PRIME MINISTER

The Advisory Council for Applied Research and Development (ACARD)
published its report on 'Computer Aided Design and Manufacture'
in February 1980 and you invited me to co-ordinate the Government
response.   I suggest that, with your approval, the reply should
take the form of the attached paper, under a covering letter
from me to the Chairman of ACARD, Dr Spinks.   The text has been
agreed at Ministerial level with the Departments of Defence,
Employment, Environment, Transport, Health and Social Security,
Education and Science, the Treasury and has been seen by
Sir Robert Armstrong.   The paper would also be released to
the press.

2   A summary of the recommendations of the ACARD Report and
the Government's responses to them is provided for easy
reference as Annex 2 to the paper.

3   I am copying this minute to the Secretaries of State for
Defence, Employment, Environment, Health and Social Security,
Education and Science, the Minister of Transport, the Chancellor
of the Exchequer and Sir Robert Armstrong.

K J

27 October 1980

Department of Industry
Ashdown House
123 Victoria Street

RESPONSE TO THE ACARD REPORT ON COMPUTER AIDED DESIGN AND MANUFACTURE

1   The report of the Advisory Council for Applied Research and Development (ACARD) on Computer Aided Design and Manufacture (CAD/CAM) was published on 6 February 1980. The Department of Industry was invited to co-ordinate the Government response and this reply incorporates views and comments from several Departments, and from the Science Research Council (SRC). Annex 2 summarises each of the ACARD recommendations and the relevant Government response.

2   For the purposes of this response CAD/CAM is taken to include the use of computers in design, manufacture and testing as well as the extension to estimating, production planning and stock control involved in Linked Engineering Business Systems.

3   The Government welcomes this report from the Advisory Council drawing attention to an important area of technology and to the benefits that are already being experienced by UK industry from its application. It supports the Council's view of the economic advantage that could be derived from wider adoption of the technology and it believes that important elements in securing that adoption are, that the economic conditions under which industry operates should be improved and that there should be increased awareness of the potential of the technology. The adoption of advanced technologies such as CAD/CAM at a rate comparable to our major industrial competitors is essential for the future of British Industry. The Government notes that comments in this report to the effect that although other countries are at present in advance of the UK the position is not irretrievable and it is therefore important that efforts should be made by all to secure the advantages of these techniques. The main responsibility

clearly rests with industry but the Government accepts that for the present it has a role to improve awareness and to provide encouragement and support to help to accelerate the pace of application, within the limited resources available for public expenditure. Support for R&D via the tax-payer is important when private investors have difficulty in assessing the benefits of new techniques and are likely to underinvest in the state-of-the-art research from the point of view of society in general. Research aimed both at advancing the technology and demonstrating its benefits is therefore an area where Government can play a valuable role. A list of projects supported by the Department of Industry is at Annex 1; it includes work in the Department's own laboratories and in industry. Some of the industrial projects are "demonstration projects" in which access is provided to potential users of similar systems who can see them in operation.

4   The Government endorses ACARD's view (paragraph 7.6) that the DoI Research Establishments (the National Engineering Laboratory, NEL, at East Kilbride and the Computer Aided Design Centre, CADC, at Cambridge) should play a significant role in providing advice on CAD/CAM to industry. However, it does not feel that the creation of a new institute would significantly aid the process. Steps have already been taken to improve co-ordination between the two establishments by appointing the Director of CADC as Director of NEL and giving him overall responsibility for both organisations. An important task of the new management will be to examine ways of improving the range and accessibility of the services provided to industry. It is also felt that the costs of relocation to a new site would not be justified.

5   The two laboratories draw part of their financial support from the DoI Requirements Boards and part from outside sources, including

repayment work from industry. In the case of CADC the amount of industrial repayment work is now 37 per cent of the cost of the Centre and it is hoped to increase this in the future.

6   The Mechanical Engineering and Machine Tool Requirement Board (MEMTRB), the largest DoI customer in this field, is currently advised by the Computer Aided Engineering Committee and by the Automated Small Batch Production (ASP) Panel. In response to the ACARD recommendation (paragraph 7.16) that the co-ordination of research should be improved the effectiveness of the links between these two bodies is being considered. This committee structure will retain its present advisory role in respect of corresponsing Science Research Council programmes. More generally, co-ordinating machinery has been established across the broad range of the Department's (and Science Research Council's) activities in the field of CAD/CAM.

7   Paragraphs 4 and 6 above outline the proposals for improving co-ordination on both the customer and contractor sides of the customer-contractor relationship. Industry is represented on the customer side through the Requirement Boards and on their advisory committees, as it is on appropriate SRC Committees. Co-ordination is being improved in respect of DoI's other activities involving the supply industry, which is discussed in paragraph 12 below.

8   Government accepts the suggestion (paragraph 7.4) that DoI should take responsibility for producing and disseminating information and for promoting awareness of CAD/CAM. NEL already disseminates information on the cost of installation of CAD/CAM equipment and has run seminars for industry and others on CAD/CAM. The main thrust is on training and giving practical experience of using CAD/CAM systems. Seventeen three day courses have taken place over the past five years

and the majority of the participants have been from industry. CADC runs courses to instruct operators in the use of software under licence from CADC. It also acts as a "clearing house" through its Computer Aided Engineering Support Unit which assesses useful software packages and registers them in a library. Relevant work being done, for example, at the Research Establishments of the Departments of Environment and Transport could be included in any information dissemination exercise. ACARD made a comparison with the DoI's successful microelectronics awareness scheme (paragraph 7.4); However, the composition of the audience to be addressed is somewhat different, in the case of CAD/CAM, as is the scale of investment which may be involved in many cases. The Department is currently examining the need for further awareness activities in the CAD/CAM area.

9   Government accepts the ACARD recommendation (paragraph 7.4) that the Department of Industry should maintain a close watch on developments overseas. The Department already has very close links with the Science Counsellors in five Embassies (Bonn, Paris, Washington, Tokyo and Moscow) and it has a network of sources of information elsewhere. Reports on the development of CAD/CAM and its applications are included in the despatches from these posts. Arrangements are in hand to increase the flow of information from Japan by the use of local consultants. NEL and CADC also monitor developments overseas and the possibility of disseminating this information more widely is being examined.

10   The Department of Industry has had discussions with the Fellowship of Engineering arising out of the ACARD suggestion (paragraph 7.5) that the Government should sponsor young people to work for a period overseas to learn about and participate in CAD/CAM developments. This recommendation clearly has broad application to

other areas of technology and it will be studied carefully. We
believe that for a scheme to be most effective it should be aimed
at people with industrial experience. Some schemes already exist
within the Science Research Council which could provide the sort of
support ACARD has in mind. The discussions with the Fellowship of
Engineering and the SRC about how these existing schemes could be
better used and about whether additional funds are necessary will
continue. In addition the Engineering Industry Training Board
operates a Manufacturing Management Fellowship Scheme for trainee
managers under which a number of young people pay short visits over-
seas to study, among other things, the impact of technology such as
CAD/CAM.

11   The Government accepts the recommendation (paragraph 7.11) that
it should consider how it might further assist companies, particularly
those of small or medium size, to adopt appropriate CAD/CAM systems.
The Council will be aware of the particular importance that the
Government attaches to the role that smaller companies play in the
economy. It already has a number of schemes specifically directed
towards their assistance. For example the Manufacturing Advisory
Service (MAS) provides consultancy on modern manufacturing methods
to companies with less than 1000 employees. Twenty five projects on
CAD/CAM are already complete and a further eleven are in progress.
The assistance to industry through demonstration projects, such as
that at Baker Perkins, is a successful way of promoting the
development of the technology. The Teaching Company Scheme jointly
funded by DoI and SRC is also a route for the encouragement of the
use of CAD/CAM in industry. There are currently 33 projects and
about a quarter of them involve computer aided engineering. In these,
Associates, closely connected with a nearby university or polytechnic

work with the partner firm. In several cases CAD turnkey systems
have been installed in the firm or university and can be used for the
firm's own problems and also for demonstration to other firms and
students. The resources of the Government research laboratories are
available on a repayment basis to industry for specific tasks and
industrial collaboration is encouraged. Companies can also submit
proposals to the Requirements Boards and apply for support under the
Product and Process Development Schemes. In collaboration with
Universities and Polytechnics they can apply for support from the
SRC under its Co-operative Grants Scheme. Many commercial organisations
offer bureau services and there are thus many ways in which industry
can obtain advice, both from the private and public sectors. The
Government believes that encouragement of the use of CAD/CAM systems
through the initial leasing of equipment is a matter for the
commercial suppliers to consider. It has no plans to provide financial
support for this purpose.

