,396 MECU funded by the Community over the period 1987-91 (with some provision for continuations into 1992) is equivalent to about £3.5 bn at May 1989 exchange rates. Contributions from other sources to the shared cost activities of the framework programme will substantially increase this amount. The contribution from UK public revenues varies from year to year but is approximately equal to £660 m over the period (the exact figure will depend on the exchange rates). As indicated in paragraph 5.2 above, these amounts are additional to the figures shown for Government funding of R&D in this Review.

Figure 5.1 EC Framework programme areas

5.4. Programmes are managed by the European Commission in Brussels, usually assisted by representatives of Member States. Management of groups of projects may be delegated to consultants or lead contractors.

5.5. About half the framework programme provides for research relevant to the competitiveness of European industry. For these programmes the DTI takes the lead for the UK in advising the Commission on the conduct of the programme and, within the UK, encouraging industrial participation. The areas covered include IT and telecommunications, industrial technologies and new materials, biotechnology and standards. A further quarter of the programme is in the energy sector (nuclear fission, fusion and non-nuclear) and DEN takes the lead for the UK. The remaining quarter covers a range of programmes including health, the environment, agriculture and fisheries, marine science, the exchange of scientists within the EC and the enhancement of major scientific facilities. The relevant UK government department takes the lead in representing UK interests.

5.6. Community research contracts are awarded on the basis of the quality of the proposal and its relevance to the programme's objectives. There are no national shares. In most specific programmes, proposals are assessed by specially appointed panels of experts and/or by the national representatives assisting the Commission in the management of the programme. Overall the UK gains more from contracts than our share of the budget, typically receiving over 20 per cent of contract payments compared with our 18.9 per cent contribution to Community resources.

5.7. The direct action activities (about 13 per cent of the framework programme) support the work of the Community's own Joint Research Centre (JRC) on four sites in Italy, FRG, Netherlands and Belgium. The JRC's largest programme is in the nuclear energy area; research is also conducted in environmental protection, industrial safety and materials. Increasingly the

JRC is expected to conduct research under contract. This should account for 26 per cent of its activities in the current four year programme.

5.8. The small expenditure on concerted action programmes financed from the framework programme is used particularly in the areas of medical and health research and the environment.

Other collaborative R&D arrangements in Europe

5.9. Collaboration between nationally funded research projects is also implemented through COST (Co-operation in Science and Technology) a grouping of 19 European countries both inside and outside the EC. EUREKA is a mechanism intended to assist European industry to collaborate in near-market research projects. Although the European Commission are participants, EUREKA is outside the organisational structure of the European Community.

5.10. Unlike the framework programme, Government spending on COST or EUREKA programmes is financed from departments' own budgets and the amounts are therefore included in the detailed figures in the Review.

1.6 International comparisons of R&D

1. Two internationally based series of R&D statistics are available for the comparison of different countries' spending. These are prepared by the Organisation for Economic Cooperation and Development (OECD) and the Statistical Office of the European Communities (SOEC). OECD is responsible for the Frascati definition outlined in annex 2. SOEC uses the same definition in their published statistics for Member countries.

2. The important difference between these two sources is that SOEC collects only budget and forward estimates of expenditure. OECD, however, also collects outturn data and makes revisions to their series as later figures become available. This means that an historic series in an EC publication never provides a final picture. Despite these drawbacks the SOEC is a useful source for data on international collaboration.

3. The tables showing international comparisons use figures expressed in £ million and are based on the work which OECD and SOEC have undertaken to establish purchasing power parities (ppp) to convert from one exchange rate to another. A recently revised set of these parities has been used so that non-sterling expenditure may be converted to the sterling equivalents used here.

R&D within the European Community

4. The SOEC uses a classification system, known by its French acronym NABS, to analyse budgetary data. The NABS classification is based upon the objective for the budgeted expenditure. The Tables 6.1 to 6.5 of section 1.7 give information at 13 separate chapter levels of the NABS classification. Tables 4.1 and 4.2 show expenditure by individual member states of the Community and by the institutions of the Community itself.

5. Altogether Governments of Community countries spent £21.2 billion on R&D in 1987. Figure 6.1 shows the national breakdown of this expenditure. Expenditure by the EC itself accounted for an additional £0.8 billion. Of expenditure by Community institutions that with the objective of "production, distribution and rational utilisation of energy" represented the largest element. This reflects the fact that the Community R&D programme grew from the EURATOM Treaty. A fuller account of EC R&D is given in section 1.5 of this review.

FIGURE 6.1 GOVERNMENT FUNDED R&D OF EC MEMBER NATIONS 1987

6. Figure 6.2 shows the breakdown, by NABS objectives, of civil R&D expenditure of member countries and the EC itself.

FIGURE 6.2 GOVERNMENT AND EC FUNDED CIVIL R&D 1987

International collaboration in R&D

7. The SOEC also collects data on international collaboration. These are those activities arising from agreements between Governments which are jointly financed. These agreements are not restricted to member countries only; collaboration with other Governments are included. However, amounts spent on international cooperation through informal arrangements are not included in the data. The existence of collaboration on matters of defence introduces an area of imprecision because some Community countries, notably France, have not separately identified expenditure on cooperation from their general defence research budget. As a result no expenditure is shown for defence cooperation for France. Figure 6.3 shows the breakdown of civil R&D collaboration. The detailed statistics are given in Tables 6.3, 6.4 and 6.5. The departmental texts in part 2 of the Review also provides more specific information on collaborative activities.

FIGURE 6.3 GOVERNMENT FUNDED CIVIL R&D: INTERNATIONAL COLLABORATION (By NABS objective)

Other international comparisons

8. As explained earlier OECD data is subject to revision as new information becomes available. Like those based on Community sources, they are expressed in sterling equivalents using the OECD calculated exchange rates based on purchasing power parities. Government spending is analysed in OECD data by socio-economic objectives. These objectives are similar to, but not identical with, the NABS objectives used by SOEC. Figure 6.4 shows the distribution by socio-economic objective of R&D funding in OECD countries. The detailed data is contained in Tables 6.6 and 6.7.

FIGURE 6.4 GOVERNMENT FUNDING BY SOCIO-ECONOMIC OBJECTIVES (OECD data, percentage of GDP)

9. The OECD also publishes R&D data on the Gross Domestic Expenditure on R&D (GERD) for member countries. Figure 6.5 shows GERD in 1983 and 1987 for a number of countries.

FIGURE 6.5 GERD IN OECD COUNTRIES

10. As explained in section 1.4, GERD is made up of R&D performed either in Government (including higher education) facilities or in non-Government organisations, mainly industry. That performed in industry is usually known as BERD - R&D performed in the Business Enterprise Sector. For a number of OECD countries Figure 6.6 shows BERD and the portion funded by industry itself for the years 1983 and 1987.

FIGURE 6.6 BERD IN OECD COUNTRIES

11. The detailed OECD data from which Figures 6.5 and 6.6 have been derived is contained in Table 6.10. This table also gives some data relating to other R&D indicators.

7. Statistical Tables

7.1. The Annual Review contains statistics drawn from several sources. This section contains all the summary tables used in producing the preceding sections. In using the statistics it is necessary to know the background to their collection and coverage since certain sets of data cannot be combined easily.

7.2. The R&D statistics in the Annual Review are consistent with the detailed description of R&D which the OECD prepared in the Frascati manual.

Government funded R&D

7.3. The data on Government funded R&D is collected by carrying out a full survey of all departments and other Central Government bodies who carry out or directly commission R&D. The Government survey has been expanded to match the S&T coverage of the PEWP. There is no internationally agreed definition of S&T. For expenditure by the Government S&T is broadly equivalent to Frascati R&D plus technology transfer, certain restructuring costs and some relatively minor items such as taught course awards. The individual texts of Part Two make clear the coverage of the non-Frascati programmes.

7.4. In expanding from R&D to S&T the Annual Review has the same coverage as the S&T table given in the supplementary analyses chapter (Chapter 21, Cm 621) of the 1989 PEWP (ref. 1). The Annual Review provides a detailed analysis of this S&T expenditure. (Note that the S&T table of the PEWP is on the same full economic cost basis as the Annual Review.)

5. The Government survey also requires respondents to analyse their expenditure in certain ways:

- by primary purpose (pp) which is essentially an analysis of why the expenditure is being made and not the nature of the work itself (see Annex C);
- by Frascati activity - an analysis of the nature of the work itself, basic, applied or experimental development (see Annex B);
- by objectives such as the NABS objectives of the EC and the source economic objectives of the OECD.

7.6. Expenditure in real terms, with 1988-89 as the base year, has been calculated using the GDP deflator in the Financial Statement and Budget Report (FSBR), 1989-90. R&D Performed in UK industry. The deflator used is shown in Table 1.2.

7.7. During 1988 the DTI carried out a sample survey of expenditure and employment on R&D performed in UK industry in

1987. The sample for this survey included 74 enterprises accounting for about 75 per cent of total expenditure on R&D in 1985, for which year a large-scale (benchmark) survey was carried out.

7.8. Results for the 1987 sample survey were obtained by comparing for the sample the expenditure for each product group in 1987 with the corresponding expenditure in the 1985 benchmark survey, and taking into account the data for 1986. In few cases, representing about three per cent of sampled expenditure, there were insufficient responses in particular categories to make a reasonable estimate for 1987. These were replaced by estimates using the average ratio for the other product groups. Once a level of intramural expenditure in 1987 was estimated for the product groups, results for the other parameters were adjusted to allow for the different weighting patterns of the sample for 1985 and 1987.

7.9. For industrial R&D statistics only research in the field of science and technology is covered. Expenditure on research in the social sciences and humanities is excluded from the survey. It is assumed to be negligible. (Note Government R&D data includes social science and humanities.)

7.10. Respondents to the survey were asked to make a return for the calendar year 1987 or for any year ending between 6 April 1987 and 5 April 1988.

7.11. For reasons noted in Section 2 data from the industrial survey cannot easily be combined with Government expenditure data.

S&T manpower in the UK

7.12. The manpower data is derived from a number of sources:

- the survey of Government funded R&D;
- the industry survey carried out by the DTI;
- the DES chapter (Chapter 12, Cm 612) of the 1989 PEWP (ref. 2);
- the DES first destination data in DES statistical bulletin 6/89, March 1989 (ref. 3);
- university staff from University Statistics, Volume 1 (ref. 4).

Total UK R&D performed in the UK

7.13. This table is derived from the data collected from the Government and industry surveys by extracting the intramural elements. This method of compilation is used by other OECD

countries.

EC R&D

14. This data is provided directly from the EC Official Journal of the European Communities. (ref. 5)

International comparisons

7.15. This section uses data provided by the OECD and the Statistical Office of the European Communities (SOEC). These organisations derive their information from data provided by national statistical offices in member countries.

Format of tables

7.16. Throughout the tables in the Review components of totals have been rounded independently of the totals. Therefore, the rounded totals will not always be equal to the sums of the rounded components. In the tables, '0.0' means less than 0.05, '..' means zero and 'N/A' means not available.

References

1. The government's expenditure plans 1989-90 to 1991-92 -
Chapter 21: Supplementary analyses and index Cm 621
HM Treasury
HMSO
1989
0 10 223589 9
2. The government's expenditure plans 1989-90 to 1991-92 -
Chapter 12: Department of Education and Science Cm 612
HM Treasury
HMSO
1989
0 10 106122 6
3. 'First known destination of first degree graduates 1983-87'
Statistics Bulletin
DES Statistical Branch
March 1989
0142-5013
4. University Statistics 1987-88
Vol 1: Students and staff
Universities' Statistical Record, PO Box 130, Cheltenham,
Glos GL50 1JW
December 1988
0 946002 22 3
0264-1968
5. Official Journal of the European Communities
No. L302/5, p7

24 October 1987
obtainable from:
HMSO Publications Centre,
51 Nine Elms Lane,
London SW8 5DR
Tel: 01-873-9090

	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	118.3	113.8	119.3	122.6	117.3	112.8
DES	68.9	72.8	82.2	85.5	87.3	88.6
DEr	192.4	176.4	195.8	174.6	144.9	140.2
DOE	59.0	62.1	63.8	71.2	73.1	74.9
DHSS	49.4	47.3	54.8	62.2	65.4	69.3
HSC	5.4	5.1	5.3	5.8	7.4	7.8
Home Office	13.3	14.2	13.3	15.8	16.0	16.2
ODA	27.0	32.5	35.0	39.4	41.5	42.5
DTI	362.9	324.4	315.8	384.0	342.1	243.3
DTp	24.6	26.4	27.0	27.8	28.0	30.2
NI Depts	17.0	16.8	19.4	22.5	23.1	23.8
Scottish Depts	53.4	51.6	54.6	54.3	54.5	54.5
Welsh Office	3.5	1.9	2.0	2.5	2.2	2.2
DEmp	1.5	2.2	2.8	3.0	3.1	3.2
TA	18.4	23.9	45.5	52.6	46.6	46.6
Other depts	28.5	31.2	36.0	40.2	41.3	42.7
Total civil departments	1043.4	1002.7	1072.6	1163.8	1093.9	998.7
Research Councils						
AFRC	46.3	49.4	58.5	67.6	68.1	69.9
ESRC	20.0	21.6	21.2	26.3	27.6	27.1
MRC	127.6	139.1	149.3	176.1	181.2	184.3
NERC	68.0	70.8	86.2	118.8	103.4	100.5
SERC	295.9	334.5	341.2	373.6	382.3	375.9
Unallocated					15.7	33.6
Total Research Councils	557.7	615.5	656.4	762.3	778.3	791.3
UGC	720.0	760.0	770.0	780.0	800.0	810.0
Total civil R&D	2321.1	2378.1	2499.1	2706.1	2672.1	2600.0
Ministry of Defence						
- Research	407.8	396.1	403.0	427.9	446.8	455.3
- Development	1778.3	1769.5	1868.9	1922.2	2012.7	2051.2
- Staff & superannuation	78.2	81.9	89.9	82.7	81.7	83.3
Total defence	2264.2	2237.5	2361.8	2432.8	2541.2	2589.8
TOTAL	4585.3	4615.7	4860.9	5138.9	5213.3	5189.8

Note: The Science Budget has unallocated provisions of 15.7 m and 33.6 m in 1990-91 and 1991-92 respectively. These sums have been retained for future distribution to the Research Councils on the advice of the Advisory Board for the Research Councils.

Figure 1.2 Expenditure on R&D by departments (in real terms)

m
(base year 1987-88)

	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	124.2	113.8	111.2	108.4	99.6	93.0
DES	72.4	72.8	76.7	75.5	74.2	73.1
DEn	202.0	176.4	182.6	154.3	123.1	115.7
DOE	62.0	62.1	59.4	62.9	62.1	61.8
DHSS	51.8	47.3	51.1	55.0	55.6	57.2
HSC	5.6	5.1	4.9	5.1	5.3	6.4
Home Office	13.9	14.2	12.4	13.9	13.6	13.4
COA	28.3	32.5	32.7	34.8	35.3	35.1
DTI	381.1	324.4	294.5	339.4	290.7	200.7
DTp	25.9	26.4	25.2	24.5	23.8	24.9
NI Depts	17.9	16.8	18.1	19.9	19.6	19.6
Scottish Depts	56.0	51.6	50.9	48.0	46.4	45.0
Welsh Office	3.7	1.9	1.9	2.2	1.9	1.8
DEnsp	1.6	2.2	2.6	2.5	2.6	2.6
TA	19.3	23.9	42.4	46.5	39.6	38.4
Other depts	29.9	31.2	33.5	35.5	35.1	35.2
Total civil departments	1095.8	1002.7	1000.1	1028.6	929.5	823.9
Research Councils						
AFRC	48.6	49.4	54.6	59.8	57.9	57.7
ESRC	21.0	21.6	19.7	23.2	23.5	22.3
HRC	134.0	139.1	139.2	155.6	154.0	152.1
NERC	71.4	70.8	80.4	105.0	87.9	82.9
SERC	310.8	334.5	318.1	330.1	324.8	310.1
Unallocated					13.3	27.7
Total Research Councils	585.7	615.5	612.1	673.7	661.3	652.8
UGC	756.2	760.0	717.9	689.4	679.8	668.3
Total civil R&D	2437.6	2378.1	2330.1	2391.6	2270.7	2145.0
Ministry of Defence						
- Research	428.2	396.1	375.7	378.2	379.7	375.7
- Development	1867.5	1759.5	1742.6	1698.8	1710.3	1692.2
- Staff & superannuation	82.1	81.9	63.8	73.1	69.4	68.7
Total defence	2377.9	2237.5	2202.2	2150.1	2159.4	2136.6
TOTAL	4815.6	4615.7	4532.3	4541.7	4430.1	4281.7

Notes: 1. The Science Budget has unallocated provisions of 15.7 m and 33.6 m (in cash terms) for 1990-91 and 1991-92; 13.3 m and 27.7 m, in real terms, respectively. These sums have been retained for future distribution to the Research Councils on the advice of the Advisory Board for the Research Councils.

2. The GDP deflator used to convert Government cash terms to real terms is:

Year	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
GDP deflator	95.219	100.000	107.250	113.149	117.675	121.205

Figure 1.3 Expenditure on R&D by departments (percentage shares)

per cent

	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	2.6	2.5	2.5	2.4	2.2	2.2
DES	1.5	1.6	1.7	1.7	1.7	1.7
DEn	4.2	3.8	4.0	3.4	2.8	2.7
DOE	1.3	1.3	1.3	1.4	1.4	1.4
DHSS	1.1	1.0	1.1	1.2	1.3	1.3
HSC	0.1	0.1	0.1	0.1	0.1	0.2
Home Office	0.3	0.3	0.3	0.3	0.3	0.3
ODA	0.6	0.7	0.7	0.8	0.8	0.8
DTI	7.9	7.0	6.5	7.5	6.6	4.7
DTp	0.5	0.6	0.6	0.5	0.5	0.6
NI Depts	0.4	0.4	0.4	0.4	0.4	0.5
Scottish Depts	1.2	1.1	1.1	1.1	1.0	1.0
Welsh Office	0.1	0.0	0.0	0.0	0.0	0.0
DEmp	0.0	0.0	0.1	0.1	0.1	0.1
TA	0.4	0.5	0.9	1.0	0.9	0.9
Other Depts	0.6	0.7	0.7	0.8	0.8	0.8
Total civil departments	22.8	21.7	22.1	22.6	21.0	19.2
Research Councils						
AFRC	1.0	1.1	1.2	1.3	1.3	1.3
ESRC	0.4	0.5	0.4	0.5	0.5	0.5
MRC	2.8	3.0	3.1	3.4	3.5	3.6
NERC	1.5	1.5	1.8	2.3	2.0	1.9
SERC	6.5	7.2	7.0	7.3	7.3	7.2
Unallocated					0.3	0.6
Total Research Councils	12.2	13.3	13.5	14.8	14.9	15.2
UGC	15.7	16.5	15.8	15.2	15.3	15.6
Total civil R&D	50.6	51.5	51.4	52.7	51.3	50.1
Ministry of Defence						
- Research	8.9	8.6	8.3	8.3	8.6	8.8
- Development	38.8	36.1	38.4	37.4	38.6	39.5
- Staff & superannuation	1.7	1.8	1.8	1.6	1.6	1.6
Total defence	49.4	46.5	48.6	47.3	48.7	49.9
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0

Note: The Science Budget has unallocated provisions of 15.7 m and 33.6 m in 1990-91 and 1991-92 respectively. These sums have been retained for future distribution to the Research Councils on the advice of the Advisory Board for the Research Councils.

Figure 1.4 Expenditure on R&D by departments (real percentage changes compared with 1986-87)

	per cent					
	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	109.2	100.0	97.7	95.3	87.6	81.8
DES	99.4	100.0	105.3	103.7	101.9	100.4
DEn	114.5	100.0	103.5	87.5	69.8	65.6
DOE	99.8	100.0	95.8	101.4	100.1	99.6
DHSS	109.6	100.0	108.1	116.3	117.5	120.9
HSC	110.7	100.0	97.1	100.9	123.4	126.5
Home Office	98.3	100.0	87.5	98.2	96.0	94.4
ODA	87.0	100.0	100.4	107.0	108.4	107.8
DTI	117.5	100.0	90.8	104.6	89.6	61.9
DTp	97.8	100.0	95.3	92.9	90.0	94.2
NI Depts	106.0	100.0	107.6	118.1	116.6	116.6
Scottish Depts	108.5	100.0	98.6	92.9	89.8	87.1
Welsh Office	191.1	100.0	97.6	112.7	96.5	92.3
DEmp	72.5	100.0	115.0	116.9	115.8	118.4
TA	80.9	100.0	177.6	194.5	166.0	161.0
Other depts	95.8	100.0	107.5	113.8	112.6	112.8
Total civil departments	109.3	100.0	99.7	102.6	92.7	82.2
Research Councils						
AFRC	98.3	100.0	110.4	120.9	117.1	116.7
ESRC	97.3	100.0	91.5	107.8	108.8	103.6
MRC	96.3	100.0	100.1	111.8	110.7	109.3
NERC	100.8	100.0	113.5	148.2	124.1	117.1
SERC	92.9	100.0	95.1	98.7	97.1	92.7
Unallocated					*	*
Total Research Councils	95.2	100.0	99.4	109.5	107.5	106.1
UGC	99.5	100.0	94.5	90.7	89.4	87.9
Total civil R&D	102.5	100.0	98.0	100.6	95.5	90.2
Ministry of Defence						
- Research	108.1	100.0	94.9	95.5	95.8	94.8
- Development	106.1	100.0	99.0	96.6	97.2	96.2
- Staff & superannuation	100.3	100.0	102.4	89.2	84.8	83.9
Total defence	106.3	100.0	98.4	96.1	96.5	95.5
TOTAL	104.3	100.0	98.2	98.4	96.0	92.8

*Note: The Science Budget has unallocated provisions of 15.7 m and 33.6 m for 1990-91 and 1991-92, respectively. These sums have been retained for future distribution to the Research Councils on the advice of the Advisory Board for the Research Councils.

