

010

Avant Dr. Nicholson

A



DEPARTMENT OF TRADE AND INDUSTRY  
1-19 VICTORIA STREET  
LONDON SW1H 0ET  
Telephone (Direct dialling) 01-215 5422  
GTN 215 .....  
(Switchboard) 215 7877

JU846  
Secretary of State for Trade and Industry

24 July 1984

Andrew Turnbull Esq  
Private Secretary to the  
Prime Minister  
10 Downing Street  
London SW1

Dear Andrew,

ACARD REPORT: NEW OPPORTUNITIES IN MANUFACTURING

I attach the draft covering letter and Government response to the ACARD Report "New Opportunities in Manufacturing" which my Secretary of State would like to send to the Chairman of ACARD in the next few weeks.

2 The Report, published in October 1983, reviews recent developments in manufacturing technology; concludes its effective adoption is essential to achieving higher productivity and efficiency; and makes recommendations to that end. The principal recommendations are addressed to industry and the report makes it clear that it is for industry to take the initiative. Nevertheless, it also says, "the Government can and must play an important part. Its role ..... is to create the right climate of advanced manufacturing technology (AMT)" and it addressed several recommendations to Government, mainly on support for AMT, MOD's purchasing policy and education and training.

3 The response endorses the main thrust of the recommendations and presents positively the Government's attitude to encouraging the adoption of AMT. Much of this is in line with ACARD's views though it may fall short of their expectations in some areas, particularly where there are more pressing demands on expenditure or where going further might restrict commercial initiatives. There have, nonetheless, been signs since the report was published of greater acceptance that industry itself must take the initiative in this area.



4 I am copying this letter to the Private Secretary to the Secretaries of State for Education and Science, Defence and Employment, the Chief Secretary to the Treasury, Sir Robert Armstrong and the Chairmen of SERC and MSC, whose Departments were represented on the inter-Departmental Working Group which prepared the draft. It is desirable to make an early response to this ACARD report and it would, therefore, be helpful, if you are content, to have your clearance as soon as possible.

Yours ever,

A handwritten signature in cursive script, appearing to read 'Ruth'.

RUTH THOMPSON  
Private Secretary



JU845

Secretary of State for Trade and Industry

DEPARTMENT OF TRADE AND INDUSTRY  
1-19 VICTORIA STREET  
LONDON SW1H 0ET

Telephone (Direct dialling) 01-215 5422

GTN 215

(Switchboard) 215 7877

July 1984

Sir Henry Chilver F Eng FRS  
Vice Chancellor  
Cranfield Institute of Technology  
Cranfield  
Bedford  
MK43 0AL

I have pleasure in sending you the Government response to the ACARD Report "New Opportunities in Manufacturing: The Management of Technology".

The Report has already had a marked influence in stimulating debate about the use of advanced manufacturing technology. It has undoubtedly sharpened awareness that manufacturing industry, not least the engineering sector on which the report focussed, must seek out and adopt such technology. Companies failing to take the necessary steps may well not survive.

The UK economy needs a competitive manufacturing sector and all concerned must work to secure this. Government has an important role to play in creating the conditions in which industry can adapt and compete. Fundamental is the creation of a healthy economic environment, free of unnecessary restrictions. Complementary to this is a range of policies and measures which can reinforce the efforts of companies seeking to improve their performance. Our response to the ACARD Report reflects a determination to play a full part in this process.

NORMAN TEBBIT

THE GOVERNMENT RESPONSE TO THE ACARD REPORT "NEW OPPORTUNITIES IN  
MANUFACTURING : THE MANAGEMENT OF TECHNOLOGY"

1. INTRODUCTION

- 1.1 For the foreseeable future, the UK will continue to depend on manufacturing industry to generate a vital part of national income. UK manufactured goods must be internationally tradeable and UK industry must therefore be as efficient as its competitors. The application of advanced manufacturing technology (AMT) is essential if a competitive edge is to be developed and maintained. The Government therefore welcomes the Advisory Council for Applied Research and Development (ACARD) report, which has contributed to the development of policy and has stimulated a wide debate about the use of AMT in manufacturing industry.
- 1.2 ACARD defined AMT as any substantial, relevant and new manufacturing technique, the adoption of which is likely to lead to changes within a firm's manufacturing practices, management systems and approaches to design and production engineering of the product. The Government welcomes this breadth of coverage, because aspects of AMT are applicable to almost all manufacturing firms which should recognise that the implementation of appropriate AMT is a key element of corporate strategy. The development of microelectronics and computing closely linked to advances in traditional manufacturing machinery has accounted for much of the advanced manufacturing technology available today.

1.3 The ACARD report focussed its attention on engineering manufacture but the Council believes that its conclusions would carry over into other manufacturing industries. In order to respond to ACARD's recommendations the Government also directs its response to engineering manufacture. However the applicability of much of the response to other manufactures such as woodworkings, textiles and electronics is recognised.