12   Government is aware of the importance to be attached to the
supply of CAD/CAM equipment by UK manufacturers in view of the large
potential market as the pace of application increases; the market
for large turnkey systems is at present dominated by American
manufacturers. It is important that the UK supply industry should be
sufficiently closely associated with any new Government initiatives
for it to benefit from resulting stimulation. The sooner industry is
aware of these initiatives the better it can respond. A British
company is developing a competitive system in partnership with the
taxpayer. Other less comprehensive systems, mainly for drafting, are
available from several UK firms. Much software development is carried
out in the Universities and public sector research establishments.
Where appropriate these can be marketed either by the originator or
through the NRDC companies Compeda and Genesys. NRDC has been

providing development finance for joint ventures and engaging in technology transfer from public sector organisations for some time. Currently some 30 projects on CAD/CAM are supported by NRDC with an authorised investment of almost £7 million; a further 25 projects are under assessment. The need for standards and new software tools are two of the subjects of a study by DoI and the Electronic Engineering Association (EEA). One of the benefits of this study should be to help the supply industry by providing relevant information. The National Enterprise Board has been involved in discussions on the development of a CAD/CAM system with a view to producing a new UK initiative in this area.

13   The report recommends (paragraph 7.15) that DoI should study Linked Business Systems. Although there are no plans for a formal study at present MEMTRB are involved with industry in developing Linked Engineering Business Systems. The practical experience gained in this way will be very valuable.

14   The Government accepts the recommendation (paragraph 7.13) that Departments should consider how they can promote applications of CAD/CAM through their own purchases. The Government believes that it has an important role to play in stimulating innovation and technical developments through the use of public purchasing throughout the whole of the public sector. For example, it is urging the nationalised industries, as far as it is consistent with their overall objectives, similarly to have regard in their purchasing to the need to promote new technology and the interests of UK manufacturers. The potential of this approach for encouraging the wider use of CAD/CAM will be examined.

15   ACARD suggest (paragraph 7.17) that DoI should promote the use of CAD bureaux and user clubs. The DoI will explore the question of user clubs possibly at a Research Association or a Government Research Establishment. Its enquiries so far indicate that there are at least forty organisations currently offering various CAD services and some manufacturers of CAD/CAM equipment provide advice on a user club basis. A number of Research Associations such as PERA and MTIRA are also active in the field. The need for further effort therefore requires careful consideration and it may be best for the DoI to concentrate its effort on making the existing services better known.

16   The Council made a number of recommendations (paragraph 7.20) concerned with education in CAD/CAM techniques. The whole area of engineering education is being examined by the Government following the report by the Finniston Committee. More specifically there has been considerable debate about the place of computing in the school curriculum. The National Development Programme in Microelectronics for Schools and Colleges recently announced by the Department of Education and Science will give further attention to this issue. In the case of computer studies and CAD itself progress is limited by the availability of hardware and of trained teachers. Staff and equipment shortages are also a barrier to the expansion of effort in CAD/CAM in the higher education system. However, the universities and polytechnics are planning,with SRC help, to launch 5 new MSc courses in computer aided circuit design. In the context of employment-oriented continuing education there may be some scope for removing administrative restrictions and financial disincentives which appear in some cases to prevent institutions of higher and further education from providing courses of the type suggested and

which industry and commerce would wish to use and be willing to pay for. DES is considering the implications of the recommendation that universities should prepare post graduate courses on programming to train students capable of writing major software programmes and modifying existing software. Design engineering skills are one of the Manpower Services Commission's (MSC) priority training areas and the MSC will be exploring with the Industry Training Boards the question of updating training in CAD.

17   In conclusion the Government welcomes the attention that this ACARD report has focused on CAD/CAM. The Government is already involved in many of the activities recommended by ACARD. It is taking steps to improve further the co-ordination of its activities and it will continue to keep under review those recommendations made by the Council which require further action.

DEPARTMENT OF INDUSTRY PROGRAMMES IN SUPPORT OF CAD/CAM

The Department spends about £3 million per annum in support of CAD/CAM.
The major programme items are as follows:-

1   Computer aids for process plant design, manufacture and
operation at CADC funded through CMRB.

2   Development of a British CAD/CAM system funded by MEMTRB and
through the Pre Production Order Scheme.

3   Development and co-ordination of software for CAD of computers,
funded through the Product and Process Development Scheme.

4   Integrated circuit design at RSRE funded by CSERB.

The following are funded by MEMTRB:-

5   Computer Aided Engineering at PERA

6   CAD system (demonstration project).

7   CAD/NC machining for tool making (demonstration project).

8   CAD for die, mould and pattern making at Cambridge University.

9   CAM system for sheet metal duct work.

10   Flexible Manufacturing System (demonstration system).

11   Computer Aided Draughting and Design System.

12   Automated Draughting.

13   Computer Aided Technology in the Mechanical Engineering Industry
at CADC.

14   Advanced Numerical Stress and Structural Testing at NEL.

15   Computer Aided Manufacture at NEL.

16   Technology transfer at NEL and CADC.

SUMMARY OF RECOMMENDATIONS AND RESPONSES

Recommendation 1   para 7.4

We recommend that DoI should produce and disseminate information on installation costs and training needs for CAD/CAM.

Response   para 8

The Government accepts this recommendation. Considerable attention is already given to improving awareness. Consideration will be given to further effort.

Recommendation 2   para 7.4

We also recommend that DoI should maintain close watch on developments overseas.

Response   para 9

The Government accepts the recommendation. A special effort is already being made in the case of Japan where a scheme has been agreed to use local consultants to obtain information over a wide range of topics. Wider dissemination of information obtained by Research Establishments is being considered.

Recommendation 3   para 7.5

We therefore recommend that the Government should sponsor able young people to work for a period overseas to learn about and participate in CAD/CAM.

Response   para 10

Discussions have taken place between DoI and the Fellowship of Engineering. SRC will discuss the use of current schemes for the purposes discussed by ACARD.

Recommendation 4 para 7.6 and Recommendation 5 para 7.9

We recommend that the advisory and bureau services of NEL and CADC be coordinated to form an Institute of Computer Aided Engineering.

We recommend that the Institute be relocated nearer the centres of manufacturing industry.

Response   para 4

Coordination between NEL and CADC is being improved. The Director of CADC has been appointed Director of NEL whilst retaining overall responsibility for CADC. The new Management will examine ways of improving the range and accessibility of the laboratories' services to industry. Relocation to a new site in the form of an Institute of Computer Aided Engineering is not thought to be necessary.

Recommendation 6   para 7.11

We recommend that the Government should consider how it might assist companies to adopt appropriate CAD/CAM systems.

Response   para 11

The Government accepts the broad recommendation. There are several measures which assist companies including the provision of demonstration systems. There are no plans for a scheme which involves the initial leasing of equipment for evaluation.

Recommendation 7   para 7.13

We recommend that the public sector as a whole considers how it can promote CAD/CAM through its purchasing policy.

Response   para 14

The Government accepts the recommendation. It believes that public purchasing has an important role to play in stimulating innovation and technical development throughout the public sector. There is scope for applying this principle in the CAD/CAM area.

Recommendation 8   para 7.14

We recommend that the National Economic Development Council should consider how market opportunities for the supply of CAD/CAM equipment by UK companies should be tackled.

Response

NEDO will be making their own reply to this recommendation.

Recommendation 9   para 7.15

We recommend that DoI should undertake a study of Linked Business Systems.

Response   para 13

There is no formal study of Linked Business Systems under way at present. The Mechanical Engineering and Machine Tools Requirements Board (MEMTRB) of DoI is supporting the development of Linked Engineering Business Systems in Industry which should provide valuable practical experience.

Recommendation 10   para 7.16

We recommend that the DoI take the lead in improving coordination between the various organisations involved in the use of CAD/CAM.

Response   para 6

There is already good liaison between the Computer Aided Engineering, and the Automated Small Batch Production Panels of MEMTRB. Further consideration is being given to better coordination of the activities of the various groups involved.

Recommendation 11   para 7.17

We recommend that the DoI should promote the use of bureaux and user clubs.

Response   para 15

DoI will explore the question of user clubs and bureaux but there is already considerable activity in this field mainly in the private sector. It may therefore be more suitable for DoI to concentrate on making existing services better known.

Recommendation 12   para 7.20 and Recommendation 13   para 7.23

We recommend that computing principles be given more emphasis in schools. Universities should include CAD at undergraduate level and provide postgraduate course in programming. Existing staff should be educated in CAD/CAM.

