COMMERCIAL - IN CONFIDENCE

B.F. when Treasury write arrives

QUEEN ANNE'S GATE LONDON SW1H 9AT

22 June 1990

Dear Nick,

FUTURE OF IBA EXPERIMENTAL AND DEVELOPMENTS (E&D) DEPARTMENT

In my letter of 18 January, I proposed that we should give the IBA an opportunity to show that a restructured version of their Experimental and Development Department could make a contribution to the future of the private transmission company which is to inherit the IBA's transmission operation at the beginning of next year. You agreed that MISC 128 should consider any case put forward by the IBA, before deciding whether to accept the IBA's proposal or simply to retain the minimum technical development unit which the company will require.

I enclose a copy of the plan prepared by the future management of the transmission company, with a paper which summarises the plan's main findings. In essence, what they propose is a slimmed down E&D Department, initially dependent for about two-thirds of its income on the ITC's research budget, but increasingly funded by contracts from other organisations.

It is encouraging that the profit and loss accounts in the plan - the assumptions for which have been checked by our financial advisers, Price Waterhouse - indicate that an E&D Department restructured on this basis would be immediately profitable and that, even on a worst-case scenario under which the Department lost the best part of half of its projected income at the end of 1992, it could return to profitability very swiftly through restructuring. (In practice, such a severe loss of funding is highly improbable, since it would entail the abandonment of long-term research projects in which customers had already made a considerable investment).

The management of the company believe that, in addition to the direct financial advantages of including the restructured Department in the new company, there is likely to be considerable cross-fertilisation of ideas and business between the Department and the rest of the company, and that the Department would provide an invaluable skills base for the company.

The new Department will be heavily dependent in its first two years upon research funding from the ITC. Although the ITC has no formal existence until the beginning of next year, we have a written assurance from its members that the level of ITC funding included in the business plan for 1991 and 1992 will be forthcoming. The source of this money, the assured ITV company rentals, is secure.

The Rt Hon Nicholas Ridley, MP.
Secretary of State for Trade & Industry
1-19 Victoria Street
LONDON, S.W.1.

/over....

We have included a £2 million bid in this year's PES to grant a loan to the ITC for its start-up costs. The Treasury have suggested that if this bid were not entirely successful the ITC might have to trim its whole budget slightly (although this loan would be only about 15% of its budget). It is clear, however, that E&D's projected income from external sources in 1991 and 1992 is based upon pessimistic assumptions, and that in the unlikely event of any trimming of the ITC research budget, the shortfall in income could be made up from other sources.

In summary, it appears that an E&D Department restructured along the lines proposed in the business plan would be an asset to the new private transmission company. Our financial advisers, Price Waterhouse, believe that it would be unlikely to depress, and might well enhance, the sale proceeds. Subject to your views, and those of other colleagues, I therefore propose to tell the IBA that we accept their plan.

I am copying this letter to the Prime Minister, to other members of MISC 128, and to Sir Robin Butler.

NATIONAL TRANSCOM

BUSINESS PLAN

FOR

THE EXPERIMENTAL AND DEVELOPMENT DEPARTMENT

June 1990

C O N T E N T S

I INTRODUCTION

1. For many years, broadcast R&D has been carried out very much on a "public service" model in the research laboratories of the major national broadcasters around the world. Almost all major broadcast developments in Europe over the past two decades have arisen not from industry, but from the broadcasters: teletext, dual-channel sound, digital studio standards, the MAC system for direct broadcasting by satellite (DBS), and compatible high-definition television (HDTV). This R&D, which has led to well-established technical standards, has benefitted broadcasters and industry alike. The technical standards have been important to ensure ease of programme interchange and to establish a situation whereby competitive procurement of interoperable equipment from manufacturers is achieved. Most of all, the broadcasters' R&D has benefitted the end consumer, since by far the major investment in the broadcast chain lies in the hands of the public and they have gained most from the planned and coherent evolution of broadcast systems and standards with new technologies. This has provided the justification for the "public service" model, though it has rarely been identified in this way.

2. The IBA Experimental and Development Department (E&D) was established in 1967 with the initial objective of developing equipment necessary for the introduction of the UHF colour service in 1969. The title E&D reflected the emphasis on development activities rather than on basic research in broadcasting. This was work which brought direct benefit to the ITV broadcasters through the speedy and efficient implementation of the new service. Later on, the work involved development of the first digital standards converter, which was put quickly into use at ITN and gave a competitive edge in rapid screening of news material live from other countries. The IBA work on the initial development of the digital video tape recorder and then through European Broadcasting Union to establish a universally-agreed, digitally-based family of recording and conversion standards was of very substantial (yet unquantified) financial benefit to broadcasters. Most recently, the development of the MAC transmission standard for DBS has set in place a major step in the competitive evolution of new television services.

3. As we enter the 1990s, the range of choice of broadcasting services available to the public is set to grow dramatically. New satellite-delivered services will offer not only wider choice, but also the prospect of fully compatible wide-screen and higher-definition television using MAC. New methods of payment, such as subscription and pay-per-view systems, will also become practicable, thanks to the secure scrambling and encryption technology made possible with MAC and related digital technology. These benefits will also be conveyed to viewers through new cable services and also perhaps by local MVDS (Multipoint Video Distribution System) services. At the same time, there is the imminent prospect of a fifth UHF terrestrial television service. Never before have there been so many diverse opportunities and new markets for broadcasters and broadcasting technology to address. The IBA's Experimental and Development Department has not only contributed greatly to the present excellence of Independent

Broadcasting within the United Kingdom, but its innovative approach to the development of new broadcast systems has had, and is continuing to have, significant impact on the broadcasting community worldwide. It is important for the success of a wide range of businesses that the UK remains at the forefront of the development of new broadcast systems for the 1990s and beyond.

4. Though E&D activities have in the past always been directed towards the evolution of new broadcast technologies and to the growth of the business base for broadcasters, they have not been carried out on a direct "customer-contractor" basis. Throughout Europe, however, R&D in most industrial sectors is now being carried out more within a customer-contractor relationship directly related to specific business interests.

5. As part of the overall restructuring of the IBA's Engineering Division and related supporting services currently being carried out to prepare for privatisation, the organisation of E&D is being reshaped so that the E&D activity can develop as a viable commercial operation with an identified customer base. The establishment is being reduced from 86 to 57. The business plan presented here is one to re-orientate and establish the IBA E&D Department as a profitable, market-orientated provider of R&D services, operating as an integral, yet separately accountable, part of Transcom.

II THE MARKET FOR RESEARCH AND DEVELOPMENT SERVICES

6. The estimated market for broadcast-related research and development in the UK is some £14-16M per annum. This is made up as follows:

BBC	:£6M
Independent Sector	
- IBA	:£3M
- ITVA	:£1M
UK Industry, Universities, etc	:£4-6M

7. The market overlaps to an increasing extent that of telecommunications-related research and development, where much larger investments are being made by a number of major commercial organisations such as British Telecom.

8. In neither the research nor development market, however, is there much flexibility for those involved to change their market share. It is unlikely, for example that the BBC would contract out any significant amount of their research and development work. Faced with their own financial stringencies, they are more likely to try to attract external funding to subsidise their research programmes. Furthermore, much of the research and development needed by industry is by nature proprietary and only contracted out when the specific expertise required is not available in-house.

9. It is estimated therefore that the maximum external market in the UK available to Transcom for broadcast research and development is unlikely to be greater than about £4M per annum, even with the assurance of funding long-range work by the ITC.

10. However, the industrial base in broadcasting is stronger in continental Europe than in the UK and with increasing new commercial ventures in broadcasting in Europe, this European market may offer vitally important opportunities for the stability and growth of Transcom's E&D activities from their present planned level. The joint investment by Thomson and Philips of £2,140m in R&D for HDTV helps establish the scale fo the broadcast R&D market in Europe. It is likely that Transcom's E&D will be looking to Europe for much of its business in the future.

III THE POSITION OF TRANSCOM E&D IN THE MARKET

11. The core market of E&D is the provision of applied research and development services in broadcasting systems and technologies in which it has a proven track record as part of the IBA. The track record is a key strength to build on in exploiting fully and profitably the established expertise and in aiding Transcom's move into new areas outside broadcasting, such as telecommunications.

12. The following mission statement in regard to Transcom E&D activities has been formulated:

"Transcom will aim to be a profitable, market-oriented provider of R&D services. E&D will operate in a fully commercial environment as a strategically valuable unit of the privatised transmission company. E&D's focus will be on providing applied research and development services in advanced broadcasting systems and technologies, but it will also exploit opportunities in related areas. High quality services that are typically the first in their field will be offered."

13. To fulfil this mission statement, the following objectives have been set:-

(a) to establish E&D activities as a separately-accountable unit within the new transmission company, in order to assist Transcom to maintain its core business and develop its non-core business areas;

(b) to establish a customer-contractor working relationship with the ITC, particularly on longer-term R&D, and through high performance on ITC contracts retain the Commission and its licencees as a long-term customer;

(c) to develop external contracts with other customers to exploit profitably Transcom E&D expertise.