Table 1.5 Departmental spending by activity 1987-88

	Basic		Strategic		Specific		Experimental Development		Total	
	m	%	m	%	m	%	m	%	m	%
Civil departments										
MAFF	5.5	4.8	32.5	28.5	42.1	37.0	33.7	29.6	113.8	100.0
DES	4.1	5.6	7.3	10.0	61.2	84.1	0.3	0.4	72.8	100.0
DEn	..	..	43.3	24.5	116.6	66.1	16.5	9.4	176.4	100.0
DOE	..	..	5.8	9.4	48.4	78.0	7.8	12.6	62.1	100.0
DHSS	0.4	0.9	8.9	16.7	33.2	70.1	4.9	10.3	47.3	100.0
HSC	..	..	1.3	25.0	3.1	60.0	0.8	15.0	5.1	100.0
Home Office	..	..	0.4	3.0	11.7	82.5	2.1	14.5	14.2	100.0
CDA	0.1	0.5	11.8	36.4	18.0	55.2	2.6	7.9	32.5	100.0
DTI	..	..	111.0	34.2	48.4	14.9	165.0	50.9	324.4	100.0
DTP	..	..	2.3	8.6	19.1	72.3	5.1	19.1	26.4	100.0
NI Depts	1.3	7.5	2.3	13.7	9.6	57.0	3.7	21.8	16.8	100.0
Scottish Depts	6.8	13.2	17.4	33.6	24.4	47.2	3.1	6.0	51.6	100.0
Welsh Office	0.4	20.7	0.2	12.7	1.3	66.6	..	..	1.9	100.0
DEsp	..	..	1.3	57.1	1.0	42.9	..	..	2.2	100.0
TA	..	..	..	..	23.9	100.0	..	..	23.9	100.0
Other depts	19.1	61.2	3.6	11.5	5.6	17.8	3.0	9.5	31.2	100.0
Total civil departments	37.6	3.8	249.3	24.9	467.4	46.6	248.4	24.8	1002.7	100.0
Research Councils										
AFRC	30.2	61.2	19.2	38.8	..	..	..	..	49.4	100.0
ESRC	8.8	41.0	11.2	52.0	1.5	7.0	..	..	21.6	100.0
MRC	30.9	22.2	68.2	49.0	40.1	28.8	..	..	139.1	100.0
NERC	48.6	68.6	14.1	19.9	8.1	11.4	..	..	70.8	100.0
SERC	178.5	53.3	156.1	46.7	..	..	..	..	334.5	100.0
Total Research Councils	297.0	48.3	268.8	43.7	49.7	8.1	..	..	615.5	100.0
UGC	505.0	66.4	165.0	21.7	90.0	11.8	..	..	760.0	100.0
Total civil R&D	839.7	35.3	683.0	28.7	607.1	25.5	248.4	10.4	2378.1	100.0
MoD	..	..	42.8	1.9	353.3	15.8	1841.4	82.3	2237.5	100.0
TOTAL	839.7	18.2	725.8	15.7	960.4	20.8	2089.8	45.3	4615.7	100.0

1.6 Departmental spending by activity 1988-89

	Basic		Strategic		Specific		Experimental Development		Total	
	m	%	m	%	m	%	m	%	m	%
Civil departments										
MAFF	5.6	4.7	35.1	29.4	44.4	37.2	34.2	28.7	119.3	100.0
DES	4.2	5.1	8.2	10.0	69.5	84.6	0.3	0.3	82.2	100.0
DEn	..	..	50.4	25.8	127.7	65.2	17.7	9.0	195.8	100.0
DOE	..	..	6.2	9.8	49.6	77.8	7.9	12.4	63.8	100.0
DHSS	..	..	10.5	19.1	37.3	68.0	7.0	12.8	54.8	100.0
HSC	..	..	1.3	25.0	3.2	60.0	0.8	15.0	5.3	100.0
Home Office	..	..	0.4	3.2	11.5	86.2	1.4	10.6	13.3	100.0
ODA	..	..	12.2	34.9	20.5	58.6	2.3	6.6	35.0	100.0
DTI	..	..	119.5	37.8	75.5	23.9	120.8	38.3	315.8	100.0
DTp	..	..	2.8	10.3	20.0	74.1	4.2	15.6	27.0	100.0
NI Depts	1.4	7.0	3.5	18.1	10.7	55.0	3.9	19.9	19.4	100.0
Scottish Depts	7.2	13.2	20.0	36.6	24.9	45.6	2.5	4.6	54.6	100.0
Welsh Office	0.4	21.1	0.2	12.0	1.4	66.9	..	..	2.0	100.0
DEmp	..	..	1.3	47.2	1.5	52.8	..	..	2.8	100.0
TA	..	..	..	..	45.5	100.0	..	..	45.5	100.0
Other depts	23.1	64.3	3.5	9.7	5.6	15.5	3.8	10.4	36.0	100.0
Total civil departments	41.9	3.9	275.2	25.7	548.7	51.2	206.8	19.3	1072.6	100.0
Research Councils										
AFRC	35.8	61.2	22.7	38.8	..	..	..	..	58.5	100.0
ESRC	10.2	48.2	10.6	50.1	0.4	1.7	..	..	21.2	100.0
MRC	33.5	22.4	74.7	50.0	41.2	27.6	..	..	149.3	100.0
NERC	62.2	72.1	15.9	18.5	8.1	9.4	..	..	86.2	100.0
SERC	187.2	54.9	154.0	45.1	..	..	..	..	341.2	100.0
Total Research Councils	328.9	50.1	277.9	42.3	49.7	7.6	..	..	656.4	100.0
UGC	515.0	66.9	165.0	21.4	90.0	11.7	..	..	770.0	100.0
Total civil R&D	885.7	35.4	718.2	28.7	688.3	27.5	206.8	8.3	2499.1	100.0
MoD	..	..	37.4	1.6	365.8	15.5	1958.6	82.9	2361.8	100.0
TOTAL	885.7	18.2	755.6	15.5	1054.2	21.7	2165.4	44.5	4860.9	100.0

1.7 Primary purpose of Government funded R&D (in cash terms)

n

	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
1 Advancement of science	718.4	781.3	832.0	887.8	890.4	901.4
2 Support for policy	382.3	299.9	348.0	378.4	381.8	391.6
3 Improvement of technology	952.6	1015.5	1025.7	1136.5	1093.5	978.4
4 Support for procurement	2237.2	2200.0	2326.8	2397.0	2503.5	2551.7
5 Support for statutory duties	111.1	122.5	128.7	135.7	118.0	121.4
6 Support for humanities	65.0	67.6	67.7	67.9	68.0	68.1
7 Support for other activities	118.8	128.9	132.1	135.5	142.5	143.6
TOTAL	4585.3	4615.7	4860.9	5138.9	5197.7	5156.2

Note: Excluding unallocated provisions: see footnote to Table 1.1.

1.8 Primary purpose of Government funded R&D (in real terms)

m
(base year 1987-88)

	Outturn		Estimate Provision		Plans	
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
1 Advancement of science	754.5	781.3	775.8	784.6	756.6	743.7
2 Support for policy	401.5	299.9	324.4	334.4	324.4	323.1
3 Improvement of technology	1000.4	1015.5	956.4	1004.5	929.2	807.2
4 Support for procurement	2349.6	2200.0	2169.5	2118.5	2127.4	2105.2
5 Support for statutory duties	116.6	122.5	120.0	119.9	100.3	100.1
6 Support for humanities	68.3	67.6	63.1	60.0	57.8	56.2
7 Support for other activities	124.8	128.9	123.1	119.8	121.1	118.5
TOTAL	4815.6	4615.7	4532.3	4541.7	4416.8	4254.0

Note: Excluding unallocated provisions: see footnote 1 to Table 1.2.

T 1.9 Analysis of 1987-88 expenditure on S&T by primary purpose

	pp1	pp2	pp3	pp4	pp5	pp6	pp7	Total R&D	pp8	pp9	Total S&T ^m
Civil departments											
MAFF	5.4	34.3	65.0	..	9.1	..	0.0	113.8	26.9	..	140.7
DES	4.1	55.8	9.6	..	0.1	2.4	0.8	72.8	..	..	72.8
DEn	..	38.2	97.5	..	40.8	..	..	176.4	5.4	..	182.8
DOE	..	24.9	6.2	4.8	26.1	..	..	62.1	0.9	..	63.0
OHSS	1.4	27.5	2.3	0.2	15.9	..	0.0	47.3	..	..	47.3
HSC	..	1.0	..	..	4.1	..	..	5.1	..	..	5.1
Home Office	..	12.9	0.6	0.5	..	..	0.2	14.2	..	..	14.2
ODA	..	..	..	..	..	..	32.5	32.5	..	..	32.5
DTI	..	3.3	318.3	..	2.8	..	..	324.4	93.3	..	417.7
DTp	..	7.2	0.2	8.8	10.2	..	..	26.4	..	..	26.4
NI Depts	1.4	4.3	10.9	..	0.1	0.2	0.1	16.8	..	..	16.8
Scottish Depts	6.1	18.8	22.4	0.0	4.3	..	..	51.6	3.5	..	55.1
Welsh Office	0.4	1.5	..	..	..	..	..	1.9	..	..	1.9
DEn	..	2.2	..	..	..	..	..	2.2	..	..	2.2
TA	..	23.9	..	..	..	..	..	23.9	..	..	23.9
Other depts	18.9	3.6	5.2	..	0.5	..	3.0	31.2	..	..	31.2
Total civil departments	37.5	259.5	538.1	14.3	114.0	2.6	36.6	1002.7	131.0	..	1133.7
Research Councils											
AFRC	33.0	..	16.4	..	..	..	..	49.4	..	3.5	52.9
ESRC	12.5	0.0	9.0	..	..	..	..	21.6	..	3.3	24.9
MRC	31.2	13.3	94.6	..	..	..	..	139.1	..	0.3	139.4
NERC	48.7	..	21.8	..	0.3	..	..	70.8	0.4	2.0	73.2
SERC	178.4	0.1	156.0	..	..	..	..	334.5	4.2	12.3	351.0
Total Research Councils	303.8	13.4	297.9	..	0.3	..	..	615.5	4.6	21.4	641.5
UGC	440.0	..	165.0	..	..	65.0	90.0	760.0	..	..	760.0
Total civil R&D	781.3	272.9	1001.1	14.3	114.3	67.6	126.6	2378.1	641.5	21.4	2535.1
Ministry of Defence	..	26.9	14.4	2185.8	8.1	..	2.3	2237.5	..	..	2237.5
TOTAL	781.3	299.9	1015.5	2200.0	122.5	67.6	128.9	4615.7	135.6	21.4	4772.6

Table 1.10 Primary purpose of Government funded R&D by departments (in cash terms)

m

(1) Advancement of science

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	4.9	5.4	5.5	5.9	6.1	6.2
DES	2.6	4.1	4.2	4.5	4.6	4.8
DEn	..	..	..	..	..	..
DOE	..	..	..	..	..	..
DHSS	1.4	1.4	1.5	1.5	1.6	1.6
HSC	..	..	..	..	..	..
Home Office	..	..	..	..	..	..
ODA	..	..	..	..	..	..
DTI	..	..	..	..	..	..
DTp	..	..	..	..	..	..
NI Depts	1.2	1.4	4.1	7.2	8.2	9.0
Scottish Depts	4.1	6.1	5.2	6.2	6.4	6.4
Welsh Office	0.4	0.4	0.4	0.5	0.5	0.5
DEmp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	17.1	18.9	22.9	26.6	28.0	29.2
Total civil departments	31.6	37.5	44.8	52.4	55.4	57.7
Research Councils						
AFRC	25.4	33.0	41.2	48.4	49.6	51.9
ESRC	8.3	12.5	11.6	15.3	16.9	16.7
MRC	28.2	31.2	35.4	45.2	46.7	48.7
NERC	47.0	48.7	61.8	86.8	73.4	70.6
SERC	157.9	176.4	187.1	184.7	183.5	185.7
Total Research Councils	266.8	303.8	337.2	380.4	370.1	373.7
UGC	420.0	440.0	450.0	455.0	465.0	470.0
Total civil R&D	718.4	781.3	832.0	887.8	890.4	901.4
Ministry of Defence	..	..	..	..	..	..
TOTAL	718.4	781.3	832.0	887.8	890.4	901.4

Table 1.11 Primary purpose of Government funded R&D by departments in (real terms)

(1) Advancement of science (base year 1987-88)

	Output	Estimate Provision Plans				
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil Departments						
MAFF	5.1	5.4	5.1	5.2	5.2	5.1
DES	2.7	4.1	3.9	4.0	3.9	4.0
DEn	..	..	..	..	..	..
DoE	..	..	..	..	..	..
DHSS	1.5	1.4	1.4	1.3	1.3	1.3
HSC	..	..	..	..	..	..
Home Office	..	..	..	..	..	..
ODA	..	..	..	..	..	..
DTI	..	..	..	..	..	..
DTp	..	..	..	..	..	..
NI Depts	1.3	1.4	3.8	6.3	7.0	7.5
Scottish Depts	4.3	6.1	5.8	5.5	5.4	5.3
Welsh Office	0.4	0.4	0.4	0.4	0.4	0.4
DExp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	17.9	18.9	21.4	23.5	23.8	24.1
Total civil departments	33.2	37.5	41.7	46.3	47.0	47.6
Research Councils						
AFRC	26.7	33.0	38.5	42.8	42.2	42.9
ESRC	8.7	12.5	10.8	13.6	14.3	13.8
MRC	29.7	31.2	33.0	39.9	39.7	40.2
NERC	49.4	48.7	57.7	76.7	62.4	58.3
SERC	165.8	178.4	174.5	163.2	155.9	153.2
Total Research Councils	280.2	303.8	314.4	336.2	314.5	308.3
UGC	441.1	440.0	419.6	402.1	395.1	387.8
Total civil R&D	754.5	781.3	775.8	784.6	756.6	743.7
Ministry of Defence	..	..	..	..	..	..
TOTAL	754.5	781.3	775.8	784.6	756.6	743.7

Table 1.12 Primary purpose of Government funded R&D by department (in cash terms)

m

(2) Support for policy

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil Departments						
MAFF	38.1	34.3	35.7	36.0	38.4	39.4
DES	66.2	55.8	64.4	66.7	67.7	68.4
DEn	33.3	38.2	43.4	45.0	45.3	45.2
DOE	20.9	24.9	27.2	31.4	32.6	34.2
DHSS	28.4	27.5	33.9	40.4	43.3	46.1
HSC	1.1	1.0	1.1	1.2	1.5	1.6
Home Office	13.1	12.9	12.2	14.7	15.0	15.2
ODA	..	..	..	..	..	..
DTI	2.6	3.3	4.2	3.8	3.7	3.7
DTp	6.5	7.2	7.7	8.2	8.3	9.0
NI Depts	5.5	4.3	5.7	7.5	7.8	8.0
Scottish Depts	12.4	18.8	21.9	22.5	23.4	24.7
Welsh Office	2.3	1.5	1.6	2.0	1.7	1.7
DEnsp	1.5	2.2	2.8	3.0	3.1	3.2
TA	15.3	23.9	45.5	52.6	46.6	46.6
Other depts	3.9	3.6	3.5	3.7	3.8	3.9
Total civil departments	251.1	259.5	310.7	340.6	342.2	350.8
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	11.4	0.0	0.0	0.1	0.0	0.0
MRC	99.3	13.3	14.0	14.7	15.4	16.2
NERC	..	..	..	..	..	..
SERC	0.0	0.1	0.1	0.1	0.1	0.1
Total Research Councils	110.7	13.4	14.1	14.8	15.5	16.3
UGC	..	..	..	..	..	..
Total civil R&D	361.8	272.9	324.8	355.4	357.7	367.1
Ministry of Defence	20.4	26.9	23.2	23.0	24.1	24.5
TOTAL	382.3	299.9	348.0	378.4	381.8	391.6

Table 1.13 Primary purpose of Government funded R&D by departments (in real terms)

(2) Support for policy

(base year 1987-88)

	Outturn	Estimate Provision Plans				
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil Departments						
MAFF	40.0	34.3	33.3	33.6	32.6	32.5
DES	69.5	55.8	60.0	59.0	57.5	56.4
DEn	35.0	38.2	40.5	39.8	38.5	37.3
DOE	21.9	24.9	25.3	27.7	27.7	28.2
OHSS	29.8	27.5	31.6	35.7	36.8	38.1
HSC	1.1	1.0	1.0	1.0	1.3	1.3
Home Office	13.8	12.9	11.4	13.0	12.7	12.5
ODA	..	..	..	..	..	..
DTI	2.7	3.3	3.9	3.4	3.1	3.1
DTp	6.8	7.2	7.2	7.2	7.0	7.4
NI Depts	5.8	4.3	5.4	6.6	6.7	6.6
Scottish Depts	13.1	18.8	20.4	19.9	19.9	20.4
Welsh Office	2.4	1.5	1.5	1.8	1.5	1.4
DEnsp	1.6	2.2	2.6	2.6	2.6	2.6
TA	16.0	23.9	42.4	46.5	39.6	38.4
Other depts	4.1	3.6	3.3	3.3	3.2	3.2
Total civil departments	263.7	259.5	289.7	301.0	290.8	289.4
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	12.0	0.0	0.0	0.0	0.0	0.0
MRC	104.3	13.3	13.0	13.0	13.1	13.4
NERC	..	..	..	..	..	..
SERC	0.0	0.1	0.1	0.1	0.1	0.1
Total Research Councils	116.3	13.4	13.1	13.1	13.2	13.4
UGC	..	..	..	..	..	..
Total civil R&D	380.0	272.9	302.8	314.1	303.9	302.8
Ministry of Defence	21.4	26.9	21.6	20.3	20.5	20.3
TOTAL	401.5	299.9	324.4	334.4	324.4	323.1

Table 1.14 Primary purpose of Government funded R&D by departments (in cash terms)

(3) Improvement of technology

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	66.5	65.0	68.4	68.4	62.3	56.5
DES	..	9.6	10.1	10.4	11.1	11.4
DEn	122.8	97.5	108.9	88.9	78.2	73.1
DOE	8.9	6.2	8.5	8.3	9.1	9.0
DHSS	3.0	2.3	2.6	2.6	2.7	3.0
HSC	..	..	..	..	..	..
Home Office	..	0.6	0.5	0.5	0.4	0.4
ODA	..	..	..	..	..	..
DTI	357.6	318.3	308.0	376.9	335.4	236.6
DTp	0.1	0.2	0.2	0.1	0.0	0.0
NI Depts	10.0	10.9	9.3	7.5	6.7	6.4
Scottish Depts	32.3	22.4	22.0	20.8	19.8	18.3
Welsh Office	..	..	..	..	..	..
DEsp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	4.5	5.2	5.4	5.6	5.6	5.6
Total civil departments	605.6	538.1	543.9	589.9	531.3	420.4
Research Councils						
AFRC	20.9	16.4	17.3	19.2	18.5	18.0
ESRC	..	9.0	9.5	10.9	10.7	10.3
HRC	..	94.6	100.0	116.2	119.0	119.5
NERC	20.6	21.8	23.7	31.2	29.3	29.1
SERC	138.0	156.0	154.0	188.8	198.7	190.1
Total Research Councils	179.5	297.9	304.5	366.3	376.3	367.0
UGC	155.0	165.0	165.0	170.0	175.0	180.0
Total civil R&D	940.1	1001.1	1013.4	1126.2	1082.6	967.4
Ministry of Defence	12.5	14.4	12.3	10.4	10.8	11.0
TOTAL	952.6	1015.5	1025.7	1136.5	1093.5	978.4

Table 1.15 Primary purpose of Government funded R&D by departments in (real terms)

(3) Improvement of technology (base year 1987-88)

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	69.8	65.0	63.8	60.4	53.0	46.6
DES	..	9.6	9.4	9.1	9.4	9.4
DEn	129.0	97.5	101.5	78.5	66.4	60.3
DOE	9.3	6.2	7.9	7.4	7.7	7.4
DHSS	3.1	2.3	2.4	2.3	2.3	2.5
HSC	..	..	..	..	..	..
Home Office	..	0.6	0.4	0.4	0.3	0.3
ODA	..	..	..	..	..	..
DTI	375.6	318.3	287.2	333.1	285.0	195.2
DTp	0.1	0.2	0.2	0.1	0.0	0.0
NI Depts	10.5	10.9	8.7	6.6	5.7	5.3
Scottish Depts	33.9	22.4	20.5	18.3	16.8	15.1
Welsh Office	..	..	..	..	..	..
DEsp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	4.7	5.2	5.0	5.0	4.8	4.6
Total civil departments	636.0	538.1	507.1	521.3	451.5	346.8
Research Councils						
AFRC	21.9	16.4	16.1	17.0	15.7	14.8
ESRC	..	9.0	8.9	9.6	9.1	8.5
MRC	..	94.6	93.2	102.7	101.1	98.6
NERC	21.6	21.8	22.1	27.5	24.9	24.0
SERC	144.9	156.0	143.6	166.8	168.9	156.8
Total Research Councils	188.5	297.9	283.9	323.7	319.7	302.8
UGC	162.8	165.0	153.8	150.2	148.7	148.5
Total civil R&D	987.3	1001.1	944.9	995.3	920.0	798.1
Ministry of Defence	13.1	14.4	11.5	9.2	9.2	9.1
TOTAL	1000.4	1015.5	956.4	1004.5	929.2	807.2

Table 1.16 Primary purpose of Government funded R&D by departments (in cash terms)

m

(4) Support for procurement

	Outturn	Estimate Provision Plans				
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	..	..	..	..	..	..
DES	..	..	..	..	..	..
DEn	..	..	..	..	..	..
DOE	3.7	4.8	1.4	1.3	1.4	1.3
DHSS	0.6	0.2	0.1	0.2	0.2	0.2
HSC	..	..	..	..	..	..
Home Office	..	0.5	0.5	0.5	0.5	0.5
CDA	..	..	..	..	..	..
DTI	..	..	..	..	..	..
DTp	8.8	8.8	9.3	9.1	9.2	9.8
NI Depts	..	..	..	..	..	..
Scottish Depts	0.1	0.0	0.1	0.1	0.1	0.1
Welsh Office	..	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts						
Total civil departments	13.2	14.3	11.4	11.0	11.3	11.8
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.0	..	..	..	..	..
HRC	..	..	..	..	..	..
MERC	..	..	..	..	..	..
SERC	..	..	..	..	..	..
Total Research Councils	0.0	..	..	..	..	..
UGC	..	..	..	..	..	..
Total civil R&D	13.2	14.3	11.4	11.0	11.3	11.8
Ministry of Defence	2224.0	2185.8	2315.3	2386.0	2492.2	2539.9
TOTAL	2237.2	2200.0	2326.8	2397.0	2503.5	2551.7