We recommend that management courses should consider the management implications of the widespread use of CAD/CAM.

Response   para 16

Engineering education is being examined in response to the Finniston Report. There may be scope for removing administrative restrictions and financial disincentives which appear to prevent institutions from providing courses of the type suggested. The recently announced National Development Programme in Microelectronics in Schools will give further attention to the place of computing in the school curriculum.

PRIME MINISTER
_____

ACARD reported this year on 'Computer Aided Design and
Manufacture'.   Keith Joseph suggests a Government response.
Earlier in the year, you agreed that ACARD had a continuing
role, at least for the present.   It seems to me that its role
is only really valid if it manages to generate some public
debate.   (I learned incidentally that these ACARD pamphlets
are bought by some 5 - 8,000 people through HMSO outlets.
This shows that there is a real interest on which one should
try to build.)   It can help in the kind of areas you
discussed with John Ashworth.

This kind of Government response seems to me to be designed
to stifle debate in a blanket of soothing bureaucratic noises.
If the exercise is worth while at all, surely it would be
better to have something snappier, backed up by much more
detailed justification in the areas where ACARD recommendations
are rejected.

Do you approve the proposed response or would you like to
ask Keith Joseph to go for something in a completely different
tone?

*No - I agree that
this report consists of
an abundance of phrases such as
Government has : 'a role to improve
awareness
'can play a valuable role'
'research establishments which
should play a significant role'
'consulting the effectiveness of
whose roles is being
considered'
'should maintain a close watch
is continually examining the need
for further awareness activities'. P.Jo.*

31 October 1980

'is having discussions which will
continue'

'will explore the question'

and so on. At the end of it
all nothing will be changed and
there is no dynamism behind the
report or sense of urgency.

Would you (1) ask John Brunate
to have a look at it and

② ask the lead department to
reconsider the whole tone & flavour
of their reply.

If they go on like this we shall
never achieve anything and
ALAR.) will have wasted their
time '

M.

cc: MOD
D/Em
D/Env
DHSS
DES
D/Trans
HMT
CO
CPRS

VB

Gat
Mark

10 DOWNING STREET

From the Private Secretary   3 November 1980

Dear Catherine

The Prime Minister has seen your Secretary of State's minute
of 27 October, in which he sought approval for a Government
response to the Advisory Council for Applied Research and Develop-
ment's report on "Computer Aided Design and Manufacture".

The Prime Minister does not like the draft. She believes
it important to stimulate an informed debate on the kind of issues
raised in reports like this from ACARD: indeed, she sees this role
as a major justification for retaining the Council. But a number
of paragraphs in the suggested response seem designed to make
soothing noises as an excuse for Government inaction on recommenda-
tions, without spelling out the reasons for Government preference
to do nothing. Mrs Thatcher has no objection to the Government
rejecting recommendations, but she would like to see the reasons
set out in a much snappier fashion.

The Prime Minister would therefore like the Department of
Industry, as lead Department, to reconsider the whole tone and
flavour of the proposed Government response. She feels that a
response like the present draft simply means that the Council's time
has been wasted in the exercise.

I am sending copies of this letter to David Omand (Ministry of
Defence), Andrew Hardman (Department of Employment), Jeff Jacobs
(Department of the Environment), Bernie Merkel (DHSS), Mary Bowden
(Department of Education and Science), Barbara Riddell (Department
of Transport), Peter Jenkins (HM Treasury) and David Wright (Cabinet
Office), and to Gerry Spence in the CPRS (who will not have received
your Secretary of State's minute with the proposed response).

Yours ever

Mike Pattison

Mrs Catherine Bell,
Department of Industry.

11 November 1980

Mike Pattison Esq
Private Secretary to the
  Prime Minister
10 Downing Street
London SW1

√ MAP

Dear Mike,

Thank you for your letter of 3 November about
the draft response to the ACARD Report on
'Computer Aided Design and Manufacture'.

We will look again at the draft in the light
of the Prime Minister's comments and let you
have a revised version as soon as possible.

Yours sincerely,

Cecily Morgan

CECILY MORGAN
Private Secretary

10 DOWNING STREET

PRIME MINISTER

You asked Keith Joseph to
reconsider the Government
response to ACARD's Report
on Computer Aided Design
and Manufacture, with the
aim of making it a more
acceptable, livelier and
less bureaucratic document.

I attach his suggested
revised version, together
with a copy of the original.
The document is considerably
improved in tone.

Content that this response
should now be issued in the
form suggested by Sir Keith
in his covering minute.

19 December 1980

10 DOWNING STREET

PRIME MINISTER

Here is another of the three ACARD Reports which have reached us this week.

This one is of less interest than the other two, because it covers a very broad subject. ACARD has since been asked to focus its work on more specific subjects.

The response is not particularly informative but it is readable. You may think that this is an adequate response to a Report which is too broad-ranging to be of much influence.

Content for the Secretary of State to publish in the form proposed in his covering minute?

19 December 1980

PRIME MINISTER

You asked this Department to reconsider the tone and flavour
of the Government response to the ACARD Report on Computer
Aided Design and Manufacture. A revised response has been
prepared and those concerned in any changes have been consulted.
I attach the original and the revised response with the passages
that have been amended and the amended versions sidelined in
each case. The response has been restructured so that each
recommendation is accompanied by a government response. This
itself has made the presentation clearer. Moreover the tone
of each response is now firmer and less qualified.

2 I suggest that the form of the reply remains as a paper under
my covering letter to the chairman of ACARD, Dr Spinks. The
paper would also be released to the Press.

3 I am copying this minute to the Chancellor of the Exchequer,
the Secretaries of State for Defence, Employment, Education
and Science, Environment, Health and Social Security, the
Minister of Transport and Sir Robert Armstrong.

K J

17 December 1980

Department of Industry
Ashdown House
123 Victoria Street

Revised version

GOVERNMENT RESPONSE TO THE ACARD REPORT ON COMPUTER AIDED DESIGN AND MANUFACTURE
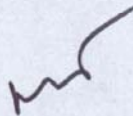
The Government welcomes this report from the Advisory Council for Applied Research and Development which focuses attention to an important area of technology and the benefits that are already being gained from its application. It agrees with ACARD that the rapid adoption of advanced technology by manufacturing industry, at a rate at least comparable with our overseas competitors, is an essential element in the restoration and maintenance of the competitivity of UK industry.

The main responsibility for taking advantage of the opportunities offered by these techniques must rest with industry which can best judge where the economic benefits lie. The Government accepts, within the limits it must set for public expenditure, that it has a role in improving awareness of the technology and in assisting research, development and demonstration as well as education and training. Government support for R&D is important at the early stages of innovation where the risk is greatest and where companies may under-invest due to poor profits and low liquidity.

The Government is itself a user of CAD/CAM, in, for example, the defence manufacturing and civil engineering fields and there is scope for promoting the development of the technology through its own requirements. Its more general interest in improving industrial awareness, in supporting R&D and in providing services, lies mainly with the Department of Industry. The DoI accords high priority to CAD/CAM activities and expects to devote an increasing proportion of its science and technology budget to this topic over the next few years. It has taken steps in response to ACARD's recommendations to improve the co-ordination of its activities, both as a customer for R&D work and as an R&D contractor, without however creating an Institute of Computer Aided Engineering.

It has established closer links with the Science Research Council,
the other major funder of research in the area. DoI is improving
its own knowledge of developments overseas and is seeking more
effective ways of disseminating information to industry.

The Government sets out, in the following pages, its response to
the individual ACARD recommendations. ACARD's report is also
directed at industry, the educational sector, the professional
institutions and the unions. The Government hopes they will also
respond to the spirit of this report.

Recommendation 1 (Paragraph 7.4)

> We recommend that the Department of Industry
> should take responsibility for producing and
> disseminating (through courses and seminars)
> information on typical costs of installation
> and on the training needed for using CAD/CAM
> systems effectively. Case histories of succ-
> essful installations showing how pitfalls can
> be avoided should be included.
>
> As with the current microelectronics awareness
> programme, all levels of management need to be
> informed of CAD/CAM. The Department should
> seek the assistance of professional institut-
> ions in this task.