(d) to retain and develop its reputation for being able to provide the highest quality staff and resources on advanced technology projects.

(e) to maintain a skill base in advanced broadcast and communications technology to assist Transcom in diversifying its business activities.

(f) to produce a minimum of 10% profit margin on all external contract work in addition to making a full contribution to corporate overheads.

14. E&D is thus seen as a customer-orientated operation, in which principal customers are identified as follows:

(a) ITC: the ITC will require access to a long-term R&D capability to fulfil its role in defining and regulating the broadcasting technical framework, and to support its national and international role in standards setting. Transcom through its E&D activities will be well placed to provide a substantial element of these requirements.

(b) Transcom: E&D will provide services for the transmission company's core business to improve the efficiency and effectiveness of the terrestrial transmission network. E&D will be expected to supply a flexible service, able to generate solutions to complex system problems, which can arise from the introduction of new technologies. E&D will equally provide services to support the Transmission Company's objective of developing new business areas.

(c) Industrial or Commercial Organisations: E&D is currently providing experimental and development services to BSB, and will be in a position to provide R&D projects and consultancy services to other external parties.

15. Transcom E&D will aim to provide these customers with system or sub-system study and design. In some cases this may involve the manufacture of prototype hardware and limited production runs, making use of sub-contractors as appropriate.

16. Given the nature of the activity, it is to be expected that Transcom E&D customers will vary in the detail of their requirements. The requirement may well be a specific report or a piece of hardware. In either case it will be important to establish a contract which sets performance measures which can be monitored at defined points during the course of the project.

IV THE COMPETITIVE POSITION OF TRANSCOM E&D

17. Table 1 shows the likely competitors that E&D will face in providing its services to the core market of advanced broadcast systems and technologies.

18. The key points are as follows:-

(a) there are some potential competitors (such as the BBC and BT) with resources at their disposal that dwarf the size of Transcom E&D capability; BBC work covers all aspects of the broadcast chain; BT has a very large business base to support the widest range of research and development.

(b) there are potential competitors (including the universities and certain European broadcast establishments) who may be able to undercut E&D services since they certainly do not at present operate under normal commercial practices; this could apply to the BBC unless constraints are placed on their external activities.

(c) it is likely that as E&D develops into non-core but related services, it will meet a wider range of competitors, particularly from industry and in some cases international organisations.

19. In summary, the major immediate competitive threat to E&D would appear to come from the universities who may be able to undercut E&D services. In the longer run, there is the prospect of a substantial competitive challenge from a privatised BBC research capability and for example from BT research in areas where telecoms and broadcasting overlap. E&D can also expect to meet strong competition as it develops its services into non-broadcasting areas.

20. E&D's key competitive strength is its impressive track record. This should provide the basis for E&D to support Transcom activities successfully and retain a substantial element of the ITC research programme. E&D's expertise should also enable it to provide high value services to customers seeking to establish a strategic position in the market place.

21. Currently the major weakness of E&D's position is its vulnerability to losses of key staff. The dominant asset of E&D is its staff, who must be retained in order to provide the innovative thrust for the new company.

22. A potential weakness is loss of access to its existing IPR if these assets are not vested in Transcom.

23. More generally, E&D presently lacks experience in managing the demands of the commercial market place including experience in depth of customer/supplier relationships and experience of marketing and selling. However, with the incorporation of marketing and business development skills in the new company, this difficulty will be solved as a result of E&D being an integral part of Transcom.

VI TRANSCOM E&D WORK PLANS FOR THE FUTURE

Work plans for the prospective customer, or customer groups, will now be reviewed.

Work for the ITC

28. The Broadcasting Bill places certain duties on the ITC which relate to experimental and development work. These involve:

    i) representation on national and international regulatory bodies concerned with future standards setting (Clause 64);

    ii) making arrangements for research and development work (Clause 63);

29. In regard to research and development work itself, the ITC will be required to:

    i) consult licence holders on the arrangements made for R&D;

    ii) contract out the R&D programme;

    iii) ensure that "to a substantial extent" the R&D contracts are financed by persons other than the ITC.

30. It is for the ITC to decide how it will carry out these duties, but it seems desirable for the ITC to set up a Research and Development Board, on which all ITC licencees would have right of representation. This Board would provide the forum for consultation with ITC licence holders, and review the work plan on an annual basis. In view of the limited tenure of ITC licencees and their differing commitments to particular research and development activity, it is essential that the ITC controls and coordinates the funding for long-range research and development. The work will involve a mix of projects, many funded on a rolling contract basis; there will be those in which the ITC has a major interest for its broadcast infrastructure planning and which may not be in the immediate interest of the existing licencees, because these projects bring into prospect changes in the competitive licensing environment; there will also be those in which the companies have a more direct interest for their medium-term business development. It is anticipated that the current, separated funding arrangements of IBA and ITVA will be brought together in this new structure, providing the mix of ITC and industry funding envisaged by government.

31. The value of contracts between the ITC and Transcom for R&D projects is planned to be £2.0 million in 1991 and 1992. This represents the level of ongoing long-range research and development work already committed in IBA plans and covered under the existing ITV programme contracts until the end of 1992. This is a reduction on the commitment of the IBA in previous years, but has been judged by those representing ITC engineering interests to be an appropriated level of

V INDEPENDENT SECTOR RESEARCH AND DEVELOPMENT FUNDING

24. At present, the experimental and development work within the IBA is planned by Engineering Division and the plans approved annually by the Authority. Revenue and capital expenditure have been at a nearly constant level for some years. For 1989-90, the total direct expenditure was approximately £3M, excluding overhead charges on accommodation and services from other Divisions (Finance, Personnel, etc).

25. Much of the experimental and development work is currently of a long-term nature, involving programmes of more than five years' duration destined to be of benefit to the independent broadcasting sector and its competitive evolution.

26. The ITV companies, encouraged by the IBA some years ago, set up three development laboratories (at Thames, Granada and Scottish Television). These laboratories comprise a total of some ten technical staff who concentrate largely on short-term projects to fulfill specific needs of the companies. However, they have one major long-term project integrated with the European Eureka HDTV initiative, on high-definition television production. The budget for these development laboratories, which currently runs at £1M per annum, is approved by ITVA Council on the basis of plans submitted by the ITVA Technical Development Board. In the uncertain economic climate faced by ITVA, there is currently no commitment to these laboratories and their funding beyond the end of this year.

27. The ITVA Technical Development Board is also the point of liaison and coordination between IBA and ITVA experimental and development activities. Progress on both work programmes is reported and discussed at the quarterly meetings of the Board. Outside there meetings, informal liaison at the working level, particulary on the Eureka HDTV programme, occurs to a large extent.

contracts, given the range of tasks involved. The IBA, at its recent meeting on 17th May agreed that:-

(i) the IBA/ITC should endorse the assumptions in the E&D Business Plan, which has been prepared and approved by the Shadow Board of Transcom, as the basis of planning for the future of E&D;

(ii) the ITC should place high priority as soon as possible, when ITC budgets are brought forward, on confirming the proposed expenditure with Transcom of £2 milion per annum for 1991 and 1992, and on incorporating, in principle, the proposed lower levels of expenditure in the medium-term forecasts for 1993-1995.

Detailed plans for the ongoing work, which is already being run in the form of an external contract with an appointed project manager representing ITC interests, are available. We have estimated that the value of R&D contracts from the ITC may fall to about £1.3M in 1995. This fall is in recognition that some projects, such as those associated with Channel 5 and MVDS, will have terminated and that Transcom cannot expect to be the exclusive provider of R&D expertise to the ITC and its licencees.

32. The contracts are planned to cover work in the following areas:-

Additional uses of the UHF Spectrum (Digital TV & HDTV)

- Studies of new uses for the UHF spectrum, in particular the applications for enhanced and high-definition television and digital TV.

  This work is of vital importance to the ITC in planning the evolution in use of the terrestrial UHF spectrum in the second half of the 1990s. Prospects are already in view for an overlay of digital television channels that could provide more than one franchise in each ITV region and substantially alter the competitive structure of the independent broadcasting sector. Studies will also be required to parallel those in the USA for the NTSC system on simulcasting HDTV in the UHF band.

  This project, which needs to cover many areas, including frequency planning, modulation studies, video coding studies, prototype hardware development, field trials, specifications and international negotiations, is planned as a 5 year programme at a contract value of £1.0m per annum, and involves 25% of the R&D effort of the department. This represents a total of around 50 engineer man years (Note 1) on this major project which

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Note 1: For each engineer man year, there is also an appropriate level of support staff provided from within the department. In addition to this, the travel materials and sub-contract costs, as appropriate, are included in the total budget indicated.

could have a dramatic impact on the structure of television and communications in the next decade. The precise deliverables are agreed at this fixed price up to the end of 1992. Beyond that date, the contract value remains agreed in outline for a further three years, but the precise deliverables of this later phase of the work must depend on choices made by the ITC in 1992.

