PREM 19/1277

MT

PART 2

Confidential Filing

The microelectronics industry. The position of INMOS. Proposed Advisory Committee on Microelectronics Development Programme.

INDUSTRIAL POLICY

Pt 1 May. 79
Pt 2. May 80

Referred to	Date	Referred to	Date	Referred to	Date	Referred to	Date
~~4.6.80~~		~~18.1.83~~					
~~11.6.80~~		24.1.83					
~~12.6.80~~		~~31.10.85~~					
~~27.6.80~~		~~12.12.83~~					
~~2.7.80~~		13.12.83					
~~23.7.80~~		~~2.3.84~~					
~~6.8.80~~		~~2/3/84~~					
4.8.80		~~16.3.84~~					
~~8.8.80~~		19.3.84					
~~20.10.80~~		PART ENDS					
~~4.11.80~~							
~~16.3.82~~							
~~26.10.82~~							
~~15.11.82~~							
~~25.11.82~~							
~~13.12.82~~							

PREM 19/1277

PART 2 ends:-

Ch/Ex to PM 19.3.84

PART 3 begins:-

SS/DTI to PM 26.4.84

TO BE RETAINED AS TOP ENCLOSURE

Cabinet / Cabinet Committee Documents

Reference	Date
E(80) 28th Meeting, item 2	28/07/1980
E(80) 78	24/07/1980

The documents listed above, which were enclosed on this file, have been removed and destroyed. Such documents are the responsibility of the Cabinet Office. When released they are available in the appropriate **CAB** (CABINET OFFICE) CLASSES

Signed J. Gray Date 23/9/2013

PREM Records Team

CCNO

CONFIDENTIAL

Prime Minister (2)

I am pursuing DTI for an E(PI) paper setting out the options.

AT
28/3

Treasury Chambers, Parliament Street, SW1P 3AG
01-233 3000

PRIME MINISTER

INMOS

File with AT

Norman Tebbit's minute of 29 February invites comments about the future of INMOS. I should like to reserve judgement on the best course until I have seen Norman's response to the questions set out in Andrew Turnbull's letter of 8 March. But in any event we need to clarify our objectives.

2. If our overriding aim is to avoid risking further Government money, then we should dispose of the company immediately. This probably means a sale to AT & T or to some other overseas company for whatever price we can get. There are risks attached to this course. AT & T appear to want the Colorado Springs and Newport factories for their own products, and are likely to decide to close Bristol and abandon the transputer. We would therefore preserve employment at the risk of losing important technology. I suspect it would not be feasible to maintain Bristol and the transputer through a separate disposal. Without a manufacturing facility, the design team at Bristol would almost certainly disperse. The transputer is the property of INMOS. AT & T appear to have a rival product and would probably prefer to see the transputer suppressed. However, this may not be true of other possible purchasers.

3. If on the other hand, our primary objective is to ensure the survival of INMOS products and technology, we must recognise the risk of further Government involvement that this implies.

CONFIDENTIAL

As you have pointed out, INMOS is likely to remain cash hungry for some time. Even if the institutional investors this year provide some or all of the sums which have been mentioned, the source of the further funds which will eventually be needed is not clear. There is a possibility that more money could be raised through a public issue in one or two years' time and that the BTG could then dispose of its investment. But it is by no means certain. So preserving INMOS' independence could prove expensive.

4. If we nevertheless decide that INMOS should be maintained as an independent company, we must make every effort to ensure that the further capital is provided from the private sector, and that the BTG investment is eliminated or substantially reduced at the earliest opportunity. In this case, I suggest we should tell Hill Samuel to proceed urgently with their plan to raise funds from institutional investors and to plan a date for public issue as soon as possible after that.

5. Copies of this minute go to the other members of E(A), to Sir Robert Armstrong and to Dr Nicholson.

N.L.

19 March 1984

Ind Pol INMOS Pt 2

010

CC 170

NBPM AT 1913

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

JU994

Secretary of State for Trade and Industry

16 March 1984

COMMERCIAL IN CONFIDENCE

The Rt Hon Lord Cockfield
Chancellor of the Duchy of Lancaster
Cabinet Office
Whitehall SW1

with AT

D Archer.

Thank you for your letter of 2 March about the apparently low price being offered for INMOS.

2 There are a number of points I would make. First, the company is only just emerging from the start-up phase. So although it is currently on track for profits in excess of £7m this year, it will be the first year of profit after several of losses.

3 Second, although the AT&T offer of some £47m is the best firm offer for the whole of the company at present on the table, other offers, including the one from institutions for a minority stake currently being put together by Hill Samuel, do imply a much higher value for INMOS.

4 Finally, I am sure that prospective investors are much influenced by the risks inherent in this type of business and the fact that if INMOS is to pursue its chosen strategy it will require further large amounts of money to maintain its technological lead and continue to introduce new state of the art products.

5 I shall be reporting on this further in the near future when I respond to the questions the Prime Minister has asked.

6 I am sending copies of this letter to recipients of yours.

Yours

NORMAN TEBBIT

Industrial Policy Pt 2

INMOS

cc NBPM

AT 14/3

Caxton House Tothill Street London SW1H 9NF

Telephone Direct Line 01-213 6400

Switchboard 01-213 3000

COMMERCIAL IN CONFIDENCE

Rt Hon Norman Tebbit MP
Secretary of State for Trade
and Industry
1 Victoria Street
London SW1

14th March 1984

Dear Norman

INMOS

Thank you for sending me a copy of your minute to the Prime Minister on INMOS and your report on progress in finding a buyer.

I certainly agree that any disposal of INMOS to AT&T at a price below past investment by the taxpayer would be extremely damaging politically, and it would obviously be far preferable if its further development could be financed with UK private sector funds.

You asked for comments, and I therefore confirm that I would certainly support the assessment set out in your minute.

I am copying this letter to Members of E(A), and to Sir Robert Armstrong.

Yours

COMMERCIAL IN CONFIDENCE

Ind. Pol : INMOS Pt 2

FILE
da

COMMERCIAL IN CONFIDENCE

cc HMT LPSO CO
NIO CDL Dr. Nicholson
D/N D/M David Pascall
SO MAFF
WO CSO
DOE DOT

10 DOWNING STREET

From the Private Secretary

8 March 1984

Dear Callum,

INMOS

The Prime Minister has seen your Secretary of State's minute of 29 February. This raises a number of difficult issues. While she agrees that the current offer from AT&T is too low, she feels that the alternative of an injection of institutional funds carries a number of risks. Although BTG's holding would be diluted, the Government could still find itself being asked to provide further funds for the company. The Prime Minister feels strongly that no more Government money should be put into INMOS. It is not clear, however, how the £75 million which is needed will be raised. The institutional investors appear to be providing only a part of this.

The Prime Minister feels that the ultimate objective remains to dispose of BTG's holding and she does not rule out the possibility of a complete sale to an overseas bidder on suitable terms and conditions. Before decisions are taken fuller information is needed. The Prime Minister would be grateful if your Secretary of State could set out the risks to the Government of the institutional investment route; assess the viability of INMOS as an independent company; consider whether a distinction should be made between the manufacturing facilities at Newport and the design facilities at Bristol, including the transputer; provide information on other prospective bidders and their offers. Meanwhile she hopes that negotiations with AT&T can continue to secure a better price and to achieve suitable terms to meet our concerns about technology.

When this information is available it will probably be desirable to hold a meeting of Ministers. I will be in touch to arrange this.

I am copying this letter to Private Secretaries to members of E(A), Richard Hatfield (Cabinet Office) and to Dr. Nicholson (Cabinet Office).

Yours sincerely
Andrew Turnbull

Andrew Turnbull

Callum McCarthy, Esq.,
Department of Trade and Industry.

da

10 DOWNING STREET

From the Private Secretary

(1)

Prime Minister

INMOS

Could I ask you to have a look at the papers. Policy Unit feel that although the injection of institutional funds into INMOS looks attractive, it has risks and could close off options. The attached note seeks to spell out the difficulties and suggests some questions we might put to DTI.

Agree PU recommendations?

AT

Yes - we cannot put £13 any more money into INMOS. That is why I wanted to tell off at least J.M. Mrs Policy Unit. Is not

MR TURNBULL 6 March 1984

INMOS

The Prime Minister is sympathetic to the idea of institutional investment to create an independent UK company and hopes that at least 75% of BTG's holdings can be sold off in the operation.

This is not an option which is currently available. The institutions are only proposing to put up perhaps half of the £75 million of new money which INMOS will require over the next two years. Of this only £20 million appears to be certain and there must be doubts, given INMOS's past track record, whether the balance can be raised on the terms proposed.

The institutions will not take on any of BTG's holdings at this stage although the injection of new money would dilute BTG's holding from 75% to perhaps about 50%.

The disposal of BTG's holding is a longer term possibility which depends upon

- the success of the proposed initial placement

- the institutions putting up further new money

- a successful flotation

- the ability of INMOS to operate as an independent company.

Although we agree with the Prime Minister that this would be an ideal solution, it is a high risk strategy spread over at least two years.

The market place for semi-conductors is changing rapidly (see Annex). With its preferred strategy of product innovation, INMOS is always likely to require significant inputs of cash to finance major investments in R&D.

There must be considerable doubt, therefore, about the ability of the company to maintain its competitive position in the up-market specialist chip sector. Consequently the willingness of the institutions to continue to finance the company must be uncertain, particularly as INMOS has no real market share in the standard memory chip market place.

The alternative route of complete sale has many obvious attractions both in terms of removing Government's commitment and in providing corporate support.

AT&T are prepared to pledge further money ($100 million) for investment in Newport which needs substantial additional investment to come up to scratch as a production centre. It is by no means clear that legitimate concerns about technology transfer and the design capability at Bristol could not be met by negotiation (see Annex).

While AT&T have not expressed an interest in the Bristol design facilities or the transputer - itself a worrying sign -, it is not clear whether they might not be prepared to contribute to maintaining the Bristol facilities as part of the price for early entry into Europe.

Alternatively we would have anticipated that some British companies would wish to take over this work in order to develop on all British VLSI systems design capability of world excellence. ICL could well come into this category.

Very Large Scale Integration

Recommendations

Before coming to any conclusions on the difficult choice confronting us, we recommend:

1) that the Prime Minister does not rule out the possibility of a complete sale to an overseas bidder;

2) that Norman Tebbit should be asked to

- spell out the risks associated with the institutional route;

- assess the viability of INMOS as an independent company;

- negotiate with AT&T to establish both a market price and suitable terms to meet our concerns about technology;

- provide information on other prospective bidders and their offers.

DLP.

DAVID PASCALL

ANNEX

INMOS is in effect three businesses:

1) an up-market specialist chip maker at Colorado Springs where INMOS is designing and making STATIC RAMs and EEPROMs largely sold to four key US computer companies - IBM, Cray, CDC, Tandem. Colorado Springs is also the base of INMOS's process technology;

2) standard memory producer with 64K and 256K RAMs to be produced at Newport;

3) a microprocessor design house at Bristol - the home of the transputer and advanced CAD facilities.

The Japanese are strongly entering the STATIC RAM market and are eroding some of INMOS's technical edge. On the 256K RAM standard memory chip, INMOS has still some way to go on process technology. This chip is already being manufactured in Japan and the USA at rates well above INMOS projections. Indeed, the race is now on to introduce the Megabit RAM.

In this context, we need to be clearer about our national technological objectives

- freedom to design and develop state of the art VLSI with access to UK production ie the Bristol activity linked if possible but not necessarily to Newport

- acquisition of as much advanced US technology as possible - the basic purpose behind the whole INMOS project.

010

W.0189 2 March 1984

PRIME MINISTER

INMOS

Sir Clive Sinclair pointed out at your Lancaster House Seminar that the UK IT industry must have ready access to the latest, most sophisticated components if it is to design and produce world competitive IT products. The key to his low-cost computers has been Ferranti's Uncommitted Logic Array. Inmos components, such as their current memory products and their revolutionary Transputer are the basis of some of tomorrow's new IT products, ranging from inexpensive consumer goods to enormously powerful parallel processing computers.

2. Inmos is now successful despite its unpropitious origins because of the brilliance of its design team at Bristol and the ready access they have to state-of-the-art silicon processing know-how in the Colorado Springs unit and a modern manufacturing unit at Newport. As the Colorado Springs know-how is transferred to the UK units, they will become a unique design-through-to-manufacturing capability in the UK. The quality of the team and the facilities are such that there must be a good expectation that a succession of highly innovative components will flow from Inmos which will not only be a substantial business in their own right but will also offer the UK IT industry an inside track in developing a wide range of new chip-based products. Inmos's capability would be lost if chip design was separated from processing and manufacturing know-how.

3. The Inmos design team are entrepreneurial in spirit and working methods - this is the basis of their success. They

could not remain effective under A.T. & T. and would disperse - no doubt A.T. & T. realise this which is why their offered price discounts the design capability of Inmos and only reflects the value of the Newport manufacturing facility. A further argument against American control is strategic - there is increasing concern about the current tightening-up on American technology exports, coupled with fears, rightly or wrongly, that legitimate security considerations are being used to gain commercial advantage for US companies.

4. It would require rare enlightened management from any large company, even British or European, to maintain the current effectiveness of the Inmos design team and I wouldn't back GEC or Siemens in this regard. Inmos's strength is best maintained and developed by fostering its independence as a company. This points to a round of institutional investment to dilute the BTG shareholding to below 50 per cent followed a little later by a public offering of shares in which the BTG holding is finally sold off.

5. I must stress that Inmos is now a superb and respected technological asset in the UK which, properly maintained and used, can become a significant pace-setter in the UK's IT industry. I believe Mr Tebbit's proposals would have this result.

6. I am copying this minute to Sir Robert Armstrong.

RBN

ROBIN B NICHOLSON
Chief Scientific Adviser

Cabinet Office
2 March 1984

CONFIDENTIAL

PRIME MINISTER

INMOS

Mr. Tebbit is seeking the views of colleagues on how to proceed with INMOS. He argues that the bid from AT & T is insufficient and suggests an alternative path of seeking institutional investors into INMOS which would dilute the Government's stake.

Policy Unit agree that the AT & T bid is insufficient but rather than proceed to an injection of funds from UK institutions, they think a more active search for buyers should be undertaken first.

* Dr. Nicholson, however, supports the idea of institutional investment to create an independent UK company.

Do you wish to express a view at this stage? When colleagues have commented we may need a meeting.

AT

* I agree - but I hope that at least 75% of BTG's holding can be sold off in the operation.

Andrew Turnbull
2 March 1984

CONFIDENTIAL

CONFIDENTIAL

2 March 1984
Policy Unit

File

PRIME MINISTER

INMOS

Norman Tebbit's paper seeks some advice.

There are two possible routes that can be pursued.

1. Seeking a buyer for INMOS at this stage. AT&T have come forward with a bid which is judged inadequate.

   This route, however, has many attractions. It takes further funding risk away from the taxpayer, providing once-and-for-all limitation on the Government's commitment. There could be some guarantees that work would remain in the UK, and AT&T have themselves pledged further monies for development, including investment in South Wales. If AT&T are prepared to make two offers within a reasonable space of time, it is likely that others also will up their offers or come into the bidding if they are encouraged to do so by the Government and BTG. Shouldn't we pursue this line to see if more players come in, and whether a better offer can be achieved?

2. Institutional funding and partial sale of the equity. There are dangers in pursuing this route. INMOS has always been a cash-hungry business, and is likely to remain so. It intends to rely on continually pushing forward the frontiers of technology, which requires major investments in R&D. The shelf life of each product it develops may be quite short, the competitive pressures build up quickly, and marketing has to be good to make money during the period of maximum popularity for the product.

   The institutional funding route is uncertain because:

   (a) The terms for raising money early this year may make it more difficult to raise money later on.

   (b) BTG would remain the main shareholder. It would therefore be the prime risk-carrier. The market for chips could fall. The transputer could disappoint. The dividing line between profit and loss is very thin. Development costs for the new range of products could escalate.

CONFIDENTIAL

(c) The institutions might become disheartened if the results were not satisfactory over the next few months, and this would make raising more money difficult.

We recommend:

1. You do not rule out the possibility of complete sale, even if the bidder is an overseas buyer. This could be the best answer.

2. AT&T do not want the transputer. Why couldn't this stay British? Several other UK firms have manufacturing and research capability.

3. Has anyone negotiated professionally with AT&T and other suitors in order to meet concerns about UK technology and employment?

4. Could the DTI tell us more about the other prospective bidders and their offers? We believe another major US corporation has also made an interesting offer.

5. Should not DTI spell out the financial risks of the institutional route more clearly? INOMS on their analysis needs £75 million more, a considerably larger sum than currently under discussion with institutions.

JOHN REDWOOD

COMMERCIAL IN CONFIDENCE

CABINET OFFICE,
WHITEHALL, LONDON SW1A 2AS

Chancellor of the Duchy of Lancaster

2 March 1984

file

Dear Norman,

INMOS

You asked for any reactions to your minute of ~~29~~ February to the Prime Minister.

INMOS estimated profits of £13.1 m - or £7.5 m after "contingencies" - for 1984 and £40.3 m for 1985. They are said to be "on target" for the £7.5 m profit.

It seems to me to be rather odd that the best offer that can be obtained for the Company is one of about £47 m. Is it possible to shed further light on this?

I am copying this letter to the other recipients of your minute.

Yours,
Arthur

COCKFIELD

The Rt Hon Norman Tebbit MP
Secretary of State for Trade
and Industry
Department of Trade and Industry
1 Victoria Street
London SW1H OET

COMMERCIAL IN CONFIDENCE

CONFIDENTIAL

file

BR

PRIME MINISTER

INMOS

Mr. Tebbit is seeking the views of colleagues on how to proceed with INMOS. He argues that the bid from AT & T is insufficient and suggests an alternative path of seeking institutional investors into INMOS which would dilute the Government's stake.

Policy Unit agree that the AT & T bid is insufficient but rather than proceed to an injection of funds from UK institutions, they think a more active search for buyers should be undertaken first.

Dr. Nicholson, however, supports the idea of institutional investment to create an independent UK company.

Do you wish to express a view at this stage? When colleagues have commented we may need a meeting.

Andrew Turnbull
2 March 1984

CONFIDENTIAL

INMOS file

Possibility of sale of INMOS to a US firm

Line to take

INMOS needs more money to capitalise on its trading success and develop further products, the company having moved into profit at the end of last quarter. New funds must come from the private sector, the taxpayer having met the start up costs. It is for the BTG, who own 75% of INMOS, to work with the company to raise this additional finance and they are having discussions with several interested parties at present. I very much hope finance will come from this country; INMOS' technology is important and our IT industry needs access to the sort of products it is developing.

/If pressed on AT & T. The BTG will consult us on where additional finance is to come from but we have had no proposals from them yet. Discussions are continuing with a number of people. In looking at any proposal, however, who owns the company is not the only consideration; of equal importance is what is being produced where./

BACKGROUND

Articles appeared in the Sunday Times on 5 February and the Financial Times on 6 February about the possibility of INMOS being sold to an American concern. The Sunday Times article contained several inaccuracies and implied that a decision had effectively been taken. This is not so. A revised offer from AT & T (which was higher than one made in January) was received at the end of last week but present indications are that it does not value the company as highly as other proposals being considered which would not involve control passing overseas. These proposals involve placing minority stakes with combinations of an American company, UK companies and financial institutions. A public offer for sale in the next 18 months has not been ruled out, and contrary to the Sunday Times, GEC have had ample opportunity to make an offer but have declined to do so even though they have received all the information supplied to others interested.

The Secretary of State for Trade and Industry has been briefed on the AT & T offer and will be seeing the company on 9 February. He will make it clear however that he is not there to negotiate on the terms of an offer; AT & T must pursue that with Sir Malcolm Wilcox, Chairman of INMOS and Board Member of BTG.

COMMERCIAL IN CONFIDENCE

JH 972

PRIME MINISTER

INMOS

When you agreed to the £10 million increase in INMOS' borrowing requirements in December you asked for a report on progress in finding a buyer. You said a special effort should be made to secure a British deal. I am now reporting where we stand.

INMOS' Present Position

2 Since December INMOS' trading position has continued to strengthen. Sales in November, December and January were above budget and on a rising trend, the current monthly rate being about £6m. Production is being built up at Newport, as it needs to be if the £97m sales target for the year is to be achieved, and improvements in yield there are ahead of plan. As a result this month Newport will for the first time ship more than 500,000 chips to assembly. The company as a whole has been in profit after interest since November, with profits also on a rising trend on target for the £7.5m profit before tax projected for 1984.

3 The company still needs substantial additional capital to finance further development. I referred in my minutes of 2 and 9 December to you of a figure of up to £75m, of which some £20m would need to be spent this year. That remains the position.

At the same time we want the BTG to dispose of its £65m investment in INMOS as soon as practicable or, if the raising of new capital for INMOS is the main priority, as I believe it must be, to have its 75% shareholding diluted to below 50% so that it is no longer standing behind INMOS' liabilities.

Outside Finance

4 In my minute to you of 2 December I referred to the interest being shown by AT&T (Western Electric). After having been told by Sir Malcolm Wilcox that the $40m they could offer for 100% of INMOS was unrealistic, AT&T put in a revised offer of $70m at the beginning of this month with an undertaking to provide $100m for further development of the company, particularly in South Wales. This was shortly before my own visit to the US, where I met the Chairman of AT&T International. He reaffirmed that his company were only interested in 100%. I entirely reserved the Government's position, pointing out that the sale of what is seen as an important UK technological capability for £30m less than the taxpayer had invested would be politically difficult, particularly at a time when the US Government was imposing its control on technology exports to overseas subsidiaries of US companies. Since then the BTG Board has rejected the offer as putting a much lower value on INMOS than other offers. But the AT&T option is not closed; it is up to them to come back with an improved offer. We would then need to consider the implications of allowing INMOS to pass into foreign ownership, in particular the restrictions this could impose on the free use and sale of

the products by UK equipment manufacturers and the damage to the Alvey programme which would be caused by the likely termination of the research work at Bristol into the transputer, in which AT&T have said they are not interested because they are already committed to a different path to the same objective. It would be difficult to dispose of the transputer work separately without access to the production facilities at Newport.

5 The reasons why I propose keeping the AT&T option open is that it has the obvious appeal of being firm, and getting the Government clear of INMOS. Moreover, for the long term INMOS needs the backing of a strong industrial company able to provide the finance that will undoubtedly be needed when the market for IC products is not as strong as it is now. The semiconductor business is one of feast and famine. That is why I am disappointed that UK industrial companies have not shown more interest, no doubt because most of them have their own sources of ICs whether in-house or external. After earlier discussions on the possibility of merging INMOS and one of their own companies MEDL, GEC made an offer in December for 51% of INMOS but were only prepared to pay a nominal sum, which they put at some £2-5m. On being told more serious offers were on the table, GEC have not pursued the matter. No other UK company has shown an interest in a majority stake, although some, including Sinclair, may take a minority position. In order to ensure that all the UK companies who could be interested in INMOS should have an opportunity at this moment to take a stake in the company, I have arranged for the BTG to write to the Chairmen concerned inviting proposals.

6 Although UK industrial companies have been slow to show interest I am encouraged by the prospect of growing financial support for INMOS from UK financial institutions. Hill Samuel have now put together a core of institutional investors who would be ready to invest £20m alongside an investment which Hill Samuel and Sir Malcolm Wilcox believe they can raise from US sources of £10-15m. The terms on which these funds would be raised would be at a price of £12 per share, which would impute a valuation of the company, before subscription of new equity, of between £80-90 million, nearly twice that set by AT&T. Hill Samuel believe that in addition to the £30-35m this would raise within the next two months they could attract a further £5-10m from other institutions outside the core group.

7 I have asked the BTG and Sir Malcolm Wilcox to pursue this route for raising further finance, allowing time for a response from the UK industrial companies. Whilst wanting them to proceed with this investigation as quickly as possible, I do not want to close the possibility of a revised offer from AT&T or from another US industrial company. I have also asked that the interest of European companies such as Siemens should be sounded out.

8 Institutional money of the sort now being investigated would not deal with the need for further funding which I referred to earlier. What I would hope, however, is that the additional institutional finance would make INMOS a more attractive

proposition for an investment by a major industrial company. I would expect the institutional financing to be followed by further investigations by the BTG and INMOS of US and European companies, if UK ones are still not interested, to see whether they would contemplate a minority stake or some form of joint venture. Alternatively, there could be a public offering of shares, possibly both in the UK and the US, after which it would be possible for the BTG to dispose of its residual shareholding. This would, however, not be possible until next year; and would not necessarily produce the sort of indepth backing that INMOS requires.

9 I do not find it easy to draw up the balance between the obvious appeal of AT&T, which is both certain and would take INMOS once and for all from our hands, and the less certain but potentially larger attraction of following the institutional route. I am persuaded, however, that it would be extremely difficult politically to defend a disposal of INMOS to AT&T, the present front-runner, against the expressed wishes of both INMOS and the BTG, for a price less than the past investment by the taxpayer, when we have an offer to finance its further development with UK money which involves no cost to the taxpayer, and which is likely to dilute the BTG's shareholding below 50%. I should be grateful if you, and others to whom I am copying this minute, could comment on whether you agree with my assessment. I shall report again once the investigations that are in hand produce a clearer picture. I fear, however, that we shall

shortly be faced with a difficult decision, with a placement with the institutions as the more likely course.

10 I am copying this minute to Members of E(A), and to Sir Robert Armstrong.

NT

N T

29 February 1984

Department of Trade and Industry

Ind Pol INMOS Pt2

CC PO

Prime Minister (2)

While X is right, we should not dwell over finding a buyer as suggested at Y

AT 13/12

No further possibilities may emerge now

CONFIDENTIAL

PRIME MINISTER

INMOS

You will know of the importance of the future of this company for all that we are trying to do to encourage economic development in Wales, and of my close involvement with it.

From all we hear, production at Newport is coming good, and therefore we may expect the prospects of a private sector sale or investment to improve with time. I therefore welcome the Chancellor of the Exchequer's willingness to increase INMOS's borrowing limit, rather than approve sale and leaseback of the assets at Colorado Springs. I am sure that would be the wrong message to send to potential purchasers, given our wish to find the right buyer at a good price.

But I also believe that it would be better not to set ourselves too tight a timetable at this stage. As the Chancellor and the Secretary of State point out, there are potential snags in both the GEC and the Western Electric approaches. I would prefer to allow time for other interesting possibilities to develop (such as those mentioned in paragraph 2 of Norman Tebbit's minute). On the assumption that Norman's proposal to increase the borrowing limit by £15 million would secure this, I would strongly support it. If we are going to give BTG time to manoeuvre we should make it adequate and not get ourselves too tightly boxed in.

... I am sending copies of this minute to other members of E(A) and to Sir Robert Armstrong.

13 December 1983

RNE

V.C.NO.

CONFIDENTIAL

Prime Minister (2)

Chancellor of the Duchy agrees a small increase in the borrowing limit provided search for a buyer starts in earnest. I have minuted to this effect.

AT 12/12

Chancellor of the Duchy of Lancaster

PRIME MINISTER

INMOS

1. If a sale is a serious possibility then I agree that it is better to give INMOS a bit more rope on the borrowing limit than to indulge in the sale and leaseback operation - particularly as it appears to be a bad bargain. I say this despite the fact that Norman Tebbit's present approach represents a complete volte face compared with the line we were taking in the summer.

2. But I do think the sloppy way INMOS handle and present their financial affairs is deplorable. Quite apart from their habit of plucking figures out the air, we have the sort of discrepancy which occurs over the £50 m to £75 m still required for development. Norman Tebbit's original minute of 2 December stated quite categorically in paragraph 3 that this was "needed ... next year". Paragraph 9 of his minute of 9 December says that this is needed "over the next two or three years": and later it "is not for expenditure in 1984". They appear also to be prepared to throw away some $3 m on the Colorado Springs lease-back just to keep it off the balance sheet.

3. It isn't good enough for INMOS to be "making and selling chips". They need to be making and selling chips at a profit. So far there haven't been any profits: only forecasts of profits which are then disappointed. I suppose someone somewhere is monitoring INMOS' profitability on a regular month by month basis.

4. But the most important thing is that the opportunity of disposing of INMOS in the light of the interest expressed by GEC and others should be pursued vigorously.

5. I am copying this to other members of E(A) and to Sir Robert Armstrong.

A.C.

A C 12 December 1983

(WD) pol.
Inmos Ltd

(2)

PRIME MINISTER

Two very interesting notes from Dr. Nicholson. I asked him whether INMOS technology was of such strategic importance that it was worth keeping in the UK. He thinks it is. This is not an objection to selling INMOS but points to trying to secure a UK deal.

On ICL, I minuted DTI after your meeting with Norman Tebbit to say that you thought it was important to maintain a computer capability in the UK provided ICL can stay competitive. Dr. Nicholson reaches the same conclusion in paragraph 9.

AT

9 December 1983

Ec Econ Pol, ICL, Pt 2

620

W.0830

PRIME MINISTER

INMOS and BT/ICL

Decisions on the sale of INMOS and the placing of the major BT contract for computer systems both relate to the UK's technological capability and the threat of American technological protectionism.

2. In the case of INMOS, it is a key semi-conductor component which can determine the competitiveness of a wide range of products made by the UK's IT industry.

3. In the case of BT's computers, what is at stake is the heart of the country's modern business and communications network and hence the supply of equipment to the many future users of this network.

4. The attachments to this minute give an indication of the strength of the technological argument in each case which needs to be balanced against the financial and general policy considerations.

RBN.

ROBIN B NICHOLSON
Chief Scientific Adviser

Cabinet Office
9 December 1983

INMOS

1. The true value of INMOS lies in the advanced and innovative designs for components which it has produced. From its early memory chips through to the recently-announced Transputer, these have combined design brilliance with state-of-the-art technology so as to be fully competitive with anything from the US or Japan. In the future, as effective design of such components becomes more and more related to the detailed fabrication processes involved, INMOS offers the opportunity to maintain a semiconductor design and manufacturing operation in the UK showing innovative skills unmatched by other UK component suppliers.

2. Availability of the latest, most sophisticated components, as Sir Clive Sinclair pointed out at your Seminar, is one of the keys to competitive products in the information industry. Just as the Uncommitted Logic Array, an advanced component of a previous generation, allowed his micro computers to be so successful, so INMOS innovations such as the Transputer itself may be the basis of future UK manufactured market-leaders. In addition, this versatile component could be of enormous importance to the development of parallel processing computers which are orders of magnitude more powerful than today's computers.

3. If, for commercial reasons, foreign semi-conductor producers only allow UK manufacturers the use of older, slower components for their products, because they retain the more advanced components for indigenous producers then UK products will become uncompetitive.

4. With its proven design capability, INMOS is thus important commercially to the UK. and if it passed to US control, the competitiveness of UK manufacturers of many IT products would be threatened.

5. However, the recent US restrictions on export of high technology raise the question of the potential strategic importance of INMOS.

Should US technological protectionism worsen, advanced components from a US-controlled INMOS could be amongst the first affected, with serious consequences for UK producers.

6. Thus there are both commercial and strategic reasons for preferring a UK-controlled INMOS but I recognise that there must be some limit to the price we are prepared to pay for this. However, I would take little comfort from any "guarantee" from a US purchaser - it would always be difficult to prove that the design capability and thus the competitive edge of the UK product was being deliberately eroded in favour of the US parent company.

Top Copy on Legal Procedure, November 1983 Conveyancing for Reward

PRIME MINISTER

Mr. Tebbit will be staying behind after Cabinet tomorrow to discuss:

(i) The solicitors' conveyancing monopoly. He seeks your guidance as to how far to push the issue, which will come to Cabinet next Thursday, 15 December (see the Policy Unit note and the Minutes of H Committee - Flag A);

(ii) He wants to give you an oral report on the complex of issues relating to BT/ICL, listed in my letter to his Private Office - see Flag B;

(iii) He also wants to raise a question of senior management in his Department. I believe he discussed this about six weeks ago and will be enquiring about progress. Unfortunately Sir Robert Armstrong will not be available;

(iv) He has minuted you on INMOS - see Flag C. He is suggesting additional funding for INMOS either in the form of an additional loan or an increase in its temporary borrowing ceiling. Lord Cockfield is extremely sceptical and would require more by way of justification. He also recommends that if any more money is put in, there should be a revision of the terms. Policy Unit are deeply sceptical and also suggest more information is required. I have not yet had the Treasury's response. I suggest you do not raise this until the Treasury have replied, but if Mr. Tebbit raises it, you should take the same line as Lord Cockfield.

AT

7 December 1983

CONFIDENTIAL

cc Mr. Mount
Mr. Redwood

MR. TURNBULL

INMOS

Mr. Tebbit's minute of 2 December raises some worrying questions. Before reaching any conclusion, we suggest that DTI explain:

1. Why has INMOS' trading performance this year been so far from plan, and why was it not intercepted earlier?

Mr. Wakeham's exhaustive investigation of last December foresaw a 1983 loss before interest and tax of £2.2 million. By June 1983, the actual loss was over four times greater than that (£9.5 million) and by September six times greater (£13.3 million).

2. Do INMOS need further funds now?

We understand that the company is not in immediate danger of reaching its borrowing limit. Rather, it wants funds to begin the 1984 capital investment programme. In our judgement, this requirement should put BTG under pressure to find a buyer for INMOS, not to look to Government for 'bridging finance' while negotiations proceed.

3. Why does INMOS need £50-£75 million for developments in 1984?

This is a major surprise. The Wakeham investigation envisaged no such sum in any year up to 1987. Indeed, the 1984 development requirements were estimated at £8.1 million for R and D and £10.2m for capital assets. If the need for £50-£75 million is real, the pressure on BTG to sell INMOS is even greater.

4. Are DTI and BTG taking a properly commercial approach to suitors for INMOS? Are they getting on with the job?

We do not see INMOS as of "increasing strategic importance" if that is thought to justify a non-commercial deal. The ideal buyer for INMOS should be familiar with the risks associated with the micro circuit industry, have the financial muscle to recover from setbacks and misjudgements, and be prepared to take the long view. We should not close the door on overseas purchasers if they are willing to preserve INMOS' expertise and manufacturing operation in the UK and offer an attractive price. Western Electric may qualify at least as well on all counts as GEC.

CONFIDENTIAL

The history of INMOS is a litany of missed targets. The business needs a lasting commercial solution to its problems in the form of a private sector owner. To raid public funds yet again while we pick over non-commercial issues is not an option we should entertain.

We recommend no increase in INMOS' borrowing limit until DTI answer the questions.

RY

ROBERT YOUNG
7 December 1983

PRIME MINISTER

INMOS

1. It would be helpful in judging the situation if we were given actual figures.

The loss for 1983 we are told "substantially exceeds that forecast a year ago". But the loss forecast a year ago is not stated, nor is the loss now expected for 1983. Annex A does not give profit figures but only something described as "PBIT" which for 1983 amounts to minus £11.8 million. After interest, the true loss must therefore have been pretty big. The sudden emergence of a profit before contingencies of £13.1 million for 1984 as shown in Annex A needs to be taken with a pinch of salt. It is very relevant to know how good a track record INMOS have for accurate forecasting.

2. There are other minor oddities. The last time we saw this the Colorado Springs facility was estimated to yield $16 m. This has now shrunk to $13 m. There is also some discrepancy between this $13 m and the £15 m which is said to be required if the Colorado Springs facility is not sold.

3. Finally and perhaps most importantly of all this is just like de Lorean ie the British Government puts in all the money and the American partners get the profit - or a very large slice of it. If we are to put in more money directly or by guarantee, there really ought to be a revision of the terms.

4. I am copying this minute to other members of E(A) and to Sir Robert Armstrong.

A C

7 December 1983

JF5016A

CONFIDENTIAL

PRIME MINISTER

INMOS

An unexpected difficulty has arisen in relation to INMOS. In general, the company has made the sort of progress hoped for when the decision was made to continue supporting it. From sales of £14m in 1982, it has now reached an annual rate of turnover of £60m, and achieved breakeven for the first time in October, in line with the last year's forecast. Although there remain risks (INMOS' production difficulties have prevented it meeting its potential and have increased the cost of its sales, so that its loss for the year substantially exceeds that forecast a year ago), the company seems to have turned the corner; even with substantial contingency provisions, it forecasts a profit next year of £7.5m. Annex A gives detailed figures.

2 As a result of this performance, private sector interest in INMOS has picked up sharply. Western Electric would like to take majority control but have not said yet what price they would pay or what they would do with the business. A Dutch company would provide $30m for ten per cent of the company on condition that an assembly plant were built in Holland. Another US company would subscribe for 17 per cent of the company provided two other investors came in on similar terms. Arnold Weinstock told me on Monday of his

interest: whereas previously he had been uninterested, he is now prepared to make an offer for it, I expect on the basis of a starting offer of a nominal cash payment with an agreement to pay royalties against future sales or a share of future profits.

3 These various offers expose a range of problems. We do not want to sell INMOS at a price which reflects its past rather than its future, and renders us liable to a charge of having disposed of an asset too cheaply. Of greater concern, I should not want to see INMOS taken over by a company which then simply broke it up, and sold out the assets, especially if the industrial capability and control were to be transferred to foreign hands. I see advantage in keeping INMOS in British hands, not least because INMOS is now of increasing strategic importance. The restrictions on the export of US technology have tightened since last year, and to sell out to a company such as Western Electric - who in any case manufacture integrated circuits for their own consumption already - could lose us an assured supply of products, important to a growing range of equipment manufacturers and service companies. To avoid this risk, some time is needed to ensure INMOS is transferred to new owners who will finance the substantial developments still needed (£50-75m next year) and not just break it up, possibly with control going outside the UK.

