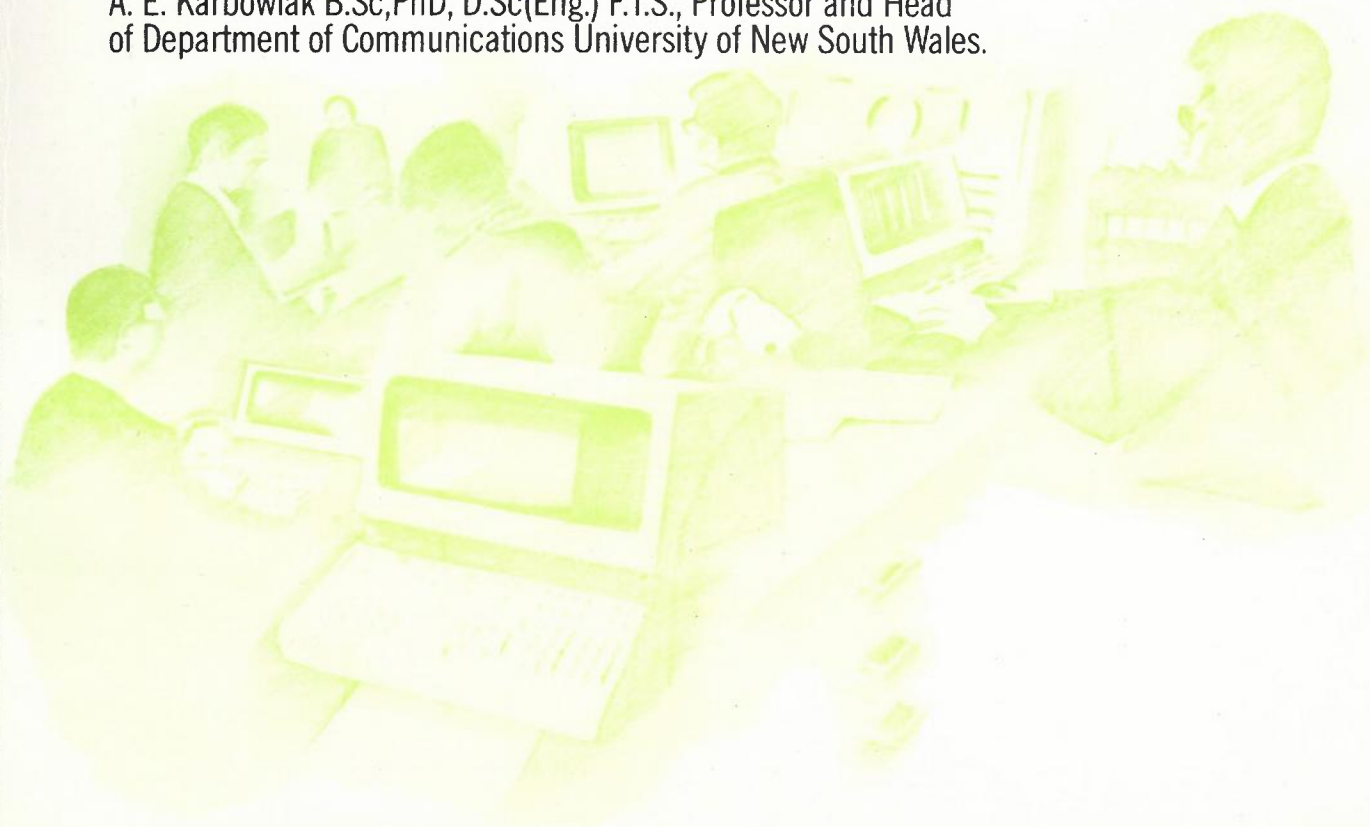




TELEPHONE NETWORK SWITCHING OPERATIONS

Study by:
A. E. Karbowski B.Sc,PhD, D.Sc(Eng.) F.T.S., Professor and Head
of Department of Communications University of New South Wales.



ARE 11 OMPQS 2 MODEL 'A'
 AI-00 PBXE FAULT 38 15 FF
 AI-02 STUI FAULT 02 2E
 AI-03 STUI FAULT 00
 AI-04 TCP DIST 04 00 01 79 6B 3E
 AI-08 MUX FAULT 38 00 01
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 AI-0C IDS RTF 39 02 00 01 00
 AI-0F SLMO FAULT 00 12
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 * DIOP:52
 DIOP:52,
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 3B WCS
 3C WMC
 3D DAO
 3E JCO
 3F WCC
 * DIRP:05;

S 2 MODEL 'A'
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 UI FAULT 02 2E
 UI FAULT 00
 TCP DIST 04 00
 MUX FAULT 38 00
 MUX FAULT 39 00
 IDS RTF 39 02
 SLMO FAULT 00 12
 SLMI FAULT 00 12

RE 11 OMPQS 2 MODEL 'A'
 2-00 STUL 02 26 ;
 SVM:00,5D;
 SVM:00,5D,08 00 ;
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OMPQS 2 MODEL 'A'
 3C STUL 02 26 ;
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 IOP:52,3A,3F,1,
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TELEPHONE NETWORK SWITCHING OPERATIONS

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of Department of Communications University of New South Wales.

This report has been prepared as required by an agreement made before the Commonwealth Conciliation and Arbitration Commission on 27th August 1978.

This agreement between the Australian Telecommunications Employees Association and Telecom Australia required the establishment of E.M.C. and E.S.C. trials in metropolitan networks, the outcome of which is considered in this report.

(Report completed October 1980)

CONTENTS

PAGE

PART 1 - Report	3
1. Terms of Reference	5
2. Telecom	7
2.1 Organisation of Telecom	7
2.2 Responsibilities of Telecom	11
3. ATEA Attitudes	13
4. National Telecommunication Network Planning & Design	15
5. Analysis and Discussion	25
5.1 General	25
5.2 Efficiency of Operation	29
5.3 Standard of Service Achieved	36
5.4 Job Satisfaction	38
5.5 Career Opportunities	44
5.6 Maintenance of Technical Standard and Retention of Expertise	49
5.7 The Public Interest	52
5.8 A Plan for the Future	60
6. Conclusions and Recommendation	69
6.1 Conclusions	69
6.2 Recommendations	75
EPILOGUE	77
PART 2 - Source Material	79
7. Bibliography	80
8. Supporting Material	87
8.1 Notes on Visit Overseas	87
8.1.1 Visit to BPO - United Kingdom	87
8.1.2 Visit to French PTT - France	92
8.1.3 Visit to Televerket/Ellemtel/LME, Stockholm - Sweden	100
8.1.4 Visit to Jutland Telephone Co. - Denmark	109
8.1.5 Visit to Netherlands PTT - Netherlands	119
8.1.6 Visit to Deutsche Bundespost - West Germany	132
8.1.7 Visit to GTE, Stamford, Connecticut, USA	140
8.1.8 Visit to Bell Co: AT&T USA, Basking Ridge - New England Tel. Co., Boston - Mountain Bell, Denver	160

8.2	Report on the Operation of Exchanges in NSW, Vic., Qld. SA and WA	180
A	Schedule of Cutover Dates	180
B	Technical Profile of Exchanges Visited	181
C	Feedback on Interviews with Staff	200
8.3	A Survey of Job Satisfaction	240
8.4	Itemised List of Activities which have provided material for this report	249
9.	List of Common Abbreviations	255

PART 1 - REPORT

1. TERMS OF REFERENCE

The scope of the Report and its purpose are defined in section 6 of the Transcript of Proceedings before the Arbitration Commission, Melbourne, 27 August 1978. The relevant parts are the following:

"That there be a trial period from the present until 30 June 1980, of ESCs and EMCs on the following basis:

- (a) There will be installed ESCs and EMCs in the various States as follows:

New South Wales	-	1 ESC, 3 EMCs
Victoria	-	1 ESC, 2 EMCs
South Australia	-	1 ESC, 1 EMC
Western Australia	-	1 ESC, 1 EMC
Queensland	-	1 ESC, 1 EMC
Tasmania	-	1 EMC

totalling in all 5 ESCs and 9 EMCs

It is provided that not more than one EMC shall be installed in New South Wales and Victoria until the ESC for that state is brought into operation. In this regard Telecom will install the New South Wales and Victorian ESCs as soon as practicable.

It is noted that in New South Wales the third EMC will be introduced late in the trial period.

- (b) Should at any stage of the trial period there be evidence that the reliability of the Telecom network or part thereof is endangered, then Telecom may, with the agreement of the ATEA, or failing agreement by decision of the Conciliation and Arbitration Commission, suspend or cancel the trial to the extent that the trial endangers reliability.
- (c) The parties agree to co-operate in every way to ensure a fair and balanced trial of both ESCs and EMCs. The details of implementation to be discussed fully between the parties.

- (d) The trials are to be the subject of an investigation and report by two independent experts, one nominated by Telecom, the other to be nominated by ATEA, the ACTU and CAGEO after consultation with the other unions represented on the Telecom Consultative Council. The report or reports are to be given to the Arbitration Commission and debated in open hearing with the parties accepting the relevance of the results.
- (e) To facilitate the trial and investigation the provisions of the 1976 DORT/EMA agreement will be extended to 30 June 1980.
- (f) Factors relevant to the trial, investigation and reports include:
 - (i) Efficiency of operation
 - (ii) Standard of service achieved
 - (iii) Job satisfaction
 - (iv) Career opportunities
 - (v) The maintenance of technical standards and retention of expertise
 - (vi) The public interest
 - (vii) That for the introduction of future technology the parties or, in the event that the parties cannot agree, the Arbitration Commission set up a programme for adequate prior discussion of problems with a provision that the matter be referred to the Arbitration Commission if the parties cannot reach agreement".

Of direct relevance to this study are the factors enumerated in sub-section (f) (i) through to (vii); the contents of this Report are organised with particular reference to these factors.

Under the terms of Agreement between Telecom Australia and myself the Report is based solely on the results of the study undertaken by me and not influenced by any other criteria.

"If we could see both sides of the coin at once, we would be halfway towards solving our differences".

P.K. Shaw

2.1 Organisation of Telecom

The Australian Post Office Commission of Inquiry (Vernon Commission) submitted its report to the Governor General of Australia on 19 April 1974. In it the Commission proposed the setting up of a new structure separating the Telecommunication and Postal Services.

The Government, following the report of the Commission, passed the Telecommunications Act 1975 thus setting up a new Commission, Telecom Australia, to administer Telecommunication Services in the Commonwealth.

The Commission of Inquiry recommended for the Telecommunication Authority an administrative structure which has been used as a model for the Telecom organization. The Report¹ recommends a Commonwealth structure headed by the Managing Director (MD) responsible to a Board. The State Managers who report to the MD through the Chief General Manager (CGM) are responsible for the administration of Telecommunication services in their respective states.

Further details concerning the operational activities in the Australian Telecommunications Commission are contained in a Report prepared by Cresap, McCormick and Paget². The report recommends that the communication operations services be provided through administrative structures based on Telecommunication Districts, each headed by a District Telecommunication Manager (DTM) responsible to the Chief Operations Manager (COM) of the State.

The Telecommunication District is defined as the smallest administrative structure responsible for service to customers. The Report foreshadows the delegation of responsibility and accountability, for quality of service and efficiency, to the Districts.

-
1. Report of the Commission of Inquiry into the Australian Post Office, Vol.1 Commission report April 1974, Vol.2 Consultants Reports. (The Parliament of the Commonwealth of Australia, Parliamentary Papers Nos. 123 and 124, 1974).
 2. Australian Post Office. Study of Organization of State-Level Operations Activities in the Australian Telecommunications Commission (Cresap, McCormick and Paget, Management Consultants, April 1975).

The recommended district organization is shown in a schematic form in Fig.1. The administrative control of the functions in the district is exercised through a number of senior officers Internal Plant Manager (IPM), External Plant Manager (EPM), etc.

The report acknowledges that in the process of partitioning the functions in a district among several senior officers a degree of overlap of functions is inevitable, but goes on to suggest that if a consultative and flexible style of management is adopted no major problems are envisaged.

Telecom Australia adopted the general thrust of the recommendations made by Cresap, McCormick and Paget but varied the details for a variety of organizational, industrial and regional interest reasons. The actual basic organization implemented by Telecom Australia is shown in Fig.2.

RECOMMENDED ORGANISATION OF
TECHNICAL OPERATIONS ACTIVITIES
FOR A LARGE DISTRICT

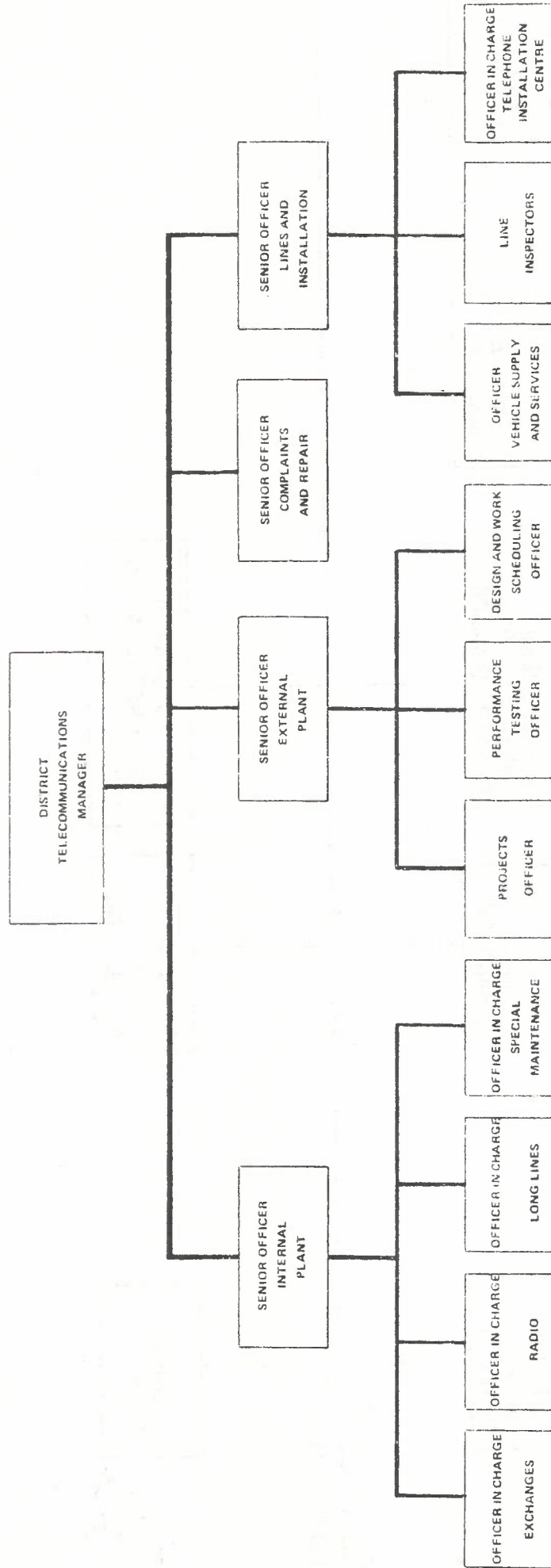


Fig.1

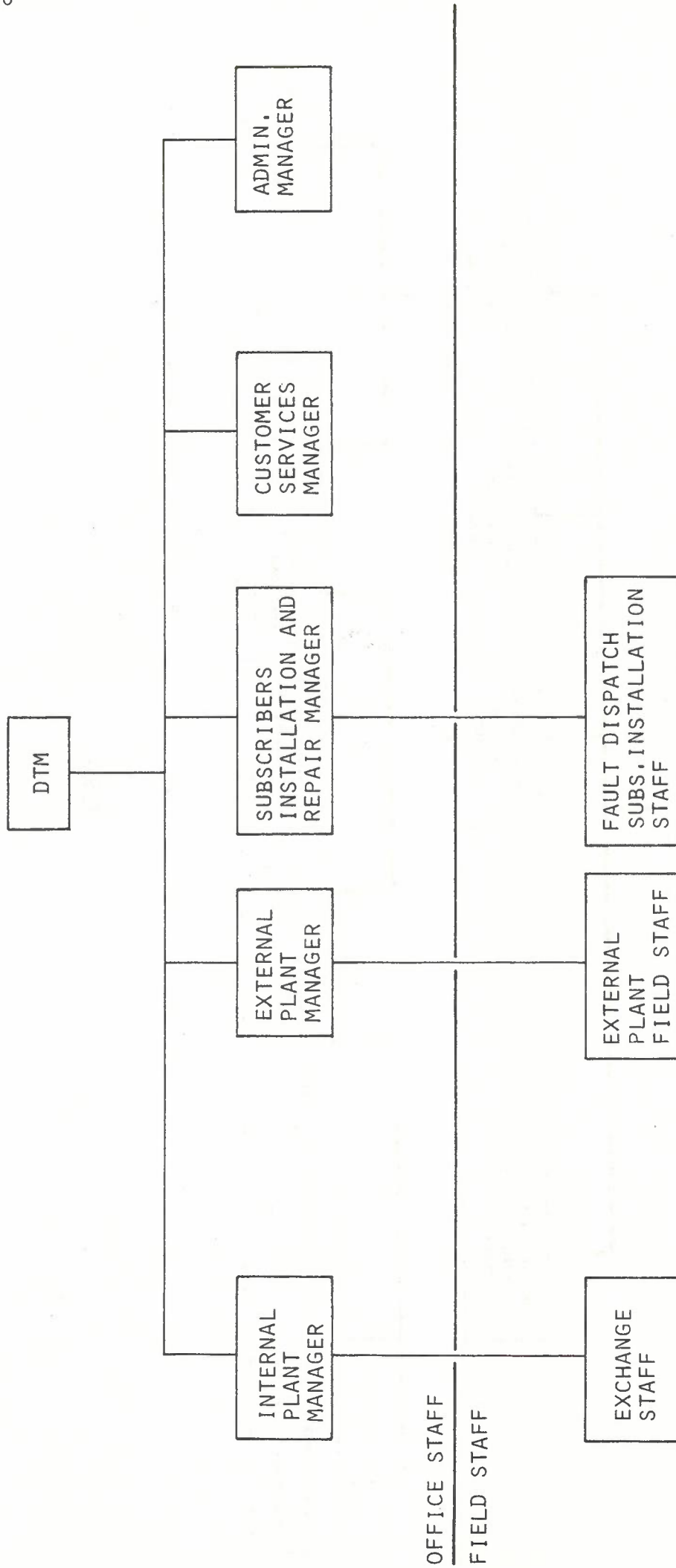


FIG. 2

2.2 Responsibilities of Telecom Australia

(a) Statutory

The functions and responsibilities of the Commission are covered in the Telecommunications Act 1975. The Commission is also bound by the general body of Commonwealth Law which binds Statutory Authorities.

The functions of the Commission are set out in Section 5(a) of the Telecommunications Act. These are: to plan, establish, maintain and operate telecommunication services within Australia.

The manner in which such functions are to be performed are discussed in Section 6 of the Act. This asserts that the functions shall be performed in such a manner as will best meet the social, industrial and commercial needs of the Australian people for telecommunication services.

The Commission is also required to consider:

- (i) The desirability of improving and extending its telecommunication services in the light of developments in the field of communications.
- (ii) The need to operate its services as efficiently and economically as practicable.
- (iii) The special needs for telecommunication services of Australian people who reside or carry on business outside the cities.

The Commission is compelled (Section 73) to pursue a policy directed towards covering each year all expenditure chargeable to revenue and providing an amount equal to not less than one-half of its capital expenditure. (This is a minimum figure; it is noteworthy that the degree of internal funding has risen significantly in each year since becoming a Commission and at 79/80 is at 71.3%).

In effect the Commission is to provide a comprehensive range of telecommunication facilities throughout Australia to all who reasonably require service, to add new services as these become feasible, and to keep charges as low as practicable.

(b) Tariffs

A major component in Telecom's Corporate Plan is to ensure that the real costs of telecommunications services to the customer should continue to decline.

(c) Productivity

To meet the implied commitments in (a) and (b) above, Telecom is committed to a programme that will lead to improved efficiency. This is achieved through improvements in management, work organisation and through practices which are made possible as a result of the introduction of new technology.

(d) Difficulties

To meet the above responsibilities, the Commission see two serious difficulties:

- (i) The availability of capital necessary to keep the Australian network up to world standards while meeting demands for service at reasonable tariffs.
- (ii) Industrial attitudes leading to disruptions of high revenue services, in particular business services and the trunk network, as a way of applying industrial pressure when negotiating on various issues. Apart from the long term effects of such attitudes on business planning, in the short term it has a direct effect on the availability of capital from internal sources increasing the problem mentioned in (i).

The Commission recognises that there is a conflict between the objectives of Telecom as spelt out in 2.2 (a) (quality of service to customer in particular) and the constraints imposed by d(i) and d(ii) above.

The Commission stated explicitly the need for an increase in efficiency. As of 30 June 1979 the total full-time staff of Telecom stood at 87,440 for a network containing 4.45 million telephone services. While a number of factors need to be taken into account for exact comparison with other countries, the ratio of 87,440 to 4.45 million is the highest, by far, amongst the Western countries (as shown on Table 5.1).

"Facts do not cease to exist because they are ignored".

Aldous Huxley

3. ATEA ATTITUDES

The ATEA feels that on a matter as complex as the subject of new technology and related issues, it is hard to present their position in a precise form, and that a brief summary or the one that follows necessarily leaves out some issues that concern ATEA. The summary given below represents my understanding of ATEA position.

ATEA attitudes evolve out of their concern for the interests of the organisation itself and that of its members. The position adopted by ATEA can be discussed under the following headings:

- (a) New technology
- (b) Work environment and nature of employment in consequence of the introduction of new technology or new work organisation (redundancy, redeployment, retraining, demarcation etc)
- (c) Organisational arrangements (installation and operation).

3.1 New Technology

In principle ATEA is not against "new technology", but questions the way in which the "new technology" is implemented in Australia.

The ATEA is not in a position to fully assess the potential of new technology in that it lacks the necessary expertise among its members and, at the same time, has not the resources to hire an independent expert to advise them on the relevant technical aspects. It therefore argues that the onus is on Telecom - which has the necessary expertise - to fully advise ATEA membership on the potential of new technology which it proposes to introduce.

3.2 Changing Environment

- (a) The ATEA feels that there is an element of fear amongst Association members that the inevitable end result of the introduction of the new technology (SPC in particular) into Telecom will be a surplus of technical staff. It argues, therefore, that a guarantee should be given by Telecom to the effect that no member of ATEA will be made redundant as a result of new technology.

- (b) The ATEA position on redeployment is that it should be voluntary and that adequate compensation be made for the costs incurred by the individual concerned.
- (c) The Association position on training for SPC technology is that it should be made available to all staff whose work is associated with the new equipment. The level of the training should be such that will enable the staff concerned to understand the system at a level such as to enable them to work on the equipment confidently.
- (d) The Association is of the view that all work presently carried out by ATEA members should continue to be carried out by them. For example, the proposal to allow new services, cancellations, temporary disconnections and changes to subscriber categories to be effected from a remote point by clerical level staff is not supported by the Association. (This is a demarcation case). The Association would seek to have such equipment operated by technical staff.

3.3 Organisational Arrangement

The Association fears that new technology and alternative organisational arrangements will go hand in hand.

- (a) In maintenance, the ATEA will seek to preserve the current practices and will oppose organisational arrangements which might reduce the number of staff employed in operation, affect the staff profile, or reduce the level of the officer-in-charge. The association is also opposed to organisational practices which imply formation of an "elitist group".
- (b) The new technology brings with it a new range of equipment and installation practices. The Association is concerned that the new equipment will be easier to install, will require less time and fewer staff to install and to test. The new generation of SPC equipment might also require a lesser level of technical expertise for its installation. The Association would seek to preserve traditional levels of staffing or have a satisfactory alternative employment for its members.

For proper evaluation of the results of the present trials it is essential to make some reference to the telecommunication network planning and design.

Planning a National Telecommunication Network cannot be undertaken in isolation from other national targets. The various national objectives, when implemented, tend to interact with one another in a complex way and in turn tend to influence national priorities. This comes about in a multitude of ways and the optimum plan evolves through a detailed consideration of available technology and extensive studies of alternative solutions. For example, the telephone network serving a variety of business enterprises has a significant impact on the growth of the national economy, which in turn generates a demand for a further range of services and for network expansion.

Clearly, telecommunication network development is an undertaking which is in competition with other national projects for its share of capital and human resources.

Network planning is an activity that calls for co-operation of a range of engineering and other skills. The subject is broad and even a summary would be too extensive for it to be incorporated as part of this report, the interested reader is referred to sources listed in the bibliography. But, what I can do is to point to a number of factors which have a significant bearing on the subject before us.

The major factors which affect planning of a telecommunication network are the following:

- . Existing investment and network configuration.
- . International standards.
- . Community needs and expectations.
- . Economic considerations.
- . Administrative needs.
- . Availability of new technology and of engineering and technical skills.
- . Attitudes of the community and of the workforce.
- . Network flexibility for future development.

As of 30 June 1979 the total fixed assets of Telecom Australia stood at \$M7,000. Of this the largest component by far, is the investment in the telephone network. This - as far as the community is concerned - implies a commitment in two respects:

- (a) The community expects Telecom to ensure a fair return on the investment, and
- (b) Any new plant added to the system must be compatible with that already in operation.

The telecommunication administration must plan at least 10 years in advance of the demand and the plant once installed is, normally, expected to remain in service for 30 to 50 years. It is this large time span - ranging from the early stages of planning through placing an order with the manufacturer, commissioning of the plant, and the expected years of service - that makes any subsequent ad hoc changes difficult and expensive to implement. For example, the decision to introduce ARE 11 equipment into the Australian network was made some years ago and cannot now be easily altered without incurring a substantial financial penalty for the community. In a similar way, many of the decisions concerning the introduction of the AXE equipment are irrevocable: there is an implied commitment by the community to a particular type of equipment, to the manufacturer and to a pattern of network development (Figs. 1, 2, 3 and 4).

The planning engineers, often assisted by computer aided modelling techniques, must anticipate through various forecasting techniques the community needs and expectations 10 or 15 years ahead. Since community expectations can only be forecast with limited confidence, it is essential that the network development plan has adequate flexibility built into it.

A national network is part of a world-wide network. As such it must conform to international standards and should preferably cater for a similar range of facilities and customer aids as offered in networks elsewhere in the world. For example, the trend to a digital mode of operation and to integrated services will, in due course, affect the standards and network development plans in Australia.

In a similar way, the move towards centralization of network operation - designed to ensure network stability - will in due time result in a mode of network operation which will require Australia to follow suit. This has arisen on account of a number of factors generated by the community and the new technology. Community needs and expectations - as I said earlier - change with time. For example, at the beginning of this century practically all telephone calls were local, and it was not until after the Second World War that the number of trunk calls became large enough to warrant the introduction of automatic services in the form of Subscriber Trunk Dialling (STD). This had consequential effects on network planning and design. Moreover, in the last two decades the rise in STD and international traffic has been unprecedented, so much so that various forms of centralised network control have been developed and rapidly implemented in a number of western countries. This development was necessary to guard against network congestion and blockage and to bring about quality of trunk traffic which would satisfy the users.

