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B/UPPRIME MINISTER

## RESEARCH AND DEVELOPMENT PRIORITIES ACROSS GOVERNMENT

I have sent you separately, under a short covering note, a report on the above subject by MISC 119, the Ministerial Group which you asked me to chair following the discussion of R & D at E(A) last July. I thought, however, that I should add the following personal comments.

2. It has frankly proved to be a very difficult exercise, and has therefore taken longer than I had hoped. The main problem was over defence R & D. All the other members of the Group were ready to endorse the MISC 110 recommendations that the total volume of resources devoted to defence R & D (including any UK effort towards SDI) should be progressively reduced in accordance with the Ministry of Defence's own 1985 Defence costings. But the then Defence Secretary strongly opposed this and I could not therefore secure a unanimous recommendation on this crucial point.

3. For the rest, I think the Group have done some very useful work on how in future to secure better appraisal of Government-funded R & D so as to ensure that greater priority is given to its potential contribution to the competitive position of British industry. The methods of appraisal and the objectives have simply got to be changed; the Group accepted this.

4. In order to make sure that the new approach is put into effect, the Group have also unanimously recommended that a new Ministerial Group on R & D should be set up under the chairmanship of the Secretary of State for Trade and Industry. This would have appropriate inter-departmental official support, backed by the Cabinet Office Secretariat. I think that such a group could





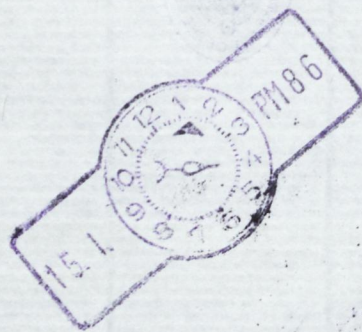
have an enormously beneficial impact on the way in which we appraise and allocate our R & D resources, and in particular, could ensure that the massive amount allocated to defence R & D is in future considered collectively alongside other R & D programmes.

5. There has not, of course, been time to seek George Younger's detailed views on the report and I should not want to hold it up further on that account. His own position is reserved and he will have an opportunity to contribute to the E(A) discussion next week. I have, therefore, with his agreement, put the report forward and I hope that, with your support, it will be possible for the new Group to make an early and constructive start on the tasks outlined for it.

WolW

Privy Council Office  
14 January 1986





COMPTON



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PRIME MINISTER

**RESEARCH AND DEVELOPMENT PRIORITIES ACROSS GOVERNMENT**

I was invited by E(A) in July last (E(A)(85)18th Meeting) to chair a small group of senior Ministers to consider the recommendation of the MISC 110 report that defence R & D expenditure should be gradually and progressively reduced over the next decade; and to explore, and make recommendations about, civil R & D priorities, given the need to secure the maximum contribution for the economy from the substantial resources that the Government are deploying in this area.

2. I now attach a copy of the report of the Group (MISC 119), which I hope it will be possible to consider soon in E(A) under your chairmanship.

3. I am sending a copy of this minute and of the report to the members of MISC 119, and to Sir Robert Armstrong.

A handwritten signature in blue ink, appearing to read 'hans', with a long horizontal flourish extending to the right.

Privy Council Office  
14 January 1986



RESEARCH AND DEVELOPMENT PRIORITIES ACROSS GOVERNMENT: REPORTIntroduction

1. E(A), at their meeting on 31 July to discuss the Annual Review of Government-funded R & D and also the report of MISC 110 (E(A)(85) 18th Meeting), were given evidence showing substantial differences between the UK and our industrial competitor countries in investment in R & D.

Specifically:

i. the UK spends a smaller proportion of Gross Domestic Product (GDP) on R & D than other major industrial countries; further our proportion is shrinking whereas theirs is growing;

ii. the UK spends a much larger proportion of Government-funded R & D on defence than other countries except the USA;

iii. the UK private sector spends much less on R & D than in other countries, except for France.

2. E(A) recognised that the application of science and technology to products, processes and services provides an opportunity for UK industry to improve its international competitiveness, and questioned whether Government-funded R & D was directed so as to secure maximum benefit in terms of the wider development of the UK economy. The Committee agreed that a searching review of R & D priorities across Government - defence as well as civil - was required, which would enable Ministers to decide on changes in the size and shape of Departmental R & D programmes, with the objective of increasing the contribution of Government-funded R & D towards improving the efficiency, competitiveness and innovative capacity of the UK economy. The Group was set up to carry out this task and make recommendations to E(A).

