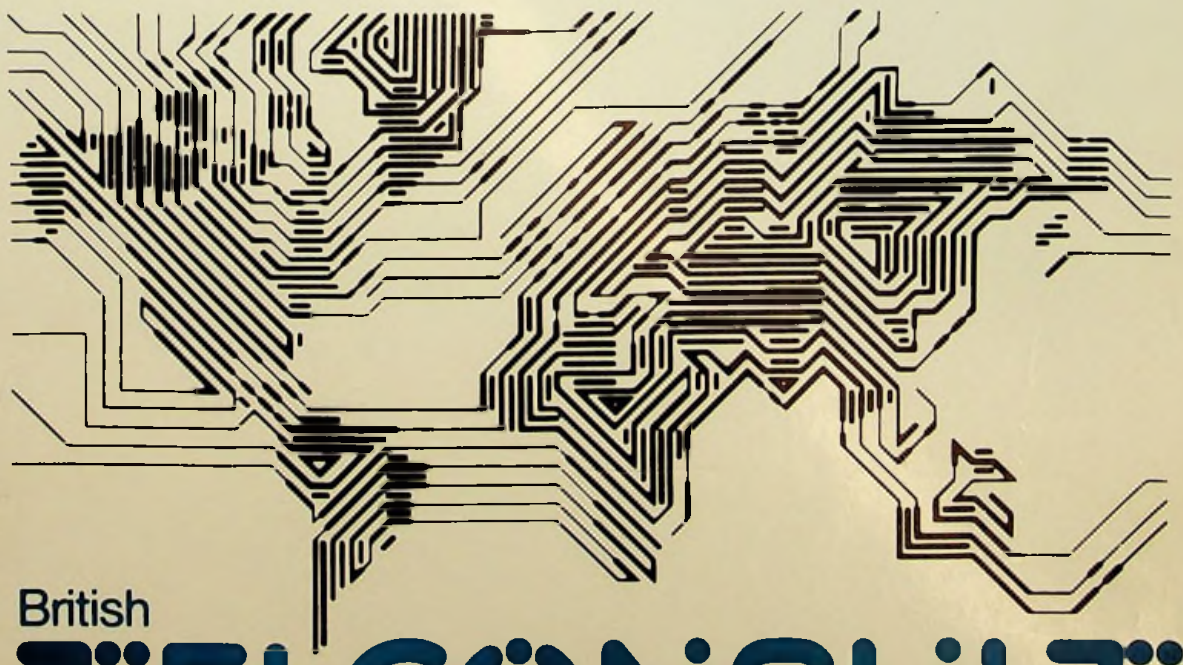
FALKLAND ISLANDS GOVERNMENT

REPORT
ON
DEVELOPMENT OF TELECOMMUNICATION SERVICES

JUNE 1984



British
TELCONSULT
The Consultancy Service of British Telecommunications

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ON
DEVELOPMENT OF TELECOMMUNICATION SERVICES

JUNE 1984

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LONDON, ENGLAND

(Under assignment by the Overseas Development Administration)

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BRITISH TELCONSULT

LONDON

ENGLAND

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BRITISH TELCONSULT STUDY OF THE INTERNAL TELECOMMUNICATIONS SYSTEM OF THE FALKLAND ISLANDS - 1984

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CONTENTS

SECTION A - PRESENT SITUATION

1. TELEPHONE EXCHANGE - STANLEY

   1.1 Description
   1.2 Subscriber Categories/Traffic
   1.3 Metering
   1.4 International Working

2. LOCAL DISTRIBUTION NETWORK - STANLEY

3. CAMP COMMUNICATIONS

   3.1 HF Radio Telephone
   3.2 2-Metre Radio System
   3.3 Overhead Telephone Lines
   3.4 Fox Bay Telegraph Link
   3.5 Interface to Stanley Telephone Exchange

4. MANAGEMENT, ENGINEERING SUPPORT AND OPERATIONS

   4.1 Management Structure
   4.2 Maintenance Staff
   4.3 Operations Staff
   4.4 Development Facilities
   4.5 Training

5 TARIFFS AND REVENUE

   5.1 Stanley Exchange and Local Network
   5.2 Camp Communications
   5.3 Annual Revenues
   5.4 International Communications

SECTION B - OPTIONS CONSIDERED

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

   1.1 Step-by-Step (Strowger)
   1.2 TXE2
   1.3 UXD5
   1.4 Subscriber Telephone Equipment

2. LOCAL DISTRIBUTION NETWORK - STANLEY

   2.1 Description

3. CAMP COMMUNICATIONS

   3.1 Improvements to Existing HF Radio Systems
   3.2 Camp Telephone Circuits
   3.3 Microwave Radio Relay Network
   3.4 2-Metre Repeater
   3.5 VHF Radio Telephone with Selective Calling
   3.6 Radio Station Accommodation on Mount Maria
   3.7 Use of Military Circuits (Goose Green and Fox Bay to Stanley)
   3.8 Cable Systems
   3.9 Satellite Systems

SECTION C - FINANCIAL ANALYSIS

1. PRESENT FINANCIAL SITUATION

   1.1 Expenditure
   1.2 Revenue

2. COSTS OF OPTIONS CONSIDERED

3. TRAFFIC ESTIMATES AND REVENUE

   3.1 Internal Communications
   3.2 International Communications

TABLE 1 CURRENT MAINTENANCE/OPERATING EXPENDITURE
TABLE 2 CURRENT ESTABLISHED STAFF EXPENDITURE
TABLE 3 ESTIMATED CURRENT ANNUAL REVENUE
TABLE 4 INVESTMENT AND OPERATING COSTS
STANLEY EXCHANGE AND SUBSCRIBERS EQUIPMENT

TABLE 5 INVESTMENT AND OPERATING COSTS
LOCAL DISTRIBUTION NETWORK IN STANLEY
TABLE 6 INVESTMENT AND OPERATING COSTS
CAMP COMMUNICATIONS
TABLE 7 TRAFFIC ESTIMATES AND REVENUES
(EXCLUDING INTERNATIONAL CALLS)
TABLE 8 ANNUAL CONTRIBUTIONS TO OVERHEADS

SECTION D - RECOMMENDATIONS

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

   1.1 Technical/Local Considerations
   1.2 Cost Considerations
   1.3 Recommendations

2. LOCAL DISTRIBUTION NETWORK - STANLEY

   2.1 Technical/Local Considerations
   2.2 Recommendations

3. CAMP COMMUNICATIONS

   3.1 Technical/Local Considerations
   3.2 Recommendations

4. RECOMMENDED TIMESCALES

SECTION E - MANAGEMENT, TECHNICAL SUPPORT AND OPERATIONS

1. STAFF STRUCTURE

2. DUTIES AND GRADINGS

3. STAFF COSTS

4. TRAINING

SECTION F - BUDGETARY IMPLICATIONS

1. ESTIMATED CAPITAL AND OPERATIONAL COSTS

2. ANNUAL CONTRIBUTIONS TO OVERHEADS

3. ANNUAL COSTS/REVENUE COMPARISON

SECTION G - PROPOSED TARIFF STRUCTURE

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

   1.1 Rental Charges
   1.2 Call Charges (Local)
   1.3 Call Charges (Stanley to Camp)

2. CAMP COMMUNICATIONS

   2.1 Rental Charges
   2.2 Licence Fees
   2.3 Call Charges

3. FOX BAY AND GOOSE GREEN TO STANLEY (USING MILITARY CIRCUITS)

4. INTERNATIONAL CALLS

5. ADJUSTMENTS TO TARIFFS

DEVELOPMENT OF TELECOMMUNICATION SERVICES - FALKLAND ISLANDS

1. INTRODUCTION

1.1 Terms of Reference

By letter dated 26 March 1984 the Overseas Development Administration engaged British Telconsult under British aid arrangements to advise the Government of the Falkland Islands on the feasibility of modernising telecommunications in the Falkland Islands. The terms of reference were:-

i) To advise the Falkland Islands Government on the economic and technical feasibility of developing an internal telecommunications system providing:-

   a) Automatic telephone exchange for Stanley with facilities for metering all calls and full international subscriber dialling via a satellite earth station presently being built.

   b) Interface with radiotelephone system covering outlying settlements to provide facilities as near as possible to those mentioned in a), with particular reference to providing a reliable automatic or semi-automatic emergency service at all hours. Advice is required on the radio system to be used, taking into account an interface with the large number of private and company owned transceivers operating in the 2-Metre amateur band.

ii) To advise on the management and engineering requirements to support the development and maintenance of such a system.

iii) To advise on the manpower required to operate the recommended system as well as any training, and its cost, that might be required by local operators.

iv) To advise on the budgetary implications of the recommended system, both in terms of initial costs and future maintenance and running expenses.

v) To make recommendations on the levels of tariffs for different categories of calls placed, including international calls dialled by subscribers.

1.2 Responsibility for Report

Although this Report has been commissioned by the British Government under British aid arrangements, the British Government bears no responsibility for, and is not in any way committed to, the views and recommendations expressed herein.

2. EXECUTIVE SUMMARY

2.1 Background to Study

The Feasibility Study covered within this Report was undertaken by British Telconsult for the Falkland Islands Government. The prime objective of the Study was the preparation of economic and technical recommendations for developing the internal telecommunications facilities on the Islands.

In order to meet the objective it was first necessary to obtain a clear understanding of current telecommunications services, both in financial and technical terms, and to gain an understanding of the future requirements of the population. This was primarily achieved during the visit of two Consultants to the Falkland Islands from 25th March 1984 to 13th April 1984.

Mr William (Bill) Harlow concentrated on the services in and around Stanley and Mr Henry Buist was responsible for investigating the telecommunications requirements of the settlements, known collectively as Camp. Interconnection arrangements and the linking of the internal facilities to the Cable & Wireless operated international services were covered, as appropriate, by each Consultant.

During the visit discussions were held with representatives of the Falkland Islands Government (FIG), the Posts and Telegraphs Department, the Public Works Department, the British Military Forces and Cable & Wireless. The work was based in Stanley but journeys were also made to a selection of the settlements.

A number of technical investigations were carried out covering the condition of the Stanley local distribution network, radio propagation to/from Camp and telephone traffic measurements for both Stanley and Camp.

Under the direction of Mr Malcolm Jamison, C.Eng., MIEE, MBCS, of British Telconsult, a team from British Telecommunications was established to study the information acquired during the visit to the Falkland Islands and prepare recommendations. The team comprised the two Consultants plus financial and tariff experts and back-up technical support. In particular experts in telephone switching, radio systems and local line planning were called upon to provide specific advice.

A selection of optional technical solutions were devised for each of the major areas of interest and the more attractive options were individually costed, both in terms of capital expenditure and on-going operational costs.

2.2 Constraints of Study

In order to draw up realistic proposals and formulate recommendations a number of basic constraints were initially assumed or set by the Study Team, as explained below.

i) All capital costs for equipment would be covered by aid in the form of non-repayable grants from the British Government to the Falkland Islands Government.

ii) Equipment would, whenever possible, be supplied from British sources.

iii) Following the implementation of the recommended solutions, the revenues obtained by the Posts and Telegraphs Department from the operations of the telecommunications services would, at least, cover all on-going maintenance/support/operational costs, ie. tariffs would be recommended at levels to make telecommunications a self-supporting service as opposed to the present highly subsidised service.

iv) Costs of future replacement of equipment would not be considered as operational costs.

In addition, following the visit to the Falkland Islands, a number of supplementary considerations were included:-

i) Due to the small size of the telecommunications operations in the Islands, the management and personnel structure would be essentially the same for all options. It would be necessary to employ the minimum number of managerial and maintenance staff for effective operations, allowing little flexibility.

Thus this subject is treated independently except where minor differences associated with a particular option occur.

ii) For comparison purposes salary rates would be based on 1982 Civil Service scales.

iii) In the absence of clear growth statistics, the levels of traffic would remain approximately the same as current levels (unless other factors were known).

2.3 Present Situation

The information and observations concerning the present facilities and operations are covered in full in Section A of this Report.

The following points summarise the findings of the Consultants with regard to existing facilities.

i) The manually operated magneto exchange serving Stanley is in a very poor condition requiring unnecessarily high levels of maintenance and should be replaced.

ii) The entire local distribution network in Stanley is in a very poor condition and would not be capable of serving a modern automatic telephone exchange.

iii) Camp-Camp (inter-settlement) communications utilises VHF (Citizens Band) Radio which has the potential of offering more effective Camp-Stanley communications than the HF Radio system presently used.

iv) All services are heavily dependent on the use of Operators, both at the Stanley Telephone Exchange and for the Camp-Stanley radio communications.

2.4 Options Considered

A number of technical alternatives were selected as options which would improve the service offered and are covered in full in Section B of this Report under the following categories:-

a) Automatic Telephone Exchange - Stanley

i) Step-by-Step Strowger: This system is still in wide use throughout the world and can be purchased in a refurbished form.
A fully containerised exchange and the piece-meal construction of an exchange in suitable accommodation were both considered as suitable options.

ii) TXE2: This system is based on electronic controlled, reed-relay switching. Piece-meal construction in suitable accommodation was considered.

iii) UXD5: This is a stored-programmed-controlled digital switch which was designed for unattended operation, primarily in rural evironments. The equipment is housed in cabinets which can be accommodated in normal office type environment.

b) Local Distribution Network - Stanley

i) Mixed underground/overhead network: This option was considered but rejected at an early stage because of the difficulties of maintaining overhead plant in the very windy and hazardous Falkland Islands environment.

ii) Fully ducted underground network: A detailed hypothetical plan for the Stanley network was prepared. This was used as a basis for costing its implementation.

c) Camp Communications

i) Improvements to Existing Systems: A number of minor improvements were considered. The most promising improvement, a 2-Metre Repeater for VHF Communications, was considered separately as an option.

ii) Microwave Radio Relay Network: A network of Microwave links and spurs was devised which would provide two telephone channels per settlement.

iii) 2-Metre Repeater: The provision of a 2-Metre Repeater to boost signal strengths for VHF CB communications to provide full coverage over the Islands was considered. Thus VHF Camp-Stanley communications would be practical and could supercede the current HF Radio System.

iv) VHF Radio Telephone with Selective Calling: A system based on the "mobile" telephone systems used by public utilities in the UK was considered. Such system would provide direct automatic connection to the Stanley exchange and could eventually replace the radio telephone operator controlled systems for Camp-Stanley communications.

v) Radio Station Accommodation on Mount Maria: Although not strictly an option, this requirement was considered to house equipment for the 2-Metre Repeater and the VHF Radio Telephone system.

vi) Use of Military Circuits (Goose Green and Fox Bay to Stanley): Circuits which would utilise military channels between the above locations were considered to provide special direct access to the Stanley exchange.

vii) Cable and Satellite Systems: These options were rejected at an early stage due to the impracticality and high cost.

2.5 Financial Considerations

Each technical option was independently costed on the following basis and is fully covered in Section C.

i) Cost of equipment was based on suppliers' recommended prices.

ii) The level of spares was set at an appropriate level for the Falkland Islands, taking into account its remoteness and the lack of available back-up.

iii) Manpower charges for project control, installation, testing, etc. were based on UK rates with allowances for travel and living expenses.

iv) Operational costs only covered those items which were specific to the option. General costs were treated independently.

3. SUMMARY OF RECOMMENDATIONS

Full lists of Recommendations are presented in Section D of this Report under the headings:-

a) Automatic Telephone Exchange - Stanley
b) Local Distribution Network - Stanley
c) Camp Communications
d) Recommended Timescales

A summary of these Recommendations is given below.

