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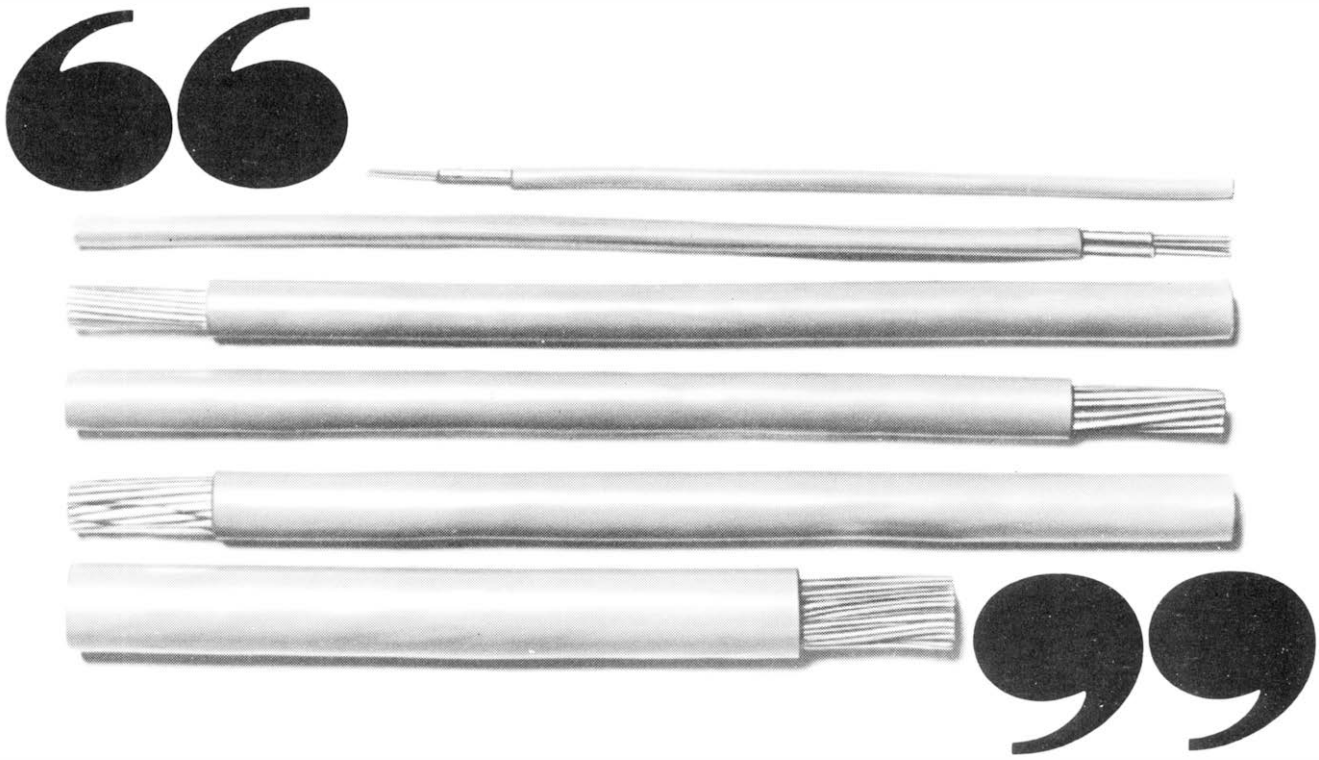

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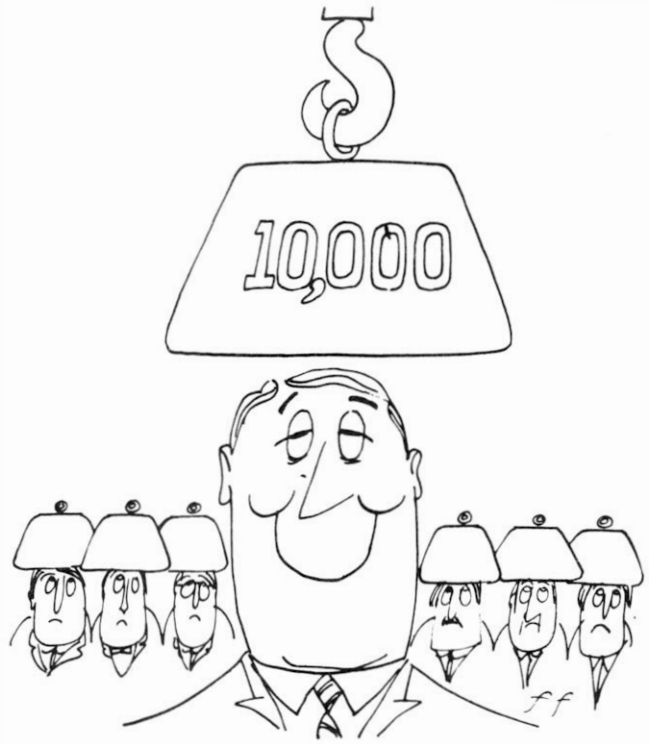

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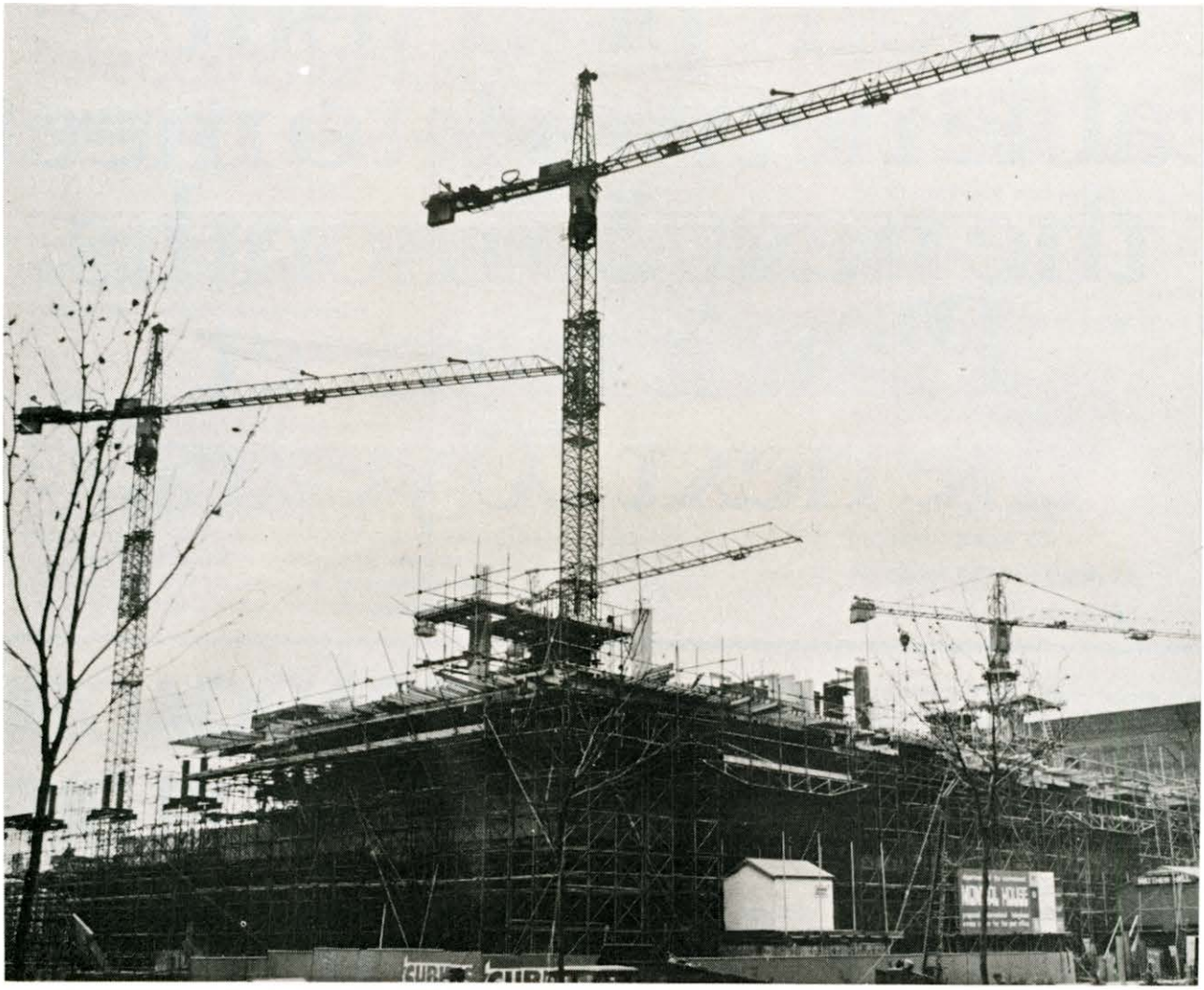

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Post Office telecommunications journal

Autumn 1972 Vol. 24 No. 3

Published by the Post Office of the United Kingdom to promote and extend knowledge of the operation and the management of telecommunications

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Wood Street boosts ISD service: **page 20**

SF signalling solves a problem: **page 23**

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COVER: Even the boating experts at Cowes, Isle of Wight, had to raise an eyebrow when this craft first appeared on the Solent. It is a 24 ft long working model of the new cable repair ships which are to be built for the Post Office, and it sailed out to sea to help work on their design. The crew of two includes a helmsman to carry out tests and manoeuvres and an observer to operate the various recording equipment. See page 9.

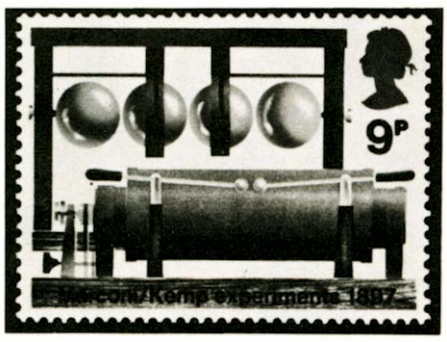
BROADCASTING AND THE POST OFFICE

THIS YEAR marks the fiftieth anniversary of the start of daily radio programmes in the United Kingdom. It is a milestone in public broadcasting with which the Post Office has a strong association.

When the great pioneer Guglielmo Marconi came to Britain in 1896 the Post Office gave him help and encouragement after seeing a demonstration of his new system of "telegraphy without wires". The following year 23-year-old Marconi conducted the first successful radio tests over water – nine miles across the Bristol Channel – and a Post Office engineer, George Kemp, was his senior assistant.

Later there were experiments in voice transmission which made "wireless broadcasting" a practical proposition. The Postmaster General's monopoly in public communication services was regarded as covering broadcasting, and for that reason the Government and the Post Office were involved in the earliest pioneer work.

The 9p stamp issued in September to celebrate the anniversary.



Broadcast programmes as we know them today began in England with experimental transmissions from Chelmsford by the Marconi Company in 1919. The following year the Postmaster General gave permission for a station to broadcast entertainment and educational programmes. It was built at Writtle, near Chelmsford, and beginning in February 1922 it put out a short programme each week with the call sign 2MT Writtle (Two Emma Tock). In May 1922 the Marconi Company began to broadcast programmes from London for more general consumption. This was the pioneering 2LO service.

On October 18, 1922 the British Broadcasting Company came into being. It consisted of manufacturing firms who wished to create a market for wireless transmission apparatus and receivers. This earlier version of the BBC started the first full-scale broadcasting service from London on November 14, 1922.

A two-year Post Office licence for the British Broadcasting Company was only once renewed. When the second expired, a new one was issued (in 1926) to the British Broadcasting Corporation, whose formation was based on principles of public service.

From these modest beginnings radio and television services have grown to greatness, and the Post Office has maintained its association with them.

Since 1969 the Minister of Posts and Telecommunications has taken over from the Postmaster General the responsibility for broadcasting policy as a whole. However, the Post Office Corporation continues to rent links to both the BBC and the independent authority connecting studios and transmitters. It provides and operates 15 TV network switching centres (such as that in the Post Office Tower) through which television programmes originated by the independent companies reach the transmitters. The Post Office also co-operates with the BBC and IBA in establishing links for programmes sent to and received from overseas. For both TV and radio guaranteed sound quality is provided on special circuits.

In total the Post Office provides one of the largest TV complexes in Europe, using some 7,000 miles of mainline links, with a reliability of 99·98 per cent.

● *The Post Office is of course involved in a number of its own broadcasting services, and provides world-wide radio and satellite communication and closed-circuit TV circuits. The first two articles in this Journal continue this theme.*

Post Office riggers erect the master aerials that will bring television and radio to homes now being built in the new city of Milton Keynes. There will be no need for unsightly arrays of aerials on the rooftops. Instead each house will have a "box-in-the-wall" (see picture below right) to which Post Office cables will provide broadcast and telephone services – and the sophisticated communications facilities of the future.

THE CITY OF TOMORROW

S H Granger

IT IS RIGHT that the planners of a new city should want to provide not only the best of present-day facilities but also prepare the way for the revolutionary changes which are likely to come in urban life over the next 30 years or so. Some of the most remarkable of these will result from the use of new communications services which advances in technology will make available for wide-scale public use. At the new city of Milton Keynes in North Buckinghamshire the Telecommunications business is already ensuring that the 250,000 people who will live there will be able to exploit to the full the communications facilities of the 1980s and 1990s. Engineers are providing for the new city a local cable network capable of expanding to supply the new visual and data services as they arise. Initially, in conjunction with the most modern types of exchange equipment available, it will provide a first-class telephone service as well as enabling BBC and commercial or other television programmes and local and national radio broadcasts to be "piped" into every one of the 100,000 houses which will ultimately be built there.

In addition the system will have such a potentially high transmission capacity as to allow it to grow by stages until ultimately it becomes a huge communication main highway capable of providing a number of new services. What these services will be is still a matter for speculation, but they could include computer data links by which a customer would make, for example, an instant armchair check on his bank account; or remote meter reading by which gas or electricity meters would be read by remote electronic equipment set up by the public service authorities. The system also has a capability for the transmission of television signals in two directions so that it can be developed to accommodate such services as a see-as-you-speak Viewphone.

The contract for the new network was won by the Post Office in competition with private relay companies. The specification required that the network distribute television programmes from the two BBC channels and the Anglia and Midlands commercial stations at both 625 and 405-line standards and to provide up to 12 channels of sound radio. In addition the system had to be capable of delivering at least a further eight television channels in frequency bands ranging from VHF to UHF as well as providing for a limited amount of two-way television transmission.

In planning the system engineers built on the experience gained from other wideband distribution systems the Post Office is providing for the new towns of Washington in County Durham, Craigavon in Northern Ireland and Irvine in the West of Scotland.

In the twin-cable network now being laid one cable will consist of conventional pairs and although initially it will provide telephone service only it will also accommodate most of the other narrow band services which will come in the near future. The second cable will be a coaxial one and will distribute television, sound radio and other services.

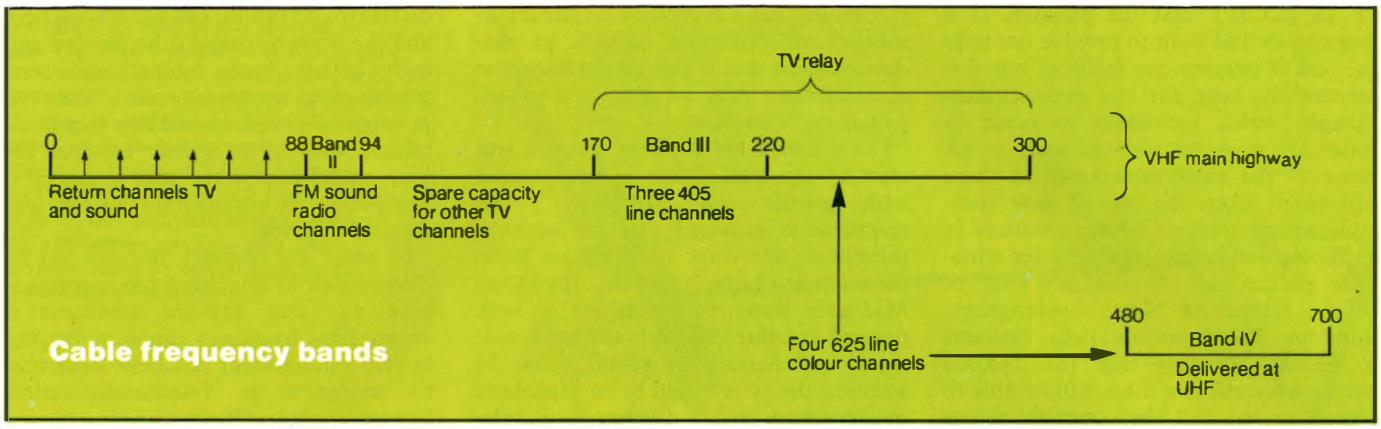
In common with traditional local line systems the Milton Keynes network is based on a system of street cabinets connected to local telephone exchanges. From the telephone exchange wideband communication main highways will be connected in tree configuration to the cabinets which serve the local housing areas from secondary highways. Two underground cables, one containing pairs and the other a coaxial tube, are led into each house. Each cabinet will serve groups of up to 400 customers. Whenever possible cable will be laid in a communal trench with other public services like gas, electricity, water and drainage to avoid inconveniencing householders with piecemeal laying.

To meet the contract specification for distribution of television programmes at both 625 and 405-line standards in appropriate frequency ranges a VHF/UHF hybrid arrangement has been developed by engineers in Telecommunications Development and Research Departments. With this arrangement sound radio and television signals from the national transmitters are picked up at Milton Keynes by a suitable aerial installation. The signals are passed to "head-end" equipment located in telephone exchanges from which distribution of programmes throughout the city begins. The head-ends consist of equipment which amplifies the signals, cleans them and, if necessary, changes their frequency. The signals are then reassembled for transmission into the main highways at frequencies up to 270 MHz with the 625-line signals located at the upper end of the VHF band.

From the main highways the VHF signals reach the street cabinets where they pass through a specially developed frequency translator which identifies the 625-line signals, shifts them back up to UHF but allows the VHF 405-line vision and sound radio signals to pass unimpeded. Finally, with all the signals back in the frequency range 80 to 700 MHz, the programmes are distributed to individual households where they are received on standard television and radio sets tuned to suitable channels.

Of the several telephone exchanges which will be needed to serve the new city at least three will be equipped with television head-ends. At first these exchanges will each be provided with suitable aerial installations but later they will be linked by low distortion transmission systems to a remote master aerial station. This master station is expected to be located on high ground near Linford Wood, but its installation will be deferred until roadworks have been completed and other basic features of the new city have begun to take shape.

