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Athens, 29 November - 20 December 1967
Provisional agenda, Item 3 (f)

UNITED KINGDOM CONTRIBUTIONS TO TECHNOLOGICAL DEVELOPMENT
IN DEVELOPING COUNTRIES

Submitted by the Government of the United Kingdom

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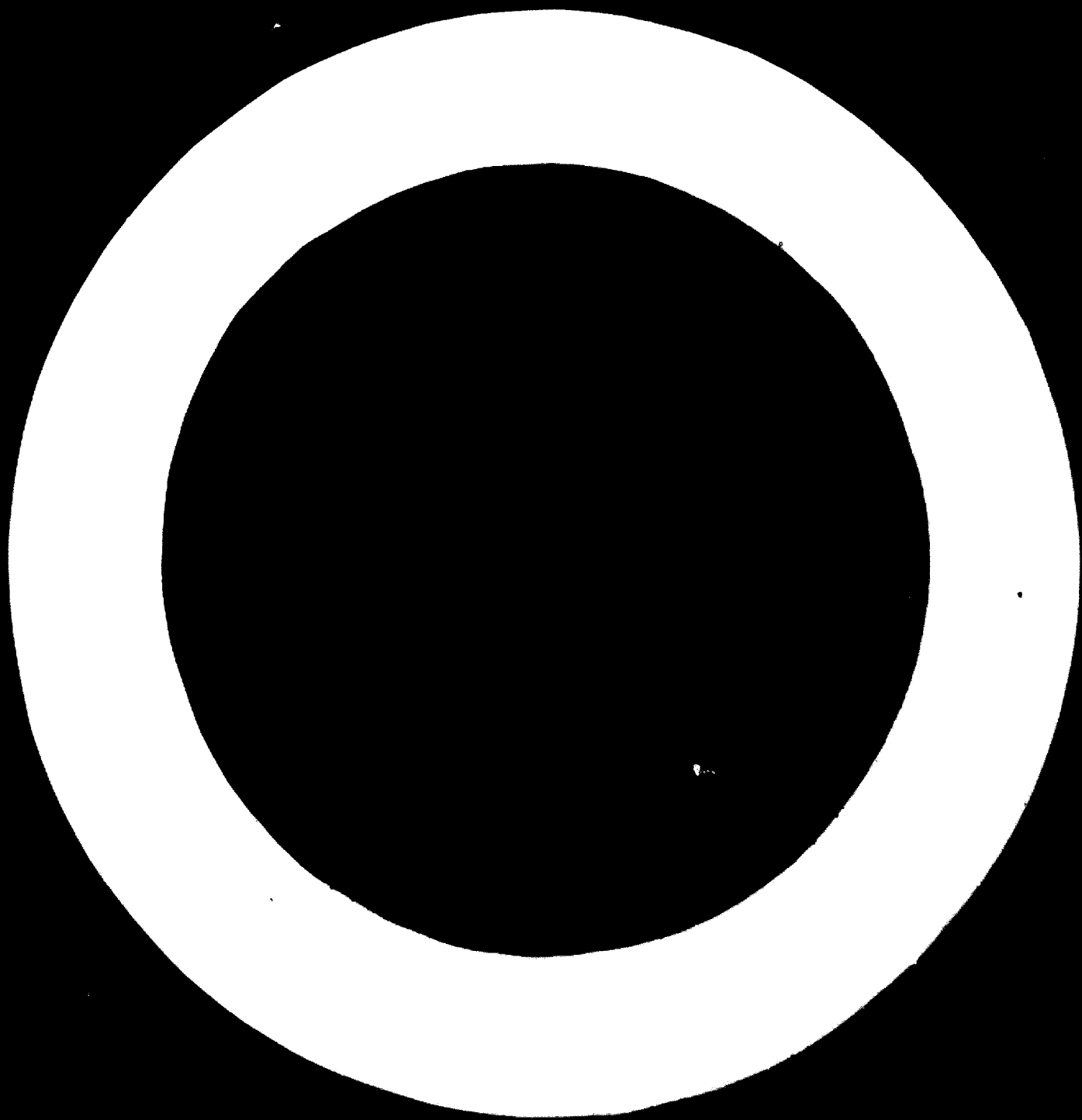
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SUMMARY

Submitted by the Government of the United Kingdom

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1. This paper considers some of the ways in which the United Kingdom has contributed to the development of industrial technology in developing countries. The greatest accumulation of technical knowledge relevant to the development of industry is in the hands of privately owned British manufacturing companies. However, Government research organizations, some of which were set up specifically to develop technology suitable for developing countries, also make important contributions. The Ministry of Overseas Development helps developing countries to broaden their use and knowledge of technology by assisting ~~with~~ the staff of new universities and technical colleges in those countries, by supporting United Kingdom research organizations such as the Tropical Products Institute, by supplying industrial experts and consultants, and by arranging technical training in the United Kingdom.

2. Various types of industrial technology, including two examples of more advanced technology of interest to developing countries - nuclear power and water desalination - are considered first in this paper. The second part identifies institutions and other ways in which the United Kingdom Government assists in the transfer of technology. The role of non-governmental organizations and the use of technology developed by British manufacturing companies are considered in the final section.

I. TYPES OF TECHNOLOGY

Technology used overseas without modification

3. Much of the technology developed by British manufacturing companies can be used in developing countries without modification. British companies have helped to establish local cement plants in many developing countries, and facilities are available in Britain for testing the suitability of local raw materials for cement manufacture. Other industrial plants using a continuous process such as petroleum refining, many chemical plants, fertilizer and petrochemical plants can easily be adapted to the conditions prevailing in developing countries.

4. Various types of industrial technology have been built up in developing countries by stages. Firms in developing countries which started by assembling imported parts

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of cars and commercial vehicles have been able to purchase an increasing proportion of their requirements from local manufacturers. As engineering and manufacturing skills are built up, an increasing proportion of the value of the finished vehicle is manufactured locally; one British company reports that the proportion has now reached 90 per cent for certain commercial vehicles produced in India. Similar development by stages have been followed, for example, by manufacturers of pharmaceuticals, radios, domestic appliances, and electronics equipment.

Technology used overseas requiring modification

5. In some industries, research and pilot operations are required before established processes can be adapted to use local raw materials. The Tropical Products Institute has helped several countries to examine local materials to determine their suitability for use in pulp and paper manufacture or the production of particle board. British manufacturing firms have also helped to establish local brewing and flour-milling plants which use local agricultural produce rather than imported materials. The British Iron and Steel Research Association has analysed a tested specimen from steel users in a wide range of developing countries and supplied technical information to others, including advice on the planning of new manufacturing plants. The British Ceramics Research Association has examined the suitability of local clays and other raw materials on behalf of many developing countries wishing to develop the building material and other industries.
6. British industrial consultants and machinery suppliers have helped to study the feasibility of a wide range of new industries in developing countries.
7. For many years the Tropical Products Institute has conducted research on equipment specifically designed for processing agricultural products of developing countries. Machinery for processing fibres such as kenaf, jute and sisal have been investigated, and processes for manufacturing building materials from agricultural waste products are being developed. Methods of processing and storing food in tropical conditions have also been investigated.

Technology developed exclusively for use overseas

8. Water desalination plants are outstanding example of British technology developed exclusively for use overseas. British firms pioneered in the development of this technology and have supplied a very large proportion of the plants now in use in the world. A master's degree in this subject can now be taken at Glasgow University's School of Engineering.

9. With units now developed to a size that can supply a million gallons a day of fresh water, these plants offer a valuable potential source of water for many developing countries in which shortage of water has been an obstacle to further economic development.

Nuclear power

10. British technology has also developed methods of harnessing nuclear energy to produce electric power. Two alternative systems have been developed and designs for fast reactors are expected to be proved commercially valuable within a few years. Nuclear power is becoming more competitive in cost with other fuels and is particularly suitable for supplying large loads in remote areas or for supplying the large power requirements of water desalination plants or other industries.