1.4 Many firms which have introduced advanced manufacturing technology have experienced a good return on their investment. The savings have encouraged them to take further steps to introduce more AMT, so moving towards an eventual integration of manufacturing activities. There are benefits for firms of all sizes not least for innovative and flexible small firms. Developments in control and sensor technologies are expected to make the highly automated factory an economic proposition bringing with it opportunities to widen the manufacturing base of the UK.

1.5 The Government supports ACARD's principal conclusion that senior management must see the evaluation and implementation of new and advanced manufacturing technology as a fundamental part of corporate strategy and therefore as one of their own major responsibilities. Government's principal responsibility is to create and sustain the right framework and conditions for industry and its main priority remains a stable macroeconomic and fiscal climate with continued control of public spending and borrowing aimed at further falls in interest rates and the rate of inflation. Within the overall

constraints on public expenditure and manpower however, Government can assist industry in various ways. But, as ACARD recognised, Government cannot substitute for good and decisive management initiative and action.

- 1.6 In discussing the role of Government, ACARD welcomed the publication of a set of aims by the Department of Industry. Following the formation of the Department of Trade and Industry (DTI) in June 1983 revised aims have been drawn up and published. Copies of these aims have already been sent to ACARD.
- 1.7 The Department's central aim is to encourage, assist and ensure the proper regulation of British trade, industry and commerce; to increase the growth of world trade and the national production of wealth. The promotion of innovation is one of the three main ways in which DTI works towards the achievement of its central aim. Within the innovation area, one of the five subsidiary aims is the awareness and adoption of key technologies and DTI recognises that AMT is a key technology in the context of its aims. Other aims which are relevant to AMT and ACARD's recommendations cover topics such as increasing the level of civil industrial R&D, the exploitation of UK and foreign science and technology, standards, quality, design, maker-user liaison (including public purchasing) and improved management and other skills in British industry.
- 1.8 The Government also recognises that it has other important roles in the specific development and application of AMT. As a major purchaser the Government encourages the use of AMT

among its suppliers where this can be seen to bring enhanced value for money. As a funder of research and development in industry, universities and government research establishments, the Government recognises the importance of work in the AMT area.

1.9 The Government has examined the recommendations put to it in the ACARD report and its response is set out below.

2. DTI SCHEMES IN SUPPORT OF MANUFACTURING INDUSTRY -  
Recommendations ix, x, d, xvii, xviii, xxi, f

DTI should consider introducing a **comprehensive Advanced Manufacturing Development Service** to advise and assist firms in the implementation of AMT. - Recommendation ix

DTI support should continue to be made available for AMT projects and consideration should be given to **a unifying scheme embracing most forms of AMT.** - Recommendation x

DTI should take measures to make the **marketing** of its schemes for AMT more effective; these might include a concerted AMT awareness campaign. - Recommendation d

2.1 The Government recognises the need for manufacturing firms to be aware of the significance of AMT and have the capability to establish long term objectives for their manufacturing activities to ensure that investment is based on a controlled approach to integration. **ACARD drew attention to the differences between Government support for the Agriculture and**

manufacturing industries highlighting the role of the Agricultural Development and Advisory Service which is currently under review. DTI schemes collectively provide an Advanced Manufacturing Development Service and the Department is currently planning more effective marketing so that this will be made clear. In the promotion of innovation, Government assistance has ~~created~~<sup>trebled</sup> in real terms since 1978 to over £300m.

2.2 Current Schemes\* providing advisory services and, in some cases other forms of support, include the Manufacturing Advisory Service (MAS), Small Firms Technical Enquiry Service (SFTES), Quality Assurance Advisory Service (QAAS), Design Advisory Service Funded Consultancy Scheme (DASFCS) and the Small Firms Service. There are also schemes for specific areas of manufacturing technology, such as Computer Aided Design and Manufacture (CADCAM), Computer Aided Production Management (CAPM), Flexible Manufacturing Systems (FMS) and the Microelectronics Application Project (MAP) etc. The expenditure on MAS, DASFCS and SFTES, less than £6m in 1982/83, has trebled in 1983/84 to more than £18m. The Government recognises that there would be benefits in regrouping of DTI's 64 schemes of assistance to industry and on 26 July the Secretary of State for Trade and Industry announced that before the end of 1984 they would be brought together under just four titles. There will be a Business and Technical Advisory Service, Support for Innovation, Support

---

\* The British Business Supplement 'Guide to Industrial Support' provides information on current Schemes.



for National and Regional Investment and British Overseas Trade Board Aid for Exports. This regrouping is a major recasting of the schemes of assistance operated by the DTI. It will harmonise the criteria used to judge applications for assistance; and it will simplify the procedures used in the Department. To make it easier for firms to get advice and assistance central contact points will be set up in DTI Headquarters and in each of DTI's Regional Offices.