To provide wideband service during the initial two or three years when small pockets of housing are likely to start almost anywhere a number of temporary television head-ends will be used to energise small self-contained systems. As the city develops these systems will be linked into the network of main highways and temporary head-end equipment will be recovered for use elsewhere. In the long term those exchanges with permanent television head-end installations will become very much the focal points of the whole system for they are just the first of several equipments which will form a complete central station supplying



all the services for distribution by the new network.

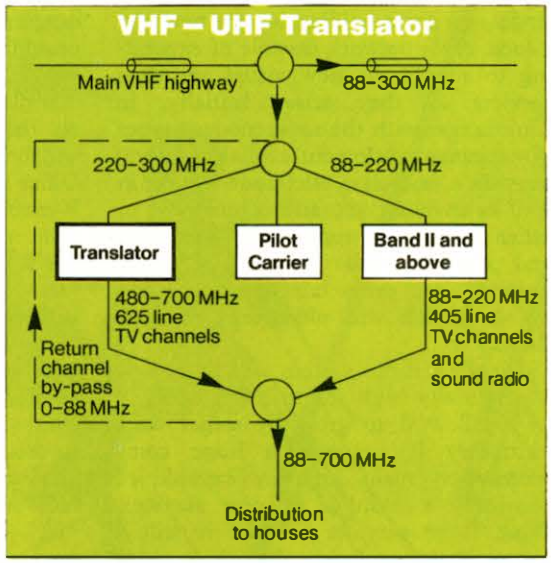
The frequency range below 85 MHz has been reserved for the provision in the more distant future of a digital multiplex supporting the telephone, Viewphone and a number of new data-type services. However, this unused portion of the bandwidth will, as a short term measure, be made available for return path communication to meet a limited demand for two-way services. These "upstream" channels could be exploited to link local programme sources, such as local education programmes from schools, hospitals or universities with the distribution centre, or to provide visual surveillance channels or data access to a central computer. In the longer term full two-way wideband transmission facilities will be combined on the main highways with the two-way digital multiplex.

The tender specification for the Milton Keynes contract included the requirement to define the performance objectives for the transmission of broadcast television under a comprehensive list of headings which included accurately defined picture quality, stability, noise and interference and isolation from receivers in neighbouring dwellings. Similarly, objectives were defined for the audio channels of television and sound radio sufficient to ensure that signals would be suitable for application to the best quality hi-fi equipment.

The new, all-purpose network, has been designed against a background of expanding technology in telecommunications. At first the system will be a fairly basic one which will minimise the initial costs, but as needs for new services develop it will be capable of evolving in stages. The new city of Milton Keynes has already aroused considerable interest overseas. Many administrations will be watching closely the contribution that its communications make towards raising the standard of city life.

Mr S. H. Granger is an Assistant Staff Engineer in Long Range Studies Division of Telecommunications Headquarters and is a member of the recently constituted local line task force team. He was previously responsible for the local line transmission laboratory at Wembley.

The diagrams show how UHF television frequencies, accommodated in the VHF main highways of the network, are shifted back up to UHF by a specially developed frequency translator.



Below: An engineer tests the television equipment housed in a local telephone exchange.

A better service for ships

J L Hyatt

The mast at North Foreland Radio Station.

Coastal radio stations provide a vital life-line for world shipping. This article describes how the medium-range service is being modernised and improved.

ALTHOUGH SMALL in terms of total Post Office investment the International and Maritime Telecommunications Region's radio service for ships is of considerable international importance. The UK is the third largest maritime country and some of the busiest shipping lanes in the world pass close by its shores.

The long-range maritime wireless telegraphy station at Burnham-on-Sea is, in fact, the largest of its kind in the world and handles some 650,000 radio-telegrams annually to and from ships of all nationalities in all parts of the world. Within 200 to 300 miles of the British Isles ships are served by 11 medium-range stations located around the coast. Between them they handle annually 220,000 radio-telephone calls and 260,000 radio-telegrams.

The successful operation of a maritime radio service depends very much upon international liaison and co-operation. It is essential that the ships of one country can work to the coast stations of another. International compatibility is achieved through the International Telecommunications Union (ITU) whose regulations, governing operating procedures and basic technical characteristics for radio stations on ships and on shore, are binding on all member nations. The regulations are kept in line with changing techniques and procedures at World Administrative Radio Conferences held by the ITU every seven years or so.

At the most recent conference, in 1967, decisions were made which are having a tremendous effect on the world's maritime communications service. To achieve economies in frequency spectrum and to improve ships communications generally new techniques and equipment are being introduced. To keep in line with these developments the Post Office is now in the throes of modernising its maritime radio station equipment. At the same time work is being put in hand to meet the requirements of the companies exploring the UK's off-shore areas for oil and natural gas and whose rigs are making increasing use of radio station facilities. In addition, the opportunity is being seized to modernise and in some cases replace radio station buildings, many of which date back to the early 1900s.

One of the major decisions of the 1967 World Conference was to adopt single-sideband working in preference to the double-sideband techniques which have been used for many years. This switch to a modern transmission system which will make more frequencies available is having a major effect on ship-to-shore

radio-telephony circuits. It has necessitated a replacement programme at coast stations scheduled for completion in 1973 and involving the provision of 50 medium-frequency transmitters and 50 receivers. The transmitters generally are designed to operate on one frequency and the provision will be on the basis of one for each frequency in use at a coast station plus a multi-frequency transmitter capable of quick changing to each of a station's frequencies for spare and reserve purposes. The greatly increased flexibility that will result should keep most of the stations abreast of traffic growth during the next few years.

The World Conference also adopted a system of selective calling which allows a shore station to contact a selected ship on demand in much the same way as a telephone number is dialled. One of the major problems of ships' communications lies in making the initial contact. The majority of ships carry only one operator who is on duty for eight hours each day, and apart from distress calls which can automatically alert ships there is no means by which coast stations can make contact if the ship's operator is off duty. With selective calling each ship is allotted its own unique code and is equipped with suitable decoding equipment which enables it to be alerted automatically throughout the 24 hours when the number is transmitted from the radio station. The selective calling system adopted is SSFC in which each ship's code consists of a five-digit number and the numbers 0–9 are represented by audio-frequency tones. A four-digit auxiliary signal can also be sent to identify the originating coast station or to provide information on the radio channel to be used for answering.

Selective calling equipment, developed for the Post Office, will be fitted at all coast stations during 1973 in readiness for the general adoption of the system world-wide.

Another development being provided at coast stations is Lincompex – a system of speech processing originally developed by the Post Office for improving the quality and efficiency of international radio telephone circuits. So successful was it that a special version has been engineered for use on maritime circuits. Although the maritime version is basically the same as the international one the design of the ships' equipment has been simplified to keep the costs as low as possible.

An international direct printing telegraphy system is also planned which will enable ships to operate a teleprinter system that is compatible with the inland

continued on page 8

In a dramatic sea rescue like the one pictured opposite, Post Office Maritime Radio Stations become the nerve centre of rescue operations, providing the vital communications links between all the emergency services.

For those in peril...

FOR SHIPS AT SEA a communications link with land is vital. It is their solitary life-line in times of danger and they depend on it for efficient day-to-day operations.

In Britain the Post Office provides this crucial link through its Maritime Service. Radio stations circle the coastline and ships of all nations can reach out to them for help or advice at any time of the day or night.

The ship-shore links by radiotelegraph (morse) and radiotelephone (speech) enable shipowners to direct their fleets at sea; crew members are kept in touch with their families and passengers in contact with their homes or offices. Besides meeting these social and business needs the coast stations contribute to safety of life at sea by broadcasting weather forecasts, navigational and gale warnings and, most important of all, give direct assistance to ships in trouble.

Making a telephone call from a ship is as easy as making an inland trunk call through the operator. You can "ring up" almost any country in the world provided the ship's position and radio conditions do not make contact impossible. With very few exceptions telegraph facilities are available to anyone on board ship and in Britain the coast stations are connected to the inland telex and teleprinter automatic switching systems so that messages can quickly be dispatched to their final destinations. Telex calls can also be made by radio to suitably equipped ships.

The safety of life at sea service is a vital concern for the coastal radio stations which keep a continuous watch on the international maritime distress frequencies for calls for assistance. Every half-hour they, and ships' stations as well, observe three-minute silence periods so that weak distress signals have a better chance of being heard. Each year between 500 and 600 distress cases are handled by the Post Office stations.

When an emergency occurs a station becomes the focal point of communication, controlling and maintaining contact between ships which have been called in to help and the rescue authorities on land including the Coastguard Service, the Royal Navy and RAF. The coast stations also provide a Medico Service free to ships of any nationality. If a call is made to a station for medical advice the ship is connected to a shore doctor and the station can arrange for a doctor to go to the ship.

The cry for help can come from anywhere at any time – from ships with sickness or accident aboard; from ships adrift or wrecked on the rocks, in collision, aground or on fire; from aircraft down in the sea. But whenever it comes it will not go unheard.

continued from page 6

telex systems. Traditionally, in the field of wireless telegraphy the mode of transmission has been Morse code. It has been obligatory for many years for all ships over 1,600 tons and all passenger ships to carry a qualified Morse operator since this is the basic method of communication for cases of distress. There has consequently been little demand from ships for more sophisticated methods of telegraphy such as teleprinter working.

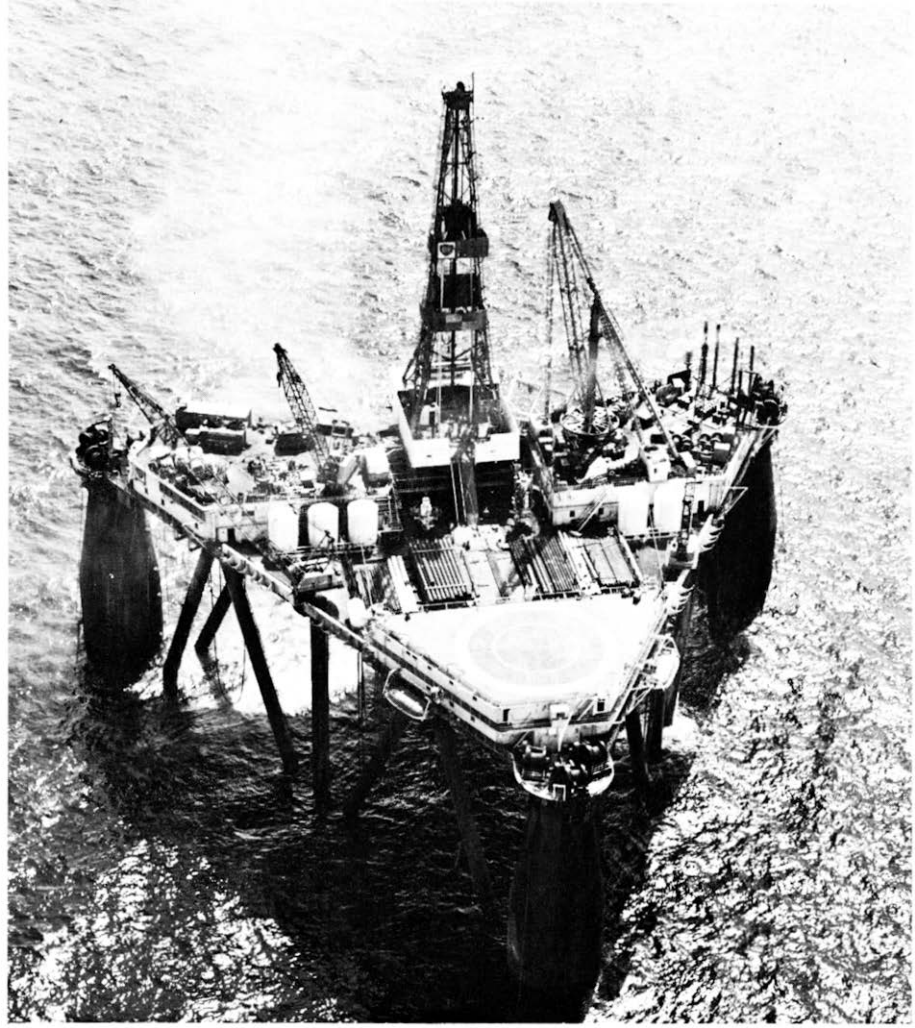
However, with the development of inland telex networks and the greater adoption of business techniques in the management of ships the need for marine teleprinter and data transmission facilities is developing. Whilst the relatively poor quality of maritime circuits would restrict the maximum permissible transmission rate for data it is quite realistic to assume the successful operation of a teleprinter system provided that some form of error protection is used.

The CCIR (Delhi 1970) reached agreement on the technical characteristics of the error detecting system (Sitor) that should be used in such a service. In effect the parameters laid down enable ships to operate a protected 50 baud teleprinter system. The Sitor detecting system has facilities for either Automatic Request for Repeat (ARQ) or forward-error detection (essential where a message is broadcast to several ships at the same time) and contains its own selective calling system that enables a record of the call to be printed out on the associated teleprinter.

On the assumption that the next World Conference in 1974 will adopt this system the Post Office is proposing to make a limited provision at its coast stations and for the long-range service. (The long-range station at Burnham has in fact operated a radioteleprinter service for ships on a limited basis since 1965, but this will become out-dated.)

The medium-range coast station programme embraces rather more than the replacement of equipment. Many of the stations date back as far as 1909; their buildings are inadequate to meet today's space requirements and standards of accommodation. In particular two of the stations, at Niton and Cullercoats, were threatened by landslides and it has been necessary to rebuild them at new locations; building modifications are being made at many other coast stations.

The opportunity is being taken at Niton and Cullercoats to locate receivers and transmitter at separate sites, with the transmitters unattended and remotely controlled from the receiving station. Traditionally receivers and transmitters have been placed on the same radio station site, but as services have developed and additional frequencies brought into use there has been a problem of increased cross-modulation and other forms of interference between receivers and transmitters. The transfer of transmitters to a remote site is also being considered for Lands End.



British Petroleum's drilling platform, Sea Quest, in the Forties oilfield off Aberdeen. It is one of the many oil rigs now operating off the British coast whose link with land depends on the Post Office Radio Stations.

Coast stations also provide very high frequency (VHF) radiotelephone facilities for ships within ranges of 40 miles or so. To meet the growing requirement for this service, which permits high quality speech circuits with cheap and simple-to-operate ships equipment, it will be extended by the provision of a further eight "fill in" stations that will be remotely operated from existing coast stations. The first of these has been opened recently at Bacton on the Norfolk coast. The other locations under consideration are in the Hastings, Start Point, Bristol Channel, Clyde, NE Scotland areas, etc.

To meet the demands of the off-shore oil and gas rigs a radio teleprinter and radiotelephone system for the exclusive use of rigs operating the North Sea was brought into service at the Humber, Cullercoats and Stonehaven coast stations in 1965 and is still in operation. The centre of interest, however, is now moving to the more northern parts of the North Sea and it is also likely that drilling will start in the Western areas off Cornwall within the next two years.

To meet the northern demand a new station is being built in the Shetlands and is scheduled for operation at the end of this year. In the meantime facilities at Wick have been strengthened to meet the demands from rigs already in the area. Plans are in hand for a new station in the South West to serve oil rigs operating off the Cornish coast.

In this survey an attempt has been made to indicate the important current developments in the medium-range maritime services. Plans for the development of the long-range maritime services will be described in a later issue. Overall the improvements now being made will allow the ship-to-shore services to cope with the ever increasing demand that will be placed on them over the next decade by the growth in radiotelephone working and the development of radioteleprinter operation.

Mr. J. L. Hyatt is Assistant Inspector of Wireless Telegraphy in International and Maritime Telecommunications Region. He is responsible for the planning and development of the maritime radio services.

THE BIRTH OF A BOAT

D N Dick

Two new cable repair ships are being built for the Post Office at a cost of about £7 million. A vast amount of preparation has gone into their design, including elaborate tests with scale models.

The 1/12th scale model, 24 ft long, goes into the water for the first time in the British Hovercraft test tank at Cowes, Isle of Wight.

TIME HAS CAUGHT up with the Post Office's cable repair ships, the *Iris* and the *Ariel*. After more than 30 years of service they are no longer suitable for cable repair work in times which have seen both an increase in the work load and the introduction of more sophisticated cable systems which they were never built to handle.

And so a new generation of cable repair ships is to be born which will be capable of meeting all the requirements of current and future repair operations.

The requirements evolved from a critical examination of all the deficiencies inherent in the older vessels. As a result it was determined that the new ships should be capable of providing a stable working platform for their crews in near gale force conditions. On the old ships work had frequently to be stopped in rough seas – conditions which exist for at least half of the year in Northern European and Atlantic waters.

To maintain their sea station under almost any conditions of wind, tide or current the new vessels have to be made highly manoeuvrable.

To speed-up loading and unloading and eliminate much of the man-handling of cable that had been necessary a new technique known as pan loading was planned. The cables will be pre-loaded into circular pans, lifted on to the ships by crane, and housed in conventional fixed cable tanks.

It was also decided that greater protection had to be given to the crew and equipment; and the cable machinery, cable working gear and plant were all to be consistent with the requirements and limitations of the most modern cables as well as the conventional. Having established these and other criteria consultant naval architects were brought in.

It is important in specialist ship design not to consider any part in isolation before having first established that the basic overall design aims are sufficiently realistic to be incorporated within the limiting dimensions of a ship's hull. The new ships are to be essentially coastal water repair ships but capable of deep sea work – factors which establish that the length and the draught should be kept to a minimum.

The dimensions of the vessels were then set and the overall configuration agreed, and from this the architects prepared "lines" which would provide the stable working platform required. The effect of various lines or shapes of vessels can best be demonstrated by comparing, say, the very fine lines of a destroyer with those of a barge. At one extreme a fast but lively vessel is produced, and at the other a stable but slow and sluggish craft which would require a lot of power to obtain any reasonable speed. To achieve Post Office requirements a shape having a compromise of the two was developed to obtain a stable craft with reasonable speed.

Having determined the envelope and its shape, then follows the problem of accommodating the necessary complement to man the ship, the machinery to propel it and the cable machinery and equipment. At the same time was considered the necessary propulsion equipment and the auxiliary thrust units to obtain a highly manoeuvrable craft. Another earlier criteria was that the vessel should be single screw. This decision was made because of the problems of the low sinking rate of lightweight cable and the possible risk of damage by twin propellers when laying lightweight cable from forward.