The Government accepts this recommendation. The National Engineering
Laboratory (NEL) currently disseminates information on the cost of
installation of CAD/CAM equipment and runs seminars for industry and
others to promote awareness. The main thrust is on training and
giving practical experience in using CAD/CAM systems. 17 three-
day courses, attended by over 200 people, mostly from industry,
have taken place over the past 5 years. The Computer Aided Design
Centre (CADC) runs courses to instruct operators in the use of
software under licence from CADC. It also acts as a "clearing-
house" through its Computer Aided Engineering Support Unit, which
assesses useful software packages and registers them in a library.
Relevant work being done in the research establishments of the
Department of Environment and Transport could also be included in
any information dissemination programme. The DoI is actively
considering other schemes to improve awareness: they include
further demonstration projects and the support of units where
potential users could examine the capability of the technology by
using it to solve their own real design and manufacturing problems.

ACARD made a comparison with the DoI's successful microelectronics
awareness programme. The Department is considering the lessons
which can be drawn from this and the way they might be applied to

promoting awareness of CAD/CAM, taking into account the somewhat different composition of the audience to be addressed and the scale of the investment which users would need to make.

ACARD suggested that a specific budget of £1.5 million over 3 years should be provided for the promotion of CAD/CAM awareness. The DoI is giving high priority to the support of CAD/CAM activities within its science and technology budget and these activities include the transfer of technology and the promotion of awareness. It therefore expects that the proportion of the budget spent on all aspects of the technology will increase over the next few years and that, within the planned expenditure, it will be possible to make adequate provision for awareness.

The ACARD report has stimulated a number of public discussions of CAD/CAM organised by the professional institutions. DoI has participated in these discussions and it will continue to encourage these institutions to promote the technology.

Recommendation 2 (paragraph 7.4)

> We also recommend that in order to keep its
> advice up-to-date the Department of Industry
> should maintain close watch on developments
> overseas, if necessary by retaining special-
> ist consultants for the task.

Government accepts the ACARD recommendation   that

the Department of Industry should maintain a close watch on

developments overseas. The Department already has very close links

with the Science Counsellors in five Embassies (Bonn, Paris,

Washington, Tokyo and Moscow) and it has a network of sources of

information elsewhere. CAD/CAM has been identified as a priority

area and we have received valuable reports from the Embassies.

Staff constraints limit the amount of coverage which the Embassies

can provide, and we are exploring the use of locally engaged

consultants, particularly in Japan, to increase the flow of

information. The staff of the Government's laboratories also

maintain a close watch on progress in other countries through

their participation in conferences and exhibitions. Collection

of information is, however, only part of the problem: it must

be disseminated as effectively as possible. DoI is continually

trying to improve this aspect.

Recommendation 3 (paragraph 7.5)

> We therefore recommend that the Government
> should sponsor able young people to work
> for a period overseas to learn about and
> participate in developments in CAD/CAM.
> We suggest that this might be conveniently
> arranged through awards by the Fellowship
> of Engineering and an initial budget of
> about £100,000 annually might be appropriate.

The type of support suggested by this recommendation has broad
application in all areas of Science and Engineering and would be
most effective if aimed at people with industrial experience.
Discussions have been held between the Science Research Council
(SRC), the Fellowship of Engineering (FOE) and the Department of
Industry (DOI). These indicate that initially an existing SRC
 scheme of industrial visiting fellowships could provide the sort
of support ACARD has in mind. It has been agreed that the FOE
will endeavour to find good candidates, suitable topics and
interested firms. The first few cases cound be funded by the SRC
under existing budgetary arrangements. If however, demand for
awards under this scheme were to grow as a result of any FOE
initiative, the situation and future funding arrangements would
need to be reviewed.

In addition, the Engineering Industry Training Board operates a
Manufacturing Management Fellowship Scheme for trainee managers
under which a number of young people pay short visits overseas
to study, among other things, the impact of technology such as
CAD/CAM.

Recommendation 4 (paragraph 7.6)

We recommend that the Department of Industry
should arrange for the advisory and bureau
services already provided by the National
Engineering Laboratory and the work on soft-
ware development of the Computer Aided Design
Centre to be co-ordinated so that they form
a single organisation (or institute) for
Computer Aided Engineering, with a single
Director responsible to a Board of Management
whose non-executive Chairman and at least
half its non-executive members should be drawn
from industry. The work of the new Institute
should include:-

(i)   evaluation of available CAD/CAM systems
through close links with user companies;

(ii)   provision of advice on the economics
and technical suitability of systems;

(iii)   supporting government departments with
advice on CAD/CAM matters such as investment
in R&D, educational requirements and standards.

Recommendation 5 (paragraph 7.9)

We recommend that eventually the Institute
should be located on one or more sites
nearer the main manufacturing centres of the
United Kingdom.

The DoI agrees with ACARD that there is a need to increase
collaboration between NEL and CADC. It has already taken steps to
achieve this by appointing the former Director of CADC as Director
                with
of NEL/responsibility for both laboratories. An important task
of the new management is to increase the range and accessibility
of the services provided for industry. The two laboratories draw
part of their support from the DoI's Requirements Boards one of
which, the Mechanical Engineering and Machine Tools Requirements
Board (MEMTRB) is advised in this area by the Computer Aided
Engineering Panel (CAE). Industry and SRC are represented on both
the   Board and the Panel. The DoI does not believe that it
would be useful to interpose a further layer of management through
the setting up of a Board of Management.

ACARD suggested that the co-ordination should extend to the creation of a "Computer Aided Engineering Institute" which would embrace the advisory and bureau services of NEL and the software development at CADC. However, in the case of NEL the advisory and bureau services are very closely integrated with the research and development work on, for example, automated small batch production, robotics and fan and pump design. DoI believes that it would be undesirable to separate these activities. The new management arrangements will ensure effective co-ordination of the work of the two establishments which will be able to cover all the items which ACARD recommended as work for the new Institute. The Department, therefore, does not propose to set up a separate "Computer Aided Engineering Institute".

Careful consideration has been given to ACARD's proposal that the DoI's CAD/CAM activities should be re-located on a new site. However, the Government does not accept that either Cambridge or East Kilbride are excessively difficult of access. Clearly some users would benefit if the laboratories were located elsewhere, but not all would benefit equally from any particular location. CADC has recently moved to a new permanent building in Cambridge. Having considered the cost involved, the good links which the laboratories have with universities and industry in their areas and the dislocation that would be caused by a geographical move, the Government has concluded that the laboratories should continue in their present locations.

Recommendation 6 (paragraph 7.11)

> We recommend in addition that the Government
> should consider how it might further assist
> companies, particularly those of small or
> medium size, to adopt appropriate CAD/CAM
> systems, for example:-
>
> a)   supporting demonstration systems in
> user companies in exchange for availability
> of information on performance; this would
> allow companies to gain practical experience
> on their own problems of draughting and
> manufacture.
>
> b)   initial leasing of equipment to companies
> until they have sufficient experience to
> show whether purchase is justified.

The Government has indicated that it attaches particular importance
to the role of smaller companies in the economy. A number of
schemes encourage their technological development . For example,
the Manufacturing Advisory Service (MAS) provides consultancy on
modern manufacturing methods for companies with less than 1000
employees. 25 MAS projects involving CAD/CAM applications have
been completed and a further 11 are in progress. Companies of all
sizes can submit proposals for financial aid to DoI's Research
Requirements Boards. The involvement of Boards through demonstra-
tion projects, such as that at Baker Perkins, is a successful way
of promoting the development of the technology. The Product and
Process Development Scheme also encourages the launching of new
or significantly improved products and processes. Annex 1 gives
some examples of the projects currently supported by the various
DoI schemes. In addition, the resources of the Government's
research laboratories are available on a repayment basis to
industry for specific tasks. Industrial collaboration is also
encouraged in their activities.

The Teaching Company Scheme, jointly funded by DoI and SRC, is a further route for encouragement of the use of CAD/CAM in industry. The scheme, which consists of projects undertaken jointly by a manufacturing company and a neighbouring university or polytechnic, currently has 30 projects, about one-quarter of them involving computer aided engineering. In several cases, CAD turnkey systems have been installed in the firm or academic establishment and can be used both for the firms' own problems and also for demonstration to other firms and students.

In addition to the schemes in the public sector, there is considerable activity by the private sector in increasing awareness and promoting sales of equipment.

DoI has given careful consideration to ACARD's proposal for a scheme of equipment leasing. DoI believes, however, that the encouragement of the use of CAD/CAM equipment through leasing is a matter entirely for the commercial suppliers of equipment. There are no plans to provide financial support for this purpose.

Recommendation 7 (paragraph 7.13)

> We recommend that Department should consider
> how they can promote economic applications
> of CAD/CAM through their purchases, and those
> of the public sector organisations for which
> they are responsible.