PAL Enhancements

- Development of enhancements to the PAL system for terrestrial broadcasting.

  This work is of prime importance and interest to ITVA who are faced with competition from satellite broadcasters able to deliver wide-screen and enhanced or high-definition television. A joint IBA/ITVA task-force, coordinated through the ITVA Technical Development Board, is already working actively on this topic.

  This project is planned as a 4 year programme at a contract value of £350k per annum, and involves 9% of the R&D effort of the department. This represents a total of around 14 engineer man years over the total contract period. The deliverables are agreed at this fixed price up to the end of 1992, with the broad objectives agreed to the end of 1994. At the end of 1994, it is envisaged that the taking forward of the work will no longer be the responsibility of the ITC, but will be left to licensees and industry from whom we would wish to take further contracts in this important area.

Data Broadcasting

- Studies of data broadcasting, in particular the efficient use of the Vertical Blanking Interval (VBI).

  The ITC has a remit to develop the usage of the VBI in the most efficient manner, with allocation of much of it by competitive tender, but having due regard to future requirements of enhanced and high-definition television. The ITC will require a number of technical studies and perhaps some practical demonstration programmes to establish the knowledge base it will require.

  This project is planned currently as a 3 year programme at a contract value of £250k per annum, and involves 6% of the R&D effort of the department. This represents a total of around 8 engineer man years over the total contact period. The deliverables for this work are agreed for the whole of the contract period, and will result in a hand over to industry of the ideas and work during 1992 and 1993.

Microwave Frequency Planning

This work falls into two closely related parts:

- Studies of Microwave Video Distribution Service (MVDS).

  This work is required by the ITC in order to establish the service area planning and technical planning aspects of local delivery licences for MVDS to be issued by the ITC in the post-1992 period.

  Studies of further development of broadcasting in the 12GHz band, in particular relating to additional satellite channels and digital TV.

  This work is anticipated to be in support of Home Office and DTI studies. An initial report has already been sent to experts in the Home Office and DTI.

  This project is planned currently as a two year programme at a contract value of £300k per annum, and involves 8% of the R&D effort of the department. This represents total of around 6 engineer man years over the total contract period. The deliverables in terms of studies, propagation tests, field trials and reports are agreed.

Channel 5 Interference

- Studies of factors affecting Channel Five, in particular relating to coverage and the retuning of VCRs.

  The ITC will require continuation of the current studies through 1991 and 1992 on planning aspects of Channel 5 for its assessment of licence applicants.

  This project is planned currently as a two year programme at a contract value of £100k per annum, and involves 2.5% of the R&D effort of the department. This represents a total of around 2 engineer man years over the total contract period. The deliverables in terms of studies, tests, field trials and reports are agreed.

Standards Committees

- Expert representation in or briefings for relevant national and international committees.

  This is not seen as a separate project as such, but an integrated part of the contracts listed above. The costs and effort are therefore included in the above items.

33. Table 2 shows the financial profile of the individual projects which are already under way and for which detailed long-term plans exist up to the end of the years indicated. At the annual reviews after 1992, some of these projects may be terminated, extended or replaced by new projects. The earliest termination dates for the projects as currently agreed are shown.

34. Table 3 shows the overall, assumed financial profile for R&D contracts placed by the ITC with Transcom. It is assumed that the ITC will continue to place contracts for around £2M per annum through 1992, but that as explained previously, Transcom cannot expect to retain the full share of this market. The profile assumes, as indicated in paragraph 31, that the projects associated with Channel 5 and MVDS will have terminated at the end of 1992, that the ITC may well wish to diversify its sources of R&D provision in 1993, but that in 1994 and beyond, E&D will continue to compete successfully for a number of the contracts as they come up for extension beyond the present limits, or as new areas of work are identified. By virtue of its expertise and previous work for the IBA/ITC, Transcom should however be in a favourable position to obtain a high level of continuing contracts.

As indicated in paragraph 31, the IBA at its Meeting on 17th May has endorsed the above work programmes as the basis of planning for the future of E&D; it has given a commitment to putting a high priority on confirming the proposed budgets of £2.0m per annum for the years 1991 and 1992 and to entering the appropriate figures into the medium term plans for the years 1993-1995.

Work for Transcom

35. Careful thought has been given to the appropriate level of R&D spending for Transcom. A company with a core business depending on relatively mature technology needs to spend less on R&D than a company which depends totally on the progressive introduction of new high-technology products. R&D expenditure varies greatly across the service and manufacturing industries from less than 1% of turnover to at least 10% of turnover. Transcom has a relatively mature core business, but will operate in an environment where technology change could have a major impact on its business. R&D to maintain position in core business areas and to develop business outside the regulated core area is thus vital to the success of Transcom.

36. Based on these factors and an analysis of project areas essential to the business of Transcom, a level of expenditure on R&D close to £1M per annum is forecast in the early years of Transcom's existence. This represents about 1½% of Transcom turnover and involves 28% of the R&D effort of the department. The £1m is calculated on the basis of full recovery of all overheads, but no allowance for a profit element since the work is internal.

    The planned rate of growth of this figure is at present modest, but this aspect depends critically on the new business growth of Transcom.

37. It is convenient to describe Transcom-funded R&D in terms of that related to the "regulated" and "non-regulated" areas of business since these will have to be separately identified and accounted.

    Initially there will be an equal split of resources between regulated and non-regulated R&D activities. Thus the £0.5m of "regulated" R&D activities represents about 1% of total "regulated" Transcom turnover, and the £0.5m of "non-regulated" R&D activities represents about 4% of total "non-regulated" Transcom turnover.

Projects relating to "regulated" area

38. This work is directed at continuing the current support to operations. The overall level of effort in this specific area is comparable with that for the equivalent work in recent years. The active projects are those considered to have highest priority at present. It can be expected in the future, as has happened in the past, that, in a particular year, an activity such as the design of specialist test equipment may become very important and require increased effort because of potential operational savings. The total programme of work proposed in the regulated area is planned at £500,000 p.a. and involves 14% of the R&D effort of the department. The projects relating to the "regulated" area are as follows:-

Development of specialist test equipment

This equipment is frequently not available from industry at all and must be developed in-house. It is important to have such equipment to ensure efficient and effective transmitter maintenance. Currently planned projects are: (1) A Digital Error Logger for monitoring the performance of dual channel sound links; (2) modifications to Insertion Test Signal generators to allow increased data capacity for teletext. This programme of work is, by its very nature, ongoing, with new requirements arising, and is currently planned at an average level of £85,000 p.a., involving around 2.5% of the R&D effort of the department.

Improvements to the efficiency of operations

This work has a direct impact on the profitability of Transcom's core business.

- Development of transmitter antenna monitoring and protection techniques.

  This project is required in order to reduce the risk of serious damage resulting in interruptions to service and high cost of restoration. During the investigation phase, this programme of work is planned at £40,000 p.a., involving 1% of the R&D effort of the department. This level will need to rise if hardware development results, although this may be a joint venture with industry.

- Investigation of reduction in S1 sound carrier power.

  This project will cost £85,000 in one year to determine the feasibility and carry out field trials, involves around 2.5% of the R&D effort of the department, and is aimed at achieving a £200,000 p.a. saving in electricity costs.

- Development of advanced computer systems for the efficient operation of service area planning and coverage monitoring or assessment.

  A current problem in service area planning is the long time required to produce a coverage map from a transmitter. This involves complex propagation calculations using a detailed terrain data base. Planning, which may involve testing many transmitter sites and aerial configurations, can thus be a lengthy and costly process. Recent IBA work using a transputer processor has shown prospects of radical improvement in calculation times, making such planning work more of an interactive process. Further work is needed to refine the techniques and integrate them with the activities of field survey teams to spread coverage assessment or monitoring. This programme of work is currently running at £85,000 p.a. and involves around 2.5% of the R&D effort of the department.

- Studies of new technologies for the implementation of broad-band studio-studio and studio-transmitter programme links.

  An important part of Transcom's business is the network interlinking its transmitters. Transcom needs to be responsive to its programme company customers in providing the future broad-band links they require. In order to have contact with and to have influence on the developments in Broadband Digital networks suited for TV distribution, the IBA is a member of the 'FUNCODE' (FUNdamentals of CODing) project of the RACE programme, a European Collaborative Project. Our effort level is at present set at around £42,000 p.a. involving around 1% of the R&D effort of the department. Part of this work is funded by the European Commission.

- Development of adaptive systems, both for control of transmitters and also for improved reception.

  An increasing need in broadcast system operations is for as much of the system to respond as automatically as possible. Development work is required to make more of the system reconfigure automatically in case of failures, thereby reducing human operator workload. With increasing density of spectrum use, advantages may be obtained if better control may be achieved over signal coverage, perhaps adaptive in character according to interference or other conditions. Early IBA work on adaptive antennas was a world first in the broadcast domain.

- Use of knowledge Based Systems, in particular for improving efficiency of transmitter operation and maintenance.