- 2.3 In addition there are the various services available from Government Research Establishments and from the Council for Small Industry in Rural Areas, an agent of the Development Commission supported by the Department of Environment. There is also a growing number of commercial services.
- 2.4 The Government accepts that it is now appropriate to unify its support for different aspects of AMT and will be bringing together the 4 activities - Computer Aided Design and Manufacture, Computer Aided Production Management, Robotics and Flexible Manufacturing Systems. In setting up these separate schemes a major objective was to draw attention to specific aspects of AMT which, if adopted, would result in a much greater commitment to the use of appropriate AMT (particularly for firms in the mechanical engineering sector), and the development of an environment of confidence in investment based on demonstrable evidence of successful application. The individual technologies have now developed and have become appreciated widely, and it is now appropriate to present the different AMT techniques as steps towards a long term objective in integrating manufacturing activities. The main thrust will be to encourage firms to undertake a

comprehensive 'planning' study in order to develop a manufacturing strategy which recognises the benefits which can be expected from introducing appropriate AMT to their business but does not overlook the consequences of failing to do so. The regrouping will be the first stage in an effort to provide a more coherent framework of assistance to manufacturing and other firms which can be used flexibly in a wide variety of circumstances.

2.5 Under the AMT Schemes, firms willing to be in the vanguard for the introduction of, often unproven, AMT were given assistance with planning studies and also with the purchase of capital equipment. They agreed to make their AMT facilities available for other firms to visit. As part of the CAD/CAM Awareness Programme the DTI has arranged demonstrations at a number of firms who are using CAD/CAM profitably. Firms assisted through the various other support schemes have also agreed to demonstrate their AMT. Over the next 9 months the coverage of the demonstration programme will be extended to bring in the FMS, robotics and the computer aided production management areas and so cover a wide range of applications of AMT for various manufacturing activities.

2.6 In 1981 £6.4m had been allocated to CAD/CAM awareness and with a further £10m this was extended in 1981 to give more emphasis to Computer Aided Production Management and include planning studies. On the FMS and Robotics schemes the Government committed £35m at the outset and increased this, subject to approval from the European Commission, by a further £20m in March 1984 towards AMT installations. The further £20m

will, like the original £35m cover planning studies and AMT including robot installations. For those firms which have not yet decided to invest in new manufacturing technology the experience of others and the implementation of well tried systems will reduce the risk of making the wrong decision. DTI's activities in this area for the future will emphasise further the need for firms to establish long term objectives for integrating manufacturing activities. Assistance for feasibility or planning studies will continue to be available as it is believed that such studies have a key role to play in helping a firm provide justification for proceeding with a project.

- 2.7 For robots a proportion of the funds will go to encourage small firms who are first time users. For other firms the Department will be looking for innovative projects which extend the use of robots into new areas. As for AMT installations there will be a shift of emphasis from concentration on metal working projects to include projects linking computer aided design, manufacturing, production control and similar activities. The selective criteria for support will be similar to R&D projects putting emphasis on innovation and spreading the technology into new areas. Firms supported must agree to demonstrate their systems to others.
- 2.8 The Government believes that the repackaging and regrouping of its schemes are significant steps towards more effective promotion of the application of AMT through the provision of demonstration, advice on planning, appropriate distance learning material and other media.

DTI should review the existing schemes to provide encouragement for investment with the specific objective of giving greater stimulus to investment in AMT during periods of low profitability and relatively high interest rates. -

**Recommendation xvii**

2.9 The Government agrees with ACARD that the prime responsibility for investment must be with industry with a strategic response from top management. The main thrust of the Government's economic policy is to create the climate within which private enterprise can flourish. However the Government has recognised that some firms may not be able to take advantage of the benefits of adopting AMT without some Government support. A range of schemes has been provided which assist firms to adopt AMT and the Government considers that these have, to a some extent, stimulated counter cyclical investment. Perhaps, of greater importance, the Schemes together with the DTI's awareness and demonstration activities have, during difficult economic times, encouraged firms to plan their future investment in new technology.

2.10 The technology specific schemes referred to earlier - FMS, Computer Aided Design, Manufacture and Test and Robotics have supported investment of more than £170m by industry in capital equipment with relatively long lead times for planning and implementation. In addition to this substantial boost for new technology there has also been support for shorter term schemes, such as the two small engineering firms investment schemes (SEFIS 1 and 2) which have stimulated investment in specific types of advanced capital equipment. As at May 1984, assistance under SEFIS totalling £91.2m had been offered for

6997 projects, representing total investment in new advanced capital equipment of £273.6m. (A further Scheme, awaiting approval from the European Commission, should provide £20m over 4 years to encourage investment on technically advanced equipment by small and medium sized firms in clothing, footwear and textiles.)