4 In the time needed for this, INMOS must be kept going. Although the company now expects to be paying its way on trading account, there is a substantial capital equipping programme early next year, for which the company will require further finance. The BTG have not asked for additional funding, but have proposed raising bridging finance to cover the period while they pursue negotiations with potential investors, through the sale and leaseback of the INMOS Colorado Springs facility. This would raise $13m without recourse back to the BTG/NEB. Although it is attractive on that score, it seems to me - and I believe also to Treasury Ministers who have discussed the matter with Sir Malcolm Wilcox, the UK Chairman - a poor tactic to pursue when trying to bring in a new investor; and to be on terms which are not particularly attractive. The alternative to this would be to agree a temporary increase of £15m in INMOS' borrowing ceiling, currently standing at just under £30m, to allow BTG time to pursue their negotiations with all the parties now showing interest.

5 I recognize that this choice is a difficult one, and should welcome views on which course you think we should pursue. I am sending copies of this minute to Members of E(A).

NT

9 December 1983

Department of Trade and Industry

Annex A

INMOS - 1983 PROGRESS

	1982			1983									Forecast 1984						
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Q1	Q2	Q3	Q4
les £m	1.6	1.9	1.7	1.5	1.7	2.1	1.8	1.9	2.4	2.4	2.9	4.2	5.1	5.3	5.9	17.2	20.0	25.4	35.1
BIT £m	(1.1)	(0.5)	(1.0)	(1.4)	(1.4)	(1.0)	(2.1)	(1.6)	(2.0)	(1.7)	(1.2)	(0.9)	-	0.3	1.2	1.4*	2.0*	3.9*	5.8*
nploy-nt																			
UK	269	275	275	280	286	311	351	397	433	455	519	549	584	625	645	708	841	995	1011
US	660	663	669	679	680	679	680	724	731	738	763	804	844	845	856	942	1047	1140	1197
fer tarts OOs																			
UK	1.9	2.2	2.2	0.6	1.6	2.4	2.9	2.6	3.2	3.6	4.0	3.6	5.4	7.4	5.8	30.7	36.1	41.6	52.6
US	9.7	9.0	6.9	8.4	7.3	8.2	8.8	11.2	11.1	11.9	13.1	11.3	14.1	13.5	11.5	38.5	40.0	45.3	48.9
nits to inished ods s	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.4	0.5	0.7	0.7	1.0	1.2	1.4	4.7	5.9	7.5	10.8

* £13.1m profit projection for 1983 has been reduced by provisions for contingencies to £7.5m.

INMOS International plc
Whitefriars
Lewins Mead
Bristol BS1 2NP
United Kingdom
(0272) 2[redacted]51
Telex 444723

cc: W.B. Willott
I.M. Barron
R. Selwood

Kenneth Baker, Esq., MP,
Minister of State for Industry
and Information Technology,
Department of Trade and Industry,
1 Victoria Street,
London. SW1H OET

31 October 1983

Dear Minister,

The Introduction of the Transputer

I felt you would like to know that we are tomorrow making a formal announcement of our plans to introduce the transputer which will be the first major VLSI product to be designed and destined to be manufactured wholly within the United Kingdom.

The transputer - now well into the development stage - is a programmable component containing a microprocessor together with memory and communications capability. It will have direct application in military telecommunication and commercial products and is expected to be highly competitive against any comparable American or Japanese device of which we have knowledge. Perhaps more important is the fact that a series of transputers has the unique quality of being capable of interconnection in such a way as to build more powerful concurrent systems, which opens the door to fifth generation applications.

The 32 bit version of the transputer will contain 250,000 transistors on a chip of 45 sq. mm and will be able to process over ten million instructions every second. To put this performance into context, an American manufacturer recently announced a 32 bit microprocessor which is capable of handling 1.2 million instructions per second.

We expect that we shall be producing the transputer in volume in 1985 and the reason for announcing it now is that it will give manufacturers ample time to incorporate it within the design of new products. To judge from the interest shown already, we believe that it will make a significant contribution to the UK electronics industry.

.../cont...2.

From the office of
the Chairman

Broad Street House
55 Old Broad Street
London EC2M 1RX
01-920 0141

I hope it will not be thought immodest if the company takes the view that this is an event of which the UK can be proud, as we believe it represents an important step in the enhancement of semiconductor design.

I am taking the liberty of sending a copy of this letter to the Secretary of State for Trade and Industry, believing that you would wish this and that such a move will be of convenience to all concerned.

Yours sincerely,

Malcolm Wilcox.

k

inmos

press release

INMOS International plc
Whitefriars
Lewins Mead
Bristol BS1 2NP
United Kingdom
(0272) 290861
Telex 444723

File

M/Forms
To see

(Please return to the Private Office)
Returned with thanks.
RJ
7/11/83

INMOS announces the transputer, a British superchip

From the office of
the Chairman

Broad Street House
55 Old Broad Street
London EC2M 1RX
01-920 0141

The transputer packs the power of a hundred home computers onto a single chip of silicon a quarter of an inch square.

It uses 250,000 transistors to form a processor as powerful as many mainframe computers, a large memory area and a sophisticated communication system to allow it to communicate with other chips and transputers.

The transputer offers a more powerful alternative to existing and planned microprocessors. Its simplicity of programming, and ease of connecting to other chips will make it attractive to system builders. Its extra processing power will make life easier for the users of devices such as word processors.

But what really sets the transputer apart from conventional microprocessors is its ability to be easily connected to other transputers to build very powerful computer systems, the so-called fifth generation systems. This concept of a programmable component, which can be used as an intelligent building brick, is basic to the design of the transputer and is what will be the key to the long term success of INMOS

The transputer was designed in the UK headquarters of INMOS and is and is a significant advance on products available in Japan or the US. It will be available in 1984, but users can already begin to develop applications through the occam programming system.

1 November 1983

For further information
please contact

Dick Selwood in Bristol

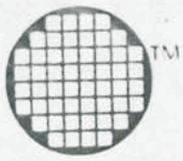
Notes to editors

1) The complexity of the circuitry can be compared to a street map of the Greater London area, which also shows gas mains, sewage systems, electricity and telephone networks. All this printed onto a quarter inch square of silicon.

2) To create such a complex device required developing an integrated set of computer based design tools. This system is widely regarded as the most advanced in the world

3) The Bristol design team which started with 20 people in 1978, now employs over 50 graduate engineers and computer scientists. This team, tiny by world standards, has already racked up an impressive list of success, with an advanced memory chip, the computer based design system, and occam, a programming language for the design and implementation of complex computer sytems.

4) The transputer is a family of products. Details of the first member of the family., a 32bit version called IMS T424 are attached. Also under development for early introduction are a 16 bit transputer a disc processor and a graphics processor. All transputer products are compatible and programs written for one transputer will run on any other transputer, current or future.



T424 Transputer

Processor memory and communications on single chip

32 bit system
10 MIPs throughput

Processor
Reduced instruction set for efficiency
High performance arithmetic

Memory
4 Kbytes on-chip
80 Mbytes/sec data rate

Memory interface
32 bit multiplexed interface for mixed memory systems
Direct address extends to 4 Gbyte
25 Mbytes/sec data rate

Peripheral interface
8 bit multiplexed interface
4 Mbytes/sec to industry standard devices

INMOS links
4 INMOS standard transputer to transputer links
1.5 Mbytes/sec data rate

Technology
250,000 devices
2 micron CMOS

Programming
Programmable in standard high level languages
Direct execution of occam for efficiency and concurrency

Refer to Hall

Suggested responses to q and A

What is a transputer

A transputer is a programmable component.

It is high performance device which has a microprocessor memory and a communication system integrated onto one silicon chip.

It is thus a high performance microprocessor, which is competitive with products to be announced by other companies, and which also has the unique ability that it is easily connected to other transputers to form more powerful systems.. (Fifth generation systems)

(Alternative way of putting it for a less technically sophisticated audience)
A Transputer is a microchip computer which packs the power of around 100 homecomputers onto a single chip of silicon.
This new British component will outperform anything that the Japanese or Americans have in production or under design.
Its immediate use is making systems easier to use (user friendly) and can be used anywhere where a conventional micro can be used.

When will it be available

Engineering samples during H2. 1984

Have you got prototypes

We have seen prototypes of all the constituents of the transputer. This has proved the design system, the process and the ideas behind the transputer concept.

How much will it cost

It is not our policy to predict pricing.
Since it has a very small chip size,(44 sqmm) particularly in comparison with other 32 bit processors we are confident it will be will competitively priced.

Where will it be made

As with all our products, the initial manufacture will be in the Colorado Springs facility.
Volume manufacture will as with all our products be at the most appropriate site.

Why have you taken so long to develop it
(alt How long has it taken to develop it)

It hasn't taken that long, particularly in comparison with some other projects. We have been concerned to get the basic architecture correct since the first products are setting the standards for the future.

We have been working on the transputer from the start of the activities at Bristol in 1979. During that time the same design centre has developed occam the INMOS CAD system and memory products

How many people have been working on the project

The design team was formed in 1979 with 20 people. It now has around 50.
The design team has also been responsible for the CAD layout and simulation work and of course all the occam work.

How much has it cost so far

The initial plans of the company budgeted around £5M for the design of the transputer. We are still within that budget.

Why did you make a memory chip

It is a memory particularly suited to microcomputer applications and also provides us with valuable experience of memory design.

Will you second source the transputer and if so to whom

We have seen considerable interest in second sourcing the transputer products but are not able to say anything yet.

What interest do you have so far

We have spoken to people, here in Europe and the US . They have all been very excited by the concepts.
We are not able to tell you in detail who we have spoken to, but one thing we can say is that we have been able to speak at an early date to significant UK companies.

Do you have any customers signed up

We don't have any committed customers yet. Our problem has been, however, not one of signing up customers, but keeping them at arms length, until we were able to give them full information which we are now able to do. Hence this announcement.

Who is the competition and why do you think you will succeed against them

The immediate competition must be Intel and Motorola. We are confident that the transputer

has significant advantages over anything coming from the US.
In the longer term we see the major competition as coming from Japan.

The advantages of ease of programming ease of communication, and ease of engineering, coupled with processing power should give us the ability to compete effectively.

How long will you be able to retain a significant lead

We don't currently know of anyone working in the same way as ourself. By being in first and by extending and exploiting the ideas,we will extend the extend the concept into silicon systems.

Where is it going to be used

The concept of a programmable component means that it will be widely applicable.
It is going to provide the user with significant advantages in any application where they would wish to use a 32 bit micro
We don't want to limit the sort of areas that the designer would consider, but the high performance means that it will be very effective in information processing and signal processing applications.

Is this going to be yet another British invention that is going to be exploited commercially by other countries

INMOS is doing its to best to ensure Britain will benefit from supplying the transputer
It is up to the UK Electronics industry to make sure it exploites this new British design in its products, and by being a British Company we have given them at least equal chance withthe rest of the world to see the transputer

If the transputer concept is so great why hasn't someone else done it before

Some one has to be first!
Britain has a good tradition of innovative cxomputer design.

Why can you program it only in occam

The Transputer has been designed to be extremely efficient in executing high level languages. We will be offering a selection including C Pascal and Fortran.
But for the most efficient development of software, and of course to

exploit concurrency and the compopnent nature of the transputer, there will be significant advantages in using occam.

Will you offer ADA

Yes, when there ios a compiler that has gained the confidence of the computing community.

Will you offer the instruction set

occam is seen as the lowest level we will offer, and provides efficiency at least comparable with many assemblers,

Which operating systems will you support

For many applications, particularly in real time, the transputer instruction set and occam make an operating system unnessecary.

For those people who rquire an operating system, it is possible to implement one (using occam!)

What is your attitude to third party software

Positive
We will be supplying source licences and encouraging its development.

Support products and when will they be available

We will be providing full support, and it is already possible, through the occm programming sytem to begin developing software for the transputer
The basic simplicity of this approach eases the users problems, and of course ease our support and training task

<u>peripheral chips</u>
Ther will be a full range of peripheral controllers in the transputer family.
At an early date there will be a disc processor and a graphics processor.

<u>development systems</u>
The occam programming system is the basis of the transputer development system. While full support for the transputer ill be available next year it is already possible to begin work on developing transputer applications.

<u>In circuit emulators</u>
Much of the work done by an ICE is unnessecary with the transputer since there is a high level of integration on chip.

What is the US involvement

The Colorado Springs Technology Center is the INMOS centre for process technology, and has developed the process which we need to make the transputer. They will also provide the initial manufacturing.

The transputer itself is totally designed in the UK

Ind Policy

file

TMP

APPOINTMENTS IN CONFIDENCE

bc JV

10 DOWNING STREET

From the Private Secretary

24 January 1983

Dear Caroline,

Thank you for your letter of 21 January, addressed to Tim Flesher, about the appointment of a new Chairman of INMOS.

The Prime Minister agrees to the appointment of Mr. Malcolm Wilcox to this post.

I am sending copies of this letter to John Kerr (HM Treasury), Adam Peat (Welsh Office), John Gieve (Chief Secretary's Office), Brian Fall (Foreign and Commonwealth Office), Andrew Hudson (Mr. Wakeham's Office, HM Treasury), John Sparrow (CPRS), Jeffrey Sterling (Department of Industry).

Yours sincerely,

Michael Scholar

Ms. Caroline Varley,
Department of Industry.

dg

APPOINTMENTS IN CONFIDENCE

cc JV

JH 677

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 3301
SWITCHBOARD 01-212 7676

Secretary of State for Industry

21 January 1983

Timothy Flesher Esq
Private Secretary to the
Prime Minister
10 Downing Street
London SW1

Prime Minister

Agree to Mr Wilcox as Chairman of INMOS, subject to any comments Sir R Armstrong may have.

MCS 21/1

Dear Tim,

In your letter to Jonathan Spencer of 29 December you said that the Prime Minister would like to be consulted about the appointment of a new Chairman of INMOS.

2 A number of names have been considered over the last week or two and in co-operation with the Department the BTG have made enquiries as to their suitability. As a result of these enquiries Sir Freddie Wood and the BTG Board have concluded that their preferred candidate is Mr Malcolm Wilcox, the former Chief Executive of the Midland Bank. In my Secretary of State's absence in the Far East, Mr Baker, after discussing it with Jeffrey Sterling, has given his support to this appointment and Sir Peter Carey has seen Mr Wilcox and established that he will be ready to take the chair of INMOS. With his background in the City, Mr Wilcox should have the ability to impose strong financial discipline within the company as well as to help with the critical task of raising private sector money later this year. As a Board member of the BTG (an appointment he may now need to relinquish) Mr Wilcox knows the background well and understands the need for close monitoring by the BTG of the public investment in INMOS. His time at the BTG has also given him an opportunity to get to know Dr Petritz and the other members of the INMOS Board, including the four non-executive members already appointed to the Board by the BTG.

3 The terms on which the £15 million will be made available to INMOS have now been settled and have been approved by Mr Wakeham, Mr Sparrow and Mr Sterling as well as by my Secretary of State. The funds will not, however, be released until the issue of the Chairmanship has been resolved. Dr Petritz is to be in this country for final discussions at the beginning of next week and I would be grateful if you could let me know by then if the Prime Minister is content for the BTG to appoint Mr Wilcox as Chairman of INMOS.

4 I am sending copies of this letter to those who received yours and also to Richard Hatfield in Sir Robert Armstrong's office.

Yours ever,

Caroline Varley

CAROLINE VARLEY
Private Secretary

4 I am sending copies of this letter to those who received yours and also to Richard Hatfield in Sir Robert Armstrong's office.

Yours ever,

Caroline Varley

CAROLINE VARLEY
Private Secretary

Med Pol

Inmos

Ind. Pol.

PA

MCS - The Prime Minister mentioned this today. You should see.

CDR 18/1

INMOS' PRODUCT STRATEGY

I understand there is no confusion, despite what the Press says. The plan for INMOS' factory at Newport was always that it would manufacture the 64K Dynamic RAM and have the relevant technology and production know-how transferred from the smaller pre-production plant at Colorado Springs. When the Newport factory was finished last spring, there were still teething problems over the production process for the 64K product and so the decision was taken for Newport to begin production with the established 16K static RAM.

The present position is that INMOS are satisfied the problems with the 64K product are over and that they are now able to revert to the plan to manufacture at Newport. I understand the INMOS Board decided to adjust its product strategy at its Board meeting last December. Decisions of this kind need to be endorsed by the British Technology Group which manages the taxpayers' majority investment in the company. The INMOS' decision is to be incorporated into its 1983 Annual Operating Plan which is to be submitted to the BTG in the next few weeks for joint agreement.

FINANCIAL TIMES

TUESDAY 18 JANUARY

Confusion over Inmos microchip strategy

By Guy de Jonquieres

THE FUTURE production strategy of Inmos, the UK microchip manufacturer which has obtained more than £100m in state backing, was thrown into confusion yesterday by apparently conflicting statements from the company and its principal shareholder, the British Technology Group (BTG).

Inmos said that it would start making its flagship product, a 64-K dynamic random access memory (DRAM), at its plant in Newport, South Wales, in February, three to four months earlier than planned.

The company also said that it no longer planned to step up output at Newport of its first product, a 16-K Static RAM, which is being made in limited volume at Newport and the company's U.S. factory in Colorado.

According to Inmos, these changes were recently approved by its full board with the knowledge of the BTG, which has been told of them before Christmas.

But this was flatly denied by the BTG, which said that the Inmos board still had to meet on the issue.

Inmos's announcement was nonetheless welcomed by officials at the Industry Department, which considers that the 64-K DRAM stands a better chance of finding a large world market than the more specialised 16-K SRAM, whose main applications are in defence electronics.

Inmos said that it had changed its production strategy because of major improvements achieved recently in producing its chip-making lines.

10 DOWNING STREET

From the Private Secretary

29 December, 1982.

Thank you for your letter of 24 December to Michael Scholar about INMOS which the Prime Minister has now seen. Mrs. Thatcher is content with the approach proposed by your Secretary of State provided that INMOS understands clearly that the additional finance is conditional on the appointment of a new Chairman. In this context she would like to see the names of the candidates the Secretary of State has in mind as soon as possible.

I am sending copies of this letter to John Kerr (HM Treasury), Adam Peat (Welsh Office), John Gieve (Chief Secretary's Office, HM Treasury), Brian Fall (Foreign and Commonwealth Office), Andrew Hudson (Mr. Wakeham's Office, HM Treasury), John Sparrow (CPRS), and Jeffrey Sterling (Department of Industry).

Timothy Flesher

Jonathan Spencer, Esq.,
Department of Industry.

cc JV

So long as it is understood that the money is conditional on a new chairman. What remedy do you suggest? NS.

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 3301
SWITCHBOARD 01-212 7676

JF2332
Secretary of State for Industry

24 December 1982

(2)

Prime Minister

To note X, which is not entirely consistent with your view but is, I think, defensible. MCS 24/12

Michael Scholar Esq
Private Secretary to the
Prime Minister
10 Downing Street
LONDON
SW1

Dear Michael,

INMOS

You wrote to me on 13 December, to convey the Prime Minister's agreement to the proposals in paragraphs 22 - 28 of Mr Wakeham's minute to her of 10 December, on the assumption that the proposal in paragraph 11 (about a British Chairman) is also agreed and implemented in step with the other decisions. I am writing to bring you up-to-date with developments since then.

2 My Secretary of State saw the Chairman of INMOS, Dr Petritz, on 17 December, to discuss the future of the INMOS chairmanship. He outlined to Dr Petritz the Government's decisions on the provision of additional finance to INMOS, and made it clear that they were conditional on Dr Petritz relinquishing the chairmanship (while retaining his other role as Chief Executive), in favour of a British Chairman. Dr Petritz was clearly disappointed at this news. He outlined INMOS' plan for raising further private sector finance over the next year or so, and said that he had a reputation in the United States for bringing new companies to the market successfully, and thought he was capable of doing the same for INMOS. But he was willing not to press the point. He did however stress that in relation to both INMOS' staff and its customers, it would be desirable to make no reference to a change in the chairmaship until it was possible to announce the name of his successor. My Secretary of State agreed that there was no need for the announcements on funding and chairmanship to be simultaneous, provided that Dr Petritz understood clearly that the question was one of timing and not of substance.

3 Against this background the BTG will respond to press enquiries about the provision of additional funding to INMOS in a low key fashion, once the terms have been agreed about the

dilution of the value of the shareholding held by the founders and employees. (This is likely to be in the first week of January). The BTG are handling the negotiations but are keeping in close touch with this Department about the progress they are making. A full announcement will be made at a later date about both the funding and the appointment of a new Chairman, for whom BTG are searching urgently.

4 I am sending copies of this letter to recipients of your letter of 13 December.

Yours sincerely,

Jonathan Spencer

J P SPENCER
Private Secretary

Ind. Pol : INMOS

P42

Ind Policy

File

CONFIDENTIAL

BF

bc: John Vereker

10 DOWNING STREET

From the Private Secretary

13 December 1982

INMOS

The Prime Minister has studied Mr. Wakeham's minute to her of 10 December.

She agrees to the proposals in paragraphs 22 - 28, on the assumption that that in paragraph 11, about a British Chairman, is also agreed and implemented in step with the other decisions.

I am sending copies of this letter to John Kerr (HM Treasury), Adam Peat (Welsh Office), John Gieve (Chief Secretary's Office, HM Treasury), Brian Fall (Foreign and Commonwealth Office), Andrew Hudson (Mr. Wakeham's Office, HM Treasury), John Sparrow (CPRS) and Jeffrey Sterling (Department of Industry).

M. C. SCHOLAR

Jonathan Spencer, Esq.,
Department of Industry

CONFIDENTIAL

No - I agree with the conclusions in paras 22-29 and with it in para 11 about Treasury chairmanship but I am unsatisfied on whether. Nig.

Prime Minister

Do you wish another meeting of the small group to consider this appraisal?

MCS 10/12

FROM : JOHN WAKEHAM

DATE : 10 December 1982

PRIME MINISTER

INMOS

Following your meeting with Geoffrey Howe, Patrick Jenkin, Nicholas Edwards and Robin Nicholson on 29 November, John Sparrow, Jeffrey Sterling and I met on 30 November and arranged for INMOS to give a presentation on 2 December.

2. We asked the company to concentrate on its prospects and financing requirements over the period 1983 and 1984, since it is in this period that the company's commercial viability should be demonstrated, now that it has launched the two major products on which its business rests. I commissioned three papers following this presentation. They .... are attached as annexes to this minute:

(a) A financial appraisal of the company with the emphasis on its immediate term financing requirements. This was carried out under Treasury chairmanship;

(b) An appraisal of the company's products and market prospects, incorporating an appraisal of the company's technological competitiveness by the CPRS.

(c) A report from Hill Samuel of their assessment of the company's ability to raise equity finance in 1983 and 1985.

3. You asked for an informed opinion about Hill Samuel's claim that private sector funding would be available in spring 1983 if certain conditions were met. We share their

judgement that private sector money is not available now and we cannot be sure Hill Samuel can raise money next year. This is a high risk venture operating in a very competitive sector at a time of world recession. On balance our judgement is that INMOS has reasonable prospects of success, and that this view will be taken by potential private sector investors.

4. The request to Government is for £15 million additional finance to see INMOS through to the point where its further financing requirements can be met from the market. The question we asked ourselves was whether providing this additional money and thereby seeing INMOS through a crucial stage of its development was the best way of protecting the Government's interest, or whether it would be better to decline to provide more money and see INMOS close.

5. Our view is that given the risks we have already taken and the size of our current investment it would make commercial sense to maintain the business. Putting in £15 million now will enable the Newport facility to be properly established at commercial production levels by the middle of next year. By then the Colorado plant presently breaking even will be generating profits. The company's value will be enhanced by this development, hopefully by at least the £15 million it will take to get the company to this stage.

6. However, we hope that putting in the extra £15 million will do more than simply enhance INMOS's break-up value. The object is to set it up on a viable basis so that it will yield a profit on the Governments original investment when we dispose of it. The appraisals suggest INMOS is a competent company with good products for which there is a growing market. Two reports by outside consultants have recently confirmed that the integrated circuit market has considerable growth potential and that INMOS products should be capable of being fully competitive.

7. I must emphasise that the figuring on which this assessment is based is subject to a range of uncertainties, some customarily attached to market forecasts of this kind while others are peculiar to this particular company. It would not be prudent to ignore these doubts. On the other hand, the financial projections include provision for under-achievement of sales and profit forecasts, so that even if the forecasts are not fully achieved there is a reasonably prospect that the proposed financial package will see the company through.

8. If INMOS is to succeed the next few months will be crucial. During this time the company will be transferring technology from the United States to this country, and the Newport facility will be built up to an economic level of production. The immediate problem is that the company is operating very close to its borrowing limit and needs another £15 million now to accomplish these tasks.

9. Our view is that there is a case for providing £15 million of additional finance to INMOS as soon as possible. The proposition you discussed on 29 November was that this should be in the form of further over-draft facilities, underwritten by the Government. But there may be a case for injecting money in the form of equity through the British Technology Group. The BTG has funds available for this purpose from disposal proceeds so there would be no extra call on public expenditure.

10. There are arguments in favour of both methods which are discussed in paragraphs 24-28. Our conclusion is that the case for equity is the stronger. As the Government will be taking the risk in providing support for the immediate period ahead it should get a return for doing this.

11. If we agreed to provide support through either route I think it would be important to secure the appointment of a new chairman who should be British, to reflect the change

in the balance of the company's activities. Up to now the company has been mainly concerned with product development but the emphasis is shifting towards technology transfer and mass production in the UK. While Dr Petritz - the present Chairman and Chief Executive - has done a good job up to now, I think the changing balance of the company's activities and its increasing UK orientation requires a change. We need someone to supervise more closely the UK end of the business and he must be British. It would also be helpful to have a British Chairman when it came to raising money for the company on the market. It will be for Sir Freddie Wood to find someone to take on this role. Dr Petritz should continue as Chief Executive. Obviously this is a delicate matter and will have to be handled tactfully and I suggest Patrick Jenkin be allowed a little flexibility in the way it is accomplished.

12. The remainder of this note develops the background and reasons for our conclusions and selection of options.

TECHNICAL AND MARKET APPRAISAL

13. The first issue is whether there is a case for continuing to support this company. The technical appraisal supports the conclusion that INMOS' latest sales and profit forecast for 1983 and 1984 have a sound basis in product terms. The main points to consider are:

(a) 90 per cent of projected revenue in 1983 and 80 per cent in 1984 is from sales of proven products;

(b) The current products are at the leading edge of technology and should be able to sustain premium prices;

(c) The advanced production facilities will allow further improvement in the current products over the next two years;

(d) INMOS has achieved the reductions in cost associated with economies derived from the learning process. Its US facility is already covering its manufacturing costs and its learning experience will be applied at Newport as it moves into volume production;

(e) INMOS has substantially achieved its original objectives. Admittedly there has been a one year delay; but this is not unusual in the industry, and its US facility is now operating close to full capacity. Some of the delay arose because INMOS sensibly anticipated competition by making their products more sophisticated, thereby enabling them to secure a firmer niche in the premium end of the market. The delay in our approving the second equity tranche in 1980 also slowed things down;

(f) Potential customers have been identified for 65 per cent of its sales in 1983 and 69 per cent in 1984.

14. These forecasts cannot, of course, be accepted without qualification. A great deal can go wrong, not perhaps so much at the technical stage at this juncture, although hereto unforeseen bugs could still appear, but more in the conditions of world demand and supply for these products. A major uncertainty concerns the timing and speed of US economic recovery, to which semi-conductor sales will be very sensitive. Another uncertainty is the size of their US Defence Department business. INMOS have done very well in securing orders from the Pentagon in so short a time. At the moment they are the single source for some products. However, it is the Pentagons policy to dual source where possible and so a proportion of these sales are at risk in the future. The company has made a reasonable allowance for this in its forward projections but there is always the risk that it will happen more quickly than they expect.

15. Finally, there is the risk, for which it is extremely difficult to provide a defence, that the company's very success might produce a tough response from its stronger and larger competitors. It could be driven out of business by companies prepared to use their financial muscle by predatory pricing.

FINANCIAL APPRAISAL

16. The financial appraisal based on the company's 1982 Corporate Plan concludes:

(a) the company's immediate problem arises because its borrowing limit is set in sterling but most of its borrowings are in dollars. This was a mistake given the financial circumstances of the company. The effect in this case is different from the effect of sterling depreciation which improves INMOS' revenue because most of its income is received in dollars. However, as most of the company's borrowings are in dollars setting the borrowing limit in sterling has the effect of reducing borrowing capacity when sterling depreciates. The limit was originally set at £35 million on the assumption of a $2 exchange rate. If it had remained at this level INMOS'total borrowings to date would be £20 million, giving sufficient headroom to get through 1983 until the hoped for equity issue could take place. The £10 million reduction in INMOS' borrowing capacity as a result of sterlings decline is the main cause of its current predicament. As a result INMOS is close to its borrowing limit and without more resources will run out of cash early in the New Year.

(b) But sterling's depreciation is not the only reason why INMOS needs more money. Even if sterling had remained at the parity assumed in INMOS' plan the

company would still need extra finance to build up capacity and train the workforce at Newport and to provide a contingency against risks. But, if sterling had not depreciated, this requirement would have been postponed - possibly until private sector equity could have been organised.

17. In assessing the company's financing requirements over the next 2 years it is prudent to allow for possible shortfalls in the revenue projections - smaller sales than expected, the need to accept lower prices than the company currently anticipate, or unexpected extra costs. The company's own assessment is that if all these risks come together they will add £20 million to cash needs by the end of 1984. This could be exceeded, but it would imply a pretty disastrous situation in the semi-conductor industry, with something like a collapse of the market. For example, if sales in 1983 and 1984 together are 15 per cent below forecast, the loss of revenue over the 2 years would be about £20 million, equivalent to the company's contingency provision. Half of the company's sales are in fairly buoyant sectors of the market and so escape the full effects of recession eg military, personal computers. A sales shortfall of £20 million would reflect a 30 per cent loss of business in the vulnerable end of INMOS' market.

18. Allowing for these risks, and adjusting the financial forecast to reflect the current exchange rate, the maximum requirement would be for an additional £36 million of finance up to the end of 1984 over the above the present £35 million borrowing ceiling. The table summarises the estimates for each year:

INMOS additional Financial Requirements 1983-84 (£m)

	1983	1984	Cumulative
Cash shortfall show in Corporate Plan	5.7	2.8	8.5
Effect of $1.60 exchange rate	8.4	-	8.4
Allowance for commercial risk	4.3	14.8	19.1
Total Additional Requirement	18.4	17.6	36.0

19. In fact, if events do start going badly INMOS would need to revise its general strategy, including its investment programme, to avoid a cash loss of this size. A detailed contingency plan to identify savings in such circumstances has not been prepared. But we believe that the £10 million planned expenditure at Newport in the first half of 1984, which is designed to expand output to full plant capacity, would be postponed if the company needed to conserve cash. Hence we take the view that a financing programme which envisages the injection of £15 million equity in the next week or so, so as to cover immediate needs, and a further £15 million new equity from private sources in the course of 1983 should be sufficient to finance the company until the end of 1984. By then, and in 1985, the company's Corporate Plan assumes that it will be generating cashflow from operations, on which basis the company should be commercially viable.

HILL SAMUEL ASSESSMENT

20. I find the Hill Samuel assessment of the prospects for an equity issue in 1983 somewhat disappointing, even allowing for the qualifications which a merchant banker will normally place on his judgement about future market prospects. However, our situation differs from that of Hill Samuel and our assessments of risk naturally reflect this. The Government has already put in £85 million and has that much to lose if INMOS closes. Hill Samuel have nothing to lose and must be expected to evaluate the risks from a more cautious viewpoint.

21. Hill Samuel remain confident that equity can be raised in 1983 but warn that this may not be until the summer. They say that a successful equity issue will depend on INMOS having demonstrated the viability of the 64K RAM product and having built up Newport to a reasonable level of production. Hill Samuel believe that the first condition can be met soon but that the second will take a few months. I believe that there are reasonable prospects that Newport will be established at economic production levels early next year, which will permit an equity issue during 1983.

CONCLUSIONS

22. INMOS remains a high risk venture. Its sales and profits forecasts could prove over-optimistic. While we see no reason to doubt that INMOS will be able to bring Newport into economic production reasonably quickly, things could still go wrong.

23. However, despite these risks and uncertainties, we have concluded that it would be wrong to allow INMOS to go out of business now. But if this is to be avoided further Government support is needed, and we believe that this should be provided for the following reasons:

(a) It was always envisaged that the initial R&D would be done in the United States where the technical competence was available, and in due course would be transferred to this country. INMOS has now reached the point where it is in fact transferring technology from the USA to Newport. If we refuse to provide support, the technology will not be transferred, and we will have provided £85 million to finance R&D in the United States. The INMOS operation is commercially attractive enough to be taken over by United States purchasers who will then benefit from the fruits of the research that this country has financed.

(b) Most of the new money would be spent in this country. The United States facility is breaking even, will generate cash next year, and will help finance the company as a whole. Money is needed now to finance the UK operation.

(c) If we withhold further support the company will close. The US facility could probably be sold, to a US or Japanese semi-conductor company, but the custom built Newport factory would be very difficult to sell. The design team would disperse, most likely to the United States. We may recover enough from

break up to pay off all its debts. At the most we may have £10 million left over. This would come to us but would be all that was left of the £50 million equity investment. We would have made a loss of £40m-£50 million on the investment and would lose the technology, developed with this money to the USA. On the other hand if we stay with INMOS its value is likely to be enhanced. We should then reap the benefits of disposal to the private sector. Hill Samuel's assessment is that the company will be worth about £200 million in 1985, at which time full privatisation should be possible.

METHODS OF PROVIDING SUPPORT

24. If we do stay with INMOS what is the best method of providing further support? We could do as the company and the BTG have asked and raise INMOS borrowing ceiling by £15 million to £50 million. This avoids an immediate call on the PSBR, but it would be a contingent liability. Moreover, although the Government would be adding to its exposure, it would have no prospect of receiving any return for assuming these additional risks. The benefits, which would flow from the company being brought up to commercial production, would accrue to the equity holders, including of course the BTG, but also the new equity investors mobilised by Hill Samuel.

25. We prefer the case for providing additional support in the form of equity. This route has two points to recommend it:

(i) If INMOS is given this opportunity to reach viability the Government would share in the benefits. As a consequence the value of the shareholding held by the founders and employees would be diluted.

(ii) But more important, if the company is financed by these means, instead of borrowing, its balance sheet and its credibility would improve and enhance

the prospects of a successful equity issue next year, and a successful flotation in due course.

26. Sir Freddie Wood has said publicly that he would be prepared to put more money into INMOS on commercial grounds. The BTG would be able to finance a further equity investment of £15 million out of proceeds already received from the sale of other holdings.

27. If we do decide to provide finance for INMOS by guaranteeing borrowing or providing equity it would be essential to put the sterling value of the ceiling onto a basis where it is not susceptible to future variations in the sterling/dollar exchange rate. Apart from this redefinition the existing ceiling will remain in place.

28. There are presentational difficulties in providing INMOS with any further finance. Ministers are on record as having said that no more support will be provided. Underwriting an increased borrowing limit is a slightly less visible way of providing backing. Direct money from BTG funds is more visible and may attract that much more attention. In fact there is no economic difference between assuming a contingent liability by underwriting loans and providing the money ourselves. But by providing equity we stand to gain a return for our risk and will strengthen the company's balance sheet, and thereby improve the prospects for eventual disposal at a profit.

29. I am sending copies of this minute and the attachments to Patrick Jenkin, Geoffrey Howe, Nicholas Edwards, Leon Brittan, Francis Pym, John Sparrow and Jeffrey Sterling.

JOHN WAKEHAM

IND. POLYNMOS: PiL

INMOS - FINANCIAL APPRAISAL

I Introduction

The BTG has asked the Government to approve a £15m increase in INMOS's existing borrowing limit of £35.3m. The additional money is needed to provide finance to keep the company going until additional equity can be raised from the private sector. Hill Samuel, INMOS's advisers, have said in a letter to the Government that £10m-£15m of private sector equity should be available in spring 1983 provided certain conditions are fulfilled in the meantime.

2. This financial appraisal reflects a presentation made by INMOS management to Mr Wakeham, Mr Sparrow (CPRS) and officials of the Department of Industry and Treasury on the morning of Thursday, 2 December. Officials continued more detailed discussions with the company in the course of the afternoon. Two further papers have been commissioned: a technical appraisal of the company's products and market outlook, prepared by Mr Davies of the CPRS, and a note from Hill Samuel on the prospects for raising private sector equity finance.

3. This paper:

(a) Describes INMOS's performance to date (Section II);

(b) Sets out the company's current financial situation (Section III);

(c) Summarises financial forecasts (Section IV);

(d) Considers how the company's cash needs arise in 1983 (Section V), 1984 (Section VI) and 1985 to 1987 (Section VII);

(e) Discusses the prospects for future private sector equity participation (Section VIII);

(f) Outlines the type of financing package that Hill Samuel say would be necessary to establish INMOS on a sound financial footing (Section IX).

II INMOS: Performance to Date

4. INMOS was established in 1978 with £25m of equity provided by the NEB. A further £25m followed in 1980. The company has also available £7m of RDGs and selective assistance grants. Borrowing facilities up to a ceiling of £35m are backed by a comfort letter from the BTG. These represent a contingent liability for HMG.

5. So far INMOS has spent £84m of these facilities as follows:

Table 1 Inmos Expenditure 1978-1982 (£M)

	USA	Bristol	Newport	Total
Fixed Assets	29	2.5	18.5	50
R & D	10	2.5	-	12.5
Working Capital & other Losses	17.5	1.5	2.5	21.5
Total	56.5	6.5	21.0	84.0

6. Accumulated losses of £39m are expected by the end of 1982. The 1980 plan, which was the basis on which the Government authorised the second equity payment, had forecast £4m of trading profits by 1982 on sales of £45m. In fact the company's latest forecast is for a trading loss of £17m and sales of £14m. The position to date is set out below against the forecasts made in the 1980 Plan.