  Failures of transmitters or antennas are serious, costly and manpower intensive. If corrective work can be carried out before a major failure occurs, considerable savings result. Knowledge based systems, at present in their infancy, offer interesting prospects, based on careful monitoring and modelling of the system, for avoiding major failures.

The total programme of efficiency improvements as listed above is planned at £250,000 p.a. and involved 7% of the R&D effort of the department.

Solutions to problems which affect the core business

This is essentially a 'fire-brigade' activity intended to deal at short notice with problems which threaten Transcom's ability to provide a service to the customer of the required quality, in particular where new technology is being introduced.

- Dual-channel sound-in-syncs link spurious muting.

  Interruptions to the dual-channel sound signal are occurring occasionally on the distribution links,

although the link equipment itself is apparently meeting specification. This project entails a study of the problem, development of instrumentation to log failures and allow analysis of mechanisms of spurious muting, and development of equipment or modifications to cure the problem. This programme of work is planned at £125,000 p.a. with a duration dependent on the problems found and solutions required, and involves around 3.5% of the R&D effort of the department.

- Development of systems to prevent unauthorised use of relay stations (anti-piracy).

  Unauthorised use of relay stations by "capturing" the repeater with a locally-provided pirate signal is not common, but is a matter of concern. Systems need to be developed to increase the security of access to relay stations.

This total programme on solutions to problems affecting the core business is planned at £125,000 p.a. and involves 3.5% of the R&D effort of the department. This must, by its nature, involve areas of work which are only identified at short notice.

National/International Committees

- Liaison with industry, in particular BREMA.

  This will be important to establish a constructive relationship with the manufacturing industry and also to help in broadening the business base of Transcom.

- Liaison with international bodies in various committees.

  Liaison only with those bodies where Transcom has a legitimate business interest will be supported.

This total programme on liaison with industry and liaison with international bodies is planned at £40,000 p.a. and involves around 1% of the R&D effort of the department.

Definition of specialist measurement techniques, in particular relating to digital technology

Prior to development of test and measurement equipment as referred to above, the specification of the parameters involved for a particular system, coupled with a clear understanding of the methods of measurement and their relationship to system performance, is vital. Again, this is an area where special expertise, not found outside broadcast system operations, is required.

Projects relating to "non-regulated" area

39. This work involves activities directed towards new business growth and diversification. This is a relatively new area of activity and involves a modest 4% re-investment of the total Transcom "non-regulated" turnover. The total programme

of work proposed in the 'non-regulated' area is planned at £500,000 and involves 14% of the R&D effort of the department. Tasks envisaged are:-

Strategic R&D

Forward-looking projects intended to position Transcom for long-term profitability and growth.

- Provision of specialist "tools", for example image processing capability, for use on major study and development contracts.

- Participation in EUREKA EU95 project to develop HDTV transmission technology based on MAC.

  It is felt important for Transcom to continue IBA involvement in Eureka 95. This is strongly supported by DTI. No DTI financial contribution is shown in the business plan for the period after 1991, but it is intended that this work should establish Transcom's position as an up-link operator for HDTV. This project will also allow influence on HDTV developments affecting Transcom's business.

Strategic R&D is currently dominated by the EUREKA project planned at £210,000 p.a., and involves 6% of the R&D effort of the department.

New Business Areas

- studies in encryption technologies, in particular relating to MAC/DBS channels.

  This is a new area of business for Transcom, upon which commercially confidential discussions are under way with a broadcaster.

  IBA is a major leader in this field and has key expertise in security, efficient data transmission etc. In addition to new satellite business, encryption technology may be used for subscription and pay-per-view services on terrestrial transmitters.

  This programme of work is currently proceeding at a cost of £125,000 p.a., and involves 3.5% of the R&D effort of the department.

- Channel five enabling technology.

  The successful launch of Channel five will depend on developing low-cost solutions for antenna, VCR interface etc in addition to other "added value" features (see below). This will give Transcom a competitive position in bidding for Channel five transmission. R&D will form part of a Channel five field-trial/demonstrator at Winter Hill.

  This programme of work is planned at £125,000 p.a., and involves 3.5% of the R&D effort of the department.

- Development of services to operators of Personal Communication Network (PCN) technology, including improvements in efficient use of spectrum.
  This project is associated with the IBA (and in future, Transcom) involvement with PCN. IBA Engineering is currently an associate member of the British Aerospace (Microtel) PCN consortium. PCN business is seen as a major opportunity for Transcom.

- Development of test equipment for MAC systems.

  Further test equipment is likely to be required for the up-link operations activity with BSB. It is also applicable to work for other DBS operators in Europe.

- Studies of broad-band optical fibre network systems, likely as a contribution in a joint venture with other commercial/industrial partners.

  The provision of a broad-band fibre optic network linking transmitter sites, programme providers and Transcom regional operations centres across the UK is a major opportunity, subject to changes that may be brought about in the telecommunications duopoly review. Substantial R&D will be required to establish the optimum system design.

The total programme of work proposed in the new business areas is planned at £250,000 p.a. and involves 7% of the R&D effort of the department.

Added Value Services

- Addition of Enhanced PAL capability to UHF transmitters.

- Development of technology relating to efficient use of the VBI for teletext services (including Closed User Groups) and including Level five teletext.

  This work is to position Transcom for new business with Additional Services Licensees in the period 1993 onwards.

- Extra sound/data channels for UHF terrestrial services including Channel five.

The total programme of work proposed on added value services is planned at £40,000 and involves 1% of the R&D effort of the department.

Work for external customers

40. Contracts are expected to total a value of at least £850k by 1992, coming from the broadcast, telecommunications and aerospace industries. A major contract, which has now been agreed and signed by both parties, is for R&D support to BSB at a level of £535k to £755k for the first year to March 91 and a commitment to negotiate further contracts at a value of £500k per annum for a further five years. This stems from a current development contract in their launch phase which has been to the value of £0.7M over the past year. Companies such as Digital Video Systems of Toronto, Canada, Thomson LGT of France, BTS in Germany, Seleco in Italy, and ITT in Germany, have made active enquiries and in some cases there is specific negotiation or already agreement on draft research contracts.

41. Areas of studies for these clients are commercially confidential. Details are not given in the main text here, but the projects include:

- Wide-screen and extended definition MAC.
- Assistance with development of data services business using packet technology.
- Promoting the development of advanced receiver designs including the development of new integrated circuits.
- Design of specialist prototype hardware for converting from HDTV to "standard TV".
- Studies of advanced transmitter concepts.
- Possible licences to manufacture above designs.
- Assistance in the development of new integrated circuits for teletext including levels four and five (still pictures).

The contracts agreed, or under negotiation, are described in more detail in the confidential appendix to this business plan.

VII TRANSCOM E&D STAFFING & SALARIES

42. The projects described in Section VI require a staffing of around 40 qualified R&D engineers, and, in addition, a team of support staff to provide essential draughting, wiring, purchasing and procurement, planning and clerical services. The size of the support team is based on the difficult balance of keeping internal overheads to a minimum, while keeping the engineers' efficiency to a maximum, and is believed to be the optimum given the range of business described in Section VI above.

The staffing proposed is:-

Engineering Management (includes marketing/client liaison)	3	
Development Engineers	37	
Total - Engineering	**40**	**40**
Design support (draughting, wiring, purchasing & procurement)	10	
Planning	2	
Technical Facilities Manager	1	
Secretarial/Clerical support	4	
Total - Support	**17**	**17**
Total proposed staffing:		**57**

The distribution of the Engineering effort across projects during 1991 is shown in Table 4. The distribution for the years 1992 to 1995 will follow the income profiles of the department as given later in this business plan. In the area of external customers, the balance of resources must be dependent on contracts finally agreed, although the basic BSB contract is already under way at the agreed level. If negotiations with commercial clients are particularly successful, then it may be necessary to recruit some temporary (contract) engineers to assist during the peaks of the business.

43. Pay comparisons for Jan 1990, as shown in Table 5, show that the salaries in BBC Research Department are approximately 8% less than those in the IBA E&D department, but that those in British Telecom Research Laboratories at Martlesham are approximately 30% more. Direct comparisons are complicated by the different structures and organisations of the different R&D laboratories, but these are based on a careful comparison of jobs with similar job descriptions.

44. Staff turnover in the last seven years is summarised in Table 6. For engineers, staff losses tend to be cyclical at intervals of around four years with an average of around 2-3 years to achieve the necessary replacement. This turnover rate, at an average of 10% of engineers per annum is believed to be higher than at BBC Research, but is considered to be an appropriate level for a Research and Development activity.

VIII TRANSCOM E&D PROFIT AND LOSS ACCOUNT

45. Table 7 shows the summarised profit and loss account for the period 1991-1995, demonstrating the cautions assumptions on which the plan is based.