Table 1.17 Primary purpose of Government funded R&D by departments (in real terms)

(4) Support for procurement

(base year 1987-88)

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	..	..	..	..	..	..
DES	..	..	..	..	..	..
DEn	..	..	..	..	..	..
DOE	3.9	4.8	1.3	1.1	1.2	1.1
OHSS	0.6	0.2	0.1	0.1	0.1	0.2
HSC	..	..	..	..	..	..
Home Office	..	0.5	0.4	0.4	0.4	0.4
ODA	..	..	..	..	..	..
DTI	..	..	..	..	..	..
DTp	9.3	8.8	8.7	8.0	7.8	8.1
NI Depts	..	..	..	..	..	..
Scottish Depts	0.1	0.0	0.1	0.1	0.1	0.1
Welsh Office	..	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	..	..	..	..	..	..
Total civil departments	13.9	14.3	10.6	9.7	9.6	9.7
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.0	..	..	..	..	..
MRC	..	..	..	..	..	..
MERC	..	..	..	..	..	..
SERC	..	..	..	..	..	..
Total Research Councils	0.0	..	..	..	..	..
UGC	..	..	..	..	..	..
Total civil R&D	13.9	14.3	10.6	9.7	9.6	9.7
Ministry of Defence	2335.7	2165.8	2156.8	2108.7	2117.8	2095.5
TOTAL	2349.6	2200.0	2169.4	2118.5	2127.4	2105.2

Table 1.1B Primary purpose of Government funded R&D by departments (in cash terms)

(5) Support for statutory duties

	Estimate Provision Plans					
	Outturn 1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	8.9	9.1	9.7	10.4	10.4	10.6
DES	0.2	0.1	0.2	0.2	0.2	0.2
DEn	36.3	40.8	43.5	40.8	21.4	21.9
DOE	25.5	25.1	26.7	30.2	30.1	30.5
DHSS	12.6	15.9	16.7	17.5	17.6	18.4
HSC	4.3	4.1	4.2	4.6	5.9	6.2
Home Office	..	..	..	..	..	..
ODA	..	..	..	..	..	..
DTI	2.7	2.8	3.6	3.3	3.0	3.0
DTp	9.2	10.2	9.7	10.4	10.5	11.4
NI Depts	0.2	0.1	0.1	0.1	0.1	0.1
Scottish Depts	4.5	4.3	4.4	4.8	4.9	5.0
Welsh Office	0.8	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	0.6	0.5	0.7	0.8	0.7	0.7
Total civil departments	105.7	114.0	119.5	123.0	104.8	107.9
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.1	..	..	..	..	..
MRC	..	..	..	..	..	..
NERC	0.4	0.3	0.7	0.8	0.8	0.8
SERC	..	..	..	..	..	..
Total Research Councils	0.5	0.3	0.7	0.8	0.8	0.8
USC	..	..	..	..	..	..
Total civil R&D	106.2	114.3	120.2	123.8	105.5	108.7
Ministry of Defence	4.9	8.1	8.5	11.9	12.5	12.7
TOTAL	111.1	122.5	128.7	135.7	118.0	121.4

Table 1.19 Primary purpose of Government funded R&D by departments in (real terms)

(5) Support for statutory duties

(base year 1987-88)

	Outturn	Estimate Provision Plans				
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	9.3	9.1	9.0	9.2	8.9	8.7
DES	0.2	0.1	0.2	0.2	0.2	0.2
DEn	38.1	40.8	40.6	36.0	18.2	18.1
DOE	26.8	26.1	24.9	26.7	25.5	25.2
DHSS	13.3	15.9	15.6	15.5	15.0	15.1
HSC	4.5	4.1	3.9	4.1	5.0	5.1
Home Office	..	..	..	..	..	..
CCA	..	..	..	..	..	..
DTI	2.8	2.8	3.4	2.9	2.5	2.5
DTp	9.7	10.2	9.1	9.2	8.9	9.4
NI Depts	0.2	0.1	0.1	0.0	0.0	0.0
Scottish Depts	4.7	4.3	4.1	4.2	4.2	4.1
Welsh Office	0.8	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	0.6	0.5	0.6	0.7	0.6	0.6
Total civil departments	111.0	114.0	111.5	108.7	89.0	89.0
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.1	..	..	..	..	..
MRC	..	..	..	..	..	..
NERC	0.4	0.3	0.6	0.7	0.6	0.6
SERC	..	..	..	..	..	..
Total Research Councils	0.5	0.3	0.6	0.7	0.6	0.6
UGC	..	..	..	..	..	..
Total civil R&D	111.5	114.3	112.1	109.4	89.7	89.7
Ministry of Defence	5.1	8.1	7.9	10.5	10.6	10.5
TOTAL	116.6	122.5	120.0	119.9	100.3	100.1

Table 1.20 Primary purpose of Government funded R&D by departments (in cash terms)

11

(6) Support for humanities

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF
DES	..	2.4	2.5	2.7	2.8	2.9
DEn
DOE
DHSS
HSC
Home Office
ODA
DTI
DTp
NI Depts	..	0.2	0.2	0.2	0.2	0.2
Scottish Depts
Welsh Office
DEsp
TA
Other depts
Total civil departments	..	2.6	2.7	2.9	3.0	3.1
Research Councils						
AFRC
ESRC
MRC
NERC
SERC
Total Research Councils
UGC	65.0	65.0	65.0	65.0	65.0	65.0
Total civil R&D	65.0	67.6	67.7	67.9	68.0	68.1
Ministry of Defence
TOTAL	65.0	67.6	67.7	67.9	68.0	68.1

Table 1.21 Primary purpose of Government funded R&D by departments in (real terms)

(6) Support for humanities m
(base year 1987-88)

	Outturn		Estimate Provision Plans			
	1985-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF
DES	..	2.4	2.3	2.4	2.4	2.4
DEn
DOE
DHSS
HSC
Home Office
ODA
DTI
DTP
NI Depts	..	0.2	0.2	0.2	0.2	0.2
Scottish Depts
Welsh Office
DEsp
TA
Other depts
Total civil departments	..	2.6	2.5	2.6	2.6	2.6
Research Councils						
AFRC
ESRC
MRC
NERC
SERC
Total Research Councils
UGC	68.3	65.0	60.6	57.4	55.2	53.6
Total civil R&D	68.3	67.6	63.1	60.0	57.8	56.2
Ministry of Defence
TOTAL	68.3	67.6	63.1	60.0	57.8	56.2

Table 1.22 Primary purpose of Government funded R&D by departments (in cash terms)

m

(7) Support for other activities

	Outturn		Estimate Provision Plans			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	..	0.0	0.0	0.0	0.0	0.0
DES	..	0.8	0.8	0.9	0.9	1.0
DEn	..	..	..	..	..	..
DOE	..	..	..	..	..	..
DHSS	3.4	0.0	..	..	..	..
HSC	..	..	..	..	..	..
Home Office	0.1	0.2	0.2	0.2	0.2	0.2
ODA	27.0	32.5	35.0	39.4	41.5	42.5
DTI	..	..	..	..	..	..
DTp	..	..	..	..	..	..
NI Depts	0.1	0.1	0.1	0.1	0.1	0.1
Scottish Depts	..	..	..	..	..	..
Welsh Office	..	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	3.1	..	..	..	..	..
Other depts	2.5	3.0	3.5	3.4	3.2	3.3
Total civil departments	36.2	36.6	39.6	44.0	45.9	47.0
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.2	..	..	..	..	..
MRC	..	..	..	..	..	..
NERC	..	..	..	..	..	..
SERC	..	..	..	..	..	..
Total Research Councils	0.2	..	..	..	..	..
UGC	80.0	90.0	90.0	90.0	95.0	95.0
Total civil R&D	116.3	126.6	129.6	134.0	140.9	142.0
Ministry of Defence	2.5	2.3	2.5	1.5	1.6	1.6
TOTAL	118.8	128.9	132.1	135.5	142.5	143.6

Table 1.23 Primary purpose of Government funded R&D by departments (in real terms)

(7) Support for other activities m
(base year 1987-88)

	Outturn	Estimate Provision Plans				
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	..	0.0	0.0	0.0	0.0	0.0
DES	..	0.8	0.8	0.8	0.8	0.8
DEn	..	..	..	..	..	..
DOE	..	..	..	..	..	..
DHSS	3.6	0.0	..	..	..	..
HSC	..	..	..	..	..	..
Home Office	0.2	0.2	0.2	0.2	0.2	0.2
ODA	28.3	32.5	32.7	34.8	35.3	35.1
DTI	..	..	..	..	..	..
DTp	..	..	..	..	..	..
NI Depts	0.1	0.1	0.1	0.1	0.1	0.1
Scottish Depts	..	..	..	..	..	..
Welsh Office	..	..	..	..	..	..
DEmp	..	..	..	..	..	..
TA	3.3	..	..	..	..	..
Other depts	2.6	3.0	3.2	3.0	2.7	2.7
Total civil departments	38.0	35.6	36.9	38.9	39.0	38.8
Research Councils						
AFRC	..	..	..	..	..	..
ESRC	0.2	..	..	..	..	..
MRC	..	..	..	..	..	..
NERC	..	..	..	..	..	..
SERC	..	..	..	..	..	..
Total Research Councils	0.2	..	..	..	..	..
UGC	84.0	90.0	83.9	79.5	80.7	78.4
Total civil R&D	122.2	125.6	120.8	118.4	119.8	117.2
Ministry of Defence	2.5	2.3	2.3	1.3	1.3	1.3
TOTAL	124.8	128.9	123.1	119.8	121.1	118.5

Figure 1.24 Overall distribution of R&D funding, 1987-88

	m	%
	-----	----
Intramural	1417.8	28.7
Research Councils	70.5	1.4
Other government depts	85.1	1.7
Universities	1072.5	21.7
Private industry	1677.8	33.9
Public corporations	159.9	3.2
Research associations	26.6	0.5
Overseas	227.6	4.6
Non-industrial research institutes	50.0	1.0
Professional & learned societies	1.8	0.0
Persons	64.0	1.3
Others	93.7	1.9
Sub-total	4947.2	100.0
less receipts	331.5	
TOTAL	4615.7	

Table 1.25 Expenditure by departments on science and technology (in cash terms)

		m					
		Outturn	Estimate Provision Plans				
		1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments							
MAFF	R&D	118.3	113.8	119.3	122.6	117.3	112.8
	other S&T	38.4	26.9	32.4	34.2	32.9	30.8
DES	R&D	68.9	72.8	82.2	85.5	87.3	88.6
	other S&T	..	..	..	..	..	..
DEn	R&D	192.4	175.4	195.8	174.6	144.9	140.2
	other S&T	5.1	6.4	18.5	30.4	28.9	14.1
DOE	R&D	59.0	62.1	63.8	71.2	73.1	74.5
	other S&T	0.8	0.9	1.1	1.4	1.6	1.6
DHSS	R&D	49.4	47.3	54.8	62.2	65.4	69.3
	other S&T	..	..	..	..	..	..
HSC	R&D	5.4	5.1	5.3	5.8	7.4	7.8
	other S&T	..	..	..	..	..	..
Home Office	R&D	13.3	14.2	13.3	15.8	16.0	16.2
	other S&T	..	..	..	..	..	..
ODA	R&D	27.0	32.5	35.0	39.4	41.5	42.5
	other S&T	..	..	..	..	..	..
DTI	R&D	362.9	324.4	315.8	364.0	342.1	243.3
	other S&T	99.2	93.3	91.6	124.0	144.0	147.4
DTp	R&D	24.6	26.4	27.0	27.8	28.0	30.2
	other S&T	..	..	0.0	0.3	0.1	0.1
NI Depts	R&D	17.0	16.8	19.4	22.5	23.1	23.8
	other S&T	..	..	..	..	..	..
Scottish Depts	R&D	53.4	51.6	54.6	54.3	54.5	54.5
	other S&T	3.7	3.5	4.7	3.1	3.1	3.0
Welsh Office	R&D	3.5	1.9	2.0	2.5	2.2	2.2
	other S&T	..	..	..	..	..	..
DEmp	R&D	1.5	2.2	2.8	3.0	3.1	3.2
	other S&T	..	..	..	..	..	..
TA	R&D	18.4	23.9	45.5	52.6	46.6	46.6
	other S&T	..	..	..	..	..	..
Other depts	R&D	28.5	31.2	36.0	40.2	41.3	42.7
	other S&T	..	..	..	..	..	..
Total civil departments	R&D	1043.4	1002.7	1072.6	1163.8	1093.8	998.3
	other S&T	147.2	131.0	148.3	193.4	210.5	197.0
TOTAL CIVIL DEPARTMENTS	S&T	1190.6	1133.7	1221.0	1357.2	1304.4	1195.3
Research Councils							
AFRC	R&D	46.3	49.4	58.5	67.6	68.1	69.9
	other S&T	7.8	3.5	5.9	8.9	6.9	6.9
ESRC	R&D	20.0	21.6	21.2	26.3	27.6	27.1
	other S&T	3.8	3.3	5.1	5.7	4.9	4.6
MRC	R&D	127.6	139.1	149.3	176.1	181.2	184.3
	other S&T	0.8	0.3	0.3	0.3	0.2	0.2
MERC	R&D	68.0	70.8	86.2	118.8	103.4	100.5
	other S&T	1.7	2.4	5.6	4.7	2.8	2.8
SERC	R&D	295.9	334.5	341.2	373.6	382.3	375.9
	other S&T	14.6	16.5	21.0	23.6	20.2	23.5
unallocated		..	..	..	..	15.7	33.6
Total Research Councils	R&D	557.7	615.5	656.4	762.3	778.3	791.3
	other S&T	28.7	26.0	37.9	43.2	34.9	38.0
TOTAL RESEARCH COUNCILS	S&T	586.4	641.5	694.4	805.5	828.9	862.8
UGC	R&D	720.0	760.0	770.0	780.0	800.0	810.0
	other S&T	..	..	..	..	..	..
TOTAL CIVIL	R&D	2321.1	2378.1	2499.1	2706.1	2672.1	2599.6

TOTAL CIVIL S&T	other S&T	175.9	157.0	186.2	236.5	245.5	234.9
		2497.0	2535.1	2685.3	2942.6	2917.6	2834.5
Ministry of Defence	R&D	2264.2	2237.5	2351.8	2432.8	2541.2	2589.8
	other S&T	..	..	..	..	..	..
TOTAL	R&D	4585.3	4615.6	4850.9	5138.9	5213.3	5189.4
TOTAL	S&T	4761.2	4772.6	5047.1	5375.4	5458.8	5424.3

Table 2.1 Expenditure on R&D in broad groups of industry, 1975 - 1987

	1975	1978	1981	1983	1985	m current prices	
						1986	1987
All product groups							
- intramural only	1340.1	2324.3	3792.5	4163.3	5121.6	5950.7	6337.0
All products of manufacturing industry	1275.4	2212.6	3511.7	3869.9	4673.2	5070.4	5369.7
Chemicals and allied products	227.4	394.1	617.4	735.0	941.9	1037.9	1303.0
Mechanical engineering	96.4	174.1	234.0	249.6	262.6	268.4	285.6
Electronics	284.0	656.6	1235.3	1473.9	1758.6	1949.7	1854.7
Other electrical engineering	73.0	100.8	120.8	117.7	125.6	152.5	142.2
Motor vehicles	86.3	129.7	180.4	239.5	371.6	394.2	450.5
Aerospace	291.5	424.6	762.9	720.0	818.0	829.6	870.9
Other manufactured products	212.8	332.6	361.1	334.3	394.9	438.1	462.8
Non-manufactured products	64.8	111.7	280.8	293.5	448.4	880.3	967.3
						m at constant 1985 prices	
	1975	1978	1981	1983	1985	1986	1987
All product groups							
- intramural only	3729.6	4439.1	4745.2	4604.6	5121.6	5745.0	5834.6
All products of manufacturing industry	3549.6	4225.7	4393.9	4280.1	4673.2	4895.2	4944.0
Chemicals and allied products	632.9	752.7	772.5	812.9	941.9	1002.0	1199.7
Mechanical engineering	273.9	332.5	292.8	276.0	262.6	259.1	263.0
Electronics	790.4	1254.0	1545.6	1630.1	1758.6	1882.3	1707.7
Other electrical engineering	203.2	192.5	151.1	130.2	125.6	147.2	130.9
Motor vehicles	245.7	247.7	225.7	264.9	371.6	380.6	414.8
Aerospace	811.3	810.9	954.6	796.3	818.0	800.9	801.8
Other manufactured products	592.2	635.2	451.8	369.7	394.9	423.0	426.1
Non-manufactured products	180.3	213.3	351.3	324.6	448.4	849.9	890.6

Notes:

1. Electronics includes office machinery and electronic data processing equipment.
2. From 1986 the figures include UKAEA.
3. For 1983, 1986 and 1987 the data are based on sample surveys, for other years they are based on large-scale benchmark surveys.

Table 2.2 Source of funds for industrial R&D: 1967-1987

	Total intramural R&D		Government funds		Overseas funds		Mainly own funds	
	m	%	m	%	m	%	m	%
1967	611.5	100	178.0	29	23.3	4	410.2	67
1968	674.6	100	191.5	30	29.1	4	427.0	66
1969	693.3	100	216.5	31	32.6	5	444.8	64
1972	838.5	100	277.3	33	54.0	6	507.2	60
1975	1352.2	100	414.1	31	84.9	6	853.3	63
1978	2341.0	100	679.7	29	185.6	8	1475.7	63
1981	3792.5	100	1137.2	30	331.3	9	2324.0	61
1983	4163.3	100	1257.6	30	283.2	7	2622.5	63
1985	5121.6	100	1175.5	23	569.0	11	3377.1	66
1986	5950.7	100	1391.8	23	727.0	12	3831.9	65
1987	6337.0	100	1228.9	20	784.2	12	4323.9	68

Notes: UKAEA is included in 1986 and 1987.

Table 2.3 Intranural current and capital expenditure on R&D, 1981-87

	1981	1983	1985	1986	^m 1987
Total expenditure	3792.5	4163.3	5121.6	5950.7	6337.0
Expenditure on:					
Capital items	323.2	310.1	515.0	541.0	618.2
Current items	3469.3	3853.3	4606.6	5409.7	5718.8
of which					
- salaries and wages	1702.7	1881.4	2163.8	2534.9	2632.1
- other current items	1766.6	1971.8	2442.8	2874.8	3086.7

Note: UKAEA is included in 1986 and 1987.

Total manpower

	Outturn		Estimate			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	1924	1769	1797	1752	1752	1752
DES	13	13	12	11	11	11
DEn	63	74	71	79	79	79
DOE	897	909	859	863	853	852
DHSS	--	--	--	--	--	--
HSC	105	113	105	119	126	126
Home Office	278	253	254	254	255	256
ODA	306	211	207	236	252	255
DTI	1194	1162	1152	1168	1177	1177
DTp	652	660	658	660	660	660
NI Depts	508	502	491	502	502	502
Scottish Depts	393	399	395	397	393	393
Welsh Office	10	9	9	9	8	7
DEn	26	66	59	61	61	61
TA	47	108	121	121	121	121
Other depts	1085	1108	1103	1099	324	1097
Total civil departments	7501	7356	7293	7331	6574	7349
Research Councils						
AFRC (1)	5278	4795	4014	3935	3810	3260
ESRC	101	101	100	105	102	100
MRC	3646	3626	3338	3332	3626	3263
NERC	2474	2475	2539	2410	2330	2230
SERC	2780	2717	2720	2690	2660	2660
Total Research Councils	14279	13714	12711	12472	12528	11513
Total civil R&D	21780	21070	20004	19803	19102	18862
Ministry of Defence	22856	22703	23154	22259	21870	21869
TOTAL	44636	43773	43158	42062	40972	40731

Note: 1. From 1986-87 staff of grant-aided institutes were reported and costed as AFRC employees.

Degree or equivalent

	Outturn		Estimate			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	849	781	794	772	772	772
DES	5	6	5	5	5	5
DEn	34	41	41	45	45	45
DOE	393	388	372	373	371	370
DHSS	..	..	..	..	..	..
HSC	71	69	61	70	75	75
Home Office	192	182	181	182	183	184
CDA	169	120	116	140	154	156
DTI	591	570	567	576	581	581
DTp	350	358	366	362	362	362
NI Depts	162	149	108	111	111	111
Scottish Depts	159	162	160	162	162	162
Welsh Office	7	6	6	6	6	5
DEp	14	46	40	42	42	42
TA	36	50	64	64	64	64
Other depts	373	347	351	347	349	349
Total civil departments	3405	3275	3232	3257	3282	3283
Research Councils						
AFRC (1)	2399	2333	1703	1665	1640	1460
ESRC	51	35	55	55	54	55
MRC	1479	1492	1531	1528	1516	1497
NERC	1344	1200	1231	1168	1130	1081
SERC	1099	1073	1075	1063	1051	1051
Total Research Councils	6372	6133	5595	5479	5391	5144
Total civil R&D	9777	9408	8827	8736	8673	8427
Ministry of Defence	4968	5005	4994	4896	4795	4794
TOTAL	14745	14413	13821	13632	13468	13221

Note: 1. From 1986-87 staff of grant-aided institutes were reported and coded as AFRC employees.