It is recommended that:

i) The local distribution network in and around Stanley be replaced by a fully ducted underground system.

ii) The planning and laying of duct-work be performed in conjunction with the proposed renewal of electricity and water services. An on-site study should be undertaken as soon as possible.

iii) The manually operated magneto exchange serving subscribers in and around Stanley be replaced by an automatic UXD5 digital exchange of 600 lines.

iv) Suitable accommodation for the exchange and maintenance staff in Stanley be identified and prepared as soon as possible. It is preferable, to reduce costs, that existing accommodation is used rather than a new purpose-built exchange.

v) Telephone circuits be provided, as soon as possible, between Fox Bay East and Stanley and between Goose Green and Stanley. These circuits would utilise military channels and be connected to pay-phones at the settlements.

vi) A Radio Station be constructed on Mount Maria to house the recommended radio equipment. Power generation should be by wind and/or solar means.

vii) 2-Metre Repeater equipment be installed at the Radio Station on Mount Maria in order to widen the coverage of VHF Radio which would replace HF Radio as a form of communication between Camp and Stanley.

viii) A Radio Telephone System with Selective Calling facilities be installed to provide automatic communications between Camp and Stanley and to provide access to the international service operated by Cable & Wireless.

ix) A revised staff structure be phased in (see Section E) which is based on the concept of service management and support rather than system operations.

x) A new tariff structure (see Section G) be introduced, timed to occur with the installation of new equipment and the provision of new services. The structure is designed to generate sufficient revenue to cover the annual overheads and operational costs of the Posts and Telegraphs Department plus an operational profit for long-term investment purposes.

The timescale for the implementation of these Recommendations is shown in Figure 1 at the end of this Report.

4. GLOSSARY OF TERMS

BT	-	British Telecommunications (British Telecom)
ODA	-	Overseas Development Administration
FIG	-	Falkland Islands Government
FIC	-	Falkland Islands Company
FIBS	-	Falkland Islands Broadcasting Service
C&W	-	Cable and Wireless Plc
UK	-	United Kingdom
Camp	-	Settlements outside Stanley
HF	-	High Frequency
VHF	-	Very High Frequency
PBX	-	Public Branch Exchange
UXD5	-	Small public digital exchange
TXE2	-	Small public electronic exchange

SECTION A

PRESENT SITUATION

SECTION A - PRESENT SITUATION

1. TELEPHONE EXCHANGE - STANLEY

   1.1 Description
   1.2 Subscriber Categories/Traffic
   1.3 Metering
   1.4 International Working

2. LOCAL DISTRIBUTION NETWORK - STANLEY

3. CAMP COMMUNICATIONS

   3.1 HF Radio Telelphone
   3.2 2-Metre Radio System
   3.3 Overhead Telephone Lines
   3.4 Fox Bay Telegraph Link
   3.5 Interface to Stanley Telephone Exchange

4. MANAGEMENT, ENGINEERING SUPPORT AND OPERATIONS

   4.1 Management Structure
   4.2 Maintenance Staff
   4.3 Operations Staff
   4.4 Development Facilities
   4.5 Training

5 TARIFFS AND REVENUE

   5.1 Stanley Exchange and Local Network
   5.2 Camp Communications
   5.3 Annual Revenues
   5.4 International Communications

SECTION A - PRESENT SITUATION

A map of the Falkland Islands showing the population distribution is presented in Figure 2 at the end of this Report.

1. TELEPHONE EXCHANGE - STANLEY

1.1 Description

The telephone exchange consists of four 120 line magneto switchboards with a full series multiple. Local lines from the Stanley network terminate on the switchboard.

The switchboard equipment is in poor condition. There is wear on the multiple jacks and the jack wiring is becoming very brittle. This makes any attempt to repair a difficult operation as it is easy to cause faults whilst attempting to move the jack wiring in order to access the faulty jack. Cord repairs are carried out in a very rudimentary form as there are limited facilities available. There are no special tools or adjustment data for indicators and keys. The battery driven motor alternators which supplied ringing tone have now ceased to work and mains driven electronic ringer units are used.

The Main Distribution Frame (MDF) is a very old locally made up frame using antiquated "House Exchange" distribution cases and cable terminating cabinets. There is no line test facility and protection consists of line fuses and carbon block lightening protectors.

There are no records in the exchange and maintenance relies very much on the previous experience of the staff. Maintenance is performed very much in a "keep it working" mode, under very difficult conditions. Spares are at a premium and much ingenuity is used by the dedicated and enthusiastic maintenance staff.

1.2 Subscriber Categories/Traffic

1.2.1 Subscriber Categories

The majority of local subscribers in Stanley are connected via direct exchange lines (DEL's). There are a number of multi-party lines accessed by coded ringing. All calls have to be connected via the switchboard. There are no private branch exchanges (PBX's) and only one coin box line. Most of the telephones have hand generators for signalling the exchange, although there are some telephones which have an integral transistorised ringing element.

Existing subscribers lines fall into the following categories:

-	Residential	216
-	Business	108
-	Party Lines	112
-	Call Office	1
	Total	437

1.2.2 Traffic

a) Local Calls Connected Within Stanley

There are no facilities for traffic measurement in the existing system as local calls are free and it is therefore difficult to deduce either present or future traffic patterns or requirements.

An ad-hoc local record taken by the exchange operators at the request of Telconsult between 31 January 1984 and 3 March 1984, suggests that the average number of calls per day, Monday to Saturday, was 1,500. The average number of calls on Sundays during this period was 850. The recording of local calls was

inconsistent and due allowance has been made in calculating these averages.

Assuming the results to be typical then the number of calls handled through the switchboard would be approximately 540,000 per year.

From two short observations made during the visit, the average call holding time was observed to be between 0.5 minute and 1 minute duration. This is much lower than call-holding times experienced in the UK but is considered to be due to the small size of the town which allows regular personal contact for longer discussions.

b) Calls to/from Camp

Calls between Stanley and Camp (and vice-versa) were observed to be considerably longer in duration, typically 4 to 5 minutes. Some calls of over twice this length were recorded. Records showed that approximately 30 calls/day are connected between Stanley and Camp. In addition a number of official government business calls are handled of which no record is kept.

As well as normal voice contact, approximately 140 telegram messages per month are connected between Camp and Stanley.

1.3 Metering

No recording or metering facilities exist for local or international calls by the Stanley operators. Manual records are kept by a Radio Telephone (R/T) Operator for telephone calls to/from Camp and separately for telegram messages as each of these services incur charges.

1.4 International Working

International trunk calls are connected at the Stanley exchange to a Cable and Wireless (C&W) operated Earth Station. It is understood that the station was provided by the Ministry of Defence and is maintained under contract by C&W.

Calls originated in the Stanley system which are routed to the Cable and Wireless Earth Station are not recorded as international calls. To the operators they are locally connected calls. It is known from internationally kept records that a considerable number of international calls are made each day, but the majority of these are not connected through the Stanley system.

The C&W franchise is for international working and not internal communications. However, as the Posts and Telegraphs Department is not able to provide circuits of sufficient quality to carry international communications, C&W have been allowed to install coin-box facilities at their earth station and are to be allowed to install pay-phone facilities at the floating "Coastel" hotels and the Mount Pleasant site for the new airfield. The latter will be connected to the Earth Station by a radio link being provided under the airport Contract.

From observation of the usage of the C&W coin-box installations (mostly used by the service personnel) it is obvious that a great deal of potential revenue for the government is being lost through the inability of the Posts and Telegraph Department to provide lines of the necessary quality on the local system.

2. LOCAL DISTRIBUTION NETWORK - STANLEY

The local distribution network within Stanley is predominantly underground and is a mixture of very old lead sheathed silk and cotton insulated cables, lead sheathed paper insultated cables and a few lengths of PVC sheathed PVC insulated cables. Most of the cables run in glazed earthenware ducts. Unfortunately, due to a gradual deterioration before the conflict, damage during the occupation and still further damage from heavy military traffic and post-conflict roadworks, much of the network is in very poor condition. There are many instances where, because of duct damage, cables have been pieced out with lengths of good cable above ground. Temporary joints in situations exposed to the elements are much in evidence.

An assessment of the standard of the underground distribution was made during the survey and the results are shown in Appendix 1 at the end of this Report. This was not a comprehensive test of the whole network but an attempt to get an estimate of the condition of the network in the time available. The results, coupled with experience of using telephones in Stanley and talking to other users, give rise to the conclusion that the underground network is in a very poor condition. It is only being kept going by considerable effort from the local maintenance staff, working under very difficult conditions, and knowing that their efforts can only keep service going on a day-to-day basis. There is no opportunity to return to temporary repairs to make good. In most cases it would require some kind of road works to re-establish the cables, even if the stores were available.

Subscribers are fed by means of open wires or dropwire from distribution poles. Again, the overhead distribution is in poor condition due to a combination of pre-conflict deterioration and damage during and post-conflict.

A considerable number of temporary wires have been run on the poles by the Military and the distribution boxes are in a very poor condition. Many of the insulators carrying the open wires are broken.

Where open telephone wires cross or are crossed by power distribution cables it is doubtful if the safety standards demanded in similar situations in the UK have been achieved. There are no formal rules for ensuring safe clearance between the two services or for ensuring that there is adequate protection at power crossing points.

The state of the underground distribution and the overhead wiring leads to the conclusion that if any other system than the magneto system currently in use were to be installed service would not be possible.

3. CAMP COMMUNICATIONS

Communications between Camp residents and Stanley are dependent on four systems:-

i) HF Radio Telephone system.

ii) 2-Metre amateur Citizens Band (CB) radios purchased by the Islanders and licensed by FIG.

iii) Overhead telephone lines.

iv) Fox Bay - Stanley radio telegraph system.

3.1 HF Radio Telephone

The HF radio telephone systems covers the whole of Camp and was introduced in 1950. Radio sets are provided at all of the major settlements with an R/T operator situated at Stanley. Generally the radio sets are provided in the farm managers' houses so the service is only available to farm workers on request.

Approximately 40 sets are installed (or on order) in Camp or on ship of which 30 are owned by FIG and rented out at £120 per year plus a £2 licence fee.

Prior to 1978 the service was very unsatisfactory but modifications were introduced which improved the service although it still suffers from noise and interference. The modifications consisted of uprating the transmitter power from 10 to 150 watts, incorporating a single sideband facility and providing a simple but efficient aerial which is easily maintained by a local farmer.

The present system uses six-channel transreceivers operating between 2 and 4.5 MHz. Five of the six channels are used and one is unallocated.

The channel allocation is as follows:

2 MHz : General use

2.835 MHz: Calling and communication to Stanley during the evening and night.

4.030 MHz: General use

4.060 MHz: Falkland Islands Company (FIC) use only

4.5 MHz : Calling and communication to Stanley during the daytime

Operation of the system is dependent on the type of call:-

Camp - Stanley: Conversation is on the appropriate calling channel via the R/T operator.

Stanley-Camp: Conversation is again via the R/T operator.

Camp-Camp: Initial contact is made on the appropriate calling channel and conversation is then carried out on one of the general use channels.

The duties of the R/T operator are summarised below:-

i) Passes messages to and from Camp over the Stanley telephone network.

ii) Receives telegrams by telephone from Stanley and reads them over the R/T.

iii) Types out telegrams received from Camp to be delivered by a messenger in Stanley.

iv) Passes information on FIG aircraft flight information to Camp, obtained via private wire to aircraft control.

v) Connects Camp to Stanley telephone network.

vi) Records information for billing purposes.

The R/T is a simplex system and it is necessary for the operator to listen in to calls between Camp and the Stanley network. A key is thrown to switch on the transmitter when the Stanley end speaks and restored to switch off the transmitter and turn on the receiver when the Camp end speaks.

A high degree of skill and patience is required by the operator to perform these tasks particularly during periods of bad reception. She is often able to decipher calls which are unintelligible to others.

The HF is showing signs of being overloaded due to the increased number of people in the Islands. This is particularly true of the airport construction company which takes up a lot of time on the R/T making calls to Stanley. People in the settlements frequently have to wait a long time while airport construction business is discussed. This situation could be alleviated by providing direct circuits from the airport construction company to the Stanley exchange when a UHF radio link between the airport and the satellite station is commissioned.

3.2 2-Metre Radio System

In recent years 2-Metre amateur Citizens Band (CB) radio sets have found increasing use in the islands. These are privately owned but licensed by FIG at £5 a year. Currently about 110 licenses are issued. There are basically two types of sets, a hand held portable with an output of about 3 watts and a larger version with 25 watts output. The latter is intended for base station or vehicle mounting. The sets are used extensively in Camp for inter and intra-settlement communication and are frequently carried by farmers to keep in touch with their houses during the day. 2-Metre communication is used exclusively by the north Camp area on East Falkland for communication into Stanley.

The 2-Metre sets provide excellent quality communications which is almost entirely noise free. Very good propagation conditions exist in the 2-Metre band in the Islands and regular long distance communication is possible (eg. from Port Howard to a low point in Stanley via a repeater near the top of Mount Maria - a distance of 75 miles).

The sets appear to be operated by all people in Camp with great ease. On most receivers 800 channels are available. One channel is used for calling and when contact is made conversation is carried out on another channel. A separate channel is used for communication to Stanley via the R/T operator.

Hand portables are fitted with whip aerials or rubber ducks. On vehicles, halos or whip aerials are used whilst halos or, more commonly, multi-element yagis are employed at fixed sites. At most places some means exists of rotating the yagis.

Besides the excellent quality of the speech another advantage of the 2-Metre system is that the receiver is gated so that it is totally quiet until a strong carrier is received.

This is in contrast to the HF system which has an open receiver so that noise and interference are heard when no conversation is taking place because of the action of the automatic gain control.

3.3 Overhead Telephone Lines

A fairly extensive overhead telephone network was provided on Camp during the early part of the century. The circuits used single-wire earth return with magneto ringing. Overhead wires were often blown down or broken by wild geese and repairs carried out by local farmers using fence wire. Transmission quality was poor and ringing difficult. Messages freqently had to be passed from settlement to settlement. On East Falkland most of the settlements were connected via a party line network and phone calls into Stanley were possible. During the conflict all but one of the lines were destroyed. Some of the poles were burnt for firewood and some of the broken lines now pass through minefields. These circuits have not been repaired and the facility is missed by the Islanders, both in Camp and in Stanley. Despite their age the wooden poles which are left were well erected and appear to be in good condition.

On West Falkland many of the light metal poles which were used have rusted and lean badly and the circuits have now been superceded by the 2-Metre system.

3.4 Fox Bay Telegraph Link

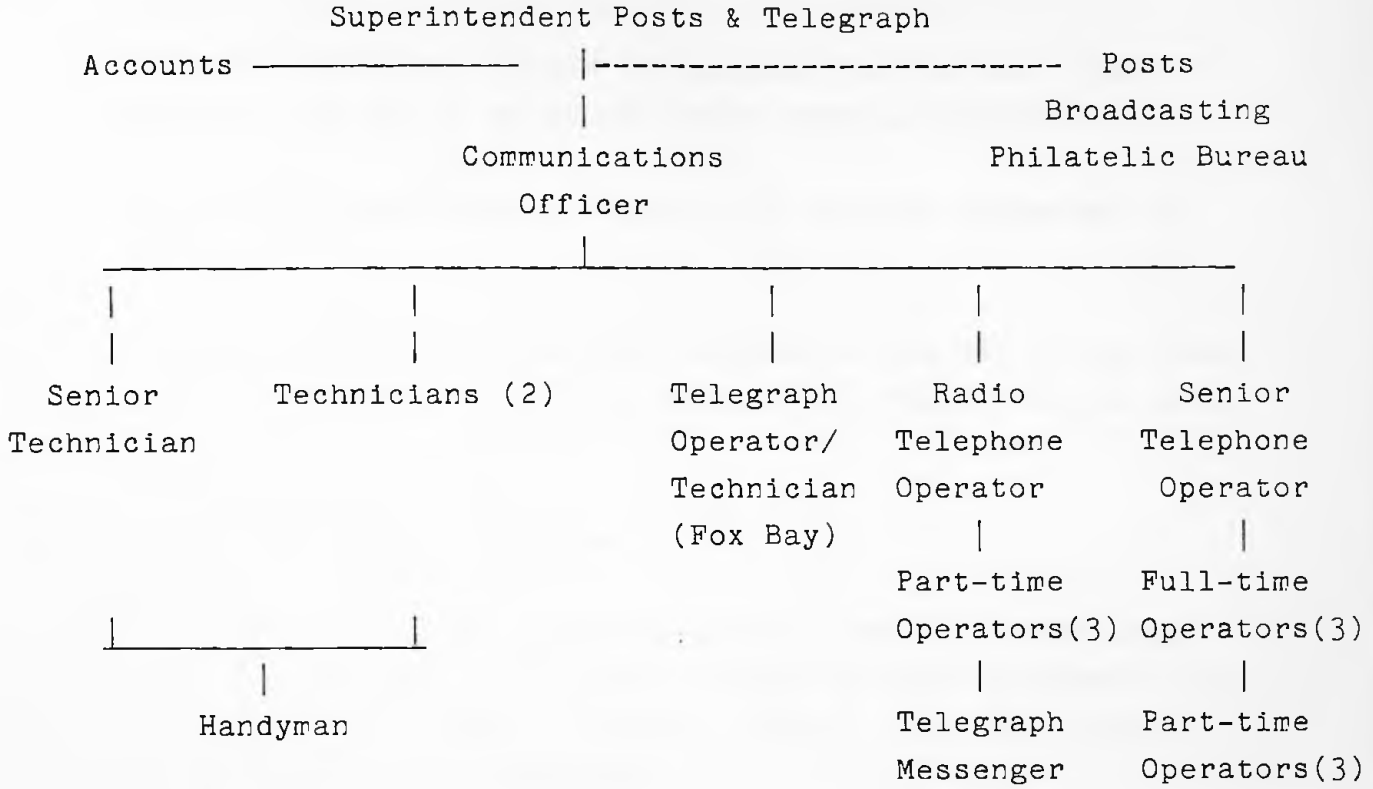
A radio telegraph link which existed between Stanley and the Post Office at Fox Bay East is now not used.