46. Various important aspects of the business plan may be drawn from this Table:

i) the dependence of Transcom E&D on long-term ITC funding decreases sharply after the end of the current ITV contract period. By 1995, this source of income is approximately one-third of the total, a level felt to be consistent with maintaining a long-term perspective in the overall transmission business.

ii) the projections on contracts with BSB and others are not considered over-optimistic. The level of £700-£800k per annum initially is consistent with the fact that contracts worth over £1M per annum are currently under negotiation.

iii) the accommodation and overhead charges are high. These represent E&D paying a proportional share of the overheads based on its staff numbers and space occupied at Crawley Court. A sum of £2.8M has been assumed for Transcom accommodation costs at Crawley Court and include a figure of £2.0M of notional rental. E&D bears approximately 20% of these accommodation charges. The detailed analysis of the corporate overheads is given in Appendix II.

iv) the staff costs are based on the staffing figures of paragraph 42, and include all employer contributions (N.I., pension etc), overtime (where payable), payments for temporary (contract) staff and any other staff related employer payments. In keeping with past experience, we have allowed for real salary increases of the order of 1.5% per annum.

v) the E&D marketing costs are represented partly in the corporate overheads of Appendix II, but also by the direct salary costs of the senior managers of the department who are actively involved in its marketing.

vi) the depreciation charges are based on a detailed analysis of the department's current capital assets, coupled with a projection given in Appendix III of the proposed capital investment for the years 1990-1995. We have identified assets which have either two, three, five or ten year lives, with resulting 50%, 33%, 20% and 10% straight-line depreciation rates. This differs from present IBA depreciation policy where all technical equipment is written off over 10 years.

47. Table 7(b) shows the forecast cash flow for the years 1991-1995.

48. Table 8(a) presents a forecast of the impact on the profit and loss account of the extreme case of the complete loss of

the ITC contract at the start of 1993. The assumption made is that the contract lapses and alternative work is not obtained, so that all the staff who would have been on the contract, are made redundant with a redundancy cost equivalent to one year's payroll. These redundancy costs represent around 30% of the value of the contract lost. This must be seen as a particularly extreme situation which would be unlikely to occur. If the ITC contract continuation is not agreed by the end of 1991 for at least the year 1993, then we would develop the many new business opportunities, particularly in Europe with a view to establishing more external contracts for 1993 and beyond, during 1992. Savings in accommodation charges are shown based on the assumption that some of the floor area is released for other uses. There would be no immediate saving in corporate overheads, but there would be a necessity to consider redundancies in Transcom support staff to reduce the overheads in line with the cut in E&D business.

49. Table 8(b) presents a forecast of the cash flow in this extreme situation of the loss of all the ITC business suddenly at the end of 1992. Under this scenario we are still able to achieve a positive cumulative cash flow by the end of 1994 and to continue to contribute towards total Transcom overheads.

50. The loss of contracts other than that of the ITC would be expected to have a proportionally less serious impact on the profit and loss accounts and cash flow. Smaller contracts would also be more readily replaced.

IX INTELLECTUAL PROPERTY RIGHTS (IPR)

51. E&D has a wide range of patents on broadcast and related digital technology. The licences taken out by industry on these patents relate mostly to professional studio equipment, which is not manufactured in sufficiently large quantities to generate high licence revenues. The cost of patenting, maintaining the patents, licensing and monitoring infringements largely balances the revenues obtained.

52. It is important, however, for Transcom E&D to retain title and the revenue stream from these patents in future, in order to protect its position on inventions and maintain a negotiating position with manufacturing industry.

53. The MAC patents are the only ones at present that have been licensed for consumer equipment manufacture. The IBA is a member of the international consortium (GIE) which was formed to coordinate the licensing of these patents. These patents may produce significantly more revenue to E&D that others in the past, but this depends critically on the sales of MAC receivers, the continuance of activity on the evolution of MAC in Transcom, and the dilution of E&D's licensing share if new patents are added into the GIE from other sources.

54. Income from IPR has not been included in the business plan at this stage in view of the uncertain nature of this income stream and the danger of placing any reliance on it.

X R&D PRICING

55. It is difficult to obtain a direct comparison between what Transcom E&D charges for R&D work and that charged by other bodies which might have the expertise and be prepared to undertake the work.

56. Most organisations, such as PA Technology or ERA Technology, quote rates, not on a project completion basis, but on daily rates. These rates are in general at least as high, if not higher, than those charged by Transcom.

57. Perhaps the best comparison is the work that has been carried out for BSB who have been keen to close down much of their business with PA Technology, Ewbank Preece and Telesat, placing greater and greater reliance on IBA Engineering during the last year, and have placed the new contract on the basis of our charges. The success of the IBA Engineering work also attracted ITT and Thomson into direct contract negotiations associated with their own needs.

58. The conclusion on pricing is that E&D is competitive in the market at the rates it charges and on which the business plan is based.

XI CONCLUSIONS

59. Over the five years of the business plan, Transcom will move through a very dynamic phase in its development. Diversification will be vitally important and the staff of E&D will play a key role in this. The contribution E&D makes in this regard is not shown in the E&D profit and loss account.

60. E&D must not become a "jobbing-shop" for R&D work. It will be a strategically important part of Transcom and its business plan will therefore have to adapt to the evolving business of the company. Some E&D staff may be drawn into the new business areas at crucial times to assist the development of these areas. E&D must therefore be a dynamic area within the company without rigid or permanent segregation of staff.

61. Care will be needed in the work undertaken by E&D on external contracts. There will be strategic choices to be made on which contracts should be taken up, to ensure that IPR and new business prospects for Transcom are properly developed and protected.

62. The business plan for E&D presented is based on the co-existence of three separate funding streams, providing a balance of work across long, medium and short-term projects and providing stability in the event of a decline of one of those funding streams with time.

63. Transcom has a major enthusiasm and commitment to the maintenance of E&D activities. It looks forward to integrating and developing this E&D business plan into its overall business plan to be produced later this year.

JRF/TPH/537/536.06
4th June 1990

Table 1
E&D Potential Competitors

Potential Competitor	Description	Competitive Threat
BBC Research	Operate as part of BBC engineering services. At least twice the size of E&D. Focus is on national service provision.	Not serious until review of BBC Charter in 1996 and possible privatisation of engineering services: (provided BBC restricted to work concerned with their own services.) - currently significantly more resources at their disposal - only major competitor working directly in the same field - will seek to gain external contracts at subsidised rates? - track record not as successful as E&D - ITC most unlikely to award contracts to BBC
BT Research Laboratories	Operate as part of British Telecom. Many times the size of E&D.	Serious threat in specialist areas: - likely to be considered by the ITC for research contracts into local delivery services - good integration of design and research but less flexible/more bureaucratic than E&D - as Transcom seeks to expand into telecoms, BT is likely to consider opportunities in broadcasting
ITVA and ITV Companies	Three laboratories (Thames, Granada and Scottish) funded, operated and monitored by the ITV Association. Total staff circa 10 engineers and 2 administrative staff. Annual budget of £1m concentrating on digital studio development and HDTV production.	Unlikely to be a serious threat: - contract only just renewed at the last round, and likely to come under pressure from new ITC licensees - however, existence of ITVA may hinder the development of direct funding between ITC licensees and E&D

Potential Competitor	Description	Competitive Threat
Universities	Vary in size and commercial awareness. Examples include Essex, currently working in packet network field and American establishments such as MIT.	Serious competitive threat (particular UK universities): - likely to take some small ITC contracts (<£200k) - funding problems are forcing universities to exploit commercial potential yet they are able to charge less than commercial rates - possible cost advantages in any case through lower salaries and overheads - but, lack E&D's focus on broadcasting and track record
Independents	Includes independently funded bodies such as E.R.A. and consultancies such as PA, Cambridge etc.	Modest competitive threat: - more generalist research outfits with no particular focus on broadcasting
Industrials	e.g. Sony, Thomson LGT.	Unlikely to be a serious threat: - see themselves more as the customers for, rather than the suppliers of, R&D services - unlikely to be interested in ITC sums below £0.5m; however, may have expertise in specialist areas eg MVDS
European Broadcast Establishments	Continental equivalents to IBA/BBC such as IRT in Germany and CCETT in France.	Possible threat to non ITC external contracts: - will have strong contacts with private and public continental R&D funds - possibly able to compete at cross-subsidised rates - unlikely to have E&D's access/experience of UK planning - track record not as successful as E&D