11. Designs of plants which have operated successfully and safely in the United Kingdom are available, along with a complete fuel service, for use by developing countries who establish nuclear power plants. Collaboration agreements have been signed with a number of countries, and a wide range of training courses, consultancy services and other forms of advice have been made available to developing countries which have become interested in considering nuclear power installations.

II. ORGANIZATIONS CONCERNED WITH THE TRANSFER OF TECHNOLOGY

Government-sponsored research organizations

12. The British Government supports a number of organizations which concentrate on developing technology suitable for use in developing countries. Frequent visits abroad are made by their staff to advise on projects and problems in developing countries. These organizations answer specific enquiries from developing countries and carry out research on their behalf.

13. The Tropical Products Institute examines the chemical and physical constitution and properties of the products of tropical agriculture, forestry and fisheries, and investigates suitable processing equipment, storage problems and other aspects of quality control and marketing. The Overseas Division of the Building Research Station has helped developing countries to develop local building materials, building methods and other aspects of the construction industry. The Tropical Section of the Road Research Laboratory aids developing countries in training their staff and adapting patterns of road construction and maintenance most suitable to local conditions. The Overseas Liaison Unit of the National Institute of Agricultural Engineers helps with the design of agricultural equipment for use in developing countries.

14. Other government research organizations without these special responsibilities for work overseas carry out research for developing countries or provide advice on request, much of which is paid for by the Ministry of Overseas Development as part of the United Kingdom programme of technical assistance. Some of these organizations also lend members of their staff to developing countries to carry out specific tasks. These organizations include the Warren Spring Laboratory, which covers chemical engineering, mineral sciences and technology, and air pollution; the Hydraulics Research Station, which has assisted with studies of river development in the field of civil engineering hydraulics; the Forest Products Research Laboratory which deals with the utilization of timber; the Torry Research Station, which is concerned with the transport and storage of fish; and the Water Pollution Research Laboratory, which deals with the control of pollution in both inland and coastal waters.

15. The National Research Development Corporation, which helps in the commercial development of inventions, also works on projects which could lead to technological advances of widespread interest to developing countries.

Trade research associations

16. In the United Kingdom, there are forty-six government-supported trade research associations which can give assistance to developing countries through the application

of the results of their research and development of the products and services provided by their member firms. Some research associations admit overseas firms as associated members. These firms receive publications which enable them to apply the results of research and development work in their own country; other associations offer advisory service. The staff of some of the associations visits developing countries, and personnel from developing countries are seconded to the associations for training and work.

Assistance provided by the Ministry of Overseas Development

17. The Ministry of Overseas Development co-operates with United Kingdom universities, international bodies and other aid-donor countries in helping developing countries to plan, finance and staff new universities which provide training in technology. The Ministry helps universities in developing countries to recruit teaching staff in the United Kingdom; it also helps to train local staff by offering scholarships for study in the United Kingdom. Visits to study teaching methods in the United Kingdom are sponsored, and co-operation agreements designed to fasten a more permanent link between universities and faculties in the United Kingdom and those in developing countries are encouraged. The same type of assistance is given to technical colleges which aim to produce the technicians so vital to success of industrialization programmes in developing countries.

18. The Commonwealth Development Corporation, which is now responsible to the Ministry, has played an important role in introducing modern technology to many developing countries in the Commonwealth. By establishing new enterprises, frequently in co-operation with local interests, and training local staff to operate them, the corporation has helped to develop knowledge in technical fields which range from hotels and low-cost housing schemes to power and water supply projects. It has helped to introduce many new agricultural crops and processing factories, including those which associate small-holder developments with nucleus estates and processing factories. By direct investment in manufacturing plants, or through local industrial

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development banks which it has helped to promote and manage, new industries ranging from cement and steel to textiles and flour-milling have been established. Technology has been transferred chiefly by training in jobs on the spot, but the corporation has also arranged training for men associated with the enterprises it supports in the United Kingdom.

19. When requested, the Ministry of Overseas Development arranges for industrial experts and consultants to visit developing countries to give advice in specific areas of industrial development. At the same time, it arranges training courses for personnel from developing countries. Many of these are in industry. British manufacturing companies accept even more trainees on their own initiative. In all, there were 6,400 trainees with British industrial firms in 1965 to new technologies which they will take home and apply in their own country.

Intermediate Technology Development Group Ltd.

20. This privately organized group aims to help developing countries by identifying inexpensive tools, machinery, equipment and materials that can be used to raise living standards in rural areas. A catalogue of these items, available from British manufacturers, is being prepared. The group hopes in future to expand its publicity programme on an international basis and further develop its valuable role as a centre where questions from developing countries on this type of technology can be answered.

Using the technology of British manufacturing companies

21. The vast accumulated technical knowledge in the hands of privately owned British manufacturing companies has usually been acquired over a period of years, requiring costly investment in basic research, developing manufacturing processes, equipment and product designs. For this reason, many processes are protected by patents; and following normal commercial practice for the transfer of technical "know-how" between firms in industrialized countries, most of these companies expect to "sell" their technology to firms wishing to use their manufacturing processes in developing countries.

22. Under an agreement to sell its technical "know-how", a British company will usually help a firm in a developing country to design a plant, select the equipment, and provide training and personnel to assist with the initial stages of operation. More Comprehensive

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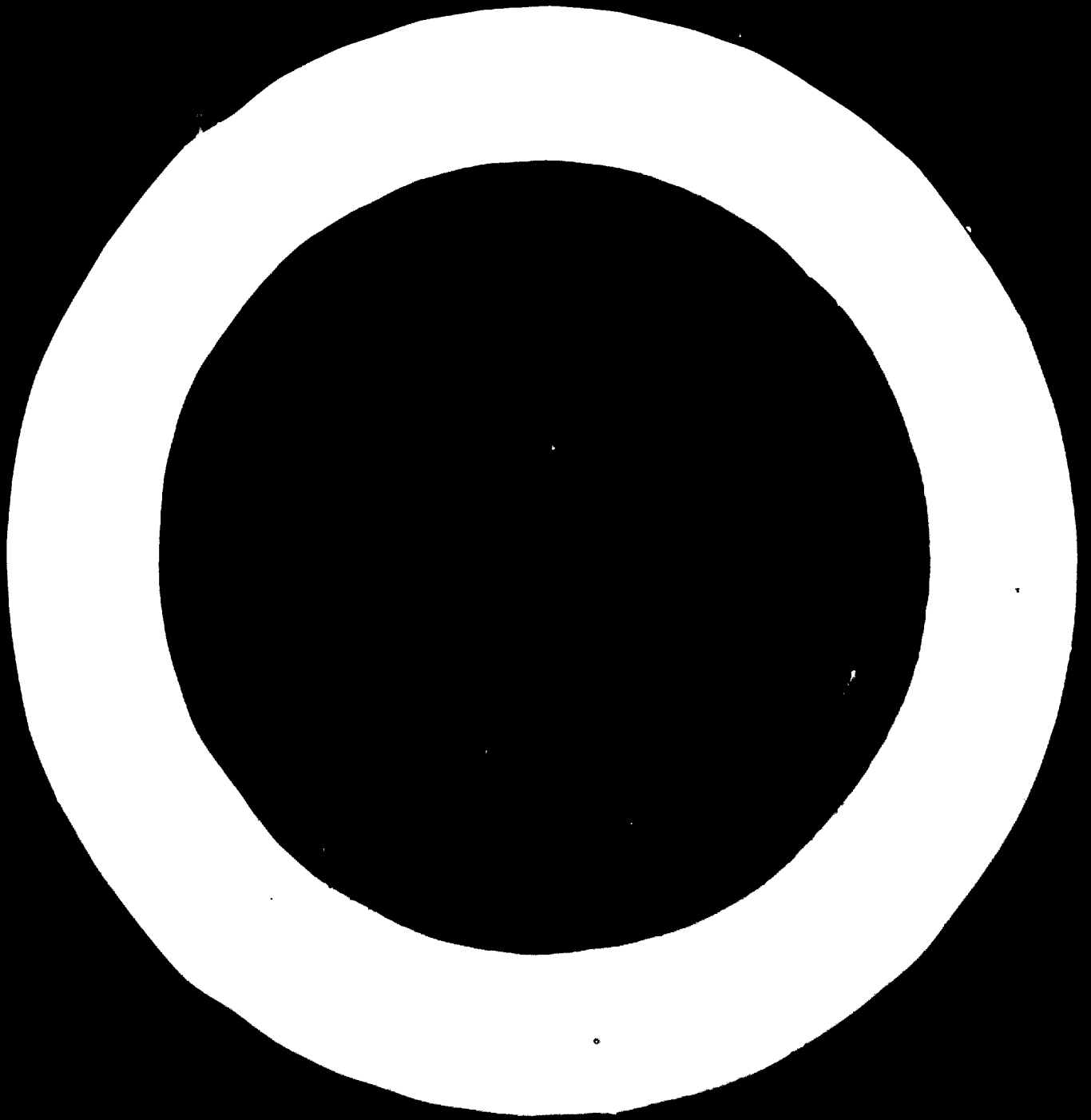
agreements, providing for continuing assistance and access to improvements in the manufacturing process, are sometimes negotiated. Payment is generally made in the form of a lump-sum fee and/or royalty payments which are usually based on sales of the company in the developing country. The British company will frequently take a share participation in the local company, which gives it a direct financial interest in the company's operations and further development; however, some British companies prefer to start with a wholly owned subsidiary.