3.5 Interface to Stanley Telephone Exchange

The only interface between Camp and the Stanley switchboard is via the R/T Operator and a manually operated switch as detailed in Para 3.1.

4. MANAGEMENT, ENGINEERING SUPPORT AND OPERATIONS

An outline of the existing Management, Support and Operations staff structure is shown below:-



4.1 Management Structure

Telecommunications is the responsibility of the Superintendent Posts and Telegraphs who is also responsible for Postal Services, Broadcasting Services and the Philatelic Bureau.

Reporting to the Superintendent is a Communications Officer, who is responsible for all communications equipment.

4.2 Maintenance Staff

The maintenance staff, located in Stanley, comprise a Senior Technician and two Technicians. A handyman is also employed. The maintenance staff are responsible for the Stanley exchange and network, and repair of the R/T equipment.

4.3 Operations Staff

A Senior Telephone Operator, three full-time Operators and three part-time Operators are used to operate the telephone switch-board in Stanley.

The Radio Telephone system is operated by one full time R/T Operator and two or three part-time evening Operators.

A Telegraph Messenger is employed to deliver telegrams in Stanley.

There is a Telegraph Operator located at Fox Bay on the West Island, who also acts as Sub-Postmaster, Registrar and local Technician.

4.4 Development Facilities

No formal development program exists. However, work-shop facilities are available with a range of test equipment which is used by the maintenance staff to conduct some small-scale development work as required.

4.5 Training

No organised courses are available for the maintenance and operations staff, as training is usually provided on the job.

One Technician has been receiving training in the UK.

Since training is informal, strict working practices are not followed which leads to lower standards of work than would be expected from fully trained staff.

5. TARIFFS AND REVENUE

5.1 Stanley Exchange and Local Network

The tariff structure for customers connected directly to the Stanley exchange is based on a rental payment only. No charge is made for local calls.

The rental charges are:-

Business	£60.00/annum
Private	£30.00/annum

A number of shared service or party lines exist and the rental per telephone varies according to the number of customers sharing a line.

5.2 Camp Communications

a) HF Radio

Customers using the HF Radio system are charged £120/annum for the rental of the radios plus a licence fee of £2/annum. A small number of users own private radios and do not pay the rental charge.

Calls connected to/from Camp are charged to the Camp subscriber at the rate of 5p/minute with a minimum charge of 15p.

Telegram messages to/from Camp are charged at the rate of 4p/word with a minimum of 7 words (28p).

b) 2-Metre Radio

2-Metre Radio users own private CB sets and pay a licence fee of £5/annum.

5.3 Annual Revenues

No formal record of revenues was made available and therefore the total annual revenues for Stanley and Camp communications has been assessed at £23,475/annum.

Details of the assumptions made are contained in Section C, Table 3.

5.4 International Communications

The tariff structure for international calls is set by Cable and Wireless. 15% of the revenue obtained from international calls originating in the Falkland Islands network is payable by Cable and Wireless to the Post and Telegraph Department, nominally on a quarterly basis.

This arrangement between FIG and C&W does not appear to be formal enough and it is unclear to what the 15% refers. From the only accounts available for inspection FIG do not appear to have collected any revenue from international calls since the earth station became operative.

Details of the revenues obtained prior to that period are contained in Section C, Para 3.

SECTION B

OPTIONS CONSIDERED

SECTION B - OPTIONS CONSIDERED

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

    1.1 Step-by-Step (Strowger)
    1.2 TXE2
    1.3 UXD5
    1.4 Subscriber Telephone Equipment

2. LOCAL DISTRIBUTION NETWORK - STANLEY

    2.1 Description

3. CAMP COMMUNICATIONS

    3.1 Improvements to Existing HF Radio Systems
    3.2 Camp Telephone Circuits
    3.3 Microwave Radio Relay Network
    3.4 2-Metre Repeater
    3.5 VHF Radio Telephone with Selective Calling
    3.6 Radio Station Accommodation on Mount Maria
    3.7 Use of Military Circuits (Goose Green and Fox Bay to Stanley)
    3.8 Cable Systems
    3.9 Satellite Systems

SECTION B - OPTIONS CONSIDERED

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

A number of switching systems have been considered to replace the existing magneto exchange. When selecting suitable options, due account has been taken of the practicality of operating and maintaining equipment in the Falkland Islands where access to spares and to support expertise is difficult. The choice has therefore been limited to systems which can be supported locally by existing staff, assuming appropriate training is provided.

The range of switching equipment in the world is wide and, in order to limit the choice, only systems of proven capability known to be available from British sources have been compared. The three exchanges selected cover the full range of distributed electro-mechanical, common-controlled mechanically switched and digital systems.

Maintenance and operational staff requirements have not been considered in this Section. The small size of the Stanley system will require the minimum practical number of maintenance staff (2 Technical Officers) and there is no requirement for Operators in an automatic exchange. Thus the staffing requirements will be the same for each option.

Details of Engineering Support and Operating Costs are given separately in Section E of this Report.

The present magneto exchange has a total of 436 customers and a probable waiting list of 50 customers. It is considered that the provision of an exchange of at least 600 lines giving a growth capability of over 20% would meet the needs within Stanley for at least the next 5 years.

1.1 Step-by-Step (Strowger)

1.1.1 Description

Step-by-step (Strowger) equipment, although old fashioned by today's electronic standards, is still widely used throughout the world. Due to the modernisation programmes in many countries second-hand Strowger equipment is generally available, either directly as recovered or refurbished. It is not considered sensible to purchase recovered equipment that has not been refurbished.

The equipment can be purchased in two ways:-

i) Piece-meal, to be constructed within suitable accommodation.

ii) Fully constructed and housed in permanent containers.

a) Piece-meal Construction

In order to supply a 600 line exchange in a piece-meal fashion it would be necessary to clearly identify and quantify all items required. On arrival of the equipment in the Falkland Islands it would be necessary for a team of construction staff to erect and wire the exchange before commissioning and other tests can be performed.

Accommodation requirements for the equipment are:-

- An area approximately 20 feet x 20 feet with a head-room of at least 10.5 feet.
- A maintenance work area to meet the needs of local staff.

- An additional room if a stand-by generator is required.

b) Containerised Units

Fully refurbished Strowger can be obtained in containerised units from British Telecom. Other sources of supply might be available but, for the purposes of comparison within this Report, configurations and costs of the BT equipment are used.

To meet the Falkland Islands requirements two insulated and air conditioned containers are required.

Container 1, the basic unit, comprises:-

400 Lines with four digit numbering scheme 2100 - 2499.
20 Outgoing local junctions with single fee metering.
10 Outgoing long distance trunks with metering over junction.
10 Incoming junctions.
Switching capacity of 27 erlangs.
Power equipment rack containing mains power units and negative 50V batteries (sufficient to power second unit).
Overhead iron work to support racks and flourescent lighting.
Main Distribution Frame.
Automatic Alarm System.

Container 2 comprises:-

Additional 500 lines for local subscribers.
25 Outgoing junctions with single fee metering.
15 Outgoing long distance trunks with metering over junctions.
10 Incoming junctions.

The containers are connected by means of a tie cable. Each containerised unit comes complete with all necessary tools, test equipment and essential spares. Additional spares are available under a guarantee for at least 10 years.

The only external requirements are a concrete base for the containers and a 240 Volt, single-phase supply to each container for power (Unit 1), lighting, air conditioning/heating and internal mains supply.

1.2 TXE2

TXE2 is a reed-relay exchange with duplicated electronic common control. It was developed for use in the British Telecommunications network, primarily for small communities of up to 3,400 lines.

The equipment is of a modular design with sliding, replaceable units. It occupies less space than a comparable step-by-step Strowger exchange and consumes less power.

Currently, due to the rapid transition to digital exchanges in the United Kingdom, some TXE2 equipment is available which has not been required within the British Telecom network.

The estimates of cost used in this Report for TXE2 are based on the availability of a 600 line exchange constructed of this unused equipment.

Accommodation requirements for the equipment are:-

- An area approximately 20 feet x 20 feet with a headroom of at least 10.5 feet.
- A maintenance work area to meet the needs of local staff.
- An additional room if a stand-by generator is required.

1.3 UXD5

1.3.1 Description

The UXD5 is a public digital exchange, manufactured by GEC and Plessey in the UK, which was developed by British Telecom primarily for use in rugged environments where maintenance and support are difficult to provide. It is based on the BT designed "CDSS" or "Monarch" PABX, suitably modified to provide system security and facilities normally associated with public telephone exchanges.

The system is of a plug-in design, enabling rapid installation and repair to be achieved. It has been designed for on-site or unattended operation as maintenance management can be achieved from a remote point by means of a Man-machine Interface. It has been proved to have a higher operational reliability than that of electro-mechanical equipment and less preventive maintenance and replacement of worn parts is required.

The system software is stored in a non-volatile memory, providing immediate and automatic restart in the event of a power supply interruption.

Two configurations have been considered:-

i) Two partially equipped units with an initial capacity of 600 lines and potential to grow to 1200 lines with the addition of extra equipment at some later date.

ii) One fully equipped 600 line unit installed in accommodation of sufficient capacity to extend to a second unit at some future date, if required.

Option (ii) is considered to be the best solution for the following important reasons.

a) The cost per line of a single unit would inevitably be lower than that for the double unit due to a saving in duplicated common control equipment.

b) Option (i) requires incoming calls from the international exchange to be routed to the unit in which the called subscriber resides over junctions dedicated to that unit. Transit working is not possible. This problem could be overcome but some development would be entailed.

c) With Private Branch Exchange (PBX) facilities being available on the UXD5 some larger installations could be more conveniently served with a PBX installation, thus reducing the number of exchange connections required. It is estimated that the initial requirement could be reduced by 50 lines and provision of a 600 line unit would allow an increase of approximately 33%. It is anticipated that planned development of the UXD5 will enable the initial unit to be extended to well in excess of 600 lines but, should this not be possible, a second unit could then be installed, if required.

Accommodation requirements for the equipment are:

- An area approximately 13 feet x 13 feet in which to accommodate up to two UXD5 units plus power racks containing batteries and rectifiers.

- A maintenance work area to meet the needs of the local staff. The man-machine interface (MMI) visual display unit (VDU), the distribution frame and the spares holding could also be accommodated in this work area or at some other location.

- An additional room if a stand-by generator and batteries, are required.

1.4 Subscriber Telephone Equipment

It will be necessary to replace all subscriber telephone instruments when a modern telephone exchange is installed.

Larger offices may be provided with Private Branch Exchange (PBX) switchboards.

Payphone facilities, currently operated by C&W for international services, could be operated by the Department of Posts and Telegraphs instead. It is estimated that 10 payphones would be required.

2. LOCAL DISTRIBUTION NETWORK - STANLEY

The state of repair of the underground and overhead distribution network in Stanley is extremely poor. (See Section A.)

As most of the cables are of obsocelent contruction and a fair proportion of the ductwork is collapsed or non existent, it is considered that complete renewal of the distribution network is necessary.

Two options have been considered for the replacement of the network line plant.

i) Ducted underground cable distribution in the centre of Stanley and aerial cable feeds and/or open wires to the outskirts of the town with or without intermediate flexibility points (cabinets).

ii) Fully ducted underground cable distribution to flexibility points (cabinets) and ring-type distribution poles near customer premises.

Although option (i) might initially provide a cheaper solution it is considered inappropriate in the Falkland Islands environment to employ large-scale overhead distribution. Due to the hazards of high winds and large birds, higher on-going maintenance costs and a lower quality of service would be experienced. Therefore only option (i) has been considered in detail in this report.

2.1 Description

An outline of a hypothetical scheme is shown in Figure 3. The scheme, which was prepared using 1:2,500 scale prints of the

area, identifies the scale of the work and has been used as a basis for costing purposes. It will be necessary to prepare an accurate plan before any work could commence.

The line plant system is based on practices currently in use in the British Telecom network employing duct to distribution cabinets and ring-type distribution poles. A few internal distribution points are located at the more important buildings.

Sufficient duct has been allocated for foreseable growth and the use of cabinets ensures flexibility.

3. CAMP COMMUNICATIONS

As outlined in Section A, the Camp communications are currently not satisfactory. The old telephone lines have been rendered inoperative. The HF radio system suffers from noise and interference, has limited facilities and is not readily available to all farm workers. The 2-Metre radio system provides good quality transmission but has limited range.

The most important requirement is good communications between Camp and Stanley, whilst Camp-Camp communication is of secondary importance. However, improvements in Camp-Stanley communications would also improve Camp-Camp communication.

A number of methods of improving the service have been considered and these are detailed in the following paragraphs.

3.1 Improvements to Existing HF Radio Systems

The only improvement considered worthwhile is to move the antenna out of the electrically noisy atmosphere of central Stanley to a quieter site outside the town. It is understood that this was previously planned but had to be abandoned because the cable connecting the proposed site to Stanley was faulty. This improvement is superceded by other options proposed.

3.2 Camp Telephone Circuits

The Camp telephone lines provided a poor but useful service before they were destroyed in the conflict. It is not considered worth renewing these lines because they are unreliable, difficult to maintain and their quality, both transmission and signalling, would be unsuitable for use with a modern automatic exchange. The cost of renewal would also be very expensive.

3.3 Microwave Radio Relay Network

A radio relay network consisting of 5 major links and spur routes to settlement has been considered (see Figure 4). This network would provide two telephone circuits per settlement. Details of each link are given below:-

LINK 1 : Stanley - Rincon Grande - San Carlos - Mount Maria.
3 hops: 60 channels

LINK 2 : Mount Maria - Byron Hights.
1 hop : 12 channels

LINK 3 : Mount Maria - East Head - Mount Alice.
2 hops: 8 channels

LINK 4 : Stanley - March Ridge (upgrade of existing 12 channel system)
1 hop : 24 channels

LINK 5 : March Ridge - Goose Green
1 hop : 12 channels

The link between Stanley and March Ridge already exists. It is a 24 channel link but only equipped for 12 channels. It has been assumed that this link could be upgraded to 24 channels.

It is assumed that the aerial masts for the link between Stanley and March Ridge could be used for the Stanley - Rincon Grande and the March Ridge - Goose Green hops, and that accommodation and power supplies would be available at the two sites.

A substantial aerial mast would be required at all main stations but a simpler mast could be provided for spur routes terminating at settlements.

Because channels have to be dropped off at each radio station in the main trunk route each intermediate station is a terminal back-back.

It is assumed that accommodation and power would be available at the settlements for the spur routes.

3.4 2-Metre Repeater

The 2-Metre radio sets give very good quality communications with almost a total absence of noise and interference, a quiet calling channel and a large number of speech channels providing a degree of privacy.

A number of test transmissions in the 2-Metre band were carried out during the visit by British Telconsult to the Falkland Islands which, coupled with information obtained from a number of users, indicates that if a 2-Metre repeater were placed on the top of Mount Maria virtually the whole of the Islands could be covered.

