cc Mr Wolfson
Mr Hoskyns

Prime Minister
I thought you would like an early note on this subject. Are you content with Sir Keith Joseph's approach; or would you like it discussed in E Committee?
TL 8/6

Before Sir Keith goes any further would he come & see me for about 1½ hours.

CONFIDENTIAL

PRIME MINISTER

MICRO-ELECTRONICS

Your Private Secretary's letter of 24 May asks for a note on current support of micro-electronics, including INMOS. This has been delayed because I have been reviewing the situation for myself.

The first point to be made is that there does seem to be almost universal acceptance that micro-electronics technology is of crucial importance to our future industrial and economic performance and our competitive position in world markets. In its way it is likely to be of the same sort of importance as was the steam engine with the difference that (a) it will be even more pervasive and (b) we are not in the forefront of its development. Because we are not in the lead, like Avis we have to try harder.

Against this background our predecessors announced last year two major schemes, the Microprocessor Applications Project (MAP) and the Micro-electronics Industry Support Programme (MISP), to which were allocated respectively £55 million over three years and £70 million over five years. The first, as its name implies, is aimed at encouraging British firms to apply microprocessors (and other micro-electronic devices). The second is intended to encourage the development and manufacture of micro-electronic devices themselves within the UK. Both schemes are described more fully in the attached notes. Flag A

I have considered carefully the necessity for using the taxpayers' money in this way and whether there is not scope for using the route of public procurement rather than that of direct support. Had we been

/in ...

in power for the last five years, I have no doubt that we would have moved decisively in this direction. I still believe that there is scope to do so and my Department is preparing proposals for a more constructive use of public procurement (not only in micro-electronics). But since our predecessors had not developed this approach vigorously, we must accept that it will take time before we can look for significant results.

MAP

The case for continuing with the MAP is that without it British industry will not embrace the technology as rapidly as its competitors. There is a fair amount of evidence that awareness of the technology varies widely in industry and even where there is awareness little action is taken - in marked contrast to what is happening particularly in Japan and America, but also increasingly in other European countries.

Apart from the fact that the readiest market for the devices developed in the US and Japan is for applications close at hand, the reasons why British industry has moved slowly in this as in other areas of innovation are not far to seek. The general environment in which business has operated for many years past has been hostile to risk taking and has not provided rewards for success commensurate with the penalties of failure; managers have been so preoccupied by the need to keep their business going from day to day in spite of all the difficulties imposed by Trade Union attitudes, pay policies and other forms of state interference that they have not had the time, even if they had the inclination, to think ahead. In some cases also lack of venture capital has been a handicap.

/Our ...

Our policies are designed to change the environment within which industry operates and encourage initiative and risk-taking; but I have to accept that the necessary transformation cannot be achieved quickly.

Of course competition will eventually drive British firms to apply micro-electronics - or drive them out of business; but I am persuaded that because of the pace at which the competition is advancing there is a real risk of the latter happening widely before our general policies can take effect. This would have far-reaching consequences for British industry and for our already diminishing share of world markets.

In these circumstances I have concluded that the MAP - which has been warmly welcomed by industry and aroused much interest - should be allowed to continue on broadly its present lines. Nearly a quarter of the £55 million total is already committed, but I hope to be able to reduce somewhat the total amount of money allocated to project support (Part C of the scheme) by setting an upper limit on the cost of projects eligible for support with a view to concentrating it on small and medium sized firms. I would hope that it would be possible to use the savings resulting to provide a further stimulus to the public procurement route.

MISP

This programme complements the MAP. It is intended to ensure that the UK has the necessary design, development and production capability to ensure that micro-electronic devices required by British users are available; this includes both the manufacture of high volume standard

/products ...

products and the capability to design and supply special circuits to meet users' particular requirements.

There are two reasons why this is important; first imports of electronic components generally and of integrated circuits in particular have been taking an increasing share of our market, and unless this trend can be reversed, the implications for the balance of payments of the expected rapid expansion of demand for these devices would be considerable; second and more important, experience has shown that to get the maximum technical and economic advantage, users of micro-electronic devices need to have ready access to, and be able to interact closely with, local circuit design and manufacturing facilities. This point was made in the report of Ian Lloyd's group on information technology; they said (in relation to INMOS, but the point is of general validity) "early access to the latest chip technology and reliable supplies are more important to British chip users than lower prices for large volumes of obsolescent foreign products".