Work of the Group

3. The Group has analysed the primary purposes of R & D in the Departments which together carry out 98% of Government-funded R & D and assessed the general factors which have contributed to the current size and scope of Departmental programmes (Annex 1).



4. The Group has received papers from Departments in order to establish, in respect of each of the main programmes:

- i. the shape and content of the programme, its size and the extent of any complementary R & D activity by the private sector;
- ii. the results, their accessibility to other users, and the contribution they make to the UK economy;
- iii. the resources (particularly of scarce skills) used, the opportunity costs of this use of resources and the scope for their redeployment elsewhere;
- iv. present arrangements for organising and financing the programmes, and the scope for greater private sector involvement in both aspects;
- v. the relation and relevance of the R & D programmes to actual and potential collaboration in the European Community and other international fora.

5. It was argued, in the course of the Group's discussions, that common criteria should be established for assessing each Department's R & D programme, and that projects should not be undertaken unless they met a target rate of return. On further reflection, however, it was recognised that such a test could not be imposed on basic science, while in other areas (particularly 'support for statutory duties') the Government has no real choice whether or not to undertake the work in question. It was further recognised that the measurement of the relevant returns would be far from straightforward, even in areas where the results of the programmes had a direct application in the market economy, since there is rarely a one-to-one correspondence of R & D programme and commercial product or process.

6. The Group noted that the private sector's approach to this difficult problem of assessing value for money in investment in R & D across a wide range of products and technologies is to relate sales revenue and profitability in each business sector to expenditure on R & D for that sector and the proportion of the product range which has evolved from that R & D. Furthermore, international and sectoral comparisons provide overwhelming evidence that there is a correlation between the quality, relevance and utilisation of R & D and the ability of industry to compete effectively and profitably in world markets.



7. The Group has accordingly sought to make judgements about each of the main programmes in relation to the criteria listed in paragraph 4, and to put the economic significance of the programmes in context by relating them to the size and performance of the relevant industrial sectors as given in Annex 2.

#### Assessment

8. In assessing the results of its work, the Group agreed with the conclusions of the recent Treasury/Department of Trade and Industry study that there is insufficient quantified information about the impact on the UK economy of specific Government-funded R & D programmes and even on their success or otherwise in meeting the original objectives. As already noted, these are extremely complex issues even in the 'bottom line' oriented world of the private sector. For Government-funded R & D the consistent measurement of a financial return is an almost intractable problem on R & D programmes as diverse as:

- i. basic scientific research in, say, electronic materials the results of which permeate the whole economy and which also produces several hundred trained postgraduates in an area of scarce skills each year;
- ii. applied R & D on weapons and equipment for the Armed Forces of which the contribution can be measured ultimately only in terms of the maintenance of peace and security;
- iii. applied R & D on a generic technology coupled with an awareness programme to encourage 'best practice' in industry such as the DTI micro-electronics initiative;
- iv. applied R & D in improved wheat strains which increases the productivity and efficiency of the British cereal farm but also increases the agricultural surplus in the European Community;
- v. applied R & D to develop more reliable and relevant measurements of vehicle emissions.



9. But notwithstanding the difficulty of securing quantitative information it is clear that Departments are making judgements which could have significant long term effects on some of the more advanced areas of our industrial base.

Conclusions

10. The Group has concluded that there is a need to:

- i. increase the leverage of Government-funded R & D in securing corresponding contributions from the market sector of the economy so as to remedy one of the outstanding weaknesses of the UK R & D scene;
- ii. ensure that Government-funded R & D programmes are turned over to the private sector as soon as possible so as to release resources for new needs and to ensure adequate funding of vital activities which only Government can fund (eg basic research);
- iii. develop new methods of "pulling through" outstanding advances in our science and engineering research base so that the resulting new products and services are sold profitably by UK industry rather than by our foreign competitors. This would be assisted by joint ventures with industry and more involvement of industry in determining Departmental R & D programmes;
- iv. ensure that when Departments are formulating R & D programmes to meet their statutory and regulatory responsibilities, they energetically address, in conjunction with other Departments as appropriate, the potential for a corresponding strengthening of the competitiveness of the product, process and service base of UK industry in the sectors which will be influenced by the R & D;
- v. recognise the increasing role that international and, particularly, European collaboration on R & D can play in certain industrial sectors which because of their size, nature or markets are inherently trans-national.