**Measures should be taken to extend the capability and availability of manufacturing systems support to UK industry perhaps through the use of Government 'pump priming' schemes similar to the Microprocessor Application Programme. -**

**Recommendation xviii**

- 2.11 The Government agrees that there is be a shortage of expertise among consultants, software houses and machinery manufacturers to support the integration of manufacturing systems in the UK. Systems capability spans several areas of technology and, as yet, the necessary overall expertise rarely exists in one organisation.
- 2.12 Within its existing schemes, such as DTI's Support for Innovation (SFI) the Teaching Company Scheme sponsored jointly by DTI and SERC and the AMT Schemes (which are similar to MAP), the Government will continue to encourage the integration of manufacturing systems and, in support of this, the development of the necessary expertise. DTI will encourage collaboration between suppliers of manufacturing hardware, software and consultancy to provide turnkey installations and support.

DTI should review the application of its 'Support for Innovation' scheme for manufacturing equipment suppliers to provide greater incentives for inter-company collaboration. -  
Recommendation xxi

- 2.13 There is, already, flexibility within SFI for higher level grants for research and development projects which encourage wide industrial participation of suppliers and users and where appropriate include universities, Research Associations etc. The scheme is already used to promote this form of collaboration. In particular, 'club' activities exist for the development of a core technology. An example of a major activity in this area is the Geometric Modeller/CAM Development project managed by Leeds University in which 11 firms are involved including 6 actively marketing AMT system elements. Another is the Culham Laser Club where 8 major firms are involved in a research programme to provide information on laser system demands and capabilities. This flexibility has also been used to advantage in fostering industry - university collaboration to promote the use of communication standards for product design and manufacture. The 'club' format has been used to bring together universities, major users and CAD/CAM system suppliers under NEDO's Engineering Construction and Process Plant EDC to establish national guidelines for standards on the Initial Graphics Exchange Specification (IGES) - a format for communicating information about product design and manufacture.

- 2.14 DTI would welcome further collaborative proposals from suppliers and users under its Support for Innovation Scheme.

Consideration should be given to the types of activities and the forms of encouragement, incentive and support needed from Government to secure the long term competitiveness of the UK's manufacturing industry after the example of the Alvey Programme for information technology. - Recommendation f

- 2.15 The long term competitiveness of the UK's manufacturing industry is the Government's objective. Last Autumn, the Prime Minister initiated and chaired a seminar which discussed ways in which wealth could be created from science and technology by industry. This is an indication of the importance that Government attaches to these issues.

- 2.16 The Government endorses the view of ACARD that co-operative ventures, after the example of the Alvey Programme have a particular role to play in stimulating R & D. Indeed the Alvey initiative will benefit manufacturing. One of the demonstrator projects 'Design to Product' will show the next generation of computer integrated manufacturing and will use intelligent knowledge based systems (IKBS) at all stages to capture the skills of human operators. Other activities include a club embracing a range of firms and independent experts to explore the potential for IKBS in process engineering applications. These specifically pre-competitive activities are positive moves to better co-operation within industry. The Government welcomes collaboration not only between firms but also between industry, research organisations and higher education.

- 2.17 In support of this collaboration in the manufacturing area the DTI's Advanced Manufacturing Technology Committee will jointly function as the management committee for the Science and Engineering Research Council's new manufacturing Directorate - Applications of Computers to Manufacturing Engineering (ACME) which aims to strongly reinforce university R & D in this field and link it effectively with relevant industrial activity. It will be the role of the joint Committee to advise the Department and the Council on the use of resources available for manufacturing technology in support of long and short term R & D to secure a competitive position for the UK's manufacturing industry. Further opportunities should emerge when the Materials Advisory Group reports. This Group which includes industrialists from the engineering and materials fields has been asked to propose a collaborative programme for a materials initiative.
- 2.18 The European Strategic Programme for Research and Development in Information Technologies (ESPRIT), already underway and based on pre-competitive collaboration between firms and research organisations in Europe, includes Computer Integrated Manufacturing. Its objective is to establish the technology base for a programmed introduction of information technologies to all phases of manufacturing leading eventually to fully integrated manufacturing systems. A further programme, Basic Research on Industrial Technologies for Europe (BRITE), covering such areas as CAD/CAM, joining techniques, laser technology and new materials, of importance to manufacturing, is under consideration.



3. RESPONSIBLE PURCHASING - Recommendations xi, xii

The Ministry of Defence (MOD) together with DTI should examine contract and pricing procedures for defence purchasing so that, in conjunction with DTI assistance, their suppliers are given stimulus and incentive to develop and adopt AMT.-

Recommendation xi

3.1 In accepting this Recommendation the Government notes that MOD's over-riding concern in defence procurement must be to obtain best long-term value for money on a national basis in providing for the equipment needs of the Armed Forces. A summary of the approach which MOD has adopted to achieve this objective is contained in the Open Government Document DOGD 1/83 on Value for Money in Defence Equipment Procurement. In this context MOD looks for the advantages of lower unit cost and higher quality which contractors can offer through the introduction of AMT.