Because of the limited machinery space available, and for other technical reasons, the machinery arrangements selected will consist of two diesel engines totalling 4,400 hp. The power from both engines is linked through a single-output gearbox which is coupled to a

controllable pitch propeller (the angle of the propeller blades to the water can be altered to give very precise control over the ship's speed). Also from the gearbox are two drives for alternators. These will provide power for auxiliary manoeuvring units and the ship's domestic services while at sea. The engines, propeller shaft and alternators will all be coupled by clutches to provide a system with a number of possible operating alternatives. For example, at low speed one of the main engines could be coupled through the gearbox to the propeller shaft whilst the other could be coupled, also through the gearbox, to the alternator, each diesel engine being independent of the other.

The auxiliary manoeuvring units were to be powered in such a way that on cable work the main propeller could be shut down. Various manoeuvring thrusters were considered. At the after end it was finally decided that there should be an active rudder. This consists of a small electric motor-driven propeller incorporated within the rudder. The steering gear with this type of installation is produced so that when the active rudder propeller is in use the rudder is capable of being turned through 180°, from 90° port to 90° starboard, to provide a thrust of four tons at any angle to the vessel within that arc.

The bow thrust unit selected was of a type which can be lowered to project from the bottom of the vessel, rotate through 360° and provide thrust of 4.3 tons in any direction. Any risk of damage to the unit, either from operating in shallow water or through critical cable angles, can be averted by retracting the unit into a conventional transverse tunnel.

During the design of the vessel a stage was reached where, if there was to be any confidence in the work done so far, certain model tests would have to be performed. To this end a comprehensive model programme was prepared embodying aerodynamic, hydrodynamic and manoeuvring tests covering a wide range of conditions which the full size vessel would be expected to encounter.

This project was given to the experimental and electronic laboratories of the British Hovercraft Corporation at East Cowes, Isle of Wight.

The aerodynamic tests were carried out by suspending a 1/60th scale model in a wind tunnel in such a way that the angle of the model to the wind could be varied. Within the tunnel it was possible to simulate the vertical wind velocity profile found at sea.

For the hydrodynamic tests a 1/30th scale model was made. The tests included resistance, flowlines, propulsion and irregular sea tests. The resistance tests on the naked hull of the model were carried out in a water tank at British Hovercraft's premises. However, since the very smooth hull of a shiny new model is so unlike the real thing, something had to be done to create the turbulence which actually takes place below the waterline of a real ship. This was achieved by hammering pins into but projecting from the hull on either side of its bow. The tests were carried out at a variety of displacements and the model was towed over a range of speeds from 5 to 17 knots. When analysing the data from the test use was made of a digital computer.

For the flowline tests something had to be done to determine conditions beneath the water line and little tufts of wool were fitted to the model's underside. The pattern of the flow of water over the hull was then ascertained by taking underwater photographs.

Further resistance tests were carried out, this time with the model fitted with bilge keels (they help to reduce rolling) and further measurements taken.

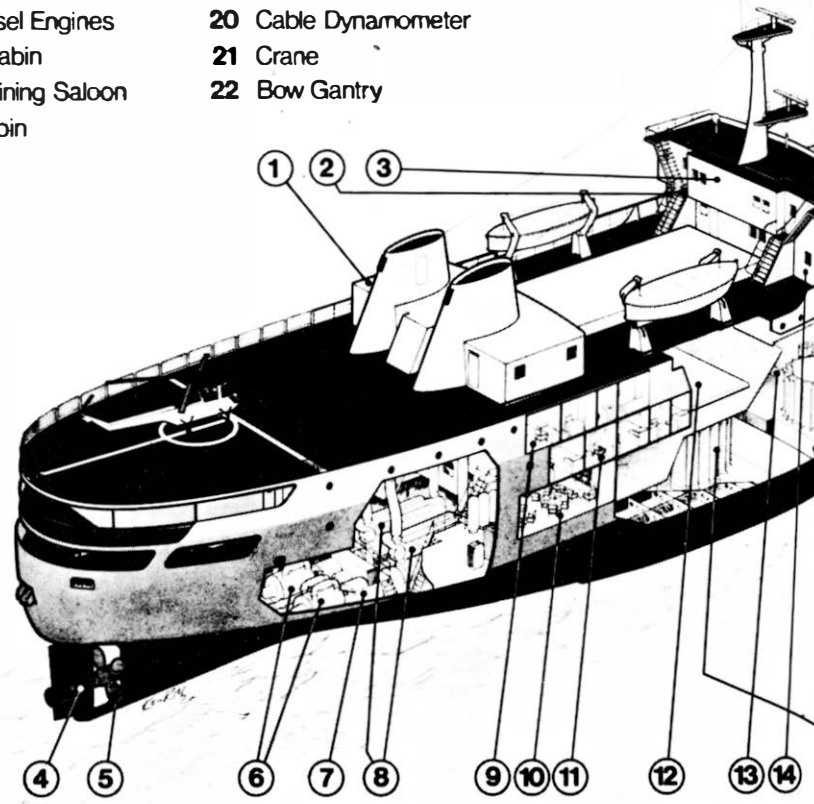
The model propeller was initially tested in open water. It was mounted upstream of a housing containing the propeller dynamometry. The complete assembly was supported by a towing carriage. Measurements of propeller thrust torque, rpm and speed of advance were recorded simultaneously during the tests.

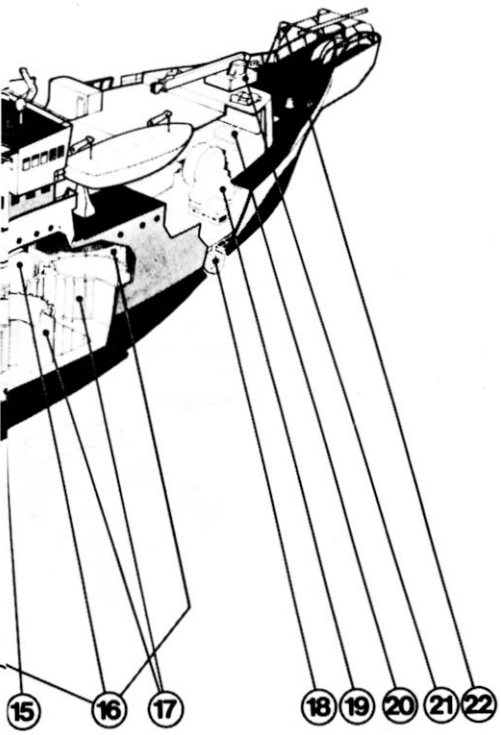
Next followed the propulsion tests, both in calm water and in irregular waves. The model was fitted with a propeller dynamometer, propeller and bilge keels. The active rudder was also represented although its propeller was not incorporated for reasons of simplicity.

Simultaneous measurements of propeller thrust, torque, rpm, model speed and the difference between the propeller thrust and the hull resistance were recorded for a range of propeller revolutions at varying speeds of advance up to and above the design speed.

For the tests in irregular waves the craft was run at four speeds into irregu-

1 Air Conditioning Plant
LER Vent Room
2 Captain
3 Navigation Control
4 Active Rudder
5 CP Propeller
6 Main Alternators
7 Main Gear Box
8 Main Diesel Engines
9 Officer Cabin
10 Officer Dining Saloon
11 Crew Cabin
12 Cable Tank Hatch
13 Cable Pan
14 Radio Room
15 Flume Stabilising Tank
16 Main Cable Tanks
17 Auxiliary Cable Tanks
18 Bow Thruster
19 Cable Engine
20 Cable Dynamometer
21 Crane
22 Bow Gantry





lar head seas which had a wave spectrum approximately representative of the waves generated by a wind of Beaufort Scale; Force 6 in the North Atlantic (wind gusts of up to 27 knots). The waves investigated had a significant wave height of 13 ft and the wave length varied from approximately 100 ft to 2,000 ft. Measurements were made of the mean increases in propeller thrust, torque and rpm. Records were also taken of the pitch, heave and vertical accelerations at the bow and stern throughout the tests and the pitch and heave data were later used to determine the pitch and heave responses.

The station-keeping, sea-keeping and manoeuvring tests presented something of a problem in as much as the full range of tests had to be performed with the bow thrust unic and the active rudder operable. Since there is a limit to which a propeller may be effectively scaled, this virtually determined the scale of our station-keeping model. Consequently a 1/12th scale model was made by British Hovercraft. This produced a model about 24 ft in length which obviously could not be tested in a conventional open tank. As a result all the tests with this model were conducted in selected areas of the Solent, and as it was required to operate in fairly severe sea conditions it was built using conventional boat-building techniques. The representative superstructure was made only in sufficient detail for windage to be approximately correct and to enable a correct assessment to be made of wetness (spray from the sea).

The model was designed to carry two personnel, a helmsman to carry out the various tests and manoeuvres, and an observer to operate the recording equipment. The helmsman's seat was placed such that his eyes would be on the same level as the real ship's bridge officer.

The tests were confined to an area near Cowes chosen because past experience had indicated that the Solent coastlines and tides could provide in a matter of days a wide range of sea conditions.

The manoeuvring tests were the standard Turning Circles and Kempf Manoeuvre, the latter involving a series of alterations in course to examine the ship's response to changes of helm. These were carried out in calm water and still air. The sea-keeping tests were initially carried out in a sea state representing Beaufort Scale; Force 7 and subsequently under Beaufort Scale: Force 4 conditions. Various parameters were recorded and the ship motions were analysed.

For the station-keeping tests a buoy was used as a mark on which to keep station. Then, using only the bow thrust unit and the active rudder, attempts were made to hold the ship steady at the mark on a particular heading. The rpm of each unit was adjusted until the ship's drift from the buoy was reduced to a minimum. When the ship was considered steady, a recording of the parameters lasting approximately five minutes was taken.

Investigations were carried out in tide rates from zero to 3.5 knots and sea state up to that corresponding to Beaufort Force 7. Horsepower requirements for each thrust unit were derived from the corrected thrust values.

It had thus been demonstrated in the model tests that by providing the infinitely variable combination of thrust direction of the two auxiliary thrust units the proposed new ships could be held over any given position or direction regardless of reasonable prevailing conditions of weather, tide or current.

The only disadvantage with such a manoeuvring system is the difficulty imposed upon the controlling officer in determining the relative directions of thrust of each unit to obtain the desired resultant position or direction. To overcome this difficulty British Hovercraft were instructed to investigate the possible introduction of an integrated control system. Such a system was subsequently produced and computer simulation exercises were carried out to study its feasibility and practicability.

The computer tests were successful and the mock-up of the integrated control unit was transferred to the 1/12th scale model and further station-keeping tests were conducted in the Solent. The results were extremely successful and have created such confidence that the unit is to be further developed for inclusion in the full-size vessel.

Concurrent with the ship model tests the preparation and agreement of arrangement of accommodation and machinery continued with the naval architects until ultimately final arrangements were agreed and specifications completed. Preliminary structural arrangements were also prepared and submitted to Lloyds for approval. Finally all specifications and arrangement drawings were gathered together and with tendering documents prepared by Contracts Division of Purchasing and Supply Department have now been despatched to a selection of British shipbuilders.

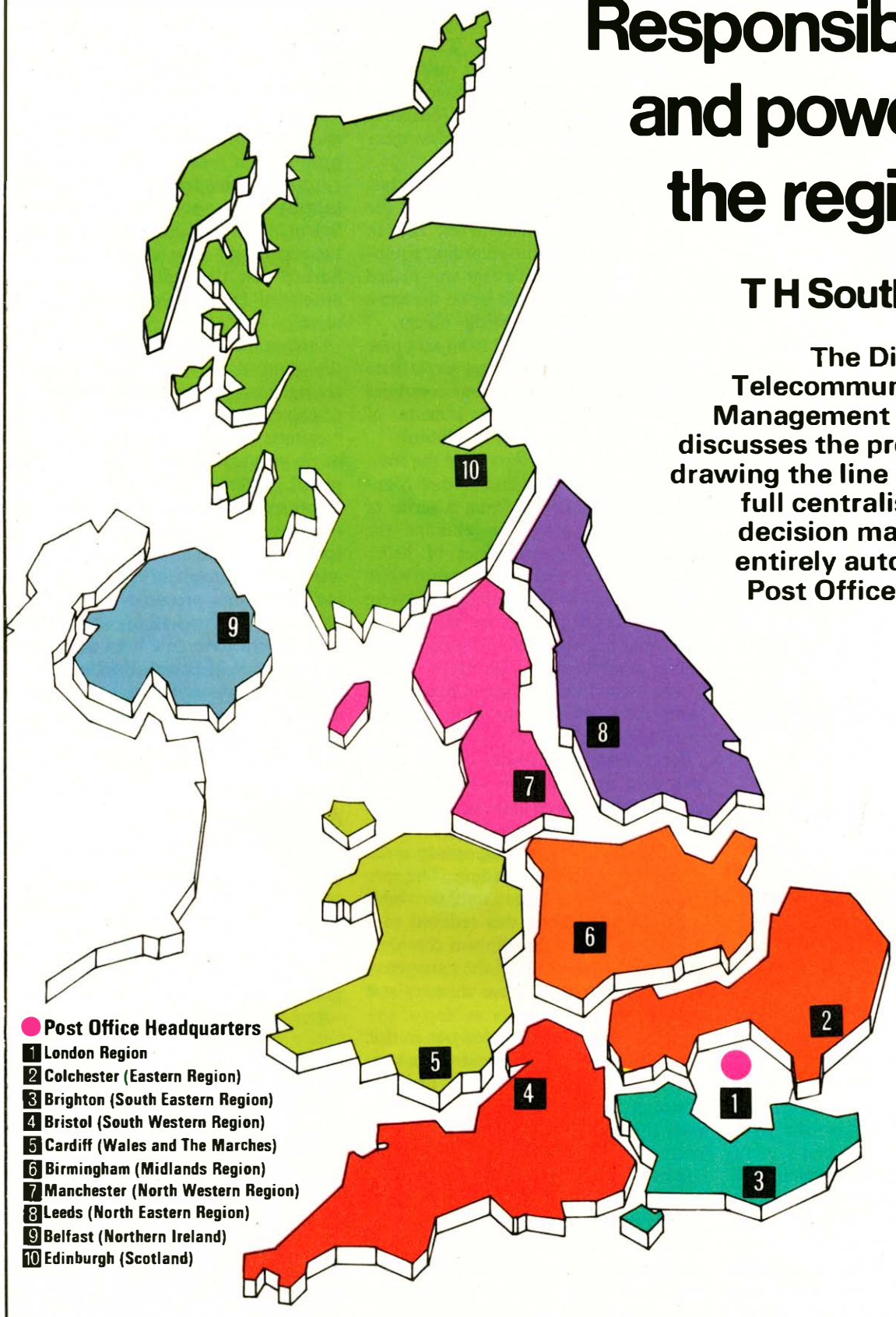
When the two new ships at last take to the water they will be the most manoeuvrable and advanced of any cable ship in their class.

On a pond near their home at Upminster, Essex, Mr Douglas Dick and his elder son Gordon try out a small working model of the new ship. Mr Dick, author of this article, built the model himself. He is Superintendent Marine Engineer in charge of marine and mechanical engineering section of Marine Branch at Telecommunications Headquarters.

Responsibility and power in the regions

T H Southerton

The Director of Telecommunications Management Services discusses the problem of drawing the line between full centralisation of decision making and entirely autonomous Post Office Regions.



Post Office Headquarters

1 London Region
2 Colchester (Eastern Region)
3 Brighton (South Eastern Region)
4 Bristol (South Western Region)
5 Cardiff (Wales and The Marches)
6 Birmingham (Midlands Region)
7 Manchester (North Western Region)
8 Leeds (North Eastern Region)
9 Belfast (Northern Ireland)
10 Edinburgh (Scotland)

THERE WILL BE no argument about responsibility (accountability) and authority (powers to act) going together. And the larger the business one is in, the more must responsibility, and therefore authority, be delegated. These principles *are* valid, but only up to the point where they conflict with another principle: overall management should optimise overall business performance. That is the overriding principle.

There are two extreme possibilities for distributing responsibility for Telecommunications in the UK. The one extreme is full centralisation of all decision-taking. The other is full decentralisation to entirely autonomous Regions, without central guidance, without direction, without co-ordination. The chaos which would arise from the adoption of either extreme can be imagined; unacceptable delays in decision making on the one hand, incompatible transmission and other system facilities on the other, to say nothing of unbalanced resource allocations and of lack of accountability to the provider of resources. The justification for a balanced distribution of responsibilities is therefore clear – it is that its existence will produce overall business results superior to the sum of the sub-optimised results of totally independent Regions. It follows, by definition, that Telecommunications Headquarters must, in order to optimise business results overall, impose constraints on the freedom of decentralised Regions to act independently.

The best balance between full centralisation and full decentralisation must be far more effective than either extreme. Just to allocate resources and agree performance is not enough. To achieve the best balance, the aims and objectives of the organisation as a whole have to be clearly understood by the whole management team. This means all of us must know where the business is now, where we want it to be at future points in time, and by what strategies we aim to get it there.

It is easier to state this condition for best balance than to achieve it. For until we have a fully developed Business Plan, we cannot tell our managers our complete set of objectives, let alone the strategies for reaching them. Nor would it be wise, in all cases, to publish those strategies which are so susceptible to the wages climate, the tariff climate, Government financing policy, Government employment policy. We can only go a limited distance along this road. But insofar as we can publish our policies and strategies, our aim is to do so. Only in this way can we give local managers a framework in which they can take decisions, thereby speeding the decision process, balancing local against national requirements and hopefully achieving the better performance and enthusiasm which comes from allowing the fullest possible local initiative. But insofar as we cannot publish our strategies, managers must be subject to policy constraints which effectively limit choice to decisions which *are* compatible with overall strategy.

Not all policies will be written down; some will be and have been built up by casework or custom. These policies work through the formal and the informal organisation. Their character resembles a culture or tradition. They are the behaviour patterns that set the style and distinctive personality that characterises every organisation. They are both a source of strength and an obstacle to progress. They are a source of strength because they provide dependability and consistency of behaviour without overloading the communication system. They are an obstacle to progress because they resist change.

Thus we see a paradox – the more we decentralise, the more we need explicit policies from the top. Without them, decision-making by the field would be paralysed. Where we can have them, each decision can be delegated to that part of the organisation which is in the fullest possession of all the relevant information.