11. The Group's specific findings in relation to each of the main Departmental R & D programmes are summarized in Annex 3.



12. The Group's approach reflects E(A)'s concern that Government-funded R & D must be more effectively coupled to an improvement in the overall performance of the UK economy and agrees that changes in the size and shape of departmental R & D programmes are one means of achieving this. A specific proposal by the Chief Scientific Adviser, which should be followed up by the proposed new new Ministerial Committee (see para 15/16 below) is given in Annex 4. Equally necessary are changes by each Department to implement "best practice" in the design, execution, evaluation and utilisation of its R & D programmes.

13. More generally Government as a whole should remove obstacles to the development and application of technology throughout the economy. Policies designed to increase the availability of skilled manpower, to facilitate the dissemination of information, to increase market awareness of the importance of effective R & D, and to increase the benefit to the wider economy of R & D programmes serving Departmental objectives in technology-dependent areas such as defence, health, energy and agriculture, will all have a part to play in this; and there may be scope for adjustments to taxation designed to encourage private sector R & D. But the majority of the Group believe that the most important element in this strand of policy is the progressive reduction over time in the extent to which scarce scientific resources (particularly in the areas of electronics and information technology) are preempted by defence procurement to the detriment of the wider needs of the economy.

14. The then Secretary of State for Defence, however, considered that this view is not founded on adequate data and analysis and reflected a failure to distinguish clearly between the different objectives of R & D expenditures of Departments with procurement responsibilities and of those with sponsoring roles. He noted that by far the greater part of the MOD's total R & D expenditure goes on engineering and software development, largely spent with industry as the direct precursor to the production of weapons and equipment. He considered that it made no sense to include this expenditure in comparisons with that which Departments direct at the encouragement of general developments, technology demonstration in the national academic or industrial interests they sponsor or regulatory responsibilities. Furthermore, he could not accept that the wider needs of the economy generally could be assessed in isolation, without also having regard to the public interest in effective defence procurement.



15. Implementing the policies in para 13 above will require that Departments:
- i. improve the information base about R & D activity throughout the economy, and the scope for the application of new technology;
  - ii. improve the evaluation of the impact on industry of Government R & D programmes and the measurement of the returns on R & D expenditure;
  - iii. monitor the progress of each major programme against the objectives set out in paragraph 10.

The burden of (i) will fall mainly on the industry sponsor Departments, and particularly on the Department of Trade and Industry, but substantial efforts will also be needed to draw on the experience of "functional" Departments (notably the Ministry of Defence Procurement Executive, Department of Health and Social Security and the Departments of the Environment and Transport). It will be primarily for the Department of Trade and Industry and the Treasury to develop the methodology for (ii), so as to improve the basis on which decisions can be made at the margin on the allocation of scarce resources. On (iii) the Group considers that continuing inter-departmental machinery will be needed.

The Group envisages a new Ministerial Committee chaired by the Secretary of State for Trade and Industry and including the Ministers responsible for all the main Departmental programmes, together with representatives of the Treasury and the Foreign and Commonwealth Office. Its task would be to develop policies to enhance the contribution of R & D expenditure, public and private, to the development of the economy. This would involve, inter alia, evaluation of the contribution of Government-funded R & D activities to the Government's wider economic objectives, assessment of the impact of Government procurement policies on the shape and content of UK R & D activity in both public and private sectors, and the making of recommendations on R & D priorities. Appropriate arrangements would be made for official support for the work of the new Ministerial Committee.

#### Recommendations

16. The Group's specific recommendations are as follows:
- i. a permanent Ministerial Committee, as outlined in para 15 above, with appropriate official support should be established to carry out the work set out below;



ii. a majority of the Group recommended that a collective Government decision should be taken to reduce the total volume of resources devoted to defence R & D (including any UK effort towards the US SDI) in accordance with the projections in the 1985 Defence Costings (the Group recognised that the impact of this recommendation on the total defence budget was a separate question to be settled in another context). The then Secretary of State for Defence, however, believed that there had been insufficient assessment to take such a decision at this juncture, and that the issue should be tackled by the new Ministerial Committee on the basis of a fuller assessment of the contribution of all government-financed R & D programmes to UK industrial performance, including the impact of scarce skilled resources absorbed by defence R & D, and the full policy, economic and industrial implications of reallocating Government-funded R & D activities from one area to another.

