Prime Minister. (2)

This is an interim progress report from Sir Robert Armstrong, drawn up in conjunction with Sir Robin Nicholson. For information only at this stage. MEPT 18/3

Ref. A085/809

PRIME MINISTER

Annual Review of Government Funded R & D 1984:
Follow up to Acard's Comments

When I submitted to you the 1984 Annual Review of Government Funded R & D last July, I enclosed the independent advice given by the Advisory Council for Applied Research and Development (ACARD) in accordance with the Annual Review mechanism set out in Cmnd 8591.

2. Your Private Secretary indicated (6 August) that you were content for the Sub-Committee of Chief Scientists to consider most of ACARD's comments, while a separate mechanism should be found to consider the issues raised in respect of defence R & D expenditure.

3. The following steps have been taken:

1. An official group, under Cabinet Office chairmanship, is currently considering ACARD's comments on defence R & D expenditure: the terms of reference are attached.

2. The Sub-Committee of Chief Scientists has set up an interdepartmental group to prepare a response to ACARD's points on the balance between the Government's support for R & D for agriculture, fisheries and food and for manufacturing.

3. The Sub-Committee of Chief Scientists has received, and endorsed, a response to ACARD's comments on the distribution of support among different industrial sectors, prepared by the Department of Trade and Industry; a copy is enclosed. In order that there can be a dialogue between Departments and ACARD, I propose to send this response to the Council so that they can take it into account whilst preparing their

advice on the 1985 Review. Similarly, when the Sub-Committee is satisfied, the response concerning the split between agriculture and manufacturing R & D will be sent directly to ACARD.

4. ACARD also commented that the statements made by Departments and Research Councils setting out the objectives and targets for their research expenditures, did not demonstrate a clear purpose, were seldom expressed in quantified terms, and did not include reference to reasons for shifts in the balance of spending. In order to encourage Departments to submit more informative statements for the 1985 Review, a revised request incorporating guidelines for Departments has been sent from the Science and Technology Secretariat which co-ordinates the Annual Review.

RTA

ROBERT ARMSTRONG

18 March 1985

ANNEX

TERMS OF REFERENCE

To prepare a report for Ministers for submission not later than the end of June 1985 covering the following matters:

i. the economic effect of current and projected levels of Government funded defence research and development, taking account of the benefits which might be derived from alternative use of the skilled human and other resources for civil research and development and production or in other ways;

ii. without prejudice to the responsibilities of the Secretary of State for Defence for the overall management of the defence programme, the broad policy options which might be available for reducing the amount of Government funded defence research and development carried out in the United Kingdom and the advantages and disadvantages of such options;

iii. the measures in prospect and any further measures which might be taken to exploit for the benefit of the United Kingdom economy the research and development carried out in the United Kingdom for defence purposes.

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ACARD'S COMMENTS ON INDUSTRIAL R&D AS REPORTED IN THE ANNUAL REVIEW OF GOVERNMENT FUNDED R&D 1984

RESPONSE FROM THE DEPARTMENT OF TRADE AND INDUSTRY

SUMMARY

ACARD's basic criticisms of DTI's R&D expenditure are that it is not in their view sufficiently related to rapidly growing sectors of industry, to the relative economic significance of particular sectors, to long term high risk ventures, or to sectors that yield high value-added per capita; and that it is not sufficiently concentrated on a few key sectors. These criticisms are based on an analysis of DTI expenditure based on the Standard Industrial Classification. But this is a fundamentally misleading analysis. DTI's expenditure is very largely concentrated on new technologies - eg microelectronics, flexible manufacturing systems, computer aided design and manufacture - which can be, and if British industry is to be competitive must be, applied across a wide range of manufacturing industries. The apparent scatter of DTI expenditure is therefore deceptive: it is in fact concentrated on developments which can produce the highest pay-off to the economy.

The detailed statistics of DTI's R&D programmes that are set out in the second part of the Annual Report show that the pattern of expenditure, once allowance has been made for the widely disseminated impact of enabling technologies, is very much in line with what ACARD proposes. It includes marked concentration on electronics and information technology

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(including the Alvey programme); major programmes on biotechnology and R&D in support of public purchasing; and a heavy expenditure on the long term, high risk areas of civil aviation and space.