23. Whichever form of financial arrangement is adopted, the developing country obtains immediate access to technical knowledge of the manufacturing process, built up over many years, which would have been difficult and expensive for the country to develop by itself. In a great many cases, industrial technology is most easily and constructively transferred in this way.

Conclusion

24. The United Kingdom is helping developing countries to accumulate technical knowledge in many different ways. The assistance provided by private British firms is a matter for negotiation between the individual parties concerned. However, representatives of the Government at the British Embassy or High Commissioner (e.g. the Commercial Secretary) in each country are available to help arrange contacts by interested bodies in developing countries with British firms or one of the Government-sponsored or private organizations mentioned in this paper.

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Introduction

1. Technology is being developed at an accelerating pace in the world today. At the same time it is being spread and used as quickly as it is developed by an ever increasing number of nations. The breadth of technological advance is clearly impossible to define, but it may be useful to sit back and consider some of the channels through which technology is transferred between nations.
2. This paper considers some of the ways in which the United Kingdom has contributed to the development of industrial technology in developing countries. This is not a one-way process; British firms who operate abroad frequently find that experience gained overseas contributes technological advances which they can and do use at home. Advances in technology, then, benefit the whole international community by improving the efficiency of industrial processes which help raise the living standards of people throughout the world.
3. Some examples of British technology which require little or no modification for use overseas are considered first, and then technologies which require considerable modification. British Government research organisations which develop technology, particularly those concerned with technology development for use in developing countries, are described next; the final section considers other ways in which technology is transferred from the United Kingdom to the developing countries.

Part I:- Types of Technology

- A. Technology developed for United Kingdom use, and most valuable for use overseas without modification and in complete form.
 1. Nuclear Energy installations.
 4. An important factor in laying the foundations for, and ensuring the continuation of, industrial take-off in a developing country is a widely-available and cheap source of energy. With the achievement of economic

nuclear power, a new and plentiful competitive source of energy is available to meet the rapidly increasing power needs of the developing countries, many of which may have uranium or thorium resources in their boundaries. The United Kingdom can already provide two alternative systems, the Advanced Gas-cooled Reactor and the steam Generating Heavy Water Reactor, and within a few years will also be able to provide commercial fast reactors. Nuclear reactors are particularly suitable as power sources for dual purpose plants producing both water and electricity. The construction of a nuclear power station enables domestic industry to become familiar with an advanced technology, and to supply some of the equipment in collaboration with the main supplier. Small power reactors, which are particularly suited to localities remote from ports and ill-served by road or rail or lacking in indigenous fuel resources, as well as research and materials testing reactors, are also available.

5. Nuclear energy installations are specifically of a kind which must be transferred unmodified because their general nature and design is such that, to meet internationally accepted standards of safety, a complex system of automatic control is essential. Furthermore, the size of nuclear power generators can only be varied between narrow limits. Any question therefore of supplying scaled-down versions or modification to take advantage of a large supply of low-cost labour does not apply.

6. The facilities are backed by a wide variety of training courses, technical assistance and consultancy services to prepare developing countries for the advent of nuclear power. The United Kingdom has signed research and collaboration agreements with a number of countries, and has played a prominent part in the work of the I.A.E.A. A wide range of training courses in nuclear energy is available in Britain and experts from the United Kingdom Atomic Energy Authority frequently visit developing countries to give advice and assistance on problems arising from the expansion of nuclear activities. Several United Kingdom firms of consultants are also experienced in the problems of setting up nuclear installations.

7. Reliable nuclear fuel, and knowledge of the techniques involved, is an essential component of an expanding nuclear technology. The United Kingdom Atomic Energy Authority can provide a complete fuel service to developing countries. Fuel elements have been produced and reprocessed for power and research reactors overseas, and assistance given on the setting up of local laboratories to handle irradiated fuel and fissionable materials.

8. The use of radioisotopes is of considerable importance to developing countries, enabling them to apply an advanced technology directly to some of the most immediate problems. A wide range of radioisotopes exists with applications in agriculture, medicine and industry, and assistance and training in the use of these materials is readily available from both the United Kingdom Atomic Energy Authority and British industry.

ii Cement manufacture

9. In the cement industry, the processes used for manufacture abroad are basically the same as those developed for use in the United Kingdom but some modification may be necessary, depending on the raw materials available. This factor affects the extent to which indigenous personnel are employed, for instance a British company operating in a West African country employs 825 indigenous personnel and 30 expatriates; this proportion of expatriates is unusually high, as a result of the more complicated nature of the process; in an operation in a South-East Asian country where the process used is simpler the proportion of expatriate staff is much lower. It is the policy of the company to replace expatriate staff with local personnel at all levels wherever possible; it runs training schemes in the developing countries where it operates, and brings personnel to the United Kingdom to study its processes and techniques.

iii Petroleum

10. The technological contribution of oil companies to the developing countries extends beyond the technology of oil extraction and refining. Technological training relating directly to the oil industry's operations is of course very important. It is the policy of the oil companies to recruit local nationals wherever possible, and promotion to the most senior posts is open on merit. The necessary operational, supervisory and managerial techniques are taught through local training facilities and schemes which provide for local nationals to study in the United Kingdom or elsewhere. The developing countries' supply of technicians, some of whom find their way into other industries, is thereby increased. However, the acquisition of other skills, which may be of equal importance to the country, also results from an oil company's operations. Frequently oil is discovered in areas totally lacking in basic facilities such as roads, water, housing etc. These facilities will be provided by the oil company in question, employing local labour. As a result, local nationals will become proficient in civil

engineering and constructional skills. Often, entirely new techniques, for example, the use of pre-stressed concrete in construction, will be acquired.

11. The oil companies have done a great deal, in collaboration with governments and local authorities, to introduce modern agricultural methods in the countries in which they operate. For example, in Saudi Arabia several model farms have been established to demonstrate improved methods of stock raising and the advantages of modern systems of crop growing. The degree of local ownership depends on the terms of the concession agreement under which the company operates. Today, it is likely that the government would have a share of the equity.