3.2 The Review Board for Government Contracts reported earlier this year. The report dealt, inter alia, with measures for increasing efficiency in the performance of Government contracts. It recommended that the adoption of a Cost Reduction Scheme (CRS) under which firms would propose cost-reducing measures, over and above those of normal efficiency with benefits being shared in agreed proportions between the contractor and Government. This recommendation has now been endorsed by Government and the scheme is in operation, although so far there have been no proposals from industry.

3.3 The installation of modern equipment or methods of the kinds included in AMT are likely to be measures which could qualify for a CRS scheme. MOD will collaborate with DTI to ensure that all concerned in the defence procurement process are aware of DTI's programme to encourage application of AMT, not least to enable the CRS scheme to provide effective encouragement for the promotion of AMT among suppliers. One possibility being examined is the inclusion of AMT familiarisation in courses for training MOD's project officers.

3.4 Competition also provides an important stimulus to the introduction of more efficient methods such as AMT. The MOD has recently taken a number of initiatives to promote more extensive and effective competition in the supply of defence equipment. An important change will be that MOD will not only be seeking competitive proposals wherever it is practicable and reasonable to do so at the level of main contracts, but also at the level of sub-contracts. The MOD will expect contractors to exercise competition to the maximum extent possible, both in letting sub-contracts and in determining whether work should be done in-house or by an outside contractor.

DTI and the public procurement agencies should be much more rigorous in the operation of the guidelines for procurement in order to provide better incentives for encouraging contractors to adopt appropriate manufacturing technology. DTI and the National Economic Development Council (NEDC) should also encourage major private sector purchasers to adopt a similar attitude to their suppliers.- Recommendation xii

3.5 The Government recognises the role public purchasing can play in bringing forward developments in new technology and one of the main aims of the Public Purchasing Initiative is to encourage the public sector to use its considerable purchasing power to help develop the technology and general competitiveness of its suppliers. The Treasury guidelines for Departments on public purchasing specify that "Actions to promote the industrial viability and hence the trading competitiveness of suppliers can justify an additional initial cost or greater technological risk if over the longer term the purchaser expects to gain improved value for money". Purchasers are encouraged to work closely with suppliers and funds have been made available within the Support for Innovation programme specifically to encourage the use of new products and processes by UK public sector bodies. The UK public sector as a whole has indicated its general support for the aims of the Public Purchasing Initiative. The DTI will continue vigorously to promote and monitor the application of the Initiative. NEDC has also strongly endorsed the Initiative and through the work of individual EDCs, SWPs and its Advanced Manufacturing Systems Group has made concerted efforts to promote the development and use of new technology by UK industry. The Confederation of British Industry (CBI) has also been active in promoting the concept of positive purchasing among its members.

3.6 Some firms are already showing the way, working closely with their suppliers to ensure that jointly they benefit from the flexibility, quality and cost savings arising from modern manufacturing technology. These firms, whose products must be internationally competitive, are increasingly working with

their suppliers to ensure that bought in components are also competitive internationally in price and quality. In some cases suppliers will be expected to share the development and tooling risks for new components in exchange for a closer partnership with their customer. The Government welcomes these moves and encourages more to do likewise.

4. **THE ROLE OF HIGHER EDUCATION - Recommendations xiii, xv, xvi, xxv, xxvi, a, b.**

4.1 The total number of mechanical engineering students in UK higher education institutions in 1982 was almost 13,000. ACARD did not say whether it considered this number of mechanical engineering students in the UK inadequate, but concentrated on the content and quality of engineering courses. The Government accepts that there is a case for increasing the number of engineering students and has taken steps to achieve this : in the local authority sector of higher education as a result of the National Advisory Board's (NAB) planning exercise for 1984-85, there will be a substantial increase in the number of students admitted to engineering courses during the coming academic year (approaching 15% between 1982-83 and 1984-85); the University Grants Committee (UGC) is similarly placing emphasis on engineering and technology in its management of student numbers in the university sector. However the Government also agrees that it is of great importance to ensure that the courses provided in higher education institutions are relevant and up to date, and the Government endorses ACARD's concentration on this.

DTI, the Department of Education and Science (DES), the Research Councils, the University Grants Committee (UGC) and the National Advisory Body for Local Authority Higher Education (NAB) should, as major public funders of AMT research, design and development, determine how these activities can be concentrated into a few strong 'centres of excellence in manufacturing technology', in which universities and polytechnics, industrial firms, industrial and government research organisations and advisory services would participate, building as far as possible on existing centres of expertise.- Recommendation xiii

4.2 The Government considers that a high level of industrial credibility is a dominant and essential feature of any AMT Centre of Expertise, (as is exhibited by institutions like IPA Stuttgart). This status cannot be created artificially but must reflect growth in commitment and achievement. Growth will be encouraged by university/industry collaboration in work such as that on the development of solid modelling at the University of Leeds, the robotics work at Oxford and Hull and the precision engineering at Cranfield.