To this end the Department of Industry worked out in close consultation with industry a five year strategy. It involved both encouraging established multinationals to set up design and production facilities in the UK or expand existing ones to serve not only the domestic market but also that in Europe, and developing the capability of UK suppliers of special (as opposed to mass-produced standard)micro-electronic devices required by particular users, and also developing the so-called "infra-structure" industry supplying equipment and special materials needed by the producers of micro-electronic devices.

/Support ...

Support (by means of grants of up to 25% or loans of up to 50%) is only given to bring about something which would not otherwise happen: it is by no means an automatic subsidy of what firms would do in any event.

The programme has already achieved a number of successes: the GEC/ Fairchild project would not have come to the UK but for Government support; ITT, who manufacture in the US, the UK and Germany, decided because of the support available to make the UK their world centre for the development and production of memories; National Semiconductors, one of the top US firms, has recently agreed to set up a major new operation in Scotland with our support.

In one way or another most of our competitors, recognising the importance of this industry, provide substantial support. In the case of the US, this comes indirectly from the Government through the Defence and Space programmes and the demands of the computer industry. In Japan there is substantial direct support to industry, and both the French and West German Governments are supporting their industries on a substantially bigger scale than are we.

The need for this arises from the very heavy initial investment required in this business, the rapidity with which the technology is advancing, and the fact that world prices for the devices seldom reflect their true cost. These factors are particular important in the context of the indigenous British suppliers who have a reasonable capability, particularly in "special" circuits, which has been created and maintained - in the economic climate to which I have referred above - only by Government support over a period of years: in the

/absence ...

absence of Government support, they would not be able to afford the necessary investment.

Of the £70 million allocation over five years, some £13 million is already committed and a further £17 million is earmarked for Plessey and Ferranti, both of which have important high-quality operations which it is undoubtedly important to preserve as "centres of excellence". That leaves £40 million for the remaining four years of the programme, and a number of other projects are already in the pipe-line.

Whilst as you know I am in principle strongly opposed to support of this kind, I accept that against the background of substantial Government support (whether direct or indirect through purchasing) in competitor countries we have little option but to continue with MISP if we are to have the capability in this country to supply the needs of user industries and to achieve a reasonable share of the rapidly expanding world market for these products as well as reducing what would otherwise be an increasing dependence on imports.

Needless to say, the maintenance of this programme and of MAP, both of which I believe to be justified, will not prejudice my Department making a substantial contribution to public expenditure savings.

INMOS

I come finally to INMOS. This is not a central part of our strategy for the industry, though if successful (and it is undoubtedly high risk) it would contribute significantly to UK micro-electronic production by the early 80s. The NEB are already contractually committed to INMOS to the extent of £25 million, and the Board attaches great

/importance ...

importance to the project, so it will need careful handling. I think therefore that it is right to consider INMOS's future within the context of NEB's activities as a whole, and particularly those concerned with the new high technologies based on micro-electronics.

I shall be putting a paper to colleagues on my conclusions about the role and functions of NEB before the end of this month, and you can be assured that I shall be examining very closely the question whether INMOS has any real future.

I am copying this minute to Geoffrey Howe and Sir John Hunt.

KJ

K J

June 1979

Department of Industry
Ashdown House

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MICROPROCESSOR APPLICATIONS PROJECT (MAP)

1 There is little argument about the importance for the economic future of any industrialised nation of the timely and effective application of micro-electronics to virtually the whole range of industrial processes and products, as well as to offices, transport and the home.

2 Stimulated by the demands of the computer and aerospace industries (the latter largely Government funded), the technology has advanced with startling rapidity in the US (and more recently Japan). In these countries too the technology has most rapidly found widespread application in other industries, and as a result their products incorporating micro-electronics are starting to pre-empt world markets: obvious examples are consumer durables and entertainment equipment, shop and office machinery, toys, manufacturing machinery and process control equipment.

3 DOI's analysis of the UK position early in 1978, based on its contacts with both supplier and customer industries, advice from research establishments, universities and trade associations, and an industry questionnaire originated by the EEC, concluded that:-

5% of firms were active in micro-electronic applications.

45% were aware but not actively pursuing applications.