In short, the only practical basic organisation form for a complex business like Telecommunications is: Central policy direction; Central control of the overall Business plans; Decentralised execution based on defined long-term operating standards and short-term objectives.

Of course, there will be a price to pay. Greater decentralisation coupled with central responsibilities for co-ordination and overall results implies better, but not necessarily more, controls. The Managing Director must be able to watch performance in key areas continuously. Detailed statistical returns are therefore here to stay – and we need not apologise for them. On the contrary, a well-known firm of consultants (Urwick Orr & Partners) is on record that we have one of the most comprehensive and useful ranges they have ever encountered.

This does not mean they are perfect; Telecommunications Headquarters staff are constantly on the look-out to eliminate unnecessary returns and improve others. Centralisation of all "management" statistics in one Section in Telecommunications Management Services Department has helped to reduce duplication. But old returns die hard, and are much beloved by their original parents long after they have become monstrous nuisances to everyone else.

We need also other forms of accountability. Devolution with accountability equates to real local freedom to decide how to meet local objectives whilst staying within the overall business objectives. Devolution without accountability equates to anarchy and ultimate failure, as managers then have no way of knowing what effect their decisions have had on the health of the business. To optimise the performance of one's own command is certainly not good enough.

The accountable management controls which have been introduced over the last few years are based essentially on establishing COST CENTRES and QUALITY CENTRES for each of the several activities into which we are or will be organised. Costs and quality are in this way made the responsibility of those who spend the money and they are related to the performance they should achieve. In short, the Post Office has gone in for responsibility budgeting in the belief that all managers have strong territorial instincts and perform better when they are operating in their own clearly defined patch. The control system which has been developed and is still being developed is therefore geared to remind each manager of his expected performance and to show where a variation has taken place. The aim is an integrated family of Plans which facilitate accountability, as a series of articles in this Journal is explaining.

The latest initiative in the history of Telecommunications decentralisation has been the issue of Circular THQ 1/72 (now a Telecommunications Instruction). It is not the first initiative. Decentralisation has been a continuing process for generations. It took a major step forward with Regionalisation just before the war. It has steadily increased since the war. At the last rough count, some 1,100 devolved powers could be detected by meticulous search through 30,000 sheets of EIS, TSIS, ESRS, Manuals and the like. What is new about Circular 1/72 is that we have abandoned the concept of powers devolved to Regions and asked ourselves what Headquarters really needs to reserve to itself to maximise business performance overall. We finished up with a list on half-a-dozen sheets of paper – a list we might hope to diminish – instead of the mammoth list of devolved powers which could be expected only to grow.

Regional Directors are now directly responsible to the Managing Director for everything not specifically reserved by that Circular.

The list of items reserved is couched in fairly general terms. This is deliberate. Too rigid a definition at this stage would inhibit the natural and necessary process of exploration in this territory. A minimum of words will encourage a critical and continuing examination by Regions and Headquarters Departments so that the Circular can be modified and refined from time to time. Nor have we tried to produce a list of new powers to compare with the old ones; that would be too time-consuming.

But it is already possible to point to some consequences. For example, a Regional Director now has freedom to create any posts he needs to carry out his approved plans, though not, as yet, to fill them at all levels. He is also at liberty to negotiate local variants of national agreements with the headquarters of staff associations. He may recruit all staff other than into graduate entry grades. In the field of finance, he has virtually a free hand to write off debts, make adjustments and waive charges. All these, together with other changes which will become evident as the precise definitions of the reserved powers emerge, amount to a significant relaxation of the control which Telecommunications Headquarters has hitherto exercised over Regional activities.

In discussing the effects of the change, it is more profitable to refer to those areas of work which remain reserved to Headquarters. These fall into five main categories. Firstly there are those which control the Business Plans to develop, expand and operate the Business. This includes those decisions which affect the amount of capital the Post Office Board will need to raise to achieve the plans and those decisions about the allocation of resources which can only be made centrally because of the totally integrated nature of Telecommunications.

Secondly, there are those decisions about national services and their technical specification which affect the pattern of the business and which need to be reserved to ensure that the business retains its basic national character. There is deep political and public interest in the services which the Post Office offers.

Thirdly, there are those decisions which have to be made nationally because we are committed with other bodies to speak with one voice. Matters under this heading include those entailing consultation with the Post Office Board, with the Ministry of Posts and Telecommunications, with other Government departments, with industry,

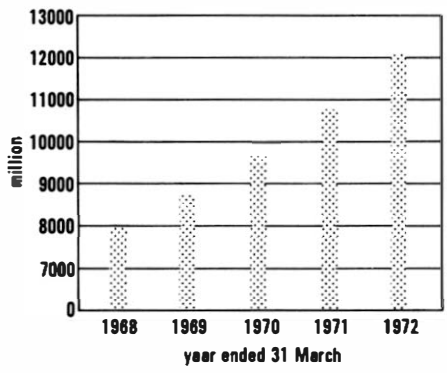
A NEW PHONE EVERY THREE S

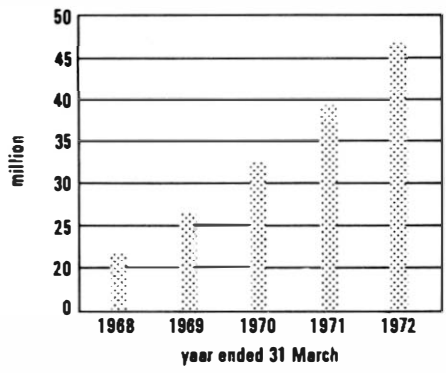
Another year of achievement for the Telecommunications Business is recorded in the Post Office annual report for 1971–72. The number of exchange lines showed the biggest annual growth for 25 years – and one new phone was installed every three seconds. But despite all this the explosive demand could not be contained and the waiting list grew to 218,000. The report spells out the urgent action which is being taken to reduce the list.

As a result of productivity improvements the considerable system growth was achieved with an increase in staff of only one per cent, and telecommunications contributed £58 million to the overall profit of the Post Office. This was ploughed back for improvement and expansion.

The standard of the automatic telephone service was better than for many years. Equipment faults and circuit congestion were reduced.

The detailed facts and figures are given in the following extracts from the report:





Orders for new exchange connections were 32 per cent up on last year and totalled 1,443,000. The supply of connections to new customers increased by 19·5 per cent to 1,297,000, equivalent to about 5,000 each working day.

By the end of the year, there were 10,028,000 telephone connections. Telephone calls connected increased by 12 per cent to a daily average of 33 million. Inland calls were up by 12 per cent and calls abroad increased by 18 per cent. More than 12,000 long distance circuits were added to the network – the highest annual figure ever achieved – and about 72,000 short distance circuits were also provided.

Nearly 5,000 stations were added to the telex system bringing the total in service to 37,770. Inland telex calls were up by 10 per cent and international telex calls connected rose by 14 per cent. The total number of telex calls handled was 74,846,000.

The waiting list

About 80 per cent of all new orders were met on demand – the remainder were placed on the waiting list for an average of about five months, mainly because of shortage of exchange equipment. As a result the waiting list grew to 218,000. A number of things are being done to reduce it.

Firstly, as a result of strenuous efforts by the manufacturers, the equipment supply situation was improved during the year, 827 exchange contracts being completed against 594 the previous year. At March 1972, manufacturers' delays on current

and with the staff associations on pay and conditions of service.

The fourth category of reservations concerns those decisions which require a degree of expertise which there is little opportunity to build up and maintain in the lower formations. These reservations are not fundamental to business optimisation but it would be foolish to build up expertise Region by Region, possibly involving a considerable amount of duplication, unless it could be shown to be in the overall interest of the business.

The fifth category contains those jobs which it is believed can most economically be run centrally; for example, Stores purchasing, Factory repair, Management training, etc.

Inevitably in all this there remain areas of uncertainty and we shall have to decide where to draw the line in many cases. This will require a measure of understanding by both Regions and Headquarters. The Regions will have to appreciate that Headquarters reservations are designed to ensure that Telecommunications grows in a balanced, controlled and economic way for the national benefit. Headquarters staff will need to understand that, in exercising powers not reserved to Headquarters, all staff in Regions and Areas will see themselves as members of the Telecommunications management team, will support the business and each other, will follow agreed Business Plans and Technical Specifications, will be aware of Headquarters policy and will consult Headquarters for advice when they want it. But uppermost in everyone's mind must be the guiding principle that the aim of the balance between centralisation and decentralisation is to optimise overall business performance.

Of course, if the principle is good for the Telecommunications HQ/Regional HQ relationship it should be good also for the Regional HQ/Area relationship. But we must take one step at a time and the new relationships between Telecommunications Headquarters and Regional Headquarters must be more fully understood before the consequential relationships of Regional HQs and Areas can be worked out. The whole process will need continual updating, because by the time we have decided the best balance for the present business, the business will itself have changed. And with new business, new staff and new knowledge, who knows what may emerge.

Mr T. H. Southerton, Director of Telecommunications Management Services, has been with the Post Office since 1934. He took up his present appointment in 1967 after serving as Controller of Factories.

ECONDS

contracts were down by a third compared with the previous year.

Secondly, investment has been increased specifically for the provision of telephone service and the reduction of the waiting list. An additional £60 million is being spent for these purposes over three years.

Thirdly, consultants have been engaged to examine the processes for ordering exchange equipment with the aim of shortening the whole procedure so that the Post Office can respond more speedily to changes in demand.

This threefold programme of action will not produce quick results but will become increasingly effective with time.

Quality of service

The drive to expand the network eliminated most of the serious congestion and the percentage of calls which failed due to insufficient plant was substantially reduced. The quality of service of dialled calls, both local and STD, improved.

The expansion of STD facilities was complemented by the extension of international dialling facilities.

Exchange equipment

In 1971 the Post Office entered into a three-year contract with one of its principal manufacturers for the supply of £15 million of electronic switching equipment for large local exchanges (TXE4). The Board will be reviewing progress with TXE4 at the end of 1972 and will then conclude whether this system should be used for modernising the local switching network.

Modernisation by the replacement of the existing electromechanical (Strowger) system is essential if Britain is to have the fast, fault-free, and flexible telephone service that modern technology is making possible and that other advanced countries will certainly have in the 1980's.

There is no dispute about this. But there is a view that the objective could best be achieved by the use, not of TXE4, but of an improved version of an electromechanical (Crossbar) system that is already being used for some purposes by the Post Office.

The Post Office is not committed to any particular solution in advance of the end-of-year review. Meanwhile the differing points of view were thoroughly explored in discussions with the manufacturers during the latter half of 1971–72.

New developments

A number of new types of private automatic branch exchange are on trial in customers' premises.

A miniaturised trunk signalling system making use of integrated circuits and needing 80 per cent less space was successfully tried. This is a step towards plant miniaturisation and an easing of the pressure on telecommunications buildings, particularly in large cities.

A Dataplex service was introduced which enables computer bureaux to offer access to computers at local call rates from towns many miles away.

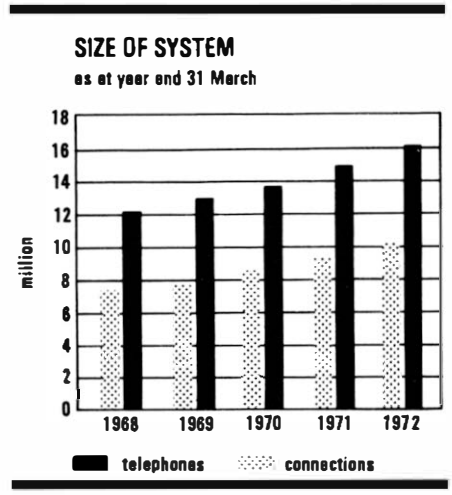
Investment in the future

During the year 312 new buildings and extensions were started mainly for telephone exchanges, and further substantial orders were placed for the manufacture and installation of exchange equipment to meet requirements from 1974 onwards. Crossbar orders for £50 million were placed for medium to large exchanges. £13 million orders were placed for TXE2; all new local exchanges up to about 2,000 lines in size are now being ordered in the TXE2 system; and by the end of the year 200 of these exchanges were in service.

Finance

Financial results for the year produced a profit of £58 million compared with £93·5 million in the 1970–71 figures. Profit fell mainly because increases in pay and prices (£65 million) were only partly offset by higher charges (£23 million).

Telecommunications statistics for the year are shown on page 32.



PHONE FOR THE MODERN HOME

Above: The new phone compared with the present standard model. It is three inches slimmer.

Below: The phone is equipped with a long, flexible cord so that it can be easily carried to comfortable positions.

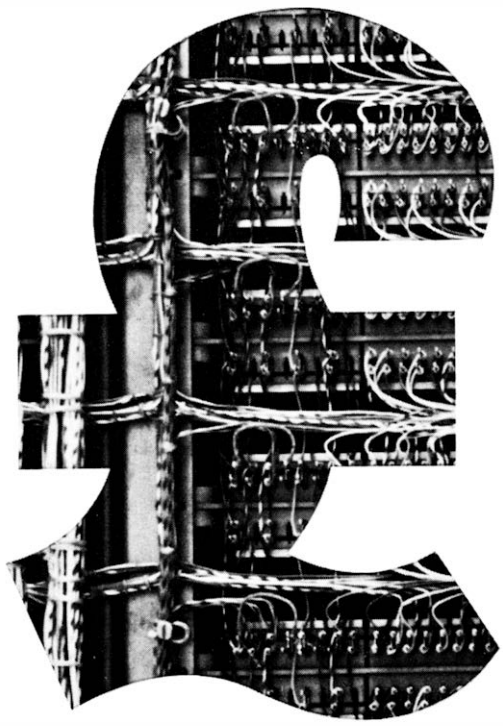
A new telephone, the first to be designed primarily for use in the home, has been introduced on a full-scale trial basis at Canterbury, Cardiff and Sheffield. Its main feature is that it is slimmer and lighter than the present standard telephone which is used by both residential and business customers. The new-style phone has a front-to-back depth almost half that of the standard sets and this will enable it to sit easily on the narrow shelves and ledges so often seen in today's modern homes.

The compact appearance has been achieved by removing the bell from the body of the instrument, and placing it in a separate unit. While this is a radical departure from practice, it is one which will appeal to many house users. Market research showed that it was something which many customers wanted. By housing the bell in a separate unit in

the hall, for example, it will be heard ringing throughout the house while the telephone itself can be used in a much more comfortable area of the home where its modern design can add to the decor.
Among the novel features of the phone is an ingeniously designed wall bracket which houses the bell unit. This "parking shelf" allows the phone to be used either as a wall-mounted or a free-standing model. Another feature is the provision for a socket in the separate bell unit into which a portable telephone can be plugged.
The new phone is the outcome of three years work by Telecommunications Headquarters staffs working in conjunction with the design consultants, David Carter Associates. It is made up to a large extent from working parts from the standard telephone, thus achieving reliability and economy.
Extensive use has been made of moulded plastic parts which use, whenever possible, "snap-fit" techniques. As a result the assembly of the telephone is simple and will help to keep production costs low. There could also be savings in installation and maintenance costs.
Normally there will be no need for a separate terminal block, the bell unit having terminals suitable for both drop-wire and internal cable.
Installation is also simplified by the use of a metal plate which can be screw-fixed to flat surfaces or with the aid of auxiliary brackets to windowsills and skirting boards. The bell unit is then simply clipped on to the metal plate.
The current trials will last for a year during which the Post Office will look closely at technical reliability and performance under working conditions. Provided they meet performance requirements – and customers like them – the new phones will eventually replace the present standard instrument for residential users.
It is also expected that they will find an application in some areas of the business market, and a number of business users have been included among the 5,000 customers who are taking part in the trials.
It is likely to be about two years before the new phone could become generally available throughout the country. However it comes at an appropriate time – when demand for phones in the home is, for the first time, racing ahead of demand from the commercial sector.

Above: The reduction in depth allows the new phone to be placed on narrow ledges and shelves.

Below: With the use of a wall bracket the phone can be instantly converted to a wall-mounted model.



INVESTMENT PLANNING

J D Cartwright

This is the second in a series of articles describing how the Telecommunications Business plans to meet the challenge of growth and technological change. It outlines the requirements of investment planning and the business planning procedures and machinery which are involved.

THE TELECOMMUNICATIONS Business exists to meet the telecommunications needs of the United Kingdom as effectively and efficiently as possible. Developing and sustaining the network of buildings and plant needed to carry out this task is a vast enterprise. There are at the moment about 10½ million exchange lines, served by over 6,000 exchanges. Over 12,000 million telephone calls a year are made over the inland public network, and this number is currently rising by around 12 per cent a year. International calls are increasing at an even faster rate. The number of exchange lines is expected almost to double in the next ten years, with more than half this growth coming within the next five years. At the same time there is a need to replace worn out plant and to satisfy customer needs for new facilities and services.

Investment Planning is concerned with the efficient allocation of resources – men, money and materials – to these tasks of developing and replenishing the network. In simple terms Investment Planning defines the nature, timing and amount of capital investment required to meet future objectives, and ensures that, as far as possible, the necessary action is taken to see that the required resources are available. The two most important features of Telecommunications capital investment are its "long lead time" and its sheer size. The expression "long lead time" means simply that the complexity of the network and of the plant and equipment comprising it make it necessary to plan developments and order plant long before they are required. For example, the planning, construction and installation of a large telephone exchange can take up to seven or eight years or even more, depending on size and type.

As for the size of the investment programme, more than £500 million was spent in 1971/2 – nearly £1½ million every day of the year. This is substantially more than the capital investment of any private sector company in the UK and represents roughly 5 per cent of all such investment in this country – almost certainly the largest share accounted for by any single commercial organisation. A capital investment programme of such complexity, size, and national importance raises many interesting business planning questions and management problems.

Part one of this article concentrates on the principles of investment planning. It explains how these are affected by the nature of the Telecommunications Business, when compared with private industry, and outlines the investment planning system used.

Before trying to explain how the Business's investment planning machinery works, it may be helpful to consider, briefly and in very general terms, what the main requirements of such planning are, and how far they are affected by the Post Office's status as a nationalised industry. In the first place, by "capital investment" is meant capital expenditure on investment in "fixed assets", that is, broadly speaking, expenditure which produces buildings or plant which have a "life", in the sense that they can be used over a period of time to help provide products or services.

The chief requirements of investment planning can be summarised as follows:

1. There is a need to find out in good time what physical assets and hence capital expenditure are required. The importance of this is in proportion to the time needed to plan and carry out such investment. For Post Office Telecommunications it is very important indeed, because of the long lead time referred to earlier. It is moreover essential to distinguish between expenditure which is "necessary" (for operational or statutory reasons) and that which is optional in order to establish investment priorities.