4.3 In a recent letter to the UGC the Secretary of State for Education and Science said that greater selectivity in the funding of research activity may be necessary both within and between institutions. This envisages a degree of concentration of research as ACARD urges. Most Government funding for AMT research is channelled through the Science and Engineering Research Council (SERC) (advised by the Advanced Manufacturing Technology Committee which also assists DTI - see paragraph 2.16) whose policy it is to concentrate

support on a limited number of chosen centres. In order to avoid the danger of stifling innovation elsewhere they also support a limited programme of coordinated research within a wider set of smaller university groups. With the proviso, therefore, that it would not wish this to be exclusively so, the Government supports the recommendation that research work should be concentrated on a limited number of centres of expertise.

The UGC and NAB, the latter in consultation with the Council for National Academic Awards (CNAA), should make resources available to establish more first degree and postgraduate course modules in manufacturing systems. We consider that at least one third of those entering mechanical, production and electrical engineering undergraduate courses, should be encouraged, by 1988, to take such options and that appropriate teaching resources should be made available.- Recommendation

xv

- 4.4 The Government supports the proposition that the higher education system should offer more opportunities for engineering students to learn about manufacturing systems. For its part, the Government has drawn this recommendation to the attention of UGC, NAB and CNAA, with a request for proposals from these bodies. The approach to be adopted will be for decision by the individual institutions and the validating bodies. The Engineering Council with its accreditation role, will have an important function in this respect.

4.5

The Government also believes that greater awareness of and expertise in AMT can be and should be provided via updating courses, not only for scientists, engineers and technicians, but also for managers. The Department of Education and Science's initiative for Professional, Industrial and Commercial Updating (PICKUP), is a vehicle for promoting this objective and one which will be exploited further. Within DTI a committee under the chairmanship of Mr J Butcher is currently examining the problem of shortages of manpower with IT skills. This committee includes a number of industrialists representing both producers of IT equipment and users. Its recommendations are likely to assist in the provision of manpower with skills appropriate to the needs of AMT.

The Science and Engineering Research Council (SERC) should be given overall responsibility for the co-ordination of grant support for postgraduate courses in advanced manufacturing technology and related topics. These courses should be concentrated into a few centres of excellence. This responsibility should be exercised in co-operation with MSC and EITB, and with the advice of the Engineering Council, and should also extend to part-time intensive courses which would employ much of the MSc course material.- Recommendation xvi

4.6

The Government recognises the difficulties identified by ACARD but differs in its approach to the problem. SERC and MSC already have schemes of grant support at post-graduate level that fulfil different roles and have different objectives but are complementary. The Government believes that the emphasis

should be on mutual support and cooperation and that it would be inappropriate for either body to take full responsibility for coordination of grant support and this approach has now been implemented.

**EITB with DES, DTI and MSC should examine the scope for expanding the scheme for Fellowships in Manufacturing Management- Recommendation xxvi**

- 4.7 The Government recognises the value of EITB's Scheme which adds to the stock of competent manufacturing managers - a much needed requirement. Since the Scheme was expanded in 1979 MSC has made available £400,000 per annum to it in the form of pump priming finance and is committed to do so until the January 1984 intake has completed the course. EITB provide £800,000 per annum for the Scheme. A review of the Scheme is taking place and the EITB are considering alternative funding arrangements to replace the MSC finance. The aim will be to secure a higher level of sponsorship from larger companies and, as part of EITB's development of services for smaller firms, to include special arrangements to meet their particular needs. The Government is satisfied that the new, more flexible arrangements should make it easier for EITB to expand the Scheme in response to demand from industry.

**SERC and DTI should take measures to develop the Teaching Company Scheme in order to increase its output of Associates involved in mechanical engineering and other batch manufacturing industries from the projected 250 per annum by 1985 to not less than 500 per annum by 1987.- Recommendation xxv**



4.8 The Government welcomes the support given by ACARD for the Teaching Company Scheme. The joint sponsors, SERC and DTI, are already funding rapid growth of the Scheme and they hope to achieve the target of 250 Associates per annum by 1985. It is hoped that expansion of the Scheme will continue, although this may be constrained by availability of university and polytechnic resources. It is difficult to find suitable candidates as Teaching Company Associates and new graduates are being encouraged to apply. The achievements of the Scheme are reviewed regularly; a major review of the last 4 years will take place over the next few months.