DTI has prepared a commentary for ACARD which addresses each of the Council's comments and sets out how DTI has already met many of ACARD's recommendations. This is attached as an Annex.

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ACARD'S COMMENTS ON INDUSTRIAL R&D AS REPORTED IN THE ANNUAL REVIEW OF GOVERNMENT FUNDED R&D 1984

A Department of Trade and Industry commentary on ACARD's views

Introduction

As announced in Cmnd 8591, the Advisory Council for Applied Research and Development (ACARD) was invited to provide independent advice on the results of the 1984 Annual Review of Government Funded R&D. ACARD made major comments about three areas:

(i) defence R&D,

(ii) the balance of support between R&D for agriculture, fisheries and food on the one hand and R&D for manufacturing on the other, and

(iii) industrial R&D.

This note addresses the third issue, in those areas for which DTI is responsible.

ACARD Comments on Industrial R&D.

ACARD made both general comments and specific comments on industrial R&D and on the features that they expected to be associated with Government expenditure. In order to assess the distribution of Government expenditures over different industries the Council examined the data - a tabulation of expenditures according to the 1980 Standard Industrial Classification (SIC) Product Groups - presented in Chapter 4 of the Review. They

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acknowledged that these were not ideal for the purpose. The Product Group analysis presents a fundamental problem when applied to DTI data, because Product Groups concentrate on 'sectors' and 'industries' and were designed for the analysis of data from firms. Much DTI support is aimed at enabling technologies which affect many sectors - for example microelectronics. It is therefore not appropriate to categorise this support by end product. DTI believes that its policy is more properly directed in this way rather than to specific sectors.

In developing its policy for the support of industrial R&D, DTI has taken note of the views expressed previously by ACARD and also the various ACARD reports already published. ACARD will be interested in Table 1 attached, in which the approximate DTI expenditure on technology and innovation in the Financial year 1983/84 has been allocated against sub-headings covered by the recommendations of ACARD reports. This represents nearly 30% of the Department's total expenditure in support of industrial technology and innovation during 1983/84 (excluding Civil Aviation Act Launch Aid). In addition to the R&D expenditure covered in the Annual Review, the Department also has additional expenditure under Section 8 of the Industry Act in the areas covered by ACARD Reports and this is included in the figures given in the table. DTI has also circulated to ACARD a copy of a graph showing the increase of industrial R&D spend since 1978. A copy of this graph is attached.

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1. ACARD's General Conclusions on Industrial R&D.

1.1 The Council concluded that "The distribution of expenditures in support of manufacturing industries appears only loosely connected with the private sector's market perceptions. A coherent policy to guide such expenditures is required. Provisionally, ACARD think this should be based on criteria related to growth, risk and concentration of resources."

DTI Comment.

1.2 A detailed statistical breakdown of DTI's support for R&D is given in Part II of the Annual Review. This shows that in 1983/4 (and the projected trend is consistent in later years) nearly three quarters of this Department's R&D expenditure was concentrated in the fields of Electronics, Information Technology, Mechanical and Electrical Engineering, Aeronautics and Space Research. These sectors represent growth and risk and demonstrate a concentration of resources. Within them priority is given to support for the applications of advanced technology. The importance of other key technologies is recognised, for example expenditure on biotechnology is just entering the growth (and risk) phase.

1.3 The Department is advised on its general industrial R & D programmes by 5 "Requirements Boards". Each has an industrial Chairman and strong industrial representation to give full weight to the private sector's market perceptions. In addition the Department is made aware of industrial needs through direct contacts with companies, through NEDO and its Sector Working Parties and Economic Development Councils and through advice from its own Industrial Development Unit and the Industrial Development Advisory Board.

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2. ACARD's Conclusions on Specific Criteria for Industrial R&D.

2.1 ACARD states that "Government expenditures appear not to respond to changes in perceptions of market opportunities or directions of technological advance."