The Government accepts this recommendation. The Government
believes it has an important role to play in stimulating innovation
and technical developments through the use of public sector
purchasing and the recommendation is, therefore, fully consistent
with current policy. The Government is urging the nationalised
industries, as far as it is consistent with their overall objectives,
to give due consideration in their purchasing to the need to
promote new technology and the interests of UK manufacturers.

Recommendation 8 (paragraph 7.14)

> We recommend that the National Economic
> Development Council, through relevant
> Sector Working Parties and Economic
> Development Committees, should consider
> how these market opportunities can best
> be tackled.

The National Economic Development Council will reply separately to ACARD on this recommendation.

The Government hopes that UK industry will increasingly be able to supply   CAD/CAM equipment to the large potential markets which will develop as   application increases; the market for large turnkey systems is at present dominated by American manufacturers. It is important that the UK supply industry should be sufficiently closely associated with any new Government initiatives for it to benefit from resulting stimulation. The sooner industry is aware of these initiatives the better it can respond. A British company is developing a competitive system in partnership with the taxpayer. Other less comprehensive systems, mainly for draughting, are available from several UK firms. Much software development is carried out in the Universities and public sector research establishments. Where appropriate these can be marketed either by the originator or through the NRDC companies Compeda and Genesys. NRDC has been providing development finance for joint ventures and engaging in technology transfer from public sector organisations for some time. Currently some 30 projects on CAD/CAM are supported by NRDC with an authorised investment of almost £7 million; a further 25 projects are under assessment. The National Enterprise Board has been involved in discussions on the development of a CAD/CAM system with a view to producing a new UK initiative in this area.

Recommendation 9 (paragraph 7.15)

We recommend that the Department of Industry should undertake a study of Linked Business Systems to review the present state of availability of such systems and their application outside high technology and large companies. It should decide whether results of any work in high technology industry in this country could profitably be transferred to or adapted for more general use in different sectors of industry and it should identify any work on standards, languages or interfaces which needs to be done to make intelligible, practical systems available.

DoI has no plans for a formal study at present but several aspects of the topic are under discussion and MEMTRB is involved with industry in developing a Linked Engineering Business System. The Computer Aided Engineering Panel places particular emphasis on the importance of Linked Business Systems and in its assessment of projects takes account of how they could be joined together in an integrated system with compatible interfaces. MEMTRB is also examining more generally the need for work on standard languages and interfaces. In addition the British Standards Institute has an ongoing activity in this area. The need for standards and new software tools are two of the subjects of a study by DoI and the Electronic Engineering Association (EEA). One of the benefits of this study should be to help the UK supply industry by providing relevant information.

Recommendation 10 (paragraph 7.16)

> We recommend that the Department of Industry
> should take the lead in improving co-ordination
> (if necessary by creating new machinery for
> the purpose) involving the SRC, Research
> Associations, sectors of industry liable to
> use CAD/CAM, and organisations supplying
> equipment and software, as well as their own
> and other government establishments concerned.
> This work would take in the activities of
> the current CAE Panel and in it the proposed
> Institute would play a major role. The effort
> for this co-ordination would not be large and
> should not, we think, require extra staff.

The arrangements for improved co-ordination of the "contractor"
side of DoI activities have been set out in response to Recommendation
4. Improvements have also been made in the co-ordination of
"customer" activities in the Department. A new Committee has been
set up to bring together the various interests in this topic
within DoI and SRC: it will/ also take account of other activities. The
MEMTRB is at present advised by the CAE Panel and by the Automated
Small Batch Production (ASP) Committee. Ways of improving the
links between CAEP and ASP are being considered (although it should
be noted that effective co-ordination is already achieved by their
having the same Chairman). Both Committees will retain their
advisory roles in respect of the corresponding SRC programmes.

14

Recommendation 11 (paragraph 7.17)

> We recommend, therefore, that the Department
> of Industry, probably through the new
> Institute, should promote the use of CAD
> bureaux, user clubs for groups of users of
> the same systems (in which they could exchange
> experience) and clubs for the exchange of
> experience on common applications software.

DoI's enquiries indicate that there are at least 40 organisations currently offering various CAD services and some suppliers of CAD/CAM equipment provide advice on a user club basis. A number of Research Associations such as those for Production Engineering and the Machine Tool Industry are also active in the field. DoI's efforts will, therefore, be directed towards making the existing services better known.

Recommendation 12 (paragraph 7.20)

We recommend that:-

a)   more emphasis should be given to
computing principles in schools;

b)   undergraduate engineering courses
should include use of CAD systems for
drawing and design, as a logical extension
of manual methods;

c)   courses should be established for
the re-education and retraining of
existing staff (draughtsmen, designers,
engineers, managers) and these should
include practical experience with CAD/CAM
systems;

d)   universities should prepare post-
graduate courses on programming to train
students in writing major software programs
and modifying existing software;

e)   increased awareness of CAD/CAM should
be encouraged, for example by discussions
between managements and employees and by
meeting promoted by the professional engineering
institutions.

Recommendation 13 (paragraph 7.23)

We recommend that, in addition to the
educationan and training measures set out
in the previous section, those offering
education in management should include
in their courses considerationof the need
and opportunity for structural changes that
can come with introduction of CAD/CAM, and
the means whereby such changes can be managed
without unnecessary friction.

The whole area of engineering education is being examined by the

Government following the report by the Finniston Committee. More

specifically there has been considerable debate about the place of

computing in the school curriculum. The National Development

Programme in Microelectronics for Schools and Colleges recently

announced by the Department of Education and Science will give

further attention to this issue. In the case of computer studies

and CAD itself progress is limited by the availability of hardware

and of trained teachers. Staff and equipment shortages are also
a barrier to the expansion of effort in CAD/CAM in the higher
education system. However, the universities and polytechnics are
planning, with SRC help, to launch five new MSc courses in
computer aided circuit design. In the context of employment-
oriented continuing education there may be some scope for removing
administrative restrictions and financial disincentives which
appear in some cases to prevent institutions of higher and further
education from providing courses of the type suggested and which
industry and commerce would wish to use and be willing to pay for.
DES is considering the implications of the recommendation that
universities should prepare post-graduate courses on programming
to train students capable of writing major software programs and
modifying existing software. Design engineering skills are one of
the Manpower Services Commission's (MSC) priority training areas and
the MSC will be exploring with the Industry Training Boards the
question of updating training in CAD.

DEPARTMENT OF INDUSTRY PROGRAMMES IN SUPPORT OF CAD/CAM

The Department spends about £3 million per annum in support of CAD/CAM. The major programme items are as follows:-

1   Computer aids for process plant design, manufacture and operation at CADC funded through CMRB.

2   Development of a British CAD/CAM system funded by MEMTRB and through the Pre Production Order Scheme.

3   Development and co-ordination of software for CAD of computers, funded through the Product and Process Development Scheme.

4   Integrated circuit design at RSRE funded by CSERB.

The following are funded by MEMTRB:-

5   Computer Aided Engineering at PERA

6   CAD system (demonstration project).

7   CAD/NC machining for tool making (demonstration project).

8   CAD for die, mould and pattern making at Cambridge University.

9   CAM system for sheet metal duct work.

10   Flexible Manufacturing System (demonstration system).

11   Computer Aided Draughting and Design System.

12   Automated Draughting.

13   Computer Aided Technology in the Mechanical Engineering Industry at CADC.

14   Advanced Numerical Stress and Structural Testing at NEL.

15   Computer Aided Manufacture at NEL.

16   Technology transfer at NEL and CADC.

PRIME MINISTER

The Advisory Council for Applied Research and Development (ACARD)
published its report on 'Computer Aided Design and Manufacture'
in February 1980 and you invited me to co-ordinate the Government
response.   I suggest that, with your approval, the reply should
take the form of the attached paper, under a covering letter
from me to the Chairman of ACARD, Dr Spinks.   The text has been
agreed at Ministerial level with the Departments of Defence,
Employment, Environment, Transport, Health and Social Security,
Education and Science, the Treasury and has been seen by
Sir Robert Armstrong.   The paper would also be released to
the press.

2   A summary of the recommendations of the ACARD Report and
the Government's responses to them is provided for easy
reference as Annex 2 to the paper.

3   I am copying this minute to the Secretaries of State for
Defence, Employment, Environment, Health and Social Security,
Education and Science, the Minister of Transport, the Chancellor
of the Exchequer and Sir Robert Armstrong.