TABLE 2. INMOS SALES AND INDUSTRY RESULTS 1978-82 (£m)

	1979	1980	1981		1982	
			1980 Plan	Outturn	1980 Plan	Outturn Forecast
Sales	-	-	9	2	45	(14)
Trading Results*	(2.5)	(8)	(8)	(16)	4	(17)

*Trading Results = Profits (Losses) before interest and tax.

7. INMOS say that the reason for the higher losses in that they slipped a year behind their production schedule. The launch of their second product 64K Dynamic RAM, was delayed to incorporate more sophisticated features to meet intensive competition. The delay in 1980 in approving the second equity tranche and certain production problems also contributed to the revenue slippage. Their latest forecasts, which are discussed in Section IV below predict a trading profit in the fourth quarter of 1983.

8. The effect of the losses has been to erode the company's equity base to an unsatisfactory level. By the year end net equity [original equity less accumulated losses] will be £11m compared with net debt of £31m. The company needs to rebuild its equity base in the near future if it is to survive.

III INMOS: CURRENT FINANCIAL SITUATION

9. INMOS's borrowing limit was set in 1980 at £35.3m in sterling terms. This figure was the maximum anticipated borrowing requirement postulated in the 1980 plan on the assumption of an exchange rate of $2. The exchange rate currently stands at about $1.6. Most of INMOS's borrowing is in dollars but its borrowing limit is set in sterling. Hence the fall in the exchange rate has, by increasing the sterling value of dollar borrowing, reduced INMOS's borrowing capacity.

10. There is commercial sense in INMOS borrowing in dollars. At present INMOS has gross dollar borrowings of $85.1m* which are backed by US assets with a book value of $61.1m. In addition more than 80 per cent of INMOS's revenue is in dollars. Dollar borrowing reduces the company's exposure to currency fluctuations. However, as noted above the combination of dollar borrowings and a borrowing limit set in sterling reduces borrowing headroom if sterling depreciates. The table below sets out INMOS's projected net borrowings at the end of 1982 on present forecasts but with varying exchange rate assumptions:

TABLE 3. INMOS NET BORROWING DECEMBER 1982

Exchange Rate ($ - £)	Expected Net Borrowing (£m)
2	20.2
1.85 ('82 Corp.Plan assumption)	23.7
1.7	27.8
1.6	31.0
1.5	34.5

*The £35.3m borrowing limit applies to net debt after deducting cash. INMOS has borrowing facilities of over $90m of which $45.5m are "back to back" loans from banks. The banks require INMOS to deposit sterling to cover, at current exchange rates, their drawings on the dollar back to back facilities. At present INMOS has dollar borrowing equivalent to about £53m, offset by sterling deposits of about £37m. In addition INMOS has sterling debt of about £17m, giving net borrowing of £31m.

11. The table shows that if the exchange rate remains at $1.6 for the rest of the year INMOS will have net borrowings of £31m, leaving £4.3m within the approved limit. A further fall would reduce their headroom still further.

12. As a consequence of the current tight position INMOS have had to curtail their plans to bring their Newport facility into full production, and have suspended recruitment. The current level of production is not economic, but Newport has sufficient physical facilities to move to a viable level of production by the end of 1983. The company's case for an increase in their borrowing limit is that additional money is needed now to enable it to bring the Newport facility into volume production.

IV SUMMARY OF INMOS FINANCIAL FORECASTS

13. Financial forecasts for INMOS for the years 1983 to 1987 are set out at Annex A. These are summarised in the table below, together with the current forecast for 1982.

Table 4 INMOS: FINANCIAL FORECASTS

	years ending 31 December				
	1982	1983	1984	1985	1986
	£m	£m	£m	£m	£m
Sales	14.5	42.5	95.5	141.0	182.0
Gross profit/(loss)	(5.7)	11.7	44.0	66.3	87.4
Research & development	4.5	5.5	8.1	12.7	16.4
Marketing/admin.	5.8	8.4	14.6	22.6	29.1
Operating profit/(loss)	(16.0)	(2.2)	21.3	31.0	41.9
As a % of sales:					
Gross profit/(loss)	(39)	28	46	47	48
R&D	31	13	8	9	9
Marketing/admin.	40	20	15	16	16
Operating profit/(loss)	(110)	(5)	22	22	23

14. The forecasts shown above are derived from the INMOS Long Range Plan 1982. These forecasts represent INMOS latest view of their future profit and loss performance. Forecasts for 1983 and 1984 have necessarily been prepared with a higher degree of confidence than those for later years. In contrast to the effect of the exchange rate on INMOS borrowing capacity the recent fall of the pound increases sterling value of sales and improves the competitiveness of Newport. The forecast reflect a dollar/sterling exchange rate of $1.85 to £1, and cost inflation at an annual rate of 10 per cent. Funding requirements, the need for further equity and the effects of the exchange rate being maintained at current levels are considered in the following sections of this paper.

15. The most important factor in the forecasts is whether INMOS can achieve its sales forecasts. Sales forecasts by product facility are set out at Annex B. In 1983 and 1984 two product facilities, the 16K static RAM and the 64K dynamic RAM account for over 90 per cent and over 80 per cent of sales respectively. These products are commercially proven; production of the 16K has started at Newport and the transfer of the 64K from US is proceeding smoothly.

16. An analysis of INMOS sales forecast for 1983 and 1984 is at Annex C. Quarterly sales forecasts and average prices are shown in the table below.

TABLE 5

INMOS: QUARTERLY SALES FORECASTS

for the years ended 31 December

	1982	1983				1984			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales (£m)	5.4	6.1	8.7	12.2	15.5	18.2	22.0	26.7	28.6
Average price(£)	11.33	5.00	4.61	4.14	3.99	3.77	3.64	3.38	2.98
Average price($) (£/$1.85)	19.26	9.25	8.53	7.66	7.38	6.97	6.73	6.25	5.51

17. Price competition is an area of particular risk for INMOS. The forecasts show a continuous nominal fall in the price of INMOS products, implying a more significant decline in real terms. This is characteristic of the industry. Average price achieved is influenced not only by competition but also by the mix of proudct, its performance, specification, and any special features it offers and the mix between distributor and direct customer sales. In the 16K market, unit prices of $7 to $9 have been assumed, which represent a significant reduction in average prices obtained in 1982 ($18 to $23) reflecting the reduction in costs from volume production and increased competition. This competition is beginning to come from Fujitsu with Hitachi and NEC yet to establish a market position; Intel have failed to enter this market and now buy from INMOS. INMOS has also, as has been previously reported, a dominant position in US military markets where a very high quality product is demanded and high prices can be achieved.

18. The 64K dynamic RAM market is more competitive than the 16K, with a greater number of competitors (the Japanese, Texas Instruments, Motorola and INMOS). This market emerged in 1982 (60 million units worldwide) and is expected to grow very rapidly through to 1986. It is predominantly directed at computer and industrial markets with less emphasis at present towards military sales. In order to minimise competitive pressure INMOS product strategy is directed to the high performance end of the market, where they have already achieved some success, and where the prices command premium prices of up to 40 per cent above average.

19. A further risk relates to sales volumes. INMOS have established a good customer base, and have achieved a measure of success in having their products designed into those of their customers. However the continued recession, particularly in the most important US market, has delayed the growth in demand for electronic equipment. The industry is still uncertain whether

demand overall will increase in 1983, although there is agreement that the 64K market growth will be very rapid (to the order of 200-250 million units). This gives some justification to INMOS argument that their sales achievement will not involve the displacement of other competitors; but overall the continued recession must be a worrying factor.

20. INMOS market share forecasts are around 50 per cent for the 16K family and 25 per cent for the 64K family.

21. Given the high capital intensity and high research and development costs, volume production has a critical effect on the economics of the industry. At Annex D is a table summarising the effects of volume and yield improvement (which is itself related to volume) on the facility at Newport. INMOS estimate that break-even* can be achieved at a production level of around 2500 wafers per week. The US facility has now achieved a break-even level and is moving towards covering the costs of the US research team and overheads early in 1983. Once reasonable production volumes have been achieved, as is the case in the US, cost reduction can be predicted with some confidence, barring unforeseen events such as machine failure or pollution in the clean room area.

22. Emphasis in the foregoing analysis has been towards the market risks rather than towards production and new product risks, as this seems more relevant to the 1983-1984 time frame. INMOS themselves have conducted a detailed statistical risk analysis of the risks discussed above. In the event of some or all of these risks crystalising, achievement of profit forecasts will be materially affected, but INMOS are confident that they have identified the maximum downside risk assuming the exchange rate does not significantly appreciate above $1.85. On this basis, the maximum downside risk to profit and cashflow is estimated to be £4-£5m in 1983 and £14-£15m in 1984, amounting in total to £20m over the next two years.

*gross profit contribution exceeding manufacturing costs.

23. To summarise, INMOS is without doubt in a high risk, price competitive, industry with volatile market conditions. It must further be recognised that the present capital structure, with its disproportionate imbalance towards debt, is also a competitive disadvantage. Its competitors are almost invariably on a sounder financial footing. Since the Plan was drawn up uncertainty over the volume of the market, particularly in 1983, has increased. Against this, INMOS will benefit from the improved competitiveness deriving from current exchange rates and lower levels of inflation, and better than planned production performance.

SECTION V INMOS: 1983 FINANCING REQUIREMENT

24. As noted in Table 3 above INMOS forecast their December 1982 borrowing level, at a dollar-sterling parity of 1.60, at £31m. On the basis of the parity used in the 1982 Plan ($1.85 = £1) the level would be £23.7m, some £3.8m less than the original plan figure of £27.5m (See Annex E).

25. The £3.8m underspend is ascribed to the rephasing of expenditure at Newport. As a consequence expenditure in 1983 needs to be higher than planned to bring the company back on course. The spending profile suggests a peak borrowing requirement of £41m in the third quarter of 1983, which would be £5.7m in excess of the current borrowing ceiling.

26. The flow of funds over this period which results in this position is set out in the table below:

TABLE 6 — 1983 Q1-Q3 funds flow

(based on Ø1.85=£1)	£m	£	
Operations			
Loss on operations	(4.8)		
Depreciation	4.9		
Net operations		0.1	
Financing			
Interest	(3.6)		
Grants/other	0.9		
Net financing		(2.7)	
Applications			
Fixed assets	(5.6)		
Working capital	(5.3)		
		(10.9)	
Net cash outflow		(13.5)	£m (Q1 7.5, Q2 4.8, Q3 1.2)
1982 underspend	(3.8)		
Year end borrowings (@ Ø1.85=£1)	(23.7)		
		(27.5)	
Borrowings at end of Q3 1983		(41.0)	

27. The Corporate Plan shows therefore, that the borrowing limit will have been breached by £5.7m at the end of Q3 1983. The actual outcome however will be dependent on two factors:

(a) dollar sterling exchange rate; and

(b) the impact on profit and loss account of variances on revenue and costs assumed in the Plan.

28. The company's estimate of the maximum increase in the current borrowing ceiling they would need if all these factors worked against them is £18.4m, as set out below:

TABLE 7	£m
Shortfall as shown by Corporate Plan	5.7
Exchange rate at $1.60 (ie the current rate is maintained)	8.4
Downside risks	4.3
Increase in borrowing over present limit	18.4

(A fall in the dollar-sterling parity to 1.50 would add a further £3.6m to this figure).

SECTION VI INMOS: 1984 FINANCING REQUIREMENTS

29. INMOS is expected to move marginally into profit in 1983 fourth quarter, and to generate profits on a rising scale thereafter. However there is a net cash outflow in the first half of 1984 as a result of the need to increase production capacity at Newport.

30. Cash flows in the first half of 1984 are as follows:

TABLE 8	£m
(Based on $1.85 = £1)	
Cash generated from operations	11.5
Expenditure on fixed assets	(10.2)
Increase in Working Capital	(5.8)
Net Cash outflow 1984 first half	(4.5)

31. The company's estimate of the increase in the borrowing ceiling they would need to the 1984 peak taking account of the 1983 peak requirements and possible futher requirements in 1984 is in the table below:

TABLE 9	£m
(Based on $1.60 = £1)	
1983 peak borrowing in excess of existing limit (as in Table 7)	18.4
1983 Q4 cash inflow	(1.7)
1984 Q1-Q2 cash outflow	4.5
1984 downside risks	14.8
Increase in borrowing over present limit	36.0

(A $1.50 = £1 parity would add a further £3-£4m to this figure)

32. Three caveats must be borne in mind when assessing the relevance of this figure of £36m.

(a) It assumes maximum product downside risk (cummulative £19.1m).

(b) It assumes no evasive action. For example, INMOS could defer or cancel their Newport expansion programme.

(c) No equity injection is assumed in these estimates.

SECTION VII INMOS: 1985-7 FINANCIAL REQUIREMENTS

33. The last half of 1984 shows INMOS with positive cash flow funds generated by operations exceeding working and fixed capital requirements. The cash surplus is forecast to amount to £6.9m (after allowing for movement on deferred grants).

34. The flow of funds in the longer term is summarised below. Forecast profit and loss accounts and balance sheets are attached at Annexes A and F. The Plan indicates significant net case generation after 1984.

TABLE 10

SUMMARY FUNDS FLOW £m (@ $1.85 = £1)

	1985	1986	1987
Operations			
Profit before tax	27.6	39.3	56.0
TAX	-	(10.3)	(20.0)
depreciation	7.8	11.5	15.8
deferred grants	(1.4)	(1.4)	(1.4)
Net operations after financing	34.0	39.1	50.4
Applications			
Fixed assets	(29.4)	(29.3)	(45.6)
Working capital	(10.2)	(8.6)	(11.4)
	(39.6)	(37.9)	(57.0)
Net cash in(out)flow	(5.6)	1.2	(6.6)

35. The high levels of working and fixed capital expenditure are based on the commencement of a further UK facility build up in 1985. If the company is on plan at this stage the fact that it is in a net cash outflow situation should not be a problem. It is shown as being extremely profitable and the raising of further external equity capital would be in prospect.

SECTION VIII INMOS: THE EQUITY REQUIREMENT

36. INMOS needs new equity for two reasons. First, without it the company could be technically insolvent in 1983, ie its liabilities will exceed its assets and it will have negative net equity. The banks continue to lend up to its borrowing ceiling because of the BTG's comfort letter, but this is not assured. By the year of 1982 its net equity as shown by the Plan is expected to have fallen to £10.9m. This figure assumes a $1.85 exchange rate.

Allowing for a $1.6 exchange rate and the downside risks net equity is forecast to be £2.4m at the end of 1983 Q1 and to have become negative at £0.9m by the middle of the year. New equity is needed to prevent this situation developing.

37. A further need for equity is to provide extra financial resources to see it through the peak in its financial requirements over the next two years. Sections V and VI above have established that a net increase in financial facilities of up to £18.4m is needed to get the company through 1983 and up to £36m to sustain it through 1984. For that reason an increase in borrowing facilities of £15m is not going to be enough.

38. Hill Samuel have argued that they should be able to raise new equity of £10m - £15m by Spring 1983. The peak borrowing requirement up to the end of Q2 1983 could amount to £48m. Hence the need to increase the borrowing ceiling by £15m.

39. Once this has been raised INMOS will need further financing, which should be in the form of equity, to cover additional financing needs until the company is able to generate cash. Section VI above put the maximum requirement for new facilities to cover the 1984 peak at £36m. This assumed:
(a) the second stage of Newport's expansion in the first half of 1984 goes ahead on schedule (b) maximum downside risk
(c) an exchange rate of $1.6.

40. It is doubtful whether the first two circumstances would coincide. If trading conditions worsen to such a degree that the £19m downside risk looks likely to arise the company could defer or scale down its plans to expand Newport. This could save about £10m in 1984, leaving a total requirement for new money of £25m.

41. Hence an equity injection of at least £10m and preferably £15m is needed as soon as possible, and by the end of Q2 1983 at the latest. The cash received through the equity issue would be used initially to reduce borrowing, but in time would be employed to finance the company's investment programme.

42. INMOS and Hill Samuel argue that the increase in the borrowing ceiling should be retained beyond the equity issue:

- first, so that the investment programme can be pursued;

- second, to avoid the company having to operate on a knife edge and with the rise of recurrent cash crises.

43. The Hill Samuel plan is that the 1983 issue would be followed in 1985 with a flotation. The money raised in 1983 together with the increase in borrowing facilities would enable INMOS to get into full production with good profit potential. This should enable a flotation in 1985 which would raise new money to finance the 1985-7 requirements and to begin to buy out the BTG.

SECTION IX POSSIBLE PACKAGE

44. Section V shows that on a $1.6 exchange rate and after a reasonable allowance for downside risk INMOS's likely peak borrowing requirement in 1983 could exceed its current ceiling by up to £18.4m. This peak is expected to be met in the third quarter of the year although this may slip if the company rephases capital expenditure.

45. INMOS therefore, requires additional financial resources of at least £18.4m some time in 1983. However, at least some of this will have to be equity or the company will be technically insolvent at some time in 1983.

46. Hill Samuel claim that £10m-£15m of private sector equity could be raised in the spring of 1983. But to achieve this they suggest the following package:

(a) An immediate increase in INMOS's borrowing ceiling from £35m to £50m. This would enable the company to meet expected cash outflows in the first half of 1983 and relieve the present extremely tight position. This additional borrowing would be from the banks and would be under-written by the BTG, adding further to the Government's exposure.

(b) The increase in the borrowing limit should be maintained after the new equity has been raised. This is necessary because £10m-£15m of new equity could be insufficient to finance the expected level of borrowing in 1983-84 over and above the present ceiling.

(c) Hill Samuel also argue for a way of protecting the company from periodic cash crises arising because of exchange rate fluctuations. Assuming the new

borrowing ceiling is set in sterling, they propose that it should be insulated from the effects of any exchange rate change from the current $1.60 level. If this is accepted this means that all dollar borrowing would be converted at $1.60 for the purpose of calculating the value in sterling of INMOS's use of the permissible borrowing facilities.

J.HALLIGAN (IA)
R.WILLIAMS (AP)
H. SCRIMGEOUR (DOI-IDU)

ANNEX A

Schedule F8

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
LONG RANGE OUTLOOK
PROFIT AND LOSS

	1981	1982	1983	1984	1985	1986	1987
SALES	2.1	14.5	42.5	95.5	141.0	182.0	236.0
SALES GROWTH	-	590	193	124	48	30	30
DIRECT MATERIAL	1.5	4.7	9.5	20.5	29.6	40.0	49.6
DIRECT MANUFACTURING COST	7.8	15.5	22.9	32.5	41.7	48.7	60.6
INDIRECT MANUFACTURING COST	2.0	2.4	3.3	4.1	7.0	10.9	14.1
INVENTORY	(.7)	(2.4)	(4.9)	(5.6)	(3.6)	(5.0)	(6.3)
MANUFACTURING COST	10.6	20.2	30.8	51.5	74.7	94.6	118.0
GPM	(8.5)	(5.7)	11.7	44.0	66.3	87.4	118.0
% SALES	-	(39.3)	27.5	46.0	47.0	48.0	50.0
ADMIN EXPENSE	3.1	3.5	4.2	6.4	10.7	13.7	17.8
MARKETING EXPENSE	1.0	2.3	4.2	8.2	11.9	15.4	20.0
RESEARCH AND DEVELOPMENT	3.3	4.5	5.5	8.1	12.7	16.4	21.2
TOTAL EXPENSE	7.4	10.3	13.9	22.7	35.3	45.5	59.0
% SALES	-	71.0	32.7	24.0	25.0	25.0	25.0
OI / (OE)	2.9	(1.7)	(3.7)	(3.8)	(3.4)	(2.6)	(3.0)
% SALES	-	(11.7)	(8.7)	(4.0)	(2.4)	(1.4)	(1.3)
PBT	(13.0)	(17.7)	(5.9)	17.5	27.6	39.3	56.0
% SALES	-	(122.0)	(13.8)	18.3	19.5	21.5	23.7
TAX	-	-	-	-	-	10.3	20.0
PAT	(13.0)	(17.7)	(5.9)	17.5	27.6	29.0	36.0
% SALES	-	(122.0)	(13.8)	18.3	19.5	16.0	15.2
ROA (After Notional Tax)	-	-	-	11.5	12.7	15.2	17.7

ANNEX B

Schedule 19

LONG RANGE OUTLOOK
SALES BY PRODUCT FAMILY

	1982		1983		1984		1985		1986		1987	
	£	%	£	%	£	%	£	%	£	%	£	%
MEMORY												
- Dynamic	.5	3.5	10.3	24.6	38.3	40.0	44.0	31.2	46.0	25.3	54.2	22.3
- Static	14.0	96.5	28.6	66.8	40.0	41.9	43.0	30.4	43.0	23.6	45.1	19.1
- Non-Volatile	-	-	3.1	7.4	8.4	8.8	36.0	25.7	47.0	26.1	52.4	22.9
Subtotal	14.5	100.0	42.0	98.8	86.7	90.7	123.0	87.3	136.0	75.0	151.7	64.3
LOGIC												
- MPU Components	-		-	-	6.8	7.1	11.5	8.2	21.0	11.5	30.3	12.8
- Systems	-		.5	1.2	2.0	2.2	6.0	4.3	16.2	9.0	31.0	13.1
- Other	-		-	-	-		.5	.2	6.5	3.5	15.0	6.3
Subtotal	-		.5	1.2	8.8	9.3	18.0	12.7	43.7	24.0	76.3	32.2
NEW BUSINESS									2.0	1.0	8.0	3.5
TOTAL	14.5	100.0	42.5	100.0	95.5	100.0	141.0	100.0	182.0	100.0	236.0	100.0

ANNEX C

1982 Long Range Plan

SUMMARY - Millions

	1983			1984		
PRODUCT	U	$	ASP	U	$	ASP
1400	3.5	30.5	8.70	5.5	36.2	6.57
1420	3.1	24.9	7.94	7.0	39.1	5.58
1600	.001	0.07	70.00	0.08	2.0	25.00
1620	.003	0.23	73.00	0.12	2.5	21.00
2600	2.5	17.6	7.05	10.0	52.5	5.25
2601	.004	0.05	12.00	0.3	2.1	7.00
2620	0.3	2.1	7.00	2.8	14.0	5.00
2630	0.1	0.8	8.00	1.0	6.0	6.00
2800	-	-	-	0.03	1.0	33.00
2820	-	-	-	0.01	0.5	50.00
3630	0.09	6.2	69.00	0.8	16.7	21.00
MEMORY TOTAL	9.6	82.5	8.59	27.6	172.6	6.25
Transputer Software	-	1.0	-	-	3.9	-
Hardware	-	-	-	.13	13.4	102.56
TRANSPUTER TOTAL		1.0			17.3	
TOTAL GROSS $		83.5			190.0	
RESERVE $		(4.9)			(13.0)	
NET $		78.6			177.0	
NET £		42.5			95.5	

ANNEX D

INMOS DUFFRYN.

UNIT COST

WAFER STARTS PER WEEK	500	2800	4200	6300	8400
	£	£	£	£	£
COST PER WAFER OUT	230	87	73	63	59
FINISHED GOODS COST					
PROBE YIELD					
25%	4.35	2.06	1.83	1.59	1.51
35%	3.26	1.61	1.51	1.26	1.21
45%	2.65	1.37	1.23	1.08	1.04
55%	2.26	1.21	1.10	0.98	0.94
65%	1.98	1.10	1.01	0.88	0.86

ANNEX E

Schedule 14

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
12 QUARTER SUMMARIZED BALANCE SHEET (£M)

	1982				1983				1984			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
GROSS FIXED ASSETS	44.8	47.4	49.6	49.3	51.8	53.8	54.9	56.0	62.0	66.2	68.2	70.8
DEPRECIATION	(4.1)	(5.0)	(6.3)	(7.3)	(8.7)	(10.2)	(12.2)	(14.1)	(15.8)	(17.8)	(19.9)	(22.0)
NET FIXED ASSETS	40.7	42.4	43.3	42.0	43.1	43.6	42.7	41.9	46.2	48.4	48.3	48.8
NET CURRENT ASSETS	(.7)	.4	2.2	3.6	5.4	8.0	9.0	9.6	12.8	15.5	16.8	19.3
TOTAL NET ASSETS	40.0	42.8	45.5	45.6	48.5	51.6	51.7	51.5	59.0	63.9	65.1	68.1
FINANCED BY:												
SHARE CAPITAL	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2
RETAINED EARNINGS	(28.4)	(33.2)	(36.5)	(39.2)	(43.3)	(45.5)	(46.6)	(45.1)	(42.7)	(38.5)	(33.1)	(27.6)
NET EQUITY	21.8	17.0	13.7	11.0	6.9	4.7	3.6	5.1	7.5	11.7	17.1	22.6
DEFERRED GRANTS	4.8	6.4	6.5	7.1	7.1	7.2	7.1	6.8	7.9	8.4	9.0	8.6
NET FINANCING (LESS CASH)	13.4	19.4	25.3	27.5	34.5	39.7	41.0 35 6m	39.6	43.6	43.8 5.3 8.1	39.0	36.9
TOTAL NET LIABILITY AND EQUITY	40.0	42.8	45.5	45.6	48.5	51.6	51.7	51.5	59.0	63.9	65.1	68.1

ANNEX F

Schedul[illegible]

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
LONG RANGE OUTLOOK
BALANCE SHEET

	1981	1982	1983	*1984	1985	1986	1987
FACILITIES	18.3	21.2	21.4	28.0	36.0	37.5	52.5
MANUFACTURING EQUIPMENT	13.9	21.8	27.5	41.2	54.2	78.0	103.6
OTHER EQUIPMENT	5.0	6.4	7.2	8.2	10.0	14.0	19.0
GROSS FIXED ASSETS	37.2	49.4	56.1	77.4	100.2	129.5	175.1
(ACCUMULATED DEPRECIATION)	(3.1)	(7.4)	(14.2)	(22.0)	(29.8)	(41.3)	(57.1)
NET FIXED ASSETS	34.1	42.0	41.9	55.4	70.4	88.2	118
CASH	14.0	3.9	0	25.3	17.5	13.7	7.1
NET CURRENT ASSETS	(1.7)	3.5	9.6	19.4	29.6	38.2	49.6
TOTAL ASSETS	46.4	49.4	51.5	100.1	117.5	140.1	174.7
SHARE CAPITAL	50.2	50.2	50.2	75.2	75.2	75.2	75.2
RETAINED EARNINGS	(21.7)	(39.3)	(45.2)	(27.6)	0	29.0	65.0
NET EQUITY	28.5	10.9	5.0	47.6	75.2	104.2	140.2
DEFERRED GRANTS	2.6	7.1	6.9	8.7	7.3	5.9	4.5
NET DEBT	15.3	31.4	39.6	43.8	35.0	30.0	30.0
EQUITY & LIABILITIES	46.4	49.4	51.5	100.1	117.5	140.1	174.7

*FOR THE LONG RANGE OUTLOOK, IT IS ASSUMED THAT £25M OF ADDITIONAL SHARE CAPITAL IS RAISED IN 1984 AND AN ADDITIONAL FACILITY STARTED

INMOS - FINANCIAL APPRAISAL

I Introduction

The BTG has asked the Government to approve a £15m increase in INMOS's existing borrowing limit of £35.3m. The additional money is needed to provide finance to keep the company going until additional equity can be raised from the private sector. Hill Samuel, INMOS's advisers, have said in a letter to the Government that £10m-£15m of private sector equity should be available in spring 1983 provided certain conditions are fulfilled in the meantime.

2. This financial appraisal reflects a presentation made by INMOS management to Mr Wakeham, Mr Sparrow (CPRS) and officials of the Department of Industry and Treasury on the morning of Thursday, 2 December. Officials continued more detailed discussions with the company in the course of the afternoon. Two further papers have been commissioned: a technical appraisal of the company's products and market outlook, prepared by Mr Davies of the CPRS, and a note from Hill Samuel on the prospects for raising private sector equity finance.

3. This paper:

(a) Describes INMOS's performance to date (Section II);

(b) Sets out the company's current financial situation (Section III);

(c) Summarises financial forecasts (Section IV);

(d) Considers how the company's cash needs arise in 1983 (Section V), 1984 (Section VI) and 1985 to 1987 (Section VII);

(e) Discusses the prospects for future private sector equity participation (Section VIII);

(f) Outlines the type of financing package that Hill Samuel say would be necessary to establish INMOS on a sound financial footing (Section IX).

II INMOS: Performance to Date

4. INMOS was established in 1978 with £25m of equity provided by the NEB. A further £25m followed in 1980. The company has also available £7m of RDGs and selective assistance grants. Borrowing facilities up to a ceiling of £35m are backed by a comfort letter from the BTG. These represent a contingent liability for HMG.

5. So far INMOS has spent £84m of these facilities as follows:

Table 1 Inmos Expenditure 1978-1982 (£M)

	USA	Bristol	Newport	Total
Fixed Assets	29	2.5	18.5	50
R & D	10	2.5	-	12.5
Working Capital & other Losses	17.5	1.5	2.5	21.5
Total	56.5	6.5	21.0	84.0

6. Accumulated losses of £39m are expected by the end of 1982. The 1980 plan, which was the basis on which the Government authorised the second equity payment, had forecast £4m of trading profits by 1982 on sales of £45m. In fact the company's latest forecast is for a trading loss of £17m and sales of £14m. The position to date is set out below against the forecasts made in the 1980 Plan.

TABLE 2. INMOS SALES AND INDUSTRY RESULTS 1978-82 (£m)

	1979	1980	1981		1982	
			1980 Plan	Outturn	1980 Plan	Outturn Forecast
Sales	-	-	9	2	45	(14)
Trading Results*	(2.5)	(8)	(8)	(16)	4	(17)

*Trading Results = Profits (Losses) before interest and tax.

7. INMOS say that the reason for the higher losses in that they slipped a year behind their production schedule. The launch of their second product 64K Dynamic RAM, was delayed to incorporate more sophisticated features to meet intensive competition. The delay in 1980 in approving the second equity tranche and certain production problems also contributed to the revenue slippage. Their latest forecasts, which are discussed in Section IV below predict a trading profit in the fourth quarter of 1983.

8. The effect of the losses has been to erode the company's equity base to an unsatisfactory level. By the year end net equity [original equity less accumulated losses] will be £11m compared with net debt of £31m. The company needs to rebuild its equity base in the near future if it is to survive.

III INMOS: CURRENT FINANCIAL SITUATION

9. INMOS's borrowing limit was set in 1980 at £35.3m in sterling terms. This figure was the maximum anticipated borrowing requirement postulated in the 1980 plan on the assumption of an exchange rate of $2. The exchange rate currently stands at about $1.6. Most of INMOS's borrowing is in dollars but its borrowing limit is set in sterling. Hence the fall in the exchange rate has, by increasing the sterling value of dollar borrowing, reduced INMOS's borrowing capacity.

10. There is commercial sense in INMOS borrowing in dollars. At present INMOS has gross dollar borrowings of $85.1m* which are backed by US assets with a book value of $61.1m. In addition more than 80 per cent of INMOS's revenue is in dollars. Dollar borrowing reduces the company's exposure to currency fluctuations. However, as noted above the combination of dollar borrowings and a borrowing limit set in sterling reduces borrowing headroom if sterling depreciates. The table below sets out INMOS's projected net borrowings at the end of 1982 on present forecasts but with varying exchange rate assumptions:

TABLE 3. INMOS NET BORROWING DECEMBER 1982

Exchange Rate ($ - £)	Expected Net Borrowing (£m)
2	20.2
1.85 ('82 Corp.Plan assumption)	23.7
1.7	27.8
1.6	31.0
1.5	34.5

*The £35.3m borrowing limit applies to net debt after deducting cash. INMOS has borrowing facilities of over $90m of which $45.5m are "back to back" loans from banks. The banks require INMOS to deposit sterling to cover, at current exchange rates, their drawings on the dollar back to back facilities. At present INMOS has dollar borrowing equivalent to about £53m, offset by sterling deposits of about £37m. In addition INMOS has sterling debt of about £17m, giving net borrowing of £31m.

11. The table shows that if the exchange rate remains at $1.6 for the rest of the year INMOS will have net borrowings of £31m, leaving £4.3m within the approved limit. A further fall would reduce their headroom still further.

12. As a consequence of the current tight position INMOS have had to curtail their plans to bring their Newport facility into full production, and have suspended recruitment. The current level of production is not economic, but Newport has sufficient physical facilities to move to a viable level of production by the end of 1983. The company's case for an increase in their borrowing limit is that additional money is needed now to enable it to bring the Newport facility into volume production.

IV SUMMARY OF INMOS FINANCIAL FORECASTS

13. Financial forecasts for INMOS for the years 1983 to 1987 are set out at Annex A. These are summarised in the table below, together with the current forecast for 1982.

Table 4 INMOS: FINANCIAL FORECASTS

	years ending 31 December				
	1982	1983	1984	1985	1986
	£m	£m	£m	£m	£m
Sales	14.5	42.5	95.5	141.0	182.0
Gross profit/(loss)	(5.7)	11.7	44.0	66.3	87.4
Research & development	4.5	5.5	8.1	12.7	16.4
Marketing/admin.	5.8	8.4	14.6	22.6	29.1
Operating profit/(loss)	(16.0)	(2.2)	21.3	31.0	41.9
As a % of sales:					
Gross profit/(loss)	(39)	28	46	47	48
R&D	31	13	8	9	9
Marketing/admin.	40	20	15	16	16
Operating profit/(loss)	(110)	(5)	22	22	23

14. The forecasts shown above are derived from the INMOS Long Range Plan 1982. These forecasts represent INMOS latest view of their future profit and loss performance. Forecasts for 1983 and 1984 have necessarily been prepared with a higher degree of confidence than those for later years. In contrast to the effect of the exchange rate on INMOS borrowing capacity the recent fall of the pound increases sterling value of sales and improves the competitiveness of Newport. The forecast reflect a dollar/sterling exchange rate of $1.85 to £1, and cost inflation at an annual rate of 10 per cent. Funding requirements, the need for further equity and the effects of the exchange rate being maintained at current levels are considered in the following sections of this paper.

15. The most important factor in the forecasts is whether INMOS can achieve its sales forecasts. Sales forecasts by product facility are set out at Annex B. In 1983 and 1984 two product facilities, the 16K static RAM and the 64K dynamic RAM account for over 90 per cent and over 80 per cent of sales respectively. These products are commercially proven; production of the 16K has started at Newport and the transfer of the 64K from US is proceeding smoothly.

16. An analysis of INMOS sales forecast for 1983 and 1984 is at Annex C. Quarterly sales forecasts and average prices are shown in the table below.

TABLE 5

INMOS: QUARTERLY SALES FORECASTS

for the years ended 31 December

	1982	1983				1984			
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Sales (£m)	5.4	6.1	8.7	12.2	15.5	18.2	22.0	26.7	28.6
Average price(£)	11.33	5.00	4.61	4.14	3.99	3.77	3.64	3.38	2.98
Average price($) (£/$1.85)	19.26	9.25	8.53	7.66	7.38	6.97	6.73	6.25	5.51

17. Price competition is an area of particular risk for INMOS. The forecasts show a continuous nominal fall in the price of INMOS products, implying a more significant decline in real terms. This is characteristic of the industry. Average price achieved is influenced not only by competition but also by the mix of proudct, its performance, specification, and any special features it offers and the mix between distributor and direct customer sales. In the 16K market, unit prices of $7 to $9 have been assumed, which represent a significant reduction in average prices obtained in 1982 ($18 to $23) reflecting the reduction in costs from volume production and increased competition. This competition is beginning to come from Fujitsu with Hitachi and NEC yet to establish a market position; Intel have failed to enter this market and now buy from INMOS. INMOS has also, as has been previously reported, a dominant position in US military markets where a very high quality product is demanded and high prices can be achieved.

18. The 64K dynamic RAM market is more competitive than the 16K, with a greater number of competitors (the Japanese, Texas Instruments, Motorola and INMOS). This market emerged in 1982 (60 million units worldwide) and is expected to grow very rapidly through to 1986. It is predominantly directed at computer and industrial markets with less emphasis at present towards military sales. In order to minimise competitive pressure INMOS product strategy is directed to the high performance end of the market, where they have already achieved some success, and where the prices command premium prices of up to 40 per cent above average.

19. A further risk relates to sales volumes. INMOS have established a good customer base, and have achieved a measure of success in having their products designed into those of their customers. However the continued recession, particularly in the most important US market, has delayed the growth in demand for electronic equipment. The industry is still uncertain whether

demand overall will increase in 1983, although there is agreement that the 64K market growth will be very rapid (to the order of 200-250 million units). This gives some justification to INMOS argument that their sales achievement will not involve the displacement of other competitors; but overall the continued recession must be a worrying factor.

20. INMOS market share forecasts are around 50 per cent for the 16K family and 25 per cent for the 64K family.

21. Given the high capital intensity and high research and development costs, volume production has a critical effect on the economics of the industry. At Annex D is a table summarising the effects of volume and yield improvement (which is itself related to volume) on the facility at Newport. INMOS estimate that break-even* can be achieved at a production level of around 2500 wafers per week. The US facility has now achieved a break-even level and is moving towards covering the costs of the US research team and overheads early in 1983. Once reasonable production volumes have been achieved, as is the case in the US, cost reduction can be predicted with some confidence, barring unforeseen events such as machine failure or pollution in the clean room area.

22. Emphasis in the foregoing analysis has been towards the market risks rather than towards production and new product risks, as this seems more relevant to the 1983-1984 time frame. INMOS themselves have conducted a detailed statistical risk analysis of the risks discussed above. In the event of some or all of these risks crystalising, achievement of profit forecasts will be materially affected, but INMOS are confident that they have identified the maximum downside risk assuming the exchange rate does not significantly appreciate above $1.85. On this basis, the maximum downside risk to profit and cashflow is estimated to be £4-£5m in 1983 and £14-£15m in 1984, amounting in total to £20m over the next two years.