2. The desired investment has to be planned and included in a capital investment programme, which is internally consistent (where various pieces of investment are interdependent, they must be properly planned and programmed in relation to each other).

3. The proposed expenditure has to be related to available resources. If there is no reasonable expectation that it can be financed, then decisions have to be taken regarding priorities and the programme reduced to viable proportions.

4. There is a need to ensure that investment proposals are adequately scrutinised before being authorised, and actual expenditure is properly monitored.

These basic requirements are common to all commercial organisations in both the public and private sectors. There are, however, a number of important respects in which the Post Office differs from large private sector companies. Firstly, it has obligations laid down by Act of Parliament (Post Office Act 1969) and has a monopoly of most forms of telecommunications in the UK, in order

to enable it to fulfil these obligations. Because of its statutory obligations and privileges it does not have to operate in the potential takeover environment experienced by private sector companies. This should in principle, make for a more stable planning environment. On the other hand, the Telecommunications Business does not enjoy the comparative (although sometimes theoretical) freedom of private sector companies to decide which markets it will enter. Only a small proportion of its capital investment is therefore optional (this is especially true when, as at present, the Business is having to make special efforts to cope with exceptionally high levels of spontaneous demand). A further important difference is that the Post Office can only borrow money for investment purposes either from the Minister of Posts and Telecommunications or, if not from him, with his consent.

In addition to its statutory obligation to provide telecommunications services, the Telecommunications Business has to meet a specific overall financial target set by government. It takes the form of a target "return on capital" (defined as profit plus interest on capital plus supplementary depreciation all divided by net book assets at the mean of the year in question) which is a recognised way of measuring value obtained from money invested in the Business. The present target return is 10 per cent. It takes account of the fact that in order to meet its obligations, the Business may need to provide certain services which would not be provided if strict commercial criteria were applied. The programming and authorisation of capital expenditure pass through the following main stages:

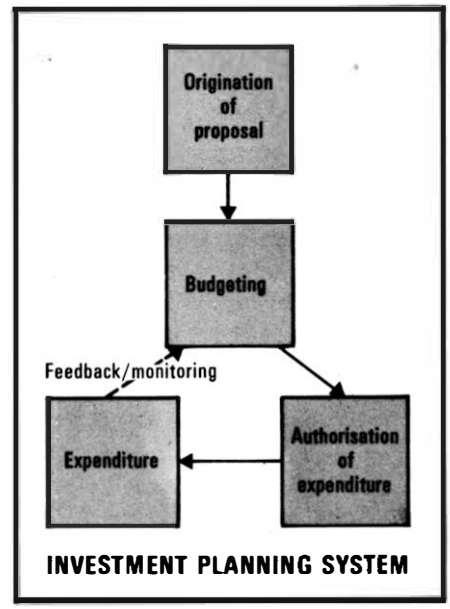
Origination of investment proposals. This takes place at various levels of the Business, depending on the size, complexity and nature of the proposals. All are framed within the context of business policies, priorities or objectives which, at the highest level, are represented by the 10-year Business Plan. Periodic guidance is given by THQ to Regions and by Regions to Areas. All investment proposals must satisfy certain criteria; necessary expenditure (which has to be incurred for statutory or operational reasons) is planned on the most economic basis. Optional expenditure has to satisfy what is called a "test discount rate" specified by government (this is not, incidentally, the same thing as the financial target set by government for the Business as a whole).

Capital budgeting. All proposals involving capital expenditure have to be built into a capital programme, which is constructed in terms of "classes of work." There are over 50 capital classes of work. Examples are Subscribers' Circuits (referred to as "CS" and covering the installation of apparatus at customers' premises) and Repayment works ("HIA", covering work made necessary by road works, for example, for which repayment is received from the local authority or other body). Any particular proposal for capital expenditure may involve more than one class of work and will thus appear in the capital programme under the various appropriate headings rather than as a single identifiable scheme.

Expenditure authorisation. A distinction needs to be drawn between outline approval and specific authorisation of expenditure. Capital investment programmes are considered and approved as a whole in the context of overall business planning; this means, in effect, that the Business may plan on the basis of a certain level of expenditure. Specific authorisation of expenditure is given in different ways according to the nature and scale of the expenditure. Major schemes are authorised at the appropriate level, the largest by the Managing Director's Committee (MDCT) or the Post Office Board. Much of the expenditure under Regional or local control, such as the supply of telephone connections and apparatus to customers' premises and construction work by direct labour in small telephone exchanges, or schemes for the local line and junction networks, takes the form of innumerable small schemes; in 1971/2, for example, 4½ million advice notes for work in customers' premises and an estimated 400,000 works authorities were issued. Such expenditure is authorised by THQ in the form of capital expenditure allotments, after being scrutinised to ensure that proposals are justified and consistent with Business plans and policies.

Monitoring of expenditure. This is carried out at all levels of the Business. Monitoring for the Business as a whole is carried out at THQ and reported periodically to MDCT and the Post Office Board.

The above analysis shows that Telecommunications investment planning varies in two important respects from such planning in most other commercial organisations in both the public and private sectors. Firstly, the scale of investment is unusual not only as to overall size but also as to the vast number of schemes covered; it is safe to say that we are unique in this respect. Secondly, because telecommunications are provided by means of networks, virtually all capital schemes are potentially interrelated. A further very important factor is that the immense scale of capital requirements and the amount of time needed to plan these and procure the necessary buildings and plant makes it even more important than normal that the Business should look ahead to assess its overall requirements and ensure that these can be met.



INVESTMENT PLANNING SYSTEM

Part two of this article (to be published later) will explain the procedures and machinery used by the Telecommunications Business to prepare and monitor its investment programme.

Mr J. D. Cartwright is a Head of Section in the Business Planning Division of Telecommunications Headquarters with responsibilities for capital programming and budgeting.

Wood Street rings the world

E T C Harris

EARLIER THIS year a new International Telephone Services Centre was opened at Wood Street in the City of London. When the major installation is finally completed around the middle of next year an additional 2,650 international circuits will be in service. These extra circuits will relieve the pressure on the Faraday International Telephone Services Centre which, for so long, has had to carry the full burden of the phenomenal growth in international telephone traffic from the UK.

A major use for the Wood Street Centre will be to extend International Subscriber Dialling (ISD) by providing access to several more countries overseas and by expanding ISD services to more customers in this country.

At the same time Wood Street will help enable the Post Office to provide, on an increasing scale, an "on demand" international service for customers outside London who currently have to book their call and wait for the international operator in London to ring back once the call has been set up.

This "on demand" service, by which provincial customers will be able to remain on the line while an operator establishes the call, will be provided by new International Control Centres (ICCs) set up in the provinces. International operators – the first to operate outside of London – will handle and control all the international calls in the area covered by their Control Centre but the switching and other necessary equipment will be housed in Wood Street, which in some cases will be several hundred miles away. Hitherto international switchboards and switching equipment have been housed in close proximity for operational and economic reasons. New techniques and equipment now make it economically possible to separate the switchboards from the exchange equipment they are using.

Wood Street has been planned to serve up to eleven ICCs. A centre in Glasgow capable of serving the whole of Scotland Northern Ireland, and Northern England will begin operating in mid-1973 and another at Leicester, serving the Midlands and East Anglia, will follow later in the year. The other provincial ICCs will come into service later.

Apart from its function of handling UK international telephone calls the Wood Street Centre will also enable London to meet its special responsibilities as one of the major centres for switching international traffic between the world's telecommunications routes. As such it provides facilities for automatically switching telephone calls between countries of Western Europe and the rest of the world and, when required to do so, between Western European countries. To do this Wood Street is equipped for a variety of standard national and overseas signalling systems.

When the new Centre was being planned it was decided to equip it with Plessey (ATE) 5005T crossbar switching equipment, used for the first time on international routes. Wood Street now has the largest installation of crossbar equipment in the country.

The international unit is basically similar to the crossbar units used in the national network. Calls are set up on the same "self-steering" principle by exploring for and marking paths through the switching matrix.

Information for the setting up of a call is received from the incoming circuit and passed via the Line Relay Group (LRG) for storage in an associated register. The register associates with a router control which seizes an incoming coder where the incoming information is examined and a signal sent which enables an outgoing circuit to be seized. The international unit is fully flexible and any one of the incoming circuits can be interconnected to any of the outgoing circuits on a four-wire basis unlike the majority of the crossbar systems in the national network which operate on the conventional two-wire basis.

One requirement of any International Telephone Services Centre is the preparation of bulk accounts covering calls made by British customers and calls from other countries passing through London, and the rendering of appropriate statements for mutual settle-

Wood Street seen through the eye of the 360 degree camera lens. Opposite page: The Call Progress Indicators, sophisticated fault-tracing equipment, scanned by TV cameras seen at the top of the picture. Top: The TV pictures appear on small monitor screens at the test consoles in the International Transmission Maintenance Centre. Bottom: The crossbar equipment which forms the heart of the Wood Street Centre. The shelves fold down to provide easy access to the wiring.

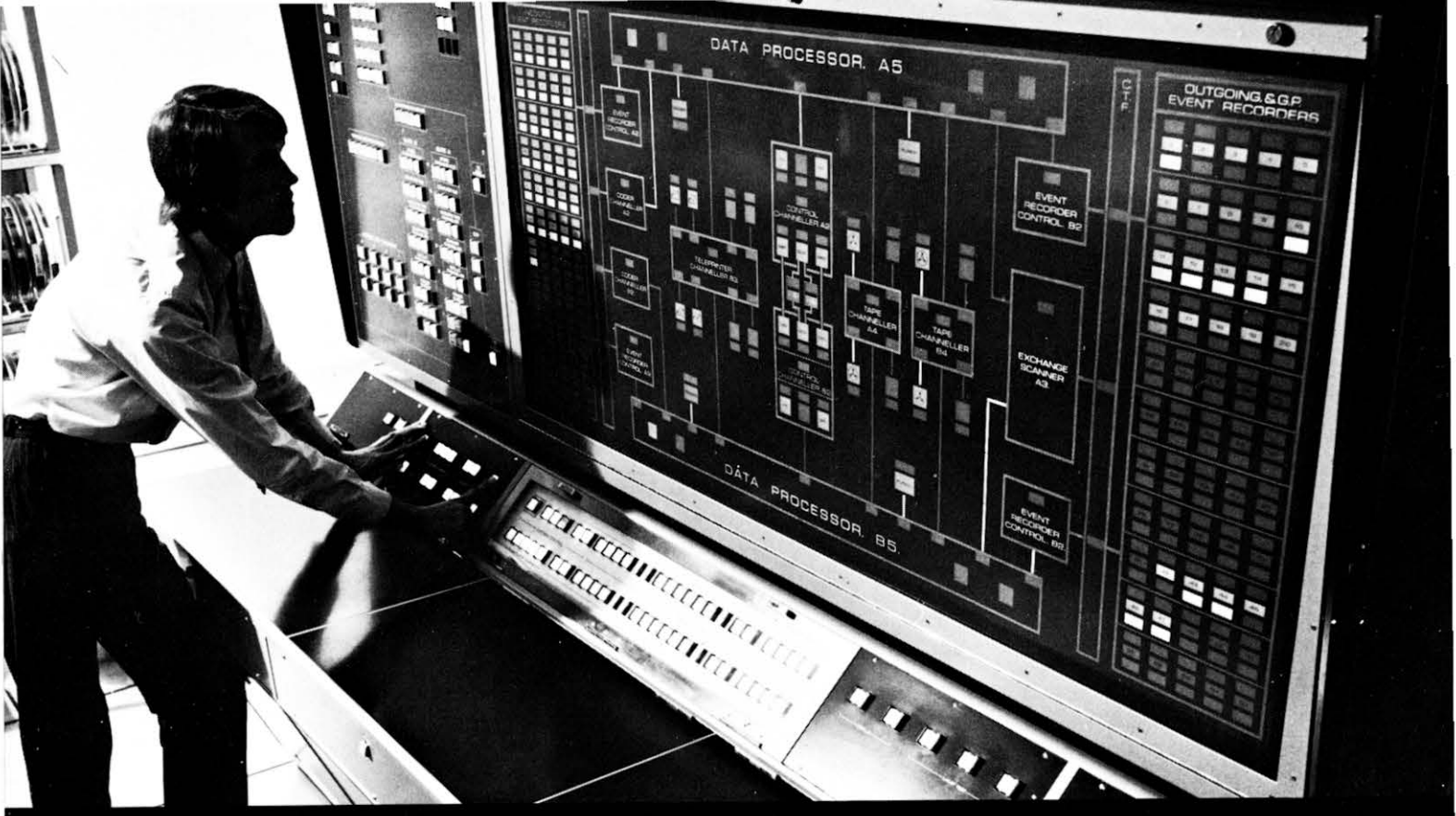
ment with foreign administrations. At Wood Street this function is carried out by the International Accounting and Traffic Analysis Equipment (IATAE) which is being used for the first time. It makes use of a computer which, linked to the switching equipment complex, provides information on the use of international circuits, routes and destinations for the clearing of international charges and at the same time provides much more detailed information than has previously been available on the performance of international exchange equipment and routes. The latter will be very useful for traffic management and maintenance purposes. For example IATAE can provide traffic loading data for selected routes at certain hours and compare this recorded data against a pre-assigned "norm". This "norm test" facility could give early warning of route failure and be an invaluable aid in ensuring maximum availability and efficiency of the high revenue-earning international circuits.

As the staff become increasingly familiar with the full potential of this new equipment as a maintenance tool, considerable use should be made of it as a maintenance aid.

Yet another advanced feature of the Wood Street complex is its International Transmission Maintenance Centre (ITMC). The ITMC introduces, again for the first time, a suite of test consoles at which technical staff will have a whole range of testing devices at their fingertips. From the consoles they will be able to keep a constant watch on live or test calls with regard to switching, transmission and signalling performance.

There are 15 such test consoles at Wood Street and the items of test equipment available are either individual to each console – such as oscillators, dB meters and psophometers – or are common and can be accessed from each console desk.

An example of the latter is the Call Progress Indicator (CPI), another maintenance aid which with its remote TV displays is being introduced for the first time at Wood Street. Simply put it is a



Above: The control of International Accounting and Traffic Analysis Equipment (IATAE). Computer-based, it provides an advanced service for the analysis of international traffic routing and the settling of costs between operating administrations in the world-wide network.

Right: The Test Jack Frame is a feature of the International Transmission Maintenance Centre at Wood Street and takes up one wall of the maintenance area. It contains "call in progress" lamps and attenuators for adjusting circuit levels in addition to break jacks.

device which allows all dialling and line signalling to be continuously monitored and faults observed as they occur.

The Call Progress Indicator, of which there are six at Wood Street, monitors and displays the timing of dialling and line signals on any selected circuit. The timing displays first appear on CPI equipment racks in the form of lamps. Each display contains up to 500 lamps arranged in configurations to suit the particular signalling system.

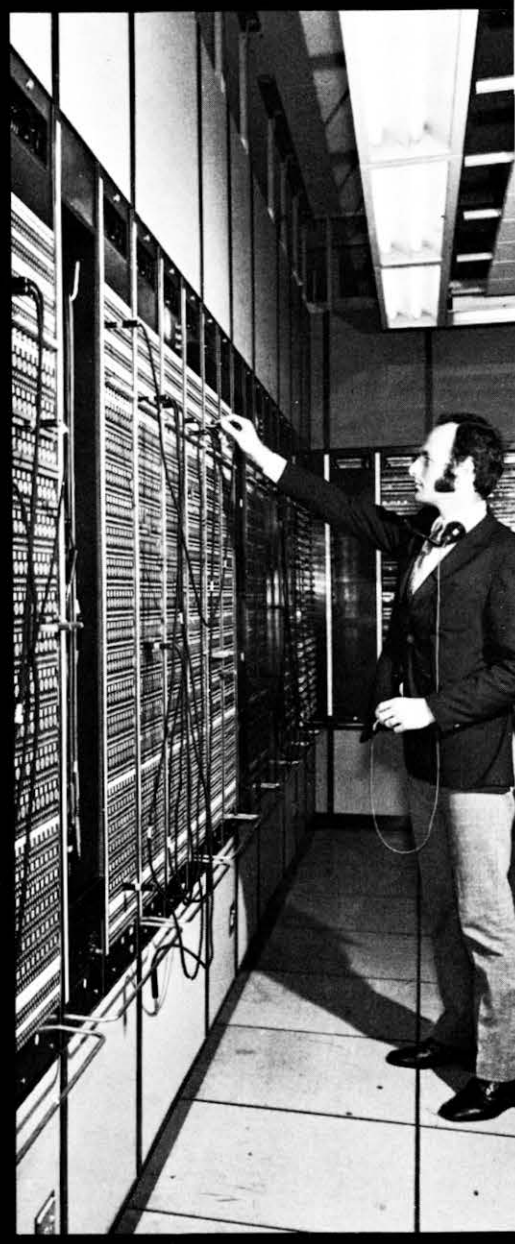
To make the information from the Call Progress Indicators available to the 15 consoles by conventional methods would have entailed the provision of complex and very expensive equipment on each of the console test desks. This problem was overcome by the adoption of closed-circuit television techniques. Television cameras set up above the CPI equipment racks scan the lamp displays and the pictures are reproduced on small (6·5 in) monitor screens built in to each of the 15 consoles. By simply depressing the appropriate button the test engineer can select any camera display he requires. By then comparing the actual signal timing shown on his monitor screen against permissible limits for the signalling system concerned valuable information is made available.

Finally, Wood Street houses two equipment installations which are additional to the planned complex.

The Post Office will take part in a field trial of an international signalling system along with certain other CCITT members and for this purpose equipment for about 40 circuits has been installed and connected to the main crossbar unit in Wood Street. The trial is being carried out on the computer-controlled CCITT No 6 system that could realise major economies in costs of signalling on large routes. If test results are satisfactory and suitable agreements can be reached, traffic could be carried on this equipment in 1973.