B. Technology developed for United Kingdom use and suitable for use overseas without modification but introduced in stages.

i Vehicle Manufacture

12. The type of operation established by vehicle manufacturers in developing countries - assembly alone or the manufacture of a greater or lesser proportion of components - depends entirely on local circumstances (the labour force available, the size of the market etc.) and no generalisation can be made. There will be a tendency for the operation to consist of assembly only at the outset, and to develop until almost all manufacturing processes are included, if market conditions are suitable. An excellent example is provided by the operation of a British company in India. This company set up a small assembly plant shortly after independence; since then the scope of the operation has been progressively expanded, and 90 per cent of the vehicle components are now manufactured locally. Over the years the company has imported into India British machinery, know-how and staff; Indians have been trained to replace expatriate staff as operators and supervisors, training being given both in India and in the United Kingdom. The Indian company's plant now covers 150 acres and produces 6000 heavy duty vehicles a year; this is shortly to be expanded to 9000. A subsidiary foundry company has been established. The management of the enterprise is almost exclusively in Indian hands; two British employees remain to exercise general supervision over the British parent's investment. It is the general policy of the company to employ local nationals to the greatest extent possible. It also encourages local shareholding, whether private or government. The company referred to a case where it had taken a 30 per cent shareholding in a country's existing vehicle manufacturing company. As a

result of this the local enterprise had been very greatly expanded and had received the full benefits of the British company's technology.

ii Radio and electronic equipment.

13. The assembly of radio and electronics equipment is well established in many countries and provides an example of an advanced technology which is more labour intensive than most in its area of origin and provides an admirable opportunity for setting up labour-intensive light industry suitable for installation on industrial estates and capable of acting as a training ground for development of further skills.

iii Pharmaceuticals.

14. The pharmaceutical and cosmetic industry follows a similar line: the normal pattern of development in this instance consists first in local packaging of finished materials imported in bulk (pellets, tablets, ampoules liquid preparations etc.) followed by compounding, tableting and encapsulating of simpler raw materials and ultimately the development of a completely locally based industry.

C. Technology developed for United Kingdom use, needing modification for use overseas.

15. The possible range of technologies, which could be included under this heading is very wide since far more industrial processes require modification to suit the available raw materials or local conditions than do not.

i Brewing.

16. An outstanding example of this is the brewing industry where local manufacture is favoured economically by the fact that the end product consists largely of water and is normally exported in heavy glass bottles so that transport and packaging costs are high compared with the value of the product. It is possible to gain further economic advantage by using indigenous sources of starch, which are rarely the same as those used for brewing in temperate areas. It has, therefore, been necessary to modify the processes developed in the United Kingdom so as to permit the use to a greater or lesser preparation of local grain which may be maize, rice or millet and British technical expertise has been extensively involved in setting up locally based breweries either as advisers or as partners.

ii Flour and Bakery.

17. These industries similarly, follow the pattern of the previous section

in their early stages; with the introduction of flour mills to process imported wheat, but then develop along somewhat different lines in the evolution of specialised techniques for the milling and subsequent use of cereals of local origin.

111 Pulp and Paper.

18. This constitutes a further example of an industry where modifications of accepted techniques may be necessary. Consideration here must be given both to scale and to available raw materials. The Tropical Products Institute has for some years been carrying out tests on the pulping quality of a wide variety of timber from many of the developing countries ranging from the West Indies to Africa and South-east Asia and has given training both here and overseas in the evaluation of pulping qualities and the determination of optimum pulping techniques to staff of overseas research institutes. It has been found not only that the pulping qualities of different species of tree vary but that the same species grown in different countries or even under different conditions in the same country may vary in pulping quality.

19. Where raw materials include a plentiful supply of water and are available on a sufficient scale it may be possible to establish an export market in paper pulp but it is rarely the case that the manufacture of paper itself in a developing country will be able to supply more than a very localised export market. In a developing country, however, the rate of demand for paper and paper products increases rapidly as administration becomes more complex and urbanisation and comparatively sophisticated markets develop. Where it is impossible for the local demands of a single developing country or those of its immediate neighbours to absorb the output of a conventional paper mill, a case has been made for the development of a small-scale mill to operate initially on waste paper and imported pulp. Such a mill with an annual output of about 2,000 tons was developed some time ago as a prototype; it was not entirely successful and the Tropical Products Institute proposes to do further work on the problem.

D. Technology developed specifically to meet Overseas needs.

1 Water Desalination.

20. The United Kingdom has been a pioneer, and remains a leader in this field: United Kingdom industry has already supplied a very large proportion of fresh water producing plants now operating all over the world. Although

the earliest development was for marine application on ships most of these plants particularly the larger ones which can deliver millions of gallons of fresh water a day, are in developing countries and have become an essential part of the technological base on which their economic progress depends. There is no doubt that sooner or later in most parts of the world the removal of salt from available salt water will be called upon to meet the ever increasing demand for fresh water. One consequence of the present pattern of desalination demand is that many developing countries are acquiring great expertise in the operation of large desalting units unmatched even in the industrialized countries. The technological consequences of the use of large desalination equipment are thus not confined to those which the very availability of large quantities of fresh water make possible. Local staff must acquire training, and expertise and may become the engineer corps for technological advance in other spheres. They are able to choose the best equipment for their own particular purposes. They are able to give expert advice to their neighbours. In a word, the technological benefits derived from the installation of desalting plant in a developing country are of widespread advantage to industrial and economic progress, quite apart from the more immediate benefit of having fresh water where none existed before, or where it was inadequate in volume or quality.

21. The United Kingdom maintains a considerable desalination research programme whose benefits will be seen in the diminishing cost of the water produced. This programme is concerned not only with the existing commercially proven methods, but with other systems, some of which may be more suited to smaller units, and to the purification of brackish water. All have the object of obtaining a reliable cheap supply of fresh water in circumstances in which the more conventional methods of water supply are inadequate to meet demands. In the sphere of education, the University of Glasgow has recently instituted a Master of Engineering degree in desalination, the first of its kind anywhere, which it is hoped will prove attractive to scientists and technologists from developing countries.

ii Agricultural-based Industries.

22. The Tropical Products Institute has for some time, as part of its general interest in helping in the exploitation of the renewable resources of the developing countries, been engaged, either directly or by supporting industrial development programmes, in the production of equipment specifically designed for the processing of the agricultural products of developing

countries. This work includes the development of machinery for extraction of vegetable fibres which are still of great importance as major exports of many countries and also in the development of methods for the use of agricultural waste products in building materials. In the field of fibre extraction, work has been done on the development of ribbing and scutching machinery for stem fibre such as kenaf and jute and trials with prototype machinery have been carried out in plantations overseas. Assistance has been given to the British engineering industry in the development of a mobile decorticator for leaf fibres such as Phormium and sisal and work is now beginning on the development of a method for extraction of fibre from the banana pseudo-stem.

23. The development of methods for utilization of agricultural waste products has received considerable attention in view of the importance of developing profitable by-products from the processing of many agricultural crops. Light-weight concrete building blocks can be made using rice hulls as aggregates or fillers; the rice hulls have hitherto had little use or value and there is in many rice growing areas a serious shortage of alternative local aggregate. Work has also been done on the manufacture of light-weight insulation blocks, based on wood wool cement. More extensive work has been carried out on the manufacture of particle board from different waste materials and one of the most successful lines of research has been into the manufacture of particle board from resin-bonded groundnut shells which can be made on a scale at a rate of 15 tons a day for about three-quarters of the cost of a timber-based board (more cheaply where large scale machinery is employed). This board does not meet the strength requirements of the British and International Standards for particle board for furniture etc. but is perfectly adequate for roofing and non-load bearing partitions. A design for an industrial plant for 15 tons per day has been prepared in conjunction with a British engineering firm and it is hoped to set up a prototype overseas before very long. More recent but equally promising work has been done on the use of coconut palm timber for particle board manufacture. It is normally good estate management practice to clear unproductive plantations and replant at intervals but the removal of the trees, which would harbour insect pests and other diseases if left on the ground, has been an expensive feature of good estate management. Preliminary experience has shown that we can make a board of coconut timber

which fully meets the requirements of British and International Standards and this opens up considerable promise in areas where the scale of coconut cultivation and the market for particle board for furniture etc. is sufficient for an economical sized unit.

iii Food Processing.