*gross profit contribution exceeding manufacturing costs.

23. To summarise, INMOS is without doubt in a high risk, price competitive, industry with volatile market conditions. It must further be recognised that the present capital structure, with its disproportionate imbalance towards debt, is also a competitive disadvantage. Its competitors are almost invariably on a sounder financial footing. Since the Plan was drawn up uncertainty over the volume of the market, particularly in 1983, has increased. Against this, INMOS will benefit from the improved competitiveness deriving from current exchange rates and lower levels of inflation, and better than planned production performance.

SECTION V INMOS: 1983 FINANCING REQUIREMENT

24. As noted in Table 3 above INMOS forecast their December 1982 borrowing level, at a dollar-sterling parity of 1.60, at £31m. On the basis of the parity used in the 1982 Plan ($1.85 = £1) the level would be £23.7m, some £3.8m less than the original plan figure of £27.5m (See Annex E).

25. The £3.8m underspend is ascribed to the rephasing of expenditure at Newport. As a consequence expenditure in 1983 needs to be higher than planned to bring the company back on course. The spending profile suggests a peak borrowing requirement of £41m in the third quarter of 1983, which would be £5.7m in excess of the current borrowing ceiling.

26. The flow of funds over this period which results in this position is set out in the table below:

TABLE 6 — 1983 Q1-Q3 funds flow

(based on $1.85=£1)	£m	£
Operations		
Loss on operations	(4.8)	
Depreciation	4.9	
Net operations		0.1
Financing		
Interest	(3.6)	
Grants/other	0.9	
Net financing		(2.7)
Applications		
Fixed assets	(5.6)	
Working capital	(5.3)	
		(10.9)
Net cash outflow		(13.5)
1982 underspend	(3.8)	
Year end borrowings (@ $1.85=£1)	(23.7)	
		(27.5)
Borrowings at end of Q3 1983		(41.0)

	£m
(Q1	7.5
(Q2	4.8
(Q3	1.2

27. The Corporate Plan shows therefore, that the borrowing limit will have been breached by £5.7m at the end of Q3 1983. The actual outcome however will be dependent on two factors:

(a) dollar sterling exchange rate; and

(b) the impact on profit and loss account of variances on revenue and costs assumed in the Plan.

28. The company's estimate of the maximum increase in the current borrowing ceiling they would need if all these factors worked against them is £18.4m, as set out below:

TABLE 7	£m
Shortfall as shown by Corporate Plan	5.7
Exchange rate at $1.60 (ie the current rate is maintained)	8.4
Downside risks	4.3
Increase in borrowing over present limit	18.4

(A fall in the dollar-sterling parity to 1.50 would add a further £3.6m to this figure).

SECTION VI INMOS: 1984 FINANCING REQUIREMENTS

29. INMOS is expected to move marginally into profit in 1983 fourth quarter, and to generate profits on a rising scale thereafter. However there is a net cash outflow in the first half of 1984 as a result of the need to increase production capacity at Newport.

30. Cash flows in the first half of 1984 are as follows:

TABLE 8 £m

(Based on $1.85 = £1)	
Cash generated from operations	11.5
Expenditure on fixed assets	(10.2)
Increase in Working Capital	(5.8)
Net Cash outflow 1984 first half	(4.5)

31. The company's estimate of the increase in the borrowing ceiling they would need to the 1984 peak taking account of the 1983 peak requirements and possible futher requirements in 1984 is in the table below:

TABLE 9 £m

(Based on $1.60 = £1)	
1983 peak borrowing in excess of existing limit (as in Table 7)	18.4
1983 Q4 cash inflow	(1.7)
1984 Q1-Q2 cash outflow	4.5
1984 downside risks	14.8
Increase in borrowing over present limit	36.0

(A $1.50 = £1 parity would add a further £3-£4m to this figure)

32. Three caveats must be borne in mind when assessing the relevance of this figure of £36m.

(a) It assumes maximum product downside risk (cummulative £19.1m).

(b) It assumes no evasive action. For example, INMOS could defer or cancel their Newport expansion programme.

(c) No equity injection is assumed in these estimates.

SECTION VII INMOS: 1985-7 FINANCIAL REQUIREMENTS

33. The last half of 1984 shows INMOS with positive cash flow funds generated by operations exceeding working and fixed capital requirements. The cash surplus is forecast to amount to £6.9m (after allowing for movement on deferred grants).

34. The flow of funds in the longer term is summarised below. Forecast profit and loss accounts and balance sheets are attached at Annexes A and F. The Plan indicates significant net case generation after 1984.

TABLE 10

SUMMARY FUNDS FLOW £m (@ $1.85 = £1)

	1985	1986	1987
Operations			
Profit before tax	27.6	39.3	56.0
TAX	-	(10.3)	(20.0)
depreciation	7.8	11.5	15.8
deferred grants	(1.4)	(1.4)	(1.4)
Net operations after financing	34.0	39.1	50.4
Applications			
Fixed assets	(29.4)	(29.3)	(45.6)
Working capital	(10.2)	(8.6)	(11.4)
	(39.6)	(37.9)	(57.0)
Net cash in(out) flow	(5.6)	1.2	(6.6)

35. The high levels of working and fixed capital expenditure are based on the commencement of a further UK facility build up in 1985. If the company is on plan at this stage the fact that it is in a net cash outflow situation should not be a problem. It is shown as being extremely profitable and the raising of further external equity capital would be in prospect.

SECTION VIII INMOS: THE EQUITY REQUIREMENT

36. INMOS needs new equity for two reasons. First, without it the company could be technically insolvent in 1983, ie its liabilities will exceed its assets and it will have negative net equity. The banks continue to lend up to its borrowing ceiling because of the BTG's comfort letter, but this is not assured. By the year of 1982 its net equity as shown by the Plan is expected to have fallen to £10.9m. This figure assumes a $1.85 exchange rate.

Allowing for a $1.6 exchange rate and the downside risks net equity is forecast to be £2.4m at the end of 1983 Q1 and to have become negative at £0.9m by the middle of the year. New equity is needed to prevent this situation developing.

37. A further need for equity is to provide extra financial resources to see it through the peak in its financial requirements over the next two years. Sections V and VI above have established that a net increase in financial facilities of up to £18.4m is needed to get the company through 1983 and up to £36m to sustain it through 1984. For that reason an increase in borrowing facilities of £15m is not going to be enough.

38. Hill Samuel have argued that they should be able to raise new equity of £10m - £15m by Spring 1983. The peak borrowing requirement up to the end of Q2 1983 could amount to £48m. Hence the need to increase the borrowing ceiling by £15m.

39. Once this has been raised INMOS will need further financing, which should be in the form of equity, to cover additional financing needs until the company is able to generate cash. Section VI above put the maximum requirement for new facilities to cover the 1984 peak at £36m. This assumed:
(a) the second stage of Newport's expansion in the first half of 1984 goes ahead on schedule (b) maximum downside risk
(c) an exchange rate of $1.6.

40. It is doubtful whether the first two circumstances would coincide. If trading conditions worsen to such a degree that the £19m downside risk looks likely to arise the company could defer or scale down its plans to expand Newport. This could save about £10m in 1984, leaving a total requirement for new money of £25m.

41. Hence an equity injection of at least £10m and preferably £15m is needed as soon as possible, and by the end of Q2 1983 at the latest. The cash received through the equity issue would be used initially to reduce borrowing, but in time would be employed to finance the company's investment programme.

42. INMOS and Hill Samuel argue that the increase in the borrowing ceiling should be retained beyond the equity issue:

- first, so that the investment programme can be pursued;

- second, to avoid the company having to operate on a knife edge and with the rise of recurrent cash crises.

43. The Hill Samuel plan is that the 1983 issue would be followed in 1985 with a flotation. The money raised in 1983 together with the increase in borrowing facilities would enable INMOS to get into full production with good profit potential. This should enable a flotation in 1985 which would raise new money to finance the 1985-7 requirements and to begin to buy out the BTG.

SECTION IX POSSIBLE PACKAGE

44. Section V shows that on a $1.6 exchange rate and after a reasonable allowance for downside risk INMOS's likely peak borrowing requirement in 1983 could exceed its current ceiling by up to £18.4m. This peak is expected to be met in the third quarter of the year although this may slip if the company rephases capital expenditure.

45. INMOS therefore, requires additional financial resources of at least £18.4m some time in 1983. However, at least some of this will have to be equity or the company will be technically insolvent at some time in 1983.

46. Hill Samuel claim that £10m-£15m of private sector equity could be raised in the spring of 1983. But to achieve this they suggest the following package:

(a) An immediate increase in INMOS's borrowing ceiling from £35m to £50m. This would enable the company to meet expected cash outflows in the first half of 1983 and relieve the present extremely tight position. This additional borrowing would be from the banks and would be under-written by the BTG, adding further to the Government's exposure.

(b) The increase in the borrowing limit should be maintained after the new equity has been raised. This is necessary because £10m-£15m of new equity could be insufficient to finance the expected level of borrowing in 1983-84 over and above the present ceiling.

(c) Hill Samuel also argue for a way of protecting the company from periodic cash crises arising because of exchange rate fluctuations. Assuming the new

borrowing ceiling is set in sterling, they propose that it should be insulated from the effects of any exchange rate change from the current $1.60 level. If this is accepted this means that all dollar borrowing would be converted at $1.60 for the purpose of calculating the value in sterling of INMOS's use of the permissible borrowing facilities.

J.HALLIGAN (IA)
R.WILLIAMS (AP)
H. SCRIMGEOUR (DOI-IDU)

ANNEX A

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
LONG RANGE OUTLOOK
PROFIT AND LOSS

	1981	1982	1983	1984	1985	1986	1987
SALES	2.1	14.5	42.5	95.5	141.0	182.0	236.0
SALES GROWTH	-	590	193	124	48	30	30
DIRECT MATERIAL	1.5	4.7	9.5	20.5	29.6	40.0	49.6
DIRECT MANUFACTURING COST	7.8	15.5	22.9	32.5	41.7	48.7	60.6
INDIRECT MANUFACTURING COST	2.0	2.4	3.3	4.1	7.0	10.9	14.1
INVENTORY	(.7)	(2.4)	(4.9)	(5.6)	(3.6)	(5.0)	(6.3)
MANUFACTURING COST	10.6	20.2	30.8	51.5	74.7	94.6	118.0
GPM	(8.5)	(5.7)	11.7	44.0	66.3	87.4	118.0
% SALES	-	(39.3)	27.5	46.0	47.0	48.0	50.0
ADMIN EXPENSE	3.1	3.5	4.2	6.4	10.7	13.7	17.8
MARKETING EXPENSE	1.0	2.3	4.2	8.2	11.9	15.4	20.0
RESEARCH AND DEVELOPMENT	3.3	4.5	5.5	8.1	12.7	16.4	21.2
TOTAL EXPENSE	7.4	10.3	13.9	22.7	35.3	45.5	59.0
% SALES	-	71.0	32.7	24.0	25.0	25.0	25.0
OI / (OE)	2.9	(1.7)	(3.7)	(3.8)	(3.4)	(2.6)	(3.0)
% SALES	-	(11.7)	(8.7)	(4.0)	(2.4)	(1.4)	(1.3)
PBT	(13.0)	(17.7)	(5.9)	17.5	27.6	39.3	56.0
% SALES	-	(122.0)	(13.8)	18.3	19.5	21.5	23.7
TAX	-	-	-	-	-	10.3	20.0
PAT	(13.0)	(17.7)	(5.9)	17.5	27.6	29.0	36.0
% SALES	-	(122.0)	(13.8)	18.3	19.5	16.0	15.2
ROA (After Notional Tax)	-	-	-	11.5	12.7	15.2	17.7

ANNEX B

Schedule 19

LONG RANGE OUTLOOK
SALES BY PRODUCT FAMILY

	1982		1983		1984		1985		1986		1987	
	£	%	£	%	£	%	£	%	£	%	£	%
MEMORY												
- Dynamic	.5	3.5	10.3	24.6	38.3	40.0	44.0	31.2	46.0	25.3	54.2	22.3
- Static	14.0	96.5	28.6	66.8	40.0	41.9	43.0	30.4	43.0	23.6	45.1	19.1
- Non-Volatile	-	-	3.1	7.4	8.4	8.8	36.0	25.7	47.0	26.1	52.4	22.9
Subtotal	14.5	100.0	42.0	98.8	86.7	90.7	123.0	87.3	136.0	75.0	151.7	64.3
LOGIC												
- MPU Components	-		-	-	6.8	7.1	11.5	8.2	21.0	11.5	30.3	12.8
- Systems	-		.5	1.2	2.0	2.2	6.0	4.3	16.2	9.0	31.0	13.1
- Other	-		-	-	-		.5	.2	6.5	3.5	15.0	6.3
Subtotal	-		.5	1.2	8.8	9.3	18.0	12.7	43.7	24.0	76.3	32.2
NEW BUSINESS									2.0	1.0	8.0	3.5
TOTAL	14.5	100.0	42.5	100.0	95.5	100.0	141.0	100.0	182.0	100.0	236.0	100.0

ANNEX C

1982 Long Range Plan

SUMMARY - Millions

	1983			1984		
PRODUCT	U	$	ASP	U	$	ASP
1400	3.5	30.5	8.70	5.5	36.2	6.57
1420	3.1	24.9	7.94	7.0	39.1	5.58
1600	.001	0.07	70.00	0.08	2.0	25.00
1620	.003	0.23	73.00	0.12	2.5	21.00
2600	2.5	17.6	7.05	10.0	52.5	5.25
2601	.004	0.05	12.00	0.3	2.1	7.00
2620	0.3	2.1	7.00	2.8	14.0	5.00
2630	0.1	0.8	8.00	1.0	6.0	6.00
2800	-	-	-	0.03	1.0	33.00
2820	-	-	-	0.01	0.5	50.00
3630	0.09	6.2	69.00	0.8	16.7	21.00
MEMORY TOTAL	9.6	82.5	8.59	27.6	172.6	6.25
Transputer Software	-	1.0	-	-	3.9	-
Hardware	-	-	-	.13	13.4	102.56
TRANSPUTER TOTAL		1.0			17.3	
TOTAL GROSS $		83.5			190.0	
RESERVE $		(4.9)			(13.0)	
NET $		78.6			177.0	
NET £		42.5			95.5	

ANNEX D

INMOS DUFFRYN.

UNIT COST

WAFER STARTS PER WEEK	500	2800	4200	6300	8400
	£	£	£	£	£
COST PER WAFER OUT	230	87	73	63	59
FINISHED GOODS COST					
PROBE YIELD					
25%	4.35	2.06	1.83	1.59	1.51
35%	3.26	1.61	1.51	1.26	1.21
45%	2.65	1.37	1.23	1.08	1.04
55%	2.26	1.21	1.10	0.98	0.94
65%	1.98	1.10	1.01	0.88	0.86

ANNEX E

Schedule 4

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
12 QUARTER SUMMARIZED BALANCE SHEET (£M)

	1982				1983				1984			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
GROSS FIXED ASSETS	44.8	47.4	49.6	49.3	51.8	53.8	54.9	56.0	62.0	66.2	68.2	70.8
DEPRECIATION	(4.1)	(5.0)	(6.3)	(7.3)	(8.7)	(10.2)	(12.2)	(14.1)	(15.8)	(17.8)	(19.9)	(22.0)
NET FIXED ASSETS	40.7	42.4	43.3	42.0	43.1	43.6	42.7	41.9	46.2	48.4	48.3	48.8
NET CURRENT ASSETS	(.7)	.4	2.2	3.6	5.4	8.0	9.0	9.6	12.8	15.5	16.8	19.3
TOTAL NET ASSETS	40.0	42.8	45.5	45.6	48.5	51.6	51.7	51.5	59.0	63.9	65.1	68.1
FINANCED BY:												
SHARE CAPITAL	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2	50.2
RETAINED EARNINGS	(28.4)	(33.2)	(36.5)	(39.2)	(43.3)	(45.5)	(46.6)	(45.1)	(42.7)	(38.5)	(33.1)	(27.6)
NET EQUITY	21.8	17.0	13.7	11.0	6.9	4.7	3.6	5.1	7.5	11.7	17.1	22.6
DEFERRED GRANTS	4.8	6.4	6.5	7.1	7.1	7.2	7.1	6.8	7.9	8.4	9.0	8.6
NET FINANCING (LESS CASH)	13.4	19.4	25.3	27.5	34.5	39.7	41.0	39.6	43.6	43.8	39.0	36.9
TOTAL NET LIABILITY AND EQUITY	40.0	42.8	45.5	45.6	48.5	51.6	51.7	51.5	59.0	63.9	65.1	68.1

ANNEX F

Schedule 2

INMOS INTERNATIONAL
1982 LONG RANGE PLAN
LONG RANGE OUTLOOK
BALANCE SHEET

	1981	1982	1983	*1984	1985	1986	1987
FACILITIES	18.3	21.2	21.4	28.0	36.0	37.5	52.5
MANUFACTURING EQUIPMENT	13.9	21.8	27.5	41.2	54.2	78.0	103.6
OTHER EQUIPMENT	5.0	6.4	7.2	8.2	10.0	14.0	19.0
GROSS FIXED ASSETS	37.2	49.4	56.1	77.4	100.2	129.5	175.1
(ACCUMULATED DEPRECIATION)	(3.1)	(7.4)	(14.2)	(22.0)	(29.8)	(41.3)	(57.1)
NET FIXED ASSETS	34.1	42.0	41.9	55.4	70.4	88.2	118
CASH	14.0	3.9	0	25.3	17.5	13.7	7.1
NET CURRENT ASSETS	(1.7)	3.5	9.6	19.4	29.6	38.2	49.6
TOTAL ASSETS	46.4	49.4	51.5	100.1	117.5	140.1	174.7
SHARE CAPITAL	50.2	50.2	50.2	75.2	75.2	75.2	75.2
RETAINED EARNINGS	(21.7)	(39.3)	(45.2)	(27.6)	0	29.0	65.0
NET EQUITY	28.5	10.9	5.0	47.6	75.2	104.2	140.2
DEFERRED GRANTS	2.6	7.1	6.9	8.7	7.3	5.9	4.5
NET DEBT	15.3	31.4	39.6	43.8	35.0	30.0	30.0
EQUITY & LIABILITIES	46.4	49.4	51.5	100.1	117.5	140.1	174.7

*FOR THE LONG RANGE OUTLOOK, IT IS ASSUMED THAT £25M OF ADDITIONAL SHARE CAPITAL IS RAISED IN 1984 AND AN ADDITIONAL FACILITY STARTED

CABINET OFFICE
Central Policy Review Staff
70 Whitehall, London SW1A 2AS Telephone 01-233 7290

Qe 0110

Arnold Lovell Esq
HM Treasury
Parliament Street
LONDON SW1

3 December 1982

Dear Arnold

INMOS - TECHNOLOGICAL EDGE AND COMPETITIVENESS

Following the presentation by INMOS yesterday morning and the subsequent discussion with your Minister of State, I met with Barron, Petritz and Heightley to discuss the competition in INMOS' market sectors. Vivian Brown was also at the meeting.

2. The main question I addressed was along the following lines:

INMOS has achieved very high penetration in the market for high speed static RAMs, due primarily to being the first into the market. However other companies, primarily Japanese, are closing the gap and so the competition in the premium market will be much more severe in 1983 and 1984. On what does INMOS base its confidence that it will retain a sizeable market share and that it will not be priced out by the Japanese high-volume manufacturers?

3. I also raised specific questions on the impact of INMOS' business of:

- the likely shift towards semi-custom devices at the expense of standard devices (for example, as predicted in the SRI report to BTG);
- the increasing preference for CMOS technology as opposed to NMOS technology;
- the possible move to 5" or 6" silicon wafers;
- any move to sub-micron technology.

4. I have listed observations against the points in paragraph 3 in the attachment. They are mostly detailed technological points. The INMOS answers were consistent with views I have heard expressed by members of the semiconductor industry. For

the reasons given in the attachment, INMOS is well placed to cope with any such changes in technology. They are not in any case expected to affect products in 1983 and 1984.

5. I have also dealt with technical aspects of the major question in paragraph 2 in the attachment. However the main messages are that:

i. the INMOS share of the premium (high speed) market will fall due to other entrants but the market in RAMs will grow sufficiently fast to compensate;

ii. INMOS expects still to have unique (highest speed) products through 1983 and 1984, enabling them to maintain an average price per chip well above the industrial average;

iii. the INMOS devices themselves have not reached the limits of their performance. Faster speeds, better chip carriers, and better design features will be coming through (14 new product launches are envisaged in 1983, all variants on the two main RAM products and the non-volatile memory);

iv. there is a good deal of inertia in Defence purchasing, due to lengthy acceptance tests and the choice of chip-packaging, that should sustain the highly profitable defence sales (currently 25% of the revenue comes from 5% of the devices) though prices will fall;

v. with volume production in Newport, following achievement of at least 25% yields in Colorado, the company is sufficiently far down the learning curve that there is no reason to expect any other company to achieve lower manufacturing costs.

6. Having made those points, it remains true of course that INMOS is no more immune than any other company to predatory pricing by comeptitors, involving cross-subsidies from other business areas. The lack of financial head-room does then force a heavy emphasis on maintaining the technological lead as the main defence and here the INMOS track record is good. In general, the market should grow sufficiently fast to ensure that, for practical purposes, the INMOS revenue is bounded by thier production capabilities.

7. I have not dealt with the transputer which will have little impact on revenue during 1983 and 1984.

Yours sincerely

DR P T DAVIES

Copies to: John Sparrow, John Stuttard, Robin Nicholson, Jack Leeming and Vivian Brown

INMOS - TECHNOLOGICAL EDGE AND COMPETITIVENESS

Random Access Memories

1. The market for random access memories (RAMs) is broadly partitioned by:

- size of memory (eg 16k or 64k);

- static (best, as holds contents indefinitely whilst power is on but needs complex circuitry) versus dynamic (less complex chip but needs refreshing);

- configuration of memory (eg 16k x 1 or 4k x 4 which affects suitability for different markets);

- speed of access (market has always moved to the fastest products);

- type of packaging and carrier (often subject to acceptance tests by customer, particularly for defence applications, and therefore inducing an inertia, ie semi-captive long-term customers, into the market).

2. All the characteristics are mainly determined by the design of the device and the fabrication equipment, which is of course susceptable to copying. However the control of the manufacturing process is responsible for the last bit of improvement in the access time and is therefore controlled by a learning curve. Thus the 45 nanosecond and 55 nanosocord 16k RAMs produced by INMOS are all produced by the same process but some of them are faster than others. If the yield of the very best devices is reliable and sufficient then a product can be launched. In time, further improvements in speed will be possible. It would not be possible for another company, without a very different technology, to go straight to the fastest devices at a competitive price without itself going down the learning curve.

INMOS 16k STATIC RAM

3. The INMOS 1982 Long Range Plan (LRP) assumes a world market for the high speed devices at $104M in 1983 and rising at 40% pa. This is broadly consistent with, though on the conservative side of, forecasts by SRI and Dataquest.

4. The market can be subdivided by access times of (nominal) 45ns, 55ns and 70ns, by configuration of memory, and by the type of packaging and mountings applied to the chips. INMOS has introduced a wide range of the latter (the order of 15) and has gained Defence approvals for some of the more expensive types (eg hermetic casings versus plastic). It has introduced 16k x 1 and 4k x 4 configurations which will sell in roughly equal quantities. INMOS serves the complete market and until recently was the only company to offer 45ns and 55ns devices, hence 75% penetration in 1982. INMOS is not in the slow 16k device market to any appreciable extent. Average prices there are 2-3 times lower than in the high speed market.

5. Fujitsu has now entered with a 55ns device. Hitachi and NEC may follow in 1983 and INMOS has revised its 1983 and 1984 market penetration to 53% and 51% respectively. Thereafter it might fall to 35%. During 1983 it still expects to maintain its lead with the 45ns device, this may be the case for 1984 but a 35ns INMOS chip might then be available.

High-Speed 16k RAMs - INMOS Assumptions

	World Market	Market Served	Penetration of Served	Shipped Units	Billing	Average Price
1983	$104M	$104M	53%	6.6M	$55M	$8.3
1984	$148M	$148M	51%	12.5M	$75M	$6

64k Dynamic RAMs

6. This market is predicted to grow very fast as 64k memories will be the work-horse of the computer industry; perhaps by a factor of five or six over the period 1982 to 1987. SRI predictions are for a demand of 250M units in 1982 with 10% being for high-speed devices. These predictions may in fact be low because the major computer manfuacturers, such as IBM, which might be expected to produce, in house, their own chips are having problems with yield and costs and are likely to buy-in significant amounts. A number of prominent companies, such as INTEL, failed to make an early entry due to the technical challenge of the product but even so there will be four or five companies operating in 1983 in the high speed market defined by access times of 100ns - 150ns. As yet, only INMOS offers a 100ns product.

7. The other strengths of INMOS include the Defence-approved packaging and chip carriers, design features such as the "nibble mode" (circuitry to allow rapid recall from more than one memory address), and unique configurations. The 16k x 4 and 8k x 8 DRAMs will be launched in Q1 1983 and should be the first entries in those configuration to the high speed market. The next step will be to static 64k RAMs early in 1984.

8. INMOS assesses its share of the high speed market at 24% in 1983 and 30% in 1984.

64k Dynamic RAMs - INMOS Assumptions

		World Market	Market Served	Penetration of served	Shipped Units	Billings	Average Price
1983	64kx1	$935M	$84M	24%	2.5M	$17.6M	$7
	16kx4				0.3M	$ 2.1M	$7
	8kx8				0.1M	$ 0.8M	$8
1984	64kx1	$1600M	$250M	30%	10 M	$52.5M	$5
	16kx4				2.8M	$14M	$5
	8kx8				1.0M	$ 6M	$6

Non-Volatile Memories

9. Most semiconductor memories are erased once the power is switched off. They are therefore suitable for short-term memory typically associated with holding transient information in support of calculations within a computer, telecommunications or whatever. The market for cheap devices which can store data or instructions indefinately is enormous but particularly if the contents can be updated from time to time (a programable read-only memory, PROM). To specify a growth rate is meaningless because the current volume of the market is very small and limited by what is available. EPROMs are available but need to be completely erased before updating by shining ultra-violet light on them. This can be inconvenient and leads to costly packaging.

10. An electrically erasable PROM (an EEPROM) is the ideal solution and INMOS expects to launch its commercial device in the second half of 1983. It will be a fast 64k device in an 8k x 8 configuration. Other entrants in the market are

likely to follow in the subsequent year, driving the price and INMOS' market share down. However the typical advantages accruing to the market leader in RAMs should also obtain here.

64k EEPROM - INMOS Assumptions

	World Market	Market Served	Penetration of served	Shipped Units	Billings	Average Price
1983	$73M	$10M	60%	0.09M	$6.2M	$69
1984	$129M	$40M	42%	0.8M	$16.7M	$21

Other Technological Developments

Shift towards semi-custom devices as oppposed to standards

11. This point was made in the SRI report to BTG. However it is not, even by SRI's predictions which are more forthright on this topic than others, likely to have a big impact on INMOS over the next five years. The MOS standards market is predicted to grow three-fold between 1982 and 1987; in so doing it will decline from 78% of the world market to 69% to the benefit of semi-custom devices.

12. Should there be a greater emphasis on the switch to semi-custom then INMOS, with its first rate design team, its transputer concept which will allow some customising on-chip and its CAD system for fast design, will be as well placed as any company to compete.

Shift towards CMOS and away from NMOS technology.

13. Broadly, CMOS allows lower power consumption, hence less heat dissipation problems and closer packing. The CMOS manufacturing process is closely related to NMOS process though with a couple of stages added. Expensive new fabrication plant is not needed, typically two or three new furnaces are required. The main cost in switching from NMOS (which is INMOS' dominent technique at present) to CMOS is related to the redesign of chips and the generation of new know-how.

14. INMOS plans that its 64k static RAMs will be launched in CMOS and CMOS 16k SRAMs and 64k DRAMS will be brought in if the market demands it.

Move to 5" or 6" silicon wafers.

15. The INMOS "steppers" (moving the lithographic process across the face of the silicon wafers) are the most up to date that can be bought and could take 5" wafers, though other aspects of the handling process would have to change. Currently they use 4" wafers which is the leading-edge of the technique. There have traditionally been cost advantages in going to bigger wafers (the majority of manufacturers still use 3" wafers becuase of old fabrication machinery) but advantages are now being constrained by limits to surface regularity across the big wafers.

16. It would be costly for INMOS to convert to larger wafers but it is unlikely to be an issue in the next five years.

Move to sub-micron technology

17. Manufacturers at the leading-edge are currently dealing with lines, on the chip, of 2-3 microns. Sub-micron tehcnology is foreseeable but many years off for commercial, volume manufacturing.

HILL SAMUEL & CO. LIMITED

100 Wood Street, London EC2P 2AJ

Telephone - 01-628 8011
Cables - HILLSAM LONDON EC2
Telex - 888822
Fax - GP 1/2: DEX 4200 Tel - 01-726 4671
Foreign Exchange Dealers
Telephone - 01-606 8383
Cables - HILLSAMFEX LONDON EC2
Telex - 888471

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Private & Confidential

John Wakeham, Esq., FCA, JP, MP
Minister of State (Revenue)
HM Treasury
Treasury Chambers
Parliament Street
London, SW1

3rd December, 1982

Dear Minister,

INMOS

After the presentation by the company and ourselves on Thursday morning, we have been asked

(a) to confirm our up to date thinking on the feasibility of a placing of equity by Inmos with institutional investors in the spring of 1983;

(b) to explain why, if such a placing would be possible next year, it is not feasible now;

(c) to give the background to our confidence in Inmos's ability to achieve its forecasts;

(d) to set out the course of action we propose to follow in order to achieve a placing; and

(e) to outline our advice to the Inmos Board concerning its desire to achieve privatisation as soon as possible.

We have for some time been saying that we thought an equity financing to raise £10-£15 million from institutional investors would be capable of being arranged in the spring of 1983 subject to two important operational criteria being satisfied, namely that,

(1) Inmos must have demonstrated the commercial viability of its 64K DRAM product; and

(2) Inmos must have built up a reasonable level of production at Newport.

An overriding condition to the feasibility of any financing is always that the general state of the markets is conducive to new investment being made and it probably should be said in this case that the feasibility of an Inmos placing will be more than usually sensitive to this condition given the complexity of the company and the reliance investors will be placing on the company's forward projections.

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HILL SAMUEL & CO. LIMITED

John Wakeham, Esq., FCA, JP, MP
HM Treasury

3rd December, 1982

The reason why a placing is not in our judgement feasible now is simply that Inmos has not yet satisfied the two operational criteria. The first criterion is essential because the 64K DRAM represents a major proportion of prospective revenues and the company, in common with some of its competitors, experienced design and process problems in preparing the product for market. At present we believe Inmos is close to demonstrating the commercial viability of the product. The company has made very considerable progress both from a design and process point of view and is achieving sales of the product. The company has made more rapid progress in achieving improved yields than it anticipated even a few months ago and has decided to begin the move of manufacture of the 64K to Newport earlier than previously planned. We are therefore increasingly confident that the first criterion will be satisfied by the spring of 1983.

The second criterion is, in our judgement, of fundamental importance because the Newport facility is intended as the centre for volume production of VLSI components and the design and process technology is being transferred to Newport from Colorado Springs. Institutional investors will wish to have evidence that a successful transfer is capable of taking place. At this stage Newport is manufacturing 16K SRAMS with good results but at a low level of wafer starts; the build up in its production levels has been delayed as a result of the doubt concerning the future financing of the company and we are frankly less confident that this criterion can now be achieved by the spring of 1983. The decision to begin 64K DRAM production at Newport earlier than previously planned will be a positive factor for an institutional placing provided that the transfer from Colorado Springs is successfully achieved but satisfactory yields are only likely to be evident in the early summer of 1983. Investors will be keenly interested in these yields and to that extent fulfilment of the second criterion may be deferred.

As and when the above operational criteria are satisfied, we believe that an institutional placing will become possible because we are confident that at that point Inmos will be able to make financial forecasts which offer the prospect to investors of a sufficient rate of return on their investment to compensate for the risks. The basis for this conviction is as follows:

(a) We are satisfied, by reference to outside market studies and to technical assessments of the company, that in general terms Inmos is capable of achieving the projections set out in its 1982 long range plan.

(b) The projected sales in 1983-84 are substantially covered by products which are either already successfully competing in the market place or, in the case of the 64K DRAM, are just entering the market.

/...

(c) The projected sales in 1983-84 are already reasonably covered by specific product programmes with major computer, graphics and military customers. Although there are no contractual commitments from these customers, and it is not usual in the industry for such commitments to be made, the forecast sales are tied in with the current production schedules which these customers are assuming for their own level of business.

(d) There is increasing evidence that Inmos can now achieve satisfactory yields which, together with volume, provide the critical determinant for operating costs. Thus the transfer of the 16K SRAM from Colorado Springs to Newport has proceeded according to plan and the improvement in 64K DRAM yields has been sufficiently ahead of forecast to bring about the earlier than planned decision to transfer production to Newport.

At the present time Inmos is working on its 1983 annual plan which will also cover, in less detail, 1984-85. The preparation of this plan is especially difficult given the uncertainty about financial support for the company. The company is also beginning to be concerned that a recovery in the US economy will be slower than we would all hope for and that this will adversely impact their ability to achieve the results envisaged for the first half of 1983 in the long range plan. To that extent we also have to become less confident that the spring of 1983 would be a sensible time to attempt to complete negotiation of a placing. However, the essential point is that we believe the financial forecasts will constitute a basis for an institutional placing and that we will be able to transmit our confidence in them to institutional investors.

Turning now to the course of action we presently propose in order to achieve an institutional placing, the steps we are planning are as follows:

(1) A preliminary presentation to a select group of institutions which we would expect to be the core investors in a placing. The presentation would be a "preliminary prospectus" containing information on Inmos's strategy, the semiconductor industry, products and competition, manufacturing, sales and marketing, planning and control, directors, management and employees and financial results and projections. The "preliminary prospectus" is currently being prepared. The intention is to provide the chosen institutions with an introduction to Inmos and to correct any false impressions they may have from the poor publicity which the company has had. The timing of first approaches to institutions will depend on resolution of the current situation and completion of the "preliminary prospectus" but could realistically be in January, 1983.

/...

(2) A public relations programme aimed at the press, financial analysts and the public at large in order further to improve the climate for negotiation by Inmos of an institutional placing. It is very important that if the Government is prepared to provide further support to Inmos, this is accompanied by strong public statements of this support and encouragement.

(3) A programme of meetings between institutional investors and Inmos management and of visits to Inmos facilities in order to expand further the familiarity of investors with the company.

(4) The preparation of a full prospectus on Inmos containing an accountants report by Peat Marwick Mitchell & Co., the auditors of the company, and a technical report by Integrated Circuit Engineering Corp. These reports are also already in preparation and are likely to be completed in March, 1983. The full prospectus will be the document which includes the details of the actual investment proposal to institutions and the then up-to-date financial forecasts of the company, and will constitute the basis for a negotiation of terms with institutions.

It is important to stress that the size of placing we have said will be feasible, that is £10-£15 million, is based on our assessment of the success we could have in the above process with primarily UK institutions at the earliest possible moment for negotiation of any financing. The value of Inmos could rise dramatically in the course of 1983 as it proves it is meeting or exceeding its targets. As Inmos proves it can perform the range of investors prepared to invest will also widen. Both these factors will influence the decision on timing of the placing and its size.

The terms which will prove acceptable to institutions will depend primarily upon their assessment of:

(a) the likely timing of a public issue and Stock Exchange listing for Inmos; and

(b) the likely value of Inmos at that time.

Both of these assessments will depend in turn on analysis of Inmos's projections and the probability of their being achieved, with the high debt element in the company's capital structure being perceived as increasing the level of risk attaching to the projections.

The results of this analysis permits the calculation of an expected rate of return which the institutions will compare to returns on other investments open to them.

In coming to our conclusion on the feasibility of an institutional placing, we are carrying out the analysis set out above and anticipating that the expected rate of return from an investment in

HILL SAMUEL & CO. LIMITED

John Wakeham, Esq., FCA, JP, MP
HM Treasury

3rd December, 1982

Inmos will be adequate to satisfy sufficient institutions to complete a £10-£15 million placing. Our expectation concerning the likely date for a public issue by Inmos is the spring of 1985 and the middle point of our range of values for the company at that time is £200 million.

Inevitably, however, the negotiation of the terms of the institutional placing depends not only on the willingness of institutions to invest but also on the willingness of the existing shareholders to accept dilution of their shareholding, and this leads us to the final question we were asked to answer.

At this stage we are expecting that the result of a £15 million placing would be to reduce the British Technology Group shareholding in Inmos to a level in the region of 60 per cent. We have, however, proposed to the Board of Inmos that the placing might be accompanied by options granted to the subscribing institutions by BTG over a portion of its existing shareholding. The principal purpose of this proposal is to provide a mechanism for possible reduction of BTG's interest in Inmos to below 50 per cent. without initial cash payments being required.

The Board of Inmos want the privatisation process to take place as soon as possible. At present our best estimate is that the full disposal by BTG of its shareholding would form part of the public issue anticipated for the spring of 1985.

Yours sincerely,

R.A. Douse
Director

SUBJECT FILE

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10 DOWNING STREET

From the Private Secretary

29 November 1982

Dear Jonathan,

INMOS

The Prime Minister held a discussion about INMOS this evening. The Chancellor of the Exchequer, the Secretary of State for Wales, your Secretary of State and Dr. Robin Nicholson of the CPRS were present.