On a smaller scale, in the last two decades in Australia, we have witnessed a rapid growth in STD and international traffic. Telecom has responded to the expectations of the community by extending these facilities and by concurrently developing plans for possible patterns of network control to ensure a reliable service in a stable multi-mesh network, peculiar to Australia (Fig 4)*. These objectives are in line with the Telecom Corporate Plan.

I said earlier that there exists an intimate relationship between network planning and economic considerations. Telephone network plant is costly, paid for by the community for its use. The plant life is long (typically cross-bar equipment has an expected life of 30 to 50 years) and its resale value is small. In comparison with other industries the telecommunication plant has a slow rate of turnover. Notwithstanding this, and in view of the long life of plant, the dominant component of the discounted costs to the community for the provision of an effective telecommunication network has been labour associated with installation and maintenance.

*Figure 4 is shown for illustrative purposes only. It illustrates a fragment of network planning taken out of the recent Tandem Study Task Force (TSTF). The general network is much more complex.

The new technology among others has given us:

- (a) New manufacturing techniques.
- (b) New types of equipment and practices.
- (c) New and more powerful electronic devices.
- (d) Stored Program Control (SPC)
- (e) Ways of achieving changes in the network and network configuration by software commands rather than by expensive hardware modifications.

Moreover, the new equipment is often less expensive than the old and the maintenance costs are substantially lower. Frequently, therefore, it becomes economically attractive to install such equipment before the originally envisaged replacement date of existing equipment.

Reliable operation of the telecommunication network is of paramount importance to the community. For this reason the subject has been studied overseas as well as in Australia.

These studies show that a large proportion of faults are human induced. Some 30% of faults originate from wiring defects which are caused by various human activities such as: strapping changes, equipment modifications, overzealous adjustments and preventive maintenance, installation activity, etc. Other faults are induced in the process of fault tracing or simply by poor workmanship and careless maintenance. Studies carried out in various European countries and in North America show that equipment operated under "hands off" condition shows a significantly higher reliability figure than equipment subjected to unnecessary preventive maintenance. Man-made faults cause a high percentage of failures and therefore the preferred and less expensive maintenance policy has evolved known as "hands off" operation where only the minimum necessary corrective maintenance is undertaken with minimum human interference. This kind of maintenance practice is particularly appropriate for the new generation of electronic switching equipment (non-electromechanical). It results in substantially reduced maintenance costs and increased service quality.

There are other side effects of the way in which new technology and costs associated with labour interact. For example, if labour costs associated with maintenance continue to rise at a faster rate than originally anticipated, then the rate of introduction of the new technology is automatically accelerated to compensate for the excess cost and to redress the economic balance.

Furthermore, while the network is designed to meet future needs and expectations of the community in the light of the best forecasts, the future rarely follows the forecast trend precisely. This is on account of various developments (eg., discoveries in science, developments in technology, community standards, etc.) which could not have been foreseen. It is, therefore, of paramount importance to so design the network as to be able to accommodate unforeseen events with the least amount of expense. In this respect SPC technology is of particular interest in that it permits, at low cost, network reconfiguration using software commands. This applies to switching plant as well as to traffic routing patterns in the network.

Finally, in the long run it will help if the community and employees are given more opportunity to understand the implications of the points raised above. In particular, to appreciate the long term need for centralised network control, alongside of decentralization of operation and delegation of responsibility to Telecommunication Districts*. This implies a need for more effective team work if technology is to benefit the country.

It is well known that technology gives people power to achieve greater things but to use this power in a worthwhile way we must learn to work more effectively in groups and widen our horizons. The aim is to serve the community by developing a more effective network and not by being exclusively concerned with our immediate task. This implies a re-education programme of self for the good of the whole.

*This was also a recommendation of the Vernon Commission.

Through various studies of Socio-Technical-Systems (STS) we now begin to understand that the real problem is not technology itself but our own inability to work in large groups, for effective utilization of technology, towards a common good.

Man-power and staff development are two further components of the central task of the National Telecommunication Network Planning and Design. To succeed in this Telecommunication Administrations must plan to help their employees to educate themselves, not only in the technical aspects of technology, but also to understand themselves better and thus to learn to cope effectively with human forces in a group environment.

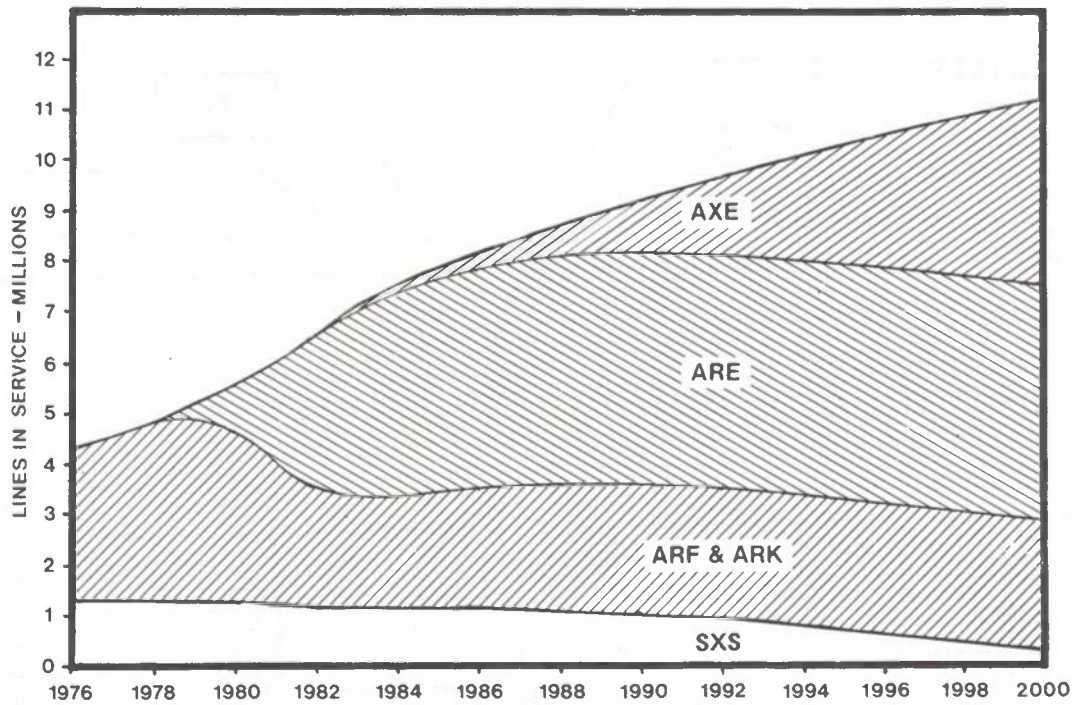
It is natural for people to be self centered - some believe that we are born like it, others argue that we acquire or, at least, reinforce these characteristics in the environment of the society - and it is for this reason that it takes a special effort on the part of each and everyone of us to be an effective group member. While arguments are still at large, there is a body of evidence that the full benefits of technology can be passed on to the community and posterity only through the medium of effective group work. The ugliness of tomorrow is unlikely to be their fault: the future is in our hands.

"Living is an art and, to practice it well, men need not only acquire skill, but also tact and taste".

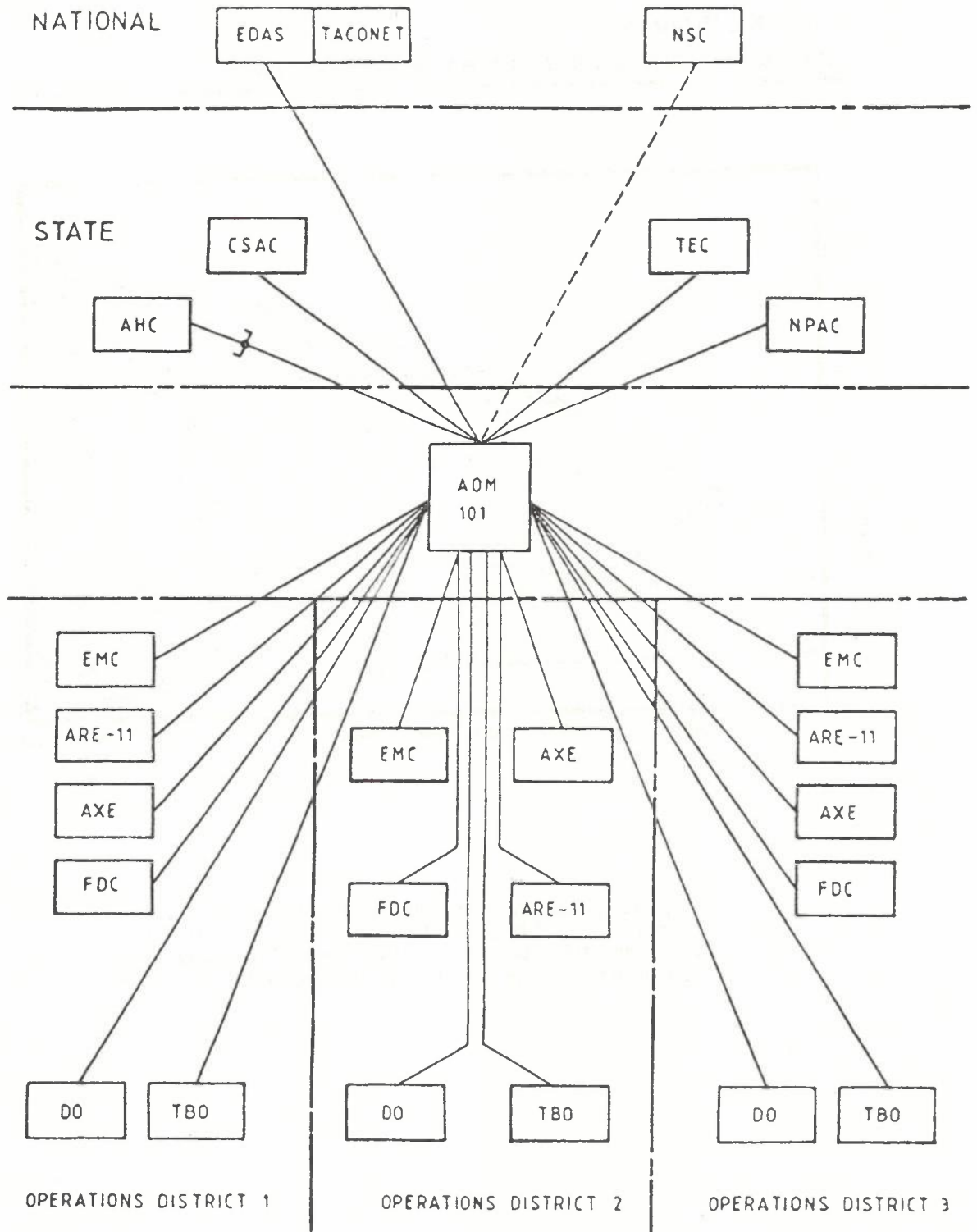
Aldous Huxley

The AXE Program

LINES IN SERVICE AT START OF EACH YEAR (CUMULATIVE)



Crossbar equipment orders including ARE 11 will grow for the next few years and it will be about 1983 before these orders decline as a result of the introduction of AXE. By about 1990 it is expected that almost all new exchange lines will be provided in AXE equipment.



NOC/SPC-LOCAL DATA COMMUNICATION NETWORK

LEGEND

- AHC - AFTER HOURS CENTRE
- CSAC - CENTRALISED SERVICE ASSESMENT CENTRE
- DO - DISTRICT OFFICE
- EDAS - EXCHANGE DATA ACQUISITION SYSTEM
- EMC - EXCHANGE MAINTENANCE CENTRE
- FDC - FAULT DESPATCH CENTRE
- NPAC - NETWORK PERFORMANCE ANALYSIS CENTRE
- TBO - TELECOM BUSINESS OFFICE
- TEC - TRAFFIC ENGINEERING CENTRE

FIG. 2

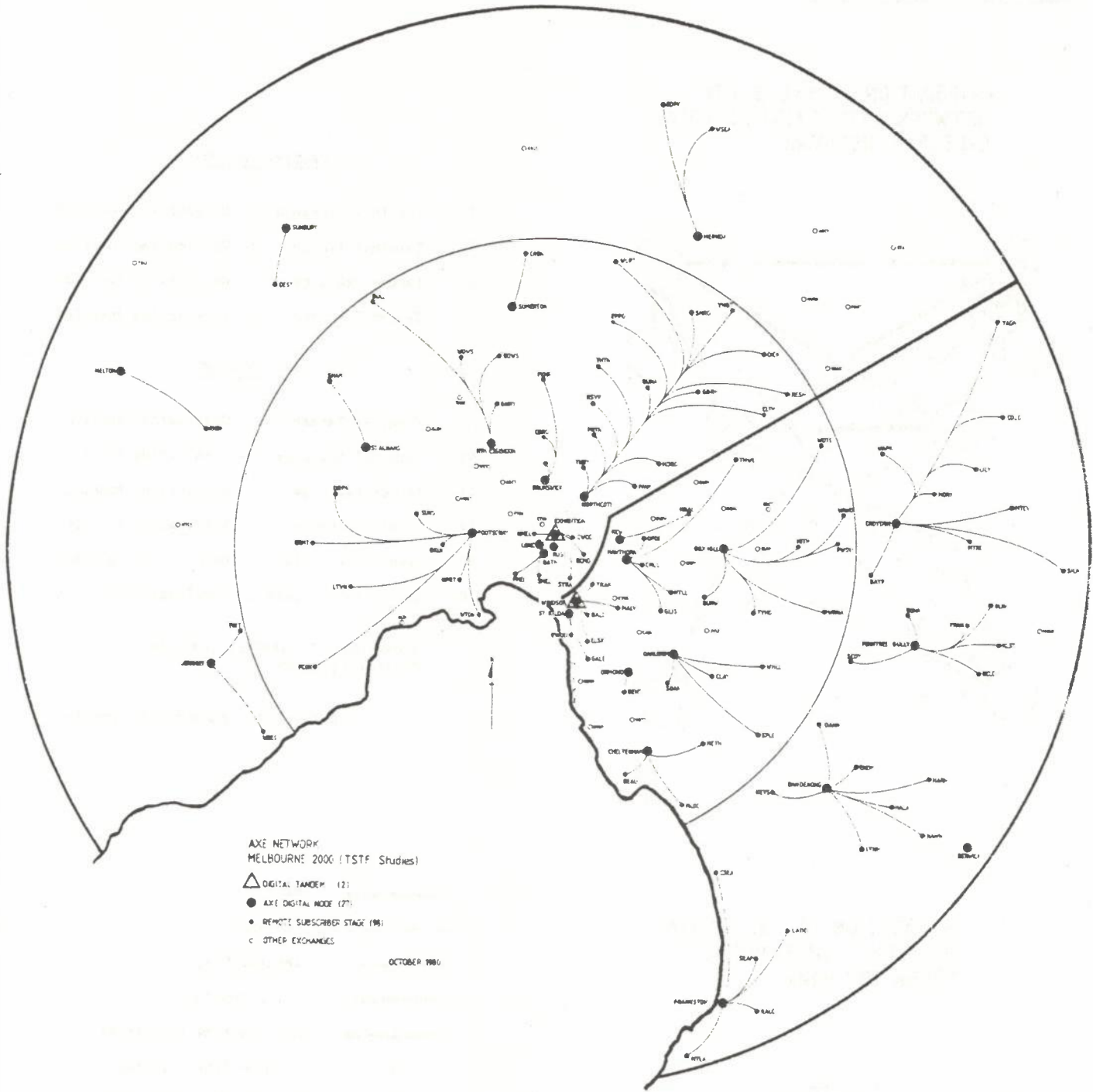
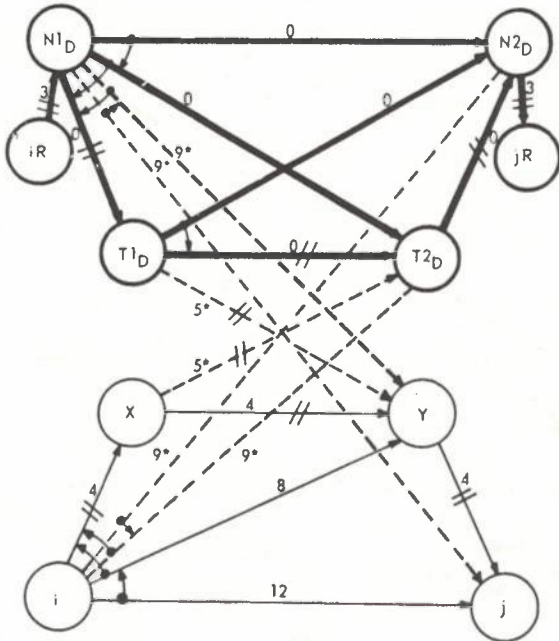


Fig.3

NETWORK PLANNING

INTEGRATION OF AXE DIGITAL NETWORK WITH EXISTING LOCAL CROSSBAR NETWORK.



CROSSBAR NETWORK

- i Terminal Exchange : Originating function
- j Terminal Exchange : Terminating function
- x Tandem Exchange : Originating function
- y Tandem Exchange : Terminating function

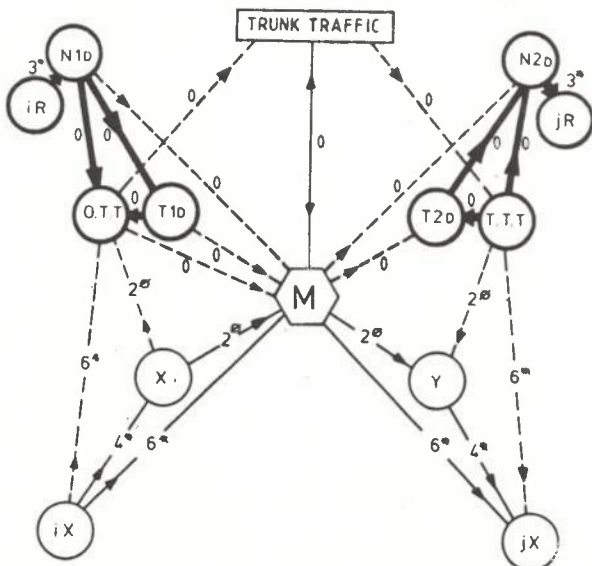
AXE NETWORK

- N1 Terminal Exchange : Originating function
- N2 Terminal Exchange : Terminating function
- T1 Tandem Exchange : Originating function
- T2 Tandem Exchange : Terminating function
- iR Remote Subs. Stage : Originating function
- jR Remote Subs. Stage : Terminating function

Subscripts D added to Indicate Digital Equipment.

Definition of Switching Symbols

INTEGRATION OF AXE DIGITAL NETWORK WITH EXISTING TRUNK NETWORK.



- AXE
- Crossbar
- - - - - Interworking
- ||—— Fully Provided
- 3—— Maximum link loss in dB
- ⊛ Minimum link loss 3dB
- ⊙ Minimum link loss 1 1/2 dB

Definition of Link Symbols

FIGURE 4

5. ANALYSIS AND DISCUSSION

5.1 General

In this section I examine the material which has been gathered as part of the activity during the trial period 1 July 1979 to 18 June 1980. In particular I analyse, as far as it is possible to do so reliably, all those factors which relate to:

- (i) Efficiency of operation
- (ii) Standard of service achieved
- (iii) Job Satisfaction (JS)
- (iv) Career opportunities
- (v) The maintenance of technical standards and retention of expertise
- (vi) The public interest.

The material for this is contained in Sections 7 and 8. Concerning Efficiency of Operation and Standard of Service we have in addition the data contained in the Telecom Report entitled "ARE 11 Exchanges EMC/ESC Field Trial Report" (Prepared by Network Operations Branch, Headquarters), which will be referred to in the report as the Field Trial Report (FTR).

Section 8.1 contains material which has been gathered by myself as part of the studies undertaken during an overseas visit to the UK, France, Sweden, Denmark, Netherlands, West Germany and the USA 30.3.-28.4.80. To preserve an impartial presentation the report adheres to a "terse-note" format with only a few explanatory comments.

Clearly, there are significant differences in the decisions and practices adopted by the various administrations visited, nevertheless there are a number of common features which need to be highlighted as part of this report. These are:

- (a) All of the administrations have accepted new technology, and to a varying degree have already introduced SPC technology into their respective networks. The principal advantages claimed are:

- (i) improved quality of service to customer
 - (ii) availability of a wider range of services to customer
 - (iii) network flexibility and stability
 - (iv) ability to re-configure the network as the customer needs change
 - (v) less expensive equipment
 - (vi) increased efficiency
- (b) There is a variety of switching equipment in operation and each administration has its views on the relative merits of the various types of exchanges. The economic considerations are, of course, of primary importance but political factors must also be considered. Clearly, equipment which is manufactured in a country will be preferred to imported equipment (see for example decisions in French PTT, Sweden or UK).

In Australia, the choice of ANA 30 equipment as the first stage in updating Telecom network was probably the right decision given the economic constraints. However, the AXE equipment is vastly superior and it is my recommendation that - Telecom given the necessary resources - move ahead with its plans for the introduction of the AXE equipment on an earlier time scale than originally envisaged (see Fig. 1 in Section 4). Such a move would benefit the network and the public.

- (c) Some administrations argue that new technology permits more effective groupwork (which can lead to enhanced job satisfaction) while others go further and maintain that a workforce organised in effective groups is necessary if full benefits of the SPC technology are to be realised.

All administrations, with the exception of the British Post Office (BPO), have re-organised the workforce so that maintenance is carried out in one or another form of an Exchange Maintenance Area (EMA). This is irrespective of the technology used. In the BPO, however, most of the equipment in operation is of the older vintage, the SXS variety, and the benefits of group operation with such equipment is less apparent. Nevertheless the BPO is experimenting with EMA-type organisations.

- (d) In all administrations the efficiency of operation is higher than in Telecom. This is particularly noticeable with France, Sweden, Denmark, Netherlands and USA. In these countries the efficiency is higher than in Telecom by at least a factor of two. A detailed analysis has been carried out comparing the switching maintenance operation of the Melbourne network with the Rotterdam network and the results are reported in Section 5.2. These two networks are similar and yet the efficiency in the Rotterdam area is better than in the Melbourne area by more than a factor of two.

The reasons why the efficiency in other countries is higher than in Telecom are many, but the principal reason is that in those countries where efficiency is high the workforce is organised in an EMA-type format irrespective of the technology used. There was no evidence anywhere that where an EMA-type of organisation had been implemented, taking human factors into account, that job satisfaction was adversely affected. Quite the contrary.

The Jutland Telephone Co. in the Arhus area is another good example. The company uses X-bar equipment which, with ANA-30 equipment, has been converted to ARE 11 some years ago. The efficiency figure for this area is better than in Victoria or NSW by a factor of 2.

- (e) With some administrations the trend is towards greater delegation of responsibility to Districts/Regions, thus favouring autonomous working groups.
- (f) With the exception of the BPO all telecommunication administrations have restructured their network to permit monitoring and control (to a degree) of many aspects of network operation. This is necessary to ensure stability of the network in the future years under heavy traffic conditions. This objective can be achieved in an effective way only with the facilities provided by the SPC technology.

- (g) The two USA administrations, GTE and Bell, are moving in a direction which eventually will provide the company with centralised control level by level of all aspects of telecommunication services.
- (h) With administrations where most of the switching equipment is X-bar or electronic, the practice of operating exchanges with no permanent staff on site is widespread. Correctly installed X-bar equipment can be left unattended for long periods of time. Corrective maintenance (as needed) is practiced because it invariably leads to a lower fault-rate and better quality of service than preventive maintenance. This is particularly the case with electronic equipment. It is common to see in France, Netherlands, or indeed in other countries, exchanges with 10,000 lines or larger left unattended and yet offering high grade of service to customers.
- (i) In some overseas administrations the installation of switching equipment is carried out by the contractor.
- (j) None of the administrations have an ESC-type of maintenance organisation with responsibility in individual exchanges. Similarly, none of these administrations have an EMC-type of maintenance organisation with individual exchange staffing. However, centralisation of various control facilities in an area in a designated office is a feature of several administrations.
- (k) In all countries visited there is a concern about the connection which could exist between unemployment and new technology. It seems that the European administrations have, on the whole, accepted the principle of no retrenchment as a result of new Technology.

I see no reasons why Telecom should not follow this policy assuming that a sound man-power development plan has been worked out and that there are no political factors that might impede implementation of a reasonable redeployment plan.

5.2 Efficiency of Operation

A perusal of the data contained in FTR (p.9) gives for the 5 EMCs, 5 ESCs and 26 exchanges involved in the trial the following in rounded figures:

(a) Establishment cost (excluding exchange equipment)

EMC: \$ 44,500

ESC: \$ 20,000

EMC exchanges: \$ 8,500

ESC exchanges: \$21,000

(b) Running costs (excluding manhours), including EMC/ESC and exchange costs averaged

EMC: \$ 0.31/stn/year

ESC: \$ 0.29/stn/year

(c) Manhours (including EMC/ESC overhead and based on the 4th quarter)

(i) ARE 11 equipment maintenance (XAM6)

EMC 0.18 mh/stn/year

EMC exchanges 0.26 mh/stn/year

ESC 0.14 mh/stn/year

ESC exchanges 0.26 mh/stn/year

(ii) Total XAM

EMC group 0.86 mh/stn/year

ESC group 0.99 mh/stn/year.

From the above one could quite simply conclude that as regards total efficiency, EMC is better than ESC.

Notwithstanding, one could argue that the time interval involved was rather small and therefore the difference, though real, is not significant.

Furthermore the manhour figures per station are not as good as originally forecast by Telecom (see, for example, relevant Staff Information Bulletins) and the discrepancy needs to be accounted.

Most importantly, one cannot discuss figures relating to efficiency without a reference to similar figures available for Telecommunication Administrations in other Western countries where cultural background and standard of living are not dissimilar to those in Australia.

Table 5.1 shows trends in overall manpower productivity, in terms of employees per 1000 telephone stations maintained, for those major administrations for which reasonably comparable statistics are available. Here we see a striking difference. While there has been a significant improvement in efficiency in Telecom Australia between the years 1965-1979, the figures still compare unfavourably with other administrations. The discrepancy is by as much as a factor of two or more (see relevant paragraphs in Section 8.1).

ADMINISTRATION	1965	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979
Telecom Aust.	23.0	19.7	19.0	18.4	18.1	17.6	16.8	15.9	15.0	14.0	13.1
Canada (Note 1)	9.3	8.1	7.8	7.6	7.5	7.4	7.3	6.9	6.8	6.8	
Bell Canada		6.5	6.2	6.1	6.1	6.2	5.7	5.8			
West Germany	16.2	11.7	11.4	11.1	10.6	10.1	9.4	8.4	7.8		
Sweden	11.5	9.1	9.1	8.8	8.4	8.0	7.5	7.3	7.2	7.1	7.0
UK		16.4	15.3	14.5	13.6	12.7	12.1	11.3	10.5	9.8	9.3
USA (AT&T)	8.1	8.0	7.7	7.3	7.2	6.9	6.5	6.2	6.0	6.0	
Japan	21.0	12.1	10.7	9.5	8.6	7.9	7.3	6.9	6.7	6.7	6.4

Note 1: Includes Bell Canada and the most significant independent Telephone Companies.