**Sandwich Placements might properly become an element of MSC's activities. - Recommendation a**

4.9 MSC already supports sandwich placements through the Sandwich Grant Scheme and in the 1983/84 academic year provided 2250 grants in engineering, technology and computer science disciplines at a cost of £4.2 m. Arrangements for the period August 1984 to March 1985 provide for 1400 grants at an estimated cost of £3.56m. The reduced period is to synchronise the scheme with the financial year. Support is limited to those subjects where a shortfall in placements could lead to skill shortages in areas of national economic importance. The shape of any subsequent grant schemes after March 1985 will be determined after consideration, amongst other things, of the results of the DES led Research into the Sandwich Education (RISE) project.

DTI should assist with the funding of the new Open University (OU) courses in AMT, commissioning SERC to manage the additional funds and so accelerate the production and maintenance of the courses. MSC with DTI should fund EITB to assist industry in the take up of OU and Open Tech courses relevant to AMT. - Recommendation b

- 4.10 MSC's Open Tech Programme is already providing development funds to industrial and educational organisations to mount open learning programmes which will help meet urgent training and re-training needs of adults at technician and supervisory management levels. It covers all aspects of new technology in manufacturing, and will include programmes in CAD/CAM, Robotics and Polymer Technology, as well as a major engineering design project with EITB. MSC's Open Tech Unit deals directly with industry and commerce and with education and training providers, rather than through third parties as suggested by ACARD. DTI is supporting the purchase of robots for the Open University AMT course and is currently considering an application from the OU with a view to providing assistance for course development in addition to the support already provided by SERC.

5 CRAFTSMEN AND TECHNICIAN TRAINING - Recommendations xiv, c

Adequate resources should be made available by the Manpower Services Commission (MSC) and the Engineering Industry Training Board (EITB) to secure effective implementation of the new training scheme for craftsmen and technicians based on standards of skill achievement. - Recommendation xiv

5.1 In relation to craftsmen, this recommendation refers to a new national training agreement between the Engineering Employers Federation and the Confederation of Shipbuilding and Engineering Unions (CSEU). The largest craft union in the industry, the Amalgamated Union of Engineering Workers (AUEW), has not accepted the agreement although the agreement covers all constituent member of CSEU. The Government and MSC welcome this agreement as an important step forward in the reform of training arrangements for engineering craftsmen and very much hope that it will rapidly be put into operation in the industry. To encourage this, EITB is already putting considerable resources into securing implementation of the agreement in leviable firms. The MSC is supporting the EITB in implementation of the standards based training aspect of the agreement in firms excluded from paying levy or outside the scope of the Board. This support covers initial marketing work and permits the staged introduction of changes as modules are validated and assessed under the agreement.

5.2 Although this agreement does not cover the training of technicians, the issues of access to training and jobs are equally important. One of the key themes of MSC's proposals on an adult training strategy is the need to secure an adequate supply of technically competent people: proposals for action by MSC and others are being prepared in the context of that strategy. The issue of securing more ready access to training and related educational opportunities for people entering at all ages, or who require such training to progress at work, also needs to be considered more generally and

particular care needs to be taken to ensure that it is relevant and accessible to those involved in the small firms sector.

- 5.3 EITB and the Business and Technology Education Council have recently signed an agreement for the introduction of a scheme of joint certification to mark the successful completion of the training and educational components of the initial formation of technicians and technician engineers. The training requirements are based on EITB's recently published recommendations for the training of technicians in engineering. The Government recognises that training of craftsmen and technicians should include experience of modern machine tools. £5m has been allocated for a very successful scheme which is providing 50% funding for Colleges running further education courses to purchase CNC machine tools.

**EITB should use its influence to attain a high standard for all of the local Group Training Associations. - Recommendation c**

- 5.4 EITB already seeks a high standard and is currently looking at ways to further this aim by including the Group Training Associations in the levy exemption process. EITB's funds for Group Training Associations are provided by MSC (£1 million in 1983-84). To encourage them to further develop their efficiency and effectiveness, MSC has recently decided that it will no longer provide funds to be used as permanent subsidies to Group operating costs and will encourage them to earn income by participating in MSC schemes under which grants are

payable. Groups with their own training centres could play an important role in meeting the objectives of the Adult Training Strategy. The EITB has agreed, in the short term, to replace the MSC operating cost subsidies from the Board levy funds.

6 **CONSULTANTS USED FOR AMT - Recommendations xix, xx**

**Consultants employed by Government to conduct Schemes concerned with AMT should be regularly assessed. - Recommendation xix**

- 6.1 The Government endeavours to regularly assess the consultants in a manner which is appropriate to the needs of the particular Scheme. The Manufacturing Advisory Service, covering a wide range of consultancy topics, monitors the performance of the consultants it uses by follow-up enquiries with the client after the project is complete. For those schemes dedicated to a specific technology, such as FMS, MAP, CAD/CAM and Robotics, the performance of the consultants is monitored through the DTI receiving and assessing the consultants report and from questionnaires completed by the companies receiving the advice.

- 6.2 A register of "approved" consultants is not provided but companies are able to refer to a list maintained by DTI. Consultants included on the list have to demonstrate relevant expertise. Those that have not been active or have proved unsatisfactory are removed from the list.