Technician or equivalent

	Outturn		Estimate			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	458	418	425	414	414	414
DES	..	..	..	..	..	..
DEn	..	..	..	..	..	..
DOE	154	191	178	179	176	176
DHSS	..	..	..	..	..	..
HSC	9	7	7	9	9	9
Home Office	32	22	25	24	24	24
ODA	64	13	13	16	17	18
DTI	155	137	136	138	139	139
DTp	19	22	15	15	15	15
NI Depts	157	169	293	301	301	301
Scottish Depts	91	91	91	91	91	91
Welsh Office	..	..	..	..	..	..
DEn	..	..	..	..	..	..
TA	..	..	..	..	..	..
Other depts	220	244	247	241	237	237
Total civil departments	1359	1314	1430	1428	1423	1424
Research Councils						
AFRC (1)	1106	954	996	580	560	460
ESRC	..	..	..	..	..	..
MRC	1019	992	854	852	845	834
NERC	102	109	112	106	103	98
SERC	215	209	209	207	205	205
Total Research Councils	2442	2264	1771	1745	1610	1597
Total civil R&D	3801	3578	3201	3173	3033	3021
Ministry of Defence	3891	3929	3914	3816	3716	3716
TOTAL	7692	7507	7115	6989	6749	6737

Note: 1. From 1986-87 staff of grant-aided institutes were reported and costed as AFRC employees.

Table 3.4 Manpower engaged on R&D

Administrative staff

	Outturn		Estimate			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	182	175	177	177	177	177
DES	8	7	7	6	6	5
DEn	25	27	25	29	29	29
DOE	140	150	148	149	147	147
DHSS	..	..	..	..	..	..
HSC	25	23	23	24	25	25
Home Office	40	37	36	36	36	36
ODA	31	39	40	40	40	40
DTI	222	229	228	232	234	234
DTp	113	115	113	117	117	117
NI Depts	54	58	40	40	40	40
Scottish Depts	56	59	57	57	57	57
Welsh Office	3	3	3	3	2	2
DEnsp	12	20	16	16	16	16
TA	11	58	57	57	57	57
Other Depts	188	193	182	187	167	187
Total civil departments	1110	1193	1152	1170	1170	1170
Research Councils						
AFRC (1)	727	615	565	550	530	430
ESRC	50	66	37	42	40	37
MRC	734	736	709	708	702	693
NERC	406	424	435	413	399	424
SERC	555	543	544	538	532	532
Total Research Councils	2472	2384	2290	2251	2203	2116
Total civil R&D	3582	3577	3442	3421	3373	3286
Ministry of Defence	2388	2334	2323	2174	2157	2157
TOTAL	5970	5911	5765	5595	5530	5443

Note: 1. From 1986-87 staff of grant-aided institutes were reported and costed as AFRC employees.

Table 3.5

Manpower engaged on R&D

Other staff

	Outturn		Estimate			
	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Civil departments						
MAFF	435	395	401	389	389	389
DES	..	..	..	..	..	..
DEn	4	6	5	5	5	5
DCE	210	180	161	162	159	159
DHSS	..	..	..	..	..	..
HSC	..	14	14	16	17	17
Home Office	14	12	12	12	12	12
ODA	42	39	38	40	41	41
DTI	226	226	221	222	223	223
DTp	170	165	164	166	166	166
NI Depts	135	126	50	50	50	50
Scottish Depts	87	87	87	87	83	83
Welsh Office	..	..	..	..	..	..
DEsp	..	..	3	3	3	3
TA	..	..	..	..	..	..
Other depts	304	324	323	324	324	324
Total civil departments	1627	1574	1479	1476	1472	1472
Research Councils						
AFRC (1)	1046	893	1150	1140	1080	910
ESRC	..	..	8	8	8	8
MRC	414	406	244	244	242	239
NERC	622	742	761	723	698	669
SERC	911	892	892	882	872	872
Total Research Councils	2993	2933	3055	2997	2900	2698
Total civil R&D	4620	4507	4534	4473	4372	4170
Ministry of Defence	11609	11435	11923	11373	11202	11202
TOTAL	16229	15942	16457	15846	15574	15372

Note: 1. From 1986-87 staff of grant-aided institutes were reported and coded as AFRC employees.

Table 3.6 Industrial employment on R&D, 1981-87

	Average for year, thousands				
	1981	1983	1985	1986	1987
Scientists and engineers	77	77	81	87	87
Technicians, laboratory assistants and draughtsmen	66	60	49	49	49
Administrative, clerical, industrial and other staff	52	49	42	52	48
Total employment	195	186	173	188	184

Table 3.7 Academic staff in United Kingdom universities: science and engineering cost centres only

	Wholly university financed			Not wholly university financed			All staff		
	Teaching and research	Research only	Total	Teaching and research	Research only	Total	Teaching and research	Research only	Total
1980-81	12936	626	13562	545	4550	5095	13481	5176	18657
1983-84	11801	592	12393	544	5717	6261	12345	6309	18654
1984-85	12075	589	12664	422	6201	6623	12497	6790	19287
1985-86	12338	591	12929	474	6621	7095	12812	7212	20024
1986-87	12472	584	13056	499	7330	7829	12971	7914	20885
1987-88	12437	574	13011	543	7659	8202	12980	8233	21213

Table 3.8 First degree graduates in Great Britain

	Actual						Projected		Thousands
	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92
Engineering	16	16	15	15	16	16	16	16	16
Science and mathematics	25	27	28	28	28	29	29	30	30

Table 3.9 First destination of science and engineering graduates in Great Britain 1987

a. Type of first destination

	UK employment		Overseas employment	Further education and training	Believed unemployed	Other	Total		Grand total
	perm	temp					known	unknown	
Engineering	9131	167	227	1209	640	1770	13144	1457	14601
Science	11918	904	416	5995	1628	1243	22306	2513	24819

b. Graduates in permanent UK employment: type of employer

	Industry	Commerce	Public service	Education	Other	Total		Grand total
						known	unknown	
Engineering	6592	1228	723	119	197	8859	52	8911
Science	4268	4202	1778	769	769	11656	169	11835

c. Graduates in permanent UK employment: type of work

	Admin Man'nt	Science Eng'ing	Market	Finance Legal	Personnel Medical	Teach Lect'	Other	Total		Grand total
								known	unknown	
Engineering	1059	6412	277	873	64	19	131	8835	76	8911
Science	4010	3037	885	2125	806	149	705	11717	118	11835

Table 4.1 R&D performed in each sector according to source of finance, 1987

in current prices

Sectors providing the funds	Sectors carrying out the work				Totals Overseas	
	Government	Higher education	Industry	Other		
Government	1197.8	1072.5	1228.9	156.0	3655.2	227.6
Higher education	..	55.0	..	..	55.0	
Industry	153.4	73.5	4323.9	146.0	4696.8	
Overseas	34.0	38.4	784.2	8.0	864.6	
Other	40.6	100.1	..	40.0	180.7	
Total	1425.8	1339.5	6337.0	350.0	9452.3	

Notes: 1. Research in the social sciences and humanities is included.

2. Industry includes the public corporations and the research associations and the UKAEA, which became a public corporation in April 1986.

3. Some of the smaller numbers have been estimated.

Table 5.1 European Community R&D: the Framework programme

Resource allocation for the period 1987-91

	MECU
Quality of life	375
Health	80
Radiation protection	34
Environment	261
Information technology & telecommunications	2275
Information technologies	1600
Telecommunications	550
New services (including transport)	125
Industry	845
S&T for manufacturing industry	400
S&T of advanced materials	220
Raw materials & recycling	45
Technical standards	180
Biological resources	280
Biotechnology	120
Agro-industrial technologies	105
Competitiveness of agriculture	55
Energy	1173
Fission: nuclear safety	440
Controlled fusion	611
Non-nuclear energy	122
S&T for development	80
Marine resources	60
Marine S&T	50
Fisheries	30
European S&T co-operation	288
Human resources	180
Use of major installations	30
Forecasting & assessment	23
Dissemination & utilisation of S&T	55
TOTAL	5396

Table 6.1 Government R & D funding in European Countries in 1987 (by NABS objectives)

								million	
	Federal Republic of Germany	France	Italy	Nether- lands	Belgium	United Kingdom	Other	Total	EC
Exploration and exploitation of the Earth	99	81	44	6	14	85	77	406	7
Infrastructure and general planning of land use	99	181	18	46	3	67	17	431	27
Control of environmental pollution	175	25	48	31	9	56	25	369	45
Protection and improvement of human health	170	207	178	25	11	202	88	881	27
Production, distribution and rational utilisation of energy	455	383	311	41	36	170	44	1440	382
Agricultural production and technology	106	205	86	43	29	196	125	789	18
Industrial production and technology	808	609	690	178	48	414	249	2944	272
Social structures and relationships	129	156	52	24	2	70	33	466	9
Exploration and exploitation of space	259	338	272	28	37	130	71	1135	11
Research financed from general university funds "GUF"	1551	684	931	411	84	760	316	4737	..
Non-oriented research	663	838	191	104	90	219	126	2232	19
Other civil research	7	59	41	44	9	14	27	201	0
Defence	660	1953	216	28	4	2232	66	5159	..
TOTAL	5181	5718	3078	1010	375	4616	1264	21190	817

Source: Statistical Office of the European Community: Government Financing of Research and Development in the Member States of the Community: 1980-1988.

Notes:

1. Data for the European Community Institutions (EC) are not included in the total. Those figures relate to appropriations for commitments and are not strictly comparable with the estimated outturn data for the individual countries.
2. Non-oriented research is principally in the field of mathematics and the natural sciences.
3. Converted to Sterling using purchasing power parities calculated by the OECD.

T 6.2 Government R & D funding in European Countries in 1967 (by NABS objectives)

	Federal Republic of Germany	France	Italy	Nether- lands	Belgium	United Kingdom	Other
Exploration and exploitation of the Earth	1.9	1.4	1.4	0.6	3.8	1.8	6.1
Infrastructure and general planning of land use	1.9	3.2	0.6	4.6	0.7	1.4	1.3
Control of environmental pollution	3.4	0.4	1.5	3.1	2.3	1.2	2.0
Protection and improvement of human health	3.3	3.6	5.8	2.5	2.9	4.4	7.0
Production, distribution and rational utilisation of energy	8.8	6.7	10.1	4.0	9.7	3.7	3.5
Agricultural production and technology	2.0	3.6	2.8	4.3	7.4	4.2	9.9
Industrial production and technology	15.6	10.7	22.4	17.6	12.9	9.0	19.7
Social structures and relationships	2.5	2.7	1.7	2.4	0.5	1.5	2.6
Exploration and exploitation of space	5.0	5.9	8.8	2.8	9.9	2.8	5.6
Research financed from general university funds "GUF"	29.9	12.0	30.3	40.7	22.4	16.5	25.0
Non-oriented research	12.8	14.7	6.2	10.3	24.1	4.8	10.0
Other civil research	0.1	1.0	1.3	4.4	2.4	0.3	2.1
Defence	12.7	34.2	7.0	2.8	1.1	48.4	5.2
TOTAL	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source and notes as for table 5.1

Table 5.3 Government R&D funding in European Countries in 1987 (by NABS objectives)

Contributions to Multilateral and Bilateral Projects	million				
	Federal Republic of Germany	France	Italy	Nether- lands	United Kingdom
Exploration and exploitation of the Earth	3.3	26.4	0.2	N/A	1.7
Infrastructure and general planning of land use	5.1	8.3	0.0	N/A	0.0
Control of environmental pollution	2.7	7.7	0.1	N/A	0.1
Protection and improvement of human health	1.0	19.4	4.1	0.2	6.3
Production, distribution and rational utilisation of energy	48.4	14.6	N/A	4.8	8.3
Agricultural production and technology	8.0	59.8	3.6	N/A	0.0
Industrial production and technology	143.4	86.8	1.1	N/A	104.7
Social structures and relationships	2.7	4.7	1.2	N/A	0.1
Exploration and exploitation of space	187.9	222.2	96.3	25.1	78.9
Research financed from general university funds "GUF"	N/A	..	N/A	N/A	..
Non-oriented research	88.4	140.1	39.1	16.6	65.7
Other civil research	N/A	..	N/A	0.2	0.3
Defence	146.6	..	N/A	0.5	320.3
TOTAL	637.6	589.8	145.6	47.5	586.3

Source and notes as for Table 5.1.

Data are not available for Belgium.

Table 6.4 Government R & D funding in European Countries in 1987 (by NABS objectives)

Contributions to Multilateral and Bilateral Projects, percentage distribution

per cent

	Federal Republic of Germany	France	Italy	Nether- lands	United Kingdom
Exploration and exploitation of the Earth	0.5	4.5	0.1	0.0	0.3
Infrastructure and general planning of land use	0.8	1.4	0.0	0.0	0.0
Control of environmental pollution	0.4	1.3	0.0	0.0	0.0
Protection and improvement of human health	0.2	3.3	2.8	0.4	1.1
Production, distribution and rational utilisation of energy	7.6	2.5	0.0	10.2	1.4
Agricultural production and technology	1.3	10.1	2.5	0.0	0.0
Industrial production and technology	22.5	14.7	0.7	0.0	17.9
Social structures and relationships	0.4	0.8	0.9	0.0	0.0
Exploration and exploitation of space	29.5	37.7	66.1	53.0	13.4
Research financed from general university funds "GUF"	0.0	0.0	0.0	0.0	0.0
Non-oriented research	13.9	23.8	26.8	35.0	11.2
Other civil research	0.0	0.0	0.0	0.4	0.1
Defence	23.0	0.0	0.0	1.0	54.6
TOTAL	100.0	100.0	100.0	100.0	100.0

Source and notes as for Table 6.1.

Data are not available for Belgium.

Table 6.5 Government R & D funding in European Countries in 1987 (by NABS objectives)

Contributions to Multilateral and Bilateral Projects, as a percentage of the programme	per cent				
	Federal Republic of Germany	France	Italy	Nether- lands	United Kingdom
Exploration and exploitation of the Earth	3.4	32.6	0.4	0.0	2.0
Infrastructure and general planning of land use	5.2	4.6	0.0	0.0	0.0
Control of environmental pollution	1.6	30.6	0.1	0.0	0.1
Protection and improvement of human health	0.6	9.4	2.3	0.8	3.1
Production, distribution and rational utilisation of energy	10.7	3.8	0.0	11.9	4.8
Agricultural production and technology	7.6	29.2	4.2	0.0	0.0
Industrial production and technology	17.8	14.3	0.2	0.0	25.3
Social structures and relationships	2.1	3.0	2.4	0.0	0.2
Exploration and exploitation of space	72.6	65.7	35.4	89.6	60.8
Research financed from general university funds "GUF"	0.0	0.0	0.0	0.0	0.0
Non-oriented research	13.3	16.7	20.4	16.0	29.9
Other civil research	0.0	0.0	0.0	0.4	2.4
Defence	22.2	0.0	0.0	1.7	14.3
TOTAL	12.3	10.3	4.7	4.7	12.7

Source and notes as for Table 6.1.

Data are not available for Belgium.

Table 6.6 Government funding of R & D in 1987 (by socio-economic objective)

	Italy	France	Federal Republic of Germany	Japan	Sweden	United States of America	United Kingdom
Agriculture, forestry and fishing	86	205	106		19	636	196
Industrial development	690	609	808		30	64	414
Energy	311	383	455		43	1191	170
Transport and communications	.	.	53		33	527	16
Urban and rural planning	18	181	46		8	57	51
Environmental planning	48	25	175		18	165	56
Health	178	207	170		8	3927	202
Social development and services	52	156	128		48	337	70
Earth and atmosphere	44	81	99		2	332	65
Advancement of knowledge	1122	1522	2215		369	1184	960
Civil space	272	338	259		21	1971	130
Defence	216	1953	660		221	22708	2232
Not elsewhere specified	41	59	7		..	..	14
TOTAL	3078	5718	5181		820	33099	4616

Source: OECD databank (May 1989)

Notes:

1. Transformed to sterling using OECD purchasing power parities (ppp).
2. See note to Table 6.9 regarding expenditure by the Japanese government.

Table 5.7 Government funding of R & D in 1987 (by socio-economic objective, as a percentage of GDP)

	Italy	France	Federal Republic of Germany	Japan	Sweden	United States of America	United Kingdom
Agriculture, forestry and fishing	0.02	0.05	0.02		0.03	0.02	0.05
Industrial development	0.17	0.15	0.17		0.04	0.00	0.10
Energy	0.08	0.09	0.10		0.06	0.05	0.04
Transport and communications	*	*	0.01		0.05	0.02	0.00
Urban and rural planning	0.00	0.04	0.01		0.01	0.00	0.01
Environmental planning	0.01	0.01	0.04		0.03	0.01	0.01
Health	0.04	0.05	0.04		0.01	0.15	0.05
Social development and services	0.01	0.04	0.03		0.07	0.01	0.02
Earth and atmosphere	0.01	0.02	0.02		0.00	0.01	0.02
Advancement of knowledge	0.28	0.37	0.47		0.55	0.05	0.24
Civil space	0.07	0.08	0.05		0.03	0.08	0.03
Defence	0.05	0.47	0.14		0.33	0.88	0.54
Not elsewhere specified	0.01	0.01	0.00		0.00	0.00	0.00
TOTAL	0.76	1.39	1.10		1.22	1.28	1.13

Source: OECD databank (May 1989).

Notes

See note to Table 5.9 regarding expenditure by the Japanese government.

Table 5.8 Government funding of R & D for civil and defence objectives (at current prices)

	Italy	France	Federal Republic of Germany	Japan	Sweden	United States of America	United Kingdom
1982, total expenditure	1576	3979	4117		600	19502	3690
expenditure on defence R & D	75	1408	351		113	11918	1758
expenditure on civil R & D	1501	2571	3766		487	7584	1932
1983, total expenditure	1822	4483	4152		685	21322	3987
expenditure on defence R & D	104	1465	399		147	13715	1976
expenditure on civil R & D	1718	3018	3753		538	7607	2011
1984, total expenditure	2084	4865	4288		733	24318	4263
expenditure on defence R & D	173	1625	428		164	16108	2170
expenditure on civil R & D	1911	3240	3860		569	8210	2093
1985, total expenditure	2326	5290	4838		759	28436	4520
expenditure on defence R & D	231	1655	577		182	19208	2335
expenditure on civil R & D	2095	3635	4261		577	9228	2185
1986, total expenditure	2692	5349	4894		761	30319	4585
expenditure on defence R & D	229	1738	593		197	21048	2259
expenditure on civil R & D	2463	3611	4301		564	9271	2326
1987, total expenditure	3078	5719	5181		820	33099	4616
expenditure on defence R & D	216	1953	660		221	22708	2232
expenditure on civil R & D	2862	3766	4521		599	10391	2384

Source: OECD data bank (May 1989)

Notes:

1. Transformed to sterling using purchasing power parities (ppp).
2. See the note to Table 5.9 regarding expenditure by the Japanese government.

Table 6.9 Government funding of R & D for civil and defence objectives (as a ratio of GDP)

	Italy	France	Federal Republic of Germany	Japan	Sweden	United States of America	United Kingdom
1982, total expenditure	0.55	1.30	1.21		1.26	1.16	1.33
expenditure on defence R & D	0.03	0.46	0.10		0.24	0.71	0.64
expenditure on civil R & D	0.52	0.84	1.10		1.02	0.45	0.70
1983, total expenditure	0.60	1.38	1.14		1.33	1.16	1.32
expenditure on defence R & D	0.03	0.45	0.11		0.29	0.74	0.65
expenditure on civil R & D	0.56	0.93	1.03		1.05	0.41	0.67
1984, total expenditure	0.64	1.43	1.11		1.32	1.19	1.32
expenditure on defence R & D	0.05	0.48	0.11		0.30	0.79	0.67
expenditure on civil R & D	0.59	0.95	1.00		1.03	0.40	0.65
1985, total expenditure	0.65	1.44	1.15		1.26	1.26	1.28
expenditure on defence R & D	0.06	0.45	0.14		0.30	0.65	0.66
expenditure on civil R & D	0.59	0.99	1.01		0.96	0.41	0.62
1986, total expenditure	0.71	1.39	1.11		1.22	1.27	1.22
expenditure on defence R & D	0.06	0.45	0.13		0.32	0.88	0.60
expenditure on civil R & D	0.65	0.94	0.97		0.90	0.39	0.62
1987, total expenditure	0.76	1.39	1.10		1.22	1.28	1.13
expenditure on defence R & D	0.05	0.47	0.14		0.33	0.88	0.54
expenditure on civil R & D	0.70	0.91	0.96		0.89	0.40	0.58

Source: OECD data bank (May 1989)

Notes:

1. Transformed to sterling using purchasing power parities (ppp).
2. Data for R&D expenditure by the Japanese government have been withdrawn by the OECD.