K J

K J
27 October 1980

Department of Industry
Ashdown House
123 Victoria Street

RESPONSE TO THE ACARD REPORT ON COMPUTER AIDED DESIGN AND MANUFACTURE

1   The report of the Advisory Council for Applied Research and Development (ACARD) on Computer Aided Design and Manufacture (CAD/CAM) was published on 6 February 1980. The Department of Industry was invited to co-ordinate the Government response and this reply incorporates views and comments from several Departments, and from the Science Research Council (SRC). Annex 2 summarises each of the ACARD recommendations and the relevant Government response.

2   For the purposes of this response CAD/CAM is taken to include the use of computers in design, manufacture and testing as well as the extension to estimating, production planning and stock control involved in Linked Engineering Business Systems.

3   The Government welcomes this report from the Advisory Council drawing attention to an important area of technology and to the benefits that are already being experienced by UK industry from its application. It supports the Council's view of the economic advantage that could be derived from wider adoption of the technology and it believes that important elements in securing that adoption are, that the economic conditions under which industry operates should be improved and that there should be increased awareness of the potential of the technology. The adoption of advanced technologies such as CAD/CAM at a rate comparable to our major industrial competitors is essential for the future of British Industry. The Government notes that comments in this report to the effect that although other countries are at present in advance of the UK the position is not irretrievable and it is therefore important that efforts should be made by all to secure the advantages of these techniques. The main responsibility

modified to become pages 1 and 2 in the revised version

clearly rests with industry but the Government accepts that for the present it has a role to improve awareness and to provide encouragement and support to help to accelerate the pace of application, within the limited resources available for public expenditure. Support for R&D via the tax-payer is important when private investors have difficulty in assessing the benefits of new techniques and are likely to underinvest in the state-of-the-art research from the point of view of society in general. Research aimed both at advancing the technology and demonstrating its benefits is therefore an area where Government can play a valuable role. A list of projects supported by the Department of Industry is at Annex 1; it includes work in the Department's own laboratories and in industry. Some of the industrial projects are "demonstration projects" in which access is provided to potential users of similar systems who can see them in operation.

4   The Government endorses ACARD's view (paragraph 7.6) that the DoI Research Establishments (the National Engineering Laboratory, NEL, at East Kilbride and the Computer Aided Design Centre, CADC, at Cambridge) should play a significant role in providing advice on CAD/CAM to industry. However, it does not feel that the creation of a new institute would significantly aid the process. Steps have already been taken to improve co-ordination between the two establishments by appointing the Director of CADC as Director of NEL and giving him overall responsibility for both organisations. An important task of the new management will be to examine ways of improving the range and accessibility of the services provided to industry. It is also felt that the costs of relocation to a new site would not be justified.

5   The two laboratories draw part of their financial support from the DoI Requirements Boards and part from outside sources, including

repayment work from industry. In the case of CADC the amount of industrial repayment work is now 37 per cent of the cost of the Centre and it is hoped to increase this in the future.

6   The Mechanical Engineering and Machine Tool Requirement Board (MEMTRB), the largest DoI customer in this field, is currently advised by the Computer Aided Engineering Committee and by the Automated Small Batch Production (ASP) Panel. In response to the ACARD recommendation (paragraph 7.16) that the co-ordination of research should be improved the effectiveness of the links between these two bodies is being considered. This committee structure will retain its present advisory role in respect of corresponsing Science Research Council programmes. More generally, co-ordinating machinery has been established across the broad range of the Department's (and Science Research Council's) activities in the field of CAD/CAM.

7   Paragraphs 4 and 6 above outline the proposals for improving co-ordination on both the customer and contractor sides of the customer-contractor relationship. Industry is represented on the customer side through the Requirement Boards and on their advisory committees, as it is on appropriate SRC Committees. Co-ordination is being improved in respect of DoI's other activities involving the supply industry, which is discussed in paragraph 12 below.

8   Government accepts the suggestion (paragraph 7.4) that DoI should take responsibility for producing and disseminating information and for promoting awareness of CAD/CAM. NEL already disseminates information on the cost of installation of CAD/CAM equipment and has run seminars for industry and others on CAD/CAM. The main thrust is on training and giving practical experience of using CAD/CAM systems. Seventeen three day courses have taken place over the past five years

and the majority of the participants have been from industry. CADC
runs courses to instruct operators in the use of software under licence
from CADC. It also acts as a "clearing house" through its Computer
Aided Engineering Support Unit which assesses useful software packages
and registers them in a library. Relevant work being done, for
example, at the Research Establishments of the Departments of
Environment and Transport could be included in any information
dissemination exercise. ACARD made a comparison with the DoI's
successful microelectronics awareness scheme (paragraph 7.4); However,
the composition of the audience to be addressed is somewhat different,
in the case of CAD/CAM, as is the scale of investment which may be
involved in many cases. The Department is currently examining the
need for further awareness activities in the CAD/CAM area.

9   Government accepts the ACARD recommendation (paragraph 7.4) that
the Department of Industry should maintain a close watch on developments
overseas. The Department already has very close links with the Science
Counsellors in five Embassies (Bonn, Paris, Washington, Tokyo and
Moscow)and it has a network of sources of information elsewhere.
Reports on the development of CAD/CAM and its applications are included
in the despatches from these posts. Arrangements are in hand to
increase the flow of information from Japan by the use of local
consultants. NEL and CADC also monitor developments overseas and
the possibility of disseminating this information more widely is
being examined.

10   The Department of Industry has had discussions with the
Fellowship of Engineering arising out of the ACARD suggestion
(paragraph 7.5) that the Government should sponsor young people to
work for a period overseas to learn about and participate in CAD/CAM
developments. This recommendation clearly has broad application to

other areas of technology and it will be studied carefully. We believe that for a scheme to be most effective it should be aimed at people with industrial experience. Some schemes already exist within the Science Research Council which could provide the sort of support ACARD has in mind. The discussions with the Fellowship of Engineering and the SRC about how these existing schemes could be better used and about whether additional funds are necessary will continue. In addition the Engineering Industry Training Board operates a Manufacturing Management Fellowship Scheme for trainee managers under which a number of young people pay short visits overseas to study, among other things, the impact of technology such as CAD/CAM.

11   The Government accepts the recommendation (paragraph 7.11) that it should consider how it might further assist companies, particularly those of small or medium size, to adopt appropriate CAD/CAM systems. The Council will be aware of the particular importance that the Government attaches to the role that smaller companies play in the economy. It already has a number of schemes specifically directed towards their assistance. For example the Manufacturing Advisory Service (MAS) provides consultancy on modern manufacturing methods to companies with less than 1000 employees. Twenty five projects on CAD/CAM are already complete and a further eleven are in progress. The assistance to industry through demonstration projects, such as that at Baker Perkins, is a successful way of promoting the development of the technology. The Teaching Company Scheme jointly funded by DoI and SRC is also a route for the encouragement of the use of CAD/CAM in industry. There are currently 33 projects and about a quarter of them involve computer aided engineering. In these, Associates, closely connected with a nearby university or polytechnic

work with the partner firm. In several cases CAD turnkey systems have been installed in the firm or university and can be used for the firm's own problems and also for demonstration to other firms and students. The resources of the Government research laboratories are available on a repayment basis to industry for specific tasks and industrial collaboration is encouraged. Companies can also submit proposals to the Requirements Boards and apply for support under the Product and Process Development Schemes. In collaboration with Universities and Polytechnics they can apply for support from the SRC under its Co-operative Grants Scheme. Many commercial organisations offer bureau services and there are thus many ways in which industry can obtain advice, both from the private and public sectors. The Government believes that encouragement of the use of CAD/CAM systems through the initial leasing of equipment is a matter for the commercial suppliers to consider. It has no plans to provide financial support for this purpose.

12   Government is aware of the importance to be attached to the supply of CAD/CAM equipment by UK manufacturers in view of the large potential market as the pace of application increases; the market for large turnkey systems is at present dominated by American manufacturers. It is important that the UK supply industry should be sufficiently closely associated with any new Government initiatives for it to benefit from resulting stimulation. The sooner industry is aware of these initiatives the better it can respond. A British company is developing a competitive system in partnership with the taxpayer. Other less comprehensive systems, mainly for drafting, are available from several UK firms. Much software development is carried out in the Universities and public sector research establishments. Where appropriate these can be marketed either by the originator or through the NRDC companies Compeda and Genesys. NRDC has been

providing development finance for joint ventures and engaging in technology transfer from public sector organisations for some time. Currently some 30 projects on CAD/CAM are supported by NRDC with an authorised investment of almost £7 million; a further 25 projects are under assessment. The need for standards and new software tools are two of the subjects of a study by DoI and the Electronic Engineering Association (EEA). One of the benefits of this study should be to help the supply industry by providing relevant information. The National Enterprise Board has been involved in discussions on the development of a CAD/CAM system with a view to producing a new UK initiative in this area.