A system consisting of a four channel repeater with a 600kHz offset between transmit and receive frequencies has been considered. The frequency split is the same as that available on the 2-Metre sets currently in use on the islands.

There are a number of ways the channels could be used. One option is to employ one channel for calling and the other three for speech, with one of the speech channels being used exclusively for calls into Stanley. Calls into the Stanley telephone network would still have to be via the R/T operator but, in order to relieve the operator from the task of continually monitoring calls and operating the transmit/receive switch, a voice operated switch could be provided on one or two of the speech channels to Stanley.

Horizontal polarisation has been adopted for 2-Metre working in the Falkland Islands. However, to obtain better isolation between transmit and receive frequencies at the repeater site vertical polarisation may be necessary. Vertical polarisation would be advantageous to hand portable and vehicles using whip antennae, but halo antennae would be at a slight disadvantage. All yagis which wish to access the repeater would need to be

repositioned which is not considered to be a major problem.

A significant advantage of the 2-Metre system is that direct communication would be possible between stations if the repeater fails. In this way messages could be passed from station to station in an emergency. It would also provide a valuable back-up facility if a Selective Calling System (covered in paragraph 3.5) is adopted.

Operation of the 2-Metre system using a repeater would provide evidence of VHF coverage of the Islands from Mount Maria. Such information would be valuable for the detailed planning for a VHF Selective Calling System.

With full coverage in the Islands and the high quality speech characteristics of the 2-Metre sets it is anticipated that use of the present HF radio system would cease.

3.5 VHF Radio Telephone with Selective Calling

This system is similar to the 2-Metre system except that the radio sets are provided with a key pad enabling individual stations to be 'dialled'. An audio and visual alarm operates to indicate that a station has been called, thus it is not necessary to continuously listen into a common calling channel. It also allows calls to be 'dialed' to an automatic telephone exchange in Stanley without the need of an operator.

The system is similar to the VHF mobile radio telephone systems used in the UK by such organisations as the police, public utilities, security firms, etc. The radio sets can be installed permanently in buildings, vehicles or be portable.

A system suitable for use in the Falkland Islands is shown in Figure 5. It consists of a central base station on Mount Maria with four radio channels. Two of the channels are connected, via a 2-channel radio link, to Stanley where the system control unit is situated. The control unit provides the selective calling switching facilities and the interface to the automatic telephone exchange.

The system could be operated as follows:

Channels 1 and 2 used for Camp to Camp calls after initial contact is made via Channel 4.

Channel 3 used for Camp to Stanley calls.

Channel 4 used for calls from Stanley to Camp, besides initial Camp to Camp calls. Thus all Camp Sations must be switched to this channel ready to receive calls.

Extra radio channels could be added at a later date if the amount of traffic justifies it.

Facilities exist within the system to limit the duration of the calls to a pre-determined time (say 5 minutes). A warning is given a short time before the call is disconnected. Such an option is recommended to avoid congestion.

A simple metering system is available as an optional extra which would record that a call has been made by a particular station. Since only the incidence of a call and not its duration is kept, the metering would not be suitable for the recording of international calls. These would still have to be made via an operator either in the Cable and Wireless satellite station or specially provided by the Posts and Telegraphs Department.

Two telephone circuits will be required from the base station on Mount Maria to Stanley. There are a number of ways of providing these:-

i) VHF two-channel radio link direct to Stanley.

ii) VHF/UHF link from Mount Maria to Goose Green and then by military circuits to Stanley.

iii) Extending the radio relay system which exists between Stanley and March Ridge to Goose Green and then Mount Maria.

The VHF two-channel radio link is preferred on grounds of cost and ease of implementation.

It is considered that the Selective Calling System should be implemented over a number of years - expansion being determined by the demands of the users. A typical scheme would be:-

Initial Installation	-	Base station and 100 sets
2 years after Installation	-	Additional 50 sets
4 years after Installation	-	Additional sets and extra channels, as required. Provision of fill-in repeater stations, if required.

The suggested siting of the base station on Mount Maria would ensure coverage over the majority of the Falkland Islands but there may be one or two shadow areas. The situation could be assessed when the 2-Metre VHF repeater has been in operation for some time. If shadow zones do exist, these will require the provision of simple repeaters.

When the Selective Calling System and automatic exchange are fully operational the R/T operators would not be required. In addition, it is unlikely that a telegram service would be required.

3.6 Radio Station Accommodation on Mount Maria

In order to provide a 2-Metre Repeater and the VHF Radio Telephone with Selective Calling it will be necessary to build a Radio Station on Mount Maria. The site has been selected as one which will allow virtually the whole of the Falkland Islands to be served and, although remote, has reasonable access from Port Howard for maintenance (by foot, tractor or horse, and by Land-Rover in dry conditions).

Accessibility for the initial installation would be more difficult and the cost of providing the station would be high, but the accommodation would have sufficient capacity to house all the radio systems likely to be needed in the foreseable future. The site is a windy one and the installation will need to be able to survive wind speeds of 140 knots.

A modified container would provide a suitable housing. This should be equipped with an automatic ventilation plant to prevent equipment overheating and a small heater for use when maintenance is being carried out. Space should also be available for a small work-bench, tools, spares and test equipment.

As no electricity supply is available, a primary power supply is required. This should be either a wind or solar power generator because of the difficulty of transporting fuel up the mountain. A large battery back-up would be required capable of providing service for at least 14 days to cope with failure of the primary power source and when insufficient wind or solar energy is available.

A substantial stayed mast would also be required, capable of withstanding the maximum wind speed of 140 knots when fitted with a variety of dipole and yagi antennae.

Cost savings would result by sharing the mast being provided for the Falkland Island Broadcasting Service (FIBS). There is, however, no room for equipment in the FIBS container nor is any spare power available.

The civil works required would be the construction of suitable bases for the container, mast and primary power source, together with bases for anchor points for the mast guys and container straps.

The cost of construction of the Radio Station will be relatively high compared to the installation in a less remote site, due to the need to travel and transport equipment from Port Howard to the top of the mountain, probably using a helicopter.

3.7 Use of Military Circuits (Goose Green and Fox Bay to Stanley)

The military are providing a comprehensive network of radio relay stations in the Islands. During informal talks with local military personnel it was indicated that it may be possible to provide a telephone channel from both Goose Green and Fox Bay to Stanley.

Application for these circuits would have to be made directly by FIG to the military authorities.

Both Goose Green and Fox Bay are suitable places for telephone circuits to Stanley. Goose Green has the largest population outside Stanley and the old magneto line destroyed in the conflict is missed. Fox Bay has been designated a development area and good communications into Stanley and the international network would be a great asset. It would also act as a telephone link to West Falklands and help to alleviate the sense of isolation felt by many on the West Island.

Initially these circuits would function as direct exchange lines into Stanley and it is recommended that at least one circuit in each settlement is made available for general use, perhaps by means of a payphone. Later a small exchange or concentrator could be provided at the settlements and the lines would then function as trunk circuits.

Links would be required to take the circuits from the military stations to the desired sites of the payphones. At Fox Bay the military camp and civilian settlement are separated by a stretch of water and a VHF or UHF radio link would be the most suitable. At Goose Green an overhead pole system would probably be the most suitable method.

3.8 Cable Systems

Underground cable systems are not considered feasible in the Falkland Islands' terrain due to the rocky conditions, aggravated by the presence of minefields. Overhead lines have proved to be very vulnerable in the past and would be difficult to maintain and are not likely to be able to provide sufficient capacity.

3.9 Satellite Systems

It is considered that present day costs preclude the use of satellite communications. It would be very expensive to provide installations at each settlement and it would require a high level of skill and training to maintain the equipment.

However, it is possible that in the longer term costs of equipment will be drastically reduced and this form of communication becomes a practical and economic possibility.

SECTION C

FINANCIAL ANALYSIS

SECTION C - FINANCIAL ANALYSIS

SECTION C - FINANCIAL ANALYSIS

It has been considered inappropriate to present a full financial analysis over the lifetime of the systems for the following reasons:-

i) The cost of all equipment, including spares/test equipment for at least 15 years (except for a small annual contingency) has been incorporated in the initial capital costs.

ii) Following the implementation of the recommended systems the annual overheads will remain constant, neglecting inflation.

iii) The equipment will have a lifetime of at least 15 years, at which time it is impractical to predict the nature and cost of its replacement.

The Financial Analysis is therefore presented in the form of Capital Expenditure and annual operating costs for each option plus an estimate of the annual general contributions to overheads.

Where appropriate all costings, tariffs and traffic estimates are based on information provided by the Accounts Department of the Falkland Islands' Posts and Telegraphs Department.

1. PRESENT FINANCIAL SITUATION

1.1 Expenditure

Estimates of Maintenance/Operating Expenditure and Staff Costs are given in Tables 1 and 2.

1.2 Revenue

Estimates of current revenue are given in Table 3.

2. COSTS OF OPTIONS CONSIDERED

Data on the investment and operating costs for each option are given in the following Tables:

Table 4 - Stanley Exchange and Subscriber Equipment
Table 5 - Local Distribution Network in Stanley
Table 6 - Camp Communications

The costs are composed of investment directly attributable to the identified equipment or system appropriate to each option. Estimated general costs and overheads are treated separately in Table 10.

Where appropriate the capital cost of equipment is derived from budgetary quotations presented by suppliers. Installation and commissioning costs assume the work will be performed by UK based engineers and include travelling and living expenses. Transport costs assume that all equipment will be containerised and shipped by sea. It has been assumed that project control will be performed by UK based managers undertaking the following activities:-

a) Identification and evaluation of suitable systems.

b) Preparation of specifications and statements of requirements.

c) Inviting and adjudication of tenders.

d) Quality assurance.

e) Factory testing.

Operating costs for each option consist mainly of the cost of additional spares and test equipment together with any extra dedicated staff costs, ie. staff costs have only been included in the costing of the various options where they are additional to normal staffing requirements, as a result of the particular nature of the system.

The cost of accommodation for the exchange in Stanley assumes the construction of a new building and is based on the cost of provision of a similar building in the UK (including stand-by plant room). A premium of 40% has been added to the UK costs for provision in the Falkland Islands, as advised by the Falkland Islands Public Works Department.

However, it is considered that the cost of accommodation could be substantially reduced by using an existing building, refurbished as required.

3. TRAFFIC ESTIMATES AND REVENUE

3.1 Internal Communications

A proposed tariff structure is given in Section G. This is used to calculate estimated Revenues, as shown in Table 7.

Traffic estimates are based on present levels, except when indicated.

3.2 International Communications

The most recent revenue received by the Posts and Telegraphs Department for international communications is summarised below.

1982/83	(Total Payment)	£3,219
1983/84	(Jan/March 1983 - last payment received)	£1,041

TABLE 1 - CURRENT MAINTENANCE/OPERATING EXPENDITURE
(EXCLUDING ESTABLISHED STAFF COSTS -SEE TABLE 2)

Service	Actual 1981/82	Approved Estimate 1982/83	Revised Estimate 1982/83	Estimate 1983/84
	£	£	£	£
Telephone Service Equipment & Maintenance	4,817	10,000	10,000	10,000
Incidental Expenses	13	100	50	100
Heat, Light & Power	4,908	6,793	5,552	6,000
Vehicle Hire	1,956	2,964	3,140	4,000
Handyman	2,800	3,014	3,087	3,145
Casual Labour	-	1,250	-	1,250
Telephone Service Unestablished Staff	2,611	2,485	2,701	2,771
Radio Telephone Service Equipment & Maintenance	1,701	1,980	1,980	2,099
Radio Telephone Service Unestablished Staff	5,221	5,464	5,464	7,500
Fox Bay Station Equipment and Maintenance	2,305	3,000	3,000	3,000
Totals	26,332	37,050	34,974	39,865

TABLE 2 - CURRENT ESTABLISHED STAFF EXPENDITURE

Title	Approved Estimate 1982/83	Revised Estimate 1982/83	Estimate 1983/84
Communications Officer	4,428	4,848	4,848
Senior Technician	3,957	4,353	4,416
Operator/Technician Fox Bay	3,827	5,068	4,302
Technicians (2)	6,248	4,910	6,768
Senior Telephone Operator	2,940	3,257	3,315
Telephone Operators (3)	7,861	9,471	8,776
R/T Operator	2,545	2,822	2,879
Telegraph Messenger	2,139	2,382	2,000
Apprentice Technician	550	1,150	10
Temporary Staff	6,330	4,071	6,685
Total	40,825	42,332	43,999

TABLE 3 - ESTIMATED CURRENT ANNUAL REVENUE

	Basis	Quantity	Charge (£ Sterling)	Total/Annum (£ Sterling)
1.	Local Calls - Stanley			
	Rental (Bus)	108	60.00	6,480.00
	Rental (Res)	216	30.00	6,480.00
	Rental (Shared)	13	43.20	561.60
	Rental (Shared)	90	21.60	1,944.00
	Rental (Shared)	6	17.40	104.40
	Rental (Shared)	3	31.60	94.80
			Sub Total	15,664.80
2.	HF Radio			
	Rental	30 Transceivers	120.00	3,600.00
	Licence	30 "	2.00	60.00
	Licence	3 Private "	2.00	6.00
	Telephone Calls	30/day	.25(1)	2,250.00(2)
	Telegrams	140/month	.80(3)	1,344.00
	Messages Passed by R/T Operator	60/day	Zero(4)	00.00
			Sub Total	7,260.00
3.	2-Metre Radio			
	Licence	110	5.00	550.00
			Grand Total	23,474.80

Notes:

(1) Average call length assumed to be 5 minutes.

(2) 300 working days/annum assumed. Call rate on Sundays assumed to be negligible.

(3) Average length of telegraph assumed to be 20 words.

(4) Messages passed via the R/T Operator are not recorded and no charge is made.

TABLE 4 - INVESTMENT AND OPERATING COSTS
STANLEY EXCHANGE & SUBSCRIBERS EQUIPMENT

1. Containerised Strowger (£ Sterling)

a) Capital Cost:

i) Exchange

900 Lines at £120 per line		108,000
Site Preparation		2,000
Installation		2,000
Additional Spares		5,000
Shipping		6,000
Project Control		2,000
	Total	125,000

ii) Subscriber Telephone Equipment:

Telephones - 500		10,000
PBX Units - 10		5,000
Payphones - 10		3,500
Installation		15,000
Project Control		1,000
	Total	34,500
	Total Capital Cost	159,500
		=======

b) Annual Operating Costs:

Staff Costs There are no additional dedicated staff costs.

Spares /Test Equipment Contingency		300
	Total Annual Operating Costs	300
		===

TABLE 4 - INVESTMENT AND OPERATING COSTS
STANLEY EXCHANGE & SUBSCRIBERS EQUIPMENT

2. 'Piece-meal' Strowger (£ Sterling)

a) Capital Costs:

i) Exchange

600 Lines at £70 per line		42,000
Installation		15,000
Additional Spares		2,000
Packing and Shipping		10,000
Accommodation (new building)		95,000
Project Control		2,000
	Total	166,000

ii) Subscriber Telephone Equipment:

Telephone	-	500	10,000
PBX Units	-	10	5,000
Payphones	-	10	3,500
Installation			15,000
Project Control			1,000
		Total	34,500
		Total Capital Cost	200,500
			=======

b) Annual Operating Costs:

Staff Costs There are no additional dedicated staff costs

Spares/Test Equipment Contingency		300
	Total Annual Operating Cost	300
		===

TABLE 4 - INVESTMENT AND OPERATING COSTS
STANLEY EXCHANGE & SUBSCRIBERS EQUIPMENT

3. TXE2 (£ Sterling)

a) Capital Costs:

i) Exchange

600 Lines at £100 per line		60,000
Installation		12,000
Additional Spares		2,000
Packing and Shipping		10,000
Accommodation (new building)		90,000
Project Control		2,000
	Total	176,000

ii) Subscriber Telephone Equipment:

Telephones	-	500	10,000
PBX Units	-	10	5,000
Payphones	-	10	3,500
Installation			15,000
Project Control			1,000
		Total	34,500
		Total Capital Cost	210,500
			=======

b) Annual Operating Costs:

Staff Costs There are no additional dedicated staff costs.