The Prime Minister said that she was highly sceptical about the case for putting more public money into INMOS, or extending the Government's financial support for the company further. £84 million had already been spent on the company, of which £56.5 million related to assets in the United States. The company was employing 269 people in the United Kingdom and 660 people in the United States. This was not a proper use of UK taxpayers' money. Nor would it be right to make further funds available in order to allow the company to realise its plans to increase its employment in the US to 1,000 by 1984. The company had consistently under-achieved its forecasts: in its 1978 plan it had forecast sales for 1982 at £60 million, profits at £6 million, cash required £71 million and UK employed 2,560. In the 1980 plan it had revised these figures to sales of £45 million, profits of £4 million, cash required of £79.9 million and UK employed of 742. The latest plan or outturn was for sales of £16 million, profits of -£17 million, cash required of £84.8 million and UK employed of 293. She was not at all impressed by the letter from Hill Samuel of 18 November, which had been drafted carefully to avoid any significant commitment. The best that Hill Samuel could say was that they would be able to put together a group of private sector investors in the spring of 1983 provided that INMOS achieved its 64K RAM production targets, and that the "Newport ramp-up" was proceeding successfully. It was all very well for INMOS to claim that they had secured 75% of the market for 16K Static RAMs. But the world market, as she understood it, was very small at present, and the factory in Colorado Springs was currently working at around one third of its viable production level. Furthermore, the price of the 64K Dynamic RAM had earlier been forecast at $12 per chip. She understood that the current price was around $4, and was expected to fall soon to around $2½. On what price assumptions were the forecasts made? What were the other assumptions underlying these forecasts?

Your Secretary of State said that in reviewing the credibility of the financial forecasts for INMOS it was more useful to compare with the 1980 plan than with the original 1978 plan. The latter

had been very broad brush, and had been drawn up before the company had a clearly defined strategy for introducing various families of products. Comparison between the 1980 plan and outturn or the latest projection showed that the 1980 projections would be achieved but with a slippage of about 1 year. This slippage was in part due to the delay in 1980 while the Government considered the case for the release of the second £25 million. INMOS's achievements were already substantial. Its design capability and production facilities were first class; indeed, it was already the sole source of supply for a number of military contractors in the US, and as both he and the Foreign and Commonwealth Secretary had pointed out, one of the reasons for keeping INMOS going was strategic, given the hold which the Americans had over the memory chip component in various electronics systems - for example in the Nimrod aircraft. He had regretted the way in which the project had been set up in the first place. But the fact was that the Government had to build on what existed. A decision was now urgent, since INMOS was likely to run through its cash ceiling within a matter of weeks.

The Secretary of State for Wales said that, in view of his interest in the future of the company, he had visited their plant both in the UK and at Colorado Springs on a number of occasions. It had always been recognised that the design work would have to commence in the United States. He supported the Industry Secretary's assessment of the success of the company in an area where a number of well-established competitors had failed. They had expected to capture only 25% of the market for 16K RAM chips, but had secured 75%. The standard of the premises which had been built at Newport was highly impressive as was the quality of the INMOS team. He understood that, if certain further work was transferred from the USA to the UK, a further 700 jobs, over and above those forecast in the attachment to the Industry Secretary's minute, would be created in the United Kingdom.

The Chancellor of the Exchequer said that the information which had been provided was not sufficient to justify a decision for the investment of further Government support. There was no information, for example, about the company's sales prospects, the likely total market, the company's market share, the price and cost assumptions and so on. There was not even a balance sheet of the company, or projected future balance sheets. It might be that some further Government support could be justified. But the case had not been made.

The Prime Minister, summing up the discussion, said that she did not accept the argument that INMOS should be kept going for strategic reasons. The fact was that, because INMOS manufactured the 16K RAMs in Colorado Springs, a US attempt to deny us use of these components as in the Siberian pipeline case would be successful, notwithstanding the UK Government's involvement in the matter. Indeed, she doubted whether these components would become wholly unavailable; they could be bought from Japan. So as far as further Government financial support was concerned, a proper financial appraisal of the company's prospects was required. She would ask the Minister of State, Revenue, HM Treasury (Mr. John Wakeham) together with Mr. John Sparrow and Mr. Jeffrey Sterling to carry out an urgent appraisal, in order to permit an informed view to be taken of

/Hill

Hill Samuel's assertion that private sector funding for INMOS would be available in the spring of 1983 if certain conditions were met.

I am sending copies of this letter to John Kerr (HM Treasury), Brian Fall (FCO), Adam Peat (Welsh Office), Gerry Spence (CPRS), Dr. Nicholson (CPRS), Andrew Hudson (Mr. Wakeham's Office, HM Treasury), and Mr. Jeffrey Sterling.

Yours sincerely,

Michael Scholar

Jonathan Spencer, Esq.,
Department of Industry.

PRIME MINISTER

You may find it helpful to have these figures in front of you at the meeting this afternoon.

	Sales	Profit	Cash required	UK emp.
1978 Plan	£60m	£6m	£71m	2560
1980 Plan	£45m	£4m	£79.7m	742
Outturn/latest plan	£16m	£-17m	£84.8m	293

MLs.

29 November 1982

Treasury Chambers, Parliament Street, SW1P 3AG
01-233 3000

PRIME MINISTER

INMOS

I have read all the correspondence on INMOS which has stemmed from Patrick Jenkin's letter to me of 12 November and have discussed the company's position with Jeffrey Sterling.

2. It goes without saying that none of us would have chosen to set up INMOS in its present form. But unfortunately we are not starting with a clean slate and we have ourselves given the company further support. It is now just about to start production in the UK and it is claimed in several quarters, admittedly largely on the basis of impressions rather than detailed figures, that it has good prospects. Thus there are obvious political difficulties in simply allowing INMOS to run out of money at this stage.

3. Nevertheless, I am very sceptical about whether we should give the company further help. The Hill Samuel letter is presented as an encouraging development. But like every other paper which I have seen on the subject, it does not come within miles of enabling us to form a commercial view. Indeed, it prompts one to ask why private sector funding seems likely to be available in 1983 but not now. The answer, we must suspect, is that no figures have yet been assembled which would persuade any prudent private investor to put up funds. The only fact that emerges from Annex A to Patrick's minute of 19 November is that £84 million has been spent on the "creation" of about 900 jobs. But on the evidence so far produced, one must wonder how long these would last in a truly commercial environment. Lastly, I have seen no figures that would convince me that the proposed increase in the lending ceiling would be for a bridging operation and not just for further funding.

4. Surely if INMOS wants more money, it is essential that it is asked to make a proper financial presentation. This would have to focus on making the financial

case and not just on the quality of INMOS' products which the company seems to be very capable of "selling" in a political sense. I am disturbed by the fact that the long chain of command through BTG to the company has not been able to develop an approach to this problem that begins to look business-like.

5. I am sending a copy of this minute to other members of E Committee, George Younger, Nicholas Edwards, Sir Robert Armstrong and John Sparrow.

(G.H.)

26 November 1982

Prime Minister

Patrick Jenkin's response to your request for more information. You will also want to see the Chancellor's minute in this folder.

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PRIME MINISTER

INMOS

As requested in your Private Secretary's letter of 25 November, I enclose a paper which compares successive financial and employment forecasts for INMOS with current forecasts and outturns, by way of additional background material for the discussion now planned for Monday 29 November.

2 The attached paper provides a detailed commentary on the tables at Annexes A - E. May I suggest that we should bear in mind three more general considerations?

i Insofar as the historic forecasts and the comparison with the present position of the company provide any guide for the decisions we now need to make, the comparison between 1980 and the present position is the more useful. This is partly because the 1980 Plan formed the basis of this Government's decision to make available the second £25 million to INMOS in July 1980. More significantly, the strategy outlined in INMOS' original 1978 Plan was still very broadbrush, whereas by 1980 the company had a clearly defined strategy for introducing various families of products.

CONFIDENTIAL

ii The comparison between the 1980 Plan and outturn or latest projection for product introductions, sales, profits, and employment all broadly indicate that the 1980 projections should be achieved but with a slippage of about a year. Compare for instance, the sales figures in the 1980 line of the upper table of Annex B with the 1982 line 1 year later. I am sure we must acknowledge that part of the slippage was due to the delay in 1980 while the Government considered the case for the release of the second £25 million; and part to the current hold-up in the build-up of employment and production at Newport due to the present borrowing ceiling. I believe Nicholas Edwards has explained that the build-up of production at the plant had to be stopped last July.

iii While these historic comparisons are of some help in judging the credibility of the company's present projections, our decision must surely be based on a well-informed view of the company's present position, and the realistic options now open to us.

3 I am sending copies of this minute and attachments to Geoffrey Howe, Nicholas Edwards, and to Dr Nicholson.

JPS

P J

26 November 1982
(Approved by the Secretary of State and signed in his absence)

Department of Industry
Ashdown House
123 Victoria Street

INMOS

1 This note compares the key financial and employment forecasts which INMOS has made in its five Corporate Plans with outturn figures for 1979-1981 and with the latest forecasts available now.

INMOS Products

2 The starting point for an analysis of how INMOS has performed against its various Plans is its record in bringing its products to the market. The employment and financial figures flow from this.

3 In 1978 when it was set up as a greenfield operation INMOS' product strategy was still largely undefined, although the company had identified the two key products on which design was to start immediately - the 16K Static RAM (1400) and the 64K Dynamic RAM (2600). The 1978 prediction was that both products would be introduced and be yielding income in 1980. (1) In 1979 it was forecast that the 16K would be launched in October 1980 and the 64K in March 1981. In the event the (2) 16K was introduced in November 1980 although it did not start yielding income until 1981. It has proved an outstandingly successful product, accounting for the bulk of INMOS' £2.5-£3m a month sales, and commands 75% of the world market for this type of chip. It is the sole source for a number of US military applications, commanding premium prices of up to $200 per chip.

4 The 64K product however was delayed longer. Fearing very intensive competition and a sharp drop in prices, INMOS modified its original plan and decided to go for a higher performance chip, more sophisticated both in terms of speed and other special features.

5 By the time the second tranche of £25 million was approved in 1980, the company had a clearly defined strategy for expanding the 16K and 64K families of products and the development of new product families including the transputer

at Bristol. It has adhered closely to this since then. The Annex A table at Annex A compares its plans for product introductions in that year with subsequent and current forecasts.

6 The table shows there was further slippage with the 64K product. After completing the new design, INMOS experienced difficulties over the production process and in particular in getting adequate yields to make a viable operation. The other leading manufacturers in the event experienced very similar problems. The technical leader of LSI products, Intel, was forced to withdraw from this market. Only Hitachi is producing an effective 64K DRAM in volume.

7 The INMOS 64K product has now been introduced with initial yields exceeding INMOS' expectations. Technical consultants rate its design as superior to Hitachi's. There is no faster dynamic RAM on offer; its only equal (from Fujitsu) is a copy. The challenge is to transfer production from Colorado to Newport and to manufacture the product there in increasing volume through 1983 and 1984 with acceptable yields.

Financial Forecasts

8 Although the 64K has not been the only product to experience delay - INMOS has also had problems with its family of EEPROMs - it was the cornerstone of what was expected to be INMOS' present business. Its one year slippage since 1980 is the main reason why INMOS has not met its financial and employment forecasts. External factors such as the recession, particularly in the US, and the fall in sterling have exacerbated the situation. The Annex B table at Annex B compares the sales and profit forecasts in INMOS' five Corporate Plans from 1978 to 1982 and shows the latest projections through to 1985. This shows the financial effect of the one year slippage, with outturn and current forecasts keeping step with the 1980 forecasts one year behind. It is particularly worth noting that 1982 outturn results match the 1981 forecasts. This shows the slippage occurred between 1980 and 1981 when INMOS had to get back on track after the delay in approving the second £25 million.

9 So far as INMOS' cash requirements are concerned the various projections set out at Annex C and the graph at Annex D show that INMOS has stayed very close to target. The figures also reveal how sensitive the £35.3m borrowing ceiling set in 1980 has always been to changes in the dollar-sterling exchange rate. In the 1980 Plan the forecast borrowings in 1983 were £34.6m; but this was at an exchange rate of $2=£. Since INMOS has liabilities in dollars of over $80m (its equipment has to be paid for in dollars) the effect of the fall in the exchange rate from $2 to $1.6=£ is in itself about £10m. In practice until last week's fall outturn cash requirements for this year were estimated to be lower than in the 1980 Plan, although admittedly much of the requirement forecast then would have been to provide working capital to support the £45m sales which INMOS was expected to achieve.

Annex C
Annex D

10. Put very simply, INMOS has found it more difficult than it expected to get its products right for the market. It has not been alone in this. Its financial performance reflects the fact that the investment in R & D it has had to make in order to establish a series of products has taken longer to start yielding a return than was forecast both in 1978 and in 1980. Only this year has it begun to generate a substantial income. Without products to sell, its plans for additional factories had to be put back and it could only have afforded to pay for these in any case, out of retained earnings or by attracting new capital into the company. The company is now forecasting to break even in the final quarter of 1983 instead of the end of 1982 which it forecast in the 1980 Long Range Plan.

Employment Forecasts

11 Since 1980, the employment forecasts also show a slippage of about one year. The detailed figures in successive Corporate Plans are at Annex E.

Annex E

12 The assumptions which have been made on the opening of new factories are critical to an understanding of the figures. There was considerable change in INMOS' thinking between 1978 and 1980, as the process technology and its own product strategy evolved. By 1980 INMOS had concluded the optimum size for each fabrication plant was about 1000 people.

13 When the Prime Minister announced the second £25 million in July 1980, employment in the UK was forecast to rise to 2039 in 1984 and 2699 in 1985. The briefing which the Department provided the Prime Minister with at the time may not have made it sufficiently clear that these figures included not only employment at the Newport factory but also at the second UK fabrication plant which was then due to open in 1983. It also included the design team at Bristol. The 2000 figure for 1984, which the Prime Minister quoted in the House, covered the 1000 workforce in Newport, the 200 design staff in Bristol as well as a workforce at the second UK plant which would have built up to 800.

14 The construction of this second fabrication plant in the UK was dependent on INMOS having achieved the sales needed to justify increased production and the revenue to meet the cost of the facilities. It was also the expectation that INMOS would need additional capital by about 1984 in order to underpin its future gorwth; and the intention since 1980 has been that this should come from the private sector.

15 There is no fundamental change in the situation. As a result of the delay on the 64K, INMOS' employment at Newport is a year behind schedule, even though the plant itself was ready at the same time as forecast in 1980 and for roughly the same capital cost. Next year's forecast headcount in the UK matches the 1982 forecast in the 1980 Plan. If the labour element for the second UK plant is excluded, the same pattern emerges in the following year. In other words, leaving aside

the question of the second plant, the headcount is following the sales pattern - ie one year behind the projection made in 1980.

16 INMOS has not abandoned its plan for a second UK plant. The latest sales forecasts for 1985 which are shown in Annex B assume that a second production plant will open in the UK in that year. This is reflected in the final column of Annex E. And it remains the case that the construction of a second plant is dependent on private capital being made available for the purpose.

17 Of course, the figures do not match precisely. The steady improvements in plant efficiency which are characteristic of this industry mean that headcount forecasts will always tend to drift downwards with the passage of time.

INMOS - PRODUCTION INTRODUCTIONS

Product Number	Type	Introduction Date		
		1980 LRP	1982 LRP	Current Best Estimate
1400	16K x 1 SRAM	Q4 1980	Q4 80 Actual	-
1420	4K x 4 SRAM	Q3 1981	Q3 81 Actual	-
1600	64K x 1 SRAM	Q2 1983	Q3 1983	Q1 1984
1620	16K x 4 SRAM	Q2 1983	Q2 1983	Q1 1984
2600	64K x 1 DRAM	Q3 1981	Q3 1982	Q3 1982
2620	16K x 4 DRAM	Not forecast	Q1 1983	Q1 1983
2630	8K x 8 DRAM	Q2 1982	Q4 1982	Q1 1983
2601	64K x 1 DRAM	Q2 1983	Q3 1983	Q1 1984
3630	8K x 8 EEPROM	Q1 1982	Q1 1983	Q2 1983
3730	16K x 8 EEPROM	Q2 1984	Not forecast	
2800	256K x 1 DRAM	Q2 1984	Q1 1984	Q4 1984
2820	64K x 4 DRAM	Not forecast	Q1 1984	Q3 1984
Transputer				
Product 1	-	Q2 1982	Q4 1983	Q4 1983?
Peripheral 1	-	Q2 1983	Q4 1983	Not forecast
Product 2	-	Q2 1984	Not forecast	Not forecast
Peripheral 2	-	Q4 1984	Not forecast	Not forecast

Annex A

SALES AND PROFIT FORECASTS IN INMOS' CORPORATE PLANS

SALES	Year						£m
Plan	79	80	81	82	83	84	85
1978)	-	6	25	60	89	119	-
1979) $2=£		0.3	10	57	102	146	-
1980)			9	45	99	146	195
1981) $2=£				15	63	124	-
1982 $1.85=£				15	43	96	141
Outturn	-	-	2	16+			

+ latest estimate

The diagonal arrows in this and other annexes demonstrate the one year slippage between the projections made in 1980 and the latest 1982 projections.

PROFIT (before interest and tax)	Year						£m
Plan	79	80	81	82	83	84	85
1978)	(9)	(7)	(4)	6	9	11	-
1979) $2=£	(3)	(8)	(10)	7	19	31	-
1980)		(8.4)	(8)	4	24	35	48
1981) $2=£				(15)	8	29	-
1982 $1.85=£				(16)	(2)	21	31
Outturn	(2.5)	(8)	(16)	(17)+			

+ latest estimate

ANNEX C

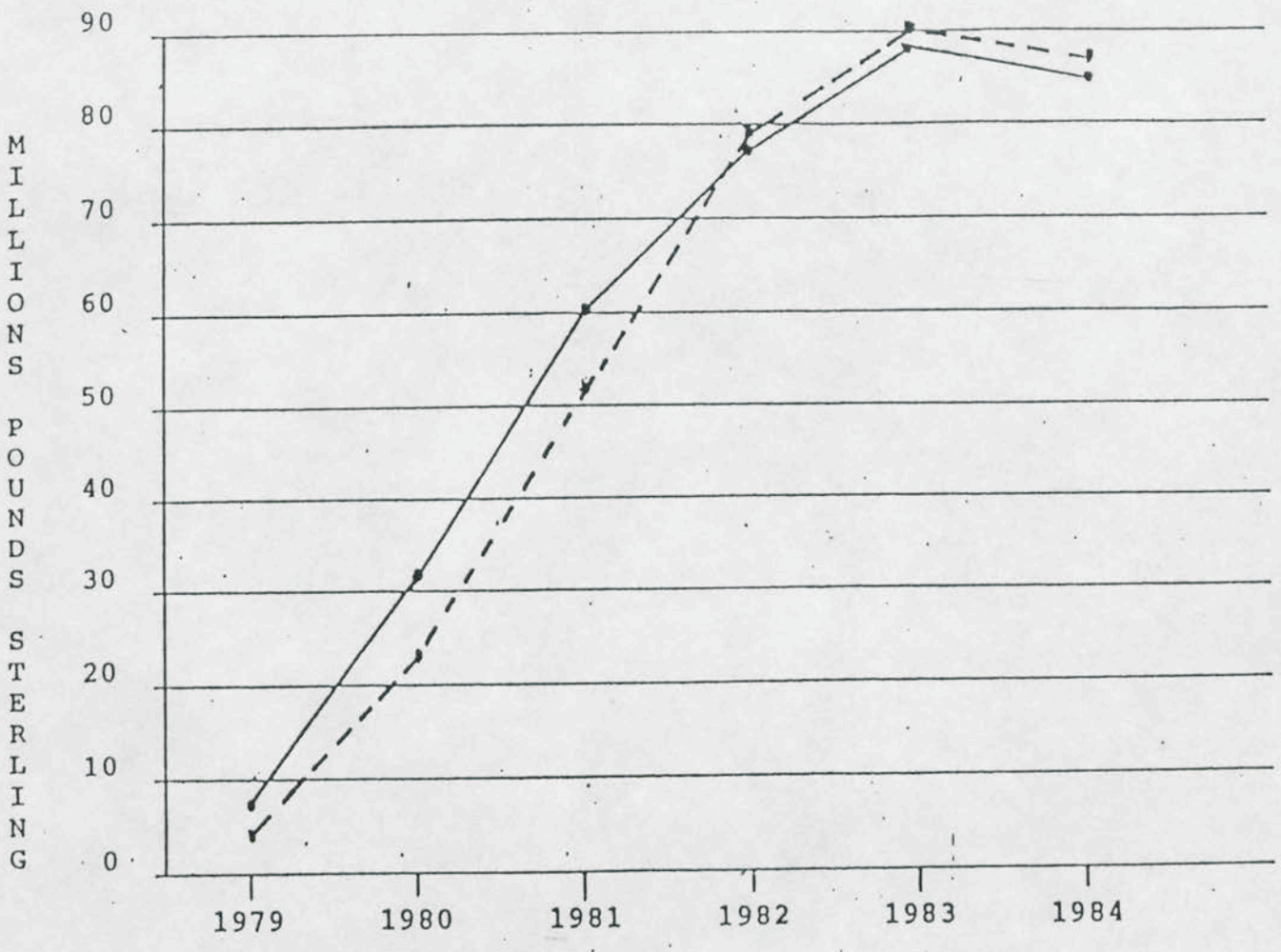
INMOS CASH REQUIREMENTS

£m

	79	80	81	82	83	84	85	86	87
				1978 Plan ($2:£)					
Total	25	41	60	71	73	77			
				1979 Plan ($2:£)					
Equity	8.1	30.0	50.2	50.2	50.2	50.2			
Debt (cash)			8.7	21.2	23.5	12.2			
Total	8.1	30.0	58.9	71.4	73.7	62.4			
				1980 Plan ($2:£)					
Equity		29.7	50.2	50.2	50.2	75.2	75.2		
Grants					8.5	11.0	9.1		
Debt (Cash)		5.9	(1.0)	29.5	34.6	20.0	10.2		
Total		35.6	49.2	79.7	93.3	106.2	94.5		
				1981 Plan ($2:£)					
Equity				49.7	49.7	49.7	74.4	74.4	
Grants				4.2	6.9	6.2	5.4	4.2	
Debt Cash				28.7	31.1	24.9	9.9	9.7	
Total				82.6	87.7	80.8	89.7	88.8	
	Outturn			1982 Plan ($1.85:£)					
Equity	8.6	29.7	50.2	50.2	50.2	50.2	75.2	75.2	75.2
Grants		0.3	2.6	7.1	6.9	8.6	7.3	5.9	4.5
Debt (Cash)	(3.6)	(7.4)	1.3	27.5	39.6	36.9	17.5	16.3	22.9
Total	5.0	22.6	54.1	84.8	96.7	95.7	100.0	97.4	102.6

INMOS INTERNATIONAL
79 LRP TO 82 LRP

TOTAL FINANCING LESS CASH
AT YEAR END



_____79 LRP (EXCHANGE RATE 2.00)

----------82 LRP (EXCHANGE RATE 1.85)

ANNEX E

INMOS: HEADCOUNT

PLAN YEAR+	1979 US	1979 UK	1980 US	1980 UK	1981 US	1981 UK	1982 US	1982 UK	1983 US	1983 UK	1984 US	1984 UK	1985 US	1985 UK
1978 Plan (US1 - Q2 1980) (UK1 - Q2 1981) (UK2 - Q2 1983)	215	70	585	350	605	1440	670	2560	710	3700	760	4820		
1979 Plan (US1 -Q1 1981) (UK1 - Q4 1981) (UK2 - Q2 1983)	117	60	532	305	1065	889	1071	1504	1366	2503	1463	3187		
1980 Plan (US1 - Nov 1980) (UK1 - Feb 1982) (UK2 - Nov 1983) (UK3 - May 1985)					846	117	1037	742	1242	1464	1335	2039	1467	2699
1981 Plan (US1 - operational) (UK1 - Feb 1982)							892	533	1162	910	1312	1330		
1982 Plan (US1 - (UK1 - operational) UK2 - 1985) (UK3 - 1987)							719	359	988	593	1188	966		
Outlook/latest forecasts*	82	53	227	64	643	114	681	293	820	750	1000	1200	1000	1800

+ The assumptions on factory opening on which these headcount forecasts were based are summarised for each plan. US1 means the Colorado Springs factory; UK1 the Newport factory, UK2 the second projected factory in the UK etc.

* The latest forecasts assume the opening of UK2 in 1985

PM/82/104

PRIME MINISTER

INMOS

1. I have seen the correspondence initiated by Patrick Jenkin about INMOS. There are strategic and Community aspects to be taken into account.

2. The Americans seem likely to continue to use their Export Administration Act to achieve their foreign policy objectives. Where we and others share the American view, and there are well-established procedures for consultation and agreement, as in COCOM, there is seldom an insuperable problem. As Patrick Jenkin has pointed out, however, we can have difficulties when the Americans use this Act to deny our companies export or re-export licences for high technology, or equipment of US origin, which is to be incorporated in equipment which we are prepared to allow British firms to export. If INMOS succeeds, this would reinforce the lesson of the pipeline by demonstrating to the Americans, to our European partners, and the Japanese, that we are serious about developing an independent European capacity in this and other high technology fields. It would also reinforce the efforts which Arthur Cockfield has undertaken to make the Americans think again about the objectionable extraterritorial aspects of this and other American legislation.

3. I also think that we should consider the position of INMOS in Europe and its ability to resist market penetration by other suppliers from outside the Community. It would clearly be undesirable for any developments in the field of advanced computer technology within Europe to be totally dependent on expertise from outside, particularly where these developments

/have a

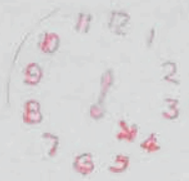
have a security element. We should also have to consider whether any future Government support need be notified to the Commission under Articles 92 and 93 of the Treaty of Rome.

4. It is for others to judge the main issues at stake, but I hope the factors I have referred to will be taken into account.

5. I am sending a copy of this minute to other members of E Committee, and to George Younger, Nicholas Edwards, Sir Robert Armstrong and John Sparrow.

(FRANCIS PYM)

Foreign and Commonwealth Office
25 November 1982



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Qa 06158

To: MR SCHOLAR

From: JOHN SPARROW

25 November 1982

INMOS

1. I have seen a copy of your minute of 25 November to Jonathan Spencer.

2. I quite agree that the Ministerial decision requires a more adequate factual basis than is currently available. Your minute does not however specifically ask for information about the future prospects of INMOS as envisaged in its business plan; it is in relation to that future that decisions need to be made. The past is relevant only as a guide to the future, and I would hope that Ministers also have before them information particularly on predicted profitability from now on, together with sufficient background material to enable the projection of profit to be properly appraised.

3. I am sending copies of this minute to the recipients of yours.

J.

CONFIDENTIAL

Ind Pol

10 DOWNING STREET

From the Private Secretary

25 November 1982

Dear Jonathan,

INMOS

As I mentioned to you on the telephone, the Prime Minister has postponed the meeting planned for today on INMOS, because she considers that the papers which are before Ministers give an inadequate factual basis for a decision.

The Prime Minister would, accordingly, be grateful if your Secretary of State, in consultation with the Secretary of State for Wales, would draw up a paper which compares the detailed original financial and employment forecasts for INMOS with out-turn. The Prime Minister would like the breakdown between employment which was predicted would be generated in the UK and in the United States; she would like too an analysis of cost estimates against cost out-turns, estimated financial requirements against actual financial requirements, estimated production against out-turn and so on.

On the assumption that this paper can be ready before the weekend we have provisionally re-arranged today's meeting for Monday 29 November at 1715.

I am sending copies of this letter to Margaret O'Mara (HM Treasury), Adam Peat (Welsh Office) and to Dr. Nicholson (CPRS).

Yours sincerely,

Michael Scholar

Jonathan Spencer Esq
Department of Industry.

CONFIDENTIAL

I think it would be better if we postponed the meeting.

Y SWYDDFA GYMREIG
GWYDYR HOUSE
WHITEHALL LONDON SW1A 2ER
Tel. 01-233 3000 (Switsfwrdd)
01-233 6106 (Llinell Union)
Oddi wrth Ysgrifennydd Gwladol Cymru

WELSH OFFICE
GWYDYR HOUSE
WHITEHALL LONDON SW1A 2ER
Tel. 01-233 3000 (Switchboard)
01-233 6106 (Direct Line)
From The Secretary of State for Wales

The facts before us

The Rt Hon Nicholas Edwards MP

24th November 1982

CONFIDENTIAL AND PERSONAL

Prime Minister (1)

Dear Prime Minister

I simply said that you wished to keep the meeting small

INMOS

I did not say that you had

As you know, I have taken a close interest in the progress of INMOS and probably know as much about the company as almost anyone in Government, and I have taken care to seek widespread advice both in North America and this country from those with the technical knowledge to judge the company's achievement and prospects. Furthermore we now have at Newport (completed ahead of time and under budget) one of the very best equipped facilities for the large-scale manufacture of chips that exists anywhere in the world. Into it has gone a considerable part of the money so far spent. If finance is available, it is all ready for a rapid build-up of production and of employment. If it continues to stand empty it will become an acute political embarassment. The company also now proposes to transfer the assembly and "burn-in"/test facilities to Wales with further substantial job benefits.

For these reasons I thought that you would have believed it right and helpful that I should be present at the meeting that is to be held tomorrow to discuss INMOS; and I have to admit that I was totally taken by surprise and most disappointed by your reaction last night. I believe I have a legitimate interest. I will have, if I feel able, to defend any decision that is taken and will be at the centre of the battle that might follow. I don't think I am all that bad at defending the Government's record! Furthermore the information I have about the company really might help us to arrive at the right decision.

/...

The Rt Hon Margaret Thatcher MP
Prime Minister
10 Downing Street
LONDON SW1

turned down a request from Mr Edwards.

Agree that he attend?

MLS 24/11

If you are not willing for me to be present, I hope you can spare the time for a very early meeting at which I can explain my views to you. It seems to me extremely important that I should do so before firm conclusions are reached and before the issue comes before colleagues for collective consideration. I feel sure you will agree that a decision which has such widespread strategic, technological, employment and political implications, and the fate of substantial public investment, is a matter that will have to be considered collectively.

Yours ever

Nick

JU201

CONFIDENTIAL

Prime Minister (1) cc JU

The expected reply on INMOS. Please see Dr Nicholson's note on the technology. Are you prepared to have a meeting - Patrick Jenkin Treasury Dr Nicholson ?

2 pps

INMOS.

PRIME MINISTER

I have seen your Private Secretary's letter of 15 November about INMOS.

MCS 19/11

2 To answer your specific questions, I enclose a table setting out how INMOS has used the funds it has had and what jobs it has created; and a letter from Hill Samuel to justify their confidence that private sector money can be raised in 1983 and that the requirement now is to adjust the borrowing limit in order to provide bridging finance. British Telecom have now decided firmly not to proceed with taking an equity stake.

3 I should like to summarise the reasons why I believe we should not withdraw support from INMOS - let me begin with the main one.

4 The main reason why INMOS was set up in the first place was to create a domestic capability at the top end of the rapidly developing market for chip technology. As I understand it, the creation of jobs, though valuable, was of secondary importance. Although you and I would not have approved of the way in which the initial financing was done, the fact is that we have to build on what we have got. We cannot start afresh. Nothing that has happened since then has lessened in any way the need for the UK to develop its own capacity to manufacture these highly complex memory chips. When we discussed the projected sale of Nimrod aircraft to Iraq, you will remember that it was in exactly this field of technology that the Americans have a hold over us because of the memory chip component in the Nimrod electronics system. You expressed then and, later, at the Paris Summit, the desirability of European countries developing their own independent capacity in this and other high technology fields in order to avoid the kind of pressures that arose over the Siberian pipeline. I believe that it would be totally inconsistent with this clearly expressed strategic objective now to let INMOS die

or be broken up for what the assets might fetch. It is not only in the defence field that INMOS' technology will be vital; it will be extremely valuable for our future IT industry as a whole.

5 Although a link-up with an established electronics company such as GEC may well make sense in the longer term, INMOS is at present a different type of business. The fact that GEC is not ready yet to make an acquisition certainly does not mean that INMOS is failing. I think the fact is that Arnold Weinstock and others resented our predecessors' decision to put public money into this high technology field and find it difficult to reconcile themselves to the fact that this small team of highly inventive entrepreneurs may well be succeeding. There is a great deal of jealousy but I am sure we should not allow ourselves to be influenced by that.

6 There is not the slightest doubt that if BTG were now to dispose of INMOS in a forced sale, the technological benefits which are now emerging and which have been acquired at such cost would almost certainly be lost to this country. I think we would face severe criticism of having killed INMOS off just at the point when it was becoming apparent that it could succeed.

7 These central considerations apart:

a the achievements which INMOS has made are substantial. There is wide confirmation from customers and technical consultants that its design capability and production facilities are of world class. Its products are now selling well; it is the sole source for a number of military contractors in the US. The Newport factory was finished on time. It is only through lack of funds that the build-up of production and employment of staff is being held up;

b continued support for one more year is the sensible commercial course. If we withdraw support, our chances of selling INMOS as a going concern are minimal, certainly as

far as the Newport factory is concerned. The BTG's estimate is that on break up, it might achieve a net figure from disposal of the assets of somewhere between nothing and £10 million. This would represent a loss to public funds of £40-50 million. If we continue to support INMOS for a year and Newport moves into volume production - and there is no reason to doubt that the facilities there can be made to operate efficiently - we would at least have something to sell of lasting value to this country with new jobs in South Wales and a reasonable chance that INMOS will by then have demonstrated its capacity to grow and to yield a positive, and possibly substantial return on our investment;

c as I indicated earlier, I would not have approved the INMOS project in the form in which it was set up. Nevertheless, in political terms I think it would be difficult to let INMOS fail now. I would certainly find it hard to reconcile with our determination to help the IT industry grow, particularly with the attention focussed on this at the end of IT 82 and your own speech at the Barbican.

8 A decision on this cannot be delayed. Extensive enquiries of potential sources of private funds have been made over the last months both by INMOS and the BTG and their respective advisors and over the last few weeks by Jeffrey Sterling. The view that private sector money can be found next year is not just that of Hill Samuel but is shared also by the Bank of England. Meanwhile confidence in INMOS is being affected and key staff are already considering leaving. If the borrowing limit is not to be increased by the £15 million I have recommended, we would then need to give the BTG as much time as possible to dispose of INMOS before it ran out of funds. There is already a risk that additional funds would be required simply to close the company down. I would therefore be grateful for an urgent meeting with you to discuss the matter.

9 I am sending a copy of this minute to other members of E Committee, George Younger, Nicholas Edwards, Sir Robert Armstrong and John Sparrow.

PJ

P J

19 November 1982

Department of Industry
Ashdown House 123 Victoria Street

201.2

ANNEX A

May I have the original costings forecasts in detail. I will have them analysed

We are making similar grants in the U.S.A.

Amount of public money invested in INMOS

a) NEB equity stake - £50 million, fully paid up

b) Grants - £8 million (of which £1.82 million of the £4 million Section 7 money and £1.32 million of the £4 million Regional Development Grants has been paid).

In addition there is exposure on outside borrowings with a limit of £35.3 million, since the NEB (BTG) folows a practice in standing behind the debts of subsidiaries. The present borrowing level is £26 million. In addition under the Industry Act there is exchange rate cover on a £5 million European Coal and Steel Community Loan. The outstanding total of these various monies is £84 million.

British European money

How has this £84 million been spent?

£m

	USA	Bristol	Newport	Total
Fixed Assets (at cost)	29	2.5	18.5	50
R&D (expensed)	10	2.5	0	12.5
Working Capital (and other accumulated losses)	17.5	1.5	2.5	21.5
	56.5	6.5	21.0	84.0

Employment

	UK	US	Total
Manufacturing related and Quality Assurance	162	437	599
Admin	48	133	181
R&D	50	69	119
Marketing	9	21	30
	269	660	929

£84 million for 269 jobs.

If Newport resumes its build up there will be a total of UK employees of 750 in 1983 and 1,200 in 1984. During the same period US employment would rise from 660 to 1,000.

HILL SAMUEL & CO. LIMITED

100 Wood Street, London EC2P 2AJ

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PRIVATE AND CONFIDENTIAL

CFC/RAD/NJA

18th November 1982

J. M. Sterling Esq., C.B.E.
4 Carlton Gardens,
Pall Mall,
LONDON SW1Y 5AB

Dear Jeffrey,

I am writing to confirm what we have said in recent discussions with you.

After over a year of exposure to the company and its management, we firmly believe Inmos has the potential to be a major factor in the world semi-conductor market and is capable of earning substantial profits. Contrary to the popular view, Inmos has achieved most of what it set out to achieve. Following our visit to the Colorado Springs facility in early November, we now also believe that Inmos will achieve the production targets they have set for their 64K DRAM in sufficient time to permit us to arrange an equity financing to raise £10 to 15 million from institutional investors in the Spring of 1983.

The company cannot unfortunately wait until the spring of 1983 for new money. In line with the forecast Inmos made in July, 1982 as part of its 1982 long range plan, the company will require, between now and the end of 1983, new cash of some £7 million to finance capital expenditure and operating losses. However, in addition, as a result of the $/£ exchange rate having fallen substantially below the $2 rate used when the borrowings limit was established in October, 1980, the company's already outstanding dollar borrowings are increasing in terms of sterling by enough to cause the borrowings limit to be breached outside the company's control.

A solution is urgently needed by way of new BTG supported finance and an amended borrowings restriction so that the company can pursue an operational plan which will permit privatisation to occur.

This must be accompanied by strong statements of support and encouragement from the Government so that the company will be able to reverse the bad press it has been getting. A feeling

Cont./.....

that the Government wanted Inmos to succeed would help the company enormously in its efforts to fill out its management, to convince existing and potential customers of its future and to get a successful privatisation process under way.