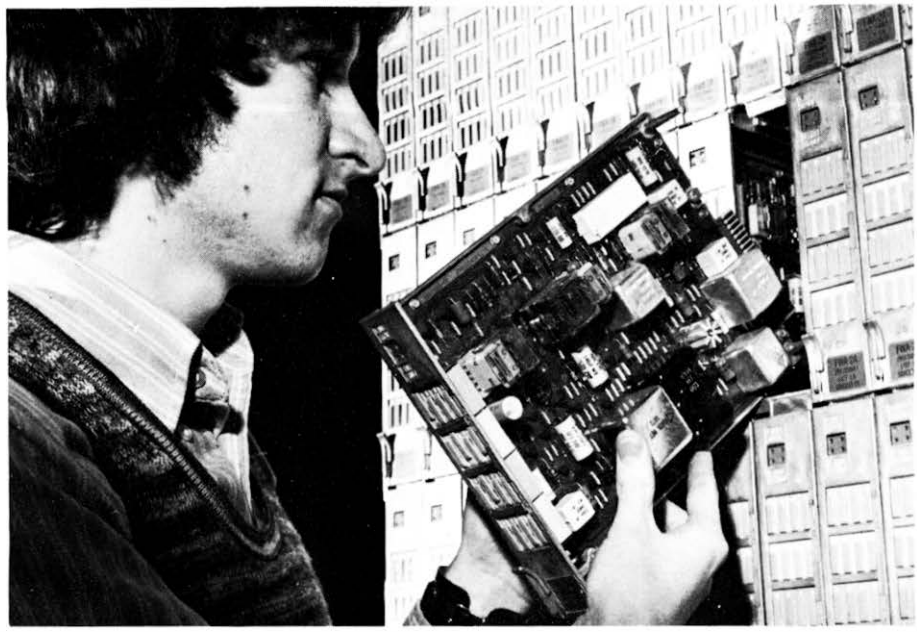
The Wood Street building also accommodates a small crossbar system Relief Unit providing some 100 circuits between London and North America. This equipment was purchased from Australia as an international exchange. It was flown over and installed during 1970 to provide a useful number of additional circuits at a time of critical shortage before the new equipment could be installed in Wood Street. (See Telecommunications Journal, Winter 1970.)

Mr E. T. C. Harris is an Assistant Staff Engineer in the Planning Division of International and Maritime Telecommunications Region and is concerned with the planning and purchase of international switching equipment.



SF SOLVES A PROBLEM

D R B Ellis



An engineer at Faraday international exchange checks one of the small printed-circuit units of the SF system equipment. A two-foot wide rack contains 132 of these units. Maintenance is simple and quick. A faulty unit is simply pulled out and immediately replaced.

THE NUMBER of telephone calls between Britain and the USA has been growing considerably for some time. More recently this growth has been stimulated by the extension of International Subscriber Dialling (ISD) for calls from this country to USA. The Britain-America ISD service was limited at first to calls between London and New York but it can now be used also by customers in the provincial Director Areas and calls can be dialled to the whole of the US mainland.

It was against this background that traffic experts in the headquarters of the External Telecommunications Executive (ETE) and in the USA calculated early last year that to cope with the expected 1972–73 growth in trans-Atlantic telephone calls would require so many extra circuits as to exceed the amount of equipment available to terminate them in London's Faraday and the newly opened Wood Street international telephone exchanges.

In itself this was a taxing problem, but other factors aggravated the situation. Because of the lead time for the manufacture of standard type equipment it could not be provided in the available time and the extra circuits had to be found, tested, installed and commissioned by March of this year if they were to be available for the 1972–73 traffic growth.

That a solution was found and equipment installed and operational three months ahead of the deadline says much for the skill and ingenuity of both the International and Maritime Telecommunications Region (IMTR) and Telecommunications Development Department staff and for the Anglo-American co-operation that existed throughout the search for an answer.

As a preliminary move, discussions were quickly arranged between the Post Office and the American Telephone and Telegraph Company (AT & T), who operate the international telephone service in the US, to examine a suggestion that we might use an alternative signalling system as a temporary measure – in other words could an inland trunk switching system from the national networks of either country be adapted for international working?

With this idea in mind as well as the March 1972 deadline Post Office representatives visited New York early in April last year and with technical staff from AT & T and the Bell Telephone Laboratories considered the compatibility of various British and American national signalling systems with the equipment in the other country's network. It became apparent that the only possibility of meeting the target date was to use the Bell single-frequency (SF) signalling system, the standard method of line-signalling used by AT & T for their national trunk network, for which equipment was reputedly available from stock from a number of American manufacturers.

Basically the SF system consists of a small printed circuit unit – 132 can be mounted on a rack only 2 ft wide – which converts loop-disconnect dc pulses to equivalent ac pulses (audio tones) of 2,600 Hz frequency, or vice versa, which are suited to the wideband high frequency speech routes used in international telephony.

The New York meeting agreed that these new circuits would be operated on a semi-automatic basis – this enables an operator in one country to dial direct to a subscriber in another country – and that each circuit would be used for unidirectional traffic.

Outgoing access from London would be by direct connection from the outgoing international manual board at Wren House by way of a sleeve-control loop-dialling relay set (dc pulses) into the SF unit terminated at the nearby Faraday Building and then (as ac pulses) out to line. In the US the circuits would be terminated in a Number Plan Area (NPA) toll exchange – equivalent to a British Group Switching Centre – where access would be given to the American national network. Incoming circuits would be connected from a US international manual board, the ac pulse signals being received in London on the SF unit, converted to dc pulses and passed forward to our inland network.

When the Post Office representatives returned to London they brought with them two SF units loaned by AT & T and immediately proceeded to set up tests on these and on typical loop-dialling relay sets of British design. Neither an outgoing nor an incoming relay-set design was available, however, to provide precisely the interface that was required between the standard international equipment and the new units. It was in solving this problem that the ingenuity of Post Office staff was put to the test.

The nearest suitable Post Office relay-

set designs were modified by Telecommunications Development Department to provide the necessary signalling-wire connections to and from the SF units and the register association and switchboard supervisory signals needed by the operators. Laboratory models of the circuits were constructed and tests proved the modified designs to be satisfactory.

In June tenders were sought from three American companies for the supply of one equipment rack and 132 SF signalling units. In the event the earliest delivery offered was a mere three months, but even this meant that the target date for completion could not be achieved. AT & T then stepped in and offered equipment intended for them so as to give us earlier delivery. An order was placed in August and by the beginning of September the equipment had arrived by air-freight.

Immediately, construction of the loop-dialling relay-sets went ahead. The relay sets for the outgoing circuits were made by the Post Office Factories Division and the relay sets for the incoming circuits, constructed by the cannibalisation of various surplus equipment from all over the country, were made by staff of IMTR Telephone Manager's Office.

There was one more problem however – a shortage of echo suppressors which are required on the international circuits. The answer was to recover from a Stores Depot a quantity of suppressors which had been sent there as obsolescent equipment. These were refurbished before reinstallation.

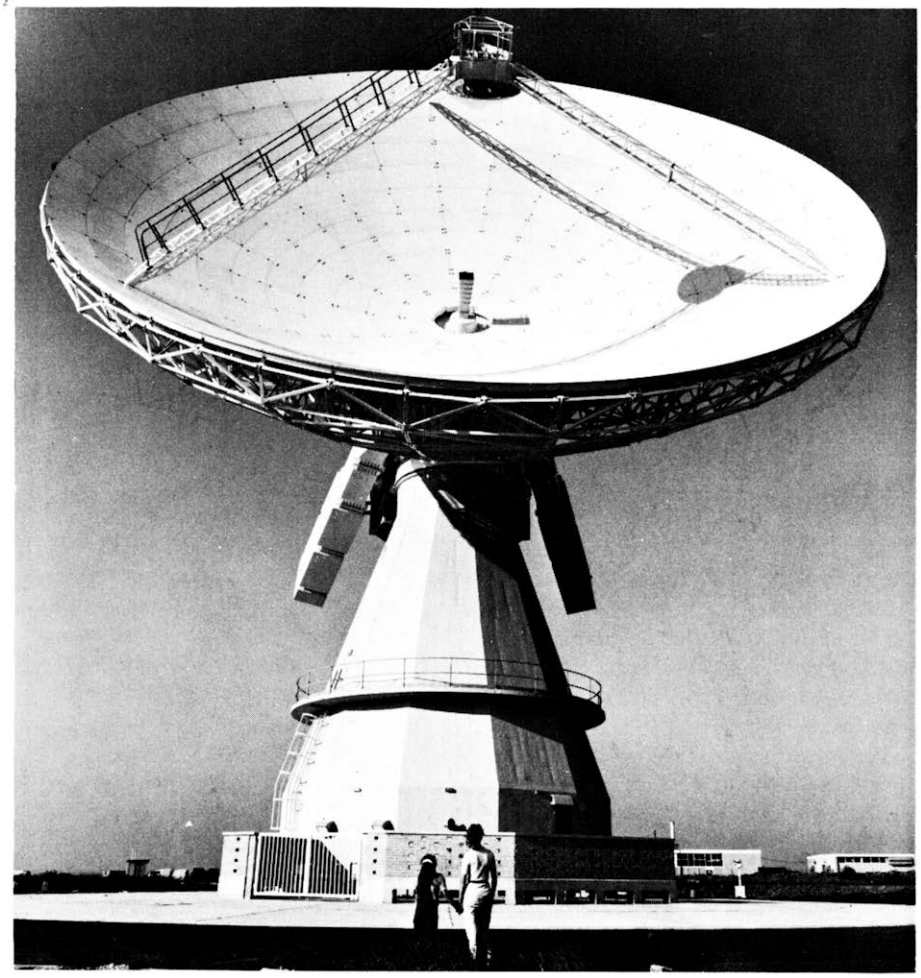
The first of the new circuits was brought into service by mid-November last year and by 22nd December all 132 SF circuits were in use and available to carry the peak Christmas and New Year traffic.

Circuits between Britain and the USA then totalled 498. As a result of this increase it was found possible to re-arrange access to routes to give a much improved service for both ISD and operator-controlled calls to the US.

It is interesting that with the additional circuits connected as a result of these expedients and with the extension of ISD to the whole of the American mainland and from the UK provincial Director exchanges, the ISD traffic to America during the Christmas period of 1971 increased by a phenomenal 885 per cent compared with the corresponding period in 1970.

Mr D. R. B. Ellis is Controller Project and Works Division, International and Maritime Telecommunications Region. He played a leading part in the London and New York meetings which led to the decision to introduce the Bell SF System.

Enter Goonhilly 3



The new Goonhilly 3 aerial.

The Post Office's Satellite Communication Earth Station on Goonhilly Downs, Cornwall, has become the world's first to operate simultaneous commercial service through three satellites. This record was achieved when the station's new £2¼ million aerial came into service carrying traffic direct between the UK and Jamaica and Trinidad. The advent of Goonhilly's third aerial also makes the Cornwall station the largest in Europe, and probably the busiest.

The 97 ft dish aerial of Goonhilly 3 is locked on to the Intelsat IV F2 satellite over the Atlantic and will ultimately provide 1,800 circuits for calls to the Americas, Africa and the Middle East.

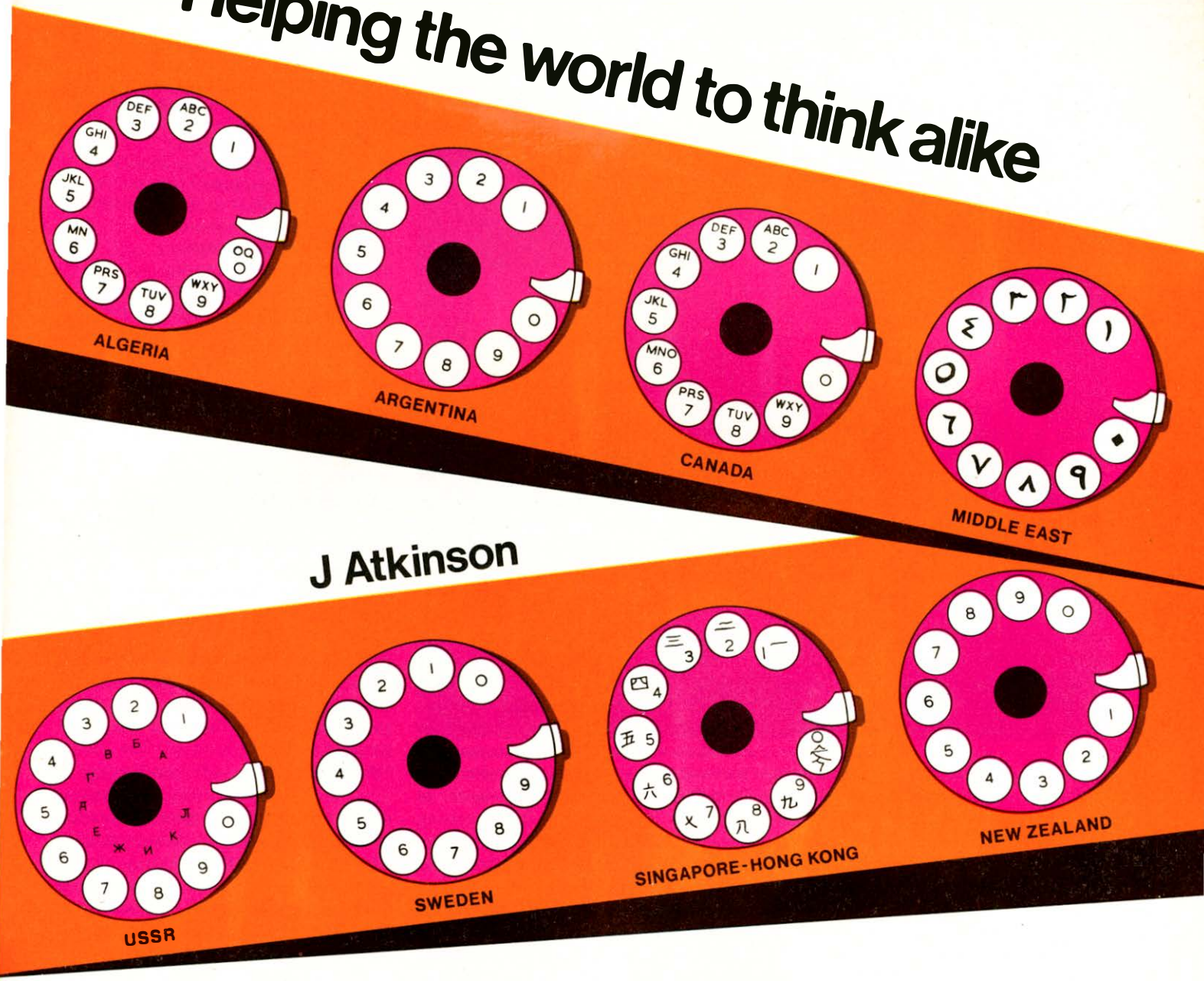
Goonhilly 1, the station's first aerial which came into service in 1962 and which provided the basic pattern for most of the world's earth stations, is now working to the Intelsat IV F5 satellite over the Indian Ocean and is giving service to the East as far as Australia.

Goonhilly 2, which has been operating since 1969, links Britain with the New World, the Middle East and North Africa through Intelsat IV F3, the other Atlantic region satellite.

About half the heavy satellite traffic to North America will continue to be routed via Goonhilly 2; the other half and smaller routes will be transferred to Goonhilly 3. By sharing the important North American service between the two aerials a greater security of service will be achieved.

The new aerial comes into service at an appropriate time – the 10th anniversary of the start of the Goonhilly Downs station for the launching of Telstar 1, the first "active" communication satellite.

Helping the world to think alike



J Atkinson

In December the International Telephone and Telegraph Consultative Committee (CCITT) holds its fifth Plenary Assembly in Geneva. Many people in the Post Office have heard of CCITT and are aware that it is connected with the International Telecommunications Union, but far fewer have any idea of how it works or of the significance of its activities to the Post Office. Illustrated here, for example, are just a few of the number of different telephone dials which exist throughout the world. It is one of the tasks of CCITT to help bring about their standardisation.

THE INTERNATIONAL Telecommunications Union (ITU) is the United Nations Specialised Agency for international telecommunications. All UN members are eligible to join it and at the present time there are 142 members. For the United Kingdom the Ministry of Posts and Telecommunications is the administrative member.

The main purpose of the ITU is to foster international co-operation and promote the development of technical facilities for the improvement of telecommunications services of all kinds.

CCITT (International Telephone and Telegraph Consultative Committee) is one of the four permanent organs of the Union, the other three being the General Secretariat, responsible for administration and finance, IFRB (International Frequency Registration Board) and CCIR (International Radio Consultative Committee). The two consultative committees are separate bodies set up to deal with technical telegraph and telephone problems and technical radio problems. CCITT dates back to 1925 when two committees were set up to study the complexities of the international telephones and telegraph services on a more regular basis than had been possible before. These committees became known as the International Telephone Consultative Committee (CCIF) and the International Telegraph Consultative Committee (CCIT). They were merged in 1956 to form the CCITT, whose terms of reference are to study technical, operating and tariff questions relating to international telegraphy and telephony and to issue recommendations or agreements on them. Despite the great technical and scientific changes that have occurred in telecommunications, the terms of reference have remained virtually the same since 1925.

All member countries of the Union are entitled to participate in the work of CCITT along with certain recognised private operating agencies (RPOA), such

Over the years push-button telephones will be used more and more throughout the world. It is preferable that international agreement be reached on the layout of the push-button keypads. The photograph shows three of the telephones which were used by staff at the Post Office Research Station, Dollis Hill, in subjective experiments related to the international standardisation of 16-button keyphone layouts. The experiments were conducted on behalf of CCITT Study Group 2.

as the Post Office is now. The CCITT holds a Plenary Assembly every 3–4 years. The Assembly draws up a list of formal questions on technical subjects and assigns them to Study Groups which consist of representatives of Administrations and RPOAs, and experts who are members of scientific or industrial organisations which have been approved by the respective Administration. Experts can only act in an advisory capacity, and can be excluded from the meeting at the request of the other representatives, for example when certain tariff questions are being considered.

Each Study Group has a Chairman and a Vice-Chairman who are appointed by the Plenary Assembly to direct the work. The Post Office at present provides Chairmen for three of the Study Groups – Group 6 (cable sheaths), Group 16 (telephone circuits) and Special A (data transmission) – and a Vice-Chairman for Group 1 (telegraph operation and tariffs).