DTI Comment

There have been significant changes in the balance of DTI's R&D expenditure over the period since the setting up of the Requirements Boards. For example, industrial energy conservation R&D rose to a peak and has fallen. Research into space technology, biotechnology, and information technology have increased. But many factors affect the changes besides changing market perceptions. For example, it may be appropriate to reduce funding when the private sector support for an emerging technology grows.

2.2 ACARD states that they expected "Government expenditure to have at least one of certain features as follows."

2.2.1 "To be concentrated in rapidly growing industries, thus accelerating their growth. But, with a few exceptions they are not."

DTI Comment

The Department supports R&D primarily to promote and encourage change. Expenditure on general industrial R&D is aimed at enhancing the adoption of key (or generic) technologies such as microelectronics or robotics. These can be applied across a wide range of industries and to a large number of products. The relevant programmes can be deployed flexibly to support firms with worthwhile applications in any sector. Rapidly growing sectors may be well able to finance their own R&D. The detailed analysis of DTI expenditure which is given in Part II of the Review shows that funds are concentrated particularly in areas undergoing rapid change.

2.2.2 "To be related to the economic significance of the sector concerned, as measured by value added or output. But patently they are not."

DTI Comment

Not all sectors are equally R&D intensive and many factors other than added value need to be taken into account in allocating support. For example manufacturers of components and materials provide essential underpinning to a wide range of industry, though they themselves may not represent high value added or direct economic significance. Also, as discussed, much support is directed to the promotion of enabling technology rather than to specific products.

2.2.3 "To be associated with long term high risk ventures. Some of course, are, but many expenditures are not, as shown by the 'seed corn' data in Chapter 6 of the Review."

DTI Comment

The definition of "seed corn" research has caused considerable difficulty as is recognised by both ACARD and the Cabinet Office Secretariat and the definition is to be changed next year. DTI does not believe that valid conclusions can yet be based on the interpretation of existing data under this heading. As explained long term high risk is one of the criteria used by DTI in allocating support.

The Department's programmes in Space Research and Aeronautics are both long term and high risk. Also, by definition, DTI support goes to ventures with a substantial degree of uncertainty - firms do not need Government support for short term low risk projects. The Alvey programme is an excellent example of longer term, high risk R&D that ACARD look to Government to support.

2.2.4 "Within manufacturing, to be concentrated in the high value added per capita industries where we have an advantage over newly industrialised countries. But they are not."

DTI Comment

In 1983/4, the DTI allocated just over half of its R&D support to Aeronautics and Space Research. General Industrial R&D expenditure amounted to a further 36% of the total expenditure and of this, 40% was concentrated on Information Technology and Electronics. This represents the type of concentration that ACARD was seeking.

2.2.5 "To be concentrated in a few sectors where the limited resources available may make a real impact. But there is a broad scatter of funding, in part the consequence of DTI support for the introduction of new technology into traditional industries."

DTI Comment

There is a balance to be struck in the distribution of DTI support. There is some concentration in a few sectors as the data on Aeronautics, Space and Information Technology demonstrates. However, a proportion of DTI support is spent in response to good proposals coming to the Department from firms in all sectors.

If ACARD are calling for a concentration of DTI support in a few areas then:

(a) the areas for concentration must be identified.

(b) the areas which are to lose support as a consequence must also be identified.

It is for ACARD to be more specific how this should be achieved. The DTI's concentration on key technologies does have many of the other consequences that ACARD has called for. It is intended to give the maximum yield from limited resources and the impact can often be strongly felt in the traditional industries. The value-added contribution which traditional industries make to the economy is considerable.

Finally, ACARD is giving further consideration to financial aspects of innovation and the DTI would welcome an exchange of views in due course.

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14 January 1985

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Table 1

DTI EXPENDITURE IN AREAS RECOMMENDED BY ACARD REPORTS

ACARD Report	Approximate DTI Expenditure £m 1983/84
Applications of Semi Conductor Technology	32
Information Technology	44
Computer Aided Design and Manufacture	5
Robotics (Joining and Assembly)	2
Biotechnology	5
R&D for Public Purchasing	15

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