iii. urgent consideration should be given to the Chief Scientific Adviser's proposal for a reallocation of resources so that immediate action can be taken to generate a pull-through of Government funded R & D to improve the efficiency, competitiveness and innovative capacity of the UK economy;

iv. further consideration, before the middle of 1986, should be given to the appropriate level and direction of funding for the science budget in order to maintain the quality of the UK's science and engineering base; to how the distribution of funds from the science budget might take better account of economic potential, and to ways in which the application of the results by UK industry might be encouraged;

v. further measures should be devised, which do not involve direct Government expenditure, to encourage additional private sector R & D;

vi. the objectives of Government R & D programmes should be changed so as to give much greater weight to the potential contribution the programmes could make to strengthening the competitive position of UK industry. MISC 110 will shortly be reporting on possible means of giving effect to this in the defence field; comparable reports should be made by officials in respect of the environment, transport and health programmes in the first half of next year, with energy and agriculture (including food) reporting soon thereafter;



vii. the Science and Technology Secretariat in the Cabinet Office, in conjunction with the Foreign and Commonwealth Office, Department of Trade and Industry and Treasury, should examine ways of ensuring appropriate UK participation in European and international collaborative R & D programmes; means of influencing their content to meet the best interests of UK industry; methods of responding more rapidly to the proposals of other countries and opportunities for the UK to initiate such programmes but avoiding inflexible commitments to international programmes which inhibit change in response to new priorities.



OBJECTIVES OF GOVERNMENT-FUNDED R & D

1. The Annual Review of Government-funded R & D classifies R & D by reference to six 'primary purposes':

- i. advancement of science;
- ii. support for policy;
- iii. improvement of technology;
- iv. support for procurement decisions;
- v. support for statutory duties;
- vi. support for other activities.

In practice, of course, the objectives of individual elements in R & D programmes are frequently much more complex than this classification would imply; many programmes have important secondary purposes, for example effects in training scientists and technologists in primary purpose (i).

2. Table 1 shows the classification of expenditure in 1985/86 in respect of each of the main programmes examined by the Group. It will be seen clearly that the universities and Research Councils account for practically all expenditure on the advancement of science. The largest elements in 'support for policy' are nuclear research by the Atomic Energy Authority and expenditure by the Universities and Research Councils especially the Medical Research Council. The Department of Trade and Industry dominates expenditure on 'improvement of technology'; the largest elements in its programme are civil aviation launch - aid (£90 million), space (mostly the UK subscription to the European Space Agency) (£65 million) and support for R & D in the fields of electronics and information technology (£80 million). Other significant elements in improvement of technology are agriculture and food and the Universities and Research Councils especially the Agriculture and Food Research Council and the Science and Engineering Research Council. Practically all expenditure on support for procurement decisions is accounted for by the Ministry of Defence with the Atomic Energy Authority the only other organisation spending more than £10 million although a significant part of the budgets of the Department of



Transport and the Department of the Environment is devoted to this purpose. Support for statutory duties is more widely spread, with the Ministry of Defence, the Atomic Energy Authority, the Department of the Environment, the Department of Health and Social Security and the Department of Transport all accounting for significant elements. More than half total expenditure in the 'other' category is accounted for by Overseas Development Administration.

Factors affecting the size of Departmental programmes

3. Different elements in the programmes summarised above will have been affected to varying extents by the following factors:

- i. public expenditure cuts;
- ii. the NATO objective of 3 per cent a year real growth in defence expenditure;
- iii. the opportunities for international cooperation, notably in the European Communities;
- iv. the objective of strengthening the technological base and competitive position of UK industry;
- v. the need for efficiency and economy in public purchasing;
- vi. the momentum of established programmes;
- vii. the application of the customer/contractor principle to the organisation of research;
- viii. economic evaluations of the results and prospects of individual projects.

4. Thus the basic science programmes of the Universities and Research Councils reflect on the one hand the established momentum of expenditure, and on the other the increasing stringency of public expenditure control; they have also been affected by European Communities and other international commitments, and by other Departments' decisions to cut back on commissioned research.



5. Programmes 'in support of policy' absorb substantial resources of nearly £0.5 billion a year; here again the main factors determining the extent of the activity appear to be the momentum of the programmes on the one hand and public expenditure stringency on the other. Unlike basic research, the objective is to evaluate a technology, an environmental problem or a type of medical treatment, which will serve a particular public purpose. The large nuclear R & D programme is directed essentially towards the future requirements of electricity generation in a world where fossil fuels are becoming exhausted or too expensive. Again there is a significant international dimension; and this programme shares many of the characteristics of defence R & D. But the eventual user is a public sector utility already engaged in the market place rather than the Government itself.