	YEAR	FEDERAL REPUBLIC OF					UNITED STATES OF	UNITED KINGDOM
		ITALY	FRANCE	GERMANY	JAPAN	SWEDEN	AMERICA	
Gross Domestic Product (GDP) (billion at ppp)	1982	286.7	305.9	341.1	617.0	47.7	1685.6	276.8
	1983	305.1	324.1	364.1	670.1	51.5	1844.4	302.3
	1984	326.1	340.3	387.8	728.9	55.4	2047.3	322.3
	1985	357.1	368.1	420.7	612.5	60.2	2261.5	352.6
	1986	376.9	385.7	442.1	654.0	62.5	2389.1	376.5
	1987	407.5	412.8	471.8	933.4	67.1	2594.3	409.9
	Domestic product of Industry (DPI) (billion at ppp)	1982	235.1	226.4	269.2	547.7	30.9	1467.4	197.0
1983		249.1	239.8	287.1	594.8	33.5	1605.9	216.1
1984		266.3	251.8	306.8	646.9	36.2	1793.6	231.2
1985		292.2	273.3	334.1	722.0	39.4	1985.0	254.6
1986		309.5	288.1	352.3	759.0	41.3	2101.6	268.9
1987		332.0	308.8	374.9	832.3	N/A	2278.9	294.1
Gross Expenditure on R&D (GERD) (billion at ppp)		1982	2.6	6.3	N/A	14.9	N/A	43.8	N/A
	1983	2.9	6.9	9.2	17.2	1.3	49.0	6.8
	1984	3.3	7.5	N/A	19.3	N/A	55.0	N/A
	1985	4.0	8.3	11.4	22.8	1.7	62.8	8.1
	1986	4.3	8.7	11.9	23.8	N/A	65.4	8.9
	1987	5.2	9.4	13.3	26.7	1.9	69.8	9.5
	GERD as a percentage of GDP	1982	0.9	2.1	N/A	2.4	N/A	2.6	N/A
1983		1.0	2.1	2.5	2.6	2.5	2.7	2.3
1984		1.0	2.2	N/A	2.6	N/A	2.7	N/A
1985		1.1	2.3	2.7	2.8	2.8	2.8	2.3
1986		1.1	2.3	2.7	2.8	N/A	2.7	2.4
1987		1.3	2.3	2.8	2.9	2.8	2.7	2.3
Percentage of GERD financed by government		1982	48.5	54.0	N/A	25.5	N/A	48.6	N/A
	1983	52.4	53.8	38.8	24.0	36.5	49.2	50.2
	1984	52.9	53.7	N/A	22.5	N/A	49.0	N/A
	1985	51.7	52.9	36.7	21.0	34	50.5	43.0
	1986	55.3	53.2	35.9	21.3	N/A	51.0	38.9
	1987	54.2	52.9	33.6	21.7	N/A	50.8	38.7
	R & D performed in the Business Enterprise Sector (BERD) (billion at ppp)	1982	1.5	3.7	N/A	9.2	N/A	31.3	N/A
1983		1.7	3.9	6.5	10.9	0.9	34.9	4.2
1984		1.8	4.3	N/A	12.6	N/A	39.3	N/A
1985		2.3	4.9	8.3	15.3	1.2	44.6	5.1
1986		2.5	5.1	8.6	15.8	N/A	46.0	6.0
1987		3.0	5.5	9.8	17.7	1.4	49.1	6.3
BERD as a percentage of GERD		1982	56.8	57.9	N/A	61.9	N/A	71.5	N/A
	1983	57.1	56.8	71.4	63.5	67.5	71.2	61.1
	1984	56.4	57.2	N/A	65.1	N/A	71.5	N/A
	1985	56.9	58.7	73.1	66.8	70.8	71.1	63.5
	1986	58.4	58.7	72.7	66.6	N/A	70.3	66.8
	1987	57.9	59.0	73.8	66.0	72	70.3	67.0
	BERD as a percentage of DPI	1982	0.6	1.6	N/A	1.7	N/A	2.1	N/A
1983		0.7	1.6	2.3	1.8	2.6	2.2	1.9
1984		0.7	1.7	N/A	1.9	N/A	2.2	N/A
1985		0.8	1.8	2.5	2.1	3.0	2.2	2.0
1986		0.8	1.8	2.4	2.1	N/A	2.2	2.2
1987		0.9	1.8	2.6	2.1	N/A	2.2	2.2

Industry financed BERD as a percentage of DPI	1982	0.5	1.2	N/A	1.7	N/A	1.4	N/A
	1983	0.5	1.2	1.9	1.8	2.2	1.5	1.2
	1984	0.5	1.2	N/A	1.9	N/A	1.5	N/A
	1985	0.6	1.2	2.1	2.1	2.6	1.5	1.3
	1986	0.5	1.2	2.1	2.0	N/A	1.4	1.4
	1987	0.6	1.2	2.3	2.1	N/A	1.4	1.5

Source : OECD

Notes:

1. N/A not available
2. The purchasing power parities (ppp) are calculated by the OECD. Revised pps are used in this table.
3. For reasons associated with the note to Table 6.9, data for Japan must be used with caution.
4. Some discontinuity arises for United Kingdom data, following the transfer of the UKAEA from the government sector to BERD, IN 1985.

CONFIDENTIAL



*File
DEPT X7*

br. BG

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

MR FAIRCLOUGH
CABINET OFFICE

INTERNATIONAL R&D PROGRAMMES

Thank you for your minute of 11 July attaching the report of the Review Team. The Prime Minister was most grateful for this material and for the work undertaken during the review. She hopes that Departments will now adopt the recommended guidelines for future international collaboration proposals. She agrees that Departments should now examine the recommendations in the report in relation to the fourteen major international facilities that were studied, and should submit their reactions through the E(ST) machinery with the aim of the Official Committee providing a final report to the Ministerial Committee by the end of the year.

I am copying this letter to the Private Secretaries to members of E(ST) and Sir Robin Butler.

ffca

PAUL GRAY
18 July 1989

CONFIDENTIAL

to



file 115

10 DOWNING STREET

LONDON SW1A 2AA

From the Principal Private Secretary

17 July 1989

Dear Tom

OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

The Advisory Council on Science and Technology (ACOST) has approved a report on Overcoming Barriers to Growth in Smaller Firms prepared by one of its Study Groups. Sir Francis Tombs will be submitting the Report shortly to the Prime Minister with a recommendation that its findings are published. A brief summary of the findings of the report have been included in ACOST's Advice on National Priorities for 1989. I am attaching a copy of the report. It would be helpful to have an early indication from your Secretary of State (and those indicated below) if he sees any difficulties in the recommendations being made public.

I am copying this letter to Neil Thornton (Department of Trade and Industry), Roger Bright (Department of the Environment), Brian Hawtin (Ministry of Defence), Shirley Stagg (Ministry of Agriculture, Fisheries and Food, Carys Evans (Chief Secretary's Office), John McCann (Minister of State for Employment's office) and to John Fairclough (Cabinet Office).


Your sincerely
Andrew Turnbull

Andrew Turnbull

Tom Jeffery, Esq.,
Department of Education and Science.

Ho

over



File

CONFIDENTIAL

W0171

MR TURNBULL

17 July 1989

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

Sir Francis Tombs will shortly be sending the Prime Minister a report by ACOST on Overcoming Barriers to Growth in Smaller Firms. He will ask for the Report to be sent primarily to the Departments of Trade and Industry, Employment, Education and Science and the Treasury for response to recommendations in the Report and to the Ministry of Defence, Department of the Environment and the Ministry of Agriculture, Fisheries and Food for general interest. Sir Francis will seek permission from the Prime Minister to publish the report.

2. I am attaching draft minutes for you to send to Private Secretaries and copies of the report. I am also attaching a three page summary of the conclusions and recommendations.

John W Fairclough

JOHN W FAIRCLOUGH
Chief Scientific Adviser

Encs

CONFIDENTIAL

ACOST REPORT: OVERCOMING BARRIERS TO GROWTH IN SMALLER FIRMS

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Smaller firms (with less than 500 employees) play a vital role in the translation of new scientific and technological knowledge into economic wealth. The small proportion of such firms which have the potential for development into larger scale international businesses, face substantial barriers to their growth such as the lack of strategic skills among managers; limited range of mechanisms to stimulate business experimentation, eg. public sector R & D contracts; and an inadequate supply of external risk capital to assist them to make major business transitions. The smaller firm is typically resource constrained and forced to follow paths of technological experimentation which are near to market in focus. These involve low risk development on a short commercial time scale and avoid collaboration in R & D. Apart from very small firms (less than 50 employees) recent changes in DTI innovation policies have not helped the smaller firm because of their emphasis on far from market research and collaboration.

Recommendation 1 - Corporate Venturing

We recommend that DTI investigates ways in which corporate venturing activity may be stimulated in the UK - both directly, and through linkages with the institutional venture capital industry. The potential role of positive incentives should be considered in this investigation.

Recommendation 2 - Business Expansion Scheme

We recommend that consideration be given to refocussing the BES in order to direct funds to companies which fall below the threshold for venture capital funds, and to exclude low risk

CONFIDENTIAL

property related investment. We recommend further that existing company and investor protection legislation be examined to see how the development of local venture capital markets might be encouraged.

In our view policies to stimulate business experimentation should be allocated on a competitive basis, so that companies compete against one another not against the eligibility criteria. We have therefore proposed that Government initiates two competitive schemes for this.

Recommendation 3 - The Genesis Programme

We recommend a new programme to enhance the creativity of smaller firms by enabling them to compete for R & D contracts to meet the mission needs of government agencies. We envisage that a sum of circa £60m be set aside annually out of the public sector R & D budget for this purpose.

Recommendation 4 - The Accelerator Programme

We also recommend that the DTI establish a complementary programme designed to help smaller firms make major strategic business transitions in R & D. Awards would be made in two stages on a competitive basis. We anticipate that the cost of the programme would be in the order of £12.5m per annum. Also in appropriate circumstances, smaller firms should be funded to participate in the programmes of Interdisciplinary Research Centres (IRCs).

Many smaller firms are unaware of the business significance and nature of their key invisible assets, particularly those technology related.

CONFIDENTIAL

Recommendation 5 - Intellectual Property

We recommend that awareness of the business role of intellectual property among smaller firms be promoted through a new Enterprise Initiative Programme and the DTI take steps to promote awareness of the market in patent litigation insurance among smaller firms and patent agents.

Improving strategic management skills is fundamental and the content and delivery of training should be directed to the specific needs of the smaller firm which are very different to those of larger companies at which the majority of existing programmes are directed.

Recommendation 6 - Strategic Management Training

We therefore recommend that series of regional competitions be established to identify and fund the application of best practice methods for delivering training in strategic management skills to the smaller firm. The funding of awards and dissemination will be the responsibility of the Department of Employment.



ACOST

*clp
(letter only)*

Advisory Council on Science and Technology
70 Whitehall, London SW1A 2AS
01-270-0109

Qn 0380

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

17 July 1989

Dear Prime Minister,

In our Advice on National Priorities for Science and Technology for 1989 we have briefly summarised the work of the Council on Barriers to Growth in Small Companies. The Council has now approved the full report on this which was prepared by a Study Group chaired by Professor Metcalfe. I am enclosing a copy. The Report makes a number of recommendations which we should like the Government to consider. These are mainly directed at the Department of Trade and Industry, the Department of Employment, the Treasury and the Department of Education and Science. Other Departments such as the Ministry of Defence, Department of Environment, Department of Health and the Ministry of Agriculture, Fisheries and Food will have an interest. We should like to publish the report as it is at an early date and I should be very grateful for your permission to do this.

Yours sincerely,

Francis Tombs

SIR FRANCIS TOMBS

CONFIDENTIAL

PRIME MINISTER

INTERNATIONAL R&D PROGRAMMES

At the end of last year you asked the Cabinet Office scientific secretariat to review the management of large international research facilities and the terms of the UK's participation.

This work has now been completed and John Fairclough's minute below attaches the report. This falls into two parts:

- recommendations in relation to each of the 14 individual facilities studied;
- a set of suggested guidelines for departments to use in considering future collaboration proposals

John Fairclough suggests that the next step should be for departments to examine the recommendations on individual facilities and report back to E(ST) so that a final report is available to E(ST) by the end of the year.

I do not suggest that you go through in detail the first part of the report on individual facilities. But you may like to go through the second half of the report on guidelines for future collaboration. There is nothing very profound in these, but they seem to me to provide a useful summary.

Content:

- (i) to commend to departments the proposed guidelines for future collaboration proposals? Yes
- (ii) to agree that departments should examine the recommendations on individual facilities so that a final report is available to E(ST) by the end of the year? Yes

REC
PAUL GRAY

17 July 1989

CONFIDENTIAL

MR PAUL GRAY - No. 10

11 July 1988

INTERNATIONAL R&D PROGRAMMES

- clapp p 8

In your minute to me of 14 December 1988 you asked me to put in hand arrangements for the Assessment Office to review the management of large international research facilities and the terms of the UK's participation.

2. The Review has now been completed and I enclose a copy of the report which the Review team have prepared. The Review has looked at fourteen major international facilities to which the UK contributes. Ten of these are scientific facilities of one sort or another, principally telescopes, neutron sources and research ships. These and are funded from allocations to the Research Councils from the DES' budget. The other four facilities are directed to specific applications - space, fusion, meteorology and aerospace - and are funded by DTI, DEn and MOD.

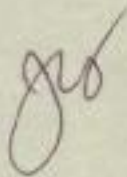
3. The report is in two parts. First come the recommendations for action in relation to each of the fourteen facilities; these are prefaced by a very brief account of the facility and the job it is there to perform. Second there is a set of suggested guidelines for Departments when they negotiate international collaborative ventures in the future. These guidelines have been considered and agreed by the official Committee which I chair.

4. I would suggest that the next step should be for Departments to examine the recommendations for action in relation to the facilities for which they are responsible and to report their reactions back to E(ST) in the way the Chief Secretary suggested in his letter to the Secretary of State for Education and Science of 1 December 1988. I would suggest that Departments' responses might be considered initially in the official Committee, with the aim of providing a final report to E(ST) by the end of the year.

CONFIDENTIAL

5. The Review team have prepared a detailed report on each of the fourteen facilities. These reports provide the factual underpinning for the detailed recommendations and have been agreed with the Departments concerned. I am making available final copies of these reports to Departments and sending a full set to the Treasury. If you think the Prime Minister would like to see any or all of these, I would be happy to send them on to you.

6. I am copying this minute and the enclosures to the Private Secretaries to members of E(ST) and to Sir Robin Butler.



JOHN W FAIRCLOUGH
Chief Scientific Adviser

REVIEW OF INTERNATIONAL R&D PROGRAMMES: RECOMMENDATIONS FOR ACTION

Table of Contents

<u>Facility Reviewed</u>	<u>Department responsible</u>	<u>Page No</u>
Anglo Australian Observatory	DES (SERC))
James Clerk Maxwell Telescope	DES (SERC)	) 2
Isaac Newton Group	DES (SERC))
ROSAT	DES (SERC)	4
Institut Laue Langevin	DES (SERC)	6
European Synchrotron Radiation Facility	DES (SERC)	8
ISIS	DES (SERC)	10
NERC Vessels	DES (NERC)	11
Ocean Drilling Program	DES (NERC)	12
European Molecular Biology Laboratory	DES (MRC)	14
European Space Agency	DTI	16
Joint European Torus	DEn	18
European Centre For Medium -Range Weather Forecasts	MOD	20
European Transonic Wind-Tunnel	DTI	21

TELESCOPES

Three observatories were reviewed:

- the Anglo Australian (AAO) in New South Wales which costs the UK and Australia each £1.1m a year to run and was built at a capital cost equivalent to £36.4m at 1989/90 prices. This comprises a 3.9m optical/infrared telescope as well as the original 1.2m optical Schmidt telescope. Together these provide Southern hemisphere observations for the UK ground based astronomy programme

- the James Clerk Maxwell Telescope (JCMT) in Hawaii which is jointly funded by the UK, Canada and Holland in the ratio 55, 25, 20 and costs £2.2m pa to run. It is a 15m millimetre wavelength telescope built at a cost equivalent to £12.2m at 1989/90 prices, and was completed in 1988

- the Isaac Newton Group (ING) of telescopes at La Palma which are funded jointly by the UK and Holland in the ratio 4:1 and cost £3m pa to run. The group consists of the 4.2m William Herschel telescope, the 2.5 Isaac Newton telescope and the 1m Jacobus Kapteyn telescope. They were completed in 1983 at a capital cost equivalent to £35.6m at 1989/90 prices. They provide Northern hemisphere optical observations.

Recommendations

- a) SERC should actively consider extending membership of these collaborations in order to reduce the costs to the UK and free resources for other activities. SERC has already benefited from Australia helping to fund the Schmidt telescope. Expansion of membership on existing telescopes should be considered when future needs, such as access to 8m telescopes, are being addressed.

b) SERC should continue to help the Spanish to develop their scientific expertise so that the quality of their projects at La Palma is more in line with those of other users. At present 20% of observation time is allocated to them and is considered by UK scientists to be poorly used.

c) SERC should monitor all non-member use of these observatories and compare this with SERC's own use (or that of its grant holders) of facilities of which it is not a member. We have suggested in relation to a number of facilities where 10% of the time is allocated to non-members subject to their proposals satisfying the necessary scientific criteria that we should satisfy ourselves that these opportunities are both reciprocated to and taken up by the UK. Results of SERC's present monitoring of non-member use here and elsewhere should be reported by DES to the Official Committee on Science and Technology.

ROSAT

This project is to launch a large satellite to carry out astronomical observations in the X-ray part of the spectrum. The UK has joined a German/USA collaboration and has provided a wide field camera at a cost of £18m alongside the German X-ray telescope. Altogether the UK has contributed 9% of the capital cost of the venture and will gain 12% of the observation time on each instrument.

Recommendations

a) SERC should review the value for money from collaborations such as this relative to the science programme of ESA which is mandatory for all members. Management of the ESA Horizon 2000 programme is currently being reviewed and decisions will be required in due course at the ESA Council. Although ROSAT has yet been launched, SERC reviews of ad hoc work will provide a valuable comparison when the UK has to express a view on Horizon 2000. We would further recommend that SERC should continue to monitor the management of ROSAT after launch to develop further lessons for the future.

Observations

i) ROSAT seems to be a rather successful opportunistic collaboration which arose through the 'Announcement of Opportunity' process used for international space and telescope projects. Under this process countries wishing to find partners for new projects advertise widely their outline proposals. The objectives in this case coincided with those of the UK scientific community and the opportunity to participate was available at a fixed cost to the UK (which was fortunate in the event since there have been greatly increased launcher costs to the US due to the Shuttle disaster).

ii) The observations obtained by ROSAT are required to be made available to the international scientific community after one year (as with other astronomical observations). This provides a strong incentive to publish results speedily and also makes it possible for users such as those in HEIs supported by SERC to have timely measures of output.

INSTITUT LAUE LANGEVIN (ILL)

The Institut Max von Laue-Paul Langevin is a neutron beam research facility at Grenoble which, at a cost of £26m a year, serves academic researchers from the three equal members - France, Germany and UK - and two scientific associates - Spain and Switzerland. The UK pays £8.5m a year. ILL makes an important contribution in advancing many fields of research in physics, chemistry and biology concerning atomic, molecular and material structure.

Recommendations

SERC are committed to reviewing their contribution to ILL in 1989 as part of their wider review of neutron facilities. The tripartite agreement for ILL is itself due to be renegotiated in 1992. The UK would have to give notice in 1990 if it were planning a change in the terms of its contribution. Against this background we recommend:

- a) SERC should review the overall scientific output from ILL against the original stated objectives. We are concerned that the review which SERC are planning may focus too narrowly on the terms and conditions of the UK's participation in ILL rather than on its scientific benefits relative to the UK's own neutron facility - ISIS - and to the related synchrotron facilities - ESRF and the UK's domestic facility SRS at Daresbury. Prima facie the very high acceptance rate for proposals to use the facility (80% of all proposals and 65% of requested beam time can be accommodated) raises some doubts about quality - and hence about overcapacity, although it is recognised that proposals have already been vetted by the national organisations who are funding the other costs of the research.

b) SERC should also establish with ILL the likely costs of decommissioning the ILL reactor and the extent of the UK's liability. Whilst we welcome the decision of the ILL Steering Committee to have an evaluation done of the decommissioning costs, it is not clear whether the French are obliged to bear these costs as the host country for the facility (as for example the UK appears to be in the case of the Joint European Torus (JET) facility at Culham). This needs urgent clarification.

c) SERC should take further steps to stimulate UK industrial interest in both tendering for ILL contracts and in using the facility. The UK share of contracts fell to a mere 5% in 1988 and industrial usage is minimal although one company has found it extremely useful. The problem seems to be lack of awareness of the capabilities, exacerbated by the lack of UK staff at the facility.

d) SERC should ensure that it obtains the necessary information from ILL to enable it to undertake a broad review of non-member sharing of the facility. A 1988 review of non-member use at ILL instigated by SERC members on the ILL Steering Committee showed that most of the beam time allocated to non-members was in collaboration with scientists from member states. However 15% use by non-member states seems high and may be a hidden additional cost to the UK. SERC should review the position again and DES report their findings to the Official Committee on Science and Technology.

e) SERC should examine the reasons for low UK staff participation at the facility and consider whether steps to increase it might be justified. We are pleased to note that on SERC's instigation, ILL has recently agreed to improve conditions for expatriate staff. SERC should monitor carefully whether this brings about the desired increase in UK staff.

EUROPEAN SYNCHROTRON RADIATION FACILITY (ESRF)

The ESRF machine and accompanying building are currently under construction alongside the ILL facility in Grenoble. The instrument will be one of four "condensed matter" facilities to which SERC currently contributes, two abroad (ILL and ESRF) and two at home (ISIS and SRS, Daresbury); two provide neutron beams (ILL and ISIS) and two synchrotron radiation (ESRF and the SRS at Daresbury). These facilities offer scientists different techniques for analysing the structure of various forms of matter - subatomic, molecular, crystalline etc. Eleven European countries are contributing to ESRF. Budgeted costs up to 1998 are £250m of which £160m represents capital expenditure. The facility is due to be opened in 1994 and the balance of £90m represents the projected operating costs for the period 1994-98. The UK has agreed to contribute 12.5% of the construction costs and 14% of the operating costs, which at current exchange rates will amount to £44m in total.

Recommendations

- a) SERC should continue to keep a very close watch on construction slippage and possible cost overrun. The Director appointed is known for his scientific ability and may need more support on the construction management side if the facility is to be completed on time and to cost.

- b) SERC should monitor the impact of ESRF on the use made of the SRS at Daresbury. The SRS at Daresbury and ESRF are to a large extent complementary. The ESRF is expected to open up new areas of science not accessible through the SRS. However, there is a danger that UK money will be spread too thinly over several facilities, resulting in most of them being under-resourced.

c) SERC should take further steps to encourage industrial use of ESRF. A similar recommendation has been made for ILL. SERC should examine whether there are lessons from ILL which can be applied to ESRF. We understand that the industrial liaison unit at the Daresbury Laboratory is already trying to stimulate industrial interest in synchrotron radiation.

d) In the light of the poor UK staff participation at ILL, SERC should consider what steps should be taken to ensure that the same situation does not occur at ESRF. We welcome the news that, as for ILL, ESRF has agreed improved benefits for expatriate workers. It will be necessary for SERC to monitor carefully whether this increases UK staff numbers.