50% were not sufficiently aware to be able to assess the opportunities and threats presented by micro-electronics to their business.

4 In July 1978 a sub-committee of the Advisory Council on Applied R&D which included industrial members, reporting on Applications of Semi-conductors, did not differ from the DOI assessment - which though published more than a year ago has not been challenged. Other studies and reports have confirmed the broad conclusion that much of UK industry is seriously lacking in awareness, and this is true even of some companies within large groups in the electrical/electronic industry. Size of company does not seem to be a decisive factor: much depends on the attitude of individual managers and technologists.

MAP

5 Against this background, MAP was introduced in 1978 to assist UK industry over the difficult introduction period for micro-electronics technology, say the first three years. Its main elements are:-

MAP(A) (i) General Awareness - A national programme of 1-day workshops: support of seminars, conferences etc.
Allocation £3m
Committed £1m +

	(ii)	Training Allocation £6m Committed £1m +	A crash programme over 2-3 years to increase the number of people being re-trained in industry in micro-electronics. By agreement with DES and MSC to be taken over by them when possible.
MAP(B)		Feasibility Studies Allocation £2m Committed £0.75M +	Short-term assistance to "first time" firms to determine the value or otherwise of the technology to their business. Very much tailored towards the smaller manufacturing firms.
MAP(C)		Project Support Allocation £43m Committed £9m	25% selective grants to encourage industry and ease the technical and financial risks to firms undertaking micro-electronics projects (especially for the first-time or at a significantly greater level of complexity).

6 Undoubtedly, left to its own devices and in its own time, British industry would have to apply micro-electronics technology and some of the more progressive firms are already doing so without MAP support. But the majority are not and the problem which the MAP is designed to tackle is the small scale and slow pace of general take-up. With lead times for applications commonly around two to three years there is every risk that many firms will be unable to react fast enough to survive if they wait until the competition is visible. Investment in development and new designs has been falling steadily in the UK for many years - example, instrument industry (a prime micro-electronics area): 1970 development expenditure 5% of sales - 1977/78 3% of sales; strongest competitors US and Germany 6% of sales throughout the period.

7 Lack of finance is not generally a reason for slow progress; plain lack of awareness undoubtedly is, together with an economic and fiscal environment which for many years has not been conducive to innovation. Hence the essence of the MAP is the use of public funds to create awareness and by means of subsidy induce companies to take action which they would not otherwise do. Public purchasing can play a part in selected areas such as defence, education, health and social services, and property services (energy saving) but is not applicable over the broad range of industries where the public sector is not a significant customer.

8 Stimulated by a 25% grant a project may proceed which would not otherwise, on a faster timescale (the most usual situation) to meet the market, or enhanced in some way. Support limited to the 25% level ensures that only sensible projects are put forward by firms since their own money is at risk, though even so the Department weeds out about half of the potential cases put forward; there is also of course a substantial gearing effect in terms of the DOI contribution. In the absence of MAP support the converse would apply.

Some projects would not proceed at all, some would go ahead on a more protracted timescale, perhaps missing the main market, and some would fail just because they had been carried out on a shoe-string.

9 All parts of the Scheme have made an excellent impact in the 10 months since its announcement and some 1000 projects are within the system under Parts B and C. MAP has been well received by senior industrialists many of whom have spoken warmly in public in its favour stressing amongst other factors the need for UK Government support to match that currently being provided by Governments in most other advanced countries. This could readily be confirmed by discussion with industrialists in both supplier and user industries. The Department is supporting a research project by the Policy Studies Institute which will study the progress of innovation in this field, and the impact of MAP.

CONCLUSION

10 There is a good deal of evidence that most of British industry is responding slowly to the opportunities and threats of micro-electronic applications, particularly in comparison with the US and Japan. Competition will eventually drive British firms to apply micro-electronics - or drive them out of business; there is a real risk of the latter because it will take time before the Government's policies can produce a more encouraging and rewarding environment for innovation. Given the all-pervasive nature of micro-electronics and the fact that its rapid application to manufacturing results in more competitive products even if they do not incorporate micro-electronics, failure to adopt this technology at much the same pace as our competitors would have far-reaching consequences for British industry generally and for our diminishing share of world markets. The MAP is a short-term programme aimed at accelerating the take-up of micro-electronics by creating awareness, providing technical training, and stimulating applications in companies by paying up to £2,000 towards feasibility studies and by provision of a 25% subsidy for approved projects.