24. With the steadily increasing tendency towards urbanization, food consumption is tending to become concentrated in the large towns while food production remains in general diffuse and based on very small-scale domestic processing. This results in high costs of food in cities due to high transport costs, multiple handling by middle-men and exaggeration of the effect of seasonal output fluctuations on prices. In addition, the product of domestic manufacture is frequently not designed for keeping over long periods and losses may occur during distribution. The industrialisation of such domestic operations can be of great value in improving utilization of raw materials, stabilizing prices and improving storage and nutritional qualities. The Tropical Products Institute is currently investigating the processing of fresh coconut kernels with the object of producing high protein foodstuffs as well as high quality edible oil and is also starting research projects on fermentation methods for food preservation on an industrial scale and on the industrialised manufacture of various foods based on root crop staples such as cassava and yam.

Part II:- Agencies for the transfer of technology

E. Government Research Organizations working on the problems of developing countries.

1 The Tropical Products Institute.

25. The Tropical Products Institute has been concerned for nearly 75 years with the supply of information and assistance for the exploitation of the renewable resources of the developing countries. It operates as part of the aid services of the Ministry of Overseas Development and its services are available free of charge to Governments and Government-sponsored organizations in the developing countries. Its work covers the chemical and physical constitution and properties of the products of agriculture, forestry and fisheries as well as quality assessment, marketing, storage and the development of processing equipment.

26. Information is disseminated through the Annual Report, the quarterly journal Tropical Science and through reports published on individual subjects

or projects, as well as by contributors to the technical specialist subjects and staff from the Institute engage in research, training and advisory work overseas and carry out feasibility studies into various industrial projects. The library, which is one of the largest of its kind in the world, takes about 1,000 journals and a similar number of serial publications such as reports of research institutes, papers etc. and on this is based a technical index which consists of about $\frac{1}{2}$ million reference cards. The Institute deals with something like 1,000 technical enquiries every year.

ii Building Research Station.

27. The Station is concerned with almost the whole field of building: for example, all building materials except wood; the design and performance of structures and constructional techniques, including mechanical aids. The efficiency of buildings in respect of heating, lighting, sound insulation, user needs and urban planning, and the organisation, productivity and economics of building work are other subjects dealt with by the Station. The results of this work are incorporated in Codes of Practice and British Standards. The Station has an Overseas Division concerned with problems of building, housing and planning in developing countries assisted by the Ministry of Overseas Development. The function is the collection from and supply to these countries - largely tropical- of information, assistance with special problems, and the answering of enquiries.

28. The major part of the Division's work is concerned with advice, and necessitates frequent visits abroad. Financial responsibility for the Division, rests with the Ministry of Overseas Development. Current examples of assistance given by the Station are visits by members of Geotechnics/^{Division} to advise on dams in Chile, and docks in Turkey; also recent visits to Jamaica, a visit by Materials Division to advise on the use of local clays for building, and a further visit by Production Division to advise on work study in the building industry.

iii Tropical Section, Road Research Laboratory.

29. The Tropical Section of the Road Research Laboratory, Ministry of Transport, is financed by the Ministry of Overseas Development. The Section deals with problems of roads and transport overseas, mainly in tropical and sub-tropical regions, as part of the British Government's technical aid to developing countries.

30. Research is organised under three main headings:

- a Transport planning; economics; traffic and safety problems.
- b Terrain evaluation (including aerial photo-interpretation).
- c Road design, construction and maintenance.

Much of the work of the Section involves tours overseas, either liaison visits by senior staff to gain first-hand knowledge of local problems, to give advice, and often to plan research in collaboration with local organisations, or tours by research teams for periods of up to three years to study specific problems. These teams are assisted by staff provided locally; this enables more to be done in a given time and, even more important, provides a valuable way of training local staff. Liaison visits are made to about ten countries each year, and as many as four research teams may be in the field at any one time. Research is undertaken to determine how to plan and construct roads, and on road transport systems, in the best interests of the local people, and to develop patterns of road construction and maintenance best suited to materials available, the climate and the state of development of the countries concerned.

31. All major aid schemes which concern roads and road transport in territories overseas are referred to the Head of the Section for technical advice. This is to ensure that, in capital aid schemes, the designs are adequate and the estimates reasonable, with particular regard to economic viability. In technical aid schemes, assistance is given in defining the problems to be studied and in framing suitable terms of reference.

32. As regards training, a limited number of engineers from developing countries is accepted in the Laboratory as voluntary workers each year for periods of six months or more. Short residential courses of about ten days' duration are run each year in the United Kingdom for overseas practising engineers visiting this country, and for representatives of consultants and firms concerned with tropical road problems and road traffic and safety problems. In addition, two or three similar courses are arranged at overseas centres each year.

33. The results of research work are made available through Road Research Laboratory Reports published by the Laboratory, Technical Papers and Road Notes published by Her Majesty's Stationery Office, and publications in the Technical Press. There is also a special series of notes, Overseas Bulletin, issued to provide up-to-date information on subjects of topical interest. Lists are available of the Laboratory's research notes and publications on

road and road transport overseas.

iv National Institute of Agricultural Engineering - Overseas Liaison Unit.

34. The Overseas Liaison Unit is responsible, in collaboration with the specialist sections of the main Institute, for the design and manufacture of agricultural equipment for use in developing countries and maintains an information service on agricultural engineering problems which complement that of the Tropical Products Institute on post-harvest aspects of agriculture. Trials are carried out overseas by staff of the unit who also travel widely to gather information on problems which may arise and to supply advice and assistance locally.

F. Other Government Research Organizations

i Warren Spring Laboratory (Ministry of Technology)

35. The Laboratory's purpose is to serve industry by carrying out research and development in selected fields, with particular emphasis on development to pilot-scale. In addition to the basic research programme the Laboratory undertakes both short and long-term sponsored investigations for industry. The basic programme covers chemical engineering, mineral sciences and technology, and air pollution. In chemical engineering there are groups investigating direct digital computer control of continuously operating chemical processes and automatic control of batch processes, the mechanics of particles and slurries with particular reference to mixing, blending, storage, pipeline transport and bulk handling, catalysis and related studies. Mineral science and technology embraces mineral processing and aspects of extractive metallurgy. Much of the applied research concerned with overseas ore deposits is sponsored by industry or the Ministry of Overseas Development or in co-operation with the Overseas Division of the Institute of Geological Sciences. The Laboratory plays an active part in the European clean air programme and is able to advise on atmospheric pollution in developing territories.

36. Advice is given on problems within the Laboratory's field of work. Arrangements can be made for managerial and technical staff to visit the Laboratory to discuss their problems or to gain experience in specialized fields. Advisory work may include cost studies and technical and economic evaluation of projects. Extensive facilities are available for testing and development to pilot-scale in mineral processing and chemical engineering. Services include a wide range of analytical procedures, both chemical and

physical, instrument development and comprehensive workshop facilities.

ii The Hydraulics Research Station (Ministry of Technology).

37. The Station is concerned with civil engineering hydraulics - that is, with the flow of water in rivers, estuaries and other open channels. The subjects studied include hydraulic structures for hydro-electric projects, flood-relief schemes, silting in estuaries, the design of harbours and breakwaters, and coast erosion. Much of this work relates to specific problems at home and overseas, and is carried out, on repayment, with scale models. A substantial programme of basic research is also carried out.

38. The Ministry of Overseas Development finances work done by the Station for the benefit of developing countries. For example, a preliminary investigation has recently been conducted on behalf of that Department to determine the feasibility of closing or partially closing one of the deltaic branches of the Orinoco River, in Venezuela, so that part of the delta can be developed for agricultural purposes. A study of the best means of improving the depth over the bar of the Baram river in Borneo, so enabling the interior of the country to be opened up, is also being financed largely by the Ministry of Overseas Development. Secondment of staff from the station for extended periods is also done through Ministry of Overseas Development. Engineers have recently been lent, one to E.C.A.F.E., for 6 months work on the Mekong and another for 12 months to investigate the hydrology of East Pakistan rivers.

iii Forest Products Research Laboratory.