ISIS - THE SPALLATION NEUTRON SOURCE AT RAL

ISIS is a pulsed neutron source located at the Rutherford Appleton Laboratory since 1985. Its facilities complement those at ILL and enable research to be carried out on the structure of molecules and materials across many disciplines. The annual budget is £12.2m pa, of which £1.5m comes from international sources such as France, Holland, Italy and Sweden. Other countries have provided instruments in return for beam time.

Recommendations

a) SERC should move towards full cost charging for external users. Some progress has been made in raising international subscriptions and attracting external funding. Some countries pay for use by in kind provision of equipment. However external funding must recover all costs and overheads. Only in this way will a fair division of costs between UK and other users be arrived at; without this it will be very difficult for SERC to form comparative judgements on the benefits of ILL and the other condensed matter sources.

b) SERC should set objectives of increasing international participation and industrial use at ISIS. SERC should continue to pursue the use of other negotiations as a lever to increase overseas participation in ISIS. However, these need careful handling, and the FCO should be involved where possible. Increased industrial participation at ISIS would help SERC to fund neutron science at ISIS and ILL.

NERC VESSELS

NERC owns 5 research vessels (and charters on average 1.25 vessels) to provide a flexible service to its various programmes in the marine sciences. The five vessels cost about £19m pa to run. This does not include replacement and refurbishment costs. 15% of their use is international, arranged as a series of exchanges, on a 'no payment' basis.

Recommendations

a) NERC is already examining the value for money from these international exchanges; they should bring this review to a speedy conclusion. This review will build on the recently instituted records of time exchanged and establish whether a fair exchange has been obtained taking into account the quality of facilities exchanged. DES should report the results of this study to the Official Committee for Science Technology.

b) NERC should reassess the cost-effectiveness of chartering vessels rather than owning them. Although we did not see the recent studies of this option there is evidence from other sources that chartering (long or short term) can lead to cost savings and greater flexibility.

c) On national projects which form part of an international programme, eg WOCE, JGOFS, and North Sea Community Research Project, NERC should assess the size of the UK contribution in relation to those from other countries. There are grounds for believing the UK may be bearing more than its fair share of the cost of these programmes. This has become apparent in the recent consideration of scientific programmes to understand global climate change, but may reflect the UK's position as a leading oceanographic nation.

OCEAN DRILLING PROGRAM (ODP)

The Ocean Drilling Program is an international agreement over 10 years to September 1993 between the USA, the UK, West Germany, France, Japan, Canada, Australia and a consortium of smaller European Science Foundation countries. The total annual budget of £20m is predominantly US funded and the UK pays £1.4m. The programme is carried out by a specially equipped drilling ship called the 'JOIDES Resolution', and the coordinated group of programmes includes studies of the formation of the ocean crust, past climates, the geological history of particular areas, observations of the Earth's crust below the sea bed, and tectonic history of continental margins.

Recommendations

a) NERC should use its influence on the ODP Management Board to further widen membership. One possibility quoted to us was that the new USA Administration might look more favourably on Russian membership which was beneficial in the previous IPOD agreement. To succeed, this will need to be pursued through diplomatic channels in parallel.

b) NERC should consider ways in which the UK can present a more consistent front to the rest of the international science community on this programme. There have been major problems recently. Even though easy entry and exit can be arranged, the nature of programme and the patient monitoring work involved call for a long term commitment; equally the extensive nature of the monitoring means several Departments and other organisations have had an interest in the data and as a result have been funding part of the work. Without long term assurance of other customers' forwards requirements however NERC have found themselves liable to meet any

shortfall from other funding bodies. Similar problems arise on a number of other international scientific programmes, all involving science vote funding. The DES may therefore wish to mount a more general examination of this problem and make recommendations in due course. On ODP, one conclusion may be that DES accepts that the programme is largely science rather than application, and hence agrees to fund the full UK subscription.

Observation

i) This programme seems to be well-managed and offers the UK good value in relation to its small share of the total cost. Of particular note is BP's participation both as a partial contributor and half-owner of the chartered drill ship.

EUROPEAN MOLECULAR BIOLOGY LABORATORY (EMBL)

The European Molecular Biology Laboratory at Heidelberg is supported by 14 European member states and carries out a programme of fundamental research, advanced instrumentation development and advanced teaching in molecular biology. The Laboratory has outstations at Grenoble for use of the neutron source at ILL and at Hamburg for use of the synchrotron radiation facility at DESY. The Laboratory and outstations cost £9.5m to build in 1974 (£39m at 1989/90 prices) of which the UK paid £1.5m (£6.2m in current prices). Its annual running costs are now £19m, of which the UK pays £2.6m.

Recommendations

a) The MRC should review the achievements of EMBL against its original objectives and assess the current priority to be given to the expenditure against other competing commitments. We propose a far-ranging review similar to the 1983 Garland study to take a fundamental look at the Laboratory. Points of concern are: - the open-ended nature of the commitment and the tendency which the Laboratory appears to have to grow without establishing new long-term objectives and without terminating existing work that may have out-lived its maximum usefulness. The programme of work should be compared with the UK national programme.

b) The MRC should examine as a matter of urgency whether the high level of non-member scientists at EMBL is justified. We understand that 15% of scientists, fellows and post-doctoral workers are from non-member states and that these countries are not required to contribute to the general overheads of the Laboratory nor to contribute retrospectively to the capital costs.

c) MRC should also examine the level of salaries paid at the Laboratory. These appear to be high in relation to other opportunities, although clearly the length of period of contract needs to be borne in mind.

Observation

i) MRC were initially doubtful about participation in EMBL. As a result the UK got off to a half-hearted start. This lack of interest appears to be continuing. This is worrying given the open ended nature of the UK's commitment to it. Although the Laboratory is undoubtedly doing much high quality science, the contribution it is making to UK scientific objectives in this critically important field needs closer examination.

EUROPEAN SPACE AGENCY (ESA)

The European Space Agency is the largest international R & D programme to which the UK contributes. It has a staff of 1800. Its budget (£1.28 billion in 1988) is divided into three parts, to which the UK contributed £84m as follows:

- £48m to optional ESA applications projects
(total budget £995m)

- £15m to the mandatory General Budget and associated items
(total budget £143m)

- £21m to the mandatory Science programme
(total budget £144m).

Recommendations

At UK insistence, ESA has set up an independent team to review the management of the Horizon 2000 Programme. The future structure of BNSC and the responsibility for space policy are due to be reviewed by the DTI in July. The following recommendations bear partly on these reviews and partly on the applications programmes.

a) BNSC should consider how to ensure that ESA focusses on potential commercial applications and that ESA partners reassess ESA's long-term rationale and manner of operation accordingly. As far as applications programmes are concerned, part of ESA's original role was to demonstrate new technologies in space. As applications have been proved in the telecommunications and launcher areas, these have been successfully transferred to commercial funding. The need to give ESA programmes a greater commercial orientation was recognised in the resolution adopted at the ESA Ministerial Council in the Hague in November 1987. However, the various

partners in ESA have different perceptions of the Agency's primary function and there are difficulties in focussing some Member States on potential commercial applications sufficiently early. A longer term view is required as space increasingly fulfils a range of different operational requirements.

b) The review of BNSC's future should also take into account this move towards more operational activities in space. This has implications for other departments that have an interest in space and see space as playing a role in their ability to fulfil their departmental objectives.

c) The BNSC (and other UK representatives) should take every opportunity to promote the 'core plus options' approach. ESA is aware of the UK view that the 'core plus options' approach should be examined, and the scope of the Horizon 2000 review is wide enough to accommodate consideration of this concept.

Observations

i) It is evident to us that there is scope for alternative collaborations in the field of space science than through ESA. For example, bi- and tri-lateral arrangements appear to have been successful on occasions. Extension of the optional programme approach would help to ensure that all ESA programmes are properly assessed.

ii) UK industry does well on gaining space contracts particularly in the light of the UK's relatively low contribution (9% compared to 16% based on GNP). BNSC has done well to ensure maximum benefit is obtained by the UK in this respect.

JOINT EUROPEAN TORUS (JET)

The Joint European Torus is a very large scientific experiment to prove the scientific feasibility of thermonuclear fusion as a source of energy. The project, located at Culham, was initiated by Euratom, which is the predominant funding body (80%). The experiment is due to come to an end in December 1992. Current total expenditure on the project, which is the central element of the European Community Fusion Programme, is around £75m a year at present. The UK host country premium (including its direct contribution to the project) is £8.5m at present. The remainder of the UK's subscription is financed through the Framework Programme (UK's contribution via this route = £11m).

Recommendations

The European Commission is setting up a team to conduct a major independent review of the Community Fusion Programme by mid-1990. The UK is urging that this should be a thorough going review which will form the basis for the future of any fusion research after 1992. The UK has also asked for assistance with the cost of decommissioning the device, for the host country premium to be dropped from 1990 and that firm milestones be set for JET's progress up to December 1992. Against this background our recommendations are:

- a) D.En should develop strong arguments that a host country premium is not appropriate. The UK has already made a case to the European Commission that the host country premium should not be levied after 1990 and the case needs to be pursued vigorously.
- b) D.En should obtain the best information possible on decommissioning costs and arguments for these to be shared.

The case has been put to the Commission but a satisfactory outcome is not yet assured. The situation at ILL might be helpful in this respect as the French, as hosts, do not appear to be liable for the whole decommissioning costs of this reactor.

c) D.En should ensure that it obtains satisfactory information on milestones from the Commission and from JET so that an informed view is obtained on whether it has met its objectives.

d) D.En should put pressure on Culham to reduce their support services for JET where these are not being used adequately. Euratom reimburse the UKAEA about £5m a year for these services but the costs to the UKAEA of providing stand by services of this kind, some of which are not then taken up, is said to be in excess of this. There may be scope for agreeing with the JET management a reduced level of some of these services.

Observations

i) Taking the host country premium and the liability to bear the decommissioning costs, the UK paid a high price to have JET located at Culham. The UK does obtain a high proportion of the contracts from JET (47%) but the benefits from this are not judged to offset the costs to the UK of having entered into the agreement on such terms.

ii) Although the bulk of the JET funding comes from Framework via Euratom, 20% comes from other sources, of which the UK contributes most (9.2%). This contribution is administered on behalf of D.En by the UKAEA under a Programme Letter arrangement. These arrangements are the subject of an Efficiency Scrutiny which is to start shortly.

EUROPEAN CENTRE FOR MEDIUM-RANGE WEATHER FORECASTS (ECMWF)

The Centre comprises a computing facility, located in the UK, with an international programme to improve and produce medium-range (4-10 day) weather forecasts. It employs 140 staff and costs £12m pa to run, of which the UK pays £1.85m.

Recommendations

- a) Given that the Meteorological Office (MO) is being considered as a candidate for a Next Steps Agency, the MOD should review the current level of UK support for the ECMWF and the arrangements under which the MO might continue to channel those funds and be responsible for monitoring the Centre's performance. Even if a change in the status of the MO were not being considered there is a case for reviewing the objectives of the Centre and the open-ended nature of the present commitment.
- b) The MO (or MOD) should press the ECMWF to adopt performance measures against which improvements in forecasting can be assessed and decisions on future levels of R & D taken by contributing countries. We have some doubts about the relevance and range of criteria apparently adopted by the Centre for measuring forecasting improvements, and about the benefits to national economies of medium-range weather forecasts of higher accuracy.
- c) The MO should review the salary levels at the Centre in relation to the three year contracts. Pay rates are about 2.1 to 2.3 times those of the MO itself. Admittedly this is accounted for in part by the short term nature of the contracts (3 years). It is worth considering whether the rates of pay are higher than necessary to attract the right calibre of staff.

EUROPEAN TRANSONIC WIND-TUNNEL (ETW)

The ETW is an engineering development project to construct a test facility at Cologne for use by the European aircraft industry. There is little research in the actual construction but about 20% of its projected usage is classified as 'research'. The cost to the UK at January 1987 is 191m DM (£62m) out of a total cost of 671m DM. The facility is expected to be used for both civil and military purposes. The wind tunnel will operate at very low temperatures and enable testing at speeds up to Mach 1.3. Although some European facilities have the capability for the latter, it is only by provision of low temperature operations that representative full scale flight conditions will be achieved in a wind-tunnel.

Recommendations

- a) DTI and MOD as co-funders of the UK contribution to this project should monitor costs during construction extremely carefully. A fixed price has been negotiated with the prime contractor but firm management by the ETW project Directors will be vital.

- b) The Joint Committee (DTI/MOD) should bring pressure to bear on the ETW company to publish clear rules for the charging regime to users. Existing plans for the ETW's use do not appear to deal with charges nor do they address questions of time allocation between the various national (civil and military) users both in the public and private sectors. Since this is clearly a near-market development project par excellence, we believe that the charges should be on a full economic cost basis including full recovery of capital cost. This would enable true industrial interest to be gauged.

REVIEW OF INTERNATIONAL R & D PROGRAMMES: GUIDELINES
FOR FUTURE INTERNATIONAL COLLABORATION

1. The Review has shown that those collaborations which have clear objectives, good management and assessment mechanisms and where the priority and likely benefits have been assessed in relation to domestic opportunities are most likely to work to the benefit of the UK. It has also shown a variable UK record in putting these aims into practice. Nonetheless, the Departments and Research Councils responsible for the fourteen international projects studied in this review all believed that their collaborations had on balance been worthwhile.

2. None of these very general observations is likely to come as a surprise. This paper sets out some more practical guidelines which build on the individual review findings. They are offered as a checklist to help Departments and Research Councils draw on past experience when considering future international collaborations and how to make them work to the UK's advantage.

3. The guidelines are broken down into 4 major areas. The first covers the assessment of the initial case for UK entry into an international collaboration. Once a satisfactory case is established, negotiations of the terms of UK participation need to take place. When the collaboration is agreed, there is a third major phase of monitoring the establishment and the running of the facility or research programme. Finally, and not to be ignored (although it often is), there is a phase after completion of the collaboration where evaluation of the benefits should be undertaken and lessons learned of both good and bad practice which can be applied (or avoided) in the future.

ASSESSING THE CASE FOR UK PARTICIPATION

i. Be clear what the UK's objectives are.

These should include scientific objectives, the benefits which might accrue to the UK from successful application of the results, training aspects, access to new expertise or facilities and establishment of standards. Some research is international by nature, eg the environment. Since commitment to any scientific undertaking is vital, it is important these objectives have the support of, or have been developed by, the science community and, where appropriate, with industrial involvement.

ii. Make sure you can define the benefits you expect the UK to enjoy as a result of carrying out the project internationally.

Advantages fall broadly into three categories: more speed, less cost, better quality. The last will include increased access to expertise and facilities, exchange of knowledge and improved training prospects. Collaboration at the R & D stage may also increase the chances of beneficial collaboration at the exploitation stage. Disbenefits should also be considered. These might include some loss of scientific, managerial and budgetary control but these can be minimised if addressed during the negotiating phase.

iii. Make sure that all departments in the UK with an interest are involved and that the UK coordinated front matches that of the potential international partners.

Many countries in Europe have a single Ministry responsible for science, which takes the overall lead in developing international collaborations. The UK, however, disperses responsibilities for R & D between Departments and Research Councils. This makes it important for appropriate inter-departmental discussion to take

place before substantive negotiations (as opposed to preliminary scientific exchanges) commence. Equally, there should be clear understanding by negotiators about how associated funding questions will be tackled, and caution exercised until funding commitment within the UK is secured. Specific mechanisms for inter-departmental co-ordination may often be required to enable a common UK negotiating position to be established. Achieving all this can be difficult since international collaborations generally require long-term commitment and Departments are constrained to annual budgeting. It is however essential to do so if internal disputes damaging to the UK negotiating position are to be avoided. Agreement among interested parties about the handling of discussions and negotiations along the critical path of potential collaborations is advisable at an early stage.

iv. One Department should take the lead, backed by clear commitment from others on long-term coordination and funding.

The problems surrounding programmes where more than one Department has interests can best be tackled by one Department taking the lead. Joint responsibility should be the exception rather than the rule. Non-lead Departments should commit funding to an agreed breakpoint which should correspond with a breakpoint in the international collaboration. Departmental commitment should preferably be confirmed by Ministerial letters, and PES transfers to the lead Department may be appropriate in some cases. Clear agreed objectives between Departments will be required. In this way, the lead Department will be confident of UK objectives, the level of support from other Departments and of the level of commitment that the UK can agree to during international negotiations. The review has confirmed that lack of clarity in these matters can cause severe difficulties.

v. Consider the relevant strengths of the UK and potential partners.

Whilst international collaborations can share the cost of research which the UK cannot afford alone, the benefits may be lost if we do not have adequate national strengths to participate fully in the work or in following up the results. The relative size and expertise of the UK research community therefore need to be considered. It is also important to consider whether resources will be available not just for the international venture but also for any domestic activity which may be required to support it. Priorities of course may change during the lifetime of the collaboration. Thus SERC is now reviewing its overall spend in 'neutron research', including ILL and ISIS, and may compare this with its spend in other areas of condensed matter research.

vi. Keep abreast of other relevant negotiations etc. that are taking place between the UK and potential international partners.

This is important both for reasons of timing and in order to understand the factors likely to influence a potential collaborator's attitude to proposals or negotiations. The Timetable of Forthcoming Decisions which is kept up to date by the Cabinet Office and circulated to Departments should be one of the sources used for this purpose. This is not just a defensive issue. Opportunities to use quid pro quo arguments in negotiations can also be taken. Thus, negotiations with West Germany on membership of ISIS hinges delicately on the use that the UK makes of DESY and partnerships in ILL and ESRF. Likewise the JET agreement requires the UK to decommission the reactor whereas the French are not committed to decommission the reactor at ILL. The latter may be a bargaining counter to renegotiate the former in the UK's favour. The Foreign and Commonwealth Office should also be kept in touch and consulted on these types of negotiations.

vii. **Don't rule out joining an existing collaboration.**

Although in most cases the UK benefits from being a founder member, through being able to influence both programme and management, there are sometimes benefits in joining late. A clear example of this is ROSAT, where West Germany and the US were already committed to a bilateral project and were happy to include a UK camera on the satellite and to share the facility. The programme met UK objectives and scientific priorities at a reasonable cost.

NEGOTIATING TERMS OF PARTICIPATION

viii. **Consider all options for minimising the UK contribution, whilst fulfilling UK needs.**

Major ways of achieving this include:

- **optional elements in the programme.** This ensures that each country has more control over how much it pays, and what science this supports. The arrangements in ESA for member states to decide which applications' projects to support and at what level may be a useful model for other collaborations.
- **method for calculating subscriptions.** In principle the more the cost is related to actual usage the better. Where contributions are determined by a formula, eg in relation to GNP, make sure the figures used are up-to-date and that arrangements are agreed in advance to vary contributions when the elements in the formula change.
- **minimising the problems of exchange rate fluctuation.** There should be clear agreement about whether the participating countries or the international venture

itself should bear the exchange risk. It is worth learning from the experience of the way other international ventures have tried to deal with the exchange rate problem, eg CERN and ESA. Where the UK bears the exchange risk, buying forward is an option, but under present Treasury rules this can only be done one year ahead. Future arrangements need to be sufficiently flexible to secure value for money.

- **expanding membership.** A number of the projects we have looked at might with advantage be extended to include new members. There are of course dangers with this. New members may have other and costly ambitions, and decision making and management may become more complex.
- **getting the host country to pay more.** It is debatable what economic benefits accrue to a country from hosting a facility. Special care should be taken where the UK is host country. The premium which the UK paid to host JET has proved expensive. Getting a host country to bear the exchange risk may be an option.
- **making sure the international organisation charges other users in a business-like way.** Where the collaboration involves running an international facility, it is important to establish that the member states who contributed to the capital costs are not subsidising other occasional users. There should be rigorous testing of claims that special terms to non-member states are justified by the preferential access they offer to their own facilities.
- **ensuring the programmes are efficiently managed.** It is important to give attention not just to the scientific content of the venture but also to the details of how it

is to be managed and how costs are to be controlled. (See the following point on this.)

ix. **Ensure there are satisfactory management arrangements and that the UK has clear channels of influence.**

These need to be established at the outset. There are two different levels to consider. First the day to day management arrangements to run the collaboration. Second the arrangements for the UK to be consulted and involved in strategic and budget setting issues and on the appointment of key staff. The UK should ensure that its representatives on executive and advisory bodies are high quality and are properly briefed.

x. **Build in review points and exit points.**

It is important that international collaborations are reviewed in the same way as national facilities. If review points are not built into the agreement from the start, then it will be more difficult to get reviews done later. It is also important that objectives are developed with milestones that can be assessed at these review points, so that facilities and programmes do not drift or become open-ended commitments. Regular assessment should also reduce the likelihood of any member state wishing to withdraw early. Reviews, particularly where they are carried out independently, have been very valuable in correcting bad management or weeding out poorer science. Examples are EMBL and ODP, and to a certain extent CERN. Exit points also offer the possibilities of major reviews and withdrawal with less acrimony, or disruption to the overall programme.

xi. **Ensure that the budget is realistic and anticipates expenditure needed to keep the facility or programme up to date.**

A formal budget plan for several years ahead needs to be agreed

and adhered to. It is important that facilities remain state-of-the-art and fully exploited. This should be recognised at the outset, and budgeted for, to avoid the tendency for the budget to keep creeping upwards. ISIS in particular appears not to have sufficient instrumentation to allow this major facility to be fully exploited, and there are early indications that ESRF may suffer similarly in the future.

xii. Consider the pros and cons of juste retour for industrial contracts.

Almost all international collaborations include clauses which aim to ensure that awards of industrial contracts for constructing, equipping and running the facility relate to contributions made by member states. It could be argued that this leads to poor value-for-money, perhaps the adoption of less than satisfactory standards and increased difficulties for senior management. A better approach will often be the adoption of competitive bidding for contracts, although this may not be liked by international partners. The relative strength of the relevant UK industry should be considered at the outset of the agreement, and where appropriate, industry might be consulted.

xiii. Consider the pros and cons of juste retour for allocation of facility use.