6. Programmes 'to improve technology' are those with the most direct relevance to the development of the UK economy; the objective is to support the production of goods and services by and for the private sector which can be sold in competitive markets.

7. Programmes - in volume terms almost exclusively defence - 'in support of procurement' have benefitted greatly from the NATO commitment to increase the real volume of defence expenditure. Unless equipment developed for the UK armed forces can be sold to overseas Governments, the role of market forces in determining the size of the programme is inevitably somewhat limited.



## GOVERNMENT R &amp; D EXPENDITURE in 1985-86. BY PRIMARY PURPOSE

Primary Purpose	(i) Advancement of Science		(ii) For Policy		(iii) To Improve Technology		(iv) For Procurement		(v) For Stat Duties		(vi) For Other Activities		TOTAL	
	£m	%	£m	%	£m	%	£m	%	£m	%	£m	%	£m	%
MAFT	4.5	3.5	12.3	9.5	98.6	76.0	0.1	0.1	14.3	11.0			129.8	100
DES (UGC & RESEARCH COUNCILS)	741.8	65.3	196.4	17.3	191.0	16.8	-	-	2.7	0.2	5.0	0.4	1136.9	100
DEn & UKAEA	0.5	0.2	182.6	80.3	4.3	1.9	17.8	7.8	14.4	6.3	7.9	3.5	227.5	100
DTI	-	-	1.1	0.3	387.0	99.3	-	-	0.7	0.2	1.1	0.3	389.9	100
DoE	-	-	16.6	38.5	3.1	7.2	3.5	8.1	19.3	44.8	0.6	1.4	43.1	100
DTp	-	-	8.3	31.3	-	-	8.8	33.2	8.0	30.2	1.4	5.3	26.5	100
DISS	-	-	12.9	49.6	0.2	0.8	0.2	0.8	9.6	36.9	3.2	12.3	26.0	100
<sup>1</sup> TOTAL CIVIL	777.2	36.3	478.1	11.3	726.4	33.9	30.3	1.4	81.6	3.8	47.9	2.2	2141.5	100
<sup>2</sup> MOD	-	-	19.3	0.8	27.9	1.2	2251.0	97.8	1.1	-	1.3	0.1	2300.6	100

1 Source: 1985 Annual Review of Government Funded R &amp; D (Published Version)

2 Source: 1985 Annual Review of Government Funded R &amp; D (June 1985 Version)



Industrial sector as % GDP	R&D programme as % of total Govt-funded R&D (1985-86)	Complementary Private Sector R&D	Accessibility of the Departmental Programme results	Value of the results in terms of contribution to GDP	Resource Constraints, etc.	Scope for greater private sector involvement in Govt programs.	Scope for international collaboration	
<u>MAFF</u> Agriculture, fisheries	2.0	2.6	negligible	Good	Substantial increase in agric output	Programme declining	Bill now before Parl provides for this to begin	Some EC scope
food	2.3	0.3	Several times size of Govt. prog.	Some through RAs. Scope for improvement	Potential	*	Scope needs examination	Some EC scope
<u>DES</u> Research Councils	n/a	12.0	n/a	Scope for improvement in take-up	Scope for improvement	Problem of brain drain	Maybe some scope: requires study	Substantial programmes in place
Universities	n/a	12.8	n/a	"	"	"	"	
<u>ENERGY</u> AEA	0.5	4.2	negligible	*	Disappointing	Program declining	Transfer more of cost to CEEB	Substantial int'l collaboration in progress
Other	8.5	0.8	large private sector prog on oil and gas	Good	Substantial	Some problems	n/a	Some scope in renewables
<u>DTI</u> Aerospace	1.3	4.1	Less than Govt.	Good	Fair	Some problems	Substantial	Already in force: further scope
Electronics /IT	3.1	1.8	Comparable to Govt.	*	*	Serious problems	Considerable (inc. defence)	Risks to competitive position of UK industry but scope, esp. in Eureka
Other Mfg.	16.3	2.7	Many times size of DTI programme but small of competitors	Good DTI awareness programmes	Potentially Very High	*	Some scope	As above
<u>Transport</u>	4.1	0.6	small	Good	Scope for improvement	Problems of recruitment	Some scope, esp in area of pollution control	Needs exploration
<u>Environment</u> Building Construction	5.4	0.2	Inadequate	Good	Scope for improvement	*	Some scope	Needs exploration
Other	n/a	0.8	Significant	Good	"	*	More involvement needed, esp in area of pollution control	Some already but further scope
<u>DISS</u>	n/a	0.6	Substantial in fields of drugs and medical eqt.	*	Good	*	More involvement needed, in area of medical eqt/	*
<u>Defence</u>	n/a	52.7	Very limited privately funded R&D specific to defence. Some civil aerospace and electronics R&D relevant.	Poor but efforts being made to improve.	Defence exports based on technology developed for UK armed forces are only about 10 per cent of MOD procurement. Spin-off currently small but enhancement measures in hand.	Serious problems, esp in fields of electronics and information technology	MOD pursuing a range of improvements; under review in MISC 110	HMG initiative in IEPG, under review in MISC 110.