Inmos' management and employees want privatisation to occur as soon as possible because it is most unhealthy for the company to have a reluctant government as controlling shareholder. The two practical routes to privatisation are firstly sale of the whole company to a single controlling shareholder, probably American or Japanese because none of the UK electronics companies sufficiently appreciates the need for the technology to contemplate the size of investment required, and second sale of the company to institutional and ultimately individual investors.

The latter is the route we are pursuing but it will take time. The main challenge is that Inmos is in a technical sense a highly complex business with a great deal of tough American and Japanese competition. At this stage of its development - some 12 months ahead of achieving its first profit - it is an investment proposal which can only be negotiated over a period of time with a restricted group of sophisticated investors, and the size of the financing is therefore limited. The investors have to be persuaded that Inmos is as good a home for their money as Intel or Fujitsu in the same industry or a whole range of alternative opportunities.

Barring a collapse of confidence in financial markets we are, however, confident we will be able to put together such a group in the Spring of 1983 provided that Inmos achieves its 64K DRAM production targets and that the Newport ramp-up is proceeding successfully.

We believe we will be able to persuade institutions that compared to other investment opportunities:-

(1) Inmos can succeed in a world market which will show substantial growth in the years to come and which could prove the essential foundation for the world's electronics companies;

(2) Inmos is the only company in the U.K. involved in this area; and

(3) Inmos has a depth of management, design skills, production experience and a highly impressive list of customers, rare at this stage of a company's development.

Since the value of Inmos could rise dramatically during 1983 as it proves it can perform, it might of course be sensible to defer a financing until later in the year. As Inmos proves it can perform, the range of investors prepared to invest in the company on both sides of the Atlantic will also widen. For those two reasons, the size of the financing which it will be feasible to arrange will also therefore enlarge.

Cont./.....

The company's objective at the earliest possible moment has always been a public issue of shares which would be broad enough to take out the BTG altogether and refinance the debt.

People who take the time to try to understand Inmos become supporters. With informed support it can become a great British/American success story.

Yours sincerely,

R. A. DOUSE
Director

W.0719

19 November 1982

TO: PRIME MINISTER

cc: Sir Robert Armstrong
Mr Sparrow

FROM: R B NICHOLSON

INMOS

I understand that you are currently considering a proposal from the Department of Industry to increase the Government guarantee for INMOS by £15 million. I am in no position to advise you on the overall financial situation at INMOS or on the cost-effectiveness of past expenditure of public money by this Company. However I felt that the Secretary of State's letter to you did not adequately cover the technological achievement and potential at INMOS.

2. I visited INMOS in the Spring knowing little about the Company except its unhappy and ill thought-out origins under the previous administration.

3. I came away extremely impressed by the quality of Ian Barron and his management team, by the care and imagination with which they had identified promising market segments where the competition is based on quality rather than price, by the originality and brilliance of their designs for these market segments, and by the positive way they were interacting with our brightest brains in universities and beginning to attract some excellent graduates and postgraduates to work for INMOS.

4. Although INMOS has some way to go before it becomes established as one of a range of British companies in the devices/microelectronics/IT/electronic equipment area, I do believe it has this potential and that our future excellence in this vital area of industry will be enhanced by the existence of a successful specialist chip company.

5. The present track record includes taking 75 per cent of the world market for premium 16K RAMs. The 64K RAM has been launched in small volume from the Colorado plant and is being taken up well by customers. Valuable property exists in the form of a new computer-aided design tool for microelectronics, a new language OCCAM, and the transputer concept. These form the basis for future innovative products.

6. The demise of INMOS would almost certainly lead to the migration of its first-class design team to the United States and would leave a significant gap in the range of British companies which would be serving the IT and associated markets.

7. In assessing the technology at INMOS I have to regard the previous public financing as a sunk cost and to try to focus on INMOS as it is today in terms of technological achievement and future potential. On this basis there is, as I have indicated above, a bright side to INMOS which I felt I should draw to your attention at a time when you are considering the commercial prospects on the basis of advice from the Department of Industry.

RBN

DRAFT LETTER FROM PRIME MINISTER TO SIR HENRY CHILVER, FEng, FRS.

Technological excellence is a major factor in the economic recovery of the United Kingdom and one outstanding asset is our universities' research base. The recent report from the ABRC/UGC "Support of University Scientific Research" has made a valuable contribution through focusing on the dual support system for scientific research in universities. It urged stronger links between universities and industry but did not enquire into or develop this theme. The report by Job Creation on "Helping Small Firms Start Up and Grow" recommended a study on university-based incubator schemes for new small companies. Established companies also look to universities to provide part of the science and technology base from which they will develop new products and processes.

There is a need to foster and improve relationships between universities and industry whilst respecting, of course, the

primary roles of both parties. I would welcome a report from the Council on this subject. It would be helpful to have it available by the Spring of 1983. The Council may feel that it would be useful for the report to be prepared in collaboration with ABRC.

Prime Minister 2

MS

4/4
18/4

PM's Questions: INMOS

1. Amount of public money invested in INMOS

a) NEB equity stake - £50 million, fully paid up

b) Grants - £8 million (of which £1.82 million of the £4 million Section 7 money has been paid and £1.32 million of the £4m Regional Development Grants).

In addition there is exposure on outside borrowings of £35.3 million, since the NEB (BTG) follows practice in standing behind the debts of subsidiaries. The present borrowing limit stands at £26 million. In addition under the Industry Act there is exchange rate cover on a £8 million European Investment Bank loan.

2. How has the money been spent?

UK.

Assets	USA	Bristol	£m Newport
			6.5
Fixed Assets (at cost)	29	2.5	18.5
R & D (expensed)	10	2.5	0
Working Capital (and other accumulated losses)	17.5	1.5	2.5
	56.5		27.5

Worldwide Employment

3.

	UK	US	Total
Manufacturing related and QA	162	437	599
Admin	48	133	181
R & D	50	69	119
Marketing	9	21	30
	269	660	929

From 1982 onwards planned development is on building up the Newport fabrication plant to give a total of UK employees of 750 in 1983 and 1,200 in 1984. During the same period US employment would rise from 660 to 1,000.

CONFIDENTIAL

c.c. Mr. Vereker

BD

IND POL.

BF

10 DOWNING STREET

From the Private Secretary

15 November, 1982.

INMOS

The Prime Minister has seen a copy of your Secretary of State's letter of 12 November to the Chancellor of the Exchequer about the future of INMOS.

The Prime Minister is far from persuaded that there should be any move on the Government's part from the view that INMOS must survive within its approved limit, without any further help from public funds. She does not believe that there are special reasons in INMOS' situation - for example, the inflation and exchange rate reasons mentioned in paragraph 4 of your Secretary of State's letter - which might justify any such move. Mrs. Thatcher is not aware of adverse publicity for INMOS which would deter private sector money, and she has enquired why, if INMOS' facilities are ahead of anything which exists in GEC, Ferranti or Plessey, GEC do not purchase the company. Finally, the Prime Minister has asked for a full account of what INMOS have done with the public funds they have so far had; how many jobs have been created, and where.

BF

I am sending copies of this letter to the Private Secretaries to the other members of E Committee, George Younger, Nicholas Edwards, Sir Robert Armstrong and John Sparrow.

M. C. SCHOLAR

Jonathan Spencer, Esq.,
Department of Industry.

CONFIDENTIAL

lo

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DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SWIE 6RB 3301
TELEPHONE DIRECT LINE 01-212
SWITCHBOARD 01-212 7676

JU144
Secretary of State for Industry

12 November 1982

The Rt Hon Sir Geoffrey Howe QC MP
Chancellor of the Exchequer
HM Treasury
Parliament Street
London SW1P 3AG

Dear Chancellor

INMOS

1 Following the brief discussion we had at our meeting on 25 October I would like to report on the position we have reached as regards the future of INMOS.

2 You will recall that INMOS was set up by our predecessors on the basis of an expectation that £50 million from the NEB, together with £35 million borrowing from the private sector (effectively at Government backed risk) would see the company through to a stage where it would be able to depend wholly on private sector funding. The company decided to develop initially two families of chips, (a 16K static RAM and a 64K dynamic RAM) starting with an R&D pre-production facility in Colorado to be followed up with production facilities here in Newport.

3 The 16K is selling well and INMOS now has 70-80% of the world market within its particular sector. More important for the longer term is the 64K chip which the Newport facility is intended to produce and the family of microprocessors which it is developing. Two recent consultants' reports which have been commissioned by the BTG forecast a considerable revival of growth in the integrated circuit market and indicate that INMOS' products should be capable of being fully competitive. This applies not just to the 64K but also to other products which are in the course of development. The company already has a most impressive list of customers engaged in the computer, telecommunications, defence and consumer electronics field. Amongst the company's top 20 customers are Intel, Westinghouse, Control Data, GE, Matsushita, IBM and Sperry.

4 On the financial side the company has kept reasonably well on target where matters have been within its control - although it has experienced the same sort of production problems with its

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new products, particularly the 64K, as other semiconductor manufacturers. But in addition it has suffered from a number of factors outside its control, the biggest item being the change in the dollar-sterling exchange rate which has reduced its capacity to borrow by about £8 million since the £35 million borrowing limit was originally set. Other factors include the effects of inflation and the delay of several months in approving the Government's second £25 million. Indeed, these factors largely account for the additional funds which the company now requires.

5 In my judgement, which is supported by merchant banks and outside technical advice, INMOS has performed well against the plans it set itself. This is in contrast to the poor perception of the company in the press and the City.

6 Kenneth Baker and I have made it clear to the BTG in discussions over the last year that future funding should come from outside sources. Although the two consultants' reports which the BTG commissioned were encouraging and should have made it easier to raise private sector money, the BTG have concluded on the basis of advice from merchant banks that there will be a gap in 1983 before they can tap private capital on reasonable terms. This is in large measure because investors have been put off by the adverse publicity which INMOS has tended to attract.

7 The BTG therefore sought my authority to increase INMOS' borrowings and to underwrite the raising of £15 million private sector finance next year. Not being ready to recommend this to me, Kenneth Baker asked Jeffrey Sterling to explore the possibility of putting together a private sector package. As I explained when we met on 25 October, his plan was to attract private sector money alongside an equity investment which British Telecom was considering providing for INMOS. BT have a good deal of expertise in this area and George Jefferson has a close personal knowledge of INMOS from his time as a Board member of the NEB. An assessment of INMOS by BT was therefore a worthwhile exercise in its own right.

8 In considering the case for an investment the British Telecom Board wanted to examine whether INMOS' expertise could make a long term contribution to BT's future business. Mainly as a consequence of the views of two of the outside Board members (Derek Vander Weyer and David Cormie) they have concluded that there was "insufficient synergy with their present mainstream business" to justify support. George Jefferson has made it clear to Jeffrey Sterling that this judgement should not be taken to reflect on BT's views either of INMOS' achievements or its prospects for success or of possible synergy in the longer term. He clearly believes that INMOS should continue and could succeed.

CONFIDENTIAL

9 I am disappointed in BT's decision because its readiness to invest in INMOS would have provided the core around which private sector participation could readily have been built. I am therefore proposing to talk with George Jefferson (who I believe shares my disappointment) and if George agrees, with the two outside directors, to explore the thinking behind their decision. I have, on several occasions, both in public and in private, said that privatisation will enable BT plc to develop into a fully integrated I T company ranking with AT& T or IBM. If INMOS succeeeds, the capacity to make advanced chips could form an asset of great value to such a company. That is what I believe George saw when he first suggested BT becoming involved (it was his idea, not mine), and I want to know why others do not share that view.

10 If on reconsideration BT changes its mind (it has, of course, to be their decision - no one else's) then the way ahead for INMOS looks reasonably hopeful. If not, then I believe we face some difficult decisions. Without BT I do not believe it will be possible to raise private sector money this year. This is the view of BTG and their advisers and my advisers as well. Without the prospect of further money now, it will not be possible for INMOS to reverse the damaging decision the Directors had to take to halt production at Newport in order to conserve cash. The factory there is otherwise on schedule but until it is in full production, there is simply no on-going business which could be continued even in the event of a forced sale. Without further money, therefore, the investment which the taxpayer has made in order to secure an independent capacity to develop and manufacture high performance chips in this country, will be lost. INMOS' Colorado Springs operation could probably be sold and thereby limit the direct loss of public funds but little of technological importance would survive in this country. This would also expose us to the criticism that we had let go an important technical development in South Wales after arguing with INMOS that it should locate its facility there.

11 The obvious question therefore is whether it is worth risking more public funds. There might be two reasons for doing so; because the company has a prospect of success and of moving into private ownership and/or because the technology on which it is engaged is of strategic national importance.

12 On the first point, I acknowledge that to support INMOS would continue to be a high risk. But to have go as far as it has, INMOS has made considerable achievements, as all the outside consultants have concluded, and we now have several independent views from Hill Samuel, Lazards and Smith Barney as well as from my own Industrial Development Unit and Jeffery Sterling, that it should be possible to raise private sector finance in 1983 and that the facility which is required now is purely bridging finance. Furthermore, not to continue support INMOS at this

CONFIDENTIAL

point when the Newport facility is ready to go into volume production and have the US technology transferred to it is like trying to sell a house before putting the roof on. Even if we were to judge in a year's time that INMOS could not succeed, it would still amost certainly have been worth investing the additional sums needed now to bring the one significant UK asset to the point where it could be disposed of as a going concern.

13 On the second point I have become increasingly aware of the strategic importance of having an independent capacity to design, develop and manufacture those electronic components which are critical to our future IT industry. This is especially so for the high density chips on which INMOS is concentrating, and its VLSI products in the future. There is an increasingly restrictive environment in world trade, particularly where the export of technology is concerned. This is apparent in our experiences with Japan where for reasons that are entirely commercial, our companies are finding difficulty purchasing innovative components. At the same time we have all been recently made aware of restrictions for defence reasons on exports from the US of critical components and manufacturing know-how and equipment. In addition to our experience with the US over the gas pipeline, there are increasing restrictions through COCOM which affect our trade; the US is now refusing to allow sales of aircraft to certain markets when particular US chips have been incorporated (we discussed the Nimrod sales to Iraq a few days ago). I do not believe, therefore, that we can count on relying on the free use of imported chips from the US and Japan for incorporation in other electronic equipment and we should certainly be putting our exports at risk if we were to do so. It is also worth stressing, in case there is a view that other UK manufacturers could fill the gap left by INMOS, that INMOS' facilities are ahead of anything which exists in GEC, Ferranti or Plessey (although their product ranges are also important for Britain).

Ask GEC do purchase it. They have looked at it before.

14 I believe, therefore, that however strongly we have all argued that INMOS must survive within its approved limits, it simply does not make sense to abandon INMOS. If it is to have a chance of success, it needs not just finance but to be seen to enjoy the confidence of its investors and their determination to give it the best chance of succeeding. It is against this background that I would like to discuss with you the best way forward after I have had a final word from George Jefferson and if it becomes clear that the BT proposal is not a runner.

15 I am sending a copy of this letter to the Prime Minister, other members of E Committee, George Younger, Nicholas Edwards, Sir Robert Armstrong and John Sparrow.

Yours sincerely
David Saunders

PP PATRICK JENKIN

(Approved by the Secretary of State and signed in his absence)

Can we be told accurately what INMOS have done with the money? How many jobs have been created and where not

Ind Pol JR
file a HATT
DOI
Welsh Office

10 DOWNING STREET

THE PRIME MINISTER
PERSONAL AND CONFIDENTIAL

26 October 1982

Dear Sir William.

Thank you for your letter of 13 October.

I understand the British Technology Group has now submitted a proposal for the Secretary of State for Industry's approval regarding the future financing of INMOS and that this has drawn attention to the achievements which INMOS has made so far and to the encouraging assessment of its prospects which is contained in a report carried out recently by an outside consultant. I do not believe that with the amount of public money already invested in INMOS through the NEB further such funds should be needed. I know that Patrick Jenkin and Kenneth Baker believe that with the progress INMOS has made it ought to be possible to raise the necessary extra funds from outside sources, and that a number of ideas are being pursued at present as speedily as possible.

I wish you and your fellow Directors all success at this important moment in INMOS' development.

Yours sincerely

Margaret Thatcher

Sir William Barlow

10 DOWNING STREET

(3)

Prime Minister

The background Industry note is interesting (Flag A)

I have toughened up their draft letter.

MLS 25/10

CONFIDENTIAL

EKPPS

A

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 3301
SWITCHBOARD 01-212 7676

JU5
Secretary of State for Industry

25 October 1982

Michael Scholar Esq
Private Secretary to the
Prime Minister
10 Downing Street
London SW1

Dear Michael,

Thank you for your letter of 14 October enclosing a letter which the Prime Minister has received from Sir William Barlow about INMOS.

2 The BTG Board decided at its September Board meeting that the success which INMOS' 16K product had achieved with 70-80% of the world share in its specialised sector and the favourable assessment of its future product range by an outside consultant, justified its confidence that private sector money could be raised in 1983 to provide for INMOS' future financing needs, provided the issue of new shares was underwritten by the BTG. However, they accepted the view of their merchant bank advisers that outside finance could not be found immediately, since the Newport factory, though on schedule, was not yet on stream. It was expected there would be a temporary gap in early 1983 for the reasons given in Sir William Barlow's letter. The BTG have approached the Department on this basis.

3 In response, Mr Baker, who has been in close touch with the BTG on INMOS, has made it clear throughout that the Government should not be asked to provide additional funds. He has insisted that a further attempt should be made to attract outside investors. The Prime Minister may like to know that the most likely investor is British Telecom, who have a close interest - and much specialised expertise - in INMOS's area of technology which is of increasing strategic importance to Britain. They have a team working at INMOS urgently and are expected to give their initial report this week. Mr Jeffrey Sterling is involved in the negotiations but my Secretary of State has made it clear to him that the BT involvement is only a runner if it is possible to bring in a number of private investors willing to support INMOS.

4 My Secretary of State has discussed this briefly with the Chancellor and Chief Secretary this morning, and has it in mind to report to the Prime Minister and to colleagues shortly when British Telecom's view is known. This is in keeping with the undertaking which Sir Keith Joseph gave in his minute to the Prime Minister of 8 October 1980. In the meantime I enclose a draft reply which the Prime Minister may like to send to Sir William Barlow.

5 I am copying this letter to Margaret O'Mara (Treasury)

Yours ever,

Caroline Varley

for DAVID SAUNDERS
Private Secretary

JU6

DRAFT REPLY FOR THE PRIME MINISTER TO SEND TO

PERSONAL AND CONFIDENTIAL

Sir William Barlow
Chairman, Engineering
Thorn EMI
Thorn EMI House
Upper St Martin's Lane
London WC2H 9ED

Thank you for your letter of 13 October.

I understand the British Technology Group has now submitted a proposal for the Secretary of State for Industry's approval regarding the future financing of INMOS and that this has drawn attention to the achievements which INMOS has made so far and to the encouraging assessment of its prospects which is contained in a report carried out recently by an outside consultant. I know that Patrick Jenkin and Kenneth Baker believe that with the progress INMOS has made it ought to be possible to raise the necessary extra funds from outside sources. ~~To this end, they are pursuing a number of ideas at present as speedily as possible.~~

I don't believe that with the amount of public money already invested in INMOS Mrgt pa NEB further such funds should be needed.

and that a number of ideas are being pursued at present as speedily as possible.

I hope ~~this will~~ assure your position and that of your fellow non-executive Directors.

and your fellow Directors

I wish you ~~en~~ all success at ~~this crucial~~ important moment in INMOS' development.

~~My colleagues~~ My department of ~~The government has~~ Industry colleagues have, as you know, made it clear that the ~~must take~~ government ~~it~~ should not be asked to provide additional funds for INMOS, and I am sure that is the right approach.

D 25/10

FILE SW

23/10

Sir William BARLOW

10 DOWNING STREET

From the Private Secretary

14 October, 1982

I attach a copy of a letter which the Prime Minister has received from Sir William Barlow, on behalf of the non-executive directors of INMOS.

I should be grateful if you could let me have a draft reply for the Prime Minister's signature by 23 October. You will wish to know that the Prime Minister has commented on the letter:

"And what has £50m of the tax-payers' money achieved?"

M. C. SCHOLAR

Jonathan Spencer, Esq.,
Department of Industry

FILE SW

10 DOWNING STREET

From the Private Secretary

14 October, 1982

I am writing on behalf of the Prime Minister to thank you for your letter of 13 October.

I shall place this before her, and a reply will be sent to you as soon as possible.

M. C. SCHOLAR

Sir William Barlow

610

Prime Minister (1)

I doubt whether this will appeal to you?

MCS 13/10

THORN EMI

THORN EMI House,
Upper Saint Martin's Lane,
London WC2H 9ED
telephone 01-836 2444
telex Thorn London 24184/5

SIR WILLIAM BARLOW
CHAIRMAN, ENGINEERING GROUP

13th October 1982.

The Rt. Hon. Mrs. Margaret Thatcher, MP,
Prime Minister,
10 Downing Street,
London SW1.

And what has £50m of the taxpayer's money achieved? MF

Dear Prime Minister,

I am writing on behalf of the non-executive directors of INMOS, namely Martin Harris, Peter Moody, John Sawkill, and myself. As four independent businessmen covering a wide range of experience, we were appointed by the NEB after your Government had approved the second £25 million of capital in the autumn of 1980. None of us have any personal financial stake in INMOS and are serving as a public duty.

Whilst, as you are no doubt aware, INMOS is developing on the lines envisaged when the Government approved the finance, a number of factors have combined to make the Company need more finance at this time. They are that the world semi-conductor market has been affected by recession, the dollar/pound exchange rate has deteriorated, and there have been teething troubles with the new generation of products being developed by INMOS.

As a result, the Company needs to be assured that additional finance of up to £15 million will be available. We are doing our best to get by without this facility but having regard to the legal obligations on us as Directors we are having to restrict the planned production build-up in order to be able to meet the obligations of the Company. However, an independent technical report recently commissioned by British Technology Group was very encouraging and supported the case for further funds to be put into INMOS so as to secure its financial base.

Your Ministers have made clear how unpalatable is the idea of further Government funding for INMOS but nevertheless we are writing to let you know that the four of us feel that this additional investment or facility should be made in the national interest and that it is justified on commercial grounds. Whilst we have faith in the future of the Company and its products we do not find it possible to raise money from the private sector on terms fair to the Government at the present time when the key product, the 64K DRAM is only just entering commercial production. This view has been confirmed by merchant banker advisors.

../.....

To:- The Rt. Hon. Mrs. Margaret Thatcher, MP. 13th October 1982.
Prime Minister.

A great deal has been achieved in this strategically important semi-conductor business thanks to the Government's foresight in financing the scheme and what it needs now is that bit extra to get the Company into a fully commercial state. The necessary additional cash made available now would in our view result in a higher value being placed on INMOS in due course. It would also be seen as a sign of confidence by your Government in the Company which would be most beneficial to its development.

Knowing that you were personally involved in the decisions on INMOS we felt it would be helpful to let you know our feelings. We have not, at this stage, sent a copy of this letter to anyone.

Yours sincerely,

William Baker.

cc MCS
JV

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 0002
SWITCHBOARD 01-212 7676

From the
Parliamentary Under Secretary of State

Prime Minister

For information (We will be letting you have a draft letter covering the various points raised by Dr Clark)

MP 17/3

£150m for 270 jobs!

COMMERCIAL IN CONFIDENCE

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

16 March 1982

Dear Mike,

I understand that at the meeting with Dr Clark on 4 March, the Prime Minister enquired about the number of jobs being created by Inmos in the UK.

Work at Inmos's Newport site is on schedule for production there to begin towards the end of this year.

The present position is that 114 people are currently employed by the company in the UK. This should grow to about 270 by the end of this year, rising to 1,000, and 1,850 if the proposed second production unit goes ahead. The forecast of UK jobs is lower than was originally expected (up to 3,600 by 1985) because the sales have built up more slowly than had been expected and the company have, therefore, had to phase their capital expenditure over a longer period.

The Prime Minister may have seen recent press reports that the company have abandoned their plans to establish a second production unit in the UK. This is speculation. The timing of a second UK unit depends on a number of uncertain factors, particularly on the company's sales performance when Newport is in production. In practice the position is unlikely to be clear until the middle of 1983. As far as the location of such a unit is concerned, the position remains that the NEB have agreed this would be in an Assisted Area.

I am enclosing for information a copy of my letter to Helen Ghosh about the first point in your letter of 4 March.

Yours ever

Anthony

A C S WILLIS
Private Secretary

Enc.

10 DOWNING STREET

From the Private Secretary

4 November 1980

INMOS

The Prime Minister has read your letter to me of 31 October, and is content with your explanation on the question of the additional liability which the NEB might have to meet if INMOS were to go into liquidation.

I am sending copies of this letter to Private Secretaries to members of E Committee and to David Wright (Cabinet Office).

T. P. LANKESTER

Mrs. Catherine Bell,
Department of Industry.

CONFIDENTIAL

2

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SWIE 6RB
TELEPHONE DIRECT LINE 01-212 3301
SWITCHBOARD 01-212 7676

PS/Secretary of State for Industry

31 October 1980

Tim Lankester Esq
Private Secretary to the
Prime Minister
10 Downing Street
London SW1

MF.

Anne Mueller

You wanted questioned this NEB's position if INMOS were to fail. X below explains that the cost of meeting INMOS's liabilities would necessarily mean extra funding because there is no NEB provision beyond 1982/83. Should say that the contingent commitment I don't think we can take this any further.

Dear Tim

INMOS

In your letter to me of 20 October you said that the Prime Minister had asked whether any additional liability which the NEB would have to meet if Inmos were to go into liquidation could be covered within the NEB's existing budget. Subject to that point, the Prime Minister would be content with the arrangements with the NEB which my Secretary of State described in his minute to her of 8 October.

2 Whilst it is certainly the normal practice for the NEB to meet the costs of the failure of any of its companies out of its own provisions, this is not always the case, nor is it always sensible to insist on this. For example, we had to take the decision on the liquidation of Alfred Herbert earlier this year, despite the fact that, at the time, it did not appear that the costs could be met out of NEB's estimate provision for this year. If we had insisted on the NEB meeting the costs they would have been forced to maintain Herberts, since this would have involved less cost this year though higher costs thereafter. In the event the delay on Inmos has resulted in savings this year which will cover the Herbert costs so there will be no overspend.

3 As far as what might happen were Inmos to fail, the Prime Minister will recall that the financial provision agreed for the NEB following the review of its role which was undertaken after the election was over £140 million over a three year period. This was to cover expenditure within the NEB's high technology and regional roles up to the end of 1982/3, and colleagues did not take any decision about the NEB going beyond that. The second tranche of £25 million for Inmos approved at E Committee on 28 July falls within this limit. But if Inmos were to fail it is most unlikely that any additional liabilities would arise until after 1982/3. As the NEB's budget stands at present, therefore, the costs of meeting any such liability would require additional funding. My Secretary of State will be considering at the end of the year what provision might be included for the NEB for the period beyond 1982/3. He will be bringing this before colleagues in the normal way at the beginning of next year, when we have examined the NEB corporate plan.

X

/4....

4 I am sending copies of this letter to the Private Secretaries to members of E Committee and to David Wright (Cabinet Office).

Yours ever

Catherine Bell

CATHERINE BELL
Private Secretary

CONFIDENTIAL

JS

10 DOWNING STREET

From the Private Secretary

20 October 1980

Dear Ian,

INMOS

The Prime Minister has considered your Secretary of State's minute of 8 October on the above subject.

She assumes that any additional liability which the NEB might have to meet if INMOS were to go into liquidation would be covered within the NEB's existing budget. Subject to this point, she is content with the arrangements which Sir Keith has made with the NEB.

I am sending copies of this letter to the Private Secretaries to members of E Committee and to David Wright (Cabinet Office).

Yours ever,

Tim Lankester.

Ian Ellison, Esq.,
Department of Industry.

JS

JH

PRIME MINISTER

INMOS

In your summing up of our discussion on INMOS at E Committee on 28 July, you invited me, if possible, to limit the Government's total liability to the £50 million equity plus regional assistance. I would like to report the arrangements I have made with Sir Arthur Knight.

2 One of the difficulties is that it is impossible to forecast a precise ceiling for INMOS' liabilities. In addition to the £50m equity which the NEB now has approval to draw down, the company has consistently estimated a requirement of peak long term borrowing of £35 million. This is now net of the expected receipts from regional assistance. £17m of the borrowing will be in the form of mortgage or leasing finance for buildings and equipment which would revert to the mortgagee or lessee in the event of INMOS' liquidation. To this extent the NEB's potential liability for the company's external borrowing is limited to £18-19 million. There will at any time be additional trading liabilities in the form of overdraft facilities, trading commitments etc. No precise limit could be set on these but I am satisfied that the Board will keep the company's working capital position firmly under review as part of its monitoring procedure.

3 Against this background and our concern about limiting the Government liability Sir Arthur Knight has agreed to monitor closely

/the ...

the performance of INMOS against specified targets. Sir Arthur has assured me that the Board will not allow the company to draw down equity unless they are satisfied with the company's progress. Officials in this Department will be able to keep a regular check on this through new quarterly monitoring procedures agreed with the NEB. In this way I am satisfied that adequate control of the company can be maintained and that the danger of its assuming liabilities which the Government might have to shoulder can be kept to the minimum.

4 You also indicated in your summing up at E Committee that the increase in the NEB's equity shareholding in INMOS should not be held to imply that the Government would always automatically stand behind any liabilities which INMOS might incur. The obligations of the NEB in relation to its subsidiaries are set out in their guidelines:-

> "In deciding on their practice in relation to the debts of their subsidiaries, the Board shall have regard to the practice of companies in the private sector in relation to the debts of their subsidiaries".

Whilst this avoids any firm commitment, the NEB has let it be known that they will meet all proved debts of a subsidiary in the event of liquidation, as indeed they are doing in the case of Herberts. This conforms with best City practice. It has also been made clear that the Government stands behind the NEB without qualification or reserve. This was confirmed to the PAC by the Accounting Officer for this Department before we took office. Many of the companies which were established at that time and still form part

/of ...

of the NEB's portfolio could not have been established on any other basis. I think we must recognise that, at least in relation to these companies - and this includes INMOS - it would not be possible for us to go back on this well-established practice.

5 Given therefore that we must accept the ultimate risk for the bulk of the venture, I am satisfied that the arrangements I have instituted will allow me to keep a close watch on the way that the risks associated with INMOS develop. I will give colleagues the earliest possible warning should there be any prospect of the Government's exposure being significantly increased.

6 I am sending copies of this minute to members of E Committee and Sir Robert Armstrong.

KJ

K J
8 October 1980

Department of Industry
Ashdown House
123 Victoria Street
LONDON SW1

Ind Pol.

10 DOWNING STREET

THE PRIME MINISTER

8 August 1980

Dear Mr Petritz,

Thank you for your letter of 1 August.

It is very kind of you to ask me to pay a visit to INMOS. I would like to do this at some point but I am afraid my diary for the foreseeable future is so overcrowded that this will not be possible for the time being. However, I shall certainly bear your invitation in mind.

Yours sincerely

Margaret Thatcher

Mr. R.L. Petritz.

P.S. I wish you great success - for all our sakes!

IND

Correspondence in GR

C.F. to note

10 DOWNING STREET

THE PRIME MINISTER

4 August 1980

Dear Mr. Jones,

Thank you for your letter of 23 July about INMOS. I was glad to be able to announce our decision on INMOS in the House on Tuesday. I am sure that you will welcome it.

You said in your letter that the National Enterprise Board had given an assurance to the Labour Government that the production units would be sited in Assisted Areas. I am not aware of any unqualified commitment by the NEB to an Assisted Area; and INMOS, for their part, denied earlier this year that they were committed in any way. . .

Yours sincerely

Margaret Thatcher

The Right Honourable T. Alec Jones, MP.

Inmos International Ltd
Whitefriars
Lewins Mead
Bristol BS1 2NP
United Kingdom
0272 290861
Telex 444723

RS/8

As regards the idea of a visit, better to wait until the INMOS factory is built.

inmos

The Rt Hon Margaret Thatcher MP
Prime Minister
10 Downing Street
London SW1

12
RS
5/8

Dear Mrs. Thatcher,

I am writing to you to personally thank you on behalf of myself and the employees of INMOS for your support announced earlier this week in the House. I am confident that INMOS will justify the faith and commitment the Government has made to this Company by becoming one of the leading companies in the world-wide VLSI semiconductor business, and I believe that your decision will prove to be a wise and significant one.

May I extend a personal invitation to you to visit INMOS in both the UK and the US at your earliest convenience. Such a visit by you would, I believe, be beneficial not only to INMOS but also to you in gaining a better understanding of INMOS' development in the microelectronics industry.

Thank you once again for your personal support of this project.

Sincerely,

Richard Petritz

Richard L Petritz

RLP/CW
1 August 1980

CONFIDENTIAL

Ref. A02723

PRIME MINISTER

INMOS

(E(80) 78)

BACKGROUND

The Secretary of State for Industry reports that, following a further extensive review, the National Enterprise Board have now concluded that INMOS's first United Kingdom factory should, after all, be in South Wales, and that they have invited him to authorise the subscription of £25 million more for the capital required.

2. The review was led by Mr. Jefferson, the Deputy Chairman of British Aerospace's Dynamics Group. He was supported by experts from his own company and by two teams of North American consultants recommended by Sir Robert Clayton of GEC (GEC themselves have now withdrawn all interest in this project). Their conclusion, reported in Sir Arthur Knight's letter of 18th July attached to E(80) 78, is that INMOS's management structure is generally sound and that the company is particularly strong in design and production. They note that the major competitors are making very slow progress.

3. There is already public expenditure provision for NEB to advance the further £25 million, which would be additional to £25 million already given. The regional grants would be up to £7 million. There would remain a risk, which has been present all along, that if the company were to fail the Government would be obliged to pick up the costs which could be as much as a further £50 million. But even if the Government were to put in no more now, and INMOS were to concentrate all its resources on its American venture, the Government's financial exposure would still be high.

4. The NEB have concluded that the earliest practicable date for the disposal of their shares on reasonable commercial terms is likely to be 1983-84. The Secretary of State for Industry recommends that agreement to the project should be on condition that disposal was completed in that year; and that in the meantime the NEB should continue to seek private capital.

5. The company has not yet decided where their site would be in South Wales. The decision will turn largely on what are the maximum regional grants available for particular areas.

HANDLING

6. After the Secretary of State for Industry has introduced the paper the Chief Secretary, Treasury will wish to comment on public expenditure implications. The Secretaries of State for Wales and for Employment will wish to speak on the question of location of the site.

7. It seems likely that most members of the Committee will consider that the outcome is satisfactory. Given that the Government has already been heavily criticised for the delays in reaching decisions on this project, the Committee may well feel that it is right to accept the present proposals and announce the decision forthwith. I understand that, if this is the conclusion, you have it in mind to announce the decision yourself in the Censure Debate.

8. It might be suggested that the discretionary regional grants should be offset against the £25 million further injection of capital. This could however further delay decisions on the project and lead the company to reconsider its decision to go to South Wales. It was fully recognised in the earlier discussions, when Ministers were pressing for a decision in favour of South Wales, that the company would benefit from regional assistance if they went there.

CONCLUSIONS

9. In the light of the discussion you will wish to record conclusions:-

(1) Authorising a further advance of £25 million and agreeing that regional grants should be available.

(2) Making it a condition that the NEB's shareholding should be disposed of by 1983-84, and noting any further conditions.

(3) Agreeing when the announcement of a decision should be made.

RetA

(Robert Armstrong)

25th July, 1980

10 DOWNING STREET

From the Private Secretary

23 July 1980

The Prime Minister has asked me to thank you for your letter of 21 July and for the copy of your letter to Sir Keith Joseph of 18 July indicating that the NEB is now supporting the INMOS management in seeking a South Wales location for the proposed UK plant.

T. P. LANKESTER

Sir Arthur Knight

PRIME MINISTER

1

This is a letter from Arthur Knight saying that the NEB have now concluded that INMOS should go to South Wales! The reason for this appears to be that, because of rising costs, INMOS will need the extra regional grants which would be available if they go there.

Of course, it is for decision whether it would be right to allow them this extra money. Sir Keith will be coming back to E Committee next week, and if you agree, I will simply acknowledge.

Agreed
MF.

22 July, 1980.

National Enterprise Board

Tel: 01-730 9600
Telex: 8812971

12/18 Grosvenor Gardens,
London SW1W 0DW

BY HAND

AWK/dmh

21st July, 1980.

The Rt. Hon. Margaret Thatcher, M.P.,
Prime Minister,
10, Downing Street,
London, SW1.

Dear Prime Minister

SOUTH WALES

On reading yesterday's press reports about events in South Wales, it occurred to me that you might find it helpful to see, in advance of the normal circulation process, the enclosed copy of a letter which I sent to Keith Joseph on Friday, following the NEB's review of the INMOS project. You will see that the NEB is now supporting the INMOS management in seeking a South Wales location for the proposed U.K. plant.

I am letting Keith Joseph know that I have written.

Yours sincerely

Arthur Knight

SIR ARTHUR KNIGHT

enc.

National Enterprise Board

Tel: 01-730 9600
Telex: 8812971

12/18 Grosvenor Gardens,
London SW1W 0DW

COMMERCIAL IN CONFIDENCE

AWK/B/sar

18th July, 1980.

The Rt Hon Sir Keith Joseph, MP, Bt,
Secretary of State for Industry,
Department of Industry,
Ashdown House,
123 Victoria Street,
London. SWIE 6RB

Dear Keith,

As you know I decided to conduct a review of the INMOS project because six months had elapsed since we decided, on the basis of INMOS' 1979 corporate plan, to approve a second £25 million in NEB funding for the project. The review which has taken about four weeks, was conducted by a team under Mr G R Jefferson, Chairman and Chief Executive of British Aerospace Dynamics Group and an NEB Board member. In laying down detailed terms of reference for the technical and commercial evaluation of the project, Mr Jefferson drew on advice from Sir Robert Clayton, Technical Director of GEC Limited, also an NEB Board member.