As for industrial contracts, most international agreements include clauses which aim to ensure that allocation of facility time relates to member state contributions. This may be appropriate for facilities which primarily benefit industry eg ETW, but in science programmes there is often an elaborate peer review mechanism with an iterative process to ensure that scientific excellence, programme content and juste retour on time are balanced. In many cases this juggling act is difficult to achieve and, as a leading scientific nation, the UK often benefits by getting more than its

juste retour. Nevertheless, a free market for allocation of facility time would encourage competition and might ensure an improvement of the science carried out. A proper assessment mechanism would need to be in place.

xiv. Adopt a business-like approach to intellectual property.

Although not encountered as a major problem in the present review, IPR is a very important factor in most fields of research. Clear arrangements for the ownership of IPR resulting from the research work and the terms on which third parties would have access to it should be agreed at the outset of the programme.

xv. Take care with treaties.

Treaties are binding documents and may need Parliamentary approval. Early involvement of diplomatic, legal and linguistic skills of the Foreign and Commonwealth Office should be considered. (The FCO successfully avoided problems arising from significant inconsistencies in the various translations of the ESRF treaty.) FCO channels of communication are also effective in ensuring that all interested departments of foreign governments (eg finance, foreign as well as science ministries) are adequately informed at each stage. Our overseas posts are also effective lobbyists, listening posts and channels of communication. It will pay dividends to ensure that they are kept informed as negotiations proceed.

MONITORING THE PROGRAMME

xvi. Make sure that there is effective monitoring within the organisation but also carry out independent UK monitoring.

The UK should ensure the organisation has satisfactory arrangements regularly to monitor budget, management, staff,

building, equipment and the content and value of the science programme. In addition the UK should carry out its own monitoring. These two objectives call for agreement on the provision of the necessary information by the organisation and effective use of UK representatives attending meetings. Where several Departments have an interest in the project, the analysis of this information will require close liaison between them.

xvii. **Ensure priorities for international work are regularly assessed alongside domestic ones.**

Even where the international collaboration involves a long term commitment, its priority should be regularly assessed against that of UK national programmes. This will ensure that the UK is able to play an effective and informed part in controlling the international budget, proposing changes of direction, or looking to renegotiation or withdrawal at appropriate renegotiation points. This is particularly important at present for SERC as they consider the future of neutron beam facilities in time for the 1992 renegotiation point for ILL and for DEN when considering any next step after JET.

xviii. **Satisfy yourself that the UK community is benefiting fully.**

It is important that the UK science community and industry are taking full advantage of international collaborations. Departments should ensure that information is available on usage of the facility and on training opportunities and that industry is informed about contracts and opportunities to use the facility.

xix. **Promote effective arrangements for public presentation of the collaboration in the UK.**

Many collaborations involve a substantial commitment of funds and

effort which might otherwise have been deployed within the UK. It is helpful if clear and accessible information is regularly provided by the organisation, in order to satisfy the needs of a varied public. It is obviously necessary to satisfy the scientific user community that adequate career prospects and arrangements for publications exist. Equally, there is a wider audience observing UK science - politicians, administrators, other scientific disciplines as well as the general public who need to be informed of the progress and value of the work. Successful collaborations can also be a stimulus to young people in considering scientific careers. These constituencies should not be overlooked in arrangements made by the international collaboration, and by sponsoring bodies in the UK, to explain its purpose and activities.

LEARNING FROM EXPERIENCE

xx. Ensure that the international organisation carries out an evaluation of performance both against scientific and management objectives.

Evaluation after the event is very rarely carried out, partly because it is quite difficult. Nevertheless, the UK should press for an assessment of whether the original objectives have been achieved and that other output measures such as publications, patents, training, facility use etc are considered.

xxi. Carry out an independent evaluation on the benefits to the UK.

As with monitoring we should not just rely on the organisation's own assessment of the performance and achievements of the collaboration. Some form of ex post evaluation of the benefits to the UK should be carried out for all major international programmes. These evaluations should focus on issues where there

is the prospect of relevant lessons for the future.

xxii. Share your experiences widely within the UK.

The aim should be to develop a consistent but flexible approach to international S&T collaborations and to learn from as wide an experience base as possible. That is the purpose of these guidelines. We recommend that if they are judged useful they should be kept under review and revised from time to time to incorporate new lessons as they emerge.

S & T Secretariat
Cabinet Office
11 July 1989

SCIENCE TECH: Budget prg



File

10 DOWNING STREET
LONDON SW1A 2AA

From the Private Secretary

19 June 1989

Dear Ireland,

EC R&D FRAMEWORK PROGRAMME: MID-TERM REVIEW

You will wish to see the attached letter I have sent out giving the Prime Minister's response to the recent exchanges on these issues. I also raised with her the possibility of these issues being discussed at an E(ST) meeting, but she is content not to plan for such a discussion.

*Yours,
Paul*

Paul Gray

R. T. J. Wilson, Esq.,
Cabinet Office.

Two



file kw
cc Richard Wilson
(6)

10 DOWNING STREET

LONDON SW1A 2AA

From the Private Secretary

19 June 1989

Dear John,

EC R&D FRAMEWORK PROGRAMME: MID-TERM REVIEW

The Prime Minister has seen the Chancellor of the Duchy's letter of 1 June in response to the Chief Secretary's letter of 24 May. She is content with the line proposed for the Research Council meeting on 20 June, but hopes that more will not be spent on the EC framework programme; she has commented that our own research provides very much better value for money.

I am copying this letter to the Private Secretaries to the Foreign and Commonwealth Secretary, the Secretary of State for Employment, Minister of Agriculture, Fisheries and Food, Secretary of State for Education and Science, Secretary of State for Health, Secretary of State for Social Services, Secretary of State for Energy, Secretary of State for the Environment, the Chief Secretary, Parliamentary Under Secretary of State (Department of Transport) and to Sir Robin Butler.

Paul Gray

Paul Gray

John Alty, Esq.,
Office of the Chancellor of the Duchy of Lancaster.

kw

PRIME MINISTER

EC R & D FRAMEWORK PROGRAMME

You may wish to be aware that the meeting of the EC Research Council next Tuesday will mark the start of the mid-term review of the EC R & D framework programme. Prior to that meeting there have been various exchanges between colleagues:

- John Major (Flag A) indicated the importance of emphasising affordability and value for money and the need for the public expenditure implications, via our EUROPES system, to be kept firmly in view;

- Tony Newton (Flag B) accepted the importance of these points and set out (at X on page 3 of his letter) a proposed line to take in Tuesday's discussion. This has now been agreed.

One point you will want to consider is whether to involve yourself in the difficult discussions of priorities that will be necessary as the meetings proceed. One possibility would be to bring the issues to a meeting of E(ST) some time in July. But I would advise against this:

- the pressures on your diary over the next month are formidable

- I am not sure the discussions you had last year in E(ST), in parallel with the normal PES process, on purely domestic R & D priorities were themselves very good value for money. It might be better this year for the EC framework review to leave the sorting out of priorities to be handled by the Chief Secretary within the PES process.

Content simply to note the position reached and not to plan for an E(ST) discussion?

Verily, Paul G

PP (PAUL GRAY)
16 June 1989

Agreed - but I hope we shall NOT spend more.

Our own research is very much better value for money not



u/c

Ministry of Agriculture, Fisheries and Food
Whitehall Place, London SW1A 2HH

From the Minister

CONFIDENTIAL

The Rt Hon John Major MP
Chief Secretary
HM Treasury
Parliament Street
London SW1P 3AG

GM

16 June 1989

Dear JH,

EC R&D FRAMEWORK PROGRAMME: MID-TERM REVIEW

FILED

Thank you for copying to me your letter of 24 May to Tony Newton on this subject. I have also seen Tony's reply to you of 1 June and would support the approach you and he propose to the negotiations on the mid-term review.

In terms of UK priorities for any re-direction of EC research, the four programmes on which my Department takes the lead, ie those on Agro-Industrial Technologies Research (ECLAIR and FLAIR), on agricultural research and on fisheries research, are not yet at a stage where meaningful judgements on their value can be made. I, nevertheless, fully support the view that, where appropriate, we should take the opportunity provided by the review to press UK priorities for Community R&D.

I note what you say about the impact increases in EC spending might have on domestic R&D programmes through the operation of the EUROPE rules. The key factor here is the extent to which EC spending in this area is allowed to increase within the ceilings set out in the financial perspective to the Inter-Institutional Agreement of June 1988. I understand that unanimity in the Council will be required to trigger such increases, and so I agree that we should use the opportunity to block any re-direction of EC research which is not justified on value for money ground.

* I am copying this letter to recipients of yours.

*Yours etc,
JH*

JOHN MacGREGOR

Ind Pol

Support & Innovation

Pt 6.

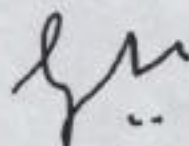




FCS/89/124

CHIEF SECRETARYEC R & D Framework Programme: Mid-Term Review

1. Thank you for copying to me your letter of 24 May to Tony Newton. I have seen his reply.
2. I agree that we should press hard at the 20 June Research Council for a thorough evaluation of the Framework Programme so far, on the lines you and Tony Newton suggest.
3. The negotiation will be about the Community's research priorities. In order to help influence the outcome, we should not lose this early opportunity to state our own. The figures will not be under discussion this month: indicating our priorities will not mean committing ourselves financially; and final agreement will still require unanimity. I therefore agree with the line Tony Newton proposes to take.
4. Copies of this minute go to the Prime Minister, the Secretaries of State for Employment, Education and Science, Health, Social Security, Energy, Scotland, the Minister of Agriculture, Fisheries and Food, the Parliamentary Under-Secretary of State for Transport, and to the Cabinet Secretary.



(GEOFFREY HOWE)

Foreign and Commonwealth Office
12 June 1989

IND POL : R + D PT6.



dti

the department for Enterprise

A *Acelu*

The Rt. Hon. Tony Newton OBE, MP
Chancellor of the Duchy of Lancaster and
Minister of Trade and Industry

Rt Hon John Major MP
Chief Secretary
HM Treasury
Parliament Street
LONDON
SW1P 3AG

Department of
Trade and Industry

1-19 Victoria Street
London SW1H 0ET

Enquiries
01-215 5000

Telex 8811074/5 DTHQ G
Fax 01-222 2629

CB

Direct line 215 5147
Our ref
Your ref
Date 1 June 1989

John Major

EC R & D FRAMEWORK PROGRAMME: MID-TERM REVIEW

Thank you for your letter of 24 May on the public expenditure aspects of the review. Colleagues might find it helpful to have a note on how I see negotiations on the review progressing and how we can most effectively further the UK's interests.

The immediate requirement is to agree a line for the forthcoming Research Council on 20 June. We also need to look ahead to how we handle the Commission's formal proposals, which are due in July. I fully accept that an important aspect in determining our approach is the public expenditure implications.

The current EC R & D framework programme was agreed in 1987. UK research contractors have done well in winning business funded by the programme and a number of valuable collaborative projects are now under way, for example in the areas of telecommunications, information technology and scientific exchanges. The agreed programme lasts until 1991 with some provision for continuing commitments thereafter.

The 1987 Council decision provided for a review during the course of 1989 of the existing programme and more generally of its future direction and resources. The Commission are

SB2ABT



now working on their proposals and Vice President Pandolfi will table a strategy document for discussion at the 20 June Council. In the light of discussion there, they expect to produce final proposals before the summer break. The Council on 20 June therefore provides a key opportunity to influence the shape of the Commission's proposals.

We first need to take account of the figures for research and development included in the Inter-Institutional Agreement (IIA). It is clear that these figures represent upper limits rather than commitments and that any decision to increase the present programme to use the headroom available would need to be taken on the basis of unanimity. Nevertheless most Member States see scope for increasing the programme. Even the French and Germans, who worked closely with us in the negotiations for the present Framework Programme, can be expected to accept some increase. The terms of reference for the review of the Framework Programme and the apparent headroom under the IIA provide the Commission with an obvious opportunity. As I said however when we met we do seem to have in Vice President Pandolfi someone who has so far at least shown a more responsible attitude than his predecessor. I met Pandolfi in February and his stated position is that the Community has to be sure that its present research programmes are right, particularly in relation to the needs of industry. He recognises that decisions on the duration and size of further research activities should follow such an analysis not precede it. This emphasis has been reflected in the strategy document. All the same, I have no doubt that the review will include proposals for new or extended programmes or both.

We will want to ensure that the results of the review reflect as far as possible UK priorities for R & D and that any changes are ones which we can support as representing value for money. This will require considerable work on our part on two fronts:

- we will need to adopt the most effective negotiating tactics in Brussels including with potential allies amongst other Member States. Given the framework for the negotiations provided by the budgetary limits set by the IIA and the terms of the review, the biggest single danger we face is pressure for a substantial overall increase in expenditure unsupported by real R & D need. We can only convincingly respond with arguments based on the real R & D benefits. We will need to argue that it is premature to consider any change to the size of the programme until a thorough evaluation of the existing programmes and an

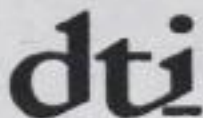
assessment of any new proposals have been carried out. We will want to ensure the phasing out of lower priority programmes - thus meeting the first condition you list. We should be able to point to the position Pandolfi himself has taken on this. But we shall only carry conviction if we are able to link this point to some indication at the Research Council of the priorities on which we think Community R & D should be focussing as well as those on which it should not. I would not of course propose to be drawn into discussion of overall figures at this stage.

- Departments with responsibility for research and development programmes will need to consider their own priorities and the balance between domestic and European R & D. You have made clear that this will need to be against the background of the usual EUROPE rules and I am sure colleagues expect you to say no less. At this stage we do not have any figures to consider. We do however want to influence the overall shape of the Commission's proposals, as these will form a starting point for subsequent negotiations. A fair amount of work has already been carried out by officials in identifying areas of greater and lesser priority and I shall expect to make use of this at the Research Council on 20 June. Once the Commission's proposals have emerged, we will need to bring together the different areas affected by the proposals and take a collective view on the overall UK stance.

X

The above analysis suggests that my line at the Research Council on 20 June should be to emphasise the need to carry out a thorough evaluation of the achievements of existing programmes and the merits of any new proposals which may be made to ensure that they represent an effective contribution to strengthening Community R & D, and do not duplicate research that is better done nationally or in other international fora; and to stress that low priority activities, or programmes which could already be seen as falling short of expectations, should be phased out. I should also be in a position to indicate what in the UK's view were areas of greater or lesser priority. On levels of expenditure I would take the line that discussion was premature in advance of the evaluation referred to above.

This broad line is consistent with your approach and I would hope that neither you nor colleagues would see difficulty in it. If need be we could discuss at one of the meetings of OD(E)



the department for Enterprise

before the Council. Otherwise I would envisage collective discussion shortly after the publication of the Commission's formal proposals.

I am copying this letter to recipients of yours.

A handwritten signature in black ink, appearing to read "Tony Newton". The signature is stylized and includes a large flourish at the end.

TONY NEWTON

SB2ABT



IND POL : Research to Development

Pr 6



CONFIDENTIAL



Treasury Chambers, Parliament Street, SW1P 3AG

The Rt Hon Tony Newton OBE MP
Chancellor of the Duchy of Lancaster
Department of Trade and Industry
1 - 19 Victoria Street
London
SW1H 0ET

26th May 1989

Dear Tony,

EC R&D FRAMEWORK PROGRAMME: MID-TERM REVIEW

When we met last week we agreed that interested colleagues would need to be consulted about the UK's approach to the Research Council on 20 June, at which Pandolfi will present his strategy document on EC R&D; and I said that I thought it important as a first step to consider the possible public expenditure implications of the mid-term review.

I am sure that you are right to expect considerable pressure for increased Community spending on R&D. The UK will need to stand firmly on arguments of affordability and value for money. Public expenditure considerations will inevitably play a large part in determining our negotiating position. EC spending on the current Framework Programme is already running well above the aggregate level of EUROPE'S provision for R&D and many Departments are having to make consequential savings in their domestic PES programmes. Even if the mid-term review led to no more than a shift in the balance of the Programme within the existing financial envelope, further offsets would be required from some Departments. Any increase in the envelope could begin to make serious inroads into domestic expenditure.

It would be premature to try to set out any detailed figures. However, some interests in the Community will no doubt argue for an increase in R&D spending to the full extent which is theoretically permitted by the financial perspective attached to the Inter-Institutional Agreement (11A) of June 1988. The

CONFIDENTIAL

CONFIDENTIAL

figures in the perspective are of course explicitly ceilings, not entitlements, and a footnote to the perspective makes clear that expenditure above the level of the current Programme would require a new unanimous decision by the Council. But it is worth noting, for purely illustrative purposes, that if all of the headroom of around 3 becu within the ceiling for multiannual programmes were to be used up between 1990 and 1992, Departments would need to find additional savings of £300 million or so over the period 1991-92 to 1993-94. Even an increase in EC spending of, say, 1 becu - which some member states might characterise as modest - would require extra savings of £100 million. Moreover, any expansion during the lifetime of the present Programme would almost certainly lead to still higher expenditure after 1992; we know that the Commission is considering a new overlapping Programme for 1990-94. The gap between EC spending and available EUROPEs baseline provision could therefore be expected to widen inexorably, and domestic programmes would be increasingly displaced by EC ones (possibly of poorer quality).

EUROPEs baselines are intended to provide a benchmark for evaluating the relative merits of domestic and EC spending; and the EUROPEs rules operate to ensure that, beyond a certain point, the latter does not impose an additional burden on taxpayers. These disciplines could not be set aside without significantly weakening our overall public expenditure control; it would be particularly inappropriate to relax them in respect of a Programme which is subject to unanimity.

The above considerations which we discussed last week, suggest that the UK should not be prepared to accept new lines of action under the Framework Programme without a number of conditions being met. Any new activities should:

- i. supplant existing activities under the Programme which are of low quality or limited relevance;
- ii. take the form of projects which can demonstrably be carried out more effectively at Community than at national level;
- iii. represent good value for money, as measured against criteria which we would apply domestically;
- iv. be consonant with the UK's own scientific and industrial priorities.

If any new action lines were to be agreed, it would of course be important for Departments with sponsorship responsibility explicitly to accept that these would be treated under the usual EUROPEs rules.

I realise that it will not be easy to give practical effect to the principle of substitution outlined at (i) above. Although almost 90 per cent of available resources under the current Programme has been incorporated into specific action

CONFIDENTIAL

CONFIDENTIAL

lines, many of these are still in their infancy and it is too early to reach a conclusive view on their performance. It will therefore be much easier for others to find good reasons to justify new activities than it will be for us to make the case for weeding out existing ones. We can draw some comfort from the stress which Pandolfi has laid on the need to ensure that the Community's present research effort is right before any decisions are taken on the size and duration of further activities. And the appointment by the Commission of the panel of five "wise men" to review the content and management of the current Programme is a step in the right direction. We must nevertheless exercise great caution in any discussions with the Commission or other member states about the future balance of the Programme. Our interlocutors need to know that any increase in overall EC spending on R & D will have to be justified on value for money grounds. In circumstances where unanimity is required I see no reason to acquiesce in additional spending that is not justified in order to influence the direction of Community policy.

I understand that work is already in hand to identify areas where increased activity might be justified and those where we would like to see cuts. We will need to take an early collective view on all this before our negotiating position can be finalised.

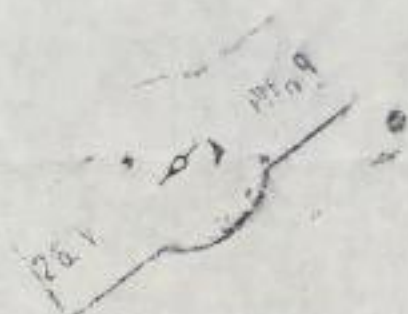
I am copying this to the Prime Minister, Geoffrey Howe, Norman Fowler, John MacGregor Kenneth Baker, Kenneth Clarke, John Moore, Cecil Parkinson, Nicholas Ridley and Peter Bottomley, and to Sir Robin Butler.

*Your Eyes,
John*

JOHN MAJOR

CONFIDENTIAL

IND ROL - K + D pt 6



PRIME MINISTER

13 April 1989

BIAS AND GOVERNMENT RESEARCH FUNDING

see attached folder
I enclose a research proposal accepted by ESRC which shows a clear, but subtle bias against government policy. (Provided by Christie Davies).

The final page is Christie Davies's assessment of the new Chairman of the ESRC only recently appointed. (DES). His position is confirmed by Malcolm Pearson, who knew him on the CNAA, as much further left than one might imagine but someone of high academic standing.

Conclusion

Before taking action, I think it is worth building up a dossier of similar cases.

Brian Griffiths

BRIAN GRIFFITHS

Commentary on E.S.R.C. research project

Illegitimacy and the Law

1. The research (see p.3) purports to be a study of the effectiveness of recent reforms (notably the Family Law Reform Act of 1987) and a guide to policy makers, and to a possible 'Family Court'. This overt aim is restated on p.26-7.

2. A careful reading of the senior researcher's report on the feasibility study indicates that the aims stated above are probably a bogus piece of P.R. while the real purposes of the research are to attack the family and smear the DHSS.

Thus in appendix p. (ii) they speak of the affiliation hearings as raising the issue of "whether unmarried parents are moulded by the court process into conforming to the model of the 'normal' nuclear family wherein the husband is the main provider and the mother is the main carer". They see this (see Appendix p.iii) as an ideological imposition presumably because they see the alternative of a deliberately fatherless family living on social security as valid and desirable. This is the disguised attack on the family. It is the only possible purpose of the very expensive (about two thirds of the total) court observation section of the work (pp.24-5) which would not significantly further the research into whether the parents are satisfied with the affiliation order system which is their "cover story" for getting the grant.

The other give away is the comment on p.(v) of the report on the feasibility study that "they tend to serve a different purpose from that enshrined in the legislation (for instance are they used by the DHSS as a way of relieving the 'public purse'?)". This is implied in a less critical way on p.4, but it is the later statement that reveals the bias of the researchers. The DHSS is to be shown up as a villain misusing legislation.