One of the most respected figures in international telecommunications will be missing from the fifth Plenary Assembly of CCITT. Monsieur Jean Rouviere, Director of CCITT since 1956, died in July after a short illness. The following message was telegraphed to Geneva by Mr Edward Fennessy, Managing Director, Telecommunications: "My colleagues and I in the United Kingdom Post Office learn with deep regret of the death of Monsieur Jean Rouviere. We wish to extend our sympathy to all who are affected by his loss and to acknowledge his wise and statesmanlike leadership of the CCITT since its formation in 1956. His term of office coincided with the great expansion of world-wide telecommunications and the consequent increase in the scale and scope of the work of CCITT. His contribution to the establishment of the CCITT as a truly international body will always be recognised."

The work of the Study Groups is done by correspondence and periodic meetings. The number of meetings held by each group between Plenaries will vary considerably, depending on the volume and nature of work to be done and the progress made. Each will draw up draft recommendations on questions in hand and these are submitted to the Plenary Assembly for approval. If the Assembly adopts these recommendations, they are published and made available to manufacturers of equipment as well as members of the ITU. These recommendations are for guidance only and are not formally binding but are used as standards to work to by operating agencies and manufacturers and designers of equipment throughout the world.

There are 19 Study Groups, 5 Plan Committees, 3 Special Autonomous Working Groups and 11 Joint Working Parties at present, although this number may well change in December as the Plenary Assembly has the power to create or disband study groups etc as required. The Post Office is represented on all of these groups with the exception of the Regional Plan Committees and tariff groups for Africa, Asia and Latin America.

The Special Autonomous Working Parties known as GAS groups were set up primarily to deal with documentary questions of special interest to new and developing countries. The Plan Committees are concerned with the development of a general plan for the international telecommunication network. The Study Groups deal with topics such as data transmission, PCM, maintenance, telephone and telegraph operation and tariffs etc. The Joint Working Parties deal with questions which are common to more than one Study Group.

These Study Groups have been working in the current study period on some 300 questions, dealing with such diverse topics as automatic service observations, facsimile transmission, synchronization of digital networks and the revision of the Telegraph Regulations.

The Post Office has 76 representatives on these Study Groups and Joint Working Parties. Many of them work on more than one group due to the inevitable overlap of work and there are of course many more people engaged on support work. The representatives are drawn from several Departments, but Telecommunications Development Department has the primary interest, providing 50 per cent of the total number.

Post Office costs of participating in CCITT are substantial; they are made up of our contribution to the running costs of CCITT, a proportion of staff salaries and travelling and subsistence etc in attending meetings. However, a number of advantages accrue to the Post Office. Technical recommendations and standards having world-wide acceptance are an essential foundation for the profitable international telecommunications services. Conformity with a CCITT Recommendation in a Post Office specification can save much time and hence money because a standard product with export potential can be supplied. Recommendations cover the quality of connections, standards of transmission, noise; this sets convenient objectives for the standards offered to customers. Having uniform testing methods and testing equipment in use on international services by member countries also saves duplication of effort. Moreover, active participation in CCITT gives an opportunity to shape the international service of the future and to match it with national objectives. Questions at present under discussion will set the standards for the future in areas such as new networks for data transmission, the planning of digital systems and their introduction into existing analogue transmission networks, and viewphones.

It is impossible in the space of this

short article to give even a brief resumé of the progress that has been made by each study group over the current study period. Just a few of the recommendations that will be submitted for approval in December, however, will illustrate the wide range of topics that are under discussion by Post Office representatives.

On data transmission, recommendations have been drafted on acoustic coupling on eight-phase modems for leased lines and for 2,400 bit/s and 4,800 bit/s on the general switched telephone network. The new data networks party has prepared a recommendation on the interworking between synchronous data networks dealing with the requirements of both terminal and transit continental and intercontinental traffic. Simplified Telegraph Regulations have also been drawn up and the Plenary Assembly is expected to support a proposal that a world administrative telephone and telegraph conference should be called in 1973 to authorise the changing of the existing regulations.

The special Group set up at the last Plenary Assembly to study Pulse Code Modulation systems has reached agreement on the encoding of analogue signals and the principal characteristics of primary and second order multiplex equipment.

Study Group 12 has made good progress in objective methods of testing telephone instruments and the subjective effect of crosstalk. Both these will react on the design of future telephone sets. Group 16 has clarified various echo and stability aspects of world-wide connections. On the transmission systems side the principal areas where progress has been made are in the standardisation of characteristics for program circuits, requirements in respect of 60 MHz systems, particularly the parameters of cables and the lightning protection of equipment.

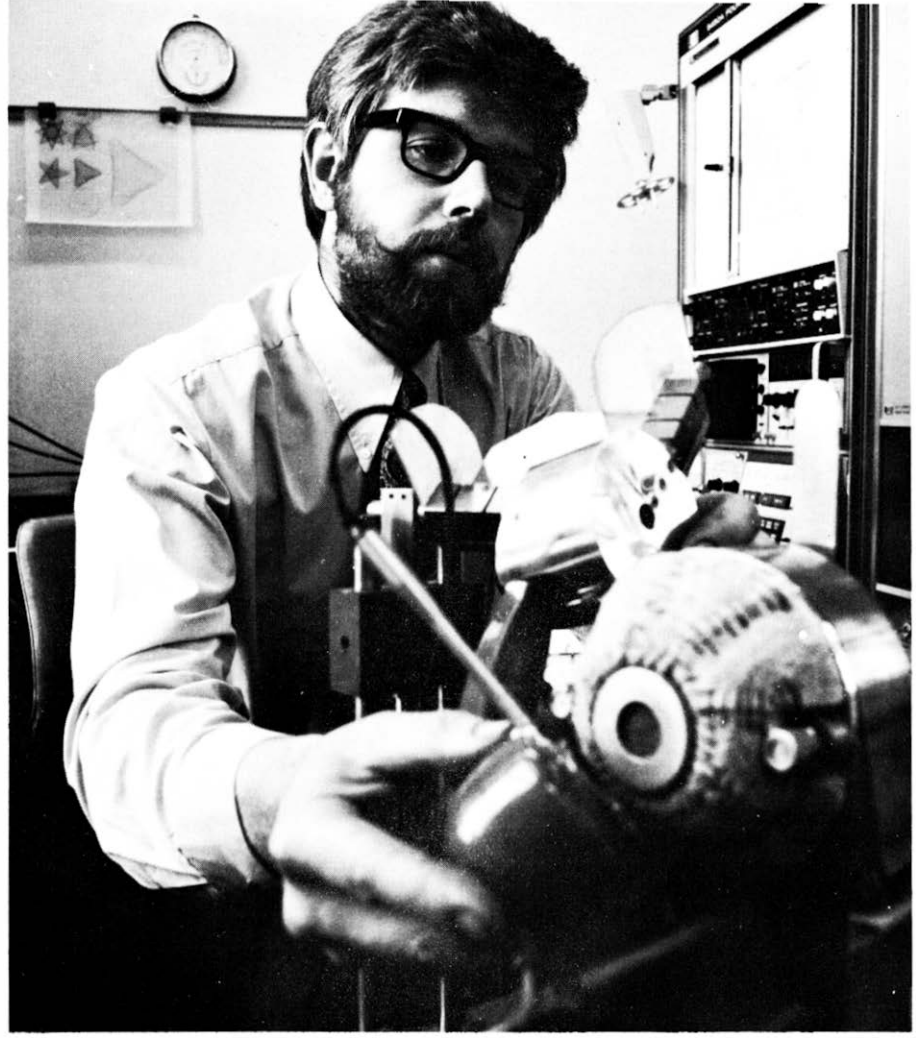
Study Group 2 has been working on international accounting and has reached agreement on the introduction of the minute as the conversation time unit and drawn up provisions for the flat rate remuneration of administrations. Another of the topics covered by this study group through its human factors working party is push-button telephones, an area of particular interest to the Post Office at present. Discussions are under way on specifications of 16 push-button keyboards for telephone sets and a questionnaire for customer surveys.

The tariff Group for Europe has completed its work and will be making proposals for new tariff standards.

On the signalling side, recommendations have been prepared on the interworking of various signalling systems and agreement has been reached on the definition of the characteristics of a signalling system for demand assignment satellites. A draft specification has been prepared by Study Group 13 of a computer program for planning the international telephone network; recommendations have also been prepared on traffic forecasts and the grade of service.

A number of informative texts have been prepared on protection such as handbooks on protection against atmospheric discharges, on earthing systems and on the impregnation of wooden poles. Work is currently under way on a booklet on the jointing of plastic and metal/plastic sheaths and it is hoped that the Plenary will approve the proposal to introduce a new question on jointing machines.

On the maintenance side, provisional approval has already been obtained for recommendations on Automatic Transmission Measuring Equipment for telephone-type circuits and sound program circuits. This was obtained under a new procedure whereby provisional approval can be given to a recommendation between Plenaries providing sufficient support is obtained from Member Administrations. This procedure was introduced in an effort to speed up the work of CCITT. Criticism is sometimes levelled against CCITT for the length of time that is required in obtaining international agreement; an *ad hoc* working party reporting to the Plenary Assembly has been set up to consider new working methods. With technology advancing so rapidly, it is essential that agreements on technical matters are reached and implemented quickly. But they must be correct and useful. It is no easy task though to reach world-wide agreement of lasting value on many of these topics, particularly since the field of interest covered is continually expanding. With so many vested interests and differing opinions to take into account, it is sometimes surprising that agreement is reached at all. It should not be overlooked that despite such difficulties the present ability to provide a world-wide telephone telex and telegraph service rests on work that has been done by CCITT and its predecessors.



A research worker at Dollis Hill studies the way sound is conveyed from the earphone to the ear. Tests of this kind are necessary to standardise transmission conditions internationally.

Mrs J. Atkinson is an Executive Officer in Telecommunications Development Department and is responsible for liaison between the Post Office and CCITT headquarters in Geneva.

MISCELLANY

A world first

A £3 million order for mobile electronic telephone exchanges – believed to be the first of their kind in the world – has been placed by the Post Office in an effort to cut back the waiting list for telephones. Between 30 and 40 of the mobile exchanges, capable of providing service to a total 45,000 customers, are to be supplied by Plessey Telecommunications. It will be a mobile version of the TXE2 exchange housed in caravan-type trailers.

Delivery will begin in May next year and all will be ready for service by September 1974. The exchanges will be moved around the country on low-loader vehicles. Once on site they can be brought into service in about six weeks.

The Post Office already has an extensive fleet of conventional-type mobile exchanges which deal with up to 400 customers each. The new electronic exchanges are considerably bigger – 25 will have a capacity of 1,000 lines each and 10 of 2,000 lines each.

The electronic units can be used to augment service at most types of telephone exchange, but two major uses are planned. The first is to bring immediate relief to areas, particularly in towns, where the waiting list is large. The exchanges will also be used as a temporary replacement for a permanent exchange which is being re-equipped or refurbished. This will speed re-equipment programmes and avoid interrupting service while work is in progress.

At present the Post Office has 250 conventional mobile exchanges. Another 350 units – including the new electronic types – are now on order and when these come into service over the next three years about 200,000 customers will be connected to the telephone network by mobile exchanges.

Transportable electronic exchanges will use normal TXE2 equipment mounted on racks of the same width and depth as standard racks, but only 8 ft 1½ in high (standard rack-height is 10 ft 6 in).

A 1,000-line exchange will be housed in two 27 ft long trailers: a line and switching trailer housing line units, A, B, C and D switches, supervisory relay sets, meters, distribution and trunk connection frames and a control trailer with the control equipment, registers and power plant, with batteries providing 10-hour standby; it will also have a workbench and test equipment.

A 2,000-line exchange will comprise two line and switching trailers and one control trailer, with five-hour battery standby.

Record cable

A new telephone cable containing 28 coaxial tubes – 10 more than in any cable previously ordered by the Post Office – is to be laid this year to link the Southbank and Faraday repeater stations in London. Each tube, only 4.4 mm in diameter, will be equipped with 14 4 MHz line systems and will have a capacity of 960 circuits. Total capacity of the cable will be 13,400 circuits. It is to be used for a large number of trunk routes serving central and outer London and for trunk routes between other places but which pass through London.

A mobile telephone exchange is hitched to the vehicle which will take it to an area where extra exchange lines are urgently needed. It is one of a new fleet of mobile exchanges which are being distributed throughout the country. See "A world first".

Better service

To improve the standard of service to the million people who call the Directory Enquiries (DQ) service in London each week an extra DQ number is to be introduced from November. The new number (142) will be used for enquiries about telephone numbers within the London Postal Area. For numbers elsewhere in the UK or the Republic of Ireland callers will continue to dial 192.

The scheme affects only those people using 01-telephones. However, if the system is successful in London the Post Office will consider extending it to the remainder of the country.

The two-code system comes in the face of a rapidly growing demand for directory enquiries, when at the same time the sheer physical task of placing all directories within reach of an enquiry operator is becoming impossible. There are now 62 telephone directories containing nine million entries – and they are growing by one million entries a year. Extensive research into the application of all available techniques has shown that the two-code system is the best current solution to this problem.

A Post Office spokesman said: "At a cost of £2½ million, London deals with more than a quarter of the 200 million directory enquiry calls made nationally each year. Demand has never been greater and action now is essential if the service is to be safeguarded in the future".

With the rapid growth of the telephone system the number of calls to directory enquiries is expected to double within the next few years.

Conferences

Two major international telecommunications conferences were held in London and Brighton during the Summer.

Representatives of 32 countries and the British overseas territories attended the ninth meeting of the Commonwealth Telecommunications Council in London in July.

The Council achieved a long-standing objective by agreeing the essential features of a new accounting scheme which will cover, for the first time, all the telecommunications services between the member countries whether operated by satellite, cable or radio.

Plans for the further development of the Commonwealth's telecommunications

network were also discussed, together with improvements in its operation, maintenance and utilisation.

The telephone working group of the 26-nation Conference of European Postal and Telecommunications Administrations (CEPT) met at Brighton.

Delegates discussed the development of international subscriber dialling, the international exchange of information about telephone numbers, arrangements for telephone calls to ships at sea and emergency plans in case of a failure of a main telephone route in Europe.

The conference was organised by the External Telecommunications Executive of the Post Office.

Lecture tour

Director of Research, Mr John Bray, delivered the 21st Bernard Price Memorial Lecture in South Africa – one of the leading events in that country's scientific calendar. He is the first British Post Office representative to do so.

Mr Bray, who was invited by the South African Institute of Electrical Engineers, took as his lecture theme "Evolutionary Telecommunications and Ecological Man" in which he examined the potential impact of advanced telecommunications systems on man's environment – in particular the way that telecommunications could radically change city and suburban life.

In a busy three week programme Mr Bray delivered lectures at the universities of Witwatersrand, Pretoria, Durban, Natal and Capetown and visited South Africa's National Institute for Telecommunications Research, National Electrical Engineering Institute and the National Physical Research Laboratory.

Honoured

Mr Richard Stevens, Head of the Telecommunications business Design Division, has been appointed President of the Society of Industrial Artists and Designers. The Society is the leading association of professional designers in the UK and the largest in the world. Mr Stevens is the business's first full-time adviser on design and played a leading part in the design of the studios and reception suites for the Confravision Service – the world's first system for inter-city conferences by television.

● Mr C. C. Farrow, a senior executive with Plessey Telecommunications, has been elected Chairman of Council of the Telecommunication Engineering and Manufacturing Association Limited (TEMA).

Printing award

The Stationery Office has won the 1972 "Printing World" Award for the best computer - assisted photocomposition with an entry containing specimen pages from the Peterborough telephone directory.

The new process, used to compile, update and print the 27 million directories distributed each year, was developed jointly by Post Office Telecommunications and HMSO. Next year the process is to be extended to the printing of the Yellow Pages books, beginning with the Stoke directory in January.

New chief

Mr Alex Reid (31) is the new Head of the Long Range Studies Division of Telecommunications Headquarters. As Director of Communications Studies at London University, Mr Reid has already been conducting research into the effectiveness of new person-to-person telecommunications systems – part of a major study commissioned by the Post Office and the Civil Service Department. In the course of this research Mr Reid has worked for short periods at Bell Laboratories, USA, and at Bell Northern Research, Canada. He has given papers at a number of international conferences and has acted as a consultant to the National Academy of Engineering Committee of Telecommunications (Washington) and the Sloan Commission on Cable Communications (New York).

Tall order

Orders for the supply of 33 telephone pole erection units are soon to be placed with British companies.

The orders, which will be worth several hundred thousand pounds, will be the result of Post Office encouragement of British industry to take part in joint development of British-made components for the units. Until now they have been supplied on British chassis but fitted largely with American or Canadian-type hydraulic components for drilling holes and for erecting and removing poles.

The Telecommunications business has a fleet of 124 pole erection vehicles. The new units will be used to increase the fleet and to replace some of the older units.

Olympic link

The Olympic Games created such a demand for extra television capacity that a temporary link had to be provided between Britain and Europe. The extra microwave-radio route spanned the Channel near Folkestone and linked the Post Office station at Tolsford Hill with the French broadcasting authority's mast at Fiennes. The route carried only television pictures from the Olympic stadium in Munich.

The Post Office's cricketing information service widened its coverage this summer to include the Gillette Cup semi-finals and the three one-day international matches between England and Australia. For the Cup matches announcements were updated every 15 minutes.

Winter dates

The Postal and Telecommunications Society has arranged the following lectures for its 1972-73 season – November 15, Maintaining the Largest Motor Transport Fleet in the World; January 10 1973, Design in Post Office Telecommunications; February 14, Mechanising the Mails; March 14, Building for a Purpose. The Society meets at 5.15 pm in the Assembly Hall, Fleet Building, London.

The following informal meetings will be held at London Telecommunications Region headquarters throughout the Winter months at 5 pm – November 8, Computer Power Just for You; December 7, Pulse Code Modulation and Digital Transmission Systems; January 2 1973, Behind the Scenes at Martlesham; February 7, Post Office Health, Welfare and Safety Services; March 8, The TXE4 Electronic Telephone Exchange.