Table 5.1 - Number of Employees per 1000 Telephone Instruments

There are a number of factors which make such comparisons difficult, i.e., variations in actual work and functions performed by the staff, ratio of telephone instruments to telephone services, penetration of automatic, STD and ISD working, telephone density and rate of growth of telephone network, type of equipment, etc.

Australia is comparable to Sweden and Bell Canada in the scale of its network but both these administrations undertake a good proportion of their capital works programme with outside contractors. Even allowing for this, Telecom at 13.1 employees per 1000 telephone instruments in 1979 is well above Sweden at 7 employees per 1000 telephone instruments and Canada which is about the same as Sweden.

The above was discussed at length between myself and Telecom Australia and I am assured that studies were made to adjust Telecom figures so as to bring them to a common denominator with some other administrations. In these calculations account was taken of such factors as:

- . Use of private contractors to undertake construction work
- . Use of staff for broadcasting, phonogram and telegraphists functions
- . Penetration of automatic STD and ISD working
- . Ratio of telephone instruments to telephone services
- . Use of part-time staff.

These adjustments were made with respect to USA and the UK using the overseas administration as the base and they have been projected to give approximate comparison figures for June 1979. From these the USA achievement of about 6 compares to an adjusted Telecom figure of 9.5 and the UK achievement of 9.3 compares to an adjusted Telecom figure of 11.0.

Considering that Telecom has a modern network by world standards, the overall productivity results are not good.

In the switching maintenance field, the staffing comparisons reflect similar ratios to the overall assessment. A more precise numerical analysis can be carried out with reference to data on switching plant maintenance eg, in the Rotterdam area (see Section 8.1). In many ways, the Rotterdam network is similar to the Melbourne network. **The equipments in use in both networks are basically similar.**

Referring to Figs 3 and 4 of Section 8.1 dealing with Netherlands PTT, I conclude that one man in the Rotterdam area maintains for switching maintenance, on average, about 4,800 services. This compares with the Melbourne area where one man maintains only about 2,000 services. Staffing for Melbourne is organised mainly on the basis of providing permanent staff for each exchange, whereas in Rotterdam, staffing is organised on the basis of providing staff groups to be used over a number of exchanges, each group ranging from about 40,000 lines to 90,000 lines.

Does this imply that Telecom's staff do not work as hard as those in other countries? Not at all. In my travels I saw no evidence to support such a conjecture. In any case working hard is not synonymous with working efficiently.

There are two broad reasons why in the more advanced western countries the efficiency is higher than in Telecom. These concern:

- (a) Work practices
- (b) Work organisation.

Some maintenance practices are fundamentally less efficient than others and, clearly, should be avoided. For example, "hands off" maintenance has been found in overseas administrations to be more efficient than routine preventive maintenance, but there is still room for scheduled preventive maintenance of specific items of plant such as batteries.

Some work practices generate an unnecessary work load. For example, the practice (which is common in Telecom) of cutting over small units of plant at frequent intervals of time (eg, 18 months) is wasteful of installation effort, and worse still, disturbs the existing equipment in the exchange thus generating additional, sometimes very substantial work load for the maintenance staff. It is much better to cut-over larger units of switching plant (say 5,000 lines at five yearly intervals) and leave the exchange undisturbed for as long as possible.

In this respect it is recommended that Telecom reviews its installation practices.

There are other examples which could be cited but the above is sufficient to illustrate the connection between work practices and efficiency of operation.

Efficiency and work organisation are intimately related. For example, consider the Rotterdam figure of 4,800 services per man for switching maintenance work achieved in a group working situation. Almost two and a half times more staff are required in Melbourne to perform similar work.

Attempting to achieve the Rotterdam results in Melbourne, without changing the organisation from one of single exchange staffing to one of group working, would lead to considerable difficulties. Staff could suffer as it would be difficult to provide for sickness, annual leave, rostered days off (RDOs), training and other absences. Staff morale would be poor; the district would have major staffing problems and efficiency would be lower.

Conceivably one could argue that perhaps the single exchange concept could be made to work by providing a pool of relief staff. This would be even more unsatisfactory on account of three factors:

- (a) By providing such a pool of labour the efficiency would be even further reduced.
- (b) Such a proposal would go against the concept of "group work", resulting in low job satisfaction and staff morale; in effect, the workforce would be split into two classes of staff, those belonging to an exchange and those in the relief group.
- (c) Such an arrangement, which preserves a multiplicity of exchanges working independently, does not provide for the needs of the network.

If, however, we organise exchanges in EMAs of suitable size the problems discussed above disappear and the efficiency will improve. On balance everyone, including the customer, benefits.

This is the reason why several years ago many overseas administrations have changed to group organisation. With SPC technology these advantages are even more apparent.

One could conceivably speculate and dismiss the above arguments by saying that the overseas experience is of little relevance to Australia. However, there is no evidence to support such speculations; indeed the Australian experience supports the overseas experience. The data for the Perth area - where an EMA-type of organisation has been in operation for a considerable time - show that the figures for efficiency there are better than elsewhere in Australia, and the survey of opinions shows that in the Perth area job satisfaction is no less than elsewhere in Telecom. The service quality is also within standard. However, the figures for Perth are not quite as good as for some overseas administrations and the reason for this might be that the EMAs in Perth are rather small in comparison.

We can now return to the discussion of the Field Trial Report (FTR) itself. As far as the EMC/ESC trial is concerned I find the report inconclusive. There are a number reasons for this, as follows:

- (a) The cut-over programme was delayed and a significantly smaller number of exchanges operated in the trial period. A proportion of the exchanges cut-over in the last six months and a good number of these did not reach a "settled maintenance condition".
- (b) Several exchanges had post-installation problems imposing a heavier than average working load on staff.

- (c) 70% of lines of the exchanges in the trial were of the ARE level 1 type with OMPOS 1 maintenance facilities, whereas the network by 1985 will be of a level 3/4 type, with considerably enhanced OMPOS 2 maintenance facilities. Thus, the results do not adequately reflect the real long-term working situation.
- (d) Both the EMC and ESC schemes were operating in conditions where they were not loaded sufficiently in normal maintenance operations to indicate the true efficiency figures possible.
- (e) There was confusion among the staff as to which account a particular task should be charged to, thus invalidating (in part) the figures compiled.

Now suppose that we had a trial in which all the exchanges involved had time to settle to normal operation after their respective cutover date and that the EMC & ESC organisations were operating under the planned "fully loaded conditions", as envisaged in Telecom and ATEA proposals respectively.

We could then estimate the maintenance costs associated with each respective organisation. It would be difficult to reproduce exactly the figures given in Attachment 4 of Staff Information Bulletin No. 15 (March 1978) in that the various details are a matter of estimate. Nevertheless the EMC-type organisation does lead to substantially lower costs which would have a direct effect on cost of services to the community.

Taking this as a basis one must conclude that EMC is a maintenance organisation which from the point of view of efficiency of operation is to be preferred to ESC.

Notwithstanding, the principal reason for this is that for the same size (say in number of exchange connections (ECs)) the EMC-type organisation employs fewer people than the ESC-type and the cost benefits are largely due to this factor.

One should now examine alternative work organisations. My studies show that a flexible EMA type of organisation is most appropriate for the Telecom network. EMA is a satisfactory work organisation that is capable of providing an efficient service to the community and if an EMA is made large enough then, as other administrations have discovered, the whole issue of EMC/ESC just does not arise.

Concerning efficiency, therefore, my recommendation is that Telecom Australia should not adopt the ESC organisation which is inefficient, nor the EMC organisation, in that better efficiency figures should be possible with a properly structured EMA organisation which is equipped with its own SPC cell. To provide efficient service to the community, steps should be taken to progressively grow the EMA, possibly, in the years to come, as large as 100,000 ECs or larger. To achieve this will take some time, but so will the implementation of the whole SPC programme.

5.3 Standard of Service Achieved

Telecom Australia uses two principal ways in which quality of service in the Telecom network is currently assessed (see pp. 8 & 10 of FTR):

(a) Service Assessment (SA)

- (i) Switching and Congestion Loss (standards 1.5% and 1.0% calls lost)
- and (ii) Technical Assistance Reports (standard 2 - per 100 telephones/4weeks)

The returned figures show EMC marginally better than ESC but both are within standard and the difference is not significant.

(b) Fault Statistics

- (i) Fault rates (standard = 10 faults/1000 lines/year for X-bar & 1 fault/1000 lines/year for ANA 30)
- (ii) Major system outages.

The fault rates for the EMC as well as the ESC exchanges were outside the standard. This could be because many exchanges did not have time to settle down after cut-over, but the differences between EMC & ESC exchanges are not significant.

As regards the X-bar component, and based on past experience, it is probably correct to assume that, given enough time both EMC and ESC exchanges would have settled to a performance close to the standard.

No such assumption is justified with respect to the ANA 30 equipment because of insufficient field experience in Australia. However, overseas experience indicates that the Telecom standard (1 fault) is reasonable and the difference between EMC (2 faults) and ESC (3.8 faults) is real but there is no evidence in the trial data to suggest that the difference, though sizeable, is significant. However, it is recommended that the fault rate of ANA 30 equipment should be closely studied in the next 12 or 18 months since long term performance of the ANA 30 equipment (better than that of the old registers) could have a noticeable effect on service quality.

System outages is a factor of major concern to telecommunication administrations all over the world. It is system outages that have an immediate effect on customer satisfaction/dissatisfaction.

The data in FTR (p.10) indicate that there were more outages associated with ESC exchanges than with the EMC exchanges. More importantly, there were three times as many major outages of long duration (longer than one hour) in ESC exchanges than in the EMC exchanges.

This is of some concern since major outages have a significant effect on standard of service. For this reason the circumstances surrounding the various outages have been examined. At this stage, however, it is not possible to be certain on the reasons behind this result, but the records seem to indicate that the ESC exchanges were sometimes slow in contacting the ESC and in seeking assistance from the NSC.

In conclusion, as regards standard of service achieved in the EMC/ESC exchanges, the results are inconclusive, but one should view with some concern the occurrence of system outages of long duration. In this respect, the record for the EMC exchanges is better than for the ESC exchanges.

In search for a solution to this problem we might turn to well documented experience overseas (see reference material in Section 7). This suggests that if the exchanges in a Telecommunication District are grouped so as to form a single EMA divided into a number of functional cells, then one of the cells could have the responsibility of the SPC aspects of exchange operation. With such an organisation the experience gained can be substantial and could be disseminated to the benefit of the whole EMA. The outages of long duration would then be less probable. Furthermore, if the District EMA were supported by efficient communication with a National Network Centre and/or National Support Centre, with software specialists advice readily available, then the quality of service would improve a step further.

The above is my recommendation.

5.4 Job Satisfaction

5.4.1 General

A great deal has been written and said in the last twenty years about job satisfaction and a number of studies relating to a variety of work environments have been published. For this reason it would be impracticable to give a complete summary of the subject as part of this report. The interested reader is referred to the sources listed in Section 7.5.

In this section, I bring to the attention of the reader a selection of items for discussion which have a direct bearing on the subject of this report. In the analysis I make use of the following sources:

- (a) Material listed in Section 7.5
- (b) Some material contained in Section 8.1 (Report on a visit overseas)
- (c) Material in Section 8.3 (A survey on job satisfaction carried out by Dr. Gardner)
- (d) Material in Section 8.2 (particularly 8.2.C).

In the immediate post-Second World War years various studies had been carried out of work organisations and of models of management. In parallel, the whole discipline of Group Dynamics has been developing. As a result of such studies a range of management styles have been identified. At the extremes of the spectrum we have the McGregor "theory X" and "theory Y" respectively.

"Theory X", described as an "autocratic" system, includes a range of styles ranging from "soft" to "hard". Theorists would consider the management style characteristic of military services as belonging to this system.

"Theory Y" describes that system of management which relies on Group Dynamic forces to motivate people in achieving their objectives. In this system, the group composed of the leader and the workers is assumed to be large enough to span all aspects of the task. Here a group, conscious of its objectives, enjoys a degree of autonomy and is free to decide, within an agreed set of guidelines, on a day-to-day basis on the best course of action.

It is probably true to say that in practice one deals with a mixture of management styles, but some observers believe that the dominant component in many cases can be identified with Theory X.

In the last two decades we have witnessed a development in various management aids - to some extent through the ready availability of the computers - such as Management Information Systems (MIS). Useful as they may be, some such systems have been criticised on account of the implied "inhuman component" and new methodologies have evolved, such as Socio-Technical Systems (STS). Many aspects

are still a matter for further study and discussion among the experts. But, it is probably true to say that the best system does not exist but must be "worked out" over a number of years, as a co-operative venture between the management and the staff, in an atmosphere of mutual trust and respect, recognising human strengths and limitations. Above all "Man's needs" must be considered.

There are several levels of "Man's needs" which must be considered. In ascending order we can discuss the following:

- (a) Physiological (food to live)
- (b) Safety (of work environment & in society)
- (c) Social needs (relating to giving & receiving)
- (d) Self (self-esteem, status)
- (e) Self-fulfilment (realise potential, being creative).

If physiological needs are not satisfied, then job satisfaction will be low and nothing else will matter. Gradually, as the lower level needs are satisfied, the higher level needs become important, and it does not follow that if one satisfies the first three that the workforce will be "happier", because at the time the dissatisfaction felt on account of the absence of the remaining two components can be just as strong. Yet, in an impartial assessment we would have to say that the work environment satisfying the first three levels is a "better one" than one that caters for the first level only.

The second factor which must be considered when evaluating job satisfaction is that part of it comes from outside (the work environment) and the other part, perhaps more important, comes from within the person himself, his nature, his education and past experience, etc.

Finally, it needs to be recognised that there does not exist an absolute scale by which we could measure job satisfaction in a way that one can measure height of a person. The scale by which people assess job satisfaction is relative. Relative to other employing organisations in the country, relative to workers with similar skills. Moreover, job satisfaction is partly a function of the discrepancy between personal expectations and aspirations

on one hand, and perceived fulfilment on the other. It is for this reason that it is important for every company to have a good staff development program, to know their staffs' individual expectations and aspirations and in the light of this knowledge to help staff to reach self-fulfilment.

5.4.2 Job Satisfaction as Perceived by Telecom Staff

In Section 8.3 we discuss the results of an extensive survey of job satisfaction which was carried out by Dr. Gardner. To summarise the results the following can be said:

- (a) Superficial examination of the numerical data seems to indicate a trend suggesting that job satisfaction might be higher in the ESC type of organisation than in the EMC-type. However, extensive statistical analysis which has been carried out shows that there is no significant difference between the levels of job satisfaction perceived by staff in the two organisations.
- (b) Analysis of numerical data pertaining to Western Australia where the EMA type of operation is practised shows that job satisfaction there is no less than in the other States. Moreover staff expressed a preference for the EMA on account of a whole range of factors (see Section 8.3).
- (c) There is a general concern about chances of promotion and staff fear that any scheme that groups exchanges might reduce their chances of promotion. In effect they see fewer OIC positions to which they could advance.
- (d) There is a concern about training. The staff feel that opportunity for training should be given to those that can benefit from such training and be not influenced by the acceptance of a particular work organisation.

Of the many observations that are embedded in the remarks made by staff during the interviews (Section 8.2.C) one stands out. In any work environment most people have a desire for their skills and abilities to be visible to their peers and to their immediate superiors and they seek a recognition for their good points. A work environment that provides for this basic need is most certainly better than one that does not do so.

The above are important findings. The analysis of staff feedback information (Section 8.2.C), in the light of the above, should help to establish a frame work of work organisation that will meet the needs of a developing network, the needs of the customer, as well as those of the staff.

In the light of my experience gained during this study as an independent observer, I draw the following conclusions:

- (a) The real issues are not those of EMC vs. ESC. The problems concerning job satisfaction of staff in Telecom are of longer standing and the EMC/ESC issue has only helped to bring the problems to the surface.
- (b) Apart from the political factors which I do not wish to discuss here, the staff have a genuine desire to satisfy their higher level "needs". Some of the "needs" are not real and arise from unreasonable expectations but others are not. Aspects of social needs and some needs relating 'self' are easier to satisfy in the framework of one organisation rather than another.
- (c) On the whole those members of staff who have worked in a well organised EMA prefer such environment to a single exchange environment. The criticism, not very extensive, comes from those who have no experience of EMA-type of operation or who had the misfortune to work in one where there were personality difficulties.

- (d) A man who works in an environment in which he cannot satisfy his higher needs becomes critical of the employer, of his superiors, and even of his peers and his union. I see it as a very natural human reaction.
- (e) The criticism of EMCs comes under three principal headings:
 - (i) The workforce is split into "them" and "us". And "them" are not part of the team. "Them" are also remote and not part of "our district".
 - (ii) The OIC of an EMC exchange often sees his authority reduced and feels that his skills are not needed. He feels that his self esteem is also affected. These observations do not apply to those who work in the EMC itself. Whether these feelings are real or imaginary is besides the point.
 - (iii) Staff see their promotion profile changed (This is taken up in the later sections of this report).
 - (iv) Staff are not unanimous in their view. There is a whole spectrum of views.
- (f) Staff have a desire to identify themselves with their district.

My recommendations are, therefore, as follows:

- (i) That in Metropolitan type areas Telecom adopt an EMA-type of organisation.
- (ii) That one EMA per Telecommunication District be concerned with all exchanges which cutover to new equipment (ARE or AXE)
- (iii) That each EMA be made up of a number of cells related to its size.

- (iv) That a Senior Technical Officer (STO) be in charge of each cell in the EMA and that a satisfactory employment profile be adopted.
- (v) That one cell in the EMA be responsible for the supervision of ARE/AXE equipment and analysis. This unit could be named District Network Centre (DNC).
- (vi) That a network of National Network Centres (NNC), one in each State, be established to interwork with the DNCs, thus ensuring network stability.
- (vii) That the development of the District EMA and day-to-day work programmes be discussed at regular consultative district meetings.
- (viii) That each Telecommunication District establish a committee whose function it will be to work out a staff development programme for all staff in the district. The programme to be updated as the district develops.
- (ix) That, at appropriate intervals of time, a survey be carried out of the important aspects of network operations and that results of such studies be disseminated.

5.5 Career Opportunities

The obligation to provide reasonable career opportunities is implicit in the Telecom Corporate Thrust 3 - Staff Relations and Development (see Section 5.7.4). This involves the establishment and implementation of programmes to improve the skills, attitudes, breadth of experience and mobility of technical staff.

In the internal plant field, Telecom employs about 22500 staff. Since 1975, the growth in the main designation groups has been as indicated in Table 5.2.

	<u>1975</u>	<u>1979</u>	<u>1980</u>	<u>Percentage Growth P.A. 1975-1980</u>	<u>Percentage Overall</u>
Asst. Technician	3902	3648	4001	0.50	2.54
Technician	8038	8766	8850	1.94	10.10
Technical Officer	<u>8191</u>	<u>9628</u>	<u>9692</u>	<u>3.42</u>	<u>18.32</u>
	<u>20131</u>	<u>22042</u>	<u>22543</u>	<u>2.29</u>	<u>11.98</u>

Table 5.2 - Internal Plant Staff Growth

This staff is distributed over a variety of field work areas; for example, on customer equipment, long line and radio, broadcast and television, local and trunk exchange switching. There are also many office type support groups in associated activities.

Opportunities for career advancement occur in many diverse situations and staff can move from field to office situations in their own field of expertise. Many technical staff branch out into other fields, depending on their previous experience and ability. Others have moved into management and some have reached quite high management positions as a result of the DTM organisation.

At present Telecom is providing assistance with

(a) Gaining of qualification for advancement through:

- primary training for new and existing staff
- bridging training for existing staff
- recognition of qualifications or expertise gained outside of Telecom (skill tests may be required)
- ad-hoc eligibility tests (Technical Officer positions)
- scholarships for higher studies and assistance with study schemes.

(b) Development of skills through:

- secondary (technical training)
- management and supervisory courses.

(c) Assistance to staff institution activities, eg, Australian Post-tel Institute (API).

It is noteworthy that, in 1978/79, Telecom Australia spent in excess of \$65 M on training for technical staff (both Technicians and Lines staff).

At present, there are about 3000 technical staff engaged on metropolitan exchange maintenance and Telecom plans suggest that by 1985 about 600 fewer staff would be needed.

There will, of course, be "natural wastage" (see Table 5.3) which will offset re-deployment of staff. However, the actual number of people that need to be redeployed can only be estimated approximately. Telecom is of the opinion that no more than 400 staff would need to be re-deployed and the figure could be lower depending on where natural wastage occurs. If the efficiency is to improve, as discussed earlier, then irrespective of whether we deal with an EMC or ESC organisation, a redeployment plan would need to be implemented.

	NATURAL WASTAGE 1976-1980	NATURAL WASTAGE 1980-1985
Technical Officers	60	70
Technicians & Tradesmen	210	200
Telecom Assistants	<u>190</u>	<u>150</u>
Total	460	420
Total Wastage 1976-1985		880

Table 5.3 - Metropolitan Exchange Maintenance Staff "Natural Wastage"

Aspects of redeployment have been discussed in a number of reports including the Myers Committee Report on Technological Change. There is room for argument that in a large organisation, such as Telecom, it should be possible to meet the problem by a planned policy of redeployment without the need to resort to retrenchment. But, it is unreasonable to argue that redeployment should be effected within a narrow sector of employment, such as exchange maintenance.

Telecom has worked out a redeployment policy and guidelines for its implementation are available. Each State administration has a responsibility for the implementation of the redeployment policy in its State. The guidelines are sound. Yet, interviews with staff seem to indicate that there is a discrepancy between the intention and what is actually done. Clearly, there is room for improvement.

Concerning career opportunities we read in the Staff Information Bulletin No. 15, March 1978, with reference to the introduction of ARE equipment.

"There will be an immediate and substantial improvement in career opportunities in metropolitan exchange maintenance with more PT0, ST02 and T02 positions by 1980."

Further on, one reads that in the exchange maintenance field introduction of ARE would have the effect of improving career opportunities in the short term. Some loss of higher level technical officer positions was expected in 1985, but this would be offset by requirements in other areas. Thus no reduction in career opportunities for technical staff would occur in the period to 1985. It was further stated that no reduction would occur in the total technical workforce as a result of ARE and that numbers over the next 5 years were expected to increase slightly.

Yet, the feedback from staff indicates that there is great concern about career opportunities. The reason for this seems to be that technical staff tend to view with suspicion assurances such as those cited above, unless such statements are supported by actual plans capable of implementation. This is problem No. 1.

Problem No. 2 arises from a different cause. The information gained in the interviews suggests that a number of staff would be happy to volunteer to move to another sector, eg, Customer Services, Customer Equipment, etc. However, there are two difficulties. The first one concerns compensation relating to losses which the employee suffers as a result of redeployment (e.g. removal expenses). The dispute here evolves around what is "adequate" or "reasonable". The second one arises from political factors associated with the fact that there are many different unions each covering a different sector of Telecom activity. A staff member moving from one sector to another is a "loss" to one union and a "gain" to another. This is a clear demarcation problem.

With respect to compensation for redeployment it seems that it would be impracticable to have agreed rules sufficient to cover all possible cases. The proper solution is to have a committee which would deal with individual cases, with a right of appeal.

Concerning the demarcation disputes it seems to me that as far as the community is concerned the best solution is for unions to amalgamate.

One additional point needs to be considered and that is training. On this issue the staff are quite vocal and in my opinion justifiably so. During the trial, those members of staff who happened to be (by chance) in an ESC exchange had full training; those who were in an EMC exchange had an abridged course. This practice does not seem reasonable.

My recommendation is that Telecom establish a maintenance organisation based on Telecommunication District EMAs and that staff who are willing and able, be given equal opportunity for training. That each EMA be headed by a high level Technical Officer of appropriate grade depending on the size of the EMA. That each EMA consist of a number of cells each headed by an STO thus ensuring a good career profile. That one cell in the EMA, named District Network Centre (DNC) be established to supervise and analyse the SPC equipment and be staffed by appropriately trained personnel. Flexible working and training arrangements should be instituted to allow staff development on various phases of activity.

That, as the District develops, other people in the EMA be given an opportunity for training (if they so wish) and, at an appropriate time, have employment consistent with their training. Irrespective of the changes resulting from new technology, it is recommended that Districts consider the benefits accruing from an EMA-type organisation and plan for the re-organisation well ahead of time.

5.6 Maintenance of Technical Standards and Retention of Expertise

Arising out of the Telecommunications Act, Telecom has a duty to maintain the Telecommunications network to a satisfactory standard. To do so it must ensure that it has adequate numbers of skilled people and that staff are employed in a manner that will ensure retention of expertise. It is in this way that the community can be assured of the continuity of higher standards of service and the availability of a range of services which it desires.

Automatic telephony was first introduced into the Australian network in 1912. The switching equipment was electromechanical of the SXS variety. Since that time the Australian network has grown very substantially.

In the sixties, common control crossbar equipment was introduced. The technical concepts behind this equipment were new and so was the technique of signalling. (Multi-frequency code signalling in lieu of decadic step pulsing). At that time, many overseas administrations had changed their maintenance organisations and, making use of some features of common control equipment, have increased their efficiency of operation. For some historical reason there was not a corresponding move in the APO, with the exception of WA, where, in the sixties, moves were made to introduce a more efficient work organisation in form like the EMA. Similar moves were adopted in Canberra and other parts of some metropolitan networks. In the remainder of the organisation substantially the same work organisation, as was established for SXS equipment, was retained for the crossbar equipment*. This was the historical reason why the efficiency was lower in the APO than in other western administrations.

* In recent years Telecom has established EMA trials in a number of metropolitan districts.

Since then Telecom has brought about a number of changes in the maintenance practices to improve technical standards and to contain costs. Among others, standards of service have been established to monitor percentage of effective calls, switching and plant congestion loss, speed with which customer complaints are dealt with, etc.

In each capital city, Telecom monitors the network switching performance through sampling from Service Assistance Centres (SACs) and from Network Performance Analysis Centres (NPACs). Exchange staff carry out traffic route testing to support such activity.

Following recommendations of the Vernon Commission, Telecom has established District Telecom Managers Districts which may cover 10 or more exchanges. However, it did not establish a District Centre or facilities for overall monitoring and control of exchange network operations. It is this omission which is in part responsible for some of the current difficulties.

Under the present arrangements each OIC of an exchange has responsibility for the switching plant and associated equipment under his control. He operates independently and he may interact with other OICs at his discretion. This does not fit with the principles of the Vernon Commission of Enquiry report, which recognised the DTM District as the basic unit of operations management.

This is not to imply that some districts in Telecom have not moved in that direction, but rather that a coherent policy stating that this should be the norm is long overdue. I believe that if every metropolitan District were organised making use of the EMA concept then many problems in maintenance would disappear and technical standards would improve. There is extensive overseas experience to back such expectations.