The review was split into four sections:

(a) An examination of INMOS' management structure and of the company's progress to date in establishing a capability in the following areas: design, production, marketing, and cost and quality control.

(b) A detailed technical evaluation of those INMOS products already at the prototype or design stage. This evaluation was carried out by a team from the British Aerospace Dynamics Group who had themselves established a MOS chip-making facility at BAe in Stevenage.

(c) Two studies, by independent consultants (DATAQUEST and MOSAID, who are both leading North American consultancy firms) of the world MOS semiconductor market and of INMOS' position in that market, with particular reference to the fact that future supply might exceed demand (or vice versa).

(d) An examination of INMOS' financial plans including sensitivity analyses based on relatively pessimistic assumptions on price, market growth, and the speed with which the company would gain market share.

The review team concluded that INMOS' management structure is generally sound and that the company is particularly strong in design and production. The technical evaluation established that INMOS' first products (the 16K static RAM and the 64K dynamic RAM which have already been announced) are at the leading edge of MOS technology and both products are on target. The independent studies of the world market for MOS products suggested that, because INMOS' major competitors have made very slow progress, the INMOS 16K static RAM could well be amongst the first on the market and, provided the design is successful, the INMOS 64K dynamic RAM should also be well within the window of opportunity. INMOS has assembled a very talented team at a time when design skills appear to be at a premium. For the future, the company has a well-develped series of new product plans encompassing inter alia an extension of its current and CMOS technology.

The review team's examination of INMOS' financial situation shows clearly that the high rates of UK inflation in the past year have reduced the purchasing power of the £50 million equity envisaged in the company's financing plans. This, and in particular the increase in UK building costs, have greatly enhanced the case for siting the company's first UK production unit (UK1) in an Assisted Area, where the company can take advantage of grants and other financial assistance which might be available.

At the same time the review team found that the technical progress made by the company in the last 6-9 months has greatly increased INMOS' confidence in its ability to manufacture its products successfully in the UK. As a result, although co-location of UK1 and the UK technology centre was a desirable objective, the company is now satisfied that it would be possible for UK1 and the technology centre to operate separately, provided the geographical separation is reasonable.

The NEB Board considered the findings of the review team at its meeting on 18 July, 1980. It agreed that in the light of progress made by the company to date, it would be unwise to call a halt to the project at this stage.

The Board considered whether, if restricted to the initial £25 million, INMOS could be developed into a profitable company, thus enabling the NEB to dispose of its shareholdings at a profit. The Board noted that in this eventuality the company would probably close down its UK operations and concentrate all its resources on the Colorado Springs factory. The sensitivity analyses done by the review team indicate that, on the most pessimistic assumptions, the risks attached to this option are excessively high, though it is at least conceivable that the Company would survive. In any event, gearing would remain very high for at least five years and the earliest practicable date of disposal of the NEB's shares at a profit would be mid-1985.

On the other hand the review has demonstrated that, with an additional £25 million in NEB funding, INMOS could meet the targets set for it considerably earlier and at less risk. Peak gearing would be much lower, and the earliest practicable date for disposal of the NEB's shares would be brought forward to early-1984. This option would fulfil the original aim set for INMOS since it would secure transfer of INMOS technology to the United Kingdom and would result in 75%-80% of the company's output being in this country by 1984/85. The INMOS technology centre would be preserved, and with it the prospect of a UK-based microsprocessor design and manufacturing operation. However, the Board noted that sensitivity analyses done by the review show a distinct financial advantage in favour of the first UK production being sited in an assisted/steel closure area because of the Government grants and EEC loans which should be available to offset the impact of UK inflation, in particular on building costs. The relevant financial comparison is as follows:

	COMBINED CENTRE IN BRISTOL	FACTORY IN ASSISTED AREA
1984 Book Value/Share (£)	12.30	12.76
1984 PBT (£M)	29.6	30.0
Peak Borrowing (£M)	45.2	35.3
Peak Gearing	0.88	0.66

These points were brought to the attention of the Directors of INMOS. At a special board meeting called on 17th July, 1980, the directors of INMOS decided unanimously that the Company's first UK production unit should be sited in South Wales, provided that this would result in the financial assistance, including discretionary grants, outlined above. This decision was endorsed by the NEB Board on 18th July, 1980.

The NEB therefore agreed that it should confirm its request to the Government for a second £25 million of public funds for INMOS. We have looked at private sector financing possibilities and, though aiming at private investment as early as is practicable, have concluded that the prospects look unattractive at this stage and we should re-examine this when the project is more advanced. The Board hoped that, in the light of the comprehensive review it had undertaken, the Government would be able to give speedy consent to the proposal. I must emphasise that there is a need for an urgent positive decision by the Government, because if the Government decides not to grant the second £25 million the NEB and the taxpayer are currently wasting money on the INMOS facilities in the UK which would be better spent pushing ahead with a purely US company. There is therefore great urgency for a Government decision in favour of the NEB's proposals.

Yours

Arthur.

Ind Pol

RESTRICTED File ds

10 DOWNING STREET

From the Private Secretary

21 July 1980

Microprocessor Application Project

The Prime Minister has read your Secretary of State's minute of 14 July, and is prepared to agree that commitments under the MAP should continue up to a maximum of £55 million in cash terms.

I am sending copies of this letter to John Wiggins (HM Treasury), Richard Dykes (Department of Employment), Peter Shaw (Department of Education and Science), David Wright (Cabinet Office) and Gerry Spence (CPRS).

T. P. LANKESTER

Ian Ellison, Esq.,
Department of Industry.

RESTRICTED ds

c/ Mr Hoskyns

RESTRICTED

Prime Minister

Are you prepared to agree continued spending on the MAP programme up to £55m as announced by the last Government? Or do you want to discuss with Sir Keith? (In my view, the MAP - which is to do with applications - is of much higher priority than support for microelectronics manufacture below).

Yes but not £55m - updated for inflation £55m in 1978 money = not.

Qa 05078

To: MR LANKESTER

From: J R IBBS

Microprocessor Awareness Project (MAP)

Flag A

1. Sir Keith Joseph wrote to the Prime Minister on 14 July seeking her agreement to spend up to the previously announced limit of £55m. on MAP.

2. As you know, the CPRS has been involved with MAP since its inception. In our view the results so far have fully justified the expenditure of the first £22m. But much remains to be done. We are still 'under-achieving' in redesigning threatened products and processes. The take-up of training places remains unusually high. We very much hope, therefore, that the Prime Minister will agree to the continued funding of the programme.

3. I am sending a copy of this minute to Sir Robert Armstrong.

JRI

17 July 1980

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PRIME MINISTER

MICROPROCESSOR AWARENESS PROJECT (MAP)

1 We met on 16 July last year to discuss several aspects of micro-electronics, one of which was the Microprocessor Application Project (MAP). On this particular programme, you said you were still not fully convinced of the need to devote £55 million of public funds to speeding up the adoption of micro-electronics in UK industry and asked me to let you have a review of what had so far been achieved before commitments passed £25 million.

... 2 The attached paper by officials, recalls the background (paragraphs 1-10); reviews progress to date (paragraphs 11-16); assesses the impact of MAP (paragraphs 17-22); suggests how in the second phase there should be changes of emphasis in the light of experience (e.g increased concentration on small and medium sized firms), and that we should seek to use MAP to bring in private sector funds (paragraphs 23-31); and finally recommends that MAP should continue up to the £55 million already announced. There is a one page summary of the main points.

3 My own experience of visiting firms in the UK and my recent visit to the US confirm the main conclusion that, although there has been a marked improvement, too many UK companies still have not grasped sufficiently the critical importance of micro-electronics to their own operations and are not taking adequate steps to adopt it. Our competitors on the other hand are proceeding much more

/quickly ...

quickly, some with substantial assistance from public funds. It will be some time before our macro-economic policy succeeds in creating the climate to encourage and reward innovation and risk-taking. Meanwhile we should, I believe, maintain our help towards improvement. You will recall that at last November's NEDC meeting both the CBI and TUC were concerned at the slow takeup of micro-electronics and recognised the importance of our companies catching up.

4 One of the obstacles, particularly for the smaller firm, is the difficulty of obtaining risk finance on reasonable terms. A survey undertaken for the Department by MORI found that one in five companies had difficulty in raising finance for projects of this nature and it was a real problem for a third of smaller companies. I have myself held meetings with entrepreneurs and financiers which brought out this gap in the availability of finance for development projects. It seems that entrepreneurs just do not understand how to present their case while financiers do not have the technical expertise to appraise the technical feasibility and commercial potential of development proposals. It will take time to change these attitudes and there seems to be scope for using MAP to bridge the gap more quickly by, for example, making available to potential sources of finance (with the applicant's consent) the Department's technical appraisals of development projects which we propose to support. In such cases a relatively small MAP grant as evidence of the Department's endorsement of the merits of the project should serve to unlock private sector funds. I believe that this could be an important development in

/the ...

the next phase of MAP and could also help to alleviate the general problem of getting private sector finance into high technology projects.

5 It is of course possible to cite examples of companies which have gone ahead on their own initiative but in 1977 for every one of these there were nineteen doing nothing at all, and many of the latter are apparently still unaware of the challenge. Some large companies in fields where micro-electronics offers clear advantages (e.g in process control) are recognising the potential only slowly. The UK semi-conductor manufacturers have told the Department that their main markets are still overseas and that the UK takeup is noticeably lower than in the US, Germany and Japan (see paragraph 22 of the report).

6 I believe that failure to apply micro-electronics would contribute to further decline of UK manufacturing industry. I believe that MAP has made a considerable (and cost effective) contribution to improving the level of awareness of micro-electronics and encouraging its application. There is still a heavy demand for information and assistance. If we were seen to curtail the programme now I believe that industry would take it to mean that the Government has changed its mind about the importance of micro-electronics and most of the achievement to date would be lost. I hope that having read this report you will now agree that MAP should continue up to the previously announced limit of £55 million.

/7 ...

7 MAP heads the list of the Department's priorities for technological support to industry. Full provision for the balance of the £55 million has been made in the Department's PES bids.

8 I should of course be happy to discuss the report with you if you wish.

9 I am sending copies of this minute to the Chancellor of the Exchequer, to the Secretaries of State for Employment and Education, to Sir Robert Armstrong and to Mr Robin Ibbs.

KJ

K J

14 July 1980

Department of Industry
Ashdown House
123 Victoria Street

RESTRICTED

COVERING COMMERCIAL IN CONFIDENCE

REVIEW OF THE MICROPROCESSOR APPLICATION PROJECT: SUMMARY

MAP was launched in 1978 against a background of concern in informed quarters at the UK's slow rate of takeup of this all-pervasive technology compared with its major competitors. Its objectives were:

i raise significantly the awareness of microelectronics at all levels in industry;
ii stimulate retraining in microelectronics skills;
iii help firms to establish the relevance of microelectronics to their own business;
iv stimulate the application of microelectronics in firm's products and processes.

To have maximum impact, MAP was to be a crash programme with £55M committed and spent over a relatively short period in three main areas - A, awareness and training (to meet i and ii above), B consultancy support (iii) and C, project support (iv). Current commitment is just over £22M with proposals amounting to a further £11M under consideration (paragraphs 3-8).

2 MAJOR ACHIEVEMENTS TO DATE INCLUDE

130,000 - people attended MAP awareness seminars; (paragraph 10)
36,000 - extra places on short term training courses by 1980 (from 2,500 in 1978) (paragraph 11)
1,360 - studies of feasibility of applications underway,some already resulting in new development projects (paragraph 12)
286 - new developments underway ranging from agricultural engineering and mining machinery to consumer products, about half by small firms (paragraphs 13-15).

3 ASSESSMENT SO FAR - although our competitors are still ahead, often with substantial help from their Governments, MAP has made significant progress towards meeting its objectives. The level of awareness has improved, but about half of UK companies are still unaware of the potential of microelectronics. The improvement in awareness is not solely due to MAP, but it has made a substantial and cost effective contribution. Lack of suitably qualified manpower and of risk finance are still major problems (paragraphs 16-22).

4 THE FUTURE - To stop now would imply that the speedy adoption of microelectronics was no longer important. MAP should continue to £55M but with changes of emphasis eg to concentrate assistance on small, first time users and sectors with high potential but low take up and to stimulate private sector finance for development. Broad plans for the remaining £30M:-

Awareness (£2M) - (paragraph 24) to encourage self-help by companies and outside bodies based on material generated by MAP, adapted to needs of particular sectors. Support for specific events as necessary;

Training (£3M) - (paragraphs 25,26) to fill gaps in coverage (geographical and level) of short courses; make available MAP material for educational use - eg "teach the teacher" kits; schools computer competition

Consultancy (£6M)- (paragraph 27) (normally) support only one study per company

Project Support (£19M) - (paragraphs 28, 30) criteria modified to bias support towards smaller companies; stimulation of private sector sources of finance; encouragement of applications in sectors where potential seems high but takeup low

DRAFT

REVIEW OF THE MICROPROCESSOR APPLICATION PROJECT (MAP)

I BACKGROUND

1 MAP was launched in 1978 in response to widespread concern at the slow takeup of microelectronics here compared with our main industrial competitors. £55M was allocated to increase awareness of the potential of microelectronics for British industry and to encourage its application. After considering the scheme last July, the Prime Minister asked for a review of what had been achieved under the Scheme before commitments exceeded £25M.

2 Commitment has now reached £22M and projects involving a further £11M have been submitted for consideration, (but without firm commitment at this stage). To date MAP has made good progress towards meeting its objectives. More firms have recognised what microelectronics can do for them and are applying it in their business but there is still a long way to go before UK companies match their competitors. This paper discribes progress so far, and recommends how the rest of the £55M should be allocated.

3 Microelectronics is expected to be the dominant technology for the immediate future. It is not, in itself, fundamentally different from

traditional electronics. But the huge reduction in size, and hence costs, and the increase in performance and reliability, so increase the range of applicability as to bring within the reach of all firms (including small and medium) techniques previously available only to large companies. However although there were exceptions (these mainly in the electronics sector - see list at Annex A) the evidence suggested that UK companies were being slow to recognise the opportunities. A Department of Industry survey in 1977 showed that only 5% of firms were aware of the potential of microelectronics; a further 45% were broadly aware but were not taking action; while 50% were not even aware.

4 Meanwhile overseas competitors were quicker to market new products and improve their production processes - usually with encouragement and backing from their governments. The German and the French goverments, for example, were launching substantial spending to encourage the use of microelectronics in industry particularly in small companies. UK companies were already under pressure; widespread adoption of microelectronics elsewhere posed a further threat to whole sectors (eg office machinery, manufacturing machinery, automobile components) which could find themselves marketing obsolete products or using out of date manufacturing processes and faced with making up the long lead times needed for new developments. The general impression was that UK companies were not looking closely at their competitors activities (and not just traditional competitors - eg electronic calculators compete with slide rules) and were being complacent about their ability to catch up. Since all nations were faced with this industrial

upheaval imposed by microelectronics, the challenge for British industry, much of it in need of modernisation anyway, was to embrace with enthusiasm this unique opportunity to catch up by updating its products and processes.

5 It was decided that a national programme of encouragement and stimulation was required. In addition to improving the general level of awareness of the potential (and threat) of microelectronics, the programme was to aim at alleviating other constraints - in particular a severe shortage of people adequately trained in the technology; the difficulty of identifying specific opportunities for using microelectronics by individual companies; the difficulty for UK companies, especially the small ones, of raising risk finance on reasonable terms for high technology projects, which seems to be much greater in this country than in others.

6 Against this background MAP was launched in July 1978 with an interim allocation of £15M. The Department of Industry envisaged a £70-80M programme while some other outside authorities and study groups felt even more was required eg £100M was suggested in ACARD's 1978 report "The Application of Semi-Conductors". However in December 1978 the Government announced that the allocation was to be raised to £55M for a programme with the objectives of:

i raising significantly national awareness of the potential of microelectronics at all levels in UK industry;

ii increasing substantially the supply of people retrained in microelectronic skills;

iii helping firms establish the relevance of microelectronics to their business;

iv improving the rate of application of microelectronics in firm's products and processes, particularly by first time users.

7 To have maximum impact the £55M was to be committed over a relatively short period - about three years - and spent over 5 or 6, in three main areas:-

A - Awareness and Training including

An awareness programme covering seminars, workshops, conferences and exhibitions and active stimultion of the media; it was estimated that 50,000 people needed to be addressed in some depth and at least five times that number more generally.

- On training, measures to increase rapidly the number of short course places of around 10 man-day duration aimed at providing initial retraining for engineers and technicians already in industry to complement the more formal educational/training role of DES and MSC which take some time to reorientate (because of devolved authority, the timing of the academic year etc).

B -Consultancy

Grants of £2,000 towards the cost of initial studies by an approved expert of the feasibility of applying microelectronics in particular firms

C- Project Support

Stimulation of the implementation by firms of particular applications by 25% grants (or exceptionally 50-50 shared contracts) as in other Science and Technology Act assistance schemes but with criteria adapted to microelectronics and smaller firms.

II PROGRESS SO FAR

General

8 So far £22M has been committed (or approved) and just under £11M is under consideration (but without commitment) this last being evidence of continuing heavy demand for the scheme.

	Committed	Approved but not yet committed	Under Consideration	Totals
MAP A	6.522	0.226	0.923	7.671
MAP B	2.562	0.332	0.152	3.046
MAP C	11.293	1.263	9.663	22.219
TOTALS	20.377	1.821	10.738	32.936

9 In order to mount the programme quickly and effectively, the maximum use has been made of existing facilities. The bulk of the awareness campaign work undertaken by the private sector and learned institutions was promoted by and supported financially by MAP. Similarly the training facilities are provided by existing private and public sector organisations and feasibility studies are undertaken by outside bodies in the private and public sector.

Awareness

10 The aim of the general awareness programme is to emphasise the pervasiveness and potential of microelectronics. The Department has itself mounted one day workshops attended by 2,000 directors of significant companies,while support in other forms (slides, films, brochures, speakers, financial assistance) has been given to over 1,000 events attended by 130,000 people. We have staged or supported exhibitions including two large events at the Design Engineering Show at the National Exhibition Centre; 11 at trades union national conferences; an ongoing trade show at the Microelectronics Centre London; an exhibition for MPs at the House of Commons; and a nine month exhibition for the general public at the Science Musuem (expected attendance over 2 million), the DoI contribution to which received a very favourable press.

Training

11 In the longer term this area is the responsibility of DES (general education) and MSC (retraining of mature people in industry) but both acknowledged in 1978 the urgent need to expand nationally the number of places on short courses, a need they could not meet in the required time. With their agreement MAP has helped to expand the number of places on short courses for retraining in micro-electronics from 2,500 in 1978 to 36,000 by 1981. In a recent survey

take up of these courses was found to be 80% (compared with a normal expectation of 60% for mature student courses). MAP support meets half the costs of setting up the courses in public and private sector establishments: thereafter they are expected to be self sustaining with participants paid for by their companies. In addition £0.5M has been offered to the TUC towards a national training programme for some 65,000 shop floor workers to be organised through Colleges of Further Education (as are other TUC courses) to standards ensured by DES procedures. Assistance is also going to the Open University for courses in microelectronics applications for 5,000 managers, with a longer version for engineers to follow shortly.

Consultancy (MAPCON)

12 There have been some 1,970 applications mostly from smaller firms for the £2000 grant towards consultancy advice for first time users of microelectronics and a steady stream of new applications is received at the rate of about 30 per week. To date 1,360 have been approved and of the 490 which have been completed, about 3/4 of companies have said they intend to follow up the results. Already 13% have resulted in applications for support for specific projects under Part C while evidence indicates that a similar number are proceeding without assistance - a trend which we shall obviously do our best to encourage. The distribution of the studies is about equal between products and processes.

Project Support

13 Support for projects aimed at implementing specific applications of microelectronics, is intended to reduce the above average risk, to a first time user when introducing new technology.

Each project is appraised individually as to technical merit and market prospects and the company must satisfy the Department that it is viable and has the resources (managerial, financial, technical, manufacturing and marketing) to carry the project through to commercial exploitation. Assistance is not given to projects which the company would undertake unaided. There must be some "additional" benefit, eg that the project would not otherwise proceed or would take much longer to complete or would be undertaken on a smaller scale without assistance.

14 Although MAP support reduces the cost and the risk,the company has to find 75% of the costs itself and the final judgement is theirs. This minimises the risk of uncommercial projects being put forward. Many companies welcome the independent technical assessment of their proposals. The fact that DoI is prepared to offer assistance may help a subsidiary convince a main board that a proposal is worth considering and has in some cases encouraged private sector sources, most of whom do not have access to adequate technical advice,to make funds available.

15 Applications are coming in at about 30 a month; about half are rejected. Of the 801 applications received by 31 May 1980 :-

	Number	Project Cost*	MAP Support
Approved	286	£48M	£12.5M
Under Consideration	132	£38M	£ 9.5M
Rejected	383	£51M	N/A

*Direct cost of MAP-element of each project. Total project cost will usually be much higher, taking account of associated investment in all plant, buildings etc not eligable for MAP support.

This means that so far 286 additional applications of microelectronic techniques are underway involving total investment likely to be in excess of say £200M so far. Analysis of the 801 cases by type of company and product are at Annexes A and B. About 50% are from small companies -see examples at Annex C.

III Assessment

16 Since MAP began, there has been a marked improvement in the general level of awareness. We would not seek to claim that MAP alone has been responsible but it has clearly played a substantial role and the interest generated by MAP activities has encouraged the private sector and the media to take up the message.

17 Among MAP's achievements to date are:

130,000 people have attended MAP awareness seminars, (reaction 74% good or excellent; 25% satisfactory; only one serious complaint);

36,000 new places on short term training courses by 1981 compared with 2,500 in 1978

1,360 feasibility studies started, 490 completed some already resulting in new development projects, not all with support under Part C;

286 new developments underway, likely to generate say £200M of additional investment with revenue earnings of many times that figure.

This seems to us a substantial and cost effective contribution to encouraging the more rapid adoption of microelectronics in the UK.

18 To help assesss the effectiveness of MAP we have supported organisations such as MORI and the Policy Studies Institute (PSI). The DoI survey of 1977 found only 5% of companies aware and active; 45% broadly aware but not active; and 50% not even aware of the pervasiveness and challenge of microelectronics. In December 1979 MORI reported on a survey carried out for the Department based on interviews with managers (often chairmen or managing directors) of over 750 significant UK companies. This was backed up by earlier group discussions with opinion leaders and also input from bankers and financial institutions. MORI reported that although the position was much improved among the 'aware' 50%, even now, around 50% still did not fully appreciate the importance of microelectronics and were not doing anything to adopt it. The main points of their report are summarised at Annex C: other important findings were lack of expertise -about 50% of companies do not have any electronics (much less microelectronics) expertise in middle or top management - and difficulties in raising finance - difficult for one in five companies and a major problem for over a third of the smaller companies.

19 The surveys underline the difficulty of putting over the message and instilling a sense of urgency. Following the MORI report we are trying to reach those companies still apparently unaware through a general mailing shot which includes an introductory booklet, advertises some of the courses and facilities supported through MAP and invites those interested to seek further information. Although there have inevitably been one or two adverse reactions, from the first 2,000 letters sent out we have had over 200 requests for further information some from companies which might have been expected to be better informed. About half a dozen companies have told us they

are already aware of the importance of microelectronics but thanked us for drawing attention to MAP's facilities.

20 Even though the general level of awareness has improved, the message from our sponsor divisions and regional offices is that companies tend not to appreciate the relevance of microelectronics to their own activities and this includes some large companies. There are many ways of sampling awareness, none of which would provide comprehensive results, but a useful indicator is perhaps to look at the 100 or so companies which were visited by the Prime Minister before the Election (and which might be expected to be "above average"). Only 17% are believed to be actually using microelectronics and 55% are apparently unaware of the potential. Of the 17% nearly three-quarters have received some form of assistance under the Science and Technology Act or Industry Act.

21 The main UK manufacturers of microelectronic components, which would be used in applications, have told us that they sell more of their output overseas than in the UK and that application of the technology in this country is markedly behind and growing at a slower rate than that of our competitors. This is so even for 'specials' where demand from UK users might be expected to exceed that from overseas firms with their own microelectronics supplies: this suggests that overseas countries are developing new applications so quickly that their own suppliers cannot meet the demand. Although UK consumption of microelectronic components has increased over the last year, the main users are in areas where there is already a high level of awareness - defence, telecommunications and consumer electronics. (Government promotion of teletext and viewdata is seen as a contributory factor here). In industry at large there has been little change; Germany and France are reported as using microelectronics more innovatively. Generally the message was that there are good ideas in the UK but 'the conversion into products is very slow' and the UK is still 'underachieving'. Our contacts with other large firms which themselves are aware tends to support this view.

The Future

22 What would happen if MAP were stopped at the £25M commitment level? Has the general awareness improved to the point where UK industry can be left to get on with the task of adopting microelectronics? It is impossible to produce conclusive answers to these questions; the stories of successful applications which attract publicity can mask the general lack of appreciation of the importance and relevance of microelectronics. There will undoubtedly be some companies who have proceeded alone but as indicated in the previous few paragraphs they are the exception rather than the rule. There is still a heavy demand for MAP activity (see paragraph 8 above) but there is evidence, e.g. in follow up to consultancy studies, that some companies are willing to proceed without help once they are confident of their ability to do so.

23 In our view if the Government were not to allow MAP to run the full course of £55M, it would be interpreted as meaning that it was not after all important for UK industry to make its special effort to adopt microelectronics. It is not enough to improve general awareness; there is still a need to ensure that companies relate microelectronics to their own activities and take the necessary action. The constraints are many- shortages of trained manpower remain and the difficulty of raising risk finance, particularly for small to medium sized companies - as well as market weakness, lack of profits/cash flow and general lack of confidence- factors which are not peculiar to users of microelectronics but which are a powerful disincentive to any investment in modernisation and new technology. Our proposals for tailoring the second phase of MAP to meet these circumstances are set out overleaf.

IV Phase 2 Proposals

Awareness (£2M)

24 In phase 1 the aim was to put over the message to as wide an audience as possible to alert them to the challenge and encourage them to think about the relevance of microelectronics to their own products and processes. Follow up action will need to be more specific - tailored to the needs of sectors or even individual companies - at the engineering and operational levels. Since it is not possible to mount events which go into individual areas in sufficient depth across the whole range of industry, the emphasis will be on self help by companies backed up by supply of material generated by MAP and by others willing to make material generally available for use by other companies (or other bodies organising seminars) to use in-house. We shall also take up opportunities to support specific events (through the media, films, books, seminars, exhibitions etc) as necessary

Training (£3M)

25 The demand from industry for people trained to all levels in microelectronics is very heavy and growing. Although a large proportion of industry is hoping it will be able to hire ready trained people, most realise that the only real solution is to train their existing people as well. Phase 2 will aim to fill the gaps in the coverage of training courses (ie improving the geographical spread and encouraging more advanced courses) and monitoring closely the support MAP is giving to the Open University and to the TUC. We are also currently negotiating with the BBC educational services to link MAP into an important microelectronics project scheduled for screening in October 1981. Without this support it is unlikely that the BBC could accommodate this important series of projects within its reduced educational budget.

26 In planning phase 1 activities we had assumed that parallel action would in due course be taken by DES in schools and MSC through the Industrial Training Boards.However this has not happened on the scale envisaged MAP cannot make good all the shortfall but we shall be considering how far it would be appropriate to bridge the gap. In particular in consultation with DES we would hope to meet some of the need for supporting hardware and software, for example in supplying training kits, "teach the teacher" courses, software modules for educational use; and we have already organised a computer competition for schools.

Consultancy (£6M)

27 There is a steady and substantial demand for consultancy grants. This activity seems to be a very cost effective way of encouraging firms to consider the specific application of microelectronics and it has been well received by industry. An incidental benefit is that MAPCON is helping to bridge the gap which exists between small to medium sized companies and universities, many of which act as MAPCON consultants. Once contact is established, they recognise that other expertise is available. We therefore intend to continue to provide this service but to tighten the criteria so that individual companies do not normally receive support for more than one study.

Project Support (£19M)

28 Most of the applications for support under Part C have been from companies who were already awake to the potential of microelectronics but had hesitated to apply it. More recently we have begun to see proposals which have resulted from earlier parts of the Scheme (eg consultancies) and this tendency is expected to increase substantially. There is welcome evidence that some companies are willing to proceed on their own once they have acquired the knowledge and confidence but we see support for development projects as a continuing need for the next few years if British industry is to hold,let alone improve its position vis a vis its competitors. It may be reasonable to assume that once a large company has recognised the opportunities, it will be in a position to take steps to improve its products and processes. In future thererefore we intend to bias project support towards smaller companies by:

i removing the lower limit of £10,000 on eligible project costs;

ii introducing accelerated appraisal procedures for projects under £25,000;

iii imposing a normal upper limit of £500,000 on project costs.

29 As shown in the MORI report and as recounted to the Secretary of State and officials at first hand, a major problem is that of tapping private sources of finance, both for start ups and for development projects. We have already held discussions with a number of institutions (eg ICFC/TBC, Midland Montague, Barclays, Development Capital Ltd, Post Office Pension Fund). We have established that

there is a communication gap. The small entrepreneurs do not know how to present their project in the right form while financiers lack access to adequate technical assessments at the development stage but need something more commercially orientated than a university could provide. DoI commitment to a project through the provision of a modest grant following a technical assessment adds confidence and it seems that arrangements for joint appraisals and hence joint funding, with the company's consent, could be a means of bridging the gap. This would be a lead into private sector backing for the much more costly manufacturing phase which MAP does not cover and with which private sector financiers are more familiar. We intend to pursue the scope for co-operation as speedily as possible. This could provide useful experience for dealing with the general problem of involving private sector finance in high technology projects. We shall also be prepared, in new start ups, to take greater risks in a limited number of cases (not exceeding £1M in total).

30 We are examining the scope for extending the sectoral approach envisaged for the awareness programme to Part C to encourage the application of microelectronics in sectors where there appear to be good opportunities but where the rate of adoption has been low. One such sector where this has already been done with good results is food processing and work on identifying a few more sectors is in hand. In addition we shall use (limited) MAP funds to underpin applications work in important ancillary technologies essential to the application of microelectronics (e.g.sensors, transducers and design aids), and in support of the new policy on public purchasing to seek out opportunities for developments in industry aimed at meeting specific requirements likely to arise in the public sector for advanced microelectronic applications.

V Conclusion

31 The first phase of MAP has already made significant progress towards meeting the objectives set in 1978.

32 To stop now would be to cut short a programme previously accorded high priority just as it is making a real impact . We could not conceal a cutback which would entail a sudden halt to new commitments and the reaction across industry and nationally would be considerable, suggesting that the Government no longer attaches importance to the adoption microelectronics and the result would almost certainly be that UK industry falls further behind its international competitors.

33 We therefore recommend that the £55M allocation should be confirmed and that MAP should run its full course with some redirection as proposed in paragraphs 22-30 above to consolidate and improve on its achievment in raising awareness and securing the widespread adoption of microelectronics by UK companies.

LA1
30 June 1980

CHARACTERISTICS OF COMPANIES APPLYING FOR MAP PART C SUPPORT

Company size

Turnover in £M	%
0 to 1	40
1 to 2	15
2 to 10	20
10 to 100	19
over 100	6

Proportion with previous microelectronics experience 53%

Proportion using a sub-contractor for microelectronics or software support 39%

Is the project
- a) novel 68%
- b) enabling the company to enter new markets 44%
- c) defensive against competition 45%

BREAKDOWN OF MAP APPLICATIONS BY PRODUCT TYPE MAY 1980

		%
Computer related products	48	6
Microelectronics design support	16	2
Data loggers	39	5
Machine tool related	66	8
Motor control	49	6
Process controllers including food/drink	99	12
Production aids	55	7
Automatic test equipment	10	1
Weighing and packing systems	36	5
Agricultural implements and equipment	5	1
Office mechanisation	41	5
Lift system	4	1
Educational equipment	8	1
Hospital/Medical equipment	16	2
Energy related products	19	2
Instrumentation	106	13
Communications	53	7
Transport	36	5
Vending and Amusement machines	10	1
Security and safety	17	2
Consumer	19	2
Retail related	15	2
Broadcasting	5	1
Hotel equipment	2	0
Other	27	3
	801	100

1. EDWARD WILSON & SON LTD - DEVELOPMENT OF A HIDE GRADING MACHINE

Turnover: £1.5M

Project size: £112K (DoI contribution - £20K)

This long established Merseyside firm, supplying tanning machinery, passed into the hands of a younger generation of the Wilson family, who are looking to arrest the gentle decline of the family business by applying microelectronics to its existing products. With DoI support the company is developing a hide grading machine, a prototype of which attracted considerable interest at the World Leather Trade Exhibition in Paris last September. The company is confidently expecting to convert provisional orders into firm business when production commences in August this year.

The problem facing the tanning industry is that during 1978 the price of rawhide rose by over 50% while the average price of the dressed leather only rose 35%. The position has deteriorated since then and tanners' margins are being further squeezed. Assistance is simultaneously assisting the revitalisation of a long established company and helping the tanning industry remain competitive, by improving the selection of quality hides which can command premium prices.

2. RDS AGRICULTURE LTD - CROP SPRAYER CONTROL

Turnover: £91K

Project size £83K (DoI contribution - £21K)

A small company of only 35 employees launched a microprocessor-based agricultural sprayer monitor on the UK market at the end of 1979. This product which had been developed with assistance under MAP gives the operator a direct measurement and display of liquid fertilisers deposited per unit area. It is built on a custom-built microprocessor chip from Intel and over 50 units have already been sold. There are some 10,000 sprayers in the UK which could use this monitor and the company estimates the worldwide potential for this product as well in excess of the £3M over 5 years. By sub-contracting the actual manufacture, while retaining selling with RDS Agriculture, this project led to increased employment in a neighbouring firm.

This is another example of a small company's ability to innovate when financial assistance is available.

3. MACWELL SYSTEMS LTD - AUTOMATIC FAULT FINDER IN DATA COMMUNICATIO

Turnover: £130K

Project size: £25K (DoI contribution - £6K)

Macwell Systems Ltd is a very small company with an idea for using a microprocessor in detecting and diagnosing faults in data communications at the modem which connects data processing equipment to the Post Office's network. The product, Autotest, is simple to use and is a unique product - the first allowed by the Post Office to be connected across a modem.

When support was agreed, to reduce the development of Autotest from 12 to 6 months, Macwell had 3 staff and a turnover of £40k. Today it has 12 staff and the turnover has increased to £130K. Fifty Autotests have been sold; of these 30 have been exported to the US, where an order for a further 50 is expected.

Through the Autotest idea, Macwell won the Technical Development Capital's Innovator of the Year Award in 1979, worth £20K.

4. BROOKES & GATEHOUSE LTD - MARINE INSTRUMENT SYSTEM

Turnover: £1.6M

Project size: £120K (DoI contribution - £30K)

Brookes & Gatehouse, part of the Unitech Group, are leading manufacturers of quality electronic instruments for yachts and small commercial vessels. The firm proposed a novel and sophisticated instrumentation system covering echo sounding, water speed, wind speed and direction and heading where the instruments and displays could be placed in any position on the ship and interconnected through a ring main.

The system makes extensive use of microelectronics and introduces digital technology in the displays. The project, which is almost complete, will result in a totally new approach to small boat instrumentation, and has assisted the company to move into micro-electronics for the first time.

5. TRAFFIC SAFETY SYSTEMS LTD - VEHICLE SPEED METER

Turnover: £130K

Project size: £18K (DoI contribution - £4.5K)

Every police force in the country uses this company's version of the American Vascar device (Visual Average Speed Computer And Recorder) for checking motorists' speed. TSS Ltd have now re-engineered the device into a miniaturised hand held portable

version incorporating a microprocessor chip (the Mostek F8). Since its launch in January this year over 40 units have already been sold to 16 police forces in the UK and further units are under evaluation in Germany and the US. The potential market for these devices worldwide is clearly most promising to show a tremendous return on the company and DoI contribution to the product's development costs.

This small London-based company with only 6 employees and a turnover of £130K pa has really taken on the world with this product, including the US where Vascar was invented.

6. TANN SYNCHRONOME LTD

Turnover: £2.6M

Project size: £296K (DoI contribution - £74K)

Tann-Synchronome Ltd is an old established company manufacturing factory clocks, access control systems and fire detection products. For the last 2 years they have been importing microprocessor based access control systems from the US, using coded magnetic cards to permit access.

The company decided that by designing and manufacturing its own system, including the sensors, it could make a potentially better product for a wider market - with the advantage of saving a considerable amount on its imports (£250K in 1979). However, funds for R & D in the company were committed to other parts of the business, particularly in fire and smoke sensors. Without help from MAP the access system development would have been delayed. This is the first entry of Tann-Synchronome into applying microelectronics itself. The early use of microelectroni in this project will have spin-offs in its other product ranges. The company estimates that this development will increase employment directly by 45 staff.

7. LEE STEEL STRIP LTD

Turnover: £14.5M

Project size: £112K (DoI contribution - £28K)

Lee is a private steel company which made a loss in 1979 and suffered from the effects of this year's steel strike. It is seeking to return to profitability by improving its manufacturing processes and the use of microprocessors within the process controllers is part of this. In this first known attempt by a private steel company to use microprocessors in the control of annealing and heat treatment, Lee aims not only to improve the quality of its products but to reduce costs, both in energy consumption and labour, the latter through natural wastage but in an area where the work environment is not particularly pleasant.