39. At the Forest Products Research Laboratory the mechanical, physical and chemical properties of timber are studied to find ways of making more efficient and economical use of available supplies, adding to basic knowledge of these properties. The Laboratory's advisory service covers all aspects of timber utilisation, including the identification of timbers, wood-boring insects and fungi. The Laboratory has excellent facilities for processing timber, namely drying kilns and conditioning rooms, impregnation plant, plywood and pulp equipment, wood-bending, woodworking, and strength-testing machinery.

40. In order that the expertise of the Laboratory might be readily

available to developing territories, it was agreed that the Ministry of Overseas Development can request any member of the staff of Forest Products Research Laboratory to work overseas on projects currently required. At the present two of the staff are overseas, one advising on the most efficient operation of management and maintenance of saw-mills, and the other, an expert in the engineering properties of Tropical hard woods, on the best use of local timber.

iv Torry Research Station (Ministry of Technology)

41. The Station carries out research into the transport and storage of fish at sea and on land. It seeks to determine the properties that contribute to the quality of fresh, frozen and cured fish, and to improve methods of preservation; to improve the equipment and methods used in handling, storing, processing and distributing fish and so obtain better products and reduce costs; and to discover what causes wastage and how it can be avoided.

42. The Station together with its extension have made between them a significant contribution towards methods of preservation of fish that are particularly applicable in developing countries, such as drying, to augment diets with inadequate protein. Full-scale trials have been mounted in co-operation with the appropriate government departments in the United Kingdom on augmenting national diets in some of the emergent territories with fish products as a source of protein. These have been successful and as a result fish ranning has been and is being further developed in various African territories. Considerable effort has been expended by the Laboratory on fish processing and distribution, both by field work, e.g. in Africa, S.E. Asia and S. America, and by training fishery officers from developing countries at Torry. Annual courses are held for this purpose.

v Water Pollution Research Laboratory

43. The Water Pollution Research Laboratory studies methods of improving the efficiency of existing treatment processes and devises new ones. It also studies the effects of pollution on rivers, estuaries and coastal waters with the object of providing an improved scientific basis for river management and pollution control, so that money expended on pollution prevention can be spent to the best advantage. Typical examples of work undertaken by the Laboratory are

- a. Surveys of effluents discharged from factories.
An information service on the toxicity and biodegradability of individual substances is provided. This is available to overseas users for a fee.
- b. Development of methods of treating industrial effluents and the study of the effects of such effluents on sewage-treatment processes.
- c. Assessment of the performance of equipment and materials intended for use in connection with the treatment of waste waters.
- d. Testing the toxicity to fish of industrial effluents and their constituents.

44. Whilst problems of emergent territories may differ radically from those of the United Kingdom at present, many of these problems have arisen at some time during the development of this country and the problems of health which could arise from inadequate treatment of sewage and trade effluents are, of course, world-wide. The Laboratory can provide in certain circumstances advice on the provision of treatment facilities for these discharges in towns in overseas territories.

45. Apart from the Government Research Stations listed above there are other official organizations, such as the Fire Research Station, the National Physical Laboratory, the National Engineering Laboratory and the Laboratory of the Government Chemist, which are able and willing to carry out projects for developing countries as and when required, although no such projects are in train at the moment.

9. Trade Research Associations

46. These organizations, of which there are 46 currently grant-aided by the United Kingdom Government give help both directly and indirectly to developing countries. Their indirect help is through the application of their research and development results by their British members to the products and services sold by these members to developing countries. Thus, the distribution analogue of the Water Research Association has been used by overseas bodies, including one in the Sudan through a British consulting engineer, whilst the Research Association's ground water analogue will shortly be used in Singapore. Much of the work of the British Hydraulics Research Association is utilized by its British contracting and consulting

engineer members for overseas schemes.

47. Directly, the Research Associations assist in two ways. The first is through the use by overseas bodies of the research facilities provided by the Associations. Just over half the Research Associations have opened their doors to members from overseas but on a restricted basis. Through becoming an Associated Member a foreign firm, organisation or government agency receives the open publications put out by Research Associations to their members. In this way the results of the Research Associations' research and development work can be applied in the member's country. As members, they can also use the advisory services offered by Research Associations - indeed non-members, at home and abroad, can use these services on a payment basis. For example, recently the British Iron and Steel Research Association has analysed and tested specimens from steel users in Argentina, Ceylon, Columbia, India, Pakistan and Uganda whilst technical information has been provided among others to Guyana, Manila and South America. The Research Association has also given advice on the planning of steel plants in Zambia and Saudi Arabia. The British Ceramic Research Association has assessed raw materials, such as indigenous clays, from countries such as Iraq, Libya, Malaysia, Mauritius, Pakistan and Tanzania whilst the Water Research Association has provided information and advice to China and India, amongst other countries, and also in particular to a Middle East country on the application of films to water surfaces to prevent evaporation from reservoirs.

48. There are quite a number of examples of work done directly for developing countries by the British Hydromechanics Research Association, especially on model tests for spillways on dams. Recent examples are the Barikesi Dam in Ghana, the Latiyan Dam in Iran, the Sasuma Dam in Kenya and the Heritage Dam in Jamaica. Advice has also been given on a Syrian irrigation scheme and on pumps for a Ghanaian growing dock. The Electrical Research Association, which has about 100 overseas members, many of whom are from Africa or India, deals principally with enquiries on power supplies and electrical insulation. Particular enquiries concern the supply of power to, or the use of small power plants in, remote areas.

49. The second is by the movement of personnel between the Research Association and the developing countries. Staff of the British Iron and Steel Research Association have visited Trinidad and, in the near future, are going to Brazil to advise on the siting of a steel plant. On average

each year four people come from developing countries to work for periods of up to six months at the British Iron and Steel Research Association to gain experience. Visits are regularly arranged for students from countries such as Brazil, Columbia, and Spain whilst high ranking officials and industrialists, from e.g. Africa and India, also visit the Research Association. Israel and Jordan have sent staff to the British Ceramic Research Association to learn the various testing techniques so that their own testing facilities for ceramics can be established whilst a British Council scholar from Israel has spent a year at the Water Research Association and a Turk on a World Health Organisation fellowship has spent a month there working on leak detection. A Jamaican engineer has recently returned to his country after working at the British Hydromechanics Research Association for 1½ years.

50. Help is also given through the medium of International Organisations. Thus, the Director of Water Research Association has recently spent six weeks with WHO as a Consultant on their research programme for community water supplies whilst his Research Association has received a WHO/^{contract}for research on health aspects of new materials for use in water supplies. The British Iron and Steel Research Association has co-operated with C.I.S.R.O. Australia on work in India whilst the Technical Commission of the United Nations has stimulated further interest in this Research Association's work in Columbia.

H. Universities and Colleges of Advanced Technology

51. The Ministry of Overseas Development co-operates with British Universities, international bodies and other aid donor countries in helping developing countries to plan, finance and staff new universities.

52. In helping in the establishment of these new universities the Ministry works with the Inter-University Council for Higher Education Overseas (I.U.C.) - which body consists of representatives of British Universities and of the overseas universities which are in association with it - and with individual British universities whose involvement helps to ensure that appropriate standards are aimed at and maintained. The Ministry has also helped to provide, at United Kingdom Government expense, external examiners for universities in developing Commonwealth countries.

53. Most of the recruitment in Britain for overseas universities is done by the British Council and the I.U.C. with the benefit of advice from the

Committee for University Secondment. This latter body, with strong academic representation, was set up to help create conditions which encourage inter-university cooperation and to increase the contribution of British Universities by way of improving the flow of British university staff to universities in developing countries, helping to train locally-born staff, and for promoting the flow of overseas academics to study methods in Britain.