It is important to realise that a work organisation which is suitable for predominantly local area traffic is not necessarily applicable to modern complex networks. Such networks involve interlinking with alternative routing through a number of tandem points and have to cater for increasing STD and ISD traffic. In such an environment the operating company while being concerned about the state of each exchange is even more concerned with stability of the network as a whole. Thus, change in customer habits can bring about changes in traffic patterns and can have consequential effects on network maintenance policies.

Moreover, network operational problems which arise from changes in consumer habits will have an effect on manufacturers of relevant equipment in that the manufacturers will be required to adapt their equipment (technology permitting) to enable it to perform the new function more effectively.

Such is the case with ARE-11 (Level 3/4 OMPOS 2) and AXE equipment respectively. This equipment brings new dimensions into the field of network switching which affect the mode of maintaining technical standards. With X-bar equipment the control logic is "hardwired" using sets of relays and electromechanical switches, whereas the new equipment uses software under the control of a processor to achieve the same objectives. Thus the work associated with changes to logic can be executed by simple commands via a terminal or a VDU, rather than be implemented by time consuming "wiring changes" and "strappings". Moreover, the equipment is flexible and can easily be adapted to changes in the network.

The decision to purchase the ARE or the AXE equipment will, as I said before, benefit the community. But, along with the commitment to the new equipment, there is an implied commitment to changes in work practices and work organisation because it is only then that the full benefits of which the equipment is capable can be realised.

The equipment of the type of ARE or AXE possesses two further characteristics. First, it has high reliability and therefore the fault rate is low; this means that retention of technical expertise can be a problem unless the maintenance team has responsibility for several sets of equipment. This means, therefore, that a District EMA of suitable size should work as one team. Second, the technical personnel must have adequate training to guard against the possibility of outages precipitated by illegal commands.

Telecom Administrations throughout the world have examined work organisational requirements for SPC networks to ensure that the network is adequately monitored and controlled and that the required staff expertise is available to minimise outages.

In the light of the studies which have been carried out, my recommendation is that Telecom establish District EMAs charged with responsibility for maintaining SPC exchanges and the associated network. The District EMA, through the District Network Centre (DNC) to have the responsibility for the SPC equipment and maintenance of the network. The staff in the EMA to have the appropriate training for their respective functions. In this way the EMA can work as one team.

5.7 The Public Interest

5.7.1 General

The Public interest is of direct concern to Telecom. This is reflected in the Telecommunications Act and also in the wording of the Corporate Plan. The appropriate sections of the Act are:

"Telecom Australia is responsible to provide, maintain and operate telecommunications services in Australia which best meet the social, industrial and commercial needs of the people of Australia and to make its services available throughout the country so far as is reasonably practicable.

Revenue must cover current expenses each year and provide not less than one-half of capital requirements.

Services are to be kept up to date and operated efficiently and economically with charges as low as practicable".

The public interest can be conveniently discussed under three headings:

- (a) Service to the community
- (b) Costs to the community
- (c) Image of Telecom as an employer.

5.7.2 Service to the Community

There are two aspects of service to the community. The first one concerns provision and maintenance of plant and facilities to meet the needs of the community and the second one concerns quality of service.

The broad aspect of planning and provisioning of plant is described in Section 7 of this report. Telecom Australia is a public monopoly, whereas some overseas administrations such as AT&T in the USA, are, in effect, regulated monopolies. This, as far as the community is concerned, has implied advantages and disadvantages and the arguments that follow can have political content. Yet, there is a link between the interpretations of the Telecommunication Act and the present dispute.

As a monopoly Telecom has wide but closely defined powers. Notwithstanding, its corresponding duties are open to subjective interpretations and it is precisely in this area that one finds roots of various disputes. On reading the Act one comes across terms such as:

-"maintain services in Australia which best meet"....
-"services available throughout the country"....
-"reasonably practicable"....
-"kept up-to-date"....
-"operate efficiently"....
-"charges as low as possible"....

Each of the above expressions is open to subjective interpretation leaving scope for unlimited disputes.

It is not my function to interpret the Act, except in so far as the matter might directly affect the conclusions of this study, but rather to express the hope that the parties involved in the dispute will interpret the meaning of the Act in a reasonable way.

As part of its duties arising out of the Act, Telecom has, amongst others, been planning a programme having for its aim, modernisation of the telephone services in Australia. Introduction of SPC technology in stages (ARE 11 Level 1 Ompos 1, ARE 11 Level 3/4 Ompos 2, AXE, network digital operation, etc.) is part of the programme. At this stage Telecom is committed to its programme as far as ARE 11 equipment is concerned (see Section 4), and Ministerial approval has been given to the gradual introduction of the AXE equipment as indicated in Section 4 of this report. This programme aims to improve and to extend the existing services and to make an additional range of services available to its customers. These plans cannot be changed in substance without heavy financial burdens on the community.

I consider this programme to be a reasonable one, in line with similar work in other Western Countries, and one that will benefit the community. I would, however, recommend, given the necessary resources, that the implementation of the AXE programme be adjusted to an earlier time scale. This is because the AXE equipment, with its greater potential, is capable of offering to the community a better service at a lower cost.

Concerning the second component of the Service to the Community that is quality of service, the following can be said as regards the new equipment.

ARE 11 Level 1 using Operational Processor MK1 (Ompos 1) is essentially updated X-bar equipment in which the electro-mechanical registers have been replaced by the electronic functions of the ANA 30 equipment under the control of the processor. The equipment is superior to the electromechanical registers and as such will offer better service to the user. Its introduction, however, makes only a minor difference to the operation of the telecommunication network as a whole.

The updated version of the ARE 11 Level 3/4 using the Operational Processor Mk 2 (Ompos 2) is a much more sophisticated piece of equipment. With this equipment the processor not only controls the functions previously performed by registers in a X-bar exchange but also all other control functions of the switching stages of a X-bar exchange. All these control functions can be monitored and controlled remotely from outside the exchange. Using this equipment, therefore, it becomes possible to monitor and to control the operation of the network as a whole. It is this facility that is needed for reliable and safe operation of the future National Telecommunication Network. These characteristics can then be used to increase the quality of service by safeguarding the stability of the network and ensuring that catastrophic network failures will not take place (c.f. relevant parts of Section 4).

Acceptable service performance of the network is one aspect of quality of service which the Telecommunication administration must guarantee. Other aspects concern security of the network in the sense of resilience to unforeseen events, flexibility of the network to meet in a timely way new or changing needs, coverage of the service both geographically and in terms of facilities. It also includes concepts such as privacy of communication, records, and accuracy of charging.

Improved surveillance and control on a network basis, with group rather than individual repair maintenance, can not only improve service performance to the individual subscriber, but can also offer greater resilience to unforeseen network events and lead to improved flexibility in quickly meeting a range of new service needs.

As part of its concern for quality of service Telecom must move ahead with implementation of its plans directed to ensure network flexibility and resilience to unforeseen events. AXE equipment is the ideal equipment to meet this objective in all its dimensions but the enhanced ARE 11 (Ompos 2) can meet most of these objectives in the immediate future.

5.7.3 Costs to the Community

The public image of Telecom is enhanced if the range of services offered meets the needs of the community, if the service is reliable, if the service is available when needed and if the service is offered at a reasonable cost.

A decision that provides for the anticipated needs of the community such as better equipment, is a good decision if it is implemented at a reasonable cost (eg, ARE 11 or AXE equipment). A decision that leads to greater security of the network and ensures that disruption of service is highly improbable (eg, that outages are minimal or network instabilities are guarded against) is a good decision.

Any malfunctioning of the National Telecommunication Network not only contributes to a poor image of Telecom but also increases the cost of the services to the community. It does so in two ways. First as a direct cost on account of increased maintenance costs to Telecom which ultimately is met by the community through increased charges. Second as an indirect cost by reducing the efficiency of the users, private or business alike.

Our standard of living is directly affected by the efficiency of the business sector irrespective of whether it is owned privately or by the State. The business community relies on Telecom in providing them with a range of services which they need in running their enterprises. Clearly, if the service offered is inadequate or unreliable, then the efficiency of the business community is affected. This in turn is reflected in the price of the commodity produced and ultimately the members of the community must pay a higher price for the articles produced and the standard of living is thereby adversely effected.

Clearly, Telecom as a public company has a duty under the Act to take steps so as to ensure that the above will not happen.

It needs to be appreciated that Telecom, unlike other authorities enjoys subsidies which are not directly visible and yet funded by the taxpayer. He, the taxpayer therefore, has a right to expect Telecom to run its business efficiently. For example, Telecom pays no income tax (unlike OTC in this country, the Bundespost and AT&T in other countries) nor does it pay sales tax for the products it buys, nor rates on its properties, etc., and in comparison of tariffs, this partly masks its high direct operating costs. These not very visible subsidies relative to other enterprises still have to be funded from business and the community, and are reflected in national accounts. For a particular sector of Telecom operations such as switching maintenance, fairly exact comparisons of manhour costs are available and show Australia in a poor light (c.f. Section 5.2).

There are social penalties in a high cost telecommunications service in increased relative isolation of lower income families - the concept of an "affordable" service with penetration equal to that of other utilities is written into most Telecommunication Administration charters in advanced countries (including Telecom's). The isolation factor resulting from high service costs and charges has secondary effects in lower income families having greater difficulties in seeking employment (lack of point of contact), in seeking help in case of sickness, feeling secure in the case of elderly people living alone, etc. This is particularly a factor in the geographically extensive Australian cities in which eg, the decline in public transport from earlier years places particular stress on an all pervasive communications network. Switching maintenance costs are not, of course, the only reasons for higher-than-necessary service costs even though significant, and Telecom has a duty to improve its efficiency in all significant areas.

5.7.4 Image of Telecom as an Employer

Telecom is one of the largest employers in Australia, with a workforce as at 30 June 1980 of some 88230. It recruited about 9300 new staff in 1980, including a large number, about 3200, for technical work. About 1700 of the number recruited for technical work were for internal plant work for which the ATEA has coverage.

As an employer dominating a large industry (i.e., there is little choice of employer for workers in the industry), Telecom has a duty to be a "good" employer; i.e., offer good conditions of service, offer a reasonable level of opportunity to its employees, enhance the well-being of its staff, not discriminate against particular groups in employment and so on. More positively it has the duty of developing the skills, attitudes, breadth of experience and capacity to progress of all of its staff. These duties are not incompatible with meeting the customer service and efficiency needs of the organisation.

These duties are clearly implicit in Telecom's Corporate Plan.

Corporate Thrust 3 - Staff Relations and Development - is:

"To provide an organisational structure, and work environment and management style which meets the customer service and efficiency needs of the organisation, recognises the career aspirations and job satisfaction requirements of its employees as well as their occupational safety and health and stimulates industrial good-will and co-operation as a team".

The Corporate Action on Staff Development is to:

"Develop and implement programmes to improve the skills, attitudes, breadth of experience and mobility of staff, and provide opportunities for women to enter all levels and types of activity within the organisation".

The prime responsibility for staff development rests with line managers. A number of programmes exist to assist managers with this task and essentially these are administered by the Training and Development Branch of the Personnel Department at Headquarters and in all States. Training establishments also exist in some other Departments in Telecom.

Having regard to this commitment, a number of programmes have been developed which are available for management and staff of Telecom.

One must accept that the Corporate Plan is beyond criticism. And yet, the survey of opinions among the maintenance staff indicates that the ideals, implicit in the Corporate Plan, are not perceived by staff as a plan of action actually implemented.

Of course, there is a spectrum of opinions, but staff see deficiencies in a number of areas and a number of staff view some of the decisions or lack of decisions as not being in line with the ideals put forward in the Corporate Plan. Clearly, Telecom has a duty to ensure that the "Thrusts" in the Corporate Plan are followed through and that all aspects of the Corporate Plan are implemented in practice in every district.

As long as organisations are run by people there will continue to be imperfections in the implementation of any plans. This we must accept. What we can do, however, is to structure a maintenance organisation in which changes for "better" can be executed locally within a set of guidelines. A properly structured EMA in the District Organisation has such a potential.

Over the years Telecom has developed a good management training plan, but it will take time to have the benefits of the scheme visible. It is recommended that while the scheme is expanding that young staff who have the appropriate gifts be given an opportunity for management training, if they so wish. In my visits to various parts of the Telecom system I have seen potential unexplored. It is my understanding that Telecom is already considering appropriate action.

5.8 A PLAN FOR THE FUTURE

5.8.1 PRELIMINARIES

It follows from the analysis in Sections 5.1 to 5.7, based on the material given in Part 2 of this report, that:

- (a) Telecom must discharge its duties to the community in strict observance of the Telecommunications Act.
- (b) The Corporate Plan is beyond criticism, but there is a feeling among the staff that the ideals, implicit in the Corporate Plan, are not being translated into practice. There is a case, therefore, for reviewing the work organisation with a view to ensuring a more effective implementation of the Corporate Plan.
- (c) Technician Districts for exchange maintenance are too fragmented in their activities and, on the whole, they do not operate as coherent teams as implied in the Vernon Commission recommendations. There is a case for providing a better work organisation for the good of the customer and staff.
- (d) An EMC-type organisation be not adopted.
- (e) An ESC-type organisation be not adopted.
- (f) A single EMA-type organisation be adopted for each Telecommunication District to deal with all aspects of SPC technology. This should be flexible to accommodate a variety of local conditions in States and Telecommunication Districts.
- (g) The EMA should be organised in such a way as to give a variety of experience to those who so desire, and, if possible, give opportunity for specialisation where required.
- (h) Each EMA should have a staff development plan. This should be an on-going activity as part of the Telecommunication District activity. In this way the District can plan in good time for the needs of its staff as well as those of its customers.

- (i) Each District should develop a plan for the introduction of SPC technology. This should be discussed with staff.
- (j) All senior technical personnel having responsibility for groups of people should be given an opportunity not only to train, if they so wish, in appropriate aspects of modern technology, but also in aspects of management to assist them in effective group management.

5.8.2 PROPOSED TELECOMMUNICATION DISTRICT ORGANISATION

"This is an approximate idea only. Our maps always maintain an element of a mystery...."

From second stanza "Christopher Columbus" W. Hart-Smith

The basic organisation, typical of metropolitan districts is shown in Fig. 2. This should be compared with the organisation recommended by Cresap, McCormick & Paget shown in Fig. 1 (copy of Fig. 1 Section 2.1)

Characteristic of the present Telecom District organisation is the multiplicity of small units (Exch. "A", Exch. "B", etc) the majority of which have three or more maintenance staff. It is this kind of organisation that has been recognised long ago in other countries as inefficient, and one that leads to staffing problems and to poor morale. Perhaps, Goethe, the celebrated German poet, had an important message when he said:

"Divide and rule, a sound motto. Unite and lead a better one"

In Western Australia, Canberra and in isolated areas in South Australia, Victoria, New South Wales and Queensland, for some time Telecom has been operating districts based on the EMA concept. Such an organisation is shown schematically in Fig. 3. An EMA is a work group which is responsible for maintenance of several exchanges, typically three to six depending on size. An EMA is larger (say 8 or more people) than the work units shown in Fig. 2. Consequently, there are fewer staffing problems and the efficiency is higher than for the organisation shown in Fig. 2. The work organisation using the concept of EMAs is similar to that which was adopted many years ago in a number of European countries, except that the EMAs encountered overseas tend to be significantly larger than those in Telecom.

The optimum size of an EMA is a function of many factors. One needs to consider demographic factors, level of education and management training, etc. However, there seems to be a good case to recommend that Telecom establish a single District EMA in each Telecommunication District so as to realise the advantages possible with larger groups. In Telecommunication Districts where EMAs are already established, plans for conversion in stages from a multiplicity of small EMAs to a single EMA should be implemented in a coherent manner.

The organisations discussed so far are "inward looking" in the sense that their objective is to help to maintain the district switching plant in a satisfactory operational condition. However, as discussed in earlier sections, Telecom must plan to meet the problems arising from rapidly growing long-distance traffic, more complex local networks and thus means must be provided to ensure network flexibility and stability. To that end it is recommended that each Telecommunication District be provided with a District Network Centre (DNC) which is part of the District EMA as indicated in Fig. 4.

The organisation shown schematically in Fig. 4 is a flexible organisation based on the EMA/DNC concept and which can be adapted to the changing needs of the Districts, be it due to growth or acquisition of new SPC equipment. More specifically, as SPC switching plant is introduced into a District, an EMA is formed headed by an appropriate high-level Technical Officer backed by his DNC cell which would be responsible for the supervision of ARE/AXE equipment and analysis. The detailed arrangements of the day-to-day operations remain the responsibility of the head of the EMA. The EMA is also provided with its own quality control unit concerned with standards and performance.

The DNC is a single point of contact between the National Network Centre (NNC), one in each State, and the District. This is to ensure network stability of the SPC telecommunication network for the whole country.

The maintenance activity in the District EMA is to be organised in a number of "cells" each headed by an STO thus ensuring a good career profile. The number of cells in the EMA is related to the size of the EMA and other demographic factors peculiar to the District and can be varied to meet the needs of the District.

By 1985/86 the majority of metropolitan exchanges will have SPC equipment and, therefore, the District EMA will grow accordingly. However, the plan shown in Fig. 4 is flexible and can accommodate, in addition, single large units such as a tandem exchange or other special maintenance requirements.

Above all, it must be accepted that there will be variations from one part of Australia to another, and what is "best" for District "A" may not be "best" for District "B". It is essential not to be rigid, but to have a "flexible" attitude to the overall plan.

It will be clear from the feedback from staff (see Section 8.2.C) that there is a degree of dissatisfaction with the present "system." This is on account of various human imperfections. In order to ensure satisfaction among the staff, it is essential to improve communications, particularly verbal communication between management and staff in the District. For this purpose two committees are proposed. The Telecommunication District Consultative Committee is an advisory committee for the District on staff related matters including work organisation. This body, which is made up from appropriate District staff, should meet on a regular basis and its recommendations should be communicated to all staff. To ensure an effective group operation, the District EMA has a Work Consultative Committee in which aspects affecting the staff as regards to the day-to-day operations are discussed. The recommendations of this body should be communicated to all staff in the EMA.

Finally, it is essential for senior management to "understand" its staff. This can only be achieved through the medium of good verbal communication, principally by "listening" to people's needs. In forming my recommendation, I can do no better than to quote from a letter which I have received from an OIC after a visit to his area. He writes:

".... It seems to me that, perhaps, if a departmental, or independent, representative for Telecom were to visit (on a regular basis?) all work centres to speak with staff, and hear of problems, then management would have a first hand idea of staff morale."

In this man I see someone who cares. Cares for the future of Telecom, cares for the future of the country and his children. He wishes to be part of the solution to the problems before us. This surely is commendable. I recommend that his proposal be adopted.

The appropriate interval of time at which such visits should be undertaken by senior management is open for discussion, but it seems to me that this should not exceed more than a few years.

"If you're not part of the solution, you're part of the problem".