3. So far as is known -

(a) The E.S.R.C. approved the research in full and made a grant (the details need to be checked).

(b) One at least of the assessors was extremely critical of the research on methodological grounds and commented that the greater part of it was a waste of money. The section on court observation which is the most costly would not provide data relevant to the apparent aims of the research stated at the beginning.

Conclusions

1. Given that a number of good projects are refused funding, there must be a strong presumption that the welcome given to the above project reflects political bias. It may well not take a direct form and indeed it is unlikely that the key decision takers are strongly left wing. Rather what happens is that the decision takers do not wish to rebuff applications which are known to be in some way associated with or under the patronage of an influential left-wing figure or institution. The principle of 'no enemies to the left' prevails. It is the usual case of the centre-left not having the courage to denounce the far-left.

2. The E.S.R.C. forms that applicants have to fill in are a bureaucratic nonsense. The amount of detail expected on academic issues and demanded on financial questions is absurd. It means that it takes a fortnight's work to fill the wretched forms in and this has an opportunity cost that falls on other institutions. The E.S.R.C. bureaucrats should be instructed to simplify drastically their forms and cease asking for trivial details in advance (the ex post figures very rarely coincide with them). This has already been done successfully for other government forms. The attempt to count and save candle-ends by the E.S.R.C. does not mean that it is concerned to avoid waste. In the case discussed above the research project could have been carried out for about one third of the sum asked for. The E.S.R.C. does not ask with any degree of thoroughness the questions; (a) Could this research be done by using an intrinsically cheaper method? (For example large sample surveys and long periods of participant observation are very expensive and often unnecessary. The E.S.R.C. only asks whether the survey is properly costed and not whether a different and cheaper method could be employed instead without any significant loss of valid results). (b) Are the results really worth

the money spent? In the case discussed above the results might conceivably be worth £10,000. The results are certainly not worth £30,000. They will contribute nothing to the social sciences as academic disciplines and are of very limited usefulness to policy makers.

The E.S.R.C. has a regrettable weakness for expensive research. This has an unfortunate knock-on effect in that it is often assumed that the ex post value of a piece of research is equal to the ex ante costs approved by the E.S.R.C. In point of fact we should be subtracting the cost of research from its notional value to obtain an estimate of the value added by the researchers. This may well be greater for a £10,000 project than for one costing £50,000 but the E.S.R.C, U.G.C./U.F.C. and other quangoes refuse to see this obvious point.

Recommendations

1. There should be a deliberate attempt to obtain political balance on the E.S.R.C. by adding members (especially in the areas of politics, sociology, social policy, social administration and geography) who are actively hostile to the left so that left-wing projects meet with an equal degree of hard scrutiny as any other.
2. There should be a considerable simplification of the forms and a concentration not on details of methodology or costing but on the questions 'Could it be done cheaper by using another method?' and 'Are the likely results worth the funding requested?' There should be more encouragement of small scale research and particularly of speculative small scale research that could pioneer new break throughs that question the ruling left-wing paradigms. At present most research tends to be a timid filling in of detail within the existing models.
3. The power of the E.S.R.C. over research should be reduced. Any attempt by this entrenched group of powerful gate-keepers to take control of the research component of the universities recurrent grant should be firmly resisted as it would lead to an intensification of the left-wing bias and bureaucratic arthritis that currently characterises the E.S.R.C. Consideration should be given to splitting the existing funds of the E.S.R.C. between two competing organisations with a much reduced payroll.

of administrators overall. It is essential to break the E.S.R.C.'s near monopoly of government grants for social science research. All subjects would be represented roughly equally on each but they should differ markedly in ethos.

Selected Publications of Howard Newby

1. Property, paternalism and power; class and control in rural England. Hutchinson 1978.
2. International perspectives in rural sociology, Wiley, Chichester 1978.
3. Green and pleasant land? Social change in rural England. Hutchinson 1979.
4. (With David Lee) The problem of sociology : an introduction to the discipline. Hutchinson 1983 [Note especially chapters 8, 9, and 10].
5. Restructuring capital: recession and reorganization in industrial society, Macmillan 1985.
6. Emergent issues in theories of agrarian development. Appleton Trust 1987.

Recommendation: Someone should read them to assess where he stands. He is probably not on the far left nor a Marxist. He is a middling left apparatchik who (a) believes there are no enemies on the left and tries to avoid clashing with the far left and (b) is a shrewd mover in the bureaucratic committee world of the liberal-left. His output of books is large but he has had a lot of collaborators and it is sometimes difficult to know who is responsible for the dominant tone of a particular book.

IWD POL : Support & Innovation pt 6

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

The following information is for your information only and should not be used for any other purpose.

Additional notes

21 March 1989

DES: FUNDING APPLICATIONS

The enclosed note has been sent to me by Dennis O'Keefe and Patricia Stoll. It documents their application for funding from DES. It is not something which puts the Department in a good light and it is the sort of thing people find extremely irritating. On the other hand, I doubt if it is typical.

B.G.

BRIAN GRIFFITHS

Brian, I will take this up with Kenneth Baker after Easter. Would you refer it back to me then?
not

DES: application for funding for the truancy project

- 23 April 1985 Dennis O'Keeffe had meeting with Lord Joseph (then Sir Keith Joseph). As a result we put in our application for funding.
- 15 July 1985 Received letter from Sir Keith Joseph acknowledging receipt of our research proposal and informing us that there were "some uncommitted funds for 1986/87".
- 21 October 1985 Letter from W.M.Caldow informing us that the DES were "considering" our research proposal "in the light of the estimated costs" in our letter.
- 12 November 1985 Letter from Stuart Sexton telling us that Bob Dunn was now the Minister responsible for DES sponsored research. In the list of research proposals received by Bob Dunn, Stuart noted that "Interestingly your proposal was not amongst that list". Stuart therefore had copies of our papers sent to Bob Dunn stressing that Sir Keith supported the proposal in principle.

As a result of this, Stuart set up a meeting with Bob Dunn, himself, three DES officials, Dennis O'Keeffe and Patricia Stoll in January 1986. At this meeting the officials stated that our research proposal had been "lost". Unfortunately there was no money left for 1986/87!

14 April 1986 D.O'Keeffe wrote to Norman Tebbitt in response to Tebbitt's remarks about truancy running at 20 per cent. Outlined our research proposals and said we had not been able to obtain funding from the DES.

30 May 1986 Received letter from A.J.Turner at Conservative Research Department. Said he would raise the truancy research project with the new Secretary of State, Kenneth Baker.

16 June 1986 D.O'Keeffe wrote to Bob Dunn in response to a telephone call from Bob. The project, we understand "is alive and kicking". We give an update on the empirical work.

July 1986

New research proposal sent to Bob Dunn

15 September 1986 Received letter from Bob Dunn who appears not to have received our proposal. To start in the 1987/88 financial year, he will need to have our "revised proposal" in October.

30 September 1986 Letter from D.O'Keeffe to Prof. Brian Griffiths.

1 October 1986 P.Stoll and D.O'Keeffe had lunch with Brian Griffiths. Explained the problems encountered at the DES (including the fact that the civil servants openly admitted to "losing" our papers). Brian Griffiths raised the matter with Ministers.

3 October 1986 Letter from Alan Howarth and copy of his letter to Kenneth Baker supporting us.

2 March 1987 P.Stoll, D.O'Keeffe and D.Marsland met with Sir Alfred Sherman and Nigel Morgan who had just set up Policy-Search and were

interested in our work.

10 March 1987

P.Stoll, D.O'Keeffe, D.Marsland and N.Morgan met Bob Dunn at the DES. Meeting with DES officials arranged for the following week.

19 March 1987

P.Stoll, D.O'Keeffe, D.Marsland and Christopher Monckton met with Bob Dunn and DES officials (three - all very hostile). Put up 12 objections to our proposal (all noted in shorthand by C.M) Final decision would be made at a meeting with Kenneth Baker and Bob Dunn on 1 April.

The proposal was re-written and expanded at Policy-Search. The documents were handed personally to Kenneth Baker, Angela Rumbold and Bob Dunn on Friday 27 March 1987. On 5 May we received a letter from B.Dunn officially turning down our research proposal. At the same time it was announced that there would be a General Election in June and so it was not possible to follow up the rejection.



Prime Minister²

Ref. A089/356

MR BEARPARK

The Science and Technology Assessment Office

In your minute of 18 January you said the Prime Minister wanted to know whether the Assessment Office was a temporary body. You asked for a short note which you could show to her.

2. The primary task of the Office, in advising on best practice in the assessment and management of Research and Development (R&D) programmes, is a finite one. That is well understood by the Assessment Office and by the Chief Scientific Adviser to whom it reports.

3. The three phases into which the Office has divided the work are as follows.

4. The first phase has been to establish precisely what systems different R&D spending Departments have for the three stages of assessment - selecting programmes and projects at the outset, monitoring their execution and evaluating the results on completion. This phase has now been completed apart from the Research Councils and Universities (where a number of policy issues on roles and objectives are still to be resolved by Ministers) and the smaller R&D spending Departments.

5. The second phase is to work with Departments to implement agreed changes. This is now under way.

6. The third and final phase of work will involve developing better R&D indicators to support the largely judgemental techniques employed at present. Again different techniques will be applicable for different forms of R&D.



7. Associated with this work the Assessment Office is engaged in training and education courses. It is shortly to produce a booklet on good R&D assessment practice.

8. Mr Fairclough envisages about two years further work for the Assessment Office to bring Departments' assessment procedures to the point where they can develop them for the future themselves. Sir Robin Butler and Mr Fairclough therefore envisage that the Assessment Office's future should be reviewed next year when the assessment procedures task should be close to completion and when it should be clearer what other support on S&T priorities E(ST) still requires.

CONQUEROR

Trevor Woolley

T A WOOLLEY

7 February 1989

IND PO: Support + Innovation
PTG



CONFIDENTIAL



Not S/R



file Ho
L63B9C

10 DOWNING STREET

LONDON SW1A 2AA

From the Private Secretary

MR. WOOLLEY,
CABINET OFFICE

You will recall that the Prime Minister answered three Written Questions from Sir Ian Lloyd on Monday concerning the Cabinet Office's Science Technology Assessment Office. As a follow-up to this, the Prime Minister enquired as to how many staff were employed by the Assessment Unit, and we have now given her that information. She has asked me to confirm that their task is temporary, as presumably the systems they are advising on will soon be in place, and suitably effective. I should be grateful for a short note on this which I could show her.

P. A. BEARPARK

18 January 1989

Leo



CABINET OFFICE

70 Whitehall London SW1A 2AS Telephone 01-270 0259

CCFV

From John W Fairclough FEng
Chief Scientific Adviser

W0978

J M M Vereker Esq
Deputy Secretary
Dept of Education & Science
Elizabeth House
York Road
London SE1

MBM
BAC
19/1

17 January 1989

Dear John,

INTERNATIONAL R&D PROGRAMMES

WITH REQUEST IF REQUIRED

Thank you for your letter of 9 January and for the general support you give my proposals.

I agree that the main focus of the review should be on management of existing programmes and the scope for improvements in value for money, including possible savings. Anthea Case has made the same point in her letter to me of 13 January. I would however hope that it would be possible to learn something valuable for the future from our past and current experience. That is why I attach importance to trying to develop guidelines, or at least a checklist of points, which might be referred to when new collaborative programmes are being developed. This would lead to good management practices being adopted from the start.

You suggest that the review should not look at the rationale for the projects and facilities selected for investigation. I agree that the aim should be to concentrate on the terms of participation rather than revisiting decisions that have already been taken. I suggest adopting Anthea Case's proposal that the review should identify the relevant scientific objectives and the rationale for taking the international collaborative route. This would enable the team to form a view on whether the relevant systems were in place in the funding bodies to take decisions of this kind, as well as providing relevant background for the rest of the study.

Turning to coverage, the request from the Prime Minister refers to international projects and large international research facilities. I think this should include facilities run by one country where the initial planning catered for significant international participation. That is why I attach importance to including ISIS and the astronomy projects. Since we are also agreed that most environmental research has to be done on an international basis, I would also like to continue to include the NERC research vessels in the exercise, even though I accept that decisions to commit expenditure may well have been taken solely in relation to national needs.

I have more difficulty with your proposal to extend the study to include the relevant EC science programmes and the operation and funding of the Joint Research Centres. These seem to me to fall into a rather different category from CERN and the projects I have suggested for the review. The EC programmes are broad and include many separate projects of widely differing types and sizes. The review team could not hope to cover in a sensible way all of the Framework Programme and I doubt the value of any conclusions drawn from a limited selection. It would also be difficult to restrict the review to the UK end since the direction of the programmes is so firmly in the hands of the Commission. I would however be prepared to think again about this if other Departments with a substantial interest in EC programmes thought there would be advantage in including them. I would expect in any case that general guidelines we developed in the review would be taken into account in the UK's response to the Commission's mid-term review of the framework programme. We will be happy to extend the terms of our question b in the way you suggest. Nich Wingfield has now developed a full questionnaire building on the framework set out in my letter. He will be in touch with Robin Ritzema over this and over the arrangements for visiting the Research Councils concerned.

I am copying this letter to other members of E(ST)(O).

Yours sincerely,



JOHN W FAIRCLOUGH

Prime Minister²,

ASSESSMENT UNIT

THE STAFF IN THE ASSESSMENT UNIT ARE AS FOLLOWS:-

1	GRADE 3	PART TIME
1	GRADE 5	FULL TIME
2	GRADE 6	FULL TIME
2	GRADE 7	FULL TIME
1	HEO	PART TIME
1	AO	PART TIME
1	AA	PART TIME
2	PS	FULL TIME
1	PS	PART TIME

12

Presumably when task is
temporary - the system must soon
have been formulated.

mt

Monday 16th January 1989

(Answered by the Prime Minister on Tuesday 17th January)

UNSTARRED
No.

Sir Ian Lloyd: to ask the Prime Minister, whether the Technology Assessment Unit of the Cabinet Office has been asked to undertake an assessment of the scientific validity of the Commission of the European Community's decision to ban the import of beef produced from cattle which have been fed with hormones.

UNSTARRED
No.

Sir Ian Lloyd: To ask the Prime Minister, whether it is her intention to publish any of the technology assessment reports carried out by the Technology Assessment Unit of the Cabinet Office.

UNSTARRED
No.

Sir Ian Lloyd: To ask the Prime Minister, whether she will publish a list of the technology assessments which have been carried out by the Technology Assessment Unit established in the Cabinet Office in 1988.

THE PRIME MINISTER

The Cabinet Office's Science and Technology Assessment Office does not itself undertake assessments of this kind. As explained in the Government response to the First Report of the House of Lords Select Committee on Science and Technology, 1986-87 Session (Cm 185), its role is to encourage the adoption of sound assessment systems by Government Departments and other bodies concerned with publicly funded research and development.

How many people are in this
Assessment unit?
MT

OUND NOTE

Science and Technology Assessment Office was established in 1986 and became operational in the Spring of 1987. Its main function has been to work closely with Departments to understand the purpose and nature of R&D undertaken as a basis for reviewing and encouraging them to adopt sound assessment and management arrangements. As part of this approach the Assessment Office plans shortly to publish guidelines on good assessment for the management of all publicly funded R&D.

The current ban on the import of meat produced from cattle treated with hormones was adopted by the Council of Ministers last year. It was voted against this ban as, on its own scientific findings and the evidence of a Scientific Committee set up by the Community, there is no evidence that the hormones produced a risk to human health, if used properly. Sir Ian Lloyd's specific Question on this matter does not, however, require a restatement of the Government's position that the ban has no scientific foundation.

A relevant extract from the Government response to the First Report of the House of Lords Select Committee on Science and Technology, 1986/87 Session, to which the proposed single Answer is attached.



Civil Research and Development

Government response to the First Report
of the House of Lords Select Committee
on Science and Technology, 1986-87
Session

Presented to Parliament by the Prime Minister by
Command of Her Majesty
July 1987

LONDON
HER MAJESTY'S STATIONERY OFFICE
£2.20 net

9. As with ACARD, the new Council's secretariat will be located in the Cabinet Office and will report to the Chief Scientific Adviser. The remit of the Chief Scientific Adviser is in Annex A.

10. The Committee of Departmental Chief Scientists, chaired by the Chief Scientific Adviser (which was established in response to the recommendation of the Select Committee five years ago, as announced in Cmnd 8591), will be enlarged to reflect its wider responsibilities, including the Government's economic objectives for science and technology, and to support the collective Ministerial considerations.

11. The Science and Technology Assessment Office, whose formation the Select Committee welcomed (7.19), will assist this work. Its role is to help Departments, the Research Councils and the University Grants Committee (UGC) to assess their R&D expenditures and evaluate the results. This should help ensure that those responsible for public R&D establish clear objectives for expenditure and develop systematic criteria for assessing and managing research. It will also be responsible for ensuring that all bodies involved in public R&D have regard to the economic impact and commercial exploitation of the work supported as well as other national benefits. The Assessment Office will build up a picture of the relative contribution of the different R&D expenditures to the United Kingdom economy and will contribute advice on these matters to the new, strengthened central structure.

12. The Select Committee recommend that approximately one per cent of all Government R&D expenditure should be devoted to evaluation (7.20). The Assessment Office will discuss with all bodies involved in the public funding of R&D the need for adequate resources to be devoted to the various stages of the assessment process, including *ex post* evaluation, in their individual expenditure programmes.

Research Councils and higher education

13. The Select Committee's recommendations embrace increased harmonisation of Research Council procedures (7.7); strong management and clear decisions about priorities between Research Councils (7.8); evolutionary progress, possibly leading to eventual unification of the Research Councils (7.9); fostering further collaboration between higher education institutions and industry (7.30); the University Grants Committee (UGC) selectivity exercise (7.31); and closer links between Government research establishments and Research Council institutes and higher education institutes (7.33). The Government welcome the general thrust of the Select Committee's thinking in these matters. The cost of research—particularly the capital cost—inevitably increases while the scientific opportunities expand at a growing rate. In order for the United Kingdom to continue to play its leading role in world class science, selectivity, building on strength, is required both nationally and internationally. At any realistic level of resources a substantial measure of concentration is essential.

14. Individually the Research Councils have made notable progress in the identification of priorities and more active management of resources, including substantial restructuring in some cases, which is described in the corporate plans they now publish. The UGC has embarked on a policy of selectivity of research funding in universities and this will be further pursued by the UGC and the successor-body announced in the White Paper on Higher Education (1987, Cm 114, Paragraph 4.40).

15. The ABRC has set out its proposals for greater concentration of research resources in *A strategy for the science base*² which is being published today. These include suggestions for strengthening the framework within which the

2. *A strategy for the science base*. ABRC. HMSO, July 1987. ISBN 0 11 270627 4.

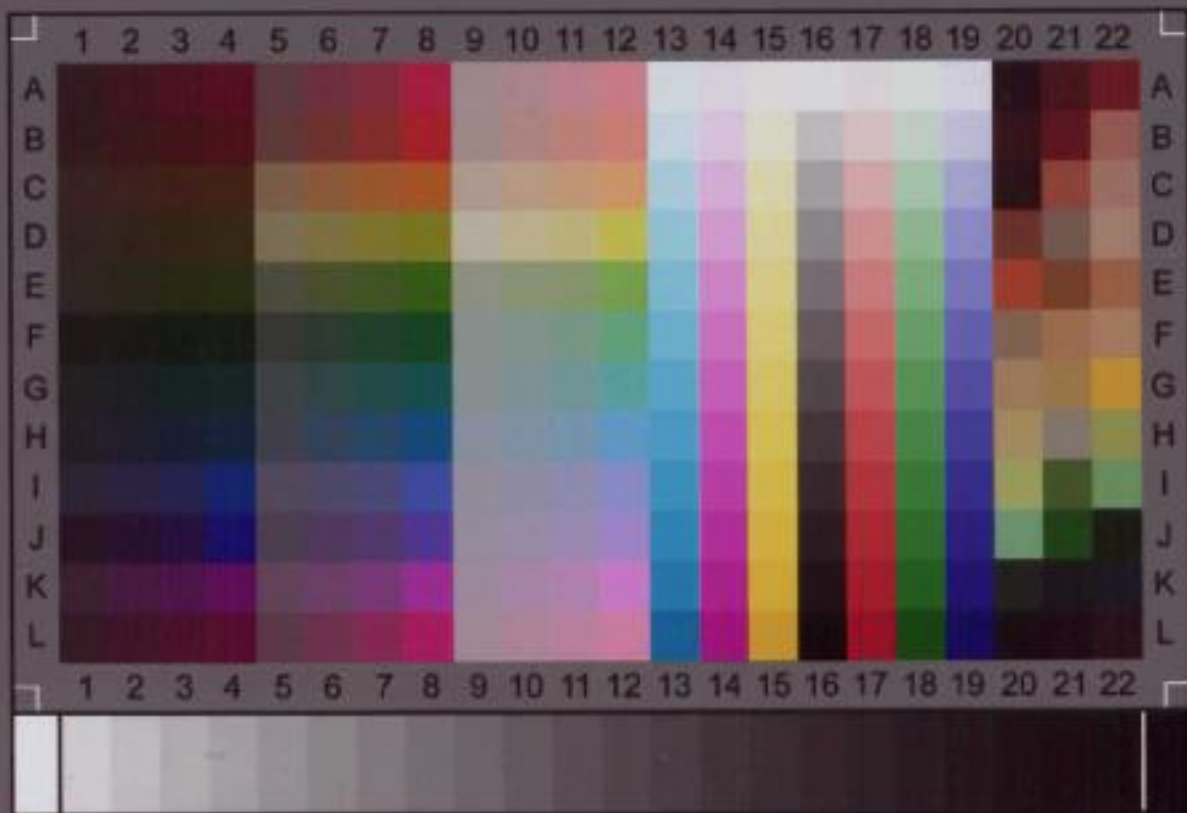


PART 5 ends:-

U. BROWN to HMT. 15.12.88

PART 6 begins:-

J. FAIRCLOUGH to DES 17.1.89



IT8.7/2-1993
2009:02

Image
Access

IT-8 Target

Printed on Kodak Professional Paper
Charge: R090212