7 May 1979

CONFIDENTIAL
COMMERCIAL IN CONFIDENCE

MANUFACTURE OF MICRO-ELECTRONICS
SUPPORT BY THE DEPARTMENT OF INDUSTRY

Background

1 By 1985 the world micro-electronics market will be approaching £10 billion per annum and equipment dependent on micro-electronics will have a value ten times greater. Systems using this equipment will have a value greater still.

2 The future importance of integrated circuit semi-conductor technology, as distinct from discrete component semi-conductor circuit technology, became obvious during the late 1960s and early 1970s. At that time UK-owned semi-conductor companies had been unable to compete in a world-wide price war and had very reduced semi-conductor operations which were unable to develop into the new integrated circuit technology on a world competitive scale.

3 The Department of Industry embarked on a Micro-electronics Support Scheme, aimed at injecting £10 million into these companies (GEC, Plessey and Ferranti), in order to maintain a UK technological capability in this new technology but accepting that the support could not help develop a UK industry capable of competing on the world market for high volume, standard, general purpose micro-electronics. This Scheme closed last year; the UK companies are left with some technological capability in all the key parts of micro-electronics, and ability to meet the needs of UK user industries for special designs, and to export as well, but no capability for high volume manufacture for the world standards market.

4 A number of US subsidiaries manufacture here, some providing a special design capability but most undertaking manufacture of a limited range of standard products of their parent companies. There is an increasing negative balance of trade in these standard products.

Strategy

5 During 1977/1978 the Department, in collaboration with the industry and its trade association and with the help of the Computers, Systems and Electronics Requirements Board (CSERB), the Electronics Research Council (ERC) and the Electronics Components Sector Working Party, worked out strategy proposals for this sector in industry, for the next five years. This strategy was announced by the SWP early in 1978.

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6 The strategy objectives were:

(1) to develop in the UK a capability for high volume manufacture of general purpose, standard micro-electronic integrated circuits to compete on the world market. The object was to exploit the export market, reduce imports, give UK user industries early access to developing products and provide technology transfer both ways;

The strategy concluded that this was most likely to be successful if established multinationals were encouraged to start or expand manufacture here; ITT, National Semiconductor, General Instruments, Motorola and Mullard (Phillips) have plans, or are already doing so. Collaboration with a UK-owned company was also thought to be worth encouraging and the GEC/Fairchild project is an example of this;

(2) to develop the UK capability for design, test and manufacture of micro-electronic products needed to meet the special requirements of individual user companies (custom designs) or particular sectors of industry (industry specific designs). This capability has to be indigenous and UK-owned companies were expected to figure strongly here (Ferranti and Plessey have prepared plans for it, GEC is doing so) but US companies could also contribute (National Semiconductors and General Instruments, for example). Independent design houses could contribute too;

(see para 12)

(3) to encourage an infra-structure industry to support (1) and (2) above. This is the industry which will supply special plant (eg, electron beam, ion implantation, high purity ventilation), materials (eg, silicon, high purity gases), computer aided design and test equipment and other special services. The strategy was to encourage particularly those areas where an indigenous capability was essential (some materials, for example) or where the UK already had an advanced capability (electron beam, CAD or ion implantation, for example) which could be developed to exploit both home and export markets;

(4) to encourage the UK manufacture of certain discrete semi-conductor devices which are a necessary part of a total micro-electronics capability (hybrids, microwave and bubble memory devices for example).

The strategy concluded that the achievement of these objectives on a scale that would be right for the UK would require investment of at least £240 million over the next five years.

The Micro-electronics Industry Support Programme

7 In pursuit of this strategy the Department announced in July 1978 the Micro-electronics Industry Support Programme (MISP). This offered £70 million support over a five year period, which, with industry making the major contribution to the total programme, was expected to generate the required investment of £240 million. (This £70 million does not include the £50 million earmarked for INMOS by the National Enterprise Board: INMOS is not an essential element in the strategy, though it is not inconsistent with it). MISP support would not normally exceed 25%, or at most 50% of total project costs.