\* = Doubtful



## TRADE BALANCES FOR SELECTED SECTORS 1980 AND 1984

£ million (cash terms)

## TRADE BALANCES (EXPORTS - IMPORTS)

	1980	1984
(1)		
Agriculture, Forestry + Fishing	-1979	-2160
Food (less drink + tobacco)	-2516	-3954
Chemicals	+1257	+1018
Pharmaceuticals	+517	+664
Construction Equipment + Mechanical Engineering Products	+3367	+1965
Electronic + Instrument Engineering	+483	-2643
Motor Vehicles + Parts	+3	-2502
Aerospace Equipment	+110	+869
Textiles + Footwear	-796	-2624
Paper, Printing + Publishing	-946	-1872
(2)		
Financial + Other Services	+3976	+6038
(3)		
Identified Defence Equipment	+390	+572
Additional Defence Equipment (Estimates)	+700	+832

Sources: (1) Business Monitor MQ10  
(2) UK Balance of Payments Pink Book  
(3) Statement on the Defence Estimates



FINDINGS IN RELATION TO PARTICULAR PROGRAMMES

The Group's findings in relation to each of the main programmes are summarised below.

a. Agriculture, Fisheries and Food

This programme has been effective in finding ways to increase agricultural output and productivity, and in securing their application by the industry but more future-oriented research is needed. The Ministry has been very slow in seeking to secure an adequate financial contribution towards the costs from the farming industry which has received the benefits. The Group endorsed the reductions already made in this programme, and the efforts now under way to secure private sector funding. A report should be made to the proposed Ministerial Committee before the end of next year on progress in reshaping the programme, in the light of future prospects for the development of UK agriculture and fisheries, and in securing private sector financial support.

b. Research Councils and higher education

This programme provides the science and technology base which plays a crucial role in providing underpinning for future R & D activity throughout the economy, and in training the scientists needed by both industry and Government. The Group welcomed the progress made in directing funds more accurately towards teams and projects of proved merit; and they noted some evidence that constraints on funding could exacerbate the brain drain. They noted that the 1985 public expenditure settlement had provided some modest additional resources in this area, which they considered should continue to have high priority in the allocation of any funds available. They saw a need for further efforts to ensure that economic potential is considered in distributing available funds from the science budget among competing teams and projects, and to create new incentives to encourage the application by UK industry of the results; there were too many instances of foreign companies moving more quickly than their UK counterparts to take up and develop the ideas (and the people) generated



in British Universities. A report should be made on these issues to the proposed Ministerial Committee before mid 1986.

c. Energy

The Group recognised the efforts made by the Secretary of State for Energy to direct the non-nuclear part of his programme more closely towards technologies with a promise of economic potential. They also recognised that substantial reductions had been secured in the nuclear programme, and that international collaborative arrangements had been made which reduce the cost to the UK (for example, savings on the fast reactor development programme amount to 30%). Nevertheless they remained concerned that the Government continues to spend large sums in an area where no early direct economic return is expected. The Group noted that increased Central Electricity Generating Board funding had already been agreed for certain aspects of Atomic Energy Authority research, following the recent review of the Authority. They considered that efforts should continue to transfer more of the costs to the electricity generation industry as opportunity offers and to scale down the commitment of Government funds.