Table 2

R&D Work Programme Contracted by ITC to TRANSCOM

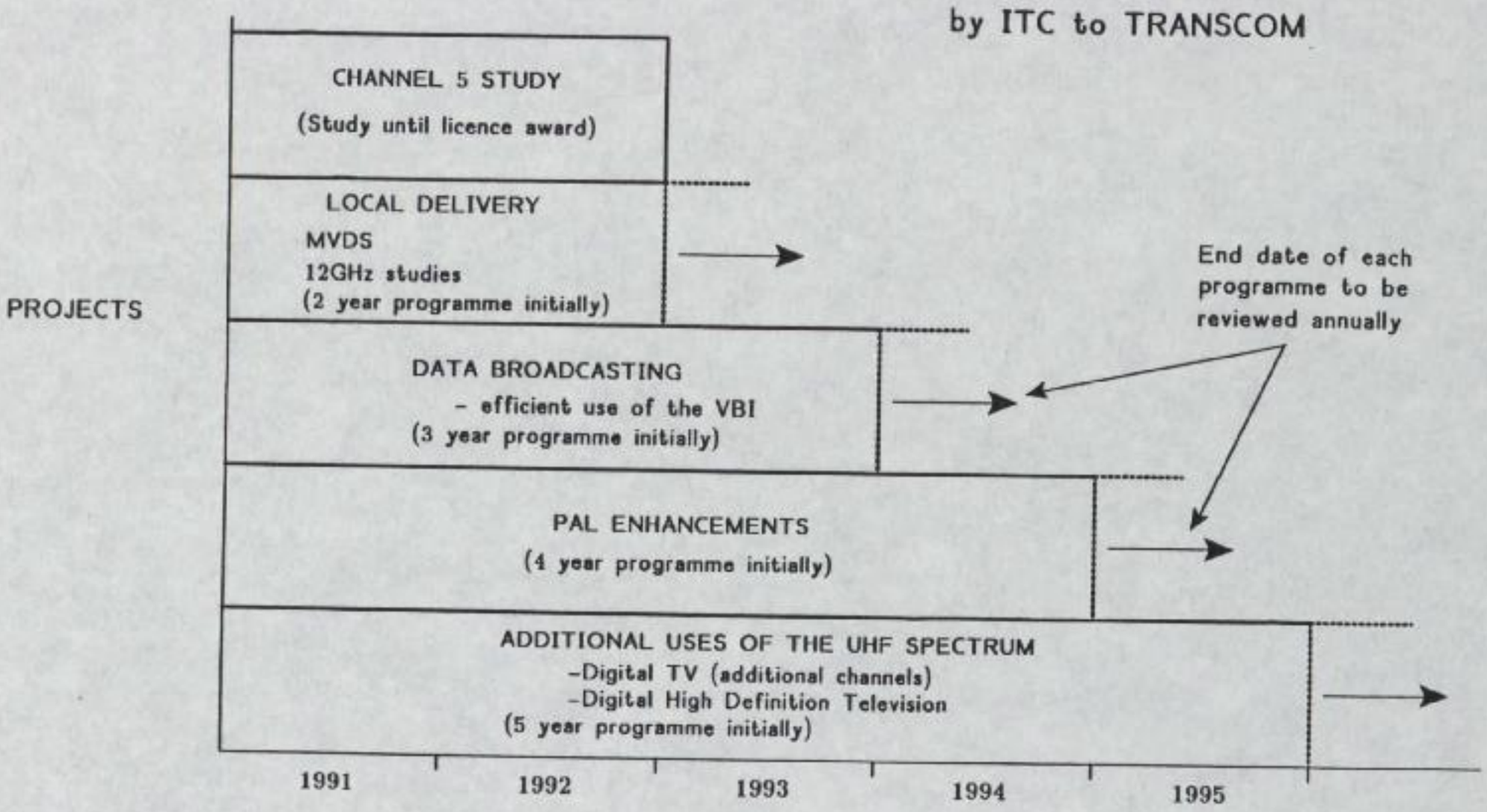

Table 3

Assumed Financial Profile For ITC R&D Work Placed With TRANSCOM

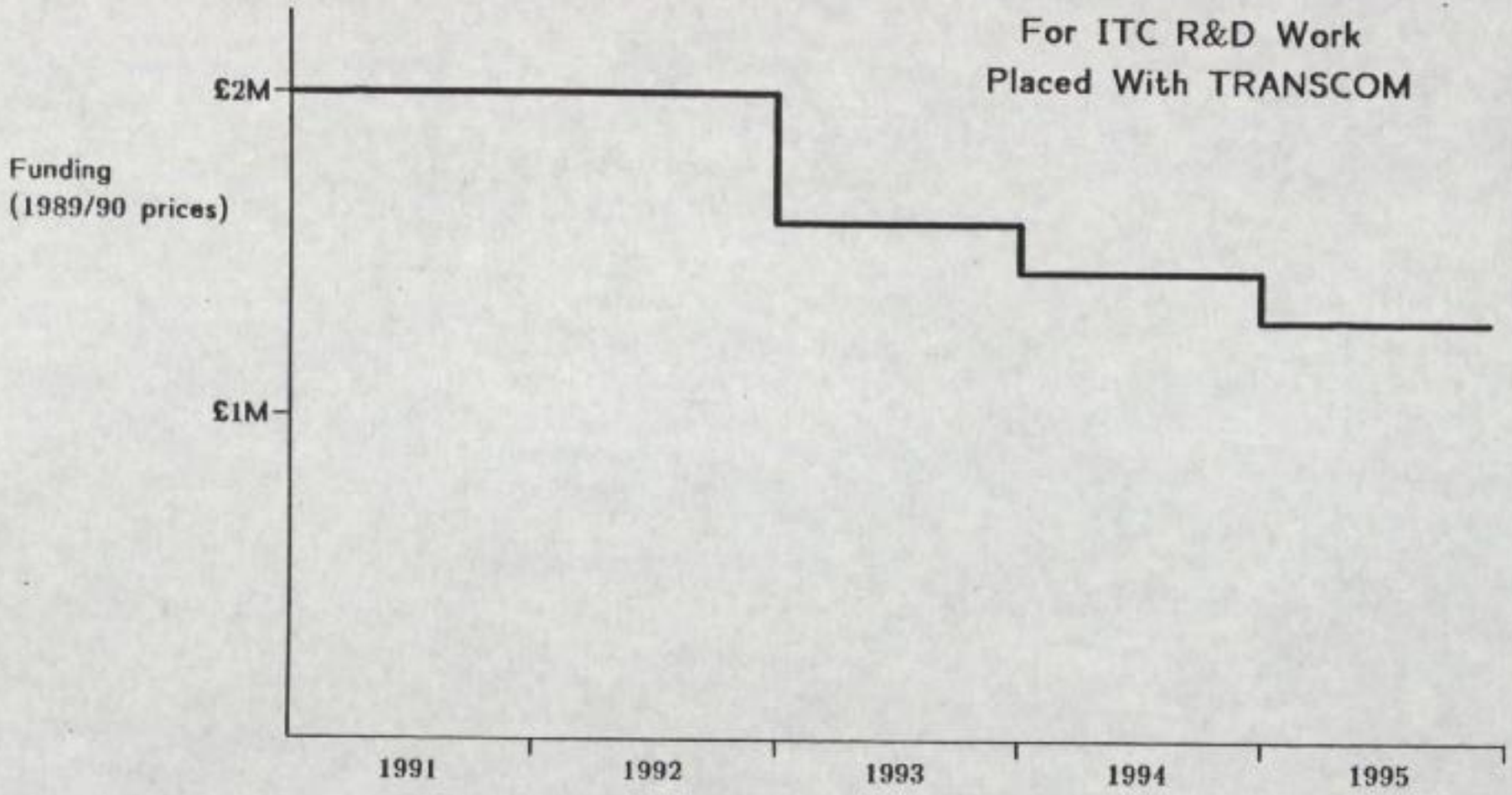

Table 4: Proposed Distribution of Engineering Effort

	Engineers in 1991	
ITC		
- Additional uses of UHF Spectrum + Digital TV	10.0	
- PAL Enhancements	3.5	
- Data Broadcasting	2.5	
- Microwave Frequency Planning	3.0	
- Ch 5 interference	1.0	
Total Engineers - ITC	20.0	20.0
Transcom Internal		
- Regulated		
- Development of Specialist test equipment	1.0	
- Improvements to efficiency of operations	3.0	
- Solutions to problems affecting the core business	1.5	
- National/International Committees	.5	
Total Engineers - Transcom - regulated	6.0	6.0
- Non-regulated		
- Strategic R&D (incl EUREKA)	2.5	
- New Business areas	3.0	
- Added Value Services	0.5	
Total Engineers - Transcom - non-regulated	6.0	6.0
External Customers		
- BSB[1] - basic contract	5.0	
- additional work (optional)	(2.0)	
- DVS[2] (initial development only to Dec 90)	1.5	
- Thomson[2]	1.5	
- ITT[3]		
- Tandberg Telecom [1] (manufacture)	0	
- BTS[3]		
- Others[3]		
Total Engineers - external contracts	8.0	8.0
Total Engineers required		40.0

Notes:
(1) contract agreed
(2) contract close to agreement
(3) contract under discussion

TABLE 5

Pay Comparisons:BBC Research Department and BT Research Laboratories

IBA Title	IBA Salary (£)	BBC Salary (£)	BT Salary (£)
Group Head	25,453-31,003	21,745-28,245	Personal Grade
Project Manager	20,200-25,275	17,120-22,225	23,500-31,355 (+personal grade)
Senior Engineer	15,812-20,212	no direct equivalent	19,607-26,143
Engineer(4-6yrs)	13,719-17,619	12,643-14,710	16,353-21,804
Engineer (new)	9,982-13,682	10,190-13,200	not available