Eldridge Cleaver

RECOMMENDED ORGANISATION OF
TECHNICAL OPERATIONS ACTIVITIES
FOR A LARGE DISTRICT

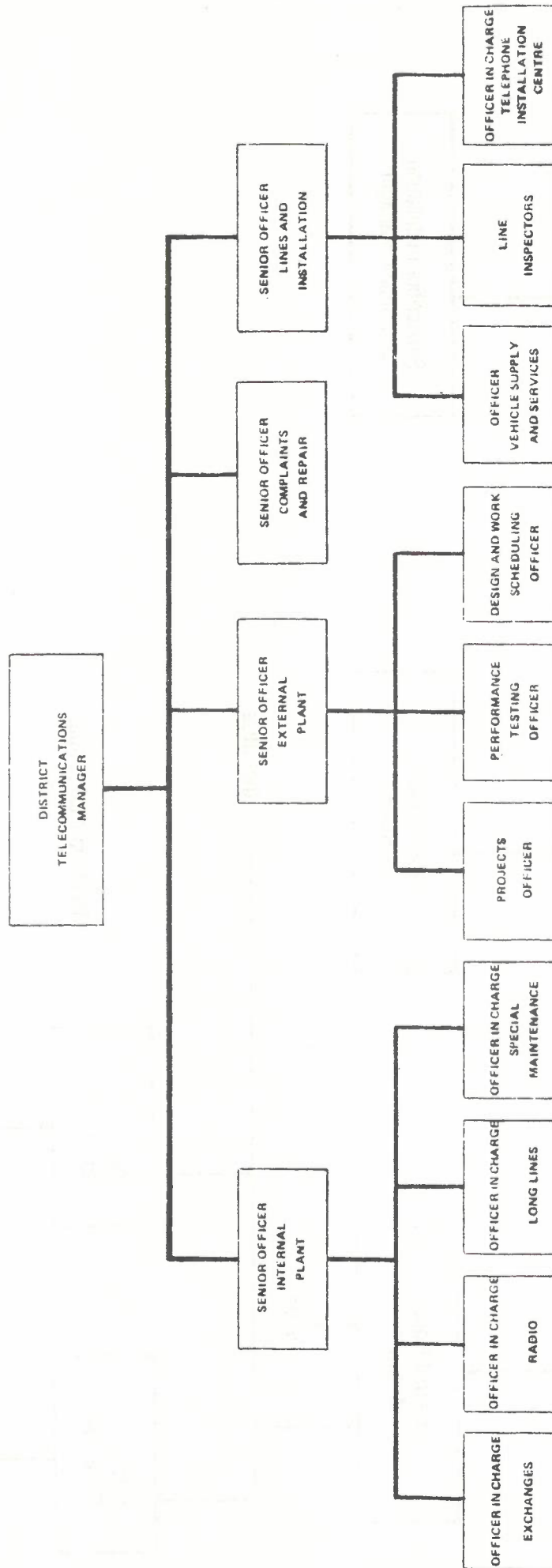


Fig. 1 - Schematic of District Organisation as Proposed by the Vernon Commission

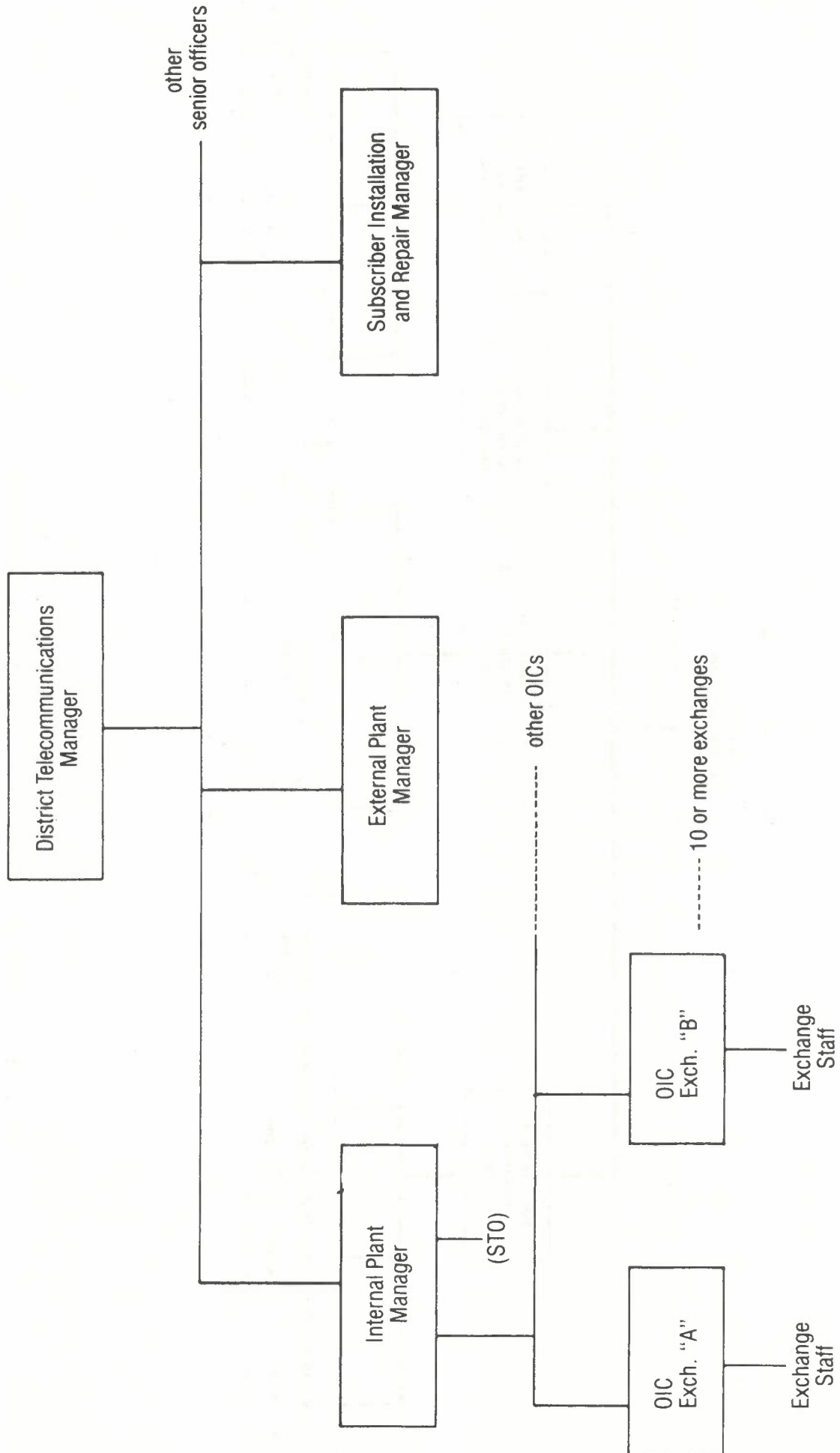


Fig. 2 — Schematic of Present District Organisation

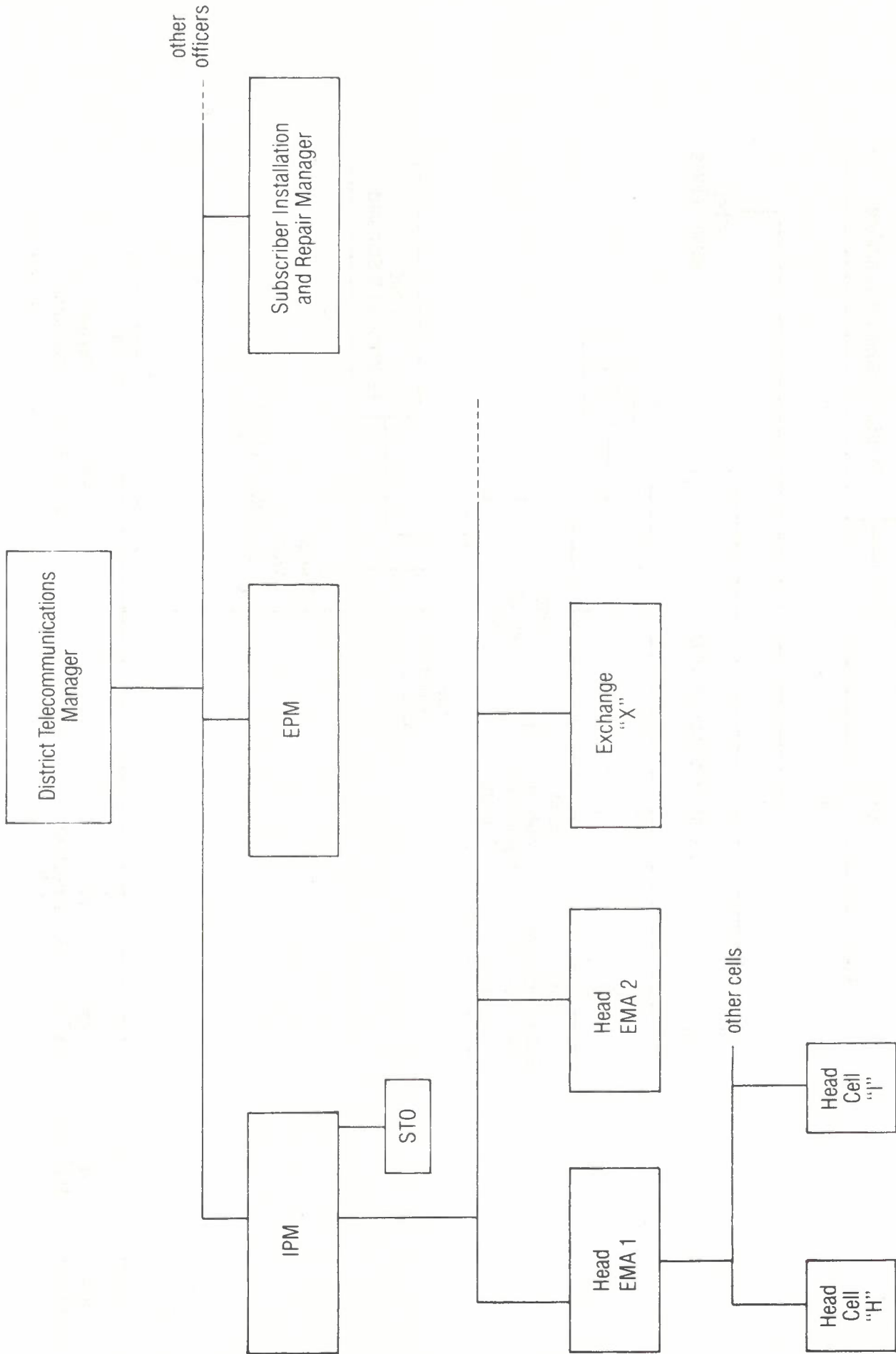


Fig. 3 — Schematic of Existing District Organisation with EMAs

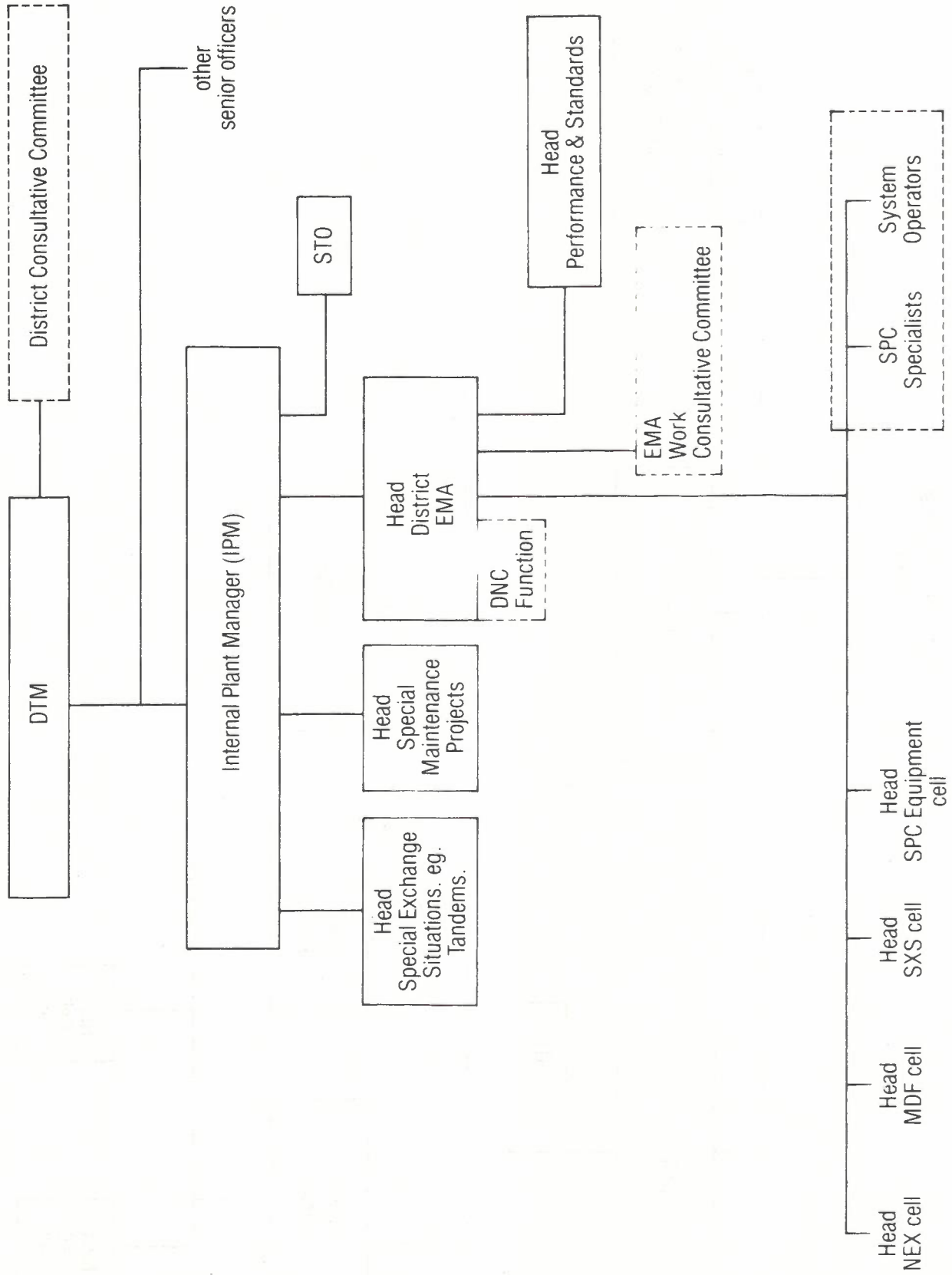


Fig. 4 — A Recommended District Organisation with Provision for SPC Technology and DNC

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 CONCLUSIONS

- (1) All overseas administrations visited, with the exception of the BPO, have re-organised the workforce so that maintenance is carried out in one or another form of an EMA. This is irrespective of the technology used. In the BPO, however, most of the equipment in operation is of the older vintage, the SxS variety, and the benefits of group operation with such equipment is less apparent. Nevertheless the BPO is experimenting with EMA-type organisations.
- (2) None of the administrations visited have an ESC-type of maintenance organisation with responsibility in individual exchanges. Again, there is no administration which has an EMC-type of maintenance organisation with individual exchange staffing. However, centralisation of various control facilities in an area in a designated office is a feature of several administrations.
- (3) The ratio of total number of people employed in Telecom Australia to the total number of its telephone instruments exceeds a similar ratio for countries such as Sweden, Netherlands, France or the USA by about a factor of two. The ratio of total number of technical staff employed by Telecom Australia in switching operations to the total number of subscribers exceeds a similar ratio for countries such as Sweden, Netherlands, France or the USA by about a factor or two.
- (4) The reasons why the efficiency in other countries is higher than in Telecom are many, but the principal reason in switching operations is that, in those countries where efficiency is high, the workforce is organised in an EMA-type format irrespective of the technology used. There was no evidence anywhere that where an EMA-type of organisation has been implemented, taking human factors into account, that the job satisfaction was adversely affected. Quite the contrary.

- (5) With administrations where most of the switching equipment is X-bar or electronic, the practice of operating exchanges with no permanent staff on site is widespread. Correctly installed X-bar equipment can be left unattended for long periods of time. Corrective maintenance (as needed) is practiced because it invariably leads to lower fault-rate and better quality of service than preventive maintenance. This is particularly the case with electronic equipment. It is not uncommon to see in France, Netherlands or other countries, exchanges with 10,000 lines or larger left unattended and yet offering a high grade of service to customers.
- (6) With the exception of the BPO, all Telecommunication Administrations visited have restructured their network to permit centralised monitoring and control (to a degree) of many aspects of network operation. Such an action is necessary to ensure stability of the network in the future years under heavy traffic conditions. This objective can be achieved in an effective way only with the facilities provided by the SPC technology.
- The two USA administrations visited, GTE and Bell, are moving in a direction which eventually will provide the companies with centralised control, level by level, of all aspects of telecommunication services.
- (7) All of the overseas administrations visited have accepted new technology and, to a varying degree, have already introduced SPC technology into their respective networks. The principal advantages claimed are:
- (a) improved quality of service to customer
 - (b) availability of a wider range of services to customers
 - (c) network flexibility and stability
 - (d) ability to re-configure the network as the customer needs change
 - (e) less expensive equipment
 - (f) increased efficiency
- (8) In all countries visited, there is a concern about the connection which could exist between unemployment and new technology. It seems that the European administrations have, on the whole, accepted the principle of no retrenchment as a result of new technology.

- (9) With some overseas administrations the trend has been towards greater delegation of responsibility to Districts/Regions, thus favouring autonomous working groups.
- (10) SPC technology is necessary for a whole variety of reasons as discussed in Section 5. AXE equipment is the right choice as far as conditions in Australia are concerned. Given the economic restrictions, ARE 11 (OMPOS 2, level 3/4) will be capable of meeting many of the needs of the network in the immediate future.
- (11) It seems that a good proportion of Telecom staff are in favour of introducing new technology. They see new technology as more challenging, more interesting and providing better opportunities for promotion. However, many think that the new technology will cause increased unemployment. It is up to someone - so the argument goes - to do something about it.
- (12) Among Telecom staff, there is a general concern about chances of promotion and staff fear that any scheme that groups exchanges might reduce their chances of promotion. In effect, they see fewer OIC positions to which they could advance.
- There is a concern about training. The staff feel that opportunity for training should be given to those that can benefit from such training and be not influenced by the acceptance of a particular work organisation.
- (13) Usually, most people have a desire for their skills and abilities to be visible to their peers and to their immediate supervisors and they seek recognition for their good points. An EMA environment is one in which this is more likely to happen. It is, therefore, a better work environment.
- (14) The survey of staff opinions show that those members of staff who have worked in a well organised EMA prefer such an environment to a single exchange environment. The criticism, not very extensive, comes from those who have no experience of EMA-type of operation or had the misfortune to work in one where there were personality difficulties.
- (15) There seems to be an inconsistency between the assurances of Telecom on career opportunities and the position as staff perceive it. Telecom gave assurances concerning career profile in the future, stating that there will be ".....substantial improvement.....". Staff do not see the future in this light. The feedback indicates that there is a general concern about career opportunities.

- (16) The Telecom redeployment policy reads well. Yet, the feedback from staff seems to indicate that some redeployment actions are not in line with the stated Telecom policies.
- (17) There is a difference of opinions on what is considered as adequate compensation for "losses" incurred by staff due to redeployment.
- (18) The survey of staff opinions seem to indicate that staff have a range of needs:
- (a) physiological
 - (b) safety
 - (c) social
 - (d) ego
 - (e) self-fulfilment

The survey shows that, in Telecom, the needs of staff as regards the first two are adequately satisfied. Most staff have a genuine need to satisfy their higher level needs (levels (c) to (e)). Some of the "needs" are not real and arise from unreasonable expectations, but others are not. In any case, aspects of social needs and some needs relating to 'self' are easier to satisfy in the framework of an EMA than in the EMC or ESC organisations.

- (19) Staff have a desire to identify themselves with their district.
- (20) The survey of job satisfaction carried out by Dr. Gardner of Melbourne University indicates that there is no significant difference between the levels of job satisfaction perceived in the two organisations EMC/ESC. But, there is general concern about chances of promotion and training.
- (21) It seems that the real issues are not those of EMC vs ESC. The problems concerning job satisfaction of staff in Telecom are of longer standing and the EMC/ESC issue has only helped to bring the problem to the surface.
- (22) The criticisms of the EMC come under three principal headings:
- (a) The workforce is split into "them" and "us", and "them" are not part of the team. "Them" are also remote and not part of "our district".
 - (b) The OIC of an EMC exchange often sees his authority reduced and feels that his skills are not needed. He also feels that his self esteem is affected. These observations do not apply to those who work in the EMC itself. Whether these feelings are real or imaginary is besides the point.

- (c) Staff see their promotion profile adversely affected. This is in spite of assurances of Telecom to the contrary.

On the question of EMC/ESC, as well as other issues, staff are not unanimous in their view. There is a whole spectrum of views.

- (23) With reference to the X-bar equipment, corrective maintenance as needed is less costly than preventive maintenance and, if diligently practised, is more likely to lead to better quality of service.
- (24) The practice, which is common in Telecom, of cutting over small units of plant at frequent intervals of time (eg, 18 months) is wasteful of maintenance staff effort and adversely affects quality of service.
- (25) The trial figures show that the efficiencies of EMC exchanges are marginally better than those for ESC exchanges (0.86 mh/stn/year as against 0.99 mh/stn/year). But the difference is not as great as originally forecast by Telecom and is not significant. The Field Trial Report as regards efficiency is not conclusive for a number of reasons as given below:
- (a) The cut-over programme was delayed and a significantly smaller number of exchanges operated in the trial period. A proportion of the exchanges cut-over in the last six months and a good number of these did not reach a "settled maintenance condition".
- (b) Several exchanges had post-installation problems imposing a heavier than average working load on staff.
- (c) 70% of lines of the exchanges in the trial were of the level 1 type with OMPOS 1 maintenance facilities, whereas the network by 1985 will be of the level 3/4 type, with considerably enhanced OMPOS 2 maintenance facilities. Thus, the results do not adequately reflect the real long-term working situation.
- (d) Both the EMC and ESC schemes were operating in conditions where they were not loaded sufficiently in normal maintenance operations to indicate the true efficiency figures possible.

- (e) The instructions as to which XAM account staff were to book their time were often misunderstood. In some cases the XAM forms were completed at the end of the week by the OIC on behalf of his staff. In other instances the staff were not sure at the end of the week how their time was spent during the earlier part of the week and the forms were completed on the basis of "judicious guesses". Such circumstances largely attenuated the validity of the figures so obtained.
- (26) The cost estimated by Telecom indicates that the EMC arrangement would be significantly more efficient than the ESC maintenance organisation. The principal basis for this is that an EMC exchange would employ fewer people than an ESC exchange of the same size. A properly organised EMA is seen as being capable of even better efficiency with fewer staffing problems.
- (27) In most exchanges which have cut over to ARE 11 OMPOS 2 operations (not many of them), the full facilities of the equipment have not been used.
- (28) The statistical data concerning standard of service - that is data from Traffic Route Tester results, fault statistics, Technical Assistance reports and switching and congestion loss - obtained as part of trial activities does not show any significant differences between the operation of the EMC and ESC exchanges. The results are within standard. However, there has been a significant number of outages and this directly affects the standard of service. The data tends to indicate that more outages of longer duration have occurred in ESC exchanges. One of the reasons for this seems to be that ESC exchanges were slow on occasions in contacting the ESC or the National Support Centre for assistance.
- (29) SPC equipment will bring a new dimension into Australia's Telecommunication network and offers a range of new services to the community. But, to derive full advantage of such equipment, a change in maintenance practices is required. A properly structured EMA (as described in Section 5), satisfies the needs of the network and is in public interest. Such a move would also lead to a more satisfactory work environment and would therefore be in the interest of Telecom staff.

6.2 RECOMMENDATIONS

- (1) That Telecom, to promote greater satisfaction among its staff, initiate action which will ensure that the ideals expressed in the Act and the Corporate Plan be put into action in all Districts in a reasonable time.
- (2) That the EMC exchange maintenance scheme be not adopted as part of the Australian Telecommunication Development Plan.
- (3) That the ESC exchange maintenance scheme be not adopted as part of the Australian Telecommunication Development Plan.
- (4) That the concept of the District EMA, as described in Section 5.8, be adopted as part of the Australian Telecommunication Development Plan. That such an EMA be headed by a high level Technical Officer of appropriate grade and that duties within the EMA be discharged by a workforce organised in a number of "cells", each headed by an STO, thus ensuring a good career profile. That each District EMA have its own quality control cell and a District Network Centre (DNC). The DNC to interact with the District on one side and the National Network Centre (NNC) in each State on the other, thus ensuring telecommunication network stability.
- (5) That SPC technology, be it in the form of ARE 11 or AXE equipment, be introduced in a planned way into the network and that Districts plan well ahead of time for its introduction.
- (6) That Telecom take steps to improve verbal (personal) communication with all its staff.
- (7) That in each Telecommunication District a Consultative Committee be formed to act as an advisory committee for the District on staff-related matters, including the work organisation. This body, which is made up from appropriate District staff, should meet on a regular basis and its recommendations should be communicated to all staff.
- (8) That in each District EMA, a Consultative Committee be formed to advise on aspects affecting the staff as regards the day-to-day operations. The recommendations of this body should be communicated to all staff in the EMA.

- (9) That a staff training programme be developed which will provide appropriate training for all staff who can benefit from such training and who have a desire to benefit in this way.
- (10) That separate segments of training courses be provided for Operations Department and Construction Branch staff with course content more appropriate for their respective roles. The courses to have a component designed to foster good group habits.
- (11) That additional training in software be provided in the future as the need arises to ensure good network performance.
- (12) That Telecom ensure that redeployment, where it needs to be practised, is carried out in line with the procedures in every instance.
- (13) That, to assist with redeployment and to reduce hardship among staff, the Unions consider amalgamation.
- (14) That, consistent with the above recommendations, duties of the IPM be reviewed and some duties at present discharged by the IPM be delegated to the senior officer in charge of the District EMA, thus freeing the IPM to spend more of his time on matters concerning staff development and training. The Telecommunication District to submit periodic reports through the State Administration to Telecom Headquarters on staff development, consequent on an adequate discussion in the District.
- (15) That, within each EMA, staff be given ample opportunity to change the nature of their employment at suitable intervals of time. Such a move might be preceded by a period of suitable training. But no member of staff should be compelled to undergo training against his wishes.
- (16) That, as part of the Telecom staff development plan, and to help in "retention of expertise" and to enhance job satisfaction, staff be encouraged to consider changing the nature of their particular duties and place of employment at suitable intervals of time, say 3 or 5 years.

EPILOGUE

There are those who despair at the present economic situation and the intrusion of electronics and computers into our daily lives, while others are excited by the prospects of the future. Of course the views expressed are coloured by one's emotion: A tidal wave might be a source of excitement to a skillful surfsider, but a source of anxiety to a person living in a small house on the beach. The fact remains that economic movements, personal self-fulfilment and the prosperity of the whole country are related to technological progress in a complex and intricate way.

It seems that while many are confused and search for scapegoats for social maladies, what is really needed is a better understanding - rather than criticism - of the forces involved to turn the tide of progress to our advantage.

If this report has helped to increase our understanding then we are better equipped to deal with the future.....

Perhaps Abraham Lincoln had an important message when he said: "You cannot help men permanently by doing for them what they could and should do for themselves".



A.E. KARBOWIAK

October 1980

PART 2 - SOURCE MATERIAL

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8. SUPPORTING MATERIAL

8.1 NOTES ON VISIT OVERSEAS 30 MARCH-28 APRIL 1980

8.1.1 VISIT TO BPO, LONDON, 1-2 APRIL 1980

People met on 1.4:

- Mr R.S. Fuller
- Mr R.H. Adams, Dept. Director,
Exchange System Dept.
- Mr R.M. Greensmith, Head of
Telecom Communications
Industrial Relation
- Mr R.H. Bluett, Maintenance
Methods & Support Division
Div. Head
- Mr T. Roberts, Section
Head, Personnel
- Mr Ninimins, Personnel (Pay
and Grading)

(a) General

- At the moment 80% of switching equipment is Strowger, 8 to 9% X-bar, and the rest electronic, reed, hard-wired.
- The rate of conversion to electronic exchanges is limited by the availability of capital.
- Because of growth, the management did not drive for higher productivity until recently.
- TXE equipment will continue to be installed for some time yet.
- System X has already undergone trials and its introduction into the system is expected to speed up.
- It has been the practice in BPO for the contractor to do the installation work. With System X, BPO will do the installation. (This is a much simpler operation.)
- The capital costs of System X are estimated to be lower by a factor of 2.
- BPO is planning to develop regional repair facility for the PCB for System X.

(b) Manhour Figures

Strowger (director)	1.2 mh/EC = 0.75 mh/station
Strowger (non-director)	0.75 mh/EC = 0.43 mh/station
X-bar	0.4 mh/EC
K3 (pentaconta)	0.75 mh/EC
E2	0.4 mh/EC

(expected to come down to 0.25)

The above figures exclude MDF work (to allow for this, 40% should be added)

System X - probably 0.2 mh/EC

- A more dramatic comparison is:

SxS - 19 mh/year/erlang

X-bar - 8 to 9 mh/year/erlang

System X possibly 1-2 mh/year/erlang

- 20% of total manhours in maintenance relates to the switching equipment, the rest relates to subscriber lines and equipment.

(c) Miscellaneous

- Management now believes (and unions agree to some extent) that consultative processes work. But it is a painfully slow process.
- In the light of some trials, it is believed that EMAs (called EMU in UK) work. but acceptance by unions remains a problem. A favourable report has yet to be accepted nationally.
- The training for maintenance of Strowger equipment is six weeks. That for E4 or E2 is 16 weeks. The latter does not include "hands on" experience with a model exchange.

(d) Discussions with the Union Representatives

POU committee members met were:

Bill Cox

Brian Harper

Mick Ronaldson

At the meeting, which was arranged at my request, the following points were made in response to our questions:

- . POU accepts the need to move towards a digital network.

- . Sometime ago a hostile motion was passed which in essence said:
No new technology (System X), unless there is adequate provision for training, job seniority agreement and no reduction in job numbers.
 - . The change should be a slow process.
 - . Will not go along with any concept of "elite group"; cannot see the need for it.
 - . It is admitted that there are communication problems with the Administration as well as within the POU.
 - . Some believe that consultative processes might work, but it will take time.
 - . The consultative processes are covered by legislation and are described in relevant documents.
 - . Importance of communication with staff at the local level is recognised.
 - . There is some concern that System X is advertised as being capable of 'stand alone' operation.
- (e) Discussions in London Telecommunication Region (LTR)
(Mr Rayner's office) South Bank.
- Met: Mr David Churcher (Control)
Mr Brian Prior (Controller Personnel)
- . There are 11 areas (including four inner London areas).
 - . Nine months ago an Executive Action put the MDF Work and private circuits under a common manager (separate from switching).
 - . Sometime ago PO engineers experimented with a machine that would speed up jumpering on MDF. This was not approved by POU and the machine has never been used since.
 - . Originally the administration has proposed a centralised repair facility for the TXE boards. This was not agreed to by the POU. As it happened, the TXE4 had a high fault rate (ten times higher than anticipated) and repair facility on the site is now preferred.
 - . In all discussions so far, the POU has completely rejected centralised operation.
 - . The Administration's view is that the future will be harder for management on three accounts:

- (i) Problems arising from reduced manpower.
- (ii) Difficulties associated with new technology.
- (iii) Need to implement centralised control which is most strongly objected to by the POU.

. With TXE4 there is no problem with staff losing expertise with time: the equipment presents sufficient number of problems to maintain one's expertise. The situation with System X is likely to be different.

. In south-east London, the Eltham area, an EMA type of organisation is in operation. This has been agreed to by the local branch, but is not "registered" as a field trial due to objections from the POU executive. The operation, which is believed to be satisfactory, is due for review in six months time.

In the light of the experience gained, management believes that the optimum size for EMA operation might be 100,000 to 150,000 lines.

(f) South Bank Exchange

- At present there are 20,000 lines of SxS and one conversion of TXE4 which still has problems. There were 30 technical staff on site before conversion. This will be gradually reduced to 16 or less.
- At present 16 technical staff service SxS and six the electronic component. On completion of conversion, the 16 will go and the six might be increased to ten. The OIC does not mind this trend since he is not an "empire builder".

(g) Visit to Shepherds Bush Exchange

This is the largest TXE4 in operation. At the moment it serves 14,000 EC but ultimately will grow to 40,000 EC. The staff consists of OIC, five TOs maintaining TXE4 equipment and seven TOs maintaining Strowger equipment (10,000 lines).

In the round the table discussion with staff the following points were made:

- Fourteen weeks training for TXE4 is barely sufficient. Actually Strowger background is a disadvantage.
- The men of their own volition tend to specialise (eg., main control, faulting, etc.).
- Some dissatisfaction with central servicing facility has been expressed.
- The equipment uses magnetic core, wired memory for sub-categories.
- Core threading is regarded as a job with low job satisfaction. The men maintain it is better to have such a job than none at all.
- There is a separate MDF jumpering team which comes under the direction of a separate district manager (see notes above).
- The OIC maintains that the exchange is understaffed.
- The opinion on centralisation was somewhat divided. On the whole the men would accept group work with centralised facilities, but not centralised "control".
- Strong views were expressed concerning poor communications. The why-don't-they-come-and-talk-to-us? syndrome.

8.1.2 VISIT TO FRENCH PTT, 3-4 APRIL 1980

Guide/interpreter: Mlle Blonz

People met: Mr Person, Directorate of Production (DPR),
 Organisation and Methods Dept. Head
 Mr M. Bertuetto, (DPR) Chief Engineer
 Mr Grange
 Mr Sangiovanni
 Mr Lacout, Assist, Dir, of Production
 Mr Cuvier, DA11
 Mr Grippai, Head Dept. of Maintenance, Assistance
 and Traffic
 Mr Toulon, Head of Personnel Dept.

(a) Organisation

HQ (DGT) Telecommunications has similar organisation to Telecom.

Principal components: DACT - Marketing
 SPEL - Personnel
 SPAF - Finance
 SPES - Corporate Planning
 DPR - Construction, engineering
 and operations

Regional services: France is divided into nine zones
 (regions) each headed by a director.
 Each region is divided into cells
 (districts)

The operation is carried out in three overlaid organisations:

- CPE (total 300 staff). Main operation centre responsible for switching systems, and other equipment associated with subscribers, etc. The maintenance of digital E10 and AXE analogue is performed by specially trained staff.
- CCN (total 150 staff) concerned with outside plant.
- ACTEL (about 100 staff), deals with the business office aspect of customer services. There are other overlay organisations concerned with transit switching. As in ATT in America, there is one long distance CPE for the whole French network. There is also one National centre which among others is available for consultation. CPE is concerned with technical matters. Total number of lines involved will vary from one part of the country to another, but might be in the range of 25,000 to 200,000.

(b) Historical Developments

1970 first exchange TDM for 10,000 lines.

1976 introduction of SPC on a large scale.

At the moment there are over one million lines of electronic equipment, about 80% SPC.