13   The report recommends (paragraph 7.15) that DoI should study Linked Business Systems. Although there are no plans for a formal study at present MEMTRB are involved with industry in developing Linked Engineering Business Systems. The practical experience gained in this way will be very valuable.

14   The Government accepts the recommendation (paragraph 7.13) that Departments should consider how they can promote applications of CAD/CAM through their own purchases. The Government believes that it has an important role to play in stimulating innovation and technical developments through the use of public purchasing throughout the whole of the public sector. For example, it is urging the nationalised industries, as far as it is consistent with their overall objectives, similarly to have regard in their purchasing to the need to promote new technology and the interests of UK manufacturers. The potential of this approach for encouraging the wider use of CAD/CAM will be examined.

15   ACARD suggest (paragraph 7.17) that DoI should promote the use of CAD bureaux and user clubs. The DoI will explore the question of user clubs possibly at a Research Association or a Government Research Establishment. Its enquiries so far indicate that there are at least forty organisations currently offering various CAD services and some manufacturers of CAD/CAM equipment provide advice on a user club basis. A number of Research Associations such as PERA and MTIRA are also active in the field. The need for further effort therefore requires careful consideration and it may be best for the DoI to concentrate its effort on making the existing services better known.

16   The Council made a number of recommendations (paragraph 7.20) concerned with education in CAD/CAM techniques. The whole area of engineering education is being examined by the Government following the report by the Finniston Committee. More specifically there has been considerable debate about the place of computing in the school curriculum. The National Development Programme in Microelectronics for Schools and Colleges recently announced by the Department of Education and Science will give further attention to this issue. In the case of computer studies and CAD itself progress is limited by the availability of hardware and of trained teachers. Staff and equipment shortages are also a barrier to the expansion of effort in CAD/CAM in the higher education system. However, the universities and polytechnics are planning, with SRC help, to launch 5 new MSc courses in computer aided circuit design. In the context of employment-oriented continuing education there may be some scope for removing administrative restrictions and financial disincentives which appear in some cases to prevent institutions of higher and further education from providing courses of the type suggested and

which industry and commerce would wish to use and be willing to pay for.   DES is considering the implications of the recommendation that universities should prepare post graduate courses on programming to train students capable of writing major software programmes and modifying existing software.   Design engineering skills are one of the Manpower Services Commission's (MSC) priority training areas and the MSC will be exploring with the Industry Training Boards the question of updating training in CAD.

17   In conclusion the Government welcomes the attention that this ACARD report has focused on CAD/CAM.   The Government is already involved in many of the activities recommended by ACARD.   It is taking steps to improve further the co-ordination of its activities and it will continue to keep under review those recommendations made by the Council which require further action.

DEPARTMENT OF INDUSTRY PROGRAMMES IN SUPPORT OF CAD/CAM

The Department spends about £3 million per annum in support of CAD/CAM.

The major programme items are as follows:-

1   Computer aids for process plant design, manufacture and operation at CADC funded through CMRB.

2   Development of a British CAD/CAM system funded by MEMTRB and through the Pre Production Order Scheme.

3   Development and co-ordination of software for CAD of computers, funded through the Product and Process Development Scheme.

4   Integrated circuit design at RSRE funded by CSERB.

The following are funded by MEMTRB:-

5   Computer Aided Engineering at PERA

6   CAD system (demonstration project).

7   CAD/NC machining for tool making (demonstration project).

8   CAD for die, mould and pattern making at Cambridge University.

9   CAM system for sheet metal duct work.

10   Flexible Manufacturing System (demonstration system).

11   Computer Aided Draughting and Design System.

12   Automated Draughting.

13   Computer Aided Technology in the Mechanical Engineering Industry at CADC.

14   Advanced Numerical Stress and Structural Testing at NEL.

15   Computer Aided Manufacture at NEL.

16   Technology transfer at NEL and CADC.

SUMMARY OF RECOMMENDATIONS AND RESPONSES

Recommendation 1   para 7.4

We recommend that DoI should produce and disseminate information on installation costs and training needs for CAD/CAM.

Response   para 8

The Government accepts this recommendation. Considerable attention is already given to improving awareness. Consideration will be given to further effort.

Recommendation 2   para 7.4

We also recommend that DoI should maintain close watch on developments overseas.

Response   para 9

The Government accepts the recommendation. A special effort is already being made in the case of Japan where a scheme has been agreed to use local consultants to obtain information over a wide range of topics. Wider dissemination of information obtained by Research Establishments is being considered.

Recommendation 3   para 7.5

We therefore recommend that the Government should sponsor able young people to work for a period overseas to learn about and participate in CAD/CAM.

Response   para 10

Discussions have taken place between DoI and the Fellowship of Engineering. SRC will discuss the use of current schemes for the purposes discussed by ACARD.

Recommendation 4 para 7.6 and Recommendation 5   para 7.9

We recommend that the advisory and bureau services of NEL and CADC be coordinated to form an Institute of Computer Aided Engineering.

We recommend that the Institute be relocated nearer the centres of manufacturing industry.

Response   para 4

Coordination between NEL and CADC is being improved. The Director of CADC has been appointed Director of NEL whilst retaining overall responsibility for CADC. The new Management will examine ways of improving the range and accessibility of the laboratories' services to industry. Relocation to a new site in the form of an Institute of Computer Aided Engineering is not thought to be necessary.

Recommendation 6   para 7.11

We recommend that the Government should consider how it might assist
companies to adopt appropriate CAD/CAM systems.

Response   para 11

The Government accepts the broad recommendation. There are several
measures which assist companies including the provision of demonstra-
tion systems. There are no plans for a scheme which involves the
initial leasing of equipment for evaluation.

Recommendation 7   para 7.13

We recommend that the public sector as a whole considers how it can
promote CAD/CAM through its purchasing policy.

Response   para 14

The Government accepts the recommendation. It believes that public
purchasing has an important role to play in stimulating innovation
and technical development throughout the public sector. There is
scope for applying this principle in the CAD/CAM area.

Recommendation 8   para 7.14

We recommend that the National Economic Development Council should
consider how market opportunities for the supply of CAD/CAM equipment
by UK companies should be tackled.

Response

NEDO will be making their own reply to this recommendation.

Recommendation 9   para 7.15

We recommend that DoI should undertake a study of Linked Business
Systems.

Response   para 13

There is no formal study of Linked Business Systems under way at
present. The Mechanical Engineering and Machine Tools Requirements
Board (MEMTRB) of DoI is supporting the development of Linked
Engineering Business Systems in Industry which should provide valuable
practical experience.

Recommendation 10   para 7.16

We recommend that the DoI take the lead in improving coordination
between the various organisations involved in the use of CAD/CAM.

Response   para 6

There is already good liaison between the Computer Aided Engineering,
and the Automated Small Batch Production Panels of MEMTRB. Further
consideration is being given to better coordination of the
activities of the various groups involved.

<u>Recommendation 11</u>   <u>para 7.17</u>

We recommend that the DoI should promote the use of bureaux and user clubs.

<u>Response</u>   <u>para 15</u>

DoI will explore the question of user clubs and bureaux but there is already considerable activity in this field mainly in the private sector. It may therefore be more suitable for DoI to concentrate on making existing services better known.

<u>Recommendation 12</u>   <u>para 7.20</u> and <u>Recommendation 13</u>   <u>para 7.23</u>

We recommend that computing principles be given more emphasis in schools. Universities should include CAD at undergraduate level and provide postgraduate course in programming. Existing staff should be educated in CAD/CAM.

We recommend that management courses should consider the management implications of the widespread use of CAD/CAM.

<u>Response</u>   <u>para 16</u>

Engineering education is being examined in response to the Finniston Report. There may be scope for removing administrative restrictions and financial disincentives which appear to prevent institutions from providing courses of the type suggested. The recently announced National Development Programme in Microelectronics in Schools will give further attention to the place of computing in the school curriculum.

cc HMT
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HS

10 DOWNING STREET

From the Private Secretary

22 December 1980

The Prime Minister has seen the Secretary of State for Industry's minute of 17 December, with which he enclosed a revised draft Government response to the ACARD Report on Computer Aided Design and Manufacture.

She is grateful for the work which has gone into the revision which she considers a considerable improvement. She is therefore content that the reply should now be issued, in the form proposed by your Secretary of State. She has noted that it would be released to the press.