54. With the advice and encouragement of the Committee for University Secondment some 60 informal departmental or faculty 'links' have been formed and many working visits have been financed at United Kingdom Government expense. The 'links' have been encouraged to develop in a variety of ways reflecting the needs and possibilities in different areas and disciplines.

55. The task of supplying young people trained for the needs of commerce and industry and the technical departments of Government lies in most countries with the technical colleges. United Kingdom Government grants have been given for extensions to existing colleges in dependent territories and British aid has been given for or towards construction of technical colleges in Commonwealth and foreign countries. Recruitment of staff for the technical colleges is undertaken by the Council for Technical Education and Training for Overseas Countries (TETOC), which acts for the Ministry of Overseas Development over most recruitment in this field.

56. College-to-College 'link' schemes have been formulated under Commonwealth Education Cooperation arrangements and visits by British college principals have been arranged for the purpose of giving advice. The Ministry of Overseas Development has also paid for visits of staffs of overseas colleges with the purpose of keeping them in touch with developments in Britain.

57. Other United Kingdom Government assistance in the application in overseas countries of science and technology to development generally takes the form of financial grants, covering a proportion of total costs, made to governments, universities or research organisations. Applications are considered on their merits in relation to other requests for assistance in the same field of research.

I. Other Government Organisations

1 National Research Development Corporation

58. The National Research Development Corporation is an independent public corporation sponsored by the Minister of Technology which promotes the adoption by industry of new products and processes invented in Government laboratories, universities and elsewhere, advancing money where necessary to bring them to a commercially viable stage. It also speeds up technological advance by investing money with industrial firms to facilitate the development of their own inventions and projects. Most types of inventions and projects can be dealt with, including agricultural machinery, pharmaceuticals agricultural and industrial chemistry, and all aspects of mechanical and electrical engineering.

59. In relation to the developing territories a role of the Corporation is to develop and exploit inventions arising from Governmental scientific and technical research establishments, for example those associated with the Ministry of Technology and the Ministry of Overseas Development, such as the Tropical Products Institute and the National Institute of Agricultural Engineering (N.I.A.E.) or the Agricultural Research Council. Arrangements for local manufacture of such products, either under licence or by the sale of drawings and know-how are also made, for instance financial support is also given for investigations and development work at Ministry of Overseas Development units which are intended to lead to marketable products or processes with associated commercial rights. The Corporation is represented on a joint Committee of Ministry of Overseas Development units and other Government Agencies which co-ordinate developments in agriculture, food technology and bio-chemistry and their introduction to developing countries (the Co-ordinating Committee on Technology for Developing Countries).

60. Examples of National Research Development Corporation projects of relevance to developing countries are:-

a. Mic-Science

Tea processing.

Tropical pest attractants.

Control of fruit ripening.

Extraction of pharmaceutical intermediates from tropical vegetable materials.

Certain antibiotics, pharmaceuticals, and also vaccines of value in animal and human health.

b. Industrial Chemistry

A variety of chemical engineering and metallurgical equipment and processes.
Plastics.

Corrosion resistant coatings.

Pre-stressed concrete pipes.

c. Scientific Equipment

Various new forms of medical apparatus and equipment.

Special programmes for teaching machines.

Equipment for use in the processing of milk and cheese.

d. Engineering

Ground nut sheller.

Animal drawn tool bar.

Various agricultural machines.

Special warehouses and sacks for produce storage and handling.

Land-based oil storage tanks.

Electronic equipment for fish finding.

Special projects such as the Hovercraft and Dracone (flexible towable barge for the cheap transportation of important liquid products, including petroleum, vegetable oils and drinking water).

ii Commonwealth Development Corporation

61. Commonwealth Development Corporation's operations in the developing countries cover a very large field. They involve such widely differing operations as agriculture (both peasant and estate plus factory processing), low cost housing schemes, hotels, power and water supplies, industrial operations such as cement making, iron and steel, textiles, flour milling, mining and wood pulp. In all these fields, the main object is the establishment of viable businesses which will not only in themselves be profitable but will also contribute immediately and in the long term to the national productivity and the national good. In the preparatory phases the Corporation helps developing countries to appraise their problems by setting up investigatory missions which may involve experts both from within and outside the Corporation.

62. The schemes are frequently new departures in the territories concerned, they involve the importation of staff having the particular skills required. It is the policy of the Corporation to train nationals of the countries in

which it operates to undertake the duties and skills which are required for carrying on the business. This policy operates at all levels and extends to both the technologies of the actual field and factory processes and also to the management training, accountancy and business knowledge requirements. Since Commonwealth Development Corporation's operations have overall to be economically viable and profit making, training in these projects involves not merely the adoption of new techniques but the training in testing and discerning which methods are capable of being introduced for the increase of profitability and which must be discarded or modified. In directly managed projects the main transfer of technology takes place by learning on the job, but scholarship schemes are also operated for training at technician, graduate and post-graduate levels. These are formal courses. In addition, local staff are brought to Europe on leave courses, when men may be accompanied by their wives who thus also benefit.

63. The foregoing applies mainly to staff and workers of Commonwealth Development Corporation or its associated companies. The Corporation does, however, also pass on its knowledge or insists that adequate training and guidance is given by appropriate extension work services to such persons as the peasant farmers or settlers whose agricultural operations are facilitated and encouraged by finance for farmer credit or by the provision of central processing factories financed or operated by the Corporation. In these cases, influence can be brought to bear through membership of the appropriate Board, and by visits by appropriate Corporation technical officers or by the provision of Corporation management.

iii Board of Trade Export Services Branch.

64. The Export Services Branch of the Board of Trade is an agency for the collection and dissemination of enquiries for British-made products which are received either directly or through commercial sections of British Embassies or High Commissions. It maintains close contact with British industry and with the various research establishments who may be able to assist in supplying information and has itself built up a considerable volume of technical knowledge over a long period. It is also able to advise British industrial organisations on needs for their services which exist overseas and acts as a two-way channel for information and inquiries.

J. Other Non-Government Organizations

The Intermediate Technology Development Group Limited

65. The Intermediate Technology Development Group Limited is a non-profit making company, formed by some 30 specialists in development problems from industrial companies and the professions. Its aim is to help raise standards of living in developing countries. The Group's work is concentrated on the promotion of methods of production appropriate to the resources, technical skills and size of markets in developing countries. Its main activities are:

a. Research.

66. One of the foremost needs of developing countries is to increase the supply of inexpensive tools, equipment and materials designed to raise productivity in rural areas. The Group is carrying out research to find out what British industry can offer to meet this requirement, both in terms of developing the overseas manufacture of its appropriate products and in direct exports. Specifically, relevant manufacturers are being asked whether they will make available designs of products, whether in current production or not, whether they will enter into licensing arrangements for joint manufacture and whether they will release personnel to help local enterprises. The results of this research will be published in the autumn in a guide called "Tools for Progress", 3000 copies of which will be available for overseas distribution. The Group hopes, however, to publish further editions on an international basis.

b. Assistance to Specific Projects.

67. The Group is not itself in a position to finance projects in developing countries. Its response, therefore, to requests from overseas has been confined to technical assistance and linking enquirers with relevant financing organisations, both official and voluntary. Some examples of the Group's technical assistance are given below:

1 In response to a request from the Government of Botswana for advice on developing their hides and skins industry the Group, in conjunction with FAO, arranged for an expert to visit the country. His feasibility study recommends developing the industry along small-scale lines.

11 Following the visit to Ceylon of a member of the Group, the Commissioner

of Agrarian Services asked ITDG for information about cheap, simple and portable lift-irrigation devices which would require little maintenance. Three appropriate designs were submitted by the Group and are now being studied by experts with a view to local manufacture. To strengthen and enlarge its technical assistance service the Group intends to initiate a scheme for linking requests from overseas with a voluntary panel of scientists, engineers, technicians and businessmen.

c. **Publicity.**

68. The object of the Group's publicity programme is two-fold. First, to foster the growth of indigenous centres in developing countries to which aid funds could be channelled for the benefit of the people living in rural areas and secondly, to show the widespread existence of alternative methods of production more suited to the resources of developing countries than those commonly used in industrialised nations. To this end numerous articles have appeared in the press and in the specialised journals.