6.3 AMT technology is constantly changing and the expertise required has, increasingly, to be relevant to the links between individual AMT elements. The experience of MAPCON shows that the existence of a Scheme in itself helps to build up the stock of consultants. The Government periodically reviews its requirements and wherever appropriate will include in its annual reviews of consultants an assessment of their work experience, and of training courses and seminars they have attended in order to keep up to date.

DTI should sponsor courses and other means necessary for the training and retraining of the consultants they employ so that they may be familiar with recent advances in manufacturing technology and their application. - Recommendation xx

6.4 The Government recognises the importance of using consultants who are fully equipped to do what is required of them but the responsibility for being up-to-date rests with the consultants themselves. Conferences are arranged by DTI to keep the consultants up to date with DTI policy and support, and to share experience. Although DTI occasionally arranges for courses to be provided, it would normally limit its role to passing on details of particularly relevant courses. It is up to consultants to keep up to date and for DTI to monitor their performance.

7 SUPPLIERS OF MANUFACTURING EQUIPMENT - Recommendations xxii, xxiii, xxiv

The DTI Pre-Production Order scheme should be extended to give emphasis to the reliability of products and processes before

they are installed in a customer's premises. The subsequent record of operational performance should become the basis for performance and reliability guarantees to support subsequent orders outside the scheme.- Recommendation xxii

- 7.1 The Government agrees with ACARD that individual pre-production orders (PPO) have not always given sufficient emphasis to reliability and expected performance. DTI has recently reconsidered the role of PPOs and this form of assistance is now offered only in exceptional cases.

DTI should develop a scheme which encourages companies to try out new applications for AMT at a reduced risk, such as free issue of robots for limited periods. - Recommendation xxiii

- 7.2 Experience of loaning equipment shows that a loan scheme must be carefully planned else it becomes too expensive to administer compared with the benefits to recipients. It is doubtful whether the approach is at all practical for an AMT project where hardware costs are often just a small part of overall costs. The Government keeps an open mind on such schemes but currently does not consider that a scheme along the lines suggested by ACARD would make the best use of available resources. In many respects the Robot, Flexible Manufacturing System and CAD/CAM Schemes have been an effective way of achieving the same objective.

DTI should examine the scope for providing grant aid for a credible scheme of voluntary certification of AMT equipment such as robots, CAD/CAM and machine tools. Wherever it is

available and appropriate, 'certified' equipment should receive preference in the DTI support schemes and public procurement policy.- Recommendation xxiv

- 7.3 The Government agrees with the intention behind ACARD's suggestion. There are considerable practical difficulties in determining what to assess, how to do it, and who might do the assessing to the benefit both of suppliers and users of AMT equipment. Nevertheless, in general, the Government sees voluntary certification as an important means of providing assurance to purchasers and at the same time helping suppliers compete in home and overseas markets. DTI is supporting work at its research establishments on robot calibration, and assessment of calibration methods.
- 7.4 The Government notes that the Machine Tool Industry Research Association (MTIRA), following discussions with its members, is drawing up proposals for a voluntary certification scheme for machine tools and possible application to industrial robots. In the longer term the ability to provide potential customers with an assurance or demonstration of performance and reliability should give suppliers of AMT equipment a major advantage.
- 7.5 The Government would welcome industry coming forward with voluntary certification schemes and launching assistance of 50% grant aid is available for schemes which meet specified criteria. Where certified equipment is on the market the Government generally support ACARD's suggestion that it should be given preference in public procurement policy.



8. DTI should devise a scheme for Research Associations and Government research establishments, and industry analogous to the Teaching Company Scheme with the principal goals of transferring technology, and the development and retraining of staff. - Recommendation e

8.1 The transfer of technology between Government research establishments and industry is an issue to which the Government is directing much attention. The arrangements in DTI were described in a recent paper to ACARD. Where appropriate, Departments have established machinery to ensure that industrial advice is brought to bear on the work of their laboratories (for example through DTI Requirements Boards). An important aspect of the appraisal of programme proposals from the RAs and research establishments is consideration of the means by which the technology will be transferred to industry. Club arrangements, in which groups of firms participate in collaborative programmes and share the results, have been particularly successful and there is scope for this to be extended to include, in addition to a number of firms, more than one research institution.

8.2 The new remit of the British Technology Group (BTG) emphasises its technology transfer function particularly for research originating in the public sector. Although the Board will lose its monopoly right to exploitation of research funded by the Research Councils in higher education institutions its services will still be available for this purpose.

8.3

The proposed extension of the model of the successful Teaching Company Scheme to Research Associations and Government research establishments is an interesting idea and the Government will look for opportunities to apply it. A first step may be to invite suitable Research Associations and Government research establishments to take an active interest in established Teaching Company Programmes.