Spares/Test Equipment Contingency	350
Total Annual Operating Costs	350
	===

TABLE 4 - INVESTMENT AND OPERATING COSTS
STANLEY EXCHANGE & SUBSCRIBERS EQUIPMENT

4. UXD5 (£ Sterling)

a) Capital Cost:

i) Exchange

600 Lines at £180 per line	108,000
Power Rack (1 hour battery stand-by)	6,000
Distribution Frame	6,000
Installation	5,000
Additional Spare Units	10,000
Shipping	6,000
Accommodation (new building)	42,000
Project Control	2,000
Total	185,000

ii) Subscriber Telephone Equipment:

Telephones - 500	10,000
PBX Units - 10	5,000
Payphones - 10	3,500
Installation	15,000
Project Control	1,000
Total	34,500
Total Capital Cost	219,500

b) Annual Operating Costs:

Staff Costs There are no additional dedicated staff costs.

Spares/Test Equipment Contingency	500
Total Annual Operating Costs	500
	===

TABLE 5 - INVESTMENT AND OPERATING COSTS
LOCAL DISTRIBUTION NETWORK IN STANLEY

1. Fully Ducted Underground Cable (£ Sterling)

a) Capital Cost:

i) Duct Provision

Duct Laying		121,500
Construction of Jointing Chambers		50,500
Stores		26,000
Shipping		4,000
Planning		10,000
On-site Supervision		25,000
	Total	237,000

ii) Network Provision:

Total Manpower Costs		57,500
Stores		26,500
Shipping		4,000
	Total	88,000
	Total Capital Cost	325,000
		=======

b) Annual Operating Costs:

Staff Costs There are no additional dedicated staff costs.

Spares/Test Equipment Contingency	650
Total Annual Operating Costs	650
	===

TABLE 6 - INVESTMENT AND OPERATING COSTS
CAMP COMMUNICATIONS

1. Microwave Radio Relay Network		(£ Sterling)
a) Capital Cost:		
i) Main Route Provision		
Radio Equipment		429,000
Spares and Test Equipment		20,000
Accommodation and Masts		455,000
Installation and Commissioning		40,000
	Total	944,000
ii) Spur Routes Provision		
Radio Equipment		217,000
Spares		10,000
Masts		31,000
Commissioning		112,000
	Total	370,000
iii) General		
Shipping Costs		30,000
Project Control		100,000
	Total Capital Costs	1,444,000
b) Annual Operating Costs:		
Maintenance (including transport & on-call support)		2,000
	Total Annual Operating Costs	2,000

TABLE 6 - INVESTMENT AND OPERATING COSTS
CAMP COMMUNICATIONS

2. 2-Metre Repeater	(£ Sterling)
a) Capital Costs:	
i) Equipment	
Radio Equipment (4 channels)	7,200
Voice Operated Switch	1,000
Antennae and Feeder	400
Spares	2,000
Shipping	100
Installation and Commissioning	3,300
Project Control	2,000
Total	16,000
ii) Radio Station Construction	
Container (with ventilation, secondary power supply, etc)	15,000
Primary Power Source	10,000
Masts	10,000
Spares	2,000
Shipping	4,000
Installation	7,500
Project Control	3,500
Civil Works	30,000
Total	82,000
Total Capital Cost	98,000
b) Annual Operating Costs:	
Part-time Engineer (Port Howard)	500
Spares Contingency	200
Total Annual Operating Costs	700

TABLE 6 - INVESTMENT AND OPERATING COSTS
CAMP COMMUNICATIONS

3. VHF R/T with Selective Calling (£ Sterling)

a) Capital Costs:

i) Equipment

Base Station Radio and Control Units (4 channels)	12,600
Spares for above	7,200
Antennae and Feeder	500
Remote Station (100 Radio Sets)	63,800
Spares for above	3,200
Antennae and Feeders (100)	5,000
VHF Link (2 channels):-	
Duplicated Radio Equipment and 1+1 Mux	11,000
Antennae and Feeders	200
Spares	1,100
Extra for Metering Equipment (Inc.Printer)	2,800
Spares (100%)	2,800
Installation	200
Total	110,400

ii) General

Shipping	300
Installation and Commissioning	4,400
Project Control	2,700
Total	7,400
Total Capital Cost	117,800

iii) Radio Station Construction
(Included in 2-Metre Repeater Costs)

Total Capital Costs	117,800

TABLE 6 - (3. Continued) (£ Sterling)

b) Annual Operating Costs:

Maintenance (Spares and Test Equipment)	500
Part-time Engineer (Port Howard)	1,000
Other Staff Costs	500
Total	2,000

TABLE 6 - INVESTMENT AND OPERATING COSTS
CAMP COMMUNICATIONS

4. Use of Military Circuits (Fox Bay/Goose Green-Stanley)

(£ Sterling)

a) Capital Costs:

i) Fox Bay:

Radio Link Equipment	6,000
Masts	100
Antennae and Feeders	100
Shipping	200
Installation and Commissioning	4,000
Project Control	1,100
Total	11,500

ii) Goose Green:

Local Distribution System	1,000
(No special equipment is needed, local labour only required)	
Subscribers' Equipment	1,000
Total	2,000
Total Capital Cost	13,500

b) Operating Costs:

No charge for use of military circuits assumed.

No additional dedicated manpower charges.

TABLE 7 - TRAFFIC ESTIMATES AND REVENUES
(EXCLUDING INTERNATIONAL CALLS)

1. Local Calls - Stanley

Basic	Quantity	Charge (£ Sterling)	Total/Annum (£ Sterling)
Rental (Bus)	108	60.00	6,480.00
Rental (Res)	328	30.00	9,840.00
Call Charges	1500/day	.10(1)	45,000.00 (2)
Call Rebate	50 units/ annum/Res Sub	.05	(820.00)
		Total	60,500.00

Notes :

(1) Average Call assumed to be 2 minutes at 5p/minute.

(2) 300 working days/annum assumed. Call rate on Sundays assumed to be negligible.

TABLE 7 - TRAFFIC ESTIMATES AND REVENUES
(EXCLUDING INTERNATIOANAL CALLS)

2. Camp Communications

Basis	Quantity	Charge (£ Sterling	Total/Annum (£ Sterling)	
a) Following introduction of 2-Metre Repeater (CB replaces HF Radio for Camp-Stanley)				
Licence (CB)	150(1)	5.00	750.00	
Call Charges	35/day	0.50(2)	5,250.00	
		Total	6,000.00	
b) After introduction of VHF Radio Telephone System With Selective Calling				
Licence (CB)	150(1)	5.00	750.00	
Licence (Radio/ Telephone)	100	50.00	5,000.00	
Call Charges:				
Camp-Stanley	60/day	0.10	1,800.00	(3)
Stanley-Camp	30/day	0.10	900.00	(3)
Camp-Camp	15/day	0.10	450.00	(3)
		Total	8,900.00	
c) Military Circuits (Goose Green/Fox Bay - Stanley)				
Call Charges	10/day	0.30(4)	900.00	(4)

TABLE 7 - (CONTINUED)

Notes

(1) Number of users assumed to increase from current 110 as HF sets are replaced.

(2) Average call length assumed to be 5 minutes at 10p/minute.

(3) 300 working days/annum assumed. Call rate on Sundays assumed to be negligible.

(4) Average call length assumed to be 3 minutes at 10p/minute.

TABLE 8 - ANNUAL CONTRIBUTIONS TO OVERHEADS

(£ Sterling)

a) Staff Costs

i) Prior to Introduction of VHF Radio System with Selective Calling

Communications Officer	(S7)	5,013
Technical Officer (A)	(S10)	4,848
Technical Officer	(S11)	4,848
Technicians (2)	(S14)	8,382
Operator/Technician Fox Bay	(S13)	4,416
R/T Operator	(S24)	3,372
Telegraph Messenger	(S27)	2,160
Handyman - unestablished		3,145
	Total	36,184

ii) Post Introduction of VHF Radio System With Selective Calling

Communications Officer	(S7)	5,013
Technical Officer (A)	(S10)	4,848
Technical Officer	(S11)	4,848
Technicians (2)	(S14)	8,382
Operator/Technician Fox Bay	(S13)	4,416
Handyman - unestablished		3,145
	Total	30,652

TABLE 8 - (CONTINUED)

b) Other Overheads

Vehicle Hire	4,000
Incidental Expenses	100
Heat, Light and Power	6,000
Casual Labour	1,250
Fox Bay Station Equipment & Maintenance	3,000
Local Distribution Network Maintenance	650
Training	3,000
Total	18,000

SECTION D

RECOMMENDATIONS

SECTION D - RECOMMENDATIONS

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

    1.1 Technical/Local Considerations
    1.2 Cost Considerations
    1.3 Recommendations

2. LOCAL DISTRIBUTION NETWORK - STANLEY

    2.1 Technical/Local Considerations
    2.2 Recommendations

3. CAMP COMMUNICATIONS

    3.1 Technical/Local Considerations
    3.2 Recommendations

4. RECOMMENDED TIMESCALES

SECTION D - RECOMMENDATIONS

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

1.1 Technical/Local Considerations

The justification for a new telephone exchange is two-fold.

Firstly, the current magneto exchange is in a very poor condition and requires a high level of maintenance effort.

Secondly, the present exchange is manually operated and significant operational cost savings would be made following the introduction of fully automatic equipment.

Each of the three types of exchange considered would provide the facilities required in Stanley and is capable of connection to the radio equipment described in Section B and to an international switching centre. The facility to automatically meter calls would enable the Post and Telegraphs Department to charge subscribers according to use of the service, an important new source of revenue.

The selection of an exchange is heavily dependent on staff ability to maintain and support the equipment. Training will be required in all cases but it is considered that the UXD5 with the modern modular replacement style of maintenance would be the most suitable for staff who also have the responsibility of maintaining radio equipment design on similar principles. It is also recognised that a large-scale military network based on Monarch PABXs will be in use in the Islands and provide a useful back-up.

Strower and TXE2 equipment is being phased out of production

throughout the world whilst the UXD5 is a modern system fully supported by both UK manufacturers and British Telecom. Enhanced facilities are under development and the Falkland Islanders would benefit from its introduction.

The UXD5 consumes less power than the other systems and requires less physical space, considered to be an important factor in Stanley, where suitable accommodation may be difficult to find. Thus the cost of provision of a new building, if required, would be significantly higher for the Strowger and TXE2 options.

Also, should existing accommodation be used, it should have a floor to ceiling height of 10.5 feet for the Strowger and TXE2 options but only 9 feet for the UXD5 equipment.

1.2 Cost Considerations

In terms of cost alone the containerised Strowger exchange is the cheapest of the four options. However, it does include the construction of new purpose built accommodation. Should it prove feasible to use existing accommodation their costs would be substantially reduced. It is not feasible to estimate the possible savings in using an existing building until one has been identified and the cost of refurbishment has been assessed.

In view of these uncertainties, the fact that the costs of all the switching systems are comparable and the technical consideration detailed above it is considered that the UXD5 system represents the most appropriate technical solution for Stanley, particularly if it can be installed in refurbished accommodation.

1.3 Recommendations

It is recommended that:

i) The existing magneto exchange serving Stanley be replaced by an automatic telephone exchange at the earliest opportunity.

ii) The choice for an automatic exchange in Stanley be the UXD5.

iii) The site for the new exchange in Stanley be identified as soon as possible and preparations made for the installation of equipment.

Note: Although cost comparisons made in Section C assume that a new building would be constructed it is preferable, to reduce costs, that existing accommodation is used.

iv) Existing Subscribers Telephone Equipment be replaced by modern equipment to operate to the choice of automatic telephone exchange.

v) Public Branch Exchanges (PBXs) be offered to selected Business customers.

vi) Pay-phones be installed at locations where there would be a general demand for international services.

2. LOCAL DISTRIBUTION NETWORK - STANLEY

2.1 Technical/Local Considerations

As explained in Section B, detailed cost comparisons of optional schemes have not been undertaken as it is considered that there is only one practical solution, ie. to totally replace the existing network using an underground ducted network.

The overriding consideration is to protect a new network from damage in the Falkland Islands environment. Failure to do so would lead to unnecessary maintenance and a lowering of the quality of service.

If a solution employing overhead/aerial cabling is required, a detailed on-site survey would be necessary in order to ascertain where it would be practical and safe to use such techniques.

An underground network based on BT principles incorporating distribution cabinets and ring-type distribution poles would allow flexibility to cope with growth and changes in subscribers' requirements.

It is understood that renewal of both electricity and water services in and around Stanley are planned to commence at the end of 1984.

If all excavations and provision of underground pipes and duct-work are coordinated savings in both time and expense would be gained.

Also it is essential that the renewal of the telephone network must take place before a new exchange in Stanley can be installed.

2.2 Recommendations

It is recommended that the existing local telephone distribution network in Stanley be completely renewed. The work should be carried out in two phases.

The first phase would be the construction of duct work and jointing chambers which should be coordinated with the planned renewal of the electricity and water services.

The second phase includes the provision of cables, jointing of cables, removal of unwanted telephone poles, provision of distribution poles and provision of drop wires to subscribers. This work must be undertaken prior to the installation of a new telephone exchange in Stanley.

It is essential that a comprehensive on-site study is undertaken as soon as possible in order to acquire detailed information for planning purposes. Plans must be drawn up covering duct routing, siting of jointing boxes, cabling details, site of distribution poles and identification of all stores.

3. CAMP COMMUNICATIONS

3.1 Technical/Local Considerations

It is considered that the up-grading of Camp communications would best be accomplished in a number of steps. These will systematically increase coverage, provide better access to users and eventually introduce facilities as near as possible to those available on a fully automatic telephone exchange in and around Stanley. In formulating a programme of implementation practical considerations and the effectiveness of the systems considered have been given a high priority.

Firstly, it is considered that the present HF Radio system does not offer a very effective form of communications. Conversely, the 2-Metre system has become widely accepted within Camp and has the potential of offering better Camp-Stanley communications through the installation of a 2-Metre Repeater on Mount Maria. This would also improve Camp-Camp communications.

It has already been seen that in locations where 2-Metre Camp-Stanley reception is good HF communication is no longer used. Instead 2-Metre radio contact is made with the R/T Operator who has the facility to connect Camp callers to Stanley residents through the existing magneto exchange.

The present need to continually monitor calls between Camp and Stanley and manually operate a switch dependent on the direction of conversation could be removed by the installation of voice-switched equipment.

Independent of the above arrangement, the provision of telephone circuits between Fox Bay East and Stanley and between Goose Green and Stanley would offer valuable telecommunications facilities in the areas and generate additional revenue,

particularly international. The circuits should be terminated in call-boxes which would be available to both local residents and military personnel.

The provision of these circuits is mainly dependent on the use of planned military circuits between Stanley and the two locations, although the local end links and call-boxes would have to be provided by the Falkland Islands Department of Posts and Telegraphs.

In order to provide radio communications with automatic facilities similar to those proposed within Stanley an additional form of communications would be required. It is considered that a VHF Radio Telephone system with Selective Calling would provide suitable facilities, primarily for Camp-Stanley. It is anticipated that Camp-Camp communications would continue to use the 2-Metre system.

The Radio Telephone system would be best installed immediately after the introduction of a new automatic telephone exchange in Stanley, to which it would have automatic connection.

3.2 Recommendations

It is recommended that the following steps are taken to enhance Camp telecommunications, leading to a fully automatic radio based service offering facilities similar to those available on the Stanley exchange.

i) Telephone links, using Military circuits, be provided between Fox Bay East and Stanley and between Goose Green and Stanley as soon as possible.

The circuits should be connected to public pay-phones in Fox Bay East and Goose Green and manually operated at the Stanley exchange.

ii) The coverage of 2-Metre VHF communications be improved by the installation of 2-Metre Repeater equipment on Mount Maria.

New accommodation will be required which will eventually be used to house Radio Telephone with Selective Calling equipment (see Recommendation iii).

iii) A Radio Telephone system with Selective Calling be provided, timed to be available immediately following the opening of a new automatic exchange in Stanley. Base station equipment be installed in accommodation provided on Mount Maria for the 2-Metre Repeater.

iv) The Radio Telephone Operator cease duties when the Selective Calling system is fully operational.

v) Additional fill-in repeaters be provided where coverage proves to be inadequate.