I am sending copies of this letter to John Wiggins (H.M. Treasury), Brian Norbury (Ministry of Defence), Richard Dykes (Department of Employment, Peter Shaw (Department of Education and Science), David Edmonds (Department of the Environment), Don Brereton (Department of Health and Social Security), Tony Mayer (Department of Transport) and David Wright (Cabinet Office).

M. A. PATTISON

Mrs. Catherine Bell,
Department of Industry.

MR PATTISON

RESPONSES TO ACARD REPORTS

You will wish to be aware of the attached replies of the Chairman
of ACARD to the Government's responses to three ACARD reports:
'Technological Change', 'Computer Aided Design and Manufacture' — 16/4/8,
and 'Biotechnology'. Of the three, the reply on 'Biotechnology'
is the most vigorous and reflects a fairly general unhappiness in
industry and the universities with the White Paper. The other two
replies are more modest in tone.

R Aram

R H ARAM

29/4/8, —

Science
sTechnology
Jan 80

Cabinet Office
6 May 1981

c.c. R. Courtney. ✓

ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT

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

29 April, 1981.

Dear Sir Keith

Response to ACARD Report: "Technological Change: Threats and Opportunities for the U.K."

You wrote to me on the 12 February with the Government's response to this ACARD report.   The Council considered the response at its meeting on 12 March and invited me to reflect its views in a letter to you.

Both the response and your covering letter indicated a preference for ACARD to examine closely focussed, clearly defined topics. The Council noted this and agreed that most of its reports should concern such topics.   It did not consider, however, that broader topics could or should be excluded.   One function of ACARD is to comment on the implications of technological development for government policies and this necessarily involves the Council in some consideration of broad issues.   I might perhaps add that the sales of this particular report have been considerably larger than those of some of our specialised reports, indicating substantial public interest in the general subject of technological change and its implications.   I believe that the Council should continue to promote increased public awareness of such issues, and hope that you will support this.

The Government response suggested that ACARD had called for a major expansion of Government involvement in industry. The Council considered this to be a misunderstanding of the report's main theme.   Our position was aptly summed up by the Prime Minister in a Parliamentary answer to Mr. Ian Mills on 14 January when she referred to Government developing with industry a framework in which industry can take R and D (and other) decisions.   Recent NEDO reports have identified industries with growth potential and others where decline seems inevitable.   The CBI have recently published a report that suggests comparable priorities.   Such studies could facilitate the creation by Government and industry of a coherent basis for the development of technological strategies. The Council would look upon this as constructive and helpful intervention and would welcome further development of it.

The response rightly pointed out the crucial part played by adequate profit in enabling industry to cope with technological change.   It did not, however, refer to the long-lead times usually needed to establish significant change. Without appropriate investment now, industry will not be ready to take advantage of the opportunities opened up when the world economic climate improves.   ACARD therefore welcomes the extra assistance for industry to which the response referred and urges that this should be given priority in the Government's spending programme since future industrial success will be founded on developments now taking place in new technologies.   ACARD reports "Biotechnology" and "Information Technology" have discussed such opportunities in more detail.   In this connection, the Council noted with some concern the apparent weakening of industrial support for Research Associations as a consequence of the recession.

I might add that long-lead times are a feature of higher education also, and that at the ACARD meeting considerable concern was expressed at the Government's slow response to the Finniston Report, and its policies on overseas students' fees, both of which are adversely affecting the ability of universities and other institutions of higher education to produce the skilled scientists and engineers required in the future.

It was, of course, never the intention of ACARD to suggest that service industries should deliberately take on more staff and thereby become uncompetitive.   But we believe that employment growth in the future will be concentrated in the service sector: therefore, special attention needs to be paid to the development of that sector.   The Council was pleased to note the support given to the development of the computer service industry.   We hope that similar support will be available in other service activities, so that Government support schemes do not concentrate exclusively or excessively on manufacturing, critically important as that obviously is.

Finally, the Council was disappointed that the Government did not give adequate consideration to the proposal for tax incentives to encourage large firms to make available to small firms inventions that they themselves cannot use.   With its limited resources, ACARD is not equipped to examine the detailed working-out of such an idea and it does seem an inadequate response on the part of Government for the proposal to be dismissed because no practical suggestions for its implementation were included in the Report. There is, I feel a parallel between this and the ACARD suggestion

in "Industrial Innovation" for a loan guarantee system for small firms which, despite administrative difficulties, has now been implemented by the Government.

Kind regards,

Yours sincerely

Dr. A. Spinks.

The Rt. Hon. Sir Keith Joseph, MP.,
Department of Industry,
Ashdown House,
123 Victoria Street,
London,   SW1E 6RB.

c.c.   R. Courtney

ADVISORY COUNCIL FOR APPLIED RESEARCH AND DEVELOPMENT

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

16 April, 1981.

Dear Sir Keith,

On 29 January you kindly sent me a departmental response to the Advisory Council's Report on Computer Aided Design and Manufacture.   The paper has been considered by members of the Council's original Working Group and discussed at the March meeting of ACARD.

The Working Group and the Council were pleased to note the number of their recommendations that have been accepted by Government.   It is regrettable that a different impression was given by several press reports that focussed on recommendations that were not accepted.

We do not think that continuing dialogue at this time between the Department of Industry and the Council is necessary or likely to be productive.   ACARD would prefer to return to the topic in about a year's time to review progress in the context of its recommendations and the Government's response.   Therefore, we do not expect a further response to the detailed points set out in the rest of this letter, but they may interest Departments . concerned.

1)   Our Working Group was unable to obtain much information on Government activities during its studies.   ACARD therefore believes that, in the light of the comment that Government is itself a user of CAD/CAM, Departments should do more, subject only to the limits of security, to make their activities and their successes with CAD/CAM known to appropriate parts of British Industry.

2)   ACARD had not expected that, at this time of financial stringency, there could be a physical move of the CAD Centre and the National Engineering Laboratory to one location.   It has been glad to learn that a single Director of the two organisations has been appointed.   The Government response leaves the Council with the impression, however, that this Director could promote more coordination of the two establishments' activities, for example, dissemination of information, and training.

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3) ACARD welcomes information being made available through the Scientific Counsellors in Embassies on activities in other countries.   It was particularly pleased to learn of the excellent flow of information on electronics coming back from the Scientific Counsellor in Tokyo who was appointed about a year ago.   Earlier, I had been, personally, impressed by discussions at our scientific offices in Tokyo and Washington.

4) Some parts of the Government response are centred on the activity of the Mechanical Engineering and Machine Tools Requirements Board and the Computer Aided Engineering Panel of the Department of Industry.   Members of ACARD are concerned that interest in computer aided design and computer aided manufacture extends outside the interests of this Board.   The electronics industry for example is an extensive user of these techniques and also has a role to play in the supply of CAD/CAM equipment and software.

5) The Council has noted that the Department of Industry believes that the encouragement of the use of CAD/CAM equipment through leasing is a matter entirely for the commercial suppliers of equipment and that there are no plans to provide financial support for this purpose.

It was reported in The Times on 11 February that the Government has decided to assist the introduction of more robots in industry by paying 25% of the cost of new processes that adopt robots as prime constituents.   We believe that it is also possible under the Product and Process Development Scheme for prototypes of new equipment, such as that for CAD/CAM, produced by British manufacturers to be placed on trial with British users.   The introduction of CAD/CAM into industry is, we believe, as urgent and important as the introduction of robots and the Council therefore assumes that financial support under such schemes could be made available for CAD/CAM.

6) The Council thinks that there may have been a misunderstanding about Recommendation 8, on which in any case a response is awaited from the National Economic Development Council. ACARD did not have in mind that British manufacturers should at this time attempt to compete with the American manufacturers

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of large turnkey systems, but believed that the need for smaller cheaper systems, for use in small companies and in education, could provide an opportunity for a British company.

Comments in the response on software development in universities and public sector research establishments are not, we believe, relevant to this proposal.   The comment that as many as thirty projects are being supported by NRDC and that a further twenty-five projects are under assessment suggests that there may be proliferations to the point where individual projects are hardly substantial or perhaps worthwhile.   The response to Recommendation 11, that there are at least forty organisations currently offering 'various CAD services', raises the same question.

Dr. Duncan Davies was present at the meeting of ACARD at which all these points were discussed and we are sure that the Department of Industry will give them further consideration. As I suggested at the beginning of this letter, an immediate response would not really be profitable.   I propose that ACARD should consider, in a year or so's time, whether it should review progress on this topic.

Dr. A. Spinks.

The Rt. Hon. Sir Keith Joseph, MP.,
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