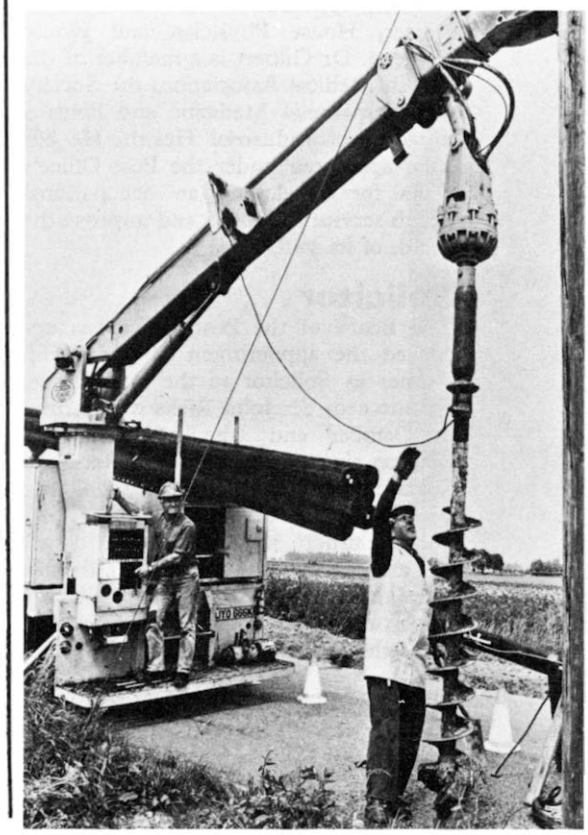
Directories

All new telephone directories are to contain a full page of postal information. To help customers pick the right enquiry point at a glance local post office addresses and telephone numbers will be brought together on the page which will also contain descriptions of the most useful facilities. The new Cambridge Area directory was the first to contain the postal information page and others will appear with the new entries as they are reprinted.

Contracts

Pye Telecommunications Ltd – £1.5 million for microwave systems. Four systems, in the 6-11 GHz bands, are in the process of manufacture or commissioning, the remainder having been taken into Post Office service. The first two

A prototype pole erection unit on trial. See "Tall order".



systems completed were the Plymouth–Caradon Hill and Bristol–Penhill links which are now carrying BBC and ITV colour television programmes. Similar systems, carrying telephony with TV capability on the protection channels, are being installed between Barrow and Lancaster and Hull and Leeds. To help meet the expanding demand for international circuits equipment has been supplied for a system between Exeter and the Goonhilly Satellite Earth Station in Cornwall and another link is to be provided between Plymouth and Goonhilly. Another system will give the new Post Office Research Centre at Martlesham access to the main trunk system. Each of its four channels will be capable of carrying either a 960 circuit telephony or a colour video signal.

Ferranti – Following full stability tests the Post Office has accepted the company's microwave equipment linking the Scilly Isles with the mainland. The system will provide up to 300 telephone channels between St Mary's, the main island in the Scillies, and St Just in Cornwall. The other islands with telephones will be served over existing Post Office cables.

Plessey Telecommunications – £600,000 for the supply of nine TXE 2 telephone exchanges and extensions for others.

Doctor . . .

Dr Peter Gilbert (49) has taken up his appointment as Principal Medical Officer, Telecommunications. He has been a Senior Medical Officer in the Civil Service Department since 1962, on loan to the Post Office as a Medical Adviser. He was in general practice for some years and held appointments as Senior House Officer, House Physician and House Surgeon. Dr Gilbert is a member of the British Medical Association, the Society of Occupational Medicine and holds a Diploma of Industrial Health. He has been appointed under the Post Office's plans for developing an occupational health service to protect and improve the health of its staff.

Solicitor . . .

The Board of the Post Office has approved the appointment of Mr Philip Turner as Solicitor to the Post Office. He succeeds Sir John Ricks who retired in October and who had held the position since 1953. Sir John joined the Solicitor's Department in 1935 and became Assistant Solicitor in 1951.

Mr Turner joined the Solicitor's Department in 1935 and, apart from a short time with the Treasury Solicitor's Department, has spent his professional life with the Post Office.

Adviser

The Minister of Posts and Telecommunications, Sir John Eden, has appointed Mr Robin Hutton as his Special Adviser. Mr Hutton will be concerned with the Ministry's functions in relation to Post Office finance and capital investment programmes, including those for expanding and developing the telephone system and reducing the waiting list for telephones.

More calls

A total of 459,361,800 trunk calls was made by Britain's telephone users during the three months to the end of June this year – an increase of 13.6 per cent on the same period last year. Customers dialled 82.8 per cent of the calls themselves, on STD. In the six months to the end of June 7,500 new circuits were added to the trunk system taking the total trunk circuits in service to 114,563.

Dialling Canada

About three million telephone users in Britain's six main population centres can now dial their calls direct to 130 million telephone numbers in the greater part of the North American continent – from the US-Mexico border to the Arctic Circle.

This has been made possible by the extension of International Subscriber Dialling (ISD) to Canada. For more than a year customers in London, Birmingham, Manchester, Liverpool, Edinburgh and Glasgow have been able to dial direct to the whole of the US – Hawaii and Alaska excepted.

It is less than 10 years since the first ISD link was established between London and Paris. Last year of the 23 million international calls made from the UK 15 million were dialled direct by customers.

Forum

A conference 'The teaching of electronic engineering in degree courses' is to be held at the University of Hull from 11–13 April next year. The conference aims to provide a forum for both academics and industrialists to exchange ideas about teaching methods, course content, admissions criteria and employment prospects for students.

Premium award

Mr D. L. Richards of the Post Office Research Department, Dollis Hill, has been awarded the Marconi Premium by the Council of the Institution of Electrical Engineers for his paper 'Loudness ratings of telephone speech paths'.

BOOK REVIEWS

Transistor Circuits in Electronics
by S. S. Haykin and R. Barrett

Published by Butterworths
£2.50 limp, £3.80 cased

This is the second edition of a book aimed at degree, HND and HNC courses in electronics and telecommunications. Although the authors disclaim its role as a text book on circuit design, the book will be useful to the engineer as a comprehensive introduction to transistor circuitry in both linear and non-linear (switching) modes of operation. Dr Haykin is Professor of Electrical Engineering at McMaster University, Hamilton, Canada; Mr Barrett is Principal Lecturer in Electrical Engineering at Hatfield Polytechnic.

The first three chapters in the book, on junction transistors, deal with transistor characteristics, graphical analysis of transistor circuit elements and small-signal equivalent circuits and parameters at low and high frequencies. The main body of the book deals with amplifier and oscillator circuits and with switching and logic circuits and circuit-elements. The book concludes with chapters dealing with modulation processes and circuits and with an introduction to the planar process types and to construction of silicon integrated circuits.

The book gives a sound and thorough treatment of the fundamentals of transistor circuits. **MBW**

Signals and Information
by C. C. Goodyear

Published by Butterworths
£2.80 limp, £4.20 cased

This book is offered as a background of communication theory at final-year undergraduate level to students specialising in telecommunications. With the broadening of the field of study of transmission beyond traditional line and radio propagation and frequency-division multiplexing for telephone speech transmission it becomes necessary for telecommunications engineers to consider the properties of the signals that have to be carried, how they are affected by the characteristics of the available channels and how they may be adapted and modified to suit these channels. The book deals concisely and clearly with many of these problems on the basis of the mathematical background appropriate to the final year of an academic course and provides a good theoretical foundation.

After a short introduction, the second, third and fourth chapters deal with the "description" of signals through the use of the Fourier series and Fourier transform, leading to energy spectra and the response of filters, then to the use of these techniques to the analysis of band-limited channels, frequency-conversion and classical modulation theory. Chapter five, a useful introduction to probability and statistics, leads naturally into the final four chapters dealing with noise and its effect on signals, channel capacity and coding. **MBW**

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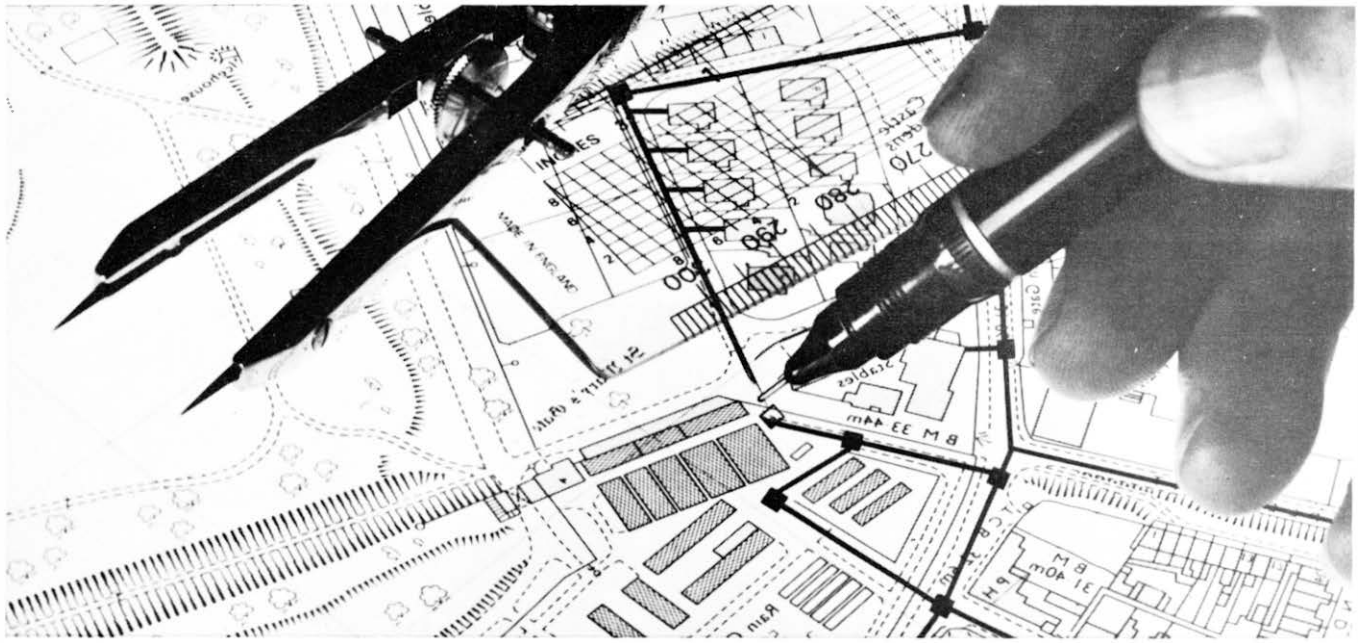
telecommunications statistics

	1971–72		1970–71		1969–70	
	Result	% growth over 70–71	Result	% growth over 69–70	Result	% growth over 68–69
TELEPHONE SERVICE						
Size of system						
Total working connections	10,028,158	8.8	9,214,499	7.8	8,550,806	8.7
Total working stations	16,157,467	7.9	14,978,751	7.3	13,958,826	8.1
Call office connections	75,905	0.1	75,799	0.6	75,321	0.3
Shared service connections	1,883,893	9.8	1,716,496	9.7	1,564,748	8.5
% of connections on auto exchanges	99.0	0.2	98.8	0.3	98.5	0.5
Growth of system						
Net demand for connections	1,442,917	32.3	1,089,940	−1.5	1,106,238	37.6
New supply of connections	1,297,068	19.5	1,085,238	4.2	1,041,535	26.8
Waiting list	217,975	79.8	121,266	12.0	108,238	23.8
Penetration						
Stations per 1,000 population	289	7.0	270	6.7	253	8.1
Traffic (in millions)						
Inland effective trunk calls	1,699	12.0	1,517	12.2	1,352	12.8
Inland effective local calls	10,330	11.9	9,230	11.6	8,270	11.5
Continental: outward calls	18.79	13.6	16.54	16.4	14.21	18.7
Inter-continental: outward calls	3.44	52.9	2.25	60.7	1.40	13.8
Telephone usage						
Calls per connection	1,253	3.4	1,212	3.2	1,174	3.6
Calls per head of population	217	13.0	192	11.0	173	10.2
Exchanges						
Local manual	68	−26.5	86	−22.1	105	−34.3
Local automatic	6,100	0.6	6,065	0.5	6,033	0.6
Local electronic	197	121.3	89	287.1	31	158.3
Local crossbar	80	135.3	34	209.1	11	266.7
Automanual and trunk	371	−1.6	377	0.5	375	−1.9
TELEX SERVICE						
Total working lines	37,774	14.7	32,945	13.0	29,147	13.4
Metered units	353,534,000	9.4	323,257,000	25.0	258,505,000	5.1
External originating traffic	28,841,000	14.3	25,210,000	23.4	20,430,000	18.5
TELEGRAPHY SERVICE						
Inland telegrams	6,847,000	2.7	6,669,000	−17.9	7,862,000	−2.3
External telegrams: UK originating	7,051,000	4.8	6,730,000	−12.6	7,576,000	3.9
UK terminating	6,919,000	4.6	6,615,000	−4.5	6,915,000	−4.5
UK transit	5,781,000	6.9	5,407,000	−13.1	6,114,000	−0.6
TELECOMMUNICATIONS STAFF						
(Part timers count as ½)						
Total	233,955	0.7	232,377	1.8	228,334	1.3
Minor engineers	100,550	2.3	98,241	2.8	95,576	1.6
Telephone operating force	50,565	−4.2	52,672	−0.9	53,176	−4.3
Clerical staff	28,452	−0.6	28,631	0.9	28,382	3.8
Other staff	54,388	2.9	52,833	3.2	51,200	5.3



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Correspondence:
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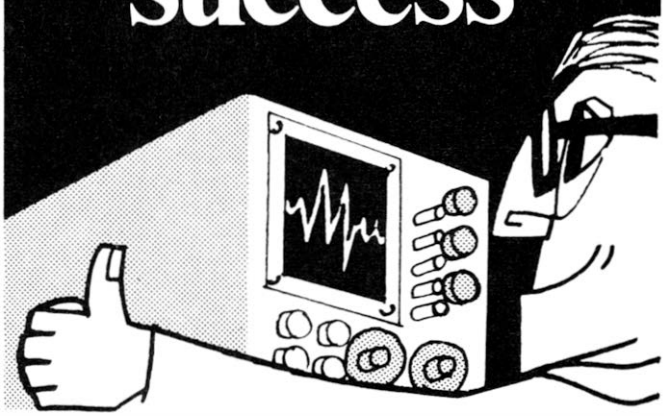

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6.34 mm Dia.
27 watts.

For Factory Bench Line Assembly

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23 watts.

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as selected for the DESIGN CENTRE LONDON

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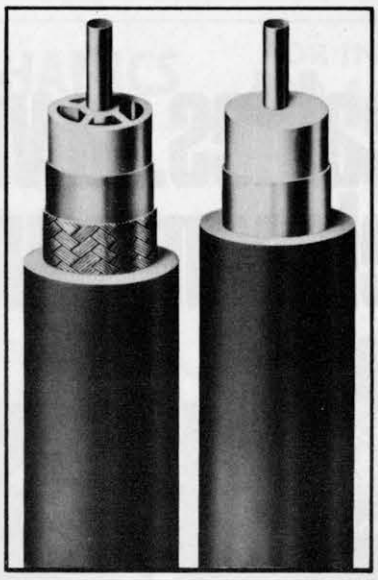

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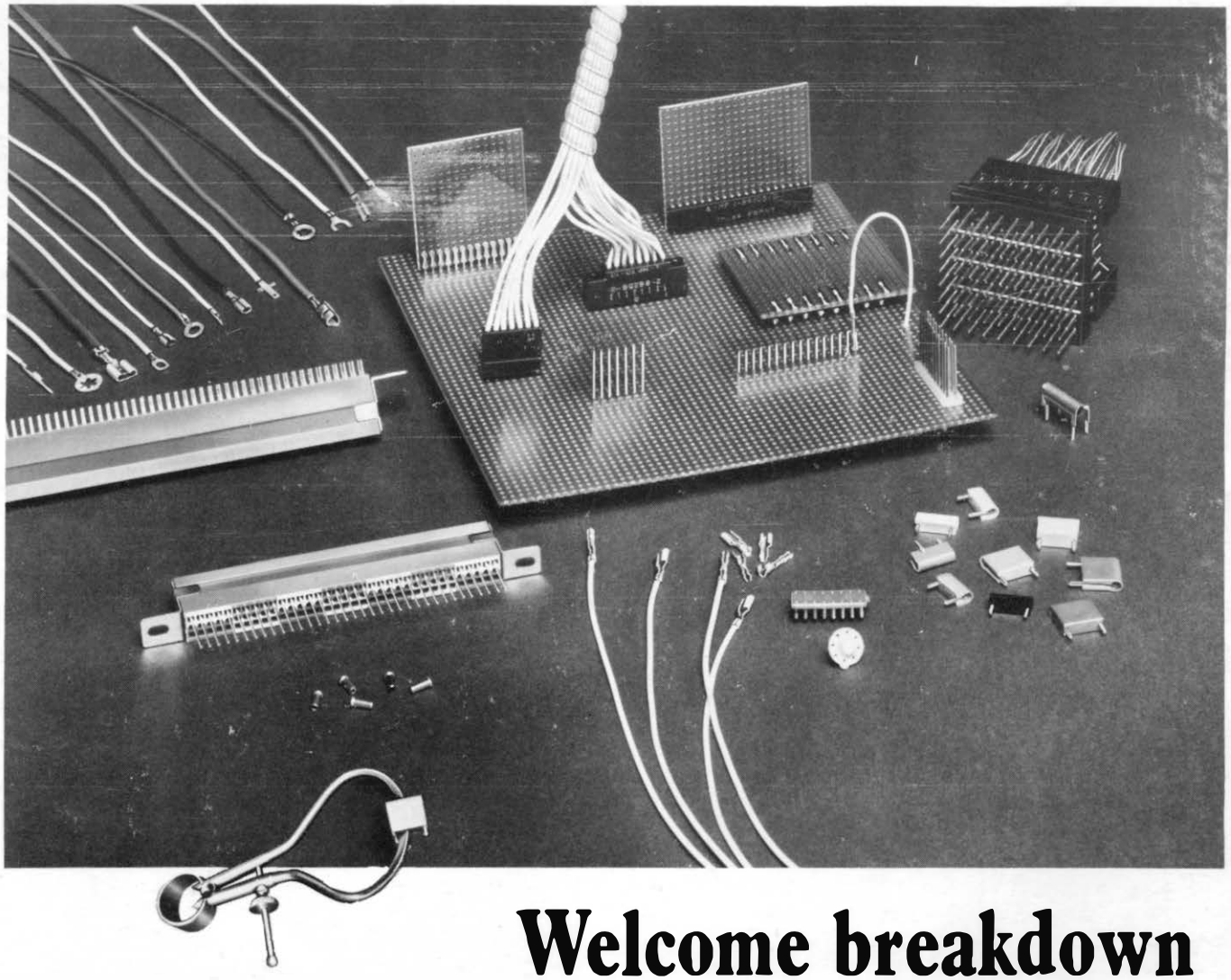

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