TABLE 6

TRANSCOM E&D STAFF TURNOVER 1983 - 1990

Period (Financial Year)	Engineering gains	Engineering losses	Support gains	Support losses
1983-84	1	3	1	3
1984-85	-	10	1	5
1985-86	5	2	4	7
1986-87	2	3	4	6
1987-88	10	3	2	1
1988-89	3	7	2	7
1989-90	4	3	0	5
Total (1983-90)	**+25**	**-31**	**+14**	**-34**
Proposed Staffing	**40**		**17**	

REVISED

TABLE 7a:
E&D FORECAST PROFIT AND LOSS ACCOUNTS 1991-1995
(At 1989/90 Prices)

1 June 1990 £000

	1991	1992	1993	1994	1995
INCOME					
ITC Contracts	2,000	2,000	1,600	1,450	1,300
Transcom-funded projects *	1,000	1,050	1,100	1,250	1,350
Other Contracts:					
DTI/Eureka	75				
BSB	564	500	500	500	500
Other	200	350	750	800	900
Total Other	839	850	1,250	1,300	1,400
TOTAL INCOME	3,839	3,900	3,950	4,000	4,050
EXPENDITURE					
Payroll & Related Costs	1,496	1,518	1,541	1,564	1,587
Other Costs:					
Travel & Subsistence	60	50	50	50	55
Materials & Subcontract	285	260	260	280	300
Maintenance	140	140	140	140	140
Office Costs	20	20	20	20	20
Total Other Costs	505	470	470	490	515
Accommodation (Appendix II)	580	580	580	580	580
Corporate Overhead (Appendix II)	370	370	370	370	370
Depreciation	306	368	388	418	374
TOTAL EXPENDITURE	3,257	3,306	3,349	3,422	3,426
E&D PROFIT	582	594	601	578	624
Percentage return on non-Transcom business *	20.5%	20.8%	21.1%	21.0%	23.1%
Turnover per E&D employee	£67.4K	£68.4K	£69.3K	£70.2K	£71.1K
Tax Charge	(200)	(215)	(225)	(213)	(220)
Profit after Tax	382	379	376	365	404

* Transcom-funded projects charged at cost

REVISED

TABLE 7b:
E&D FORECAST CASH FLOW 1991-1995
(At 1989/90 Prices)

1 June 1990 £000

	1991	1992	1993	1994	1995
CASH FLOW PROJECTIONS					
INCOME					
ITC	2,000	2,000	1,600	1,450	1,300
Transcom	1,000	1,050	1,100	1,250	1,350
DTI/Eureka	75				
BSB	439	500	500	500	500
Other	177	333	704	794	888
Income Received	3,691	3,883	3,904	3,994	4,038
OUTGOINGS					
Payroll	(1,496)	(1,518)	(1,541)	(1,564)	(1,587)
Accommodation	(580)	(580)	(580)	(580)	(580)
Corporate Overhead	(370)	(370)	(370)	(370)	(370)
Other Costs	(447)	(474)	(470)	(488)	(512)
Capital Expenditure	(355)	(436)	(352)	(497)	(335)
Tax Paid		(200)	(215)	(225)	(213)
Total Outgoings	(3,248)	(3,578)	(3,528)	(3,724)	(3,597)
Net Cash Inflow/(Outflow)	443	305	376	270	441
Cumulative Inflow/(Outflow)	443	748	1,124	1,394	1,835

TAXATION

Tax Charge Estimate					£000
Profit per accounts	582	594	601	578	624
Depreciation added back	306	368	388	418	374
Disallowed expenses	3	3	3	3	3
Adjusted Profit	891	965	992	999	1,001
less Capital Allowances	(321)	(351)	(350)	(390)	(372)
Taxable Profit	570	614	642	609	629
Tax Charge	(200)	(215)	(225)	(213)	(220)

TABLE 8a:
E&D FORECAST PROFIT AND LOSS ACCOUNTS 1991-1995
(At 1989/90 Prices)

1 June 1990 £000

	1991	1992	1993	1994	1995
INCOME					
ITC Contracts	2,000	2,000			
Transcom-funded projects *	1,000	1,050	1,100	1,250	1,350
Other Contracts:					
DTI/Eureka	75				
BSB	564	500	500	500	500
Other	200	350	750	800	900
Total Other	839	850	1,250	1,300	1,400
TOTAL INCOME	3,839	3,900	2,350	2,550	2,750
EXPENDITURE					
Payroll & Related Costs	1,496	1,518	901	915	929
Redundancy Payments (estimated at 12 mths salary per employee)			502		
Other Costs:					
Travel & Subsistence	60	50	29	31	37
Materials & Subcontract	285	260	152	175	200
Maintenance	140	140	140	140	140
Office Costs	20	20	20	20	20
Total Other Costs	505	470	341	366	397
Accommodation (Appendix II)	580	580	426	426	426
Corporate Overhead (Appendix II)	370	370	370	370	370
Depreciation	306	368	388	418	374
TOTAL EXPENDITURE	3,257	3,306	2,928	2,495	2,496
E&D PROFIT	582	594	(578)	55	254
Percentage return on non-Transcom business *	20.5%	20.8%	(46.2%)	4.2%	18.1%
Turnover per E&D employee	£67.4K	£68.4K	£75.8K	£82.3K	£88.7K
Tax Charge	(200)	(215)	188	(30)	(91)
Profit after Tax	382	379	(390)	25	163

* Transcom-funded projects charged at cost

TABLE 8b:
E&D FORECAST CASH FLOW 1991-1995
(At 1989/90 Prices)

1 June 1990 £000

	1991	1992	1993	1994	1995
CASH FLOW PROJECTIONS					
INCOME					
ITC	2,000	2,000			
Transcom	1,000	1,050	1,100	1,250	1,350
DTI/Eureka	75				
BSB	439	500	500	500	500
Other	177	333	704	794	888
Income Received	3,691	3,883	2,304	2,544	2,738
OUTGOINGS					
Payroll and Redundancy Costs	(1,496)	(1,518)	(1403)	(915)	(929)
Accommodation	(580)	(580)	(426)	(426)	(426)
Corporate Overhead	(370)	(370)	(370)	(370)	(370)
Other Costs	(447)	(474)	(356)	(363)	(393)
Capital Expenditure	(355)	(436)	(352)	(497)	(335)
Tax Paid		(200)	(215)	188	(30)
Total Outgoings	(3,248)	(3,578)	(3,122)	(2,383)	(2,483)
Net Cash Inflow/(Outflow)	443	305	(818)	161	255
Cumulative Inflow/(Outflow)	443	748	(70)	91	346

TAXATION

Tax Charge Estimate					£000
Profit per accounts	582	594	(578)	55	254
Depreciation added back	306	368	388	418	374
Disallowed expenses	3	3	3	3	3
Adjusted Profit	891	965	(187)	476	631
less Capital Allowances	(321)	(351)	(350)	(390)	(372)
Taxable Profit	570	614	(537)	86	259
Tax Charge	(200)	(215)	188	(30)	(91)

Appendix I
Contracts with external customers

Much of the information in this appendix is the subject of confidentiality agreements with the clients and may not be disclosed to a third party without the client's agreement.

A1. British Satellite Broadcasting

The BSB contract, which was signed on Monday 21st May 1990 has four schedules of services to be provided as follows:-

1st April 1990 - 31st March 1991

Schedule I	:	£487,000	- fixed price
Schedule II	:	£ 50,000	- Time and Materials
Schedule III	:	£220,000	- OPTIONAL (Time and Materials)

1st April 1991 - 31st March 1996

Schedule IV	:	£500,000 per year - to be reviewed and agreed annnually six months before completion of the existing programme.

These four schedules are detailed as follows:-

Schedule I: The IBA is to provide Manpower Resource from its E&D Department and materials for the period 1st April 1990 to 31st March 1991, to cover the following tasks. This section of the contract is on a fixed price basis to be paid in four equal parts, 3-monthly in arrears:-

I.1	W-MAC for IBC90 (based on an estimate of 83.2 man weeks + £15,000 materials)	£223,000	Fixed Price
I.2	W*-MAC for end March 1991 (based on an estimate of 93.6 man weeks + £30,000 materials)	£264,000	" "
	(All labour at £500 per day)		
	FIXED PRICE TOTAL	**£487,000**	(Excluding VAT)

Schedule II: the IBA is to provide the indicated Manpower Resource from its E&D Department for the period 1st April 1990 to 31st March 1991, to cover the following tasks on a time and materials basis:-

II.1	Further MAC System integration and Interface maintenance	£ 30,000	
II.2	Demonstration support for IBC	£ 20,000	
	(All labour at £500 per day)		
	INITIAL ADDITIONAL CHARGES TOTAL:	**£ 50,000**	(Excluding VAT)

Schedule III: the IBA is to provide manpower resource from its E&D Department for the period 1st April 1990 to 31st March 1991, to cover the following tasks but subject to BSB requesting that this Service should be undertaken and IBA agreeing to undertake this Service as follows:

III.1	Chipset and Receiver Tests	£ 20,000
III.2	Conditional Access - Further development	£ 80,000
III.3	MAC Development related to Datavision	£ 60,000
III.4	System Performance Analysis including Interface tests	£ 60,000
	(All labour at £500 per day)	
	ANTICIPATED OPTIONAL CHARGES TOTAL	**£220,000** (Excluding VAT)

Schedule IV: Over the period from 1st April 1991 to 31st March 1996 there shall be further research and development services provided by the IBA which shall be reviewed and agreed annually six months in advance of the completion of the existing programme of work in order that the IBA may clarify work plans and to ensure their agreement with BSB.