4. RECOMMENDED TIMESCALES

The activities covered by the Recommendations in this Section for the installation of equipment in and around Stanley and in Camp should be performed in accordance with Recommended Timescales shown in Figure 1.

The first priority is to plan the duct-work for the new Stanley Distribution Network. It is recommended that this is done in conjunction with the planning of new water and electricity services starting in September 1984.

It is recommended that the provision of circuits to Goose Green and Fox Bay proceed immediately in order to generate extra revenue as early as possible.

It is also recommended that the planning of a Radio Station on Mount Maria for the early provision of a 2-Metre Repeater (and later provision of a Base Station for the Radio Telephone Selective Calling System) be given a high priority.

Any delay in the provision of equipment will mean a reduction in potential revenue and higher operating costs.

SECTION E

MANAGEMENT, TECHNICAL SUPPORT AND OPERATIONS

SECTION E - MANAGEMENT, TECHNICAL SUPPORT AND OPERATIONS

1. STAFF STRUCTURE

2. DUTIES AND GRADINGS

3. STAFF COSTS

4. TRAINING

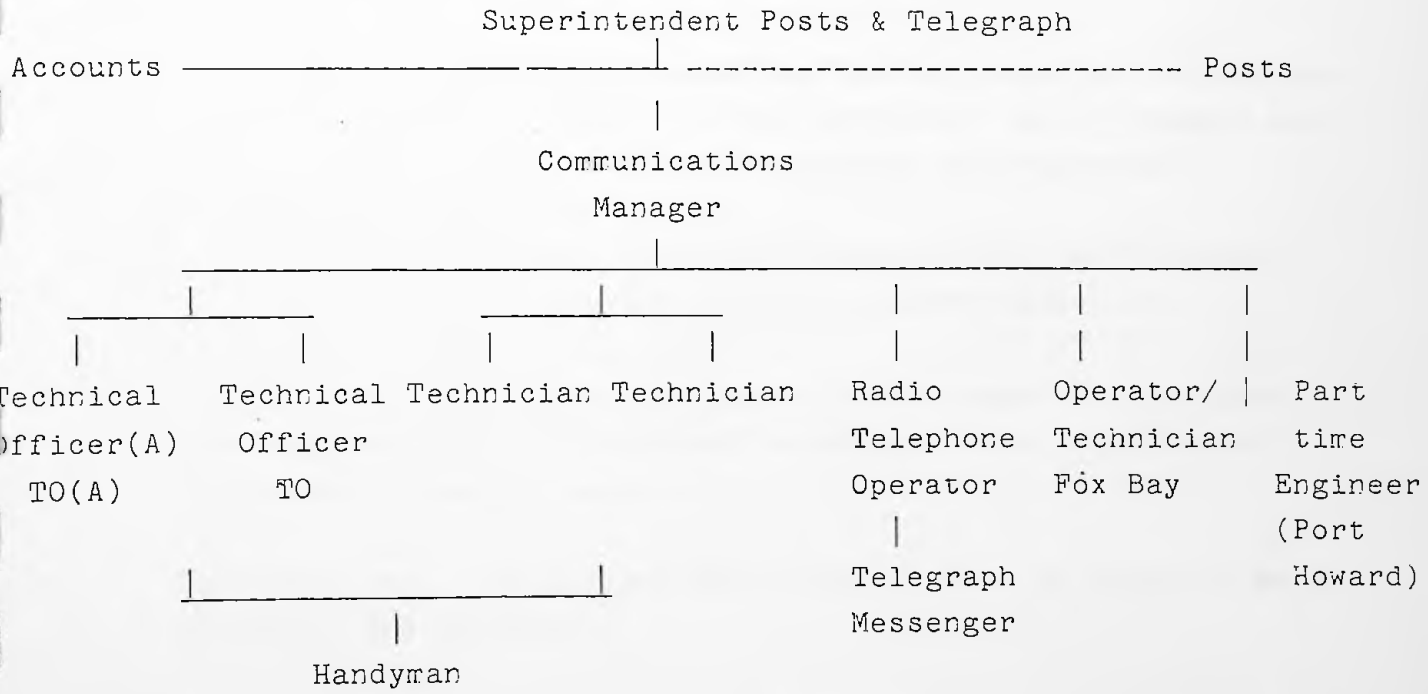
SECTION E - MANAGEMENT, TECHNICAL SUPPORT AND OPERATIONS

1. STAFF STRUCTURE

a) Initial Structure

An outline of the proposed staff structure for the first phase when Stanley exchange and network has been replaced and the first stages of improvement in Camp communications have been achieved is shown below.

With the introduction of a new switching system capable of providing management and maintenance data on demand, the structure envisaged for staffing should be styled to manage the system rather than the present maintenance orientated approach.



The proposed structure would devolve day to day management of the Islands' communications to the Communications Manager. The two Technical Officers (TO's) would be responsible for the maintenance and management of the Exchange Equipment plus Power Equipment, Radio Telephone Equipment and any Broadcasting Equipment for which the Falkland Islands Government was responsible. One of the TO's would be senior in status and would be capable of standing in for the Communications Manager during his absence. He is designated TO(A).

The two Technicians would be responsible for the day to day maintenance and installation of subscribers' equipment (including PBX's and payphones) and underground and overhead plant maintenance.

The Handyman would support as necessary.

The Operator/Technician located at Fox Bay would be responsible for all telecommunications at the settlement as at present and would also continue to be Sub-Postmaster and Registrar.

The duties of the Radio Telephone Operator and the Telegraph Messenger would be similar to their present functions.

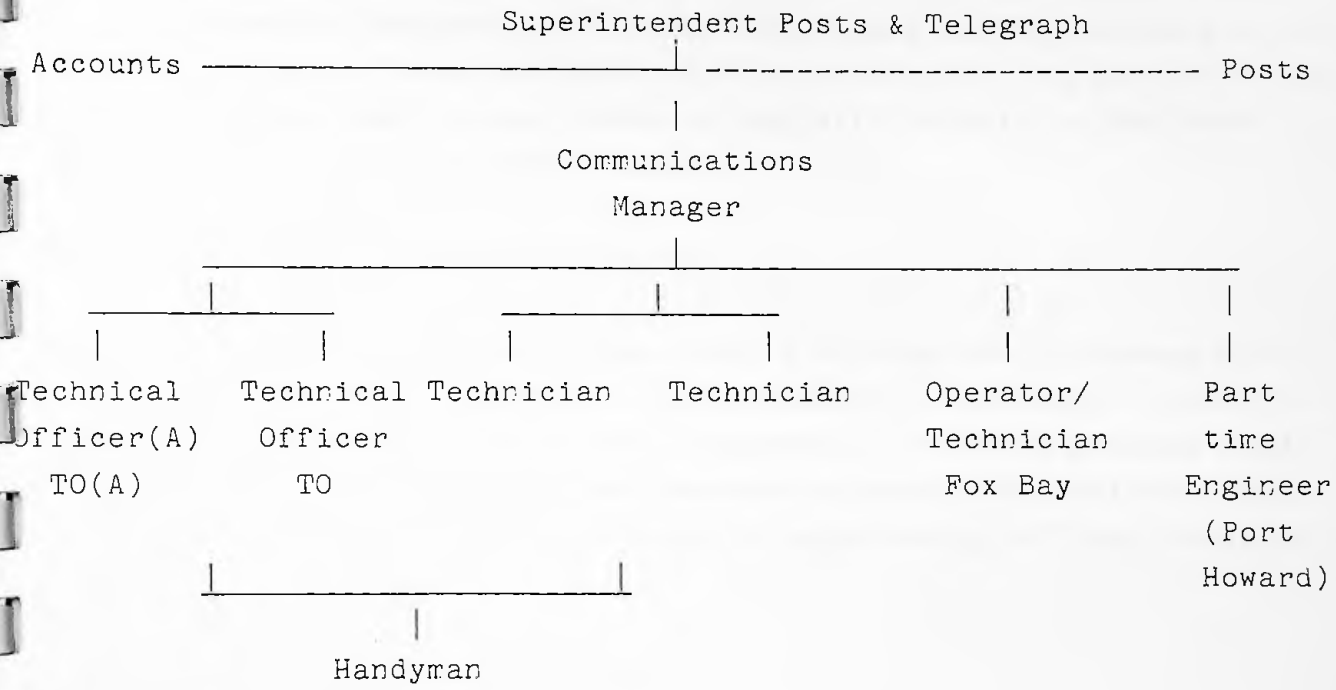
When the repeater station is installed on Mount Maria a part time engineer will be required to perform basic maintenance functions on the equipment.

Part-time Radio Telephone Operators will also be required as is currently the practice.

Accounts data will be fed to the accounts section, perhaps via the Superintendent.

b) Revised Structure

When Selective Calling equipment is installed at Camp locations, the staff tree would be modified to that shown below.



This is basically the same structure as before but with no requirement for a Radio-Telephone operator. The part-time technician function at Port Howard would become more onerous as a Radio Station (unattended) would replace or supplement the Repeater equipment.

2. DUTIES AND GRADINGS

Gradings and salary levels used in the following sub-paragraphs are related to the scales indicated in the Civil Service scale, revised 1st July 1982. The gradings are not directly comparable with existing posts as the duties and job content of the new posts will be different. In general it is assumed that higher rates of pay will be paid as the work content will be more complex.

a) Communications Manager

The Communications Manager would be required to manage the Telecommunications Systems Department, reporting directly to the Superintendent Posts and Telegraphs. He would possess good leadership qualities and require a sound technical knowledge. He would be trained at least to supervising officer level on the new equipment.

His duties would include:

- Assistance to the Superintendent on budgeting control and finance for the Department.
- Long and short term planning requiring the ability to analyse management data output from the system.
- Responsibility for ensuring that service performance was satisfactory and initiation of remedial action as required.
- Responsibility for dealing with the more serious customer complaints and maintenance of good customer relations.
- Liaison with Cable and Wireless plc on international call matters.
- Assistance to the Superintendent on staff appointments, training and recruitment.

Some technical qualifications would be an advantage but lack of them should not preclude selection of a suitable candidate. He should be capable of temporarily performing the Superintendent's duties during his absence.

It is proposed that this post should attract S7 status.

b) Technical Officer (A)

The Technical Officer (A) should have a sound technical knowledge and be trained to maintain the equipment for which he is responsible.

His duties would include:

- Maintenance of the new switching system.
- Maintenance of the system power equipment.
- Maintenance of radio-telephone equipment.
- Maintenance of any broadcasting equipment for which the Falkland Islands Government is responsible.
- Responsibility for devising and maintaining adequate records of the exchange and any other equipment maintained.
- Responsibility for direction and control of external staff when necessary.

He should be capable of relieving the Communications Manager when necessary.

It is proposed that this post should attract S10 status.

c) Technical Officer

The duties of the Technical Officer are very similar to those of the TO(A) but do not include the capability of relieving the Communications Manager.

It is proposed that this post should attract S11 status.

d) Technicians

The two Technician posts, located in Stanley, should be filled by officers having suitable technical knowledge and skills and trained on underground faulting and jointing techniques, subscribers apparatus and line maintenance.

Their duties would include:

- Installation and maintenance of subscribers equipment, including Private Branch Exchanges (PBX's) and payphones.
- Maintenance of underground plant and equipment.
- Maintenance of overhead plant.
- Responsibility for the maintenance of adequate records for all external plant and equipment.

It is proposed that these posts should attract S14 status.

e) Operator/Technician Fox Bay

This Officer should have a suitable technical knowledge and ability to work without direction.

His duties would include:

- Maintenance of all communications equipment located at Fox Bay.

- Maintenance of power plant.
- Radio-Telephone operation.
- Sub-Postmaster) These duties are not strictly the
- Registrar) responsibility of the
) telecommunications department but
are included for completion.

It is proposed that this post should attract S13 status.

f) Handyman

The Handyman should be capable of giving general assistance to the Technical Officers and Technicians when required.

The post would not be established.

g) Radio Telephone Operator

The Radio-Telephone Operator would be required to operate the HF and 2-Metre radio systems whilst they are still in use.

The duties would include:

- Passing messages to and from Camp over the Stanley telephone network.
- Receiving telegrams and reading them over the R/T.
- Typing out telegrams received from Camp over the R/T.
- Obtaining FIG flight information via private wire from aircraft control and passing it on to Camp.
- Connecting Camp R/T to Stanley Telephone Network.
- Recording calls and telegrams for billing information.

It is proposed that this post should attract S21 status.

h) Telegraph Messenger

The duties of the Telegraph Messenger are the delivering of telegrams and messages in and around Stanley.

It is proposed that this post should attract S27 status.

i) Part-time Engineer/Technician - Port Howard

A Part-time Engineer should be recruited from the inhabitants of Port Howard and be given sufficient training to carry out first line maintenance of the Radio Station equipment on Mount Maria.

The duties would be:

- To carry out routine checks on the equipment.
- To restore service by changing units in the event of failure.

The salary for the part-time engineer should be negotiated, dependent on the work-load. An initial salary of £500/annum leading to £1000/annum following the introduction of a Radio Station and a VHF Radio Telephone System has been assumed for costing purposes.

3. STAFF COSTS

The total Staff Costs per annum would initially be as shown below, based on the Civil Service scale as at 1st July 1982.

Communications Officer	(S7)	5,013
Technical Officer (A)	(S10)	4,848
Technical Officer	(S11)	4,848
Technicians (2)	(S14)	8,382
Operator/Technician Fox Bay	(S13)	4,416
Radio Telephone Operator	(S24)	3,372
Telegraph Messenger	(S27)	2,160
Handyman - unestablished		3,145
Total		36,184

The Total Staff Costs per annum, following the introduction of a VHF Radio Telephone System with selective calling would be as shown below based on the Civil Service scale as at 1st July 1982.

Communications Officer	(S7)	5,013
Technical Officer (A)	(S10)	4,848
Technical Officer	(SII)	4,848
Technicians (2)	(S14)	8,382
Operator/Technician Fox Bay	(S13)	4,416
Handyman - unestablished		3,145
Total		30,652

Additionally the annual cost of a Part-time Engineer at Port Howard (£500 initially and eventually £1000) would be incurred. This is considered as an operational cost associated with the Radio Station on Mount Maria.

4. TRAINING

The successful provision of telecommunications services in the Falkland Islands is dependent on the existence of trained personnel.

Due to the lack of suitably qualified people on the Islands it will be initially difficult, if not impossible, to secure such staff locally. However, it is considered impractical to depend on the employment of overseas staff, although this may be necessary in the short term.

Consideration must therefore be given to ensure that adequate training is provided to both existing and locally recruited staff.

Training arrangements would best be performed locally in order to minimise cost and the inconvenience of having staff absent overseas.

The new types of equipment recommended in this Report do not require Operators and training should be directed at the maintenance/support staff.

Advantage should be taken of the presence of trained personnel during the installation, testing and commissioning phases, when nominated maintenance/support staff should involve themselves in the work and hence acquire on-the-job experience. The costs for the provision of all the recommended equipment (Stanley Exchange, Distribution Network, Radio Equipment, Power Equipment) include local training in this manner.

Maintenance/support/operational manuals would also be required for future reference and it is assumed would be delivered with the equipment.

If required, courses covering the maintenance/support/operation of the systems and equipment are available in the United Kingdom.

A typical course would be of 2 weeks duration and cost approximately £3,000 including travel and accommodation. Alternatively, training courses could be run in the Falkland Islands at a similar cost.

It is not known what the on-going requirement will be for training as it is dependent on staff turn-over but it is recommended that an annual budget of £3,000 is set aside for this purpose.

SECTION F

BUDGETARY IMPLICATIONS

SECTION F - BUDGETARY IMPLICATIONS

1. ESTIMATED CAPITAL AND OPERATIONAL COSTS

2. ANNUAL CONTRIBUTIONS TO OVERHEADS

3. ANNUAL COSTS/REVENUE COMPARISON

SECTION F - BUDGETARY IMPLICATIONS

The costs given below are extracted from Section C - Financial Analysis, and should be read in association with the Recommendations in Section D and the Manpower Requirements shown in Section E.