800,000 in E10

250,000 in 11F (Metaconta) - a hard wired system

13,000 AXE (adapted space division)

- Other systems: Thomson-CSF, MT20, MT25, German EWS, and others.
- In the future only E10 and MT designs (MT20, 25, 35 etc.).
- AXE is only an interim solution.
- X-bar and SxS will all be removed by 1990 (at the moment there are 15 million lines in X-bar and 1 million SxS).
- Rate of installation of new equipment: 2 million lines each year.
- By 1990/91 the programme will be complete if funds are available and meet the plans. The plan is strongly influenced by the integrated digital network (IDN) philosophy and Government pressure to make "telematique" advances in France to support export potential in French products. They are examining a number of possible solutions.
- In 1977 there were 7 million subscribers.
In 1978 there were 12 million subscribers.
In 1979 there were 14 million subscribers.
By 1990 there will be more lines than households.

(c) Operation Practices

- In France, for a long time, small exchanges (less than 10,000 lines) have been operated with no permanent staff in exchanges.
- E10 exchange has facilities for remote control and testing. All changes and controls can be effected in software, but MDF jumpering must still be done by sending someone to the concentrator station.
- Normally the contractor carries out the installation work. PTT staff are only involved with maintenance.
- It is normal practice to allow technical staff to maintain special classes of equipment only after receiving appropriate training.

- In the 3-step progression chain, Assistant Tech - Tech -Chief, there are bars. The person can normally progress from one class to another by virtue of some studies and/or examinations. Direct entry to the higher grades is possible.
- It is important to appreciate that the network was organised in terms of CPEs before the arrival of electronic exchanges.
- When forming CPEs the only problem raised by the unions was the increased travelling distance for some employees. Otherwise the unions see advantages in the concept of CPE (EMA).
- Before the advent of CPE a technician worked on his own. Now he works as a member of a team specialising in an aspect of maintenance. He works to rules (Note that in this interview it was stated that the technicians on the whole do not mind working to a set of rules devised by PTT but there are minor dissatisfactions with some particular rules, eg., no "preventive maintenance").
- The technicians report that they now prefer being members of a team wherein they can share experiences and better retain expertise. In addition they feel freer and often have the use of PTT car and in the evening can take it home.
- Another advantage of CPE is that more sophisticated and expensive facilities can be provided in the central office to service the whole area. They feel availability of sophisticated equipment is a form of job enrichment.
- When complex faults are encountered the National Support Centre (NSC) at Lyon and also regional expertise is available to assist the CPE.
- As regards maintenance of hardware the manufacturer carries out some repairs of PCB; others are repaired in several DGT repair centres (eventually one per zone).
- Staffing of a typical CPE switching group consisting of six exchanges (Table 1) is:
 - One chief, one computer tech, 5 to 6 Techs, 1 AT.

- French have developed an overall quality of service index which takes into account, through the medium of a formula, using agreed weights for components such as: customer complaints per 100 lines/year, proportion of successful local and STD calls, proportion of customer reported faults cleared in less than two days, ditto cleared in less than eight days.
- There is no measurable difference in the quality of service as offered by the alternative systems because the quality of service is largely determined by breakdowns of lines and subscriber equipment.
- The specification on the outage of the new equipment is 5×10^{-5} /line.
- Reasons for preferring an electronic exchange system with centralised control:
 - . Cost of electronic exchange = $\frac{1}{2}$ cost of X-bar (there is an additional factor due to saving in building cost)
 - . Reduction of cost of installation (Four months instead of ten months for X-bar)
 - . Extensions are less expensive (One month/1000 lines instead of eight months for X-bar)
 - . Running costs are lower: (i) fewer people employed
(ii) the average grade of technician is lower with electronic exchanges
 - . Extra services to customer
 - . Fewer faults. This however needs qualifying. With the E10 equipment there are now 130 exchanges operating. The number of faults encountered is extremely low, therefore fewer people are needed for maintenance. There are two types of faults:
 - (i) v. easy to put right; low level of technical expertise is sufficient.
 - (ii) v. hard, for which invariably attention from a professional engineer is required. During 1979 there were only ten such faults. Three of these were v. serious. In the latter case the expertise from NSC was needed.

- Supervision after hours is by Centre of Information processing (CTI). The next stage will be telesupervision and telediagnosics for several CTIs.
- There exists a whole variety of testing programs (and further software will be written) to automatically trace the faulty equipment and indicate the offending PCB.
- In total there are:
 - 160 centres for E10
 - 60 CTIs
 - 20 centralised maintenance centres each looking after a number of CTIs using telemetry circuits for supervisory diagnosis and special test programmes.
- There are also savings in after hours operation. At night there will be only one person in each CTI. Should a fault occur in an exchange he would alert the appropriate person in the area.
- Other advantages of centralised control:
 - . Administrative advantages in controlling people (fewer centres and stores of spares).
 - . Distribution of documentation (they say quality of documentation is more important than training).
 - . Better retention of expertise.
 - . Each zone has a support centre (engineer) but for TDM (reliability is much higher) only one centre is needed and Mr Grippai is the man.
 - . Better security of software.
- Until now they had no problems with security of software. To meet the problems of the future they plan periodic checks of software by appointed engineers. This will be a routine program prepared for the purpose. The policy is that software programs are agreed upon with the manufacturer and must not be tampered with by CPE personnel.

(d) Visit to CPE and Exchange in Evry

M. Auzet, Director and

M. Vivier, Engineer

- This exchange is the Head Exchange (10,000 lines) and employs one Chief and two Techs. The cell has in excess of 50,000 SPC lines.
- The cell is in Corbeil DOT (District/Region) CPE totalling 330,000 lines.

- Later when all exchanges are converted to E10 (or MT25) for after hours operation all alarms will be transferred to Corbeil.
- In total there are 200 techs. (for 330,000 lines) the majority of whom are concerned with lines and subscriber equipment.
- Typically, before conversion a X-bar exchange might have had 20,000 lines and employed eight people. After conversion there might be 25,000 lines and three people employed. The adjustment in personnel numbers is through natural wastage.
- After conversion, the OIC of a cell has reduced responsibility but keeps his rank.
- Data changes are effected through the terminal, with hard copy.
- At the moment software checks are made once in three months.
- Should the exchange go down, the engineer believes that it would take about one hour to restore the service.
- In round figures the Evry district employs seven people/1000 lines. This figure for the whole of France is 12 people/1000 lines. (About the same as in Britain). Note, that in Telecom, the ratio is 20 people/1000 lines.

(e) Relations with Unions: Some observations by M. Toulon (Inspecteur General, Service du Personnel)

- Levels of communication with the unions:
 - (i) Informal contact with M. Toulon or the Manager
 - (ii) Administrative and technical committee (a consultative body)
 - (iii) Superior council of PTT (a ministerial body)
- M. Toulon is burdened with (i) above.
- In the consultative committee (ii), a vote might be taken but the resolution is not binding on the parties.
- Personnel matters may be discussed in (ii).
- Employment problems may be discussed in (ii) or (iii).

- Setting-up of CPE did not present any problems with the unions. But, when book of rules (3 volumes) was issued there have been strong objections to many of the rules. The book of rules has been rejected by the unions.
- There were some reactions against centralised control (see above) but of little consequence.
- The change in responsibility of the OIC was not objected to. But, the unions have obtained some guarantees and concessions concerning increased travelling time for some personnel.
- The implied specialisation of maintenance personnel was not objected to but there were objections to the programmed maintenance. However, maintenance only affected the operators of the terminals.
- Fears that management might exploit the centralised system for "Big-brother's-watching-you" purposes have been expressed and not entirely overcome.
- People in the field have lost some initiative. This has been objected to in the past, but seems to have been accepted now.
- Some concern has been expressed (by the Unions) at the implied reduction in the labour force. However, the effect is largely attenuated since PTT continues to expand its activity. It was most fortunate that centralised control was introduced during a period of economic growth.

Table 1
Le Mans Jacquard CPE

Exchange	Lines
La Fleche	9523
Sable/Sarthe	8629
Chateau du Loir	9728
Beaumont/Sarthe	13997
Saint Calais	4088
La Ferte Bernard	<u>11256</u>
Total	57221

VISIT TO TELEVERKET/ELLEMTEL/LME, STOCKHOLM 8-10 APRIL 1980

People met: Mr T. Andersson, L.M. Ericsson
Mr E. Ericsson, Ellemtel/Televerket
Mr S. Rimbleus, Televerket, Stockholm Telecommunications Area
Mr D. Ryberg, Deputy Manager, Marketing, Ericsson
Mr S. Sundstrom, Local Exchanges, Ellemtel
Mr K. Persson, Ellemtel (Organisation & Development Programme)
Mr B. Nilsson, Ellemtel (System verification)
Mr A. Carlsson, Televerket
Mr A. Sundblad, Televerket
Mr G. Appelgren, Televerket
Mr K. Ljungkrist, Televerket

(a) Swedish Telecommunications Administration Organisation (STA)

In the recent years the STA has been re-organised in accordance with national guidelines with a double objective in mind:

- (i) A structured control system enabling each level of the organisation to observe results with area of responsibility.
- (ii) Decentralisation of operation.

The structure used is a matrix organisation. The basic structure:

- (i) Twenty Telecommunication Areas and four services (Alarm Systems, Materials, Radio and Industrial) form the vertical structure;
- (ii) Three horizontal functional departments in each area (Data Communication Marketing, Telephone Marketing and Network Planning);
- (iii) Central Administration: Functional departments provide policies, guidelines, targets and broad financial control.

The 20 Telecommunication Areas are each directly responsible to the Director-General. Areas enjoy a considerable amount of autonomy but, in turn, are fully responsible for economic results and the quality of service provided (full delegation). Results are measured in term of degree of fulfilment of goals.

Sweden is committed to a policy of decentralisation. A high degree of co-operation between the Areas, the central departments and services is implied. The Central Administration, among other things, co-ordinates purchasing, development and marketing.

Another feature of STA is that while it is a public utility operating on a commercial basis, it has a number of partly owned subsidiaries:

- | | | |
|-------|----------|---|
| (i) | SWEDTEL | (A consulting company) |
| (ii) | TEFAB | (Telecommunication materials manufacturing company) |
| (iii) | ELLEMTEL | (Development company, owned 50/50 with LME and STA) |
| (iv) | SOS-AB | (Alarm-giving-services body) |

(b) Historical Developments

- The AGF/500 equipment has given good service during the past 50 years. It is planned not to produce this equipment any more after 1982.
- A 204 crossbar equipment is used to the extent of 3M exchange connection.
- During the years 1963 onwards, LME has been working towards TDM/WL system, while TVT had evolved a Space/SPC system. The two developments were ultimately combined (1970 onwards), resulting eventually in the present AXE system (digital).
- Presently LME continues to produce ARE 11 for export. There is no intention to introduce this system into the Swedish network.
- The Administration is planning to replace all AGF equipment with AXE by the year 1995, involving in total some 1000 exchanges. Crossbar exchange replacement by AXE will extend into the early years of the 21st century with priority given to the 4000 small rural exchanges, system 41 (by the year 2000). Others by the year 2010.

- (c) Development of the Operating Maintenance Centres (OMC)
- The project was started some years ago. This is to cover not only AXE but also AXB (telex), PDN (Public Data Network), NMT (Nordic Mobile Telephone Network), A345 (PABX) and PCM equipment.
 - Development of this facility is regarded as essential for effective operation of a modern network. However, this is not a centralised control system of operation for the whole country since there is a commitment to decentralisation of operation to each OMC. The system offers centralised information handling and processing with a view to improving services to customers. Planning is not yet firm, or facilities precisely defined, but goals are there to gain full advantage from SPC.
 - The following are the advantages:
 - (i) Full potential of SPC can be realised.
 - (ii) Better service for customer (eg., by continuous surveillance of customer lines).
 - (iii) Better work environment.
 - (iv) Co-ordinated aids (eg., for fault clearance).
 - (v) All information for the whole network can be gathered and processed to benefit the whole country (c.f., AOM in Telecom).

The first OMC is to go on trial in 1985, and eventually current plans are for 22 throughout Sweden but this may change.

At present there is one computer centre located in Stockholm. A second one will go into operation shortly in Gothenburg. Eventually there might be four such centres interconnected by a data network in the whole of Sweden. These will be manned 24 hours a day and will support the OMC centres (possibly 22 as previously mentioned).

OMC concept and modernisation of the Swedish Telecommunication Network (MOTE plan) are closely related. The key planning document is titled MOTE-ABU the first acronym stands for Modernisation of the Telephone network, the second A for work distribution, B for manning, U for education (in Swedish).

As part of the planning and implementation of the OMC/MOTE activity, an OMC working/consultative party has been set up. This consists of some nine people, 3 of whom have been selected from the wider membership by the National Executive. There are other co-opted members and one of Mr Ericsson's functions is to co-ordinate this activity. The working group discusses matters such as work distribution, manning, education/training, producing recommendations for local administration, etc. This form of consultation is covered by Swedish law for Government employees (the Code for Maintenance Agreement).

(d) AXE and Manpower

AXE will be introduced systematically but at a suitable pace. It is recognised that adequate and sometimes exhaustive communication between management and workforce is imperative. The management will spare no effort to maintain a dialogue on all aspects concerning the operation of the system.

The "introductory phase" from AGF to AXE is succeeded by a "follow-up phase" concerned with successive removal of tasks from the exchanges. Next is the "continuing phase" when OMC is introduced and the final stage of serving all AXE exchanges (which will be unmanned) by a mobile field group is achieved.

Training programme complements the three phases. It is left to the Unions to make recommendations on the selection for training (about 5 out of 20).

The trend is:

- . Remote control and surveillance
- . Redistribution of tasks
- . Technical operation from OMC.

There are discussions with Unions on a variety of matters, from details of corrective maintenance to priority and confidentiality of data and security.

The envisaged average manning figures for AXE system during the "follow-up" phase prior to OMC will be one skilled field (roving) man, classified as stations technician I with slightly heavier provision of less skilled, stations technician II, per 10,000 lines. In the steady state phase with OMC, this will decline to one per 30,000 lines.

By 1995, the overall workforce in switching might be 20% of the present figure (see paper by Rimpleus). This has been discussed with the Unions and they have been invited to help more in discussions to find alternative jobs for their children. The problem, in the light of new technology, is to find a sufficient number of meaningful jobs for the people. This is regarded as a challenge for management and the Unions.

The exchange switching maintenance effort per 1000 AXE subscribers lines per annum is expected to decline from 280 to 55 mhrs, over the decade.

In answer to my specific question inviting views on what could be the reason for strong opposition to EMC in Australia, came the response that it could be inadequate amount of time spent on communication with Unions and the workforce.

(e) Sodertalje AXE Exchange

This is located some 40 km south-west of Stockholm.

Originally 3,000 lines were cutover on March 1977.

Before the cutover took place, all subscribers affected received a publicity leaflet. This was the early version of AXE which used reed relay switches and some miniature relays. This has since been updated to a completely solid state version (in 1979/80).

Sodertalje is the zone centre for the Sodertalje trunk code area and a number of group centres and terminal exchanges are connected to the exchange.

It is to be noted that, with the early version of AXE, a few outages have occurred, mainly due to software deficiencies.

Also, a good number of reeds and diodes have been replaced.

Presently, preparations are being made for cutover of a further 10,000 lines (later in 1980) and a complete removal of the AGF equipment (30,000 lines) in 1981.

It has been said that should the exchange go down it need not take more than five minutes to bring it on again.

Unlike its predecessor, the new version of AXE has given very few problems.

Although AXE is advertised as being capable of factory testing before despatch - using a complete set of interconnecting cables, factory prepared - this is not the case in the present exchange.

While the floor area occupied by the AXE equipment is very significantly less than for the equivalent AGF equipment, the power consumption is large (15 kw for 3,000 lines). The processor alone is using 6 kw of power. As a general rule, the power consumption is approximately 1.2 W/subscriber plus 6 kw for the central processor.

There is an earlier paper by Rimpleus that describes other features of the Sodertalje exchange.

Surveillance of the Sodertalje exchange is located in Jeriko, Stockholm, in the same building as the International Maintenance Centre (IMC).

A feature of the operation of the system is that instead of having to make out orders, the centrally located staff (eg., Administrative Office) can execute remotely commands relating to:

- Connecting and disconnecting different subscriber facilities.
- Traffic recording.
- Traffic observations.
- Reading of call meters.
- Changing the charging and traffic routing.
- Collecting statistics.

Ultimately, all operational and maintenance work within a specified area will be performed from one central place.

The operational/maintenance functions are decentralised in the sense that the dispatch of technical personnel and responsibility rests with the local group.

The operational experience indicates that the system software and hardware of AXE is reliable and that maintenance is simple (due to modular structure).

Note: MDF work is carried out by a separate team employing lesser grade technicians. New types of MDF and work organisation are being tried. It is anticipated that these innovations and the ability to do software jumpering will lead to a reduction in the labour force to about 20% of the present.

(f) LME on ARE 11: Present and Future

The information given below was obtained in response to specific questions:

- The work on upgrading ARF crossbar started in the late 60s. The technology is, therefore, many years old.
- The ARE equipment has been marketed to 14 countries. Significant markets exist in:
 - Colombia
 - Egypt
 - Finland
 - Iceland
 - Kuwait
 - Saudi Arabia
 - Spain
 - Yugoslavia
- Australia and Denmark represent the biggest customers. Australia represents more than 50% of the market.
- Denmark do not propose to purchase any more ANA 30 equipment; it is committed to full SPC although the type is not yet known.
- Televerket do not propose to upgrade older electromechanical systems. ANA 30 is really not compatible with AGF and the economics are not there. AGF is best replaced directly by AXE. ANA 30 is not the right choice for A204 crossbar equipment.
- Originally ANA 30 was conceived as a replacement for EM registers of the ARF crossbar system. The levels 2 to 4 came as a later development.
- OMPOS 2 came quite a bit later and the additional cost was less than 10%. The additional cost is probably justified in the light of the additional features.
- The software cost of the ANA 30 equipment represents more than 50% of the total cost.
- Software is rather primitive by modern standards and the operator must rely heavily on the information provided in the maintenance manuals. There are errors but these are getting fewer.
- Better software could have been developed but there are reasons why this was not done:

- (i) The technology used is old, and memory costs are significant. Better software would mean higher memory costs.
 - (ii) Software development costs are very high indeed. One has to tailor software development for the size of the market envisaged. LME believe that the right balance has been achieved. Anyhow, most markets will switch over to AXE and it has first rate software.
- Ergonomically, ANA 30 design is short of perfection, for example, the problems we had with power supplies and fuses need not have occurred. The particular disposition of boards and cross-coupling the buffer boards in MUX equipment was not mandatory. The equipment could be redesigned but economics don't justify.
 - With a typical exchange, in case of an accidental shut-down (assuming average skills), it might take up to 30 minutes to restore the service if the system is to be loaded from tape. If, however, the program resides in a PROM, then service can be restored in five minutes.
 - Paper tape loading is a function of the vintage of the equipment. Magnetic tape loading - which is more satisfactory - could be arranged. This is not, at present, available in Australia.
 - Completely software strapping of PBX facilities is not possible with the present equipment (C-wire jumper must be provided). To overcome this problem, expensive modifications would need to be executed.
 - One would expect labour saving in going to levels 3 and 4, but the savings themselves are not very great. Principal labour savings result from changes in practices and from centralised operation. It should not normally be necessary to man the exchanges permanently. After all, most exchanges in Australia are unstaffed after hours with no disastrous effects.

My understanding is that ARE equipment will be produced in Australia and Telecom is committed to its introduction as part of a long-term network modernisation plan. The rate of introduction of AXE equipment could be limited by human factors and capital availability. The equipment will have to be produced in Australia, and this will take some time to accomplish.

- LME, in addition to work done in Ellemtel, carry out their own programme of development and innovation. Some 600 people are involved with product oriented innovations. This is concerned, among others, with:

- (i) Wholly digital systems/network
- (ii) Large exchanges of 40,000 lines
- (iii) PCM
- (iv) Man-machine language development
- (v) System security
- (vi) New Input/Output devices

Arhus Regional Area & HQs.

People met: Mr M. Schoeney, General Manager
 Mr G. Petersen, Inspector, Exchange Division
 Mr E. Rishoej, Inspector (in charge of software)
 Mr Chr. Neergaasol - Petersen, Sectional Engineer,
 Switching Dept.

(a) General

Denmark population : 5 M
 No. of subscribers : 2 M
 Jutland population : 2 M
 No. of subscribers : 800,000
 Arhus population : 200,000 (2nd largest in Denmark)
 No. of subscribers : 90,000

- Growth rate is about 8%.
- Jutland is divided into six Regions (04 to 09), see Fig.1.
- The switching equipment is all X-bar, mainly ARF100, since 1963.
- ANA 30 equipment has been installed in the Arhus Region (with the exception of the Lemvig Exchange).
- Arhus Region 120,000 subscribers, 13 Exchanges. ANA 30 equipment was first brought in in 1975.

(b) Operation

- The maintenance organisation is shown schematically in Fig.2. Under the telephone master (Petersen) there are five chief mechanics each, together with three (could be less) mechanics, and a clerical assistant, are as a group responsible for a group of exchanges (Fig.3). The organisation is flexible and is left to the decision of the people in the region how they wish to run it.
- With the exception of two of the exchanges, all exchanges are unmanned. Usually one exchange is nominated as the head exchange where the alarms are brought in and the Centrum exchange is the control exchange for the area, equipped with alarms, teleprinters, VDUs and other data processing facilities. This exchange also provides expert advice on ARE 11 software, carries a stock of PCB and has one mechanic who, in his spare time, burns* PROMS and repairs the PCBs as necessary.

* ProLog PROM burner

The total staff of the central exchange is two clerical assistants, two clerks and seven mechanics who also are responsible for maintenance of the 29,000 line exchange and for data collection.

- . First stage REG-L
- . Second stage REG-1
- . Third stage direct control of 1 GV

(c) Characteristics

- The introduction of equipment necessitated extensive modification of ARF 100 system.
- In the beginning they had some problems with the adjustment of the ARF system to work with the precise time sequence of the ANA 30 equipment.
- At cutover they have encountered a variety of problems, but there were no adverse reports from subscribers.
- In the beginning there were some outages, but not now.
- Fault statistics are good (Figs.4, 5 and 6). In particular, the fault rate in the period 1975-1979, has improved by a factor of two (Fig.5). This is thought to be, in part, due to better performance of the ANA 30 equipment compared with that of the old registers and, in part, due to better diagnostics and maintenance procedures.
- The effect of ANA 30 equipment on maintenance can be summarised as follows:

- | | | |
|------|--------------------------------------|-------------|
| (i) | Before introduction of ANA 30 equip. | 0.33 mh/sub |
| (ii) | With ANA 30 in 1979 | 0.28 mh/sub |

The above figures do not include MDF and associated cable work. This is done by a separate team of (lower grade) mechanics.

- In all, there are 800,000 subscribers, 4,000 employees, of whom 250 are engaged in maintenance (some are non-mechanics).
- Subscriber category changes, temp. disconnections, etc., are carried out by a (girl) clerical assistant in the central office. It is believed that, in this way, the number of errors encountered is minimised. No technical training to operate the VDUs is necessary.

- Access barring is controlled by the subscriber.
- There is no PBX software control.

(d) Training

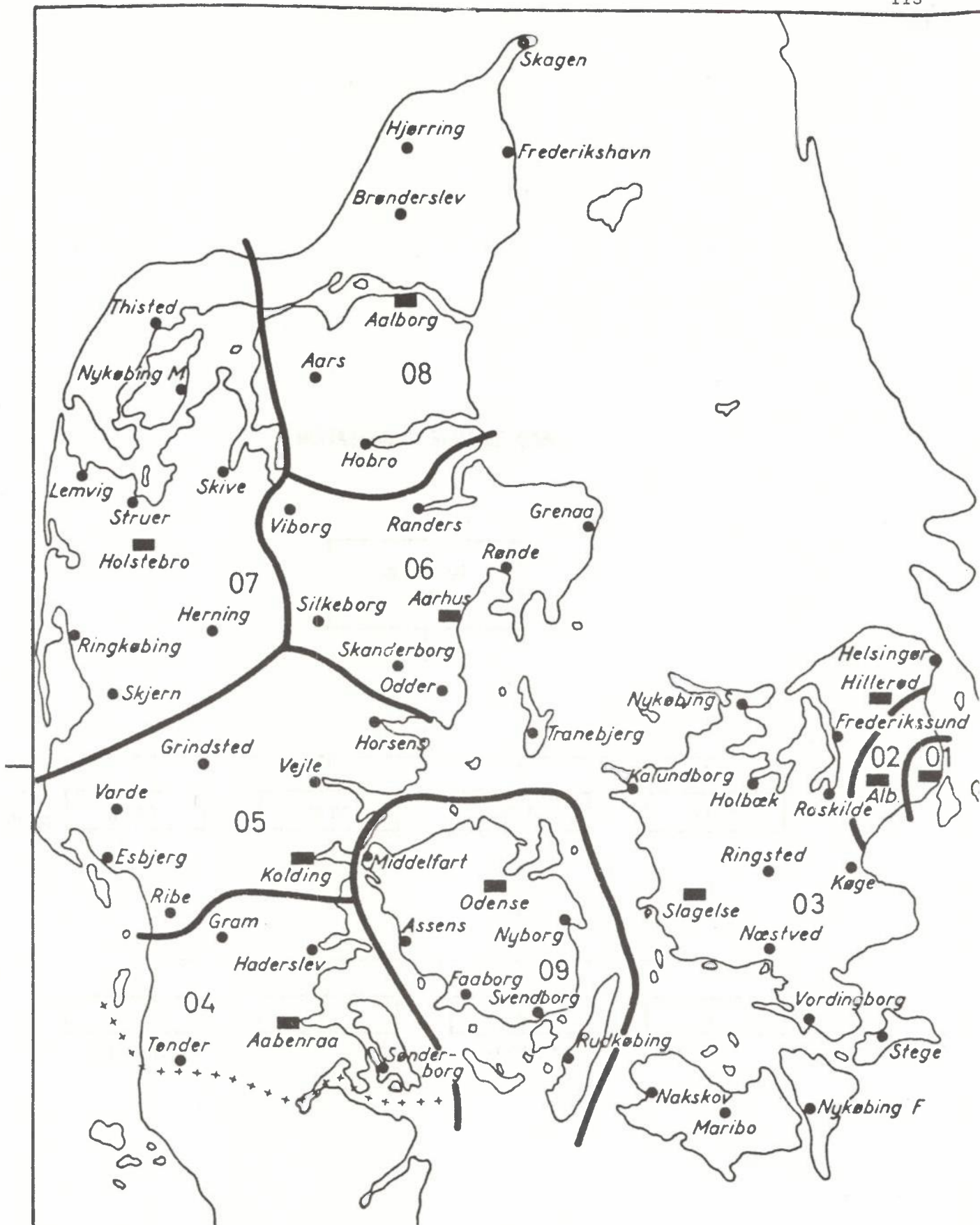
- All mechanics were offered ANA 30 training. Most accepted the company's offer. The company maintains that this step is worthwhile in that it helps retain good relations between the company and staff and, also, that it is a significant factor in job satisfaction.
- Some engineers act as lecturers in the training courses (it is good for them and for the staff).
- A complete course contains 140 hrs instruction, with a substantial component spent in "hands on" training at one of the exchanges, just before cutover. This is similar to the practice in Telecom.
- For the whole of the Arhus district 19 mechanics have been trained.