d. Defence

The majority of the Group was extremely concerned about the opportunity costs imposed on the economy in general, and private sector R & D in particular, by the very heavy preemption of resources by the defence R & D programme. The Group did also note that a high proportion of defence R & D expenditure (85%) was devoted to engineering and software development largely spent with industry as a direct precursor to the production of weapons and equipment. But the majority of them was not satisfied that the incidental benefits of defence development programmes, whether in terms of civil spin-off or exports of defence equipment, were yet commensurate with the high level of Government expenditure. The Group welcomed, however, the range of initiatives being taken by the Ministry of Defence to that end, including the establishment of Defence Technology Enterprises Ltd and the programme in conjunction with SERC to support research in the universities; they considered that these initiatives should be pursued vigorously and developed further whenever possible. They noted that MISC 110 would be submitting papers in the near future on



possible action to reduce barriers between defence and civil industry, and to exploit relevant UK strengths through international collaboration. The majority of the Group acknowledged that resources could not be redeployed quickly from defence R & D activity into the civil economy without substantial frictional costs, and - with the then Defence Secretary reserving his position - endorsed the MISC 110 recommendation that defence R & D should be progressively trimmed and reshaped over an extended period, in line with the projections in the 1985 Defence Costings. In recommending a collective Government decision to constrain defence R & D expenditure in this way, it was recognised that this did not necessarily have implications for the total size of the defence budget, which would need to be settled separately between the Ministry of Defence and the Treasury in the context of the public expenditure survey. The then Secretary of State for Defence made clear the fact that the overwhelming proportion (95%) of his procurement budget was spent with British industry. He believed that if the Ministry of Defence budget for equipment development were to be reduced he would of necessity be forced to buy increasing quantities of equipment from overseas suppliers; and that this would obviously have damaging implications for British high technology industries in the defence field. The majority of the Group also attached importance to ensuring that UK participation in the US Strategic Defence Initiative did not increase the overall extent to which UK scientific resources are preempted for defence purposes.

e. Environment and Transport

These programmes are closely linked, through the supervision of a Chief Scientist common to the two Departments, through the two Departments' shared responsibility for building and civil engineering, and through their common concern with the problems of pollution. The Group noted the inadequate performance of the spectrum of industry running from building through major construction to civil engineering in undertaking sufficient R & D; much more needed to be done, and a larger share of the total should be borne by industry than is the position now. They urged the need for this dimension, as well as the requirements of the two Departments in terms of their statutory duties (eg for pollution control) and programme responsibilities (eg for major road construction), to be taken into account in planning the work of the Building Research Establishment and



the Transport and Road Research Laboratory. They were impressed by the commercial opportunities created by the increasing stringency of national and international regulation of pollution for UK suppliers of equipment (including vehicles) designed to reduce pollution, and urged the need for this aspect to be taken fully into account both in decisions on Government R & D activity and in the formulation of policy.

f. Health

The Department of Health and Social Security programme, which is primarily directed towards the management of health care, is small in relation both to R & D by the drug companies (to which the National Health Service indirectly contributes about £250 million a year through the prices paid for drugs) and to R & D by companies producing medical equipment and supplies. The Group urged that greater account be taken, in consultation with the Department of Trade and Industry as sponsor Department, of the opportunities for strengthening the competitive position of UK industry through the formulation of National Health Service R & D and procurement policies. The world market for medical equipment is growing rapidly but the UK share of this market is falling. The Group noted with approval the Advisory Council for Applied Research and Development's intention to carry out a quick study of the industrial opportunities.

g. Trade and Industry

The Group emphasised the importance of this programme which - with the exception of aircraft launch aid - is now primarily directed towards encouraging the application by the generality of manufacturing industry of the results of technological advance, notably in the fields of electronics and information technology. They welcomed the progress made in developing cooperative programmes jointly financed by Department of Trade and Industry and private industry, and endorsed the objective of expanding the coverage of such programmes and drawing in contributions from the Ministry of Defence (particularly the Research Establishments) and Department of Education and Science (through the Research Councils), but they were concerned that overall R & D effort by UK industry apparently continues to fall far short of the performance of other major industrial countries; and they saw a need for much more active involvement of the Department of



Trade and Industry, as sponsor Department for the bulk of manufacturing industry, in the shaping of other Departments' R & D programmes, so that their potential impact on the competitive position of UK industry can be taken fully into account. They noted that the further work of MISC 110 would have an important bearing on this objective. International collaboration - notably through Eureka - could also play an important role in stimulating UK industry to be more ambitious in the development and exploitation of new technology to serve market needs.