It is envisaged that, each year, BSB will require such R&D services from the Experiment and Development Department equivalent to a total of £0.5M at 1990 prices, the exact sum to be agreed as indicated in the paragraph above. The particular activities and tasks covered by this Schedule will be:

IV.1 Wide screen and improved definition systems development and implementation, including later phases of work begun in financial year 1990/91 and described in the Technical Schedule to this contract. To include standards promotion, demonstrations and prototype equipment provision and operational implementation of these systems.

IV.2 Development of the BSB Datavision service by system studies of DMAC packet services and their implementation. To include full channel data transmissions, standards development, demonstrations and prototype equipment provision and operational implementation of these systems.

IV.3 System performance analysis.

The charges for the services and the details of the tasks in each financial year shall be agreed no less than six months in advance of the start of the financial year by consultation and agreed amendment to the Contract.

A2. **Digital Video Systems (Scientific Atlanta)**

Following earlier discussions, we received on 14th May 1990 from DVS a draft contract for the development and manufacture of 1125 line to 525 line video down-converters, to be incorporated into their HD-B-MAC equipment. The design is to be based on our earlier successful IBA development of a 1250 line to 625 line video downconverter.

The essential contract terms under discussion and close to finalisation are as follows:-

I Develop the prototype and lend for demonstrations starting in late June 1990.

II Manufacture four off units at £45,000 each for delivery in January 1991.

III Manufacture fifth unit at £45,000 for delivery by May 1991. On delivery of this unit, the prototype is to be returned to the IBA.

The total minimum contract value is therefore £225,000 in the period May 1990 to May 1991. The precise scheduling of payments is currently being discussed and agreed. We are aware that DVS already have firm orders for three of these units.

In addition, DVS have the option to purchase up to five further units at £40,000 each, the delivery to be agreed. From their orders to date, we expect this option to be exercised. The options beyond 10 units total include an option for DVS to purchase the design or the option for us to continue manufacture at a price to be agreed.

In summary:

May 1990 - May 1991		
Minimum contract	- 5 units at £45,000	£225,000
Beyond May 1991		
Option	- up to 5 units at £40,000	£200,000
	- further units at price to be agreed	

A3. **Thomson LGT**

Following discussions with Thomson-LGT, E&D has made a proposal to LGT for a programme of work to develop certain new digital techniques particularly appropriate to their business of manufacture of TV transmitters. The area of work calls on particular areas of expertise in E&D, takes advantage of equipment which we have, and draws on patents developed at the IBA. The project splits into three phases:-

I **Pilot Investigation:** this will involve studies of the overall system including initial theoretical studies and the detailed definition of specifications and of the work

of Phases II and III. The total effort in this phase is estimated at 0.8 man years, being 1.5 people for ~0.5 years, and is at a fixed price of £84,132 plus VAT.

II **Computer Simulations:** detailed estimates of the work involved have to be defined in Phase I of the contract. An initial estimate is for around 1.5 man years with an expected contract value of around £150,000.

III **Full test-bed hardware:** detailed estimates of the work involved have to be defined in Phase I of the contract. An initial estimate is for 1.5 man years with an expected contract value of around £150,000.

The three phases are to be serial and will involve 1.5 to 2.0 engineers and associated support staff full-time for approximately 2 to 2.5 years.

Discussions are continuing on the details of the contract, with Thomson inviting us to carry out additional work, at additional cost, in the first phase of the contract. The work is part of a three way development contract, the other parts being two parts of the Thomson company with whom we have already worked well in the past. A meeting to discuss details of the contract has been established for 14th June in Paris.

A4. **ITT**

Discussions are currently in hand with ITT, Freiburg on a one year study for up to two people to work on adding either Level 4 Teletext (Computer Graphics) or Level 5 Teletext (Still Pictures) to one of the ITT Digivision chips. At present, the probability of this contract is estimated to be reasonably high, the key uncertainty being at ITT on the feasibility of this project. We believe ITT will be keen to identify other avenues of collaboration and contract, if this option is not possible.

A5. **Tandberg Telecom**

We have recently developed a particular technique called E7 which is implemented on a single printed circuit card. This unit is designed to be installed into Tandberg Telecom MAC encoders. We have already provided 20 units at £6000 each, which represents a full recovery of development costs.

There is now a further contract with Tandberg Telecom for the provision by us of between 10 and 25 of these "E7 units". The contract value is £4000 per unit, of which the full manufacture costs are £1500 per unit. This contract is an example of those which can result from taking existing developments for clients further to the manufacture stage.

A6. **BTS (Joint Bosch - Philips studio equipment company)**

BTS have a commitment with the EUREKA project to provide downconverters (1250/50/2:1 to 625/50/2:1). Their own design is not satisfactory and they have approached us and indicated our design is suitable. We have had preliminary discussions and BTS have expressed an interest in our manufacturing a limited number of these units. The activity would be complementary to that proposed with DVS. These discussions will continue in the coming month.

A7. **British Aerospace**

We have completed a 1 month consultancy contract on PCN matters and are currently negotiating for further work in this area. This area can be expected to develop as Transcom involvement in PCN related contracts grows.

A8. **Seleco**

We have been approached by Seleco (Italy) about collaboration on PAL decoding and upconversion. Discussions are at a relatively early stage.

A9. **Sony Broadcast and Communications**

We are in discussion with Sony Broadcast & Communications on possible R&D projects in the field of digital signal processing. Discusssions are at a relatively early stage.

A10. **Hitachi-Denshi**

Hitachi have been impressed by our work in the field of Extended Definition Television and have expressed an interest in a possible contract in this area. Discussions are to be held in June on this topic.

A11. As indicated in paragraph 10 in the main text of this business plan, a significant number of these companies are international in nature. At this stage, we have not yet developed our marketing in Europe, but, with the scale of R&D funding in Europe, this could be a market with greater potential than that of the UK. The international reputation of the IBA is an asset here.

APPENDIX II
E&D BUSINESS PLAN NOTES

1. CORPORATE OVERHEADS

(i) Overheads have been directly allocated to Business Groups where appropriate. In other cases staff numbers or floor area has been used.

(ii) Overheads such as mortgage subvention and staff removal costs have not been allocated to E&D.

	Total £K	E&D £K	%	Basis of Charge
Human Resources				
Staff costs	280			
Supplementary pension	350			
Restaurant facilities	165			
Recruitment costs	85			
Training	390			
Other	220			
	1,490	130	8.7	Staff nos.
Finance				
Staff costs	562			
Other costs	200			
	762	66	8.7	Staff nos.
Secretary				
Staff costs	483			
Property insurance	340			
Other costs including staff insurance, legal & professional fees	330			Staff nos. (except
	1,153	81	7.0	insurance)
Computer Services				
Staff costs	528			
Equipment maintenance	400			50 % to Regions. Balance on
Other costs	50			
	978	43	4.3	staff nos.
Business Development				
Staff costs	1,345			
Other costs	216			
	1,561	33	2.1	See note
Other	422	17	4.0	Various
TOTAL	6,366	370	5.8	

Note:
Basis of allocation: E&D Other 3rd Party Income = £0.25M
Transcom total non core income £12.0M

2. ACCOMMODATION COSTS	£M
Notional Rent of Crawley Court	2.0
Rates	0.3
Telephones	0.2
Electricity	0.1
Maintenance	0.1
Office costs	0.1
	£2.8M

3. FLOOR AREA	m^2
Assumes one floor of technical block 57 staff @ 18m^2 per person	1,030
Allocation to E&D of common areas e.g. restaurant, boiler house, storage areas (on floor area)	500
Allocation of support groups - Finance, Human Resources etc. (on staff numbers)	245
Total allocated floor area E&D	1,775m^2

Total Crawley Court	8,567m^2
% of floor area chargeable to E&D	20.7%
Annual charge to E&D	£580K

APPENDIX III

E&D CAPITAL EXPENDITURE 1990-95
SUMMARY

	1990	1991	1992	1993	1994	1995	TOTAL 1991-5
TWO YEAR LIFE							
HDTV	30	-	-	-	-	-	
THREE YEAR LIFE							
Network computer system General computer equipment Image sequence processor Codec	90	50	250	90	-	50	440
FIVE YEAR LIFE							
Video equipment	60	160	30	75	45	80	390
Computer aided engineering	50	50	50	50	400	50	600
TEN YEAR LIFE							
Laboratory equipment Furniture	90	125	110	130	65	140	570
TOTAL	320	385	440	345	510	320	2000

BROADCASTING: Pol. & Pt1