(e) Miscellaneous Comments and Observations

- There are no spare PCBs in exchanges. A central stock is kept in Arhus.
- There are facilities for centralised data storage, monitoring and supervision.
- Their concept of group work is similar to Telecom's EMA but is more flexible, in that it permits, among others, larger unit operation. But there is no centralised control of operations from an outside centre.
- No exchanges are staffed after hours (outside 7 am to 4 pm Monday to Friday).
- An operator has a list of qualified mechanics available on call in case of an alarm. This happens only occasionally.
- During daytime operation, on the whole, the various groups manage their own operation but movement of every man is monitored on a board in the central exchange. As the need arises, the central exchange may re-direct a mechanic to an exchange in case of an urgent alarm. Unions do not object to this practice and they see advantage in it.
- Normally staff only carry out corrective maintenance. There is a separate team (of two mechanics) who, in a cycle of four years, visit all exchanges to carry out adjustments on switches.
- HQs do not control in detail the operation of districts. They provide guidelines and control the budget.

This is an important factor in job satisfaction in that it satisfies the need for decentralisation and gives districts and groups a degree of responsibility and accountability.

- JT Maintains that because of the centralised information and decentralised operation the service to customer is improved.
- JT Does not believe in the value of Service Assessment (was used in the 50s). They use:
 - (i) Extensive TRT tests which are carried out in the busy hour for two hours (9-11 am) under laid-down conditions.
 - (ii) Fault statistics.
 - (iii) Subscriber complaints.
 - (iv) Visits to subscribers to obtain verbal feedback.
- The company continues to have problems with mechanics wishing to continue to do "KAN strapping in software".
- This and other work problems eg., how many OMC, which facilities, etc. will be discussed by a working group.
- JT Has no plans to introduce further ANA 30 equipment into their network. They consider it more economical to go over to digital such as AXE which will be introduced in the early 1980s.



Telephone map of Denmark (1975)

- Border of interurban area
- Interurban transit exchange (automatic)
- Interurban exchange (automatic)

MAINTENANCE ORGANISATION

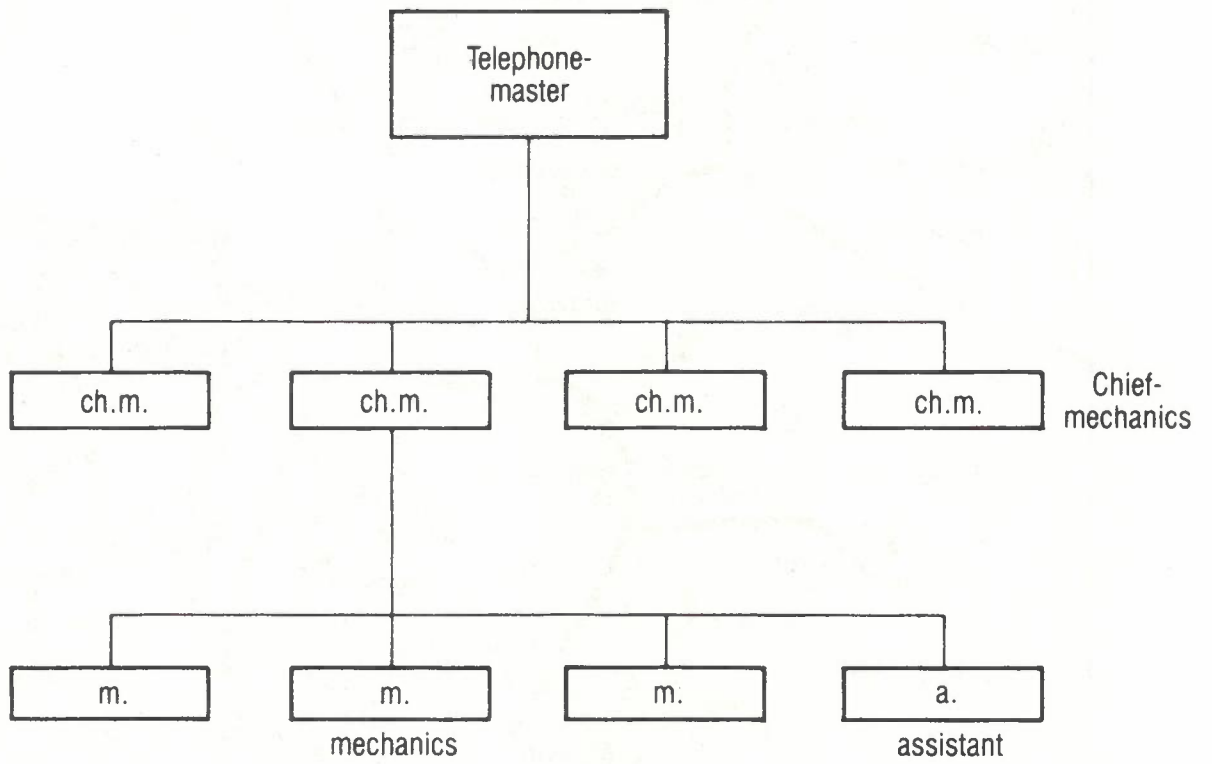


Fig. 2

9-4-80

Århus Lokalområde
total 126 000 subscribers

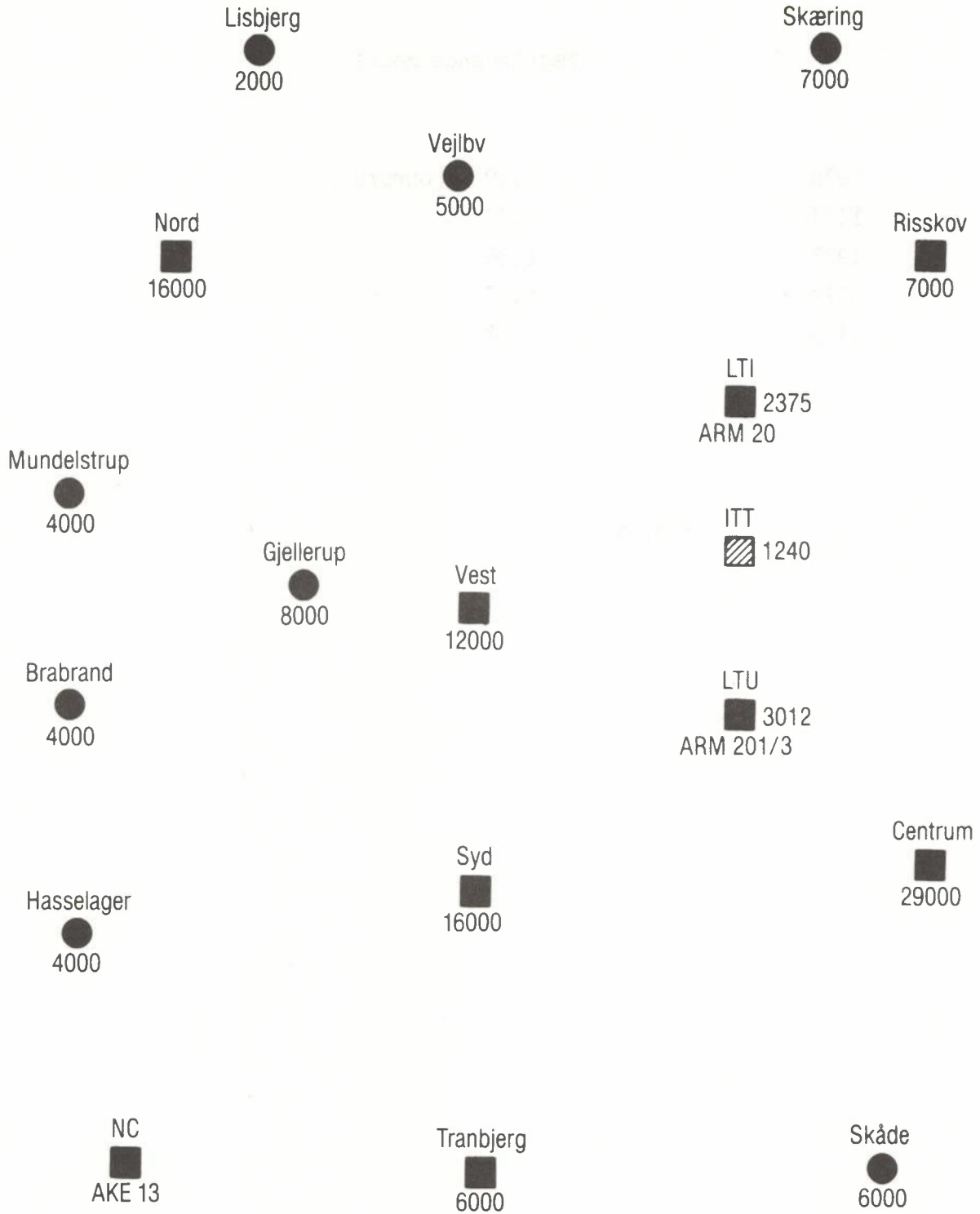


Fig. 3

ARF 100 (ANA-30)

Maintenance Hours

1975	0,30	hours/sub
1976	0,33	"
1977	0,30	"
1978	0,27	"
1979	0,28	"

Fig. 4

ARF 100 (ANA-30)

		Faults/100 lines installed
1975	2,8	" " "
1976	2,3	" " "
1977	2,1	" " "
1978	1,9	" " "
1979	1,4	" " "

Fig. 5

1979 (one year)

Printboards ANA-30

40 000 printboards total installed

80 printboards repaired

i.e. 1 fault per 500 years per printboard

Fig. 6

People met: Mr L.B. Van der Lem
Mr R. Rijschdorp
Mr D.L.J. Van der Elst
Mr J.A. Hamers
Mr A. Willemse
Mr A. Both

(a) Relevant Technical Articles

- (i) J.A. Hamers, Some Aspects of the Introduction of Controlled Corrective Maintenance, PTT Bedrijf Vol. XXI, No.4, Dec. 1979, pp. 222-227.
- (ii) R.A. Beukers & J. Van Wingerden, Application of Traffic Route Tester TRT m70 in the Netherlands, *ibid*, pp. 232-239.
- (iii) L.B. Van der Lem, Development of Remote Management of SPC exchange in the Netherlands, *ibid*, pp. 240-245.
- (iv) J.J. Van der Wilt, The Supervision and Management Systems PMT-100 and PMT-200, *ibid*, pp. 246-252.

(b) General

- Netherlands is divided into 13 administrative districts, each one sub-divided into sectors (refer to Figs. 5 & 6).
- The dominant switching equipment in Rotterdam is L.M. Ericsson X-bar, some remaining AGF bi-motional selector. That in Utrecht and other districts is made up of rotary selectors (mainly Bell 7E, 8000 system or Philips UR).
- A typical district might have of the order of 100,000 lines and up to 20 exchanges but could be up to 500,000 lines and 100 SPC exchanges.
- Planning for centralised maintenance started over ten years ago.
- The first SPC exchange, installed in 1971, was a trunk exchange: AKE/3.
- The first local SPC exchange was installed in 1974 (Philips PRX 205).
- Netherlands PTT is committed to Program controlled Management (PMT). The trial system is the PMT-100. The newer version is the PMT-200 (both described in literature).

- The PRX or AXE equipment* will replace all the remaining em equipment: A substantial proportion by 1985 and all by 2010. ARE 11 might be considered for some districts.
- At present, PMT is limited in its capabilities (software needs to be developed and also PMT cannot work effectively with some of the old em equipments.
- Cost estimates indicate that PRX is superior by a substantial factor when compared with older systems such as UR. This applies to capital as well as to maintenance costs.
- Manhours: 7E rotary - 1.4 mh/EC/yr
UR - 0.6 mh/EC/yr

(c) Organisation: SPC & PMT (Utrecht)

- The envisaged control in Utrecht district is shown schematically in Fig.1.
- Operation Maintenance Centre (OMC) under the PMT-200 implies full remote surveillance and network control. The computer used is PDP-11 using system RSX-11D, at this stage with no high-level language (Fortran is not suitable). In due course they hope to have a suitable language.
- The estimated maintenance effort using PRX equipment is eight to ten men/100,000 EC, excluding MDF Work and cleaning.
- Some argue that new machines with more sophisticated software will not need "superior maintenance staff", but in 1974 with less "intelligent" machines, higher level staff were needed and there were some industrial problems.
- The move to centralised operation is welcomed by most. It is envisaged that, later on, it will be possible to decentralise responsibility to districts. (DTM type Districts).
- Each OMC has a special group responsible for maintenance of SPC equipment in the district (some similarity to EMC).
- At the moment, the central computer is limited in what it can do because of non-availability of software.

*Rotterdam and Southern District use LME equipment, the rest PRX.

- Digital operation with PRX might present some problems (PRX is analogue). AXE is superior in this and other respects. PRX will provide the customers with marginally better service than at present. Line monitoring function included in AXE is not with PRX but a separate external system is being developed by the Netherlands PTT.
- Some data on Utrecht district:
 - . The longest travelling distance across Utrecht district is 100 km.
 - . Population 1.4M
 - . There are in excess of 500,000 subs:
 - 200,000 in PRX (employing 22 people on switching maintenance and five on training) and 300,000 in UR and Siemens F system.
 - . In total there are 2,200 people employed, 20 of them engineers.
 - . Afterhours, the alarms are extended to an operator who, as needed, will contact a technician on duty. He, in turn, has at home a portable terminal.
 - . The OMC is located in Utrecht North.
 - . The PRX program has been delayed in order to match manpower planning limits - high percentage of relatively young staff with low wastage through retirement.

(d) Miscellaneous

- The principle seems to be that management has the capability to produce plans for the future. This they do.
- The plans are then sent to groups for discussions.
- The management and unions encourage consultative discussions on experimental and trial systems.
- Rate of conversion to SPC is to some extent limited by the effects it has on people.
- The average effort for jumpering on MDF is one man for 12000 EC for old technology, and one man for 15000 EC for SPC. In the latter case, software changes imply additional small effort.
- PCB repairs are done by Philips Co. Unions are happy with the arrangements (the same union may exist in Philips).

- Tariffs have recently been reduced in the Netherlands reflecting lower costs - from 16c per pulse to 14c per pulse.

(e) Rotterdam Area

- There are 3000 people employed, serving a district of 625,000 subscribers divided into six sectors. The total number of people employed on all classes of switching maintenance ie., including "quality" department, circuit specialist, power plant people, cleaning, meter photographing is 250.
- The organisation of work and staffing has been agreed with the unions in a series of discussions (in operation since 1977).
- The detailed distribution of work within the group is entirely the decision of the group members.
- In Rotterdam, the MDF jumpering is done by the technicians (cat.A), elsewhere it is the responsibility of Outside Plant.
- Each district has its own quality centre unit which co-operates directly with HQs (Mr Hamers has 170 people employed in HQs Central Quality Control Department).
- Traffic observation in Rotterdam amounts to 5,000 calls per year, about 50,000 for the whole country. This is used not as an assessment of quality of service, but as a way to study the behaviour of subscribers.
- Sophisticated TRT runs programme leads to a reliable assessment of quality of service. These results provide information on (see article by Beukers and van Wingerden):
 - . Project quality
 - . Design faults
 - . Technical quality.
- It is claimed that, in this way (also using results of Automatic Fault Detection and assessment of other indicators), the management can accurately assess the quality of service. Exchanges can then be graded according to the quality of service provided. But it is not possible to grade the quality of maintenance, nor could one conclude whether the maintenance staff are lazy or work hard.

- Customer complaints are of limited value, since they mostly relate to subscriber equipment and lines.
- The district employs a team to carry out periodic maintenance on AGF and other equipment.
- With few exceptions, staff are not employed after hours. The alarms are transferred to the International Operator who, in turn, calls, should the need arise, a technician on duty.
- On Job Satisfaction, it has been said that group operation is preferred because:
 - . It gives opportunity for variety of work.
 - . There is less preventive maintenance and staff spend more time on fault tracing, which is more interesting.
 - . It gives to the group members a feeling of total responsibility for the district and feeling of doing good work for customers in the district.
 - . After a time, the feeling of being "king of a small empire" is no longer important in that the group members define for themselves higher goals.
 - . After the initial period, most people like it but, in some other districts, there have been complaints relating to "too much to do" and "exploitation". This district is however a "happy one" and the technicians are ready to tell when they have too much to do or not enough to do.
- The quality of ARF equipment is said to be very good. The few faults which occur relate to register malfunctioning. This problem will be circumvented by ANA 30 equipment.
- The manpower requirement for ARF maintenance can be worked out from the table shown in Fig. 4. This works out to about 0.2 man/1,000 EC. This seems to be lower by a factor of 2.5 than in Telecom. AXE equipment will make only a small difference in this respect, at least initially.
- First AXE equipment in Rotterdam is to be cutover in July 1980. In view of the higher quality of ARF equipment, there is still uncertainty about the optimum time at which ARF should be replaced by AXE.

There are also some objections from technicians (maintenance less interesting). Business offices will enable and disable subscribers - this has been another cause of disagreement with technical staff. Present HQs policy is: no more ARF equipment after 1981, only AXE. It is proposed to offer training to all capable technicians. Retention of expertise might be a problem.

- The choice of the central computer is still in doubt. It could be PDP 11/40.
- Some reduction in staff numbers in the Rotterdam area is a possibility. This might be, in part, due to introduction of AXE equipment and a new type of MDF.
- On the whole, it is true that the technician who attends courses and passes examinations is likely to proceed faster through the grades than one that does not get involved with new technology.
- There are 25,000 staff employed in the Netherlands PTT (this should be increased to 33,000 to equate with work functions undertaken by Telecom in Australia) serving 5M subscribers. This figure is 87,000 in Telecom, a factor of 2.6 up on Netherlands.
- Consultative meetings are held at district and other levels.
- It was admitted that PTT has problems with trying to educate its managers.
- Notes on City Exchange:
 - . Three Exchanges in one, 54,500 EC plus 1840 transit connections and including two "Centrex" type PABXs, 27 people employed.
 - . Half of the equipment is AGF the rest ARF m=8 X-bar.
 - . The maintenance chief (A. Both) manages in consultation with the chiefs as indicated in Fig.2. He is also a part time Union chief (in part paid by the government).
 - . The favoured operation organisation is one that embodies shared responsibility.
 - . Responsibility is encouraged to lowest technical category who are required to know two or three systems.

- . Supervisors are responsible for instructing staff.
- . Very few professional engineers for the number of lines connected.
- . There has been an agreement on 2% productivity increase. This has not materialised this year.
- . There is an agreement on the principle that it is beneficial to the employees to be moved around (at say five yearly intervals, if possible).
- . Personal knowledge and understanding of staff is regarded as the biggest factor in management, apart from motivation.
- . It remains union policy that "everybody is equal" in the sense that "it is not his fault* that he is not as efficient as others" and therefore must be paid the same. If things don't turn out right "blame heavens!"
- . Some say that subscribers are getting better service than they did 8 to 9 years ago. Others do not agree.

*He is the product of the society.

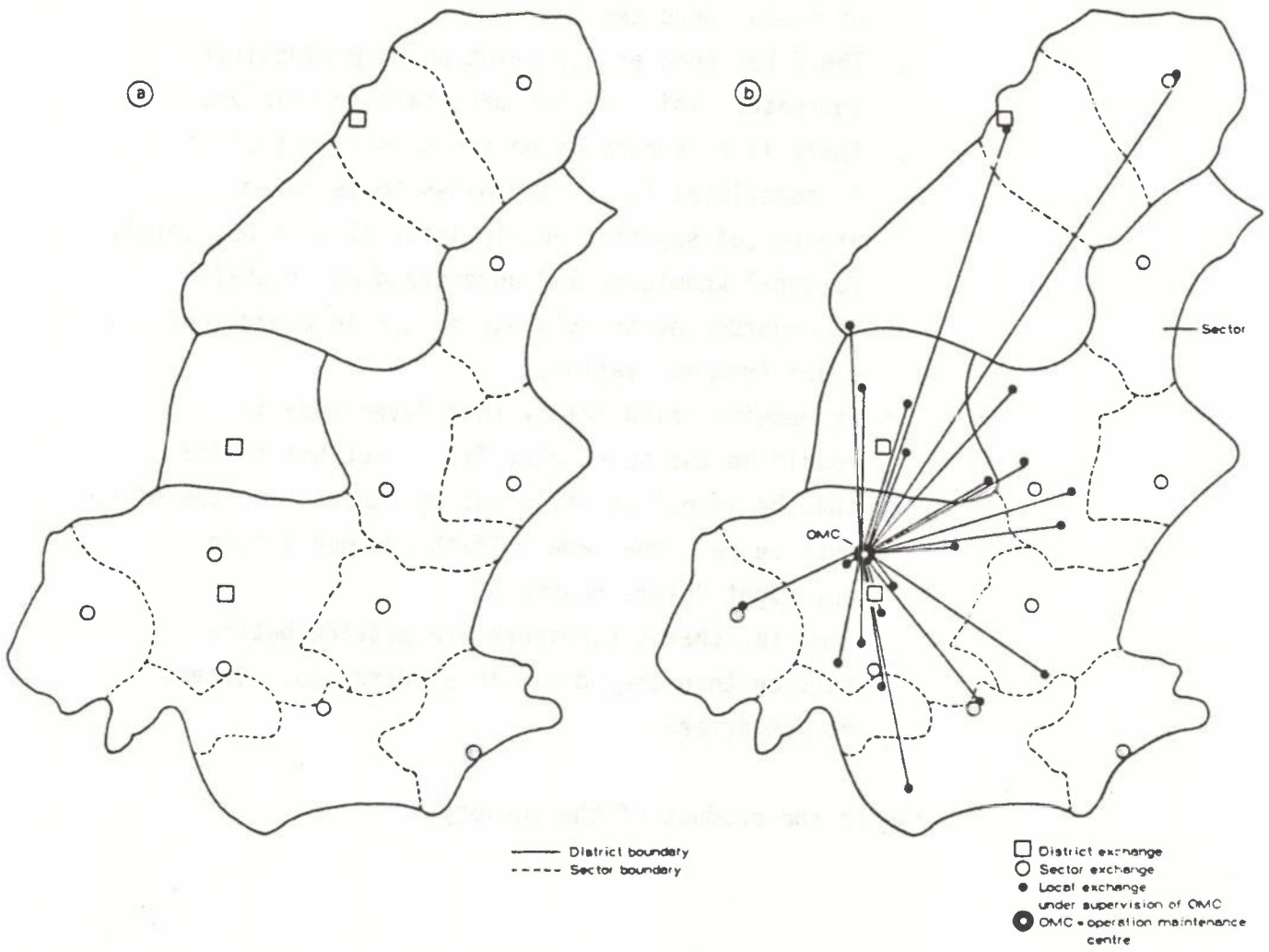


Fig.1

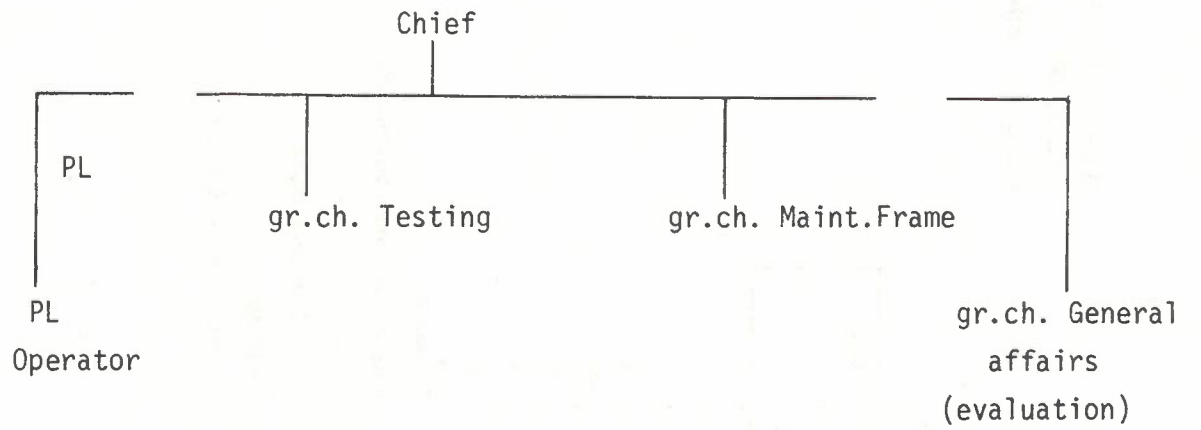


Fig.2

organisation of a maintenance area (MA)
with 80.000 - 100.000 numbers and
a transit exchange (\approx 1000 lines)

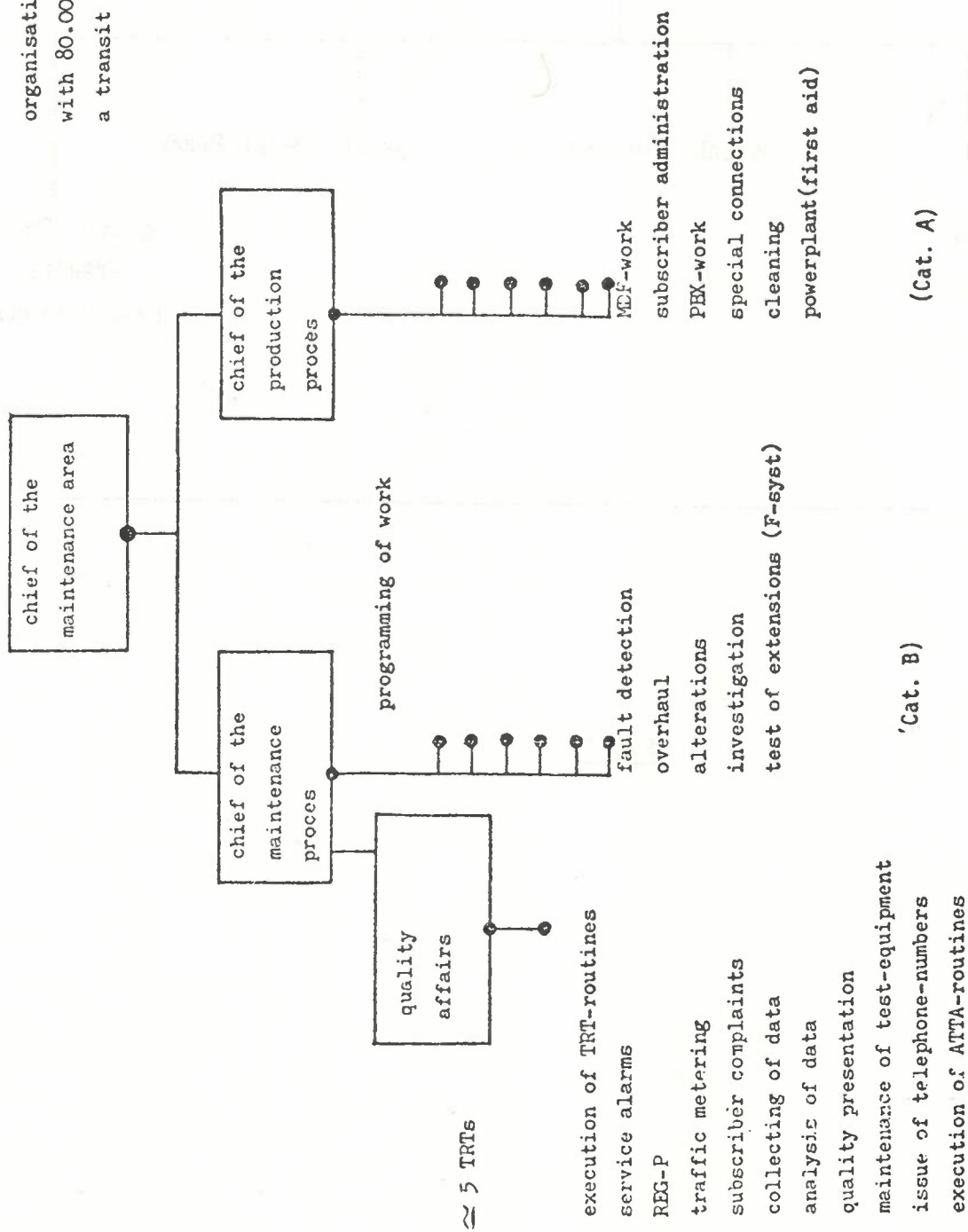


Fig.3

City of Rotterdam MA = 80-100K

(Cat. B)