Although it is possible to indicate estimated initial costs for each of the recommended options it is more pratical to group the future maintenance and running expenses under the heading of Annual Contributions to Overheads.

1. ESTIMATED CAPITAL AND OPERATIONAL COSTS

The capital costs given below are estimates of the cost of providing the identified systems. Included in these figures is all work associated with the preparation of specifications, acquisition of equipment, preparation of accommodation, shipping, on-site installation, testing and commissioning.

The equipment includes that required for initial operations plus a quantity of spares/test equipment which would enable the system to be maintained for at least 15 years.

Operating costs include dedicated man-power plus a small annual contingency allowance for spares/test equipment.

	System	Capital Cost (£ Sterling)	Annual Running Cost (£ Sterling)
i)	Automatic Telephone Exchange - Stanley (UXD5)	185,000	500
ii)	Subscriber Telephone Equipment	34,500	
iii)	Local Distribution Network - Stanley		
	i) Duct Provision	237,000	650
	ii) Network Provision	88,000	
iv)	2-Metre Repeater	16,000	700
v)	Radio Station on Mount Maria (required for iv and vi)	82,000	-
vi)	VHF Radio Telephone with Selective Calling	117,800	2,000
vii)	Use of Military Circuits (Fox Bay/Goose Green-Stanley)		
	i) Fox Bay	11,500	-
	ii) Goose Green	13,500	-
	TOTALS	785,300	3,850

2. ANNUAL CONTRIBUTIONS TO OVERHEADS

The estimated annual overhead costs given below are based on 1982 Civil Service Rates of Pay and are maxima of scales.

		£ (Sterling)
a)	Staff Costs	
	i) Prior to introduction of VHF Radio Telephone with Selective Calling	36,184
	ii) Post introduction of VHF Radio Telephone with Selective Calling	30,652
b)	Other Overheads	18,000

3. ANNUAL COSTS/REVENUE COMPARISON

A comparison of the annual costs and an estimate of revenues (Section C - Table 7) indicates that total running costs will be approximately £52,000/annum following the full implementation of the recommended options with a derived revenue of £76,300 when all reductions in staff complement have been implemented.

This assumes that telephone traffic in Stanley will not be suppressed by the intrdocution of local call charging. Any suppression would, of course, reduce the surplus.

However, the Post and Telegraphs Department should be self sufficient once the schemes have been introduced and be able to invest any operational profit in readiness for the replacement of equipment in the longer-term.

SECTION G

PROPOSED TARIFF STRUCTURE

SECTION G - PROPOSED TARIFF STRUCUTRE

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

    1.1 Rental Charges
    1.2 Call Charges (Local)
    1.3 Call Charges (Stanley to Camp)

2. CAMP COMMUNICATIONS

    2.1 Rental Charges
    2.2 Licence Fees
    2.3 Call Charges

3. FOX BAY AND GOOSE GREEN TO STANLEY
   (USING MILITARY CIRCUITS)

4. INTERNATIONAL CALLS

5. ADJUSTMENTS TO TARIFFS

SECTION G - PROPOSED TARIFF STRUCTURE

The Tariff Structure recommended below has been devised with the following objectives:-

i) To generate Revenues sufficient to cover the Overall Running Costs of the Posts & Telegraphs Department including all staff salaries plus an operational profit for long-term investment purposes.

ii) To generate Revenues for each category of service proportionally to the cost of running each service.

iii) To keep existing tariffs, wherever possible, at similar levels to those experienced by users of the current system.

iv) To set new additional tariffs at levels which can realistically be met by subscribers.

1. AUTOMATIC TELEPHONE EXCHANGE - STANLEY

1.1 Rental Charges

It is recommended that the present arrangement for annual telephone rental should apply. In the absence of party lines only two rates are proposed:-

Residential	£30/annum
Business	£60/annum

1.2 Call Charges (Local)

For all calls between subscribers connected directly to the Stanley exchange, the following rate is recommended:-

All categories	5p/minute (or part of minute)
Residential	First 50 units/annum free

1.3 Call Charges (Stanley to Camp)

For all calls from subscribers connected to Stanley network to Camp subscribers, the following rate is recommended:-

a) Via R/T Operator

All categories	10p/minutes

b) Via Radio Telephone System with Selective Calling

All categories	10p/call

c) To Fox Bay and Goose Green (using Military Circuits)

All categories	10p/minute

2. CAMP COMMUNICATIONS

2.1 Rental Charges

The current rental charge of £120/annum should continue whilst HF radio communication is still in existence.

No rental charge is possible for CB radios as it is anticipated that these will be privately owned.

A rental of £50/annum is recommended for the VHF Radio Telephone sets associated with the Selective Calling System.

2.2 Licence Fees

The current licence fee of £2/annum for HF transceivers should continue whilst this form of communication is still in use.

The current licence fee of £5/annum for CB radios should continue.

A licence fee of £5/annum should be introduced for the VHF Radio Telephone Sets associated with the Selective Calling System.

2.3 Call Charges

a) Via R/T Operator

All categories	10p/minute

b) Via Radio Telephone System with Selective Calling

All categories	20p/call

3. FOX BAY AND GOOSE GREEN TO STANLEY (USING MILITARY CIRCUITS)

These calls will be made using coin-box facilities and should be charged at a rate of 10p/minute.

4. INTERNATIONAL CALLS

All international calls made via the Automatic Telephone Exchange at Stanley, including Camp calls connected by the R/T Operator or automatically by the Radio Telephone System with Selective Calling, should bear two charges:-

a) Normal Falkland Islands Charges

The calls should be charged as if they were calls connected to the Stanley exchange.

b) International Charges

Calls should incur the appropriate charge according to destination set by C&W.

5. ADJUSTMENTS TO TARIFFS

The levels of the tariffs recommended in this section are, as stated, set to ensure that all annual operational costs of the Posts and Telegraphs Department are met and an annual profit is obtained sufficent for long-term investment purposes.

If in the light of experience it is found that tariffs are either set too low or too high or that the traffic estimates prove incorrect, adjustments could be made to control the level of profit.

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APPENDICES/FIGURES

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APPENDIX 1

RESULTS OF INSULATION TESTS ON STANLEY DISTRIBUTION NETWORK

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RESULTS OF INSULATION TESTS ON STANLEY DISTRIBUTION NETWORK

CABLE ONE - Fitzroy Road 11-30, John Street East 31-50

	A-B	A-E	B-E
Pair 10	50K	100K	50K
" 15	2M	1.5M	20M
" 26	600K	300K	200K
" 36	40K	10K	10K
" 41	500K	500K	500K

CABLE TWO - Studio Passage 1-20, Moody Street 21-50

Pair 8	00	00	00
" 16	50K	50K	50K
" 26	2M	150K	20M
" 35	10M	20M	4M
" 45	10M	3M	7M
" 49	3M	4M	1.5M

CABLE THREE - Govt. Paddock West - Sullivan House

Pair 3	800K	200K	800K
" 9	150K	100K	50K
" 13	3M	3M	00
" 25	50K	50K	10K
" 43	10K	10K	10K
" 8	2K	3K	1K - To DP37
" 10	3.5K	1K	0 - To DP37
" 13	10K	10K	10K - To DP37
" ?	1.5K	10K	3K - DP37-D912
" 18	00	00	00 - To DP37
" ?	4K	10K	3.5K- DP37-DP12
" 22	3K	10K	3K
" 31	00	00	00
" 37	2.5K	2K	10K

CABLE TO VPC Remote Control

	A-B	A-E	B-E
Pair 6	5M	2M	2M
" 7	50M	3M	50M
" 8	6M	2M	3M

CABLE FOUR TO DP66

Pair 13	40K	10K	10K
" 24	200K	200K	10K

CABLE FIVE TO DP28

Pair 8	40K	30K	10K

CABLE FIVE TO DP34

Pair 41	400K	500K	10K

CABLE SIX TO DP34

Pair 38	15K	15K	10K

CABLE SEVEN TO DP44

Pair 35	10K	10K	10K

CABLE EIGHT TO TOWN HALL DP

Pair 12	20M	00	00

CABLE TEN TO DP5

	A-B	A-E	B-E
Pair 1	00	00	00
" 13	30M	20M	20M
" 15	20M	20M	00
" 18	50M	20M	10K
" 24	20M	00	20M

CABLE ELEVEN TO DP35

Pair 7	50M	50M	50M
" 13	20M	1.5M	10M

TO DP58

Pair 44	600k	12K	300K

CABLE TWELVE TO DP24

Pair 22	6M	6M	10M
" 33	100K	200K	200K

CABLE THIRTEEN TO DP56

Pair 11	5M	300K	5M
" 29	150K	10K	50K

CABLE FORTEEN TO DP56

Pair 10	10K	10K	10K
" 30	50M	50M	10K

CABLE FIFTEEN TO DP4

	A-B	A-E	B-E
Pair 9	8M	8M	400K
" 25	1.5M	10K	1.5M

CABLE SIXTEEN

Pair 14	4M	2M	10M
" 30	500K	10K	10K

All tests carried out with 500V Megg.

A-B = A Leg to B Leg
A-E = A Leg to Earth
B-E = B Leg to Earth

M = Megohms
k = Kilohms

APPENDIX 2

ESTIMATED COSTS FOR MICROWAVE RADIO RELAY NETWORK

RADIO RELAY SYSTEM

BASIC COSTS

Radio Equipment (8-72 channel system)	Rack	600
	Power Shelf	500
	Duplicated Tx Rx	9,000
		10,100
Antennae Installation	Antennae	200
	Feeder (30m)	300
	Connector Kit	100
	Installation Malercots	900
		1,500
Multiplex	8 Channel Mux	4,700
	Signalling Units	600
		5,300
	12 Channel Mux	7,000
	Signalling Units	600
		7,600
	24 Channel Mux	10,400
	Signalling Units	900
		11,300
	60 Channel Mux	32,000
	Signalling Units	1,800
		33,800

Substantial stayed mast	10,000
Container and Power Supplies	25,000
1+1 Channel Radio System	
Per terminal	
Transmitter receiver	1,700
1+1 mux	1,100
AC Power unit	170
Battery back-up	230
Feeder	150
Connector kit	50
Aerial	100
	3,500
Per link	7,000
Commissioning installation	£3,600 per hop
Aerial mast for spur route at settlement	£1,000

APPENDIX 2 (Contd)

HOP		NO OF CHANNELS	RADIO EQUIP.	ANTENNAE INSTALL.	MULTIPLEX	TOTAL
	Link 1					
1	Windy Ridge	60	10,100	1,500	33,800	45,400
1	Rincon Grande	60	10,100	1,500	33,800	45,400
2	Rincon Grande	60	10,100	1,500	33,800	45,400
2	San Carlos	60	10,100	1.500	33,800	45,400
3	San Carlos	60	10,100	1,500	33,800	45,400
3	Mount Maria	60	10,100	1,500	33,800	45,400
						272,400
	Link 2					
1	Mount Maria	12	10,100	1,500	7,600	19,200
1	Byron Hights	12	10,100	1,500	7,600	19,200
						38,400
	Link 3					
1	Mount Maria	12	10,100	1,500	7,600	19,200
1	East Head	12	10,100	1,500	7,600	19,200
2	East Head	8	10,100	1,500	5,100	16,700
2	Mount Alice	8	10,100	1,500	5,100	16,700
						71,800
	Link 4					
1	Windy Ridge	12			4,000	4,000
1	March Ridge	12			4,000	4,000
2	March Ridge	12	10,100	1,500	7,600	19,200
2	Goose Green	12	10,100	1,500	7,600	19,200
						46,400
				Grand Total		429,000

ACCOMMODATION AND ANTENNAE MASTS

	ACCOMMODATION	MAST	CIVIL WORKS	TOTAL
Windy Ridge	E	E	-	
Rincon Grande	25,000	10,000	30,000	
San Carlos	25,000	10,000	30,000	
Mount Maria	25,000	10,000	30,000	
Byron Hights	25,000	10,000	30,000	
East Head	25,000	10,000	30,000	
Mount Alice	25,000	10,000	30,000	
March Ridge	E	E	-	
Goose Green	25,000	10,000	30,000	
	175,000	70,000	210,000	455,000

Commissioning and Installation	8 hops x 3,600 =	28,800
	Plus expenses =	10,000
		38,800

TOTAL COSTS

Equipment Link 1	272,400
" " 2	38,400
" " 3	71,800
" " 4	46,400
Accommodation and Masts	455,000
Commissioning and Installation	38,800
	922,800

SPUR ROUTES

Stanley	1	7,000
Rincon Grande	6	42,000
San Carlos	2	14,000
Mount Maria	5	35,000
Byron Hights	6	42,000
East Head	4	28,000
Mount Alice	4	28,000
March Ridge	2	14,000
Goose Green	1	7,000
		217,000
Aerial Masts	31	31,000
Commissioning/Installation		111,600
Total Cost of 31 spare routes		359,600