The Group recognised the growing importance of Tradeable Services for future economic activity and noted that this sector's competitiveness depends on an effective take up of high technology manufactured products and advanced software. There appears to be little Government R & D aimed at the needs of the service industries and some overseas developments eg. the "smart card" in France, USA and Japan, give cause for concern for future UK performance in this area.



PROPOSALS BY THE CHIEF SCIENTIFIC ADVISER FOR REALLOCATION OF RESOURCES FOR GOVERNMENT-FUNDED R & D

1. I believe there is an urgent need to start the reallocation of resources to promote the better "pulling through" of outstanding advances in our science and engineering research base to provide new products and services to be sold profitably by UK industry. This problem applies to several University-Research Council/Government Department/Private Sector Industry combinations. But the most urgent is probably the Science and Engineering Research Council/Department of Trade and Industry/Private Sector Manufacturing Industry combination.
2. There have been several successful joint Science and Engineering Research Council/Department of Trade and Industry/Private Sector initiatives on a small scale such as the Polymer Engineering Directorate, the Joint Opto-electronics Research Scheme and the recent scheme in Advanced Manufacturing. But I believe there is a need for a "switch" in R & D resources towards focussed collaborative programmes which is every bit as important as the Government's earlier decision to "switch" educational resources to provide more people trained in scarce skills.
3. I envisage a scheme (which might be called "Switch II") which would only be open to projects based on advances in science and engineering which the private sector believed to have innovative product/process potential.

The scheme might have the following characteristics:

- i. projects would involve collaboration between universities, research institutes and manufacturing industry in a form determined by the nature of the project;
- ii. decisions on whether or not proposals met the objectives of the scheme would be taken by a small board drawn from SERC, DTI and its private sector advisers rather than by the conventional peer review system;
- iii. this board would also assess and rank proposals on the basis of the quality and commercial potential of the R & D, on the level of the resources offered by the private sector and on their commitment to commercialise the innovation if the R & D was successful;



iv. government funds for the scheme would be drawn from a single point and allocated to the proposals purely on the merits of the projects offered ie. there would be no predetermined share of the overall resources going to specific types of organisations.

4. I believe such a scheme, operating with Government funds of £100m pa and with total funds of £300m - £500m pa when industrial development and pre-production costs are taken into account, would have a real and rapid impact on the problem which MISC 119 was given.

5. I propose that Switch II be funded by the Department of Trade and Industry, 25% by Science and Engineering Research Council from their existing resources and 50% by funds reallocated from other areas of Government funded R & D with lower priority for the enhancement of the innovative capability of the economy. The build-up to £100m pa will take place over three years.

6. I propose that the re-allocated funds be obtained by applying the principles outlined in paragraph 10 of the report especially 10(ii):

Two possible areas are:

(i) transferring part of the Department of Energy fast reactor R & D funding to the responsibility of the Central Electricity Generating Board. I believe that this could be done immediately, and I see it as having been foreshadowed in the Department's recent report on United Kingdom Atomic Energy Authority which stated:-

"There should be significant changes in the way the nuclear programmes are funded and in the Authority's relationships with the rest of the nuclear industry.... the Generating Boards will be the owners and operators of the eventual UK lead reactor and subsequent reactors and should therefore assume greater responsibility for funding R & D as the programme approaches that stage."

(ii) continuing the transfer of funding responsibility of the Ministry of Agriculture, Fisheries and Food's agricultural research to the beneficiaries as recommended by MISC 100 (Ministry of Agriculture, Fisheries and Food officials dissenting). This would need to be done over a period of time.



7. Finally I propose that other Departments consider "Switch" combinations for example

- (i) Medical Research Council and Science and Engineering Research Council/Department of Health and Social Security and Department of Trade and Industry/Private Sector  
on medical equipment and instrumentation (including diagnostics);
- (ii) Agriculture and Food Research Council/Ministry of Agriculture, Fisheries and Food/Private Sector  
for plant breeding using genetic engineering and non-food outlets for agricultural products;
- (iii) Natural Environment Research Council and Science and Engineering Research Council/Department of Trade and Industry and Ministry of Defence/Private Sector  
on oceanographic equipment
- (iv) Science and Engineering Research Council/Department of Environment/Private Sector  
on civil engineering R & D for the construction industry.