The Case for Government Support

8 For the objective of creating a major high volume world standard production capability (para 6(1) above) the argument must be based mainly on whether support is needed to attract sufficient inward investment from established multinationals. Multinationals have the option of expanding at home or overseas. At present, many of them believe that they need a significant foothold in Europe, with proximity to its markets. The UK is particularly attractive to the US companies because of the common language and the UK, in common with West Germany, France and, to a lesser extent, Italy, can also offer a good technical and scientific environment in which to work.

9 However, all these countries and others such as Southern Ireland, offer support of various kinds to encourage inward investment. In this situation there will be some level of support which will tip the balance in favour of one country rather than another. Despite the inbuilt attractions of the UK it does look as if this investment will go elsewhere unless some support is on offer. For example, MOSTEK found the support offered by Southern Ireland to be the decisive factor for them; UK support persuaded ITT to make the UK rather than Germany or the US their world centre for standard memories: £2M of support will result in annual production of £40M in the early 1980s; Fairchild made it clear that they would not set up their joint project with GEC in the UK in the absence of Government support: £2.8M of MISP support (plus normal RDG's) is expected to lead to annual output of £50M of memories and microprocessors by 1983; National Semiconductors have compared the relative attractions of West Germany, the UK, Southern Ireland or expansion at home and have decided on a major expansion in Scotland because of the support offered. Experience suggests that the support needed varies according to the circumstances of each company but averages about twenty-five percent.

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10 The case for support for a manufacturing and design capability for custom and industry specific products (para 6(2)) is different. This activity is not one to attract much inward investment for it does not open up major world markets; its potential is mainly to serve home and European user industries. For this reason the main suppliers are UK-owned companies.

11 At present many potential user industries are not aware of the benefits of this class of micro-electronics and can survive for a while with obsolete technology; hence the micro-electronics industry cannot, in the short term, recover their R & D and investment costs through the price of their products, particularly in competition with directly or indirectly subsidised foreign suppliers. This situation should change in the coming years and the volume of demand will rise but the capability required needs to be built up now.

12 Without support two of the three main companies in this class of business - Plessey and Ferranti - would probably not be able to develop their business and the third - GEC - would probably reduce its operations to meet primarily in-house needs. All of them would only accept outside work very selectively, for high volume customers. The UK user industries would lose access to an effective custom or industry specific design and production service, except from a few of the multinationals who would also be very selective in choosing only high volume customers. Until therefore user industries recognise and are prepared to pay for the value of special micro-electronics, support for the suppliers is needed to keep them in the business until the market adjusts itself.

13 The case for support of the other parts of the strategy - the infra-structure industry and certain discrete semi-conductors (6(3) and (4)) follows from the first two. There are some infra-structure activities, easy and certain access to which is crucial to the manufacturing industry; certain special materials can be difficult to obtain reliably (or at all) from overseas. The expectation that there will be a major customer industry in the near future to consume these products will, in some cases, be sufficient to generate the investment needed without Government support but there will be other cases where market pull is not likely to be sufficient; liquid hydrogen, high purity silicon, some so-called 'III-V' materials, could be in this category.

14 In the same way there are certain peripheral but crucial discrete devices, eg some high power devices, bubble memories, acoustic wave devices and displays. In both cases Government support may be needed to ensure security of supply in good time to meet the needs of the suppliers of micro-electronic devices and systems.

/Summary

Summary

15 The case for support may be summarised as follows:

(1) The development of the indigenous device manufacturing industry complements the action being taken under the Microprocessor Application Project to accelerate the adoption of micro-electronic devices over the whole range of products and processes. This will generate greatly increased demand for micro-electronics devices which if met largely from abroad would have serious balance of payments implications, and mean that British users did not have ready access to the latest technology.

(2) The business environment in the UK is not currently sufficiently conducive to the creation of the investment required to achieve the strategy without Government support.

(3) Without support inward investment, a big factor in the strategy, will be attracted elsewhere by the support offered by other Governments.

(4) So long as user industries remain insufficiently aware of the benefit of special micro-electronics there will not be a profitable business for UK suppliers of these products. Without support our capability to supply these products will wither: the absence of this local capability would weaken the competitive position of the users.

(5) In view of the importance of this industry, Governments of other industrialised countries give substantial support either directly or (in the US) through defence and space procurement. In view of the high investment required in R & D and plant and the rapid advance of the technology, the risks are high; British firms can hardly be expected to match their foreign competitors without comparable support.

7 June 1979