SPARE EQUIPMENT

Main routes	41,900
Spur routes	21,700
Test equipment	30,000
	93,600

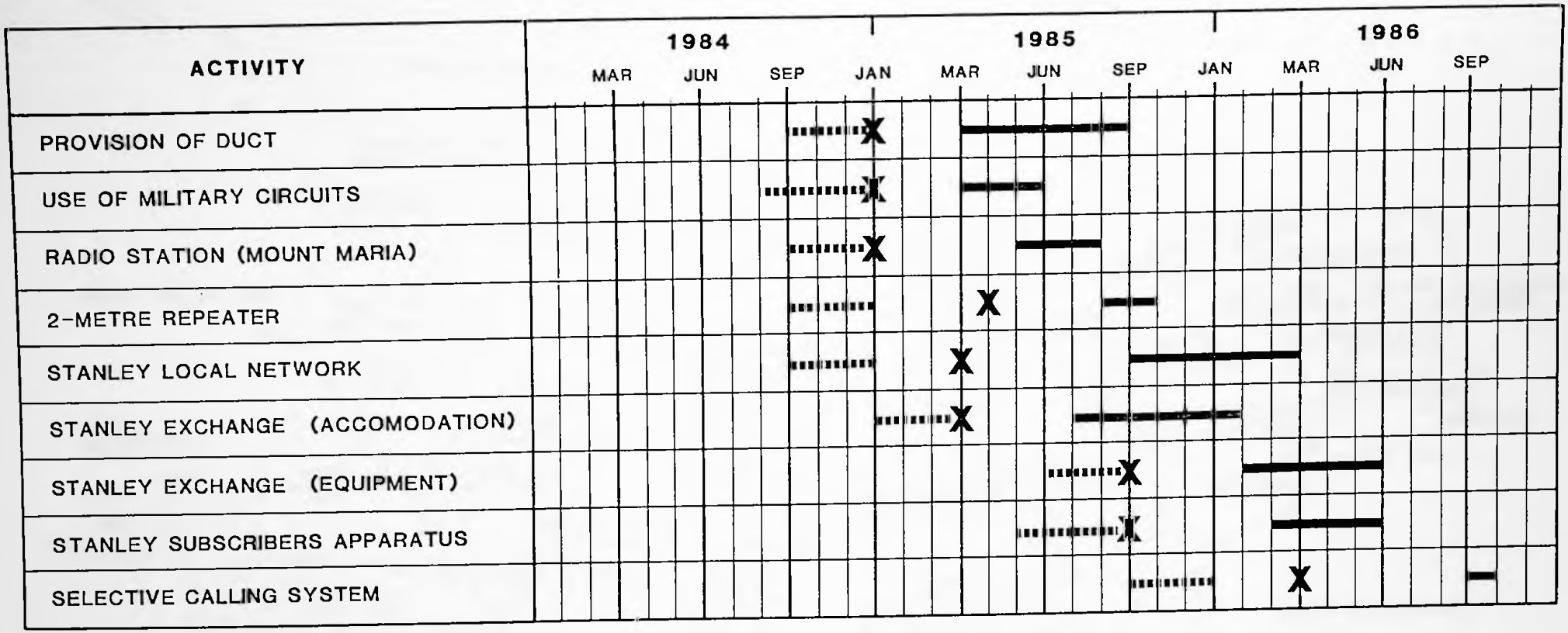

Fig.1 RECOMMENDED TIMESCALE FOR INTRODUCTION OF NEW EQUIPMENT

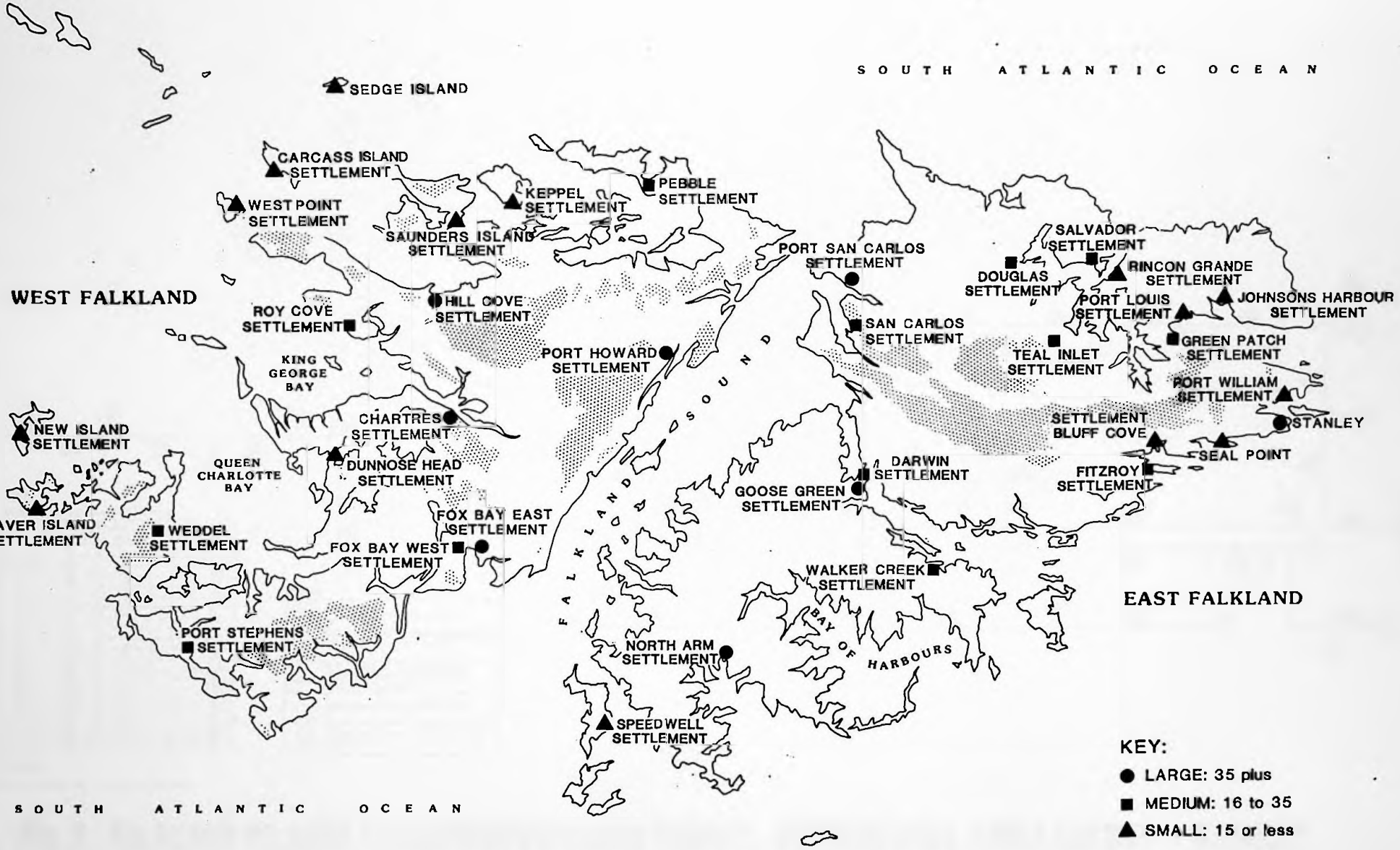

Fig.2 FALKLAND ISLANDS POPULATION DISTRIBUTION

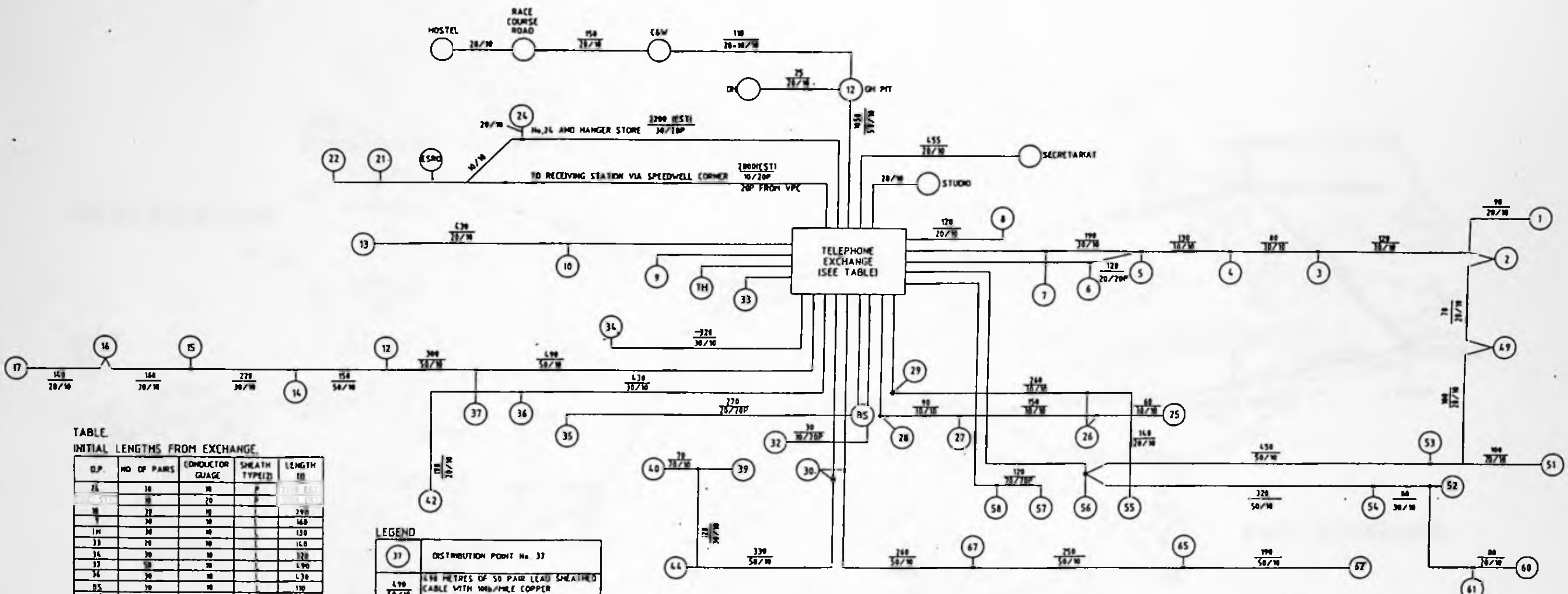

TABLE.
INITIAL LENGTHS FROM EXCHANGE.

D.P.	NO OF PAIRS	CONDUCTOR GUAGE	SHEATH TYPE(2)	LENGTH (1)
24	30	10	P	2200 EST
[illegible]	10	20	P	2800 EST
10	20	10	L	290
9	30	10	L	140
TH	30	10	L	130
33	20	10	L	140
34	30	10	L	320
37	50	10	L	490
36	30	10	L	430
BS	30	10	L	110
BS	30	20	P	110
30	50	10	L	210
40	50	10	L	210
29	30	10	L	190
28	30	10	L	120
58	20	20	P	300
56	100	10	L	450
6	30	10	L	200
7	30	10	L	200
8	20	10	L	120

1. IN METRES
2. L = LEAD SHEATHED   P = PLASTIC SHEATHED

LEGEND

(37)	DISTRIBUTION POINT No. 37
490 / 50/10	490 METRES OF 50 PAIR LEAD SHEATHED CABLE WITH 10lb/MILE COPPER CONDUCTORS.
270 / 20/20P	270 METRES OF 20 PAIR PLASTIC SHEATHED CABLE WITH 20lb/MILE COPPER CONDUCTORS.
(TH)	DISTRIBUTION POINT IN TOWN HALL
(BS)	DISTRIBUTION POINT IN BROADCASTING STUDIO

Fig. 3 FALKLAND ISLANDS TELECOMMUNICATIONS SURVEY. HYPOTHETICAL CABLE LAYOUT – STANLEY

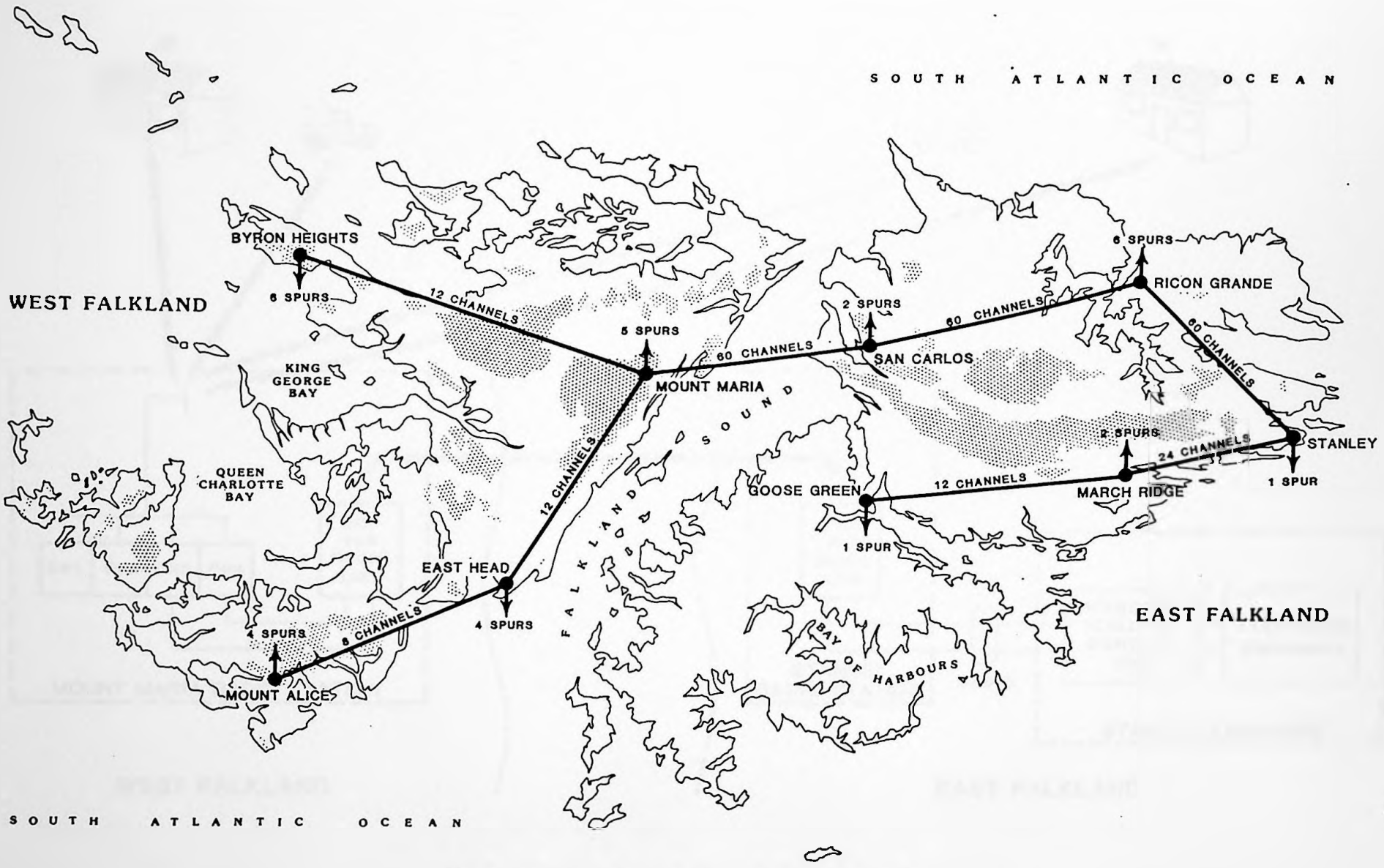

Fig. 4 MICROWAVE RADIO-RELAY NETWORK

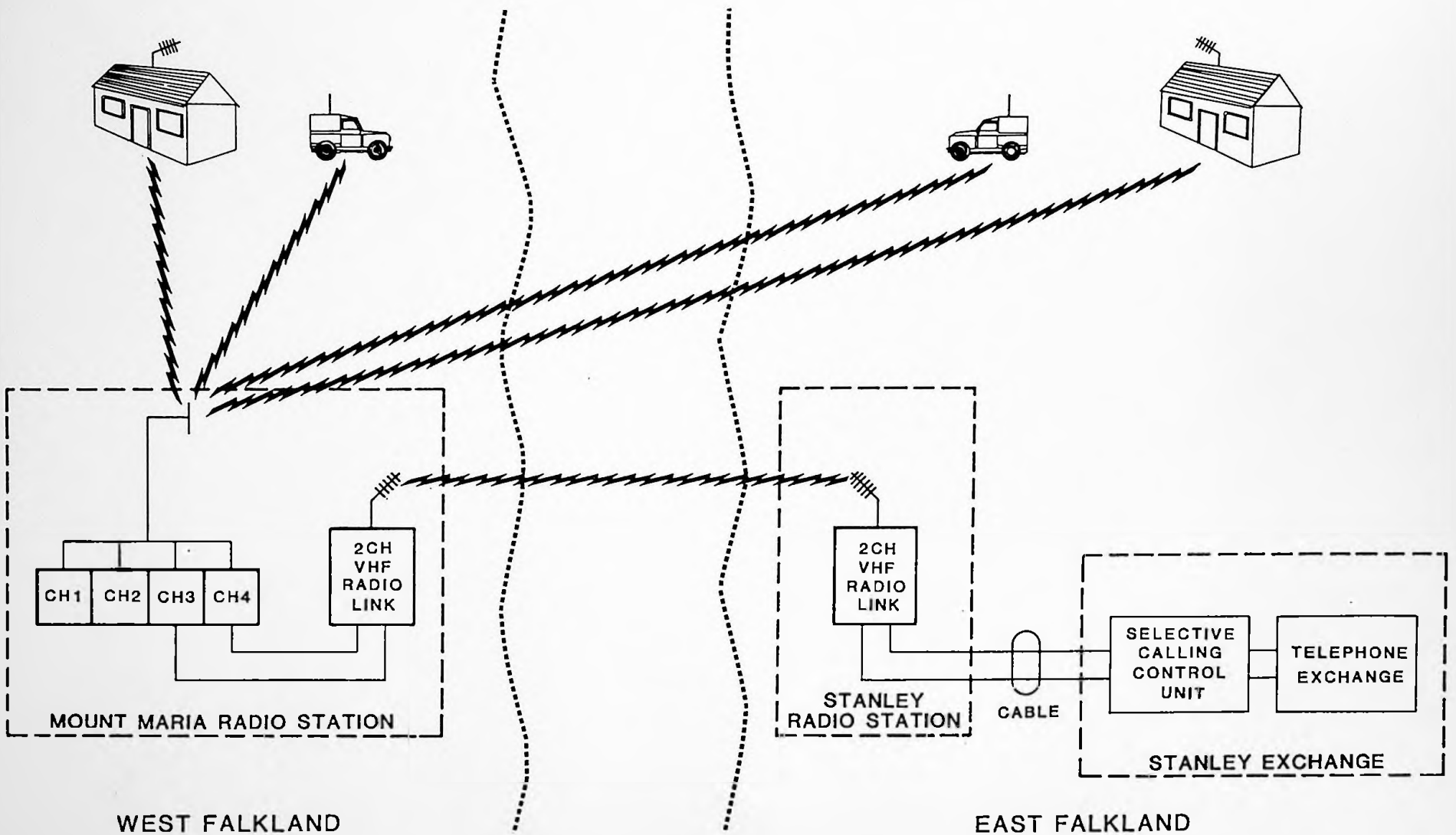

Fig.5 VHF RADIO SYSTEM WITH SELECTIVE CALLING