The Company has agreed to demonstrate the new system when it is completed next year to other companies in the industry, and we believe that this will encourage further applications of microelectronics in the private steel sector.

8. MJN INSTRUMENTS LTD

Turnover: Not yet trading

Project size: £50K (DoI contribution - £12.5K)

This company was formed in September 1979 to develop and exploit a fuel consumption meter for private cars. The main elements are a German fuel flow guage, a car mileage sensor developed by MJN and a microprocessor. The objective is to produce a kit which can be installed by garages or by moderately proficient do-it-yourself car-owners. MJN has interested car accessory dealoers such as Halfords who commented enthusiastically on the concept and initial design, but will not order until an engineered version is demonstrated.

We felt this was a valuable project in providing drivers with immediate information on fuel consumption. However it was clear that the company did not have the funds to pay for the whole of its share of the development, even with MAP support, nor were we satisfied on its arrangements to manufacture.

Contacts were made by the Department, with the knowledge and consent of the company, to find alternative sources of finance. As a result the Penta Group, which has existing interests in the retail motor trade and has a subsidiary already applying microelectronics to the flow control of liquids, acquired a share in MJN and is supporting this venture. The backer was found through the Department's knowledge of industry but would not have participated without some government financial involvement.

The development is now proceeding on schedule and is likely to be commercially successful.

9. PRESTIGE GROUP LTD

Turnover: £35M

Project size: £458K (DoI contribution - £115K)

The Prestige Group manufactures a wide range of domestic products and is one of Europes principal manufacturers of pressure cookers. However, 1979 was a bad trading year for the company and the existing products have not been selling well. Prestige has therefore been looking at a new product, perhaps embodying a novel approach in the kitchen.

In collaboration with Petscentre, a research consultancy, Prestige conceived the Electronic Cooking Centre which will cook under pressure without venting steam, and also slow cook, steam, deep fry and roast. Pressure, temperature and cooking time are the variables controlled, through a range of punched cards, which contain the printed recipe and can be inserted into the Cooking Centre to programme the type of cooking requireed.

This is the first time that Prestige has used microelectronics, and without MAP support it is likely that the project would be delayed by at least a year or may not go ahead at all. If successful it will provide a significant alternative capital investment for the home as an alternative to microwave ovens, most of which are Japanese.

ANNEX D

Some Important Extracts from the MORI Report

A1.1 Knowledge of Microelectronics Technology (UK Managers)

	Awareness Seminar/Course	
	Have attended	Not Attended
Great deal ...	9%	4%
Fair Amount ...	45%	23%
A Little ...	40%	44%
Next to Nothing ...	5%	28%

+ + + + + + + + +

A1.2 Seminar/Course Attendance

Category of Firm	Seminars Attended	
	At least one DOI Mission or MAP Seminar	None
'Times 1000' ...	63%	37%
250 + employees ...	51%	49%
Up to 250 employees ...	39%	61%

+ + + + + + + + +

A1.3 Source of Knowledge

		Seminars Attended	
	Total	None	One +
Press/Technical Articles ...	31%	41%	22%
Seminars/Courses.. ...	25%	7%	40%
Colleagues at work ...	7%	7%	6%
Case Studies/Other Companies.	6%	6%	5%
* TV/Radio	2%	2%	3%
** Manufacturers/Suppliers ...	2%	2%	1%

Table demonstrates the excellent relative performance of the Seminar/Course, also the surprisingly bad rating of * TV/Radio in spite of the undoubted impact of such excellent films as the BBC/TV "Chips are Down"

Note also the poor showing of the ** microelectronics industry itself. Clearly, it is no use expecting that potential users will 'receive the word' from the latter source.

+ + + + + + + + +

A1.4 Microelectronics Expertise in UK Companies

Number of Engineers with experience in the firm	Percentage of Companies		
	Current Status	Hoping to Recruit	Intending to Retrain
None	48%	53%	74%
1 - 5	33%	39%	13%
Over 50	2%	3%	2%

Table demonstrates the paucity of microelectronics expertise residing in firms, also the probably misplaced hope that many will be able to buy in the necessary skills. Demonstrates the need for massive re-training facilities.

+ + + + + + + + + +

A1.5 Proportion of Companies which have applied microelectronics to their product or process - October 1979
(Excluding data handling, computing, stock control, etc.)

Area of Activity	Percentage of Companies	
	Already	Planned
Manufacturing/production process	33%	29%
Quality Control/Testing ...	26%	21%
Design	20%	16%
In product	15%	34%

Table indicates a significant improvement over the Department's composite (5%) 1977/78 picture but needs to be treated with caution because it does not demonstrate adequately the depth to which companies are applying the technology - much in fact remains to be done.

+ + + + + + + + + +

A1.6 Companies admitting to loss of market share through a slowness in microelectronics application.

Lost share already ...	4%
Expectation, further ...	8%

Half those who had already lost market share had lost to overseas competition.

+ + + + + + + + +

A1.7 Perceived UK Speed to Take-Up

Too fast	...	2%
About right	...	24%
Too slow	...	57%

+ + + + + + + + +

A1.8 Perceived Need for Government Involvement

Awareness Programme		60%
Training	...	65%
Feasibility Studies		52%
Project Support..		40% *

* This figure might be expected to increase as more firms become aware of microelectronics and reach the application stage.

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A1.9 Finance

Finance for application is a problem for about one in five of the larger companies and is a major problem for more than a third of the smaller companies.

+ + + + + + + + +

JU

Resolution on phone NJS Ind Pol.

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 3301
SWITCHBOARD 01-212 7676

Secretary of State for Industry

30 June 1980

Murdo McLean Esq
Private Secretary to the
Chief Whip
House of Commons
London SW1A OAA

Dear Murdo

INMOS DEBATE: 1 JULY

We spoke on the telephone this morning when I told you that the Secretary of State would like the Government to table an amendment to the Opposition's motion for Tuesday's debate as follows:-

> That this House recognises the importance of promoting the United Kingdom's micro-electronics industry and welcomes the review which the National Enterprise Board has decided, on its own initiative, to undertake on the prospects of Inmos International Ltd.

I have also conveyed this proposed form of words to Nick Sanders at No 10 and Petra Laidlaw in the Chancellor of the Duchy's Office, to whom I am also copying this letter.

I would be grateful if this form of words for the Government motion could be cleared as soon as possible.

Yours sincerely
Catherine Bell

CATHERINE BELL
Private Secretary

CONFIDENTIAL

SECRETARY OF STATE FOR EMPLOYMENT

Caxton House Tothill Street London SW1H 9NA

Telephone Direct Line 01-213 6400
Switchboard 01-213 3000

The Rt Hon Sir Keith Joseph Bt MP
Secretary of State for Industry
Department of Industry
Ashdown House
123 Victoria Street
LONDON SW1

27 June 1980

Dear Keith

INMOS

In your minute to the Prime Minister of 13 June you undertook to bring the Inmos question back before our colleagues "at the very earliest opportunity", as soon as the NEB's fresh review of the matter had been completed.

I now learn that Arthur Knight reckons that this review, which has been entrusted to a part-time member of the NEB, will require 8 weeks to complete, which would prevent our considering the matter again until well into August.

You spoke in your minute of "the damage that the delay is doing to the reputation of the Government, quite apart from any effect it may have on Inmos". This theme was taken up in the leader-page article in the Financial Times of 24 June, which said:

> "But time is running out for Inmos. Its request for a second £25m in Government funding, which it needs to build a UK factory, has been blocked in Cabinet for six months. Dr Petritz has told the NEB that there must be a decision by the end of the month if the plant is to be built at all. Otherwise, he has hinted, he and his colleagues may consider decamping to the US, where they are confident of getting private backing".

Can the NEB not be told that their review must be greatly accelerated, so that we can be put in a position to decide this question well before the Recess?

I am copying this to members of E Committee and Sir Robert Armstrong.

Yours

SM cc/AD

CONFIDENTIAL

Prime Minister

Although this means more delay, a review of the project does seem sensible. (I am told that Inmos's June deadline is not to be taken seriously).

PRIME MINISTER

INMOS

On my return from America I saw the minute which the Secretary of State for Employment sent you on 3 June urging an early discussion on Inmos in E Committee. I deferred commenting because officials in this Department expected important developments within the next few days.

I entirely agree that we should reach a decision just as soon as possible: I am very much aware of the widespread concern about this matter and I am conscious of the damage that the delay is doing to the reputation of the Government, quite apart from any effect it may have on Inmos.

This delay and some differences of view within the NEB have led Sir Arthur Knight to decide to undertake a review of the project, and this will be related to the company's new Corporate Plan which the NEB expect to receive this week. (The previous Plan, which has underpinned our discussions hitherto, is now over 9 months old). I think that until the outcome of the NEB's review is known it would not be profitable to take our collective discussion further. I hope that the fact that the review has been announced will diminish the pressure on the Government.

The proposal for the involvement of private finance is still being considered but any proposal will necessarily be affected by the review.

/I ...

CONFIDENTIAL

I will press the NEB to reach conclusions as soon as possible but I think we shall have to accept the inevitability of some further delay. However, I will return to colleagues at the very earliest opportunity.

I am sending copies of this note to members of E Committee and Sir Robert Armstrong.

KJ

K J
13 June 1980

Department of Industry
Ashdown House
123 Victoria Street

FILE Ind Pol. NB

cc WO
NIO
CSD
CSD (Min)
CO

10 DOWNING STREET

From the Private Secretary 11 June 1980

Thank you for your letter of 10 June, with a correction on the subject of the Micro-Electronics Advisory Committee. The Prime Minister has noted this.

I am sending a copy of this letter to John Craig (Welsh Office), Andrew Brown (Northern Ireland Office), Geoffrey Green and David Laughrin (Civil Service Department) and David Wright (Cabinet Office).

M. A. PATTISON

Mrs. Mary Bowden,
Department of Education and Science.

BV

Ind 85. 2.

ELIZABETH HOUSE,
YORK ROAD,
LONDON SE1 7PH
01-928 9222

FROM THE SECRETARY OF STATE

M Pattison Esq
10 Downing Street
LONDON
SW1

Prime Minister

This is a correction to Mr Carlisle's comment that the body would in no way be a quango.

MMP 10/VI

10 June 1980

Dear Mike,

You wrote to me on 4 June about our proposed Microelectronics Advisory Committee.

Could I correct one point of detail? While the Committee would be fully accountable to Ministers and would involve no increase in the number of paid Ministerial appointments, it would, technically, be regarded as a non departmental public body and would have to appear in any published list. However, as Mr Carlisle explained, the sole function of the 5 outside specialists would be to help the departmental members and Assessors to advise Ministers on the conduct of the programme.

I am copying this letter to the recipients of yours.

Yours sincerely

Mary Bowden

MRS M E BOWDEN
Private Secretary

C

10 JUN 1980

FILE

c/c Master Set.

1wd PS/PS

cc WO
NIO
CSD
CSD (Min)
CO

10 DOWNING STREET

From the Private Secretary

4 June 1980

Dear Mary

Your Secretary of State today had a word with the Prime Minister about the proposed Advisory Committee for the Micro-electronics Development Programme. Our previous correspondence rests with Robert Green's letter of 19 May to me.

Mr. Carlisle explained to the Prime Minister that he felt a need for high quality professional advice in the development of the programme worth £9 million. Lady Young had now selected five individuals who could offer this advice. His intention was to keep the matter close to Ministers. The new Committee would in no sense be a "quango", and there would be no payment involved. If the Prime Minister were to agree that he could go ahead, he would intend to keep the arrangements low key and not to seek significant publicity.

On the basis of these explanations, the Prime Minister agreed that a Committee composed of these five individuals could be set up.

As was made clear in the enclosure to Robert Green's letter of 1 May, the Committee would automatically be wound up when the programme comes to an end. The five individuals have clearly been selected for the personal contribution they can make and there is no assumption that any one of them should automatically be replaced if he were to cease to participate.

I am sending copies of this letter to John Craig (Welsh Office), Andrew Brown (Northern Ireland Office), Geoffrey Green and David Laughrin (Civil Service Department) and David Wright (Cabinet Office).

Yours ever

Mike Pattison

Mrs. Mary Bowden,
Department of Education and Science.

VR

CONFIDENTIAL file

10 DOWNING STREET

From the Private Secretary

4 June 1980

Dear Richard,

INMOS

The Prime Minister has read your Secretary of State's minute of 3 June. She has noted his suggestion that the Government should be prepared to guarantee the second tranche of £25 million for INMOS, while still pursuing the possibility of replacing this with private capital. She agrees that this whole issue needs to be brought back to E Committee as soon as possible.

I am sending copies of this letter to the Private Secretaries to the members of E Committee and to David Wright (Cabinet Office).

Yours ever.

Richard Dykes, Esq.,
Department of Employment

CONFIDENTIAL

CONFIDENTIAL

cc D A Duguid 2

Prime Minister

You won't want to take an immediate view on the proposal at X; but I will ensure that this comes back to E as soon as possible.

E (80) 14 Mtg item 1.

PRIME MINISTER

INMOS

When we last considered the question of INMOS at E Committee on 24 April we agreed to give GEC a chance to negotiate terms with the NEB for the company's participation in the INMOS venture, and asked Keith to report back within a month. I had hoped therefore that we should be in a position to take a decision in the matter before the end of May. Now however I see from his minute to you of 23 May that although GEC are no longer interested there is "a fair possibility" that something may come of discussions that are continuing with other sources of private finance, and that the prospect of a decision in the matter is therefore receding again.

Keith Joseph told us a month ago at E Committee that in view of the delay to which their application had been subjected INMOS were considering the transfer of their entire operation to Colorado Springs, and were convinced that they could raise private US capital for this purpose. As the record of Keith's remarks at E puts it: "The result would be a purely American venture, with no facilities or jobs in the UK, either in the Assisted Areas or elsewhere ... Both the NEB and INMOS claimed that the delay by the Government in reaching a decision was putting the whole project at risk".

Of course the best outcome would be the injection of private capital into the company to enable it to go ahead in this country. But in view of the growing risk that it might decide to take itself off to the United States (with the loss of up to 4,500 jobs to this country) I wonder whether an acceptable solution might be for the Government to announce that to enable production to go ahead in the UK it was prepared to guarantee the second tranche of £25 million (but no more), while still pursuing the possibility of replacing this with private capital. If Keith's soundings thereafter result in a firm offer of private participation we could allow this to be substituted for our own £25 million.

In any case, I hope you will agree that we should take up this question again, as soon as Keith is back, with a view to reaching an early decision. It would be regrettable in my view if we decided not to back

INMOS with the second tranche of capital, if this cannot be found from private sources, but it would be far worse, and very difficult for our supporters to defend us, if INMOS decided to withdraw to the States simply because of the delay in arriving at a decision.

I am copying this to members of E Committee and to Sir Robert Armstrong.

J P

3 June 1980

CONFIDENTIAL

PCC(80)13

2
PRIME MINISTER
MS
30/6

It is hoped that the attached brief will prove of use for the debate on Tuesday, 1st July 1980 on an Opposition Motion on INMOS.

Conservative Research Department,
32 Smith Square, London S,W,1

RH/JMH
3 .6.80

1. Background

The origins of INMOS lay in the fertile brain of Dr. Richard Petritz Dr. Petritz was director of research and development for the Texas Instruments in the United States. In 1968 he launched a venture capital firm, New Business Resources, in Dallas, Texas and the following year founded Mostek, which is now one of the leading US 'chip' manufacturing firms. Dr. Petritz was joined by Dr. Ian Barron and Dr. Paul Schroeder. Dr. Barron founded Britain's first mini-computer company, CTL, in 1965. From 1971 to the time of the launching of INMOS he was involved in consultancy and academic work. Arguably, the key figure of the founding triumvirate is Dr. Schroeder. Dr. Schroeder is now Deputy Managing Director of INMOS. It was he who designed the industry standard 4K and 16K dynamic RAM's, which are the largest volume products the semi-conductor industry has seen.

For these three INMOS was and is essentially an entrepreneurial venture - in a sector where high risk and entrepreneurship are the key features. Their argument - which they subsequently "sold" to the National Enterprise Board - is essentially as follows. Since the development of the first transistor in 1959 the complexity of integrated circuits has approximately doubled each year. This means that the market for the products involved i both rapidly expanding and very demanding. The size of the predicted market for semi-conductors is over £3 billion a year in 1984. The greatest part of this demand will be - it is said - for a small number of standard products manufacture in very high volume - this is INMOS's target. Over the next five years it is predicted that the most important single product will be the 64K dynamic RAM with an annual market of £500 million in 1984.

The demanding nature of the market is the result of the existence of a number of clearly defined technological "steps". INMOS argue that at each "step" a new entrepreneurial company has emerged as a market leader. In the 1960's it was Fairchild; in the 1970's it was Intel; now in the era of VLSI (Very Large Scale Integration) it might be INMOS. It is difficult, without enormous efforts, for existing companies to up-date their design and production facilities sufficiently quickly - and this gives new-comers a chance.

INMOS believe that at the start of this new "step" forward into VLSI they have special opportunities as a new firm with undoubtedly superlative design skills provided by their team. They call this their "super-star" strategy. Not even the most severe critics of the venture doubt that they in this have succeeded to a high degree. INMOS claim that the 16K static RAM and the 64K dynamic RAM are well chosen to maximise the value of this strategy for,

a) they require "super-star" designers rather than massive injections of funds and

b) they represent the two single largest volume markets for semi-conductor devices over the next five years, and so provide an adequate base for INMOS's further growth. (The 16K static RAM is a high performance, i.e. very rapid, memory component built into an "accellerator unit" to make conventional computers work faster. The 64K dynamic RAM is a general purpose memory component mainly used in the computer industry).

It is important to realise that both for INMOS and for the NEB - and so, perhaps above all, for the tax-payer - it is the next stage of the company's strategy which is most important and probably most risky. A number of other memory products are currently at the design stage in INMOS's UK facility at Bristol. But most important is the projected development of micro-computers. These are complementary to memory products. These micro-processor products are usable in a vast range of goods such as automatic type-writers, sewing machines and cars. General Motors, for example, recently placed a major order

for these products in the US and it is estimated that each car may employ 6 to 8 of them by the late 1980's. INMOS envisage the revenues from these microprocessors as exceeding that from sales of the 16K static RAM in about 1984.

The three originators of the plan to break into the VLSI market thus approached the NEB in 1977 at Dr. Barron's suggestion. It was known that the NEB were already involved and interested in the high technology field. It is said by INMOS that there was a shortage of high-risk venture capital at the time in the US and that in the UK it was simply unavailable.

In the event, in July 1978 the NEB and the Labour Government accepted the INMOS plan and agreed that £50million should be committed to the project in two tranches of £25 million. The second tranche was to be dependent upon the performance and progress of the project subsequent to the payment of the first tranche. In the summer of 1979, as planned, INMOS submitted to the new Conservative Government an up-dated corporate plan and requested the release of the second £25 million. The NEB approved the investment of the second tranche in September 1979.

2. The Present Position

So far almost £4 million has been spent on UK operating costs of INMOS and over £5 million has been invested in manufacturing plant. A total of £20.5 million has been invested - most of it in the pilot production facility under construction in Colorado Springs. At the moment UK recruitment and work on the site of the planned production facility at Bristol has been halted pending the Secretary of State's decision both as to the location of the site and as to the future funding of INMOS. INMOS claim that £1 million has been committed to the Bristol site through architect's fees etc..

INMOS's structure divides it between the US and the UK with the holding company - INMOS International Ltd. - based in Bristol. The intention is to transfer most of INMOS's activities to the UK but at present the viable part of the project is at Colorado Springs as 'INMOS Corporation'. There process development is being carried on in a 25,000 square ft. facility at Harrison Park. Memory product development is also under way. Pilot production is to be located in a 125,000 sq. ft. facility currently under construction at Cheyenne Mountain. INMOS Corporation has 120 staff and recruitment is proceeding rapidly.

The UK picture is very different. Only 60 staff are employed by INMOS Ltd. - the UK company - most being concerned with micro-computer development. INMOS claim that with the expected growth in revenue to £150 million they expect to be employing over 4,000 people by 1984, most of them in the UK. This, however, will depend initially upon the building of the planned facility at Bristol. Design work there has been taken as far as is practicable without Governmental endorsement of INMOS's plans.

The NEB having given its approval to the second tranche after the resignation of the old board and its Chairman, Sir Leslie Murphy, it was up to Sir Keith Joseph to make his decision as to the funding and siting of the project. Consequently authorisation for the siting of the new facility at Bristol through grant of an IDC - which INMOS announced it had selected at the end of 1979 - and for the payment of the second tranche was sought by INMOS from Sir Keith at the beginning of this year. Because of the long delay, resulting principally from the resignation of the old NEB, the new Board under Sir Arthur Knight have embarked upon a further review of INMOS's plans which is expected to take a further 6 weeks or so to complete. The Government is awaiting the result of this further review before it announces its decision concerning the IDC application and that for the second tranche of funds.

3. The Arguments

Those involved in the controversy which has surrounded INMOS since its inception in 1978 have broadly divided into three camps. First, there are those who accept INMOS's strategy, believe that venture capital would not be forthcoming to fund it without the intervention of the NEB and want the NEB's original commitment to a £50 million investment with a 70% equity stake to be fulfilled. They accept the project as an essentially entrepreneurial one with the pursuit of economic rather than social goals in view (see below). They note that:

- US high technology ventures benefit substantially from high defence and space budgets and from high volume consumer demand to a degree which the UK could not hope to emulate without direct funding. They point to the major injections of finance and intervention by the Japanese Government. They argue that with over 70% of semi-conductor production being undertaken by US companies and over 20% by the Japanese only an ambitious bid by government-funded companies in Europe to enter at the "leading edge" of the market can hope to succeed.

- If the second tranche of £25 million is not provided the first tranche will have benefited the US INMOS Corporation which will probably be able to continue but will have done little or nothing to help the UK either in terms of employment or of industrial strategy. Work is already progressing on costly US plant: in the UK there will only be a bill of £1 million for the advance costs of developing the Bristol site which someone will have to pick up.

- In the event of the project succeeding the UK will gain an indigenous semi-conductor capability which- it is argued-no independent country should be without; there will be over 3,000 UK jobs provided; there will be a contribution to net exports of £95 million a year by 1984.

The second group in the controversy adopt many of the arguments used above, but see the INMOS project as essentially a social rather than a strategic economic one. They argue that since INMOS is in receipt of substantial sums of public money it should agree to locate its production facilities in an assisted area in order to relieve the unemployment problem. Mr. Alan Williams, who was Minister of State at the Department of Industry under the last Government, claims that INMOS gave an undertaking to locate its first two factories in an assisted area. INMOS hotly deny this. They claim that the statement in the NEB's annual report for 1978 that "The firm intention is that the United Kingdom production facilities will be located in assisted areas" represented the view of the NEB, not of INMOS. INMOS chose the Bristol site in order to attract the right kind of personnel and - above all - because it is said to be essential for their purposes to develop an "integrated capacity" - in other words ensuring that the research and design and production facilities are side by side. This is crucial in the early stages of chip production because the "yield" of successful chips from each wafer of silicon needs to be raised by continued efforts from a very low initial level. The second volume production facility could go to an assisted area because by then the final form of the product will have been stabilised.

The third group in the INMOS controversy believe that the project has no future and that to inject a further £25 million would be to put in good money after bad. They point to the high development costs faced in the initial stages of such high technology ventures and doubt whether £50 million would be adequate. They argue that it is the use to which micro-processors will be put rather than their volume production which is likely to yield the best opportunities for British companies. They suggest that the high risks, low early returns and highly sophisticated nature of products involved make INMOS just the

sort of venture which Government and its agencies should avoid. They also doubt whether Government is capable of the speedy decision-making which is required in order to survive in a highly competitive market.

In reaching its decision concerning the payment of the second tranche and concerning the grant of the necessary IDC for INMOS to begin construction in Bristol the Government will be bearing in mind all of these sets of arguments. It is at present awaiting the further report from the NEB on the question. The NEB itself will be operating against the background of the guidance given by Sir Keith Joseph in his statement of 19th July 1980 in which he explained the Government's view of its proper function both as far as the regions and its "catalytic" role in the high technology field are concerned. Sir Keith then said:

"I shall also be requiring the NEB to make a substantial reduction in its expenditure in the current year and in the following years.

"I exclude, however, the investments which the NEB has made in a dozen or so newly established high technology companies, chiefly concerned with computer software, micro-electronics and their applications and which I believe justify special attention. The market has been discouraged in recent years from supporting such ventures. Time will anyway be needed for these companies to evolve before the NEB can sell them.

"In the light of this it seems sensible to use the NEB as one means of familiarising the market with new technologies. For my part I see this role as being necessary only until the market is clearly strengthened and I would not wish to put a term to the role now. The budget for it will be limited - but clearly defined. The objective will be to secure in each case the maximum amount of private investment, with a view to full private ownership in each case as soon as practicable. The NEB will be able to re-invest some of their receipts from disposals of these companies in new high technology ventures, but only in partnership with private capital. A market that has met the huge risks of North Sea exploration should find no insuperable difficulty here.

"The Government is also much concerned with the problems of the areas of high unemployment. An element of that regional policy is that the NEB should continue to exercise an industrial investment role in the North and North-West and with small firms, seeking always to maximise private investment and with the objective of transfer of full ownership to the private sector as soon as possible. The NEB's regional role will be very similar to the industrial investment activities of the Scottish, Welsh and Northern Ireland Development Agencies in Scotland, Wales and Norther Ireland respectively." (Hansard, 19th July 1979 Col. 2006)

The Government will further clarify its position on INMOS in due course in the light of its and the NEB's commitment to these objectives.

Ind Pol

File

D&G

10 DOWNING STREET

From the Private Secretary

29 May 1980

Robert Green wrote to me on 19 May, explaining that your Secretary of State had reconsidered the proposed Advisory Committee on Microelectronics Development Programme.

The Prime Minister is still most reluctant to agree this proposal. She would like to have a word with Mr. Carlisle about it. I suggest that we arrange this in the margins of the next occasion on which Mr. Carlisle attends a meeting here.

M. A. PATTISON

Mrs. Mary Bowden,
Department of Education and Science.

D&

cc A Dugmid

IDL (OE) R
to see
MJS

Ind 89. 2

PRIME MINISTER

I hope this can be resolved before too long

MJS
23/5

PRIME MINISTER

As you know, I will be out of the country for the next two weeks, but before my departure I think I should report where we now stand on Inmos.

The NEB have had considerable discussion and correspondence with GEC but I am told that it is now clear that GEC no longer have any interest in an involvement in the company. This is disappointing, in view of the initiative which Sir Arnold Weinstock himself took, but I am glad to be able to say that discussions with other sources of private finance are continuing and I am told that there is a fair possibility that these will lead to definite proposals. When these are sufficiently well-formulated I will seek your views, and those of colleagues in E Committee, on the course that we should follow.

I am sending copies of this minute to members of E Committee and to Sir Robert Armstrong.

KJ

K J

23 May 1980

Department of Industry
Ashdown House
123 Victoria Street

PRIME MINISTER

Mr. Carlisle has rethought the attached proposal. He had already looked at existing agencies, and concluded that there was none suitable to cover the wider range of activities which the programme is to promote. He found no alternative but for the Department to have direct responsibility for the programme, with close Ministerial oversight.

He now asks whether you would accept an advisory committee, with the number of outside specialists "as near as possible" to the three or four which you suggested.

This would not be a quango, but a departmental body. Agree that Mr. Carlisle may go ahead on this revised basis?

Perhaps he would like to have it
round. I think that
is about right

MTP

20 May 1980

BV

ELIZABETH HOUSE,
YORK ROAD,
LONDON SE1 7PH
01-928 9222

FROM THE SECRETARY OF STATE

M A Pattison Esq
10 Downing Street
LONDON SW1

19 May 1980

Dear Mike,

MICROELECTRONICS DEVELOPMENT PROGRAMME: ADVISORY COMMITTEE

Thank you for your letter of 6 May. When my Secretary of State decided to launch this development programme, he considered first whether an existing agency could handle it or supply the necessary expert advice. Mr Carlisle concluded that there was no existing body which could be made to cover the wider range of activities which the development programme will seek to promote. He was therefore driven to the conclusion that the programme would have to be the direct responsibility of the Department, with close Ministerial oversight.

Mr Carlisle will try to get the number of outside specialists on the advisory committee as near as possible to that suggested by the Prime Minister - given the very wide range of the programme. Would the Prime Minister be content for him to proceed on this basis?

I am sending copies of this letter to the recipients of yours.

Yours ever
Robert Green
R J GREEN
Private Secretary

DEPARTMENT OF INDUSTRY
ASHDOWN HOUSE
123 VICTORIA STREET
LONDON SW1E 6RB
TELEPHONE DIRECT LINE 01-212 6401
SWITCHBOARD 01-212 7676

From the
Minister of State

The Hon Adam Butler MP

Ian Lloyd Esq MP
House of Commons
London SW1A OAA

7 May 1980

Dear Ian.

Keith Joseph has asked me to thank you for your letter of 17 April about your visit to Inmos at Colorado Springs.

It was greatly encouraging to learn of the impressions that you formed. It is, perhaps, not generally appreciated that the company's plans from the outset have envisaged that in the early stages development will be centred at the American base. The purpose, as doubtless you were told, is to secure the closest possible contacts between Inmos and the vanguard of research and development activity in this field in America. The choice of Colorado Springs seems to have been particularly well judged since the older growth centre of Silicon Valley has become very much overcrowded with companies making greater demands on local resources than can be sustained. In particular, the splendid surroundings of Colorado Springs have proved to be highly attractive to new recruits of the first rank in their particular disciplines.

Although the American end of the Inmos venture will take the lead at the outset the cross over point should come, in terms of employees, by the middle of 1982. Thereafter the British end should be well in the lead.

I note what you say about the difficulties that might attach to an involvement at this stage by GEC, and also to the difficulties that are presented by the choice of site for the first UK factory. I am sure you will understand that these are matters that the Government is giving the most careful consideration.

I am sending a copy of this letter to the Prime Minister.

Yours ever
Adam.

ADAM BUTLER

Original
CF to Sarah

mr J
cc DOI
Cavell

10 DOWNING STREET

THE PRIME MINISTER

6 May 1980

Dear Mr. Morris,

Thank you for your letter of 17 April, enclosing a copy of the letter of 2 April from Mr. D.G. Wilson, President of the Manchester Chamber of Commerce and Industry, about Inmos.

As you know, Inmos have applied for an Industrial Development Certificate for Bristol with the aim of combining their Research Centre with the first production unit on the same site. This proposal is still being considered and a statement will be made as soon as possible.

With regard to the second production unit, the selection of the site will be in the first instance a matter for the company itself, and I have no doubt that they are fully aware of the excellent facilities that are available in the Manchester area. However, I would not expect the company to be in a position to consider possible locations for a second production unit for some considerable time - and certainly not until after a decision has been made on the first unit.

Yours sincerely

Margaret Thatcher

The Right Honourable Alfred Morris, M.P.

JS

File do

10 DOWNING STREET

From the Private Secretary

6 May 1980

The Prime Minister has seen your letter to us of 1 May, about your Secretary of State's intention to establish an advisory committee for the microelectronics development programme.

The Prime Minister is most reluctant to see the creation of new non-departmental public bodies. In this particular case, she is surprised that your Secretary of State finds a need for a body with 13 members. She has asked why this advice could not be channelled through some existing body, preferably by using a team of 3 or 4 specialists.

I am sending copies of this letter to Geoffrey Green (Civil Service Department), John Craig (Welsh Office), Jonathan Margetts (Northern Ireland Office), David Wright (Cabinet Office) and David Laughrin (Civil Service Department).

M. A. PATTISON

Robert Green, Esq.,
Department of Education and Science.

PT

1.

ELIZABETH HOUSE,
YORK ROAD,
LONDON SE1 7PH
01-928 9222

FROM THE SECRETARY OF STATE

C A Whitmore Esq
Principal Private Secretary
10 Downing Street
LONDON SW1A 2AZ

1 May 1980

Not a new quango - part of existing ~~some~~ other committee. And not 13 members 3 or 4?

PRIME MINISTER

Content that this advisory committee be set up?

MTF 2/v

Dear Clive,

MICROELECTRONICS DEVELOPMENT PROGRAMME: ADVISORY COMMITTEE

My Secretary of State proposes to establish a small committee, chaired by an official but including individuals outside the Government, to advise the Education Departments on the management of the microelectronics development programme for schools and colleges which was announced in an oral reply on 4 March. This requires the Prime Minister's approval ... and I am enclosing a submission, which my Secretary of State has approved, containing details of the proposed size and structure of the advisory committee.

The Head of the Civil Service has been consulted and is content with what is proposed. I am sending a copy of this letter to his Private Secretary and to the Private Secretary to the Secretary of the Cabinet as well as to Geoffrey Green (CSD), Craig (Welsh Office) and Brown (DENI).

Yours ever,

Robert Green

R J GREEN
Private Secretary

MICROELECTRONICS DEVELOPMENT PROGRAMME FOR SCHOOLS AND COLLEGES
PROPOSED ADVISORY COMMITTEE

Note by the Department of Education and Science

A microelectronics development programme for England, Wales and Northern Ireland was announced in the House of Commons on 4 March. The programme is designed to give schools and colleges a better understanding of the potential applications of microelectronic technology by commissioning new development projects and by building on existing work in this field. Nine million pounds is to be made available for this purpose over the next four years. The programme will consist of a number of projects, managed by a fulltime director under the supervision of the Education Departments (DES, Welsh Office Education Department and the Department of Education Northern Ireland).

2. It is proposed to appoint a small advisory committee to assist the Education Departments in the supervision of this programme by providing expert advice. The committee would be chaired by a senior DES official but most of its 13 members would be individuals from outside the Government knowledgeable and experienced in the field of microelectronics applications in education or in the demands which this technology is likely to make on young people in employment. The external members would be appointed on a personal basis (not nominated by representative bodies) but would between them cover the main interests in this field.

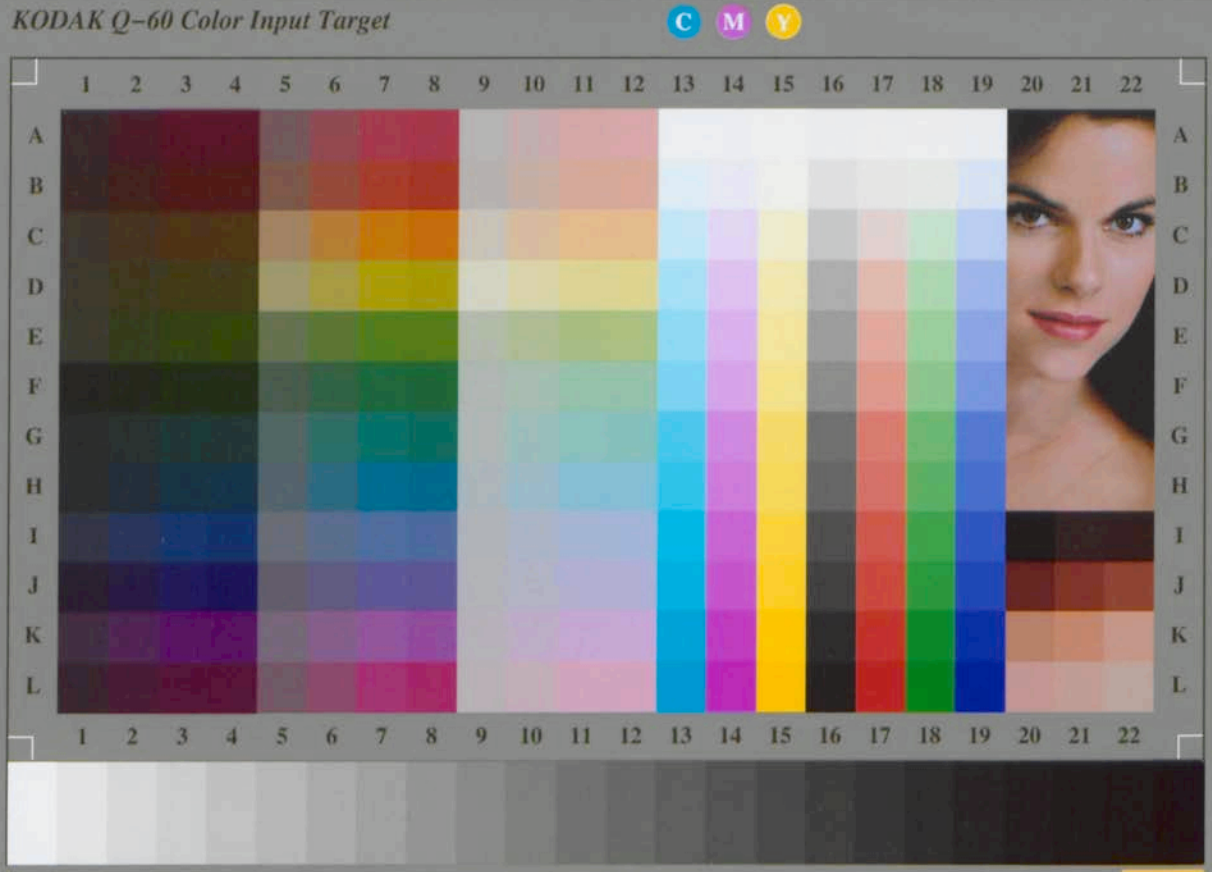
3. The advisory committee would have no executive functions and would cease to exist when the development programme came to an end. This would be made clear to prospective members, and they would be appointed on the understanding that the Departments were free to reject their advice. The chairman of the committee would be required to submit an annual report to the Secretaries of State reviewing past work and outlining their plans for the following year. This will provide Ministers and other senior officials with a regular opportunity to review progress.

PART 1 ends:-

S/S Ind to S/S Trade 30.4.80

PART 2 begins:-

DES to CAW 1.5.80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