K. Experts in technology recruited by Ministry of Overseas Development

69. The supply of qualified people for service overseas in developing countries is a prime function of the Ministry of Overseas Development, which is the main British agency for recruiting and financing, in whole or part, such people. The Ministry's own recruitment efforts account for nearly one half of the five thousand or so annual appointments made under British official or officially assisted schemes. In addition to the Ministry itself, other agencies responsible for such recruitment are the Crown Agents, the British Council, the Inter University Council, the Council for Technical Education and Training and the various societies sending volunteers overseas.

70. The majority of the people so recruited are required for teaching, in primary, secondary and technical schools and universities, and to help run the various administrative departments of the overseas governments and quasi-government organisations in the administrative, public works, agricultural, financial, health and social services fields. Many are required to give specialised advice on the technical or managerial aspects of projects involved in the various development programmes, covering banking, industrial development and housing corporations, steel making, precision optics, cement manufacture, oilseed processing and so on.

71. The Ministry also undertakes recruitment of British experts for the

various multilateral agencies such as the United Nations itself, U.N.E.S.C.O. P.A.O., the International Atomic Energy Agency, the International Aid Bank for Reconstruction and Development. Just under 200 appointments of British experts were made to these international agencies in 1966. Among the appointments made were those for a Mineral Dressing Engineer (Bolivia), a Metalworking Industry Adviser (Chile), an Exploration Geophysicist (El Salvador), a Marine Adviser (Ethiopia) an expert in the Medical application of Radioisotopes (Malaysia) an Expert in Industrial Engineering (Jamaica) and an Expert adviser on small scale industries development (Nigeria). Under the British Volunteer Programme the majority of volunteers are engaged in teaching but some hundreds a year are industrial apprentices who are able to pass on their practical skills.

1. Using the technology developed by British manufacturing companies

72. The greatest accumulation of technical knowledge about industry in the United Kingdom is in the hands of privately owned manufacturing companies. In most cases the technical processes or "know-how" have been developed only after the investment of considerable sums of money over a period of years in research, process development and product design. It is therefore natural for these companies to seek some financial compensation if the technology and machinery they have developed are used in other countries. This is the normal practice for exchanges of technology between firms in advanced countries, so that British companies are only following normal commercial practice when they "sell" their technology to developing countries.

73. A company in a developing country wishing to acquire the technical "know-how" needed to establish a new industry will normally make a technical agreement for the purchase of "know-how" and technology from the British company. Payment will be made in the form of a lump sum payment and/or royalty payments usually based on sales volume. In return for this payment, the company in the developing country will receive assistance in designing its plant, choice of machinery, training of operating personnel and usually the assistance of the British company's personnel in starting up and operating the plant in the initial stages. The continuing technical advice of the British company over a period of years, including access to knowledge of further improvements in the manufacturing process made by the

company in Britain, is frequently provided for in the more comprehensive type of agreement.

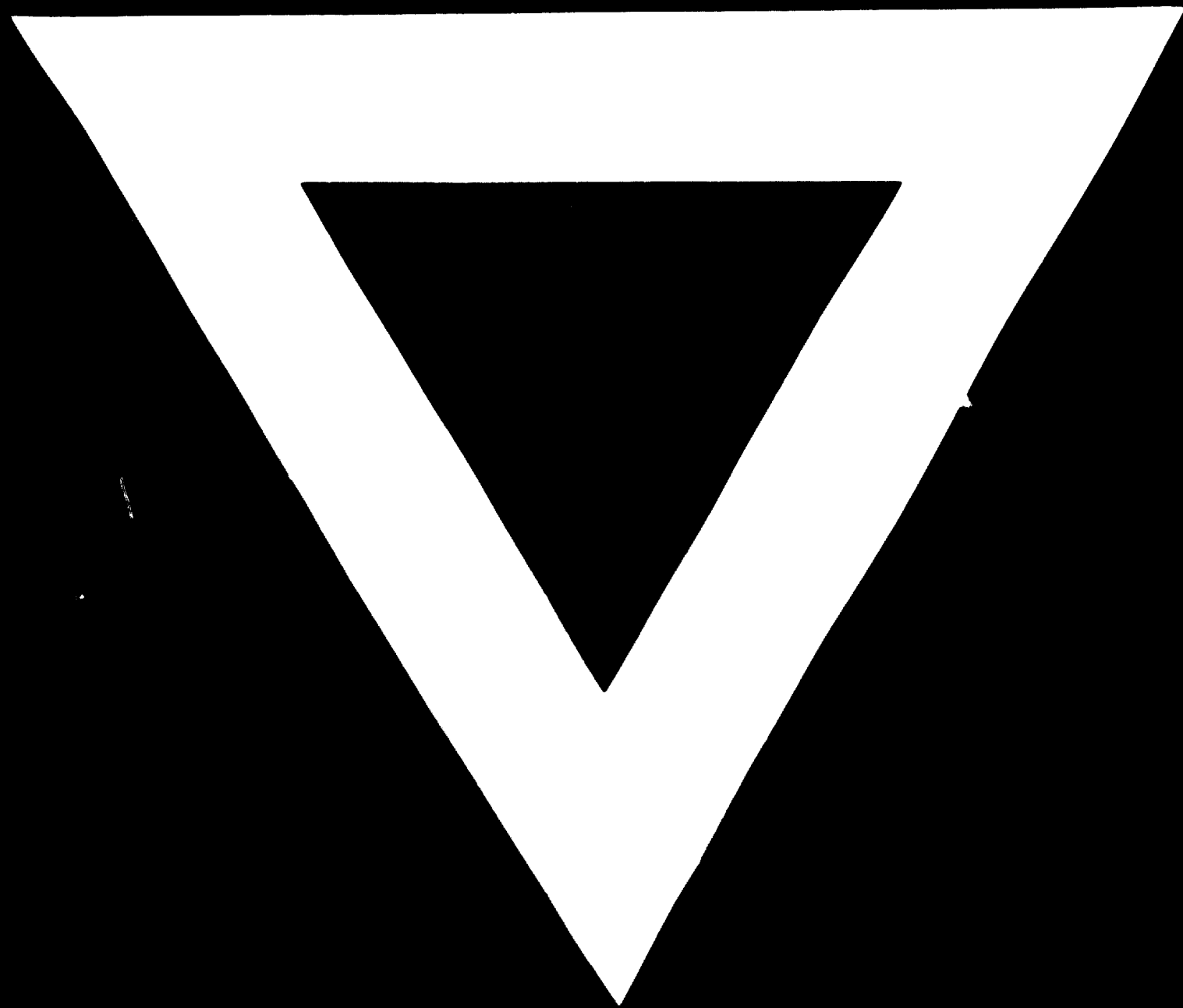
74. The nature of the agreement and the cost of buying the "know-how" varies from industry to industry, and firm to firm. Many British companies prefer to have a share in the ownership of the company established in a developing country; this helps to establish a closer working relationship between the two companies' management teams and gives the British company a direct financial interest in its operations and future development. In some cases, a British company may decide to set up a wholly owned subsidiary in a developing country.

75. But whichever procedure is adopted, the developing country derives the benefit of using a new technology. Local personnel are trained to manage and operate the plant and all the skills associated with operating a new industrial plant are developed.

M. Conclusion

76. The United Kingdom, then, is helping the developing countries to accumulate technical knowledge in many different ways. The assistance provided by private British firms is a matter for negotiation between the individual parties concerned. But representatives of the Government at the British Embassy or High Commission (e.g. the Commercial Secretary) in each country are available to help put interested bodies in developing countries in touch with British firms or one of the Government-sponsored or private organisations mentioned in earlier sections of this paper. For British contributions to technology can and should play an increasingly important role in helping nations to raise their standard of living throughout the world.





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