(Cat. A)

SURVEY OF THE MAINTENANCE AREAS 01-01-1980 DISTRICT OF ROTTERDAM

maintenance area	Capacity of number-exchanges				capacity of transit-exchanges (incl.)				number of personnel				
	AGF	ARF101	ARR	F-system	in total	ARM 10	ARM 20	AKE	ARF 101	ARF 102	cat A	cat B	total
Centrum	28.500	26.000			54.500			1.840			9	18	27
Lombardijen		58.000			58.000						3	4	7
Noord	10.000	80.000			90.000						4	13	17
Spanse Polder	17.000	49.000			66.000			1.360			6	12	18
Vlaardingen		60.000			60.000						3	5	8
Zuid		80.000			80.000			1.600			5	10	15
Dordrecht		85.600		1.300	86.900			2.400		1.280	3	13	16
Gouda		70.000		9.000	79.000		1.600				2	13	15
Middelharnis/ Oud Beijerland		25.400	9.100		34.500		1.200				1	5	6
Sliedrecht/ Gorinchem		36.400	6.800	6.500	49.700		1.800				2	10	12
Spijkenisse/ District-ex 1		42.400	2.400		44.800		2.200				2	7	9
District-ex 2 (including itn 1)					12.800			7.200		2.700	12	26	38
itnex				2.000							3	7	10
	55.000	612.800	18.300	16.800	703.400	12.800	8.800	9.600	4.800	3.980			
*including 2 CABXs											1	3	4
											1	4	5
											5	4	9
											10	2	12
											76	174	250
											in total		

Fig. 4

Organisation of the Netherlands
Postal and Telecommunications Services (PTT)

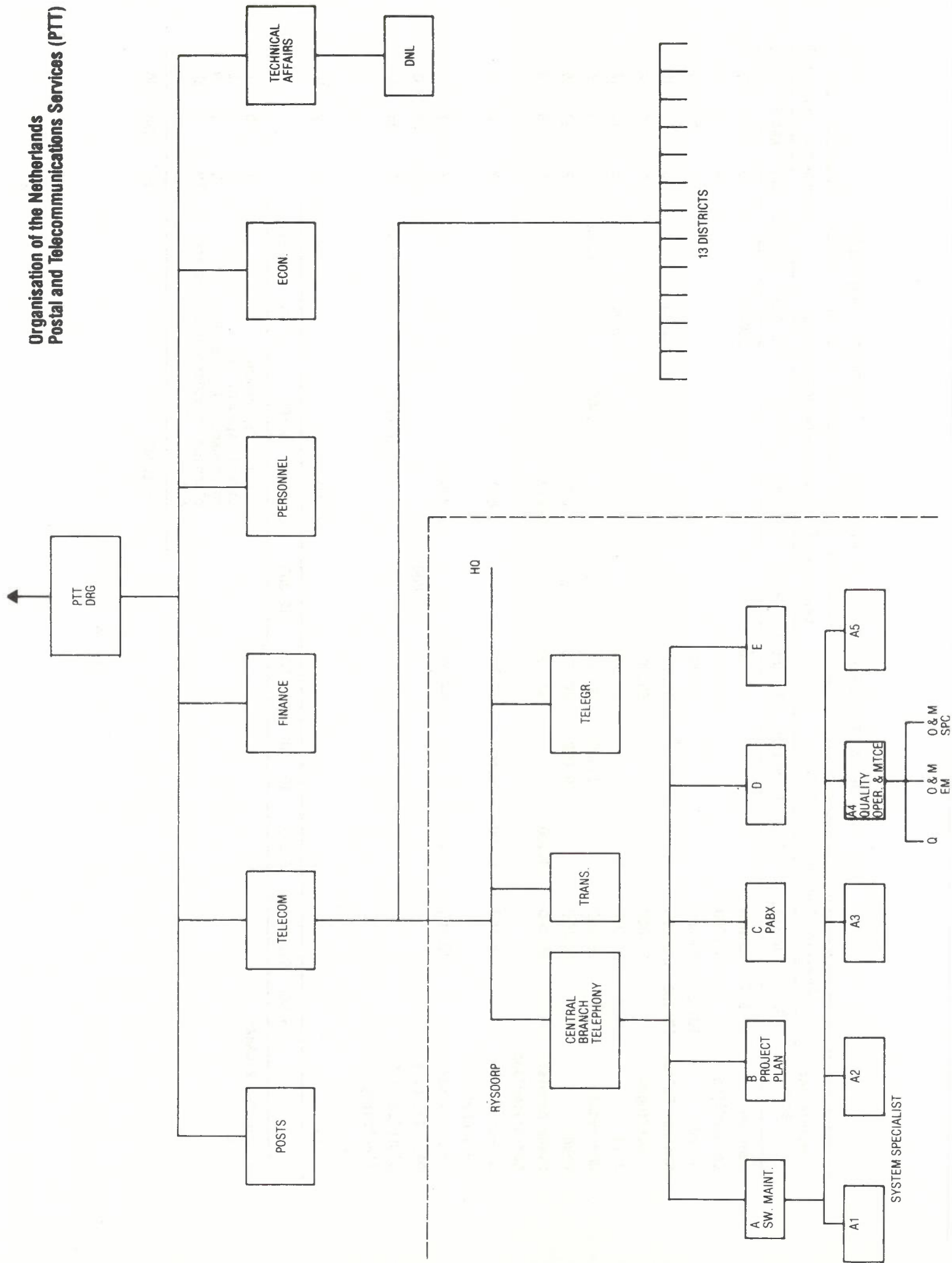
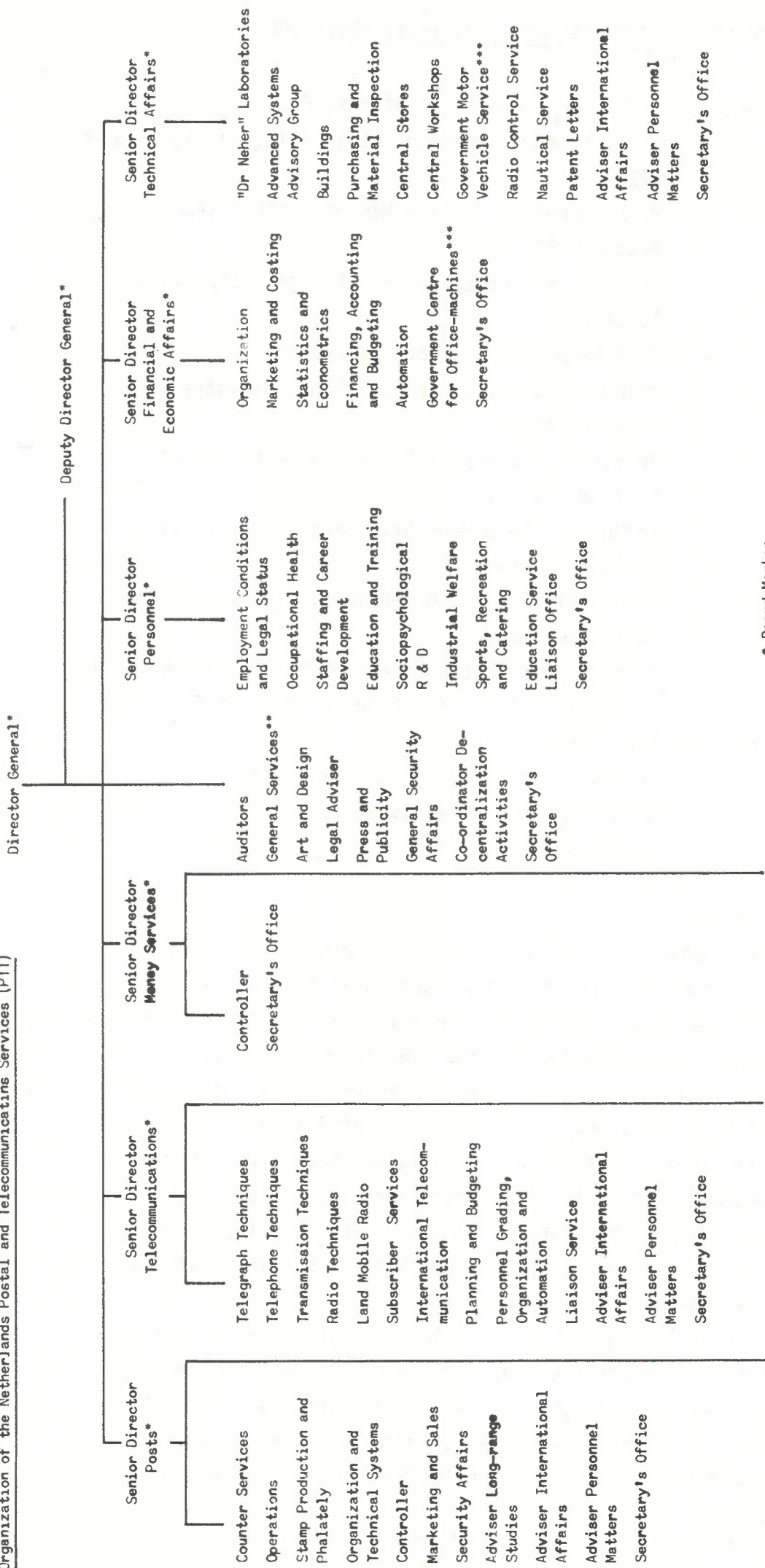


Fig. 5

Organization of the Netherlands Postal and Telecommunications Services (PTT)



* Board Member

** Under the General Services come units providing services to:
 - Headquarters only, viz Internal Services; Personnel Matters; Security Affairs; Typing Pools and Reprography;
 - the undertaking as a whole, viz Archives; Foreign Languages; Historiography; Library, Information and Documentation.

*** Activities also for other Government Services.

12 Postal Districts
 Long Lines and Radio Communications
 13 Telephone Districts
 Postal Giro Service (3 Giro Offices)
 Postal Savings Bank
 Radio and Television Licence Fees

People met: Mr R. Roga, Public Relations, FTZ
Mr G. Altehage, Head of Dept, Switching Techniques, FTZ
Mr K. Schultz, Section Manager, SPC Telephone Systems, FTZ
Mr Kratzen, Deputy Section Manager, SPC Telephone Systems
Mr Dahman, FTZ Software Laboratory
Mr Hoffman, Telephone Switching, Ministry of Posts & Telecom
Mr Vacear, Telephone Switching, Ministry of Posts & Telecom
Mr Muller, Telephone Switching, Ministry of Posts & Telecom
Mr Junker, Telephone Services, Ministry of Posts & Telecom
Mr Reinhart, Section Head in the Dir. of Dusseldorf
Mr Kolutowich, Engineer in the Dir. of Dusseldorf

Places visited: FTZ, Darmstadt
Computer control centre, Dusseldoft
District SPC centre, Dusseldorf
Ministry of DB

(a) General

DB is under the direct control of the Ministry. The telephone services are organised in 17 Regions each divided into a number of telecommunication office districts (about 100,000 subscribers). The Telecommunication Research and Technical Development Unit (FTZ) acts in an advisory capacity to the Ministry but has no direct control over operation. The regions have a considerable degree of operational autonomy deriving historically from the federal structure of Germany. The Ministry at Bonn has powerful planning responsibilities eg, in choice of new systems.

Most of the equipment is of the EMD type, requiring for its maintenance about 0.35 technicians per 1000 lines. This does not include MDF work. The EMD system is a high quality motor driven selector exchange - an example of an early version EMD is installed in Australia at Maribyrnong (Vic).

More recently, 10 or 11 Siemens EWS exchanges have been introduced in several districts but, by direction of Ministry, no further equipment will be ordered. However, the plans on digital have not been finalised (and will not be for some time) but the Ministry has decided that there should be field testing of digital exchanges from three sources, proposing eventually to choose one system for manufacture from two sources in Germany. The systems are understood to be Siemens EWSD, SEL system 12, and Philips PRX for TEKADE.

The EWS equipment is SPC analogue but with reed relay switching matrix. In a way it is similar to 10C exchanges and, in terms of the new facilities which it provides, it is about equivalent to ARE 11, Ompos 2, level 4. Remote operation of the exchanges is provided with a service computer system developed by FTZ which can service 300,000 lines of EWS equipment approximately.

District organization of the particular area in Dusseldorf, as far as internal plant is concerned, is shown in Fig.

1. There is a group responsible for EMD exchanges and another one for EWS exchanges. In addition this particular district has the responsibility for the service computer, BL group. The staff of the latter consists of 3 engineers and 3 technicians.

The computer centre uses duplicated processors and is capable of handling 300,000 subscribers. All other SPC exchanges will be connected to this until full capacity is reached. The computer hardware (processors and peripherals) cost DM 12M and software, which took 5 years to develop, cost DM 100M.

(b) Some Characteristics

- The local processor of the exchange has a 2Mbit solid state memory and the reloading time from tape is about half an hour. The next generation of processor might have a disc store in preference to magnetic tape. Development of EWS started in 1965, the first exchange was introduced in 1974. Further development of EWS analogue for DB use ceased on Ministry instructions in January 1979. The availability is 0.9999.

- Software was, and still is, the principal cause of faults, but the quality of software improves from month to month, in direct co-operation with the manufacturer (Siemens).
- The system is equipped with automatic testing routines (many of which are carried out at night). It has been stated that in principle one could grade with confidence the performance/ quality of the exchanges.
- It has been estimated that some 50% of faults are human induced.
- In most exchanges there is no permanent staff on site.
- Typically, a group of 15 people might service 10 to 30 em exchanges with 150K to 200K exchange connections. The EWS SPC exchanges use more people eg, 50K lines use 18 people (for 7 exchanges) 6 of them graduate engineers but this ratio would have improved if development of EWS had continued and with higher penetration of EWS. The group is autonomous and the duties are assigned usually on a weekly basis in consultation with "Einsatzleiter" and "Aufsicht" personnel (these are the two levels of OICs). Since 1974 the staff are not supposed to do any preventive maintenance, but old habits are difficult to break. There are three grades of technicians A,B and C.
- In the case of the particular group dealing with SPC exchanges (No. 7) the staff consists of 18 people: 6 engineers (lower grade), 10 technicians and 2 clerical. Except for the two clerical staff, all others had training in SPC technology (50 weeks for technicians and somewhat longer for engineers) but, after a few months, they all specialize to the extent that is desirable for the functioning of the group. The higher staff ratios for SPC than em is stated to be a learning phase problem -the fault rate is also significantly higher.
- There is no staff on after hours duty. The alarms are transferred to the operator who, in the case of an A1 alarm, would get in touch by phone with a technician on call, as appropriate.
- Enabling and disabling subscribers is done by technical staff at the service computer centre, at the present time.

(c) Operation

- There is a teleprinter in each exchange for communication with the local processor. But no access can be gained to the service computer via the local teleprinter. The local processor is in communication with the service computer within the rules of the protocol. Some processing of data is carried out in the service computer.
- The target of 15 faults/1000 lines for SPC exchanges has not yet been reached, the figure at the moment is 24 faults/1000 lines. This figure is expected to improve, as software improves.
- The EWS centre is equipped with teleprinters and VDUs. There are direct lines of communication with the exchanges in the area and the computer centre. A hard copy is available of all data changes for file.
- The Ministry produces a detailed book of rules, concerning maintenance of em exchanges, but the rules have not yet been finalised as regards EWS exchanges. The book of rules deals with all aspects of operation and staffing.
- FTZ acts as a body of consultants. Among others, FTZ is the body that approves software changes which are ordered from the manufacturers and checked before distribution to the districts. FTZ also acts as the national support centre. They are frequently consulted on software problems by the district groups which do so at their own discretion.
- On occasions, time and motion studies have been carried out and the results have been reported and discussed.
- The training of technicians is worked out in detail but there are no examinations (rule of Ministry).
- In June last, there were in total 20M exchange connections and 5M PABX connections serviced by 14,000 Switching and Maintenance technicians. The total Telecom staff for all functions is about 170,000.
- The testing programmes do not include tests of subscriber lines.

- The administration is emphatic that group operation is likely to lead to better quality of service and job satisfaction, because the group is well-motivated, autonomous, and accountable. Ultimately, when the staff get accustomed to the SPC technology, and when software problems get solved, the group operation will be shown to be more efficient.
- The geographical size of the area is limited so that service travel does not exceed 1 hour.
- Note that DSt-Leitung (equivalent to IPM) is staffed by an engineer (lower grade).
- When a new SPC exchange is due for installation, the administration asks for volunteers for SPC training. There is no shortage of volunteers, as such training offers increased chances of promotion.
- There is no management training within DB.
- The present plans have resulted from discussions taking into account some computer modelling results.
- There is one PBA repair centre within DB (in Nuremberg).
- The service computer could do much more than what it is doing now, but more software development would be needed and they have decided to draw the line here. For example there is no facility to input customers' requests at the city office. This is still done in the conventional way: the office writes a request and the appropriate district centre makes the necessary entry via the terminal.
- Information about faults is stored for one year in the form of paper printout only. There is no software to store it on magnetic tape.
- With the SPC equipment available the optimum size of the District centre would be 50 to 70,000 subscribers.
- If the technician called after hours cannot clear the A1 alarm he will get in touch with a colleague of his who has the required expertise - this is where the group is expected to take responsibility and be accountable. Serious after-hour faults are very rare indeed.

(e) Notes on the Exchange Visited (Grafenburg - Telecom Office No. 2)

- There are two exchanges in the same building:
 - EMD of 10,000 lines
 - and EWS of 6,200 lines

- The EWS equipment has been in operation since March 1979.
- At the beginning, the fault rate was 10-20 PCB boards per month. Now it is down to 3 PCB boards per month. The hardware faults have been mainly associated with relays in boards handling the incoming traffic. Siemens are making changes in the design.
- On average, there are twice as many software faults as there are hardware faults. These are referred to FTZ. These faults are getting fewer.
- Last down time was in last September ($\frac{1}{2}$ hour). The reloading of memory takes 20 minutes.

(f) Notes on Discussions at the Ministry

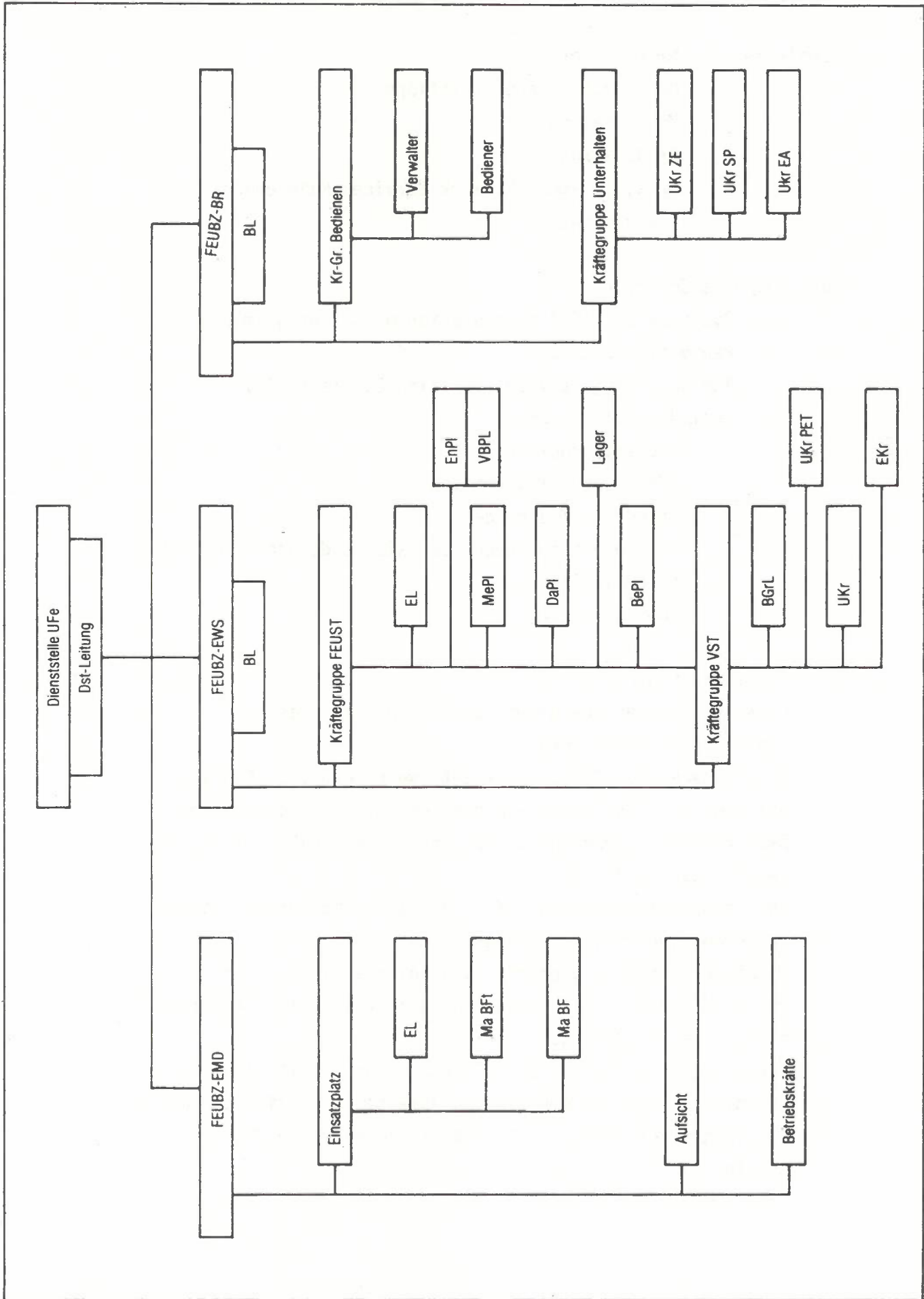
- The staff are represented on the top consultative body. The members are elected representatives. Some are union members, others are not.
- There is an executive which deals with union matters and prepares material for the plenary meeting.
- The plenary meeting is attended by full time and part time members.
Depending on the proposal the discussion can be:
 - (i) to inform
 - (ii) to hear opinion
 - (iii) with right of co-determination
- The matter can be referred to arbitration but this has never happened.
- The employees are public servants and must not strike.
- There are consultative committees in districts.
- This system has operated for 20 years.
- In 1975, it was decided to re-organise maintenance operation in autonomous groups (15 to 30 employees). The system was put on a trial basis and was accepted by management and the operations staff. Local councils have effected implementation which is not yet uniform.

- It is important to appreciate that, at the time, DB was in a high-growth phase and could easily adapt to the higher efficiency and still take on new staff. In addition, the promotion profile was improved*. The staff gained an advantage in pay and benefits of group operation and increased responsibility, autonomy and accountability.
- With new technology, there will eventually be fewer people needed to run the system, but, if the difference cannot be made up entirely by growth of the network, the intention is to put up for the time being with excess staff. It is more important to have the new technology.

(g) Personal Impressions

- It seems that every endeavour is made to encourage group operation.
- Members of the group are engineers (lower grade) and three levels of technicians.
- The trials have shown that groups are effective and the employees have adapted themselves successfully.
- It is important to appreciate the autonomous nature of the groups in most aspects.
- All technicians (above grade A) are fully trained.
- There have been many software problems and it has been necessary to have the National Support Centre closely involved with all software problems.
- It is likely that the Ministry will not allow the workforce to decrease in numbers in spite of modern technology.

*Under the old scheme there was one senior (OIC) position for 20 employees. With the new organisation there are three senior positions for 20 employees. See Fig. 1.



Gliederung der Dienststelle UFe (Endzustand)

Bild 7

Fig. 1

8.1.7 VISIT TO GTE, STAMFORD, CONNECTICUT, USA-21 APRIL 1980

People met: Mr H. Jones
Mr Gorecki, Labor relations
Mr N. Salmon
Mr J. Saxon
Mr W.E. James, Network Services Maintenance
Administrator

(a) Subjects Covered

- Overview of GTE & presentation of GTE programme & range of products.
- The Switching Service Operation Centre (SSOC) including aspect of:
 - . Job satisfaction
 - . Efficiency of operation
 - . Standard of service
 - . Maintenance of technical standards and retention of expertise
 - . Public interest

(b) Facts and Figures about GTE

Only key figures are given here. Other figures are available in literature.

As at the end of 1979, GTE assets were more than \$18.4 billion. In 1979, revenue and sales totalled to more than \$9.9 billion. Consolidated net income was \$645M. Telephone revenue was \$5.2 billion.

The corporation consists of 19 domestic and international telephone operating companies.

Domestic telephone operating subsidiaries serve over 15.1M telephones distributed in 31 states. Manufacturing plants are in 28 States.

GTE employes in total nearly one quarter million people, of which 99,450 are employed in domestic operating companies, the largest of which, in California, employs 25,800 people.

(c) The Concept of Centralised Control of the Network & Services

The operation of the network and services is controlled through a 3 level organisation

- (i) Dispatch and repair
- (ii) Switching Services Operation Centre (SSOC)
- (iii) Switching Services Support Centre (SSSC)

The concept behind SSOC is described in literature. The implementation started early in 1979.

SSOCs are located in suitable geographical positions and each one houses:

- (i) administration personnel
- (ii) maintenance crews and dispatch office

It is backed by equipment and data required for efficient monitoring and control of the company's network.

There are six discrete maintenance functions:

- (i) Fault identification
- (ii) Service protection
- (iii) Fault isolation
- (iv) Repair (remote via software, and/or physical by attendance at the exchange)
- (v) Verification, check on quality of service and recording of details of fault and its clearance
- (vi) Return of normal service

Physical repair is carried out by dispatching a technician to the site.

The full benefits of SSOC is only possible with SPC technology. The characteristic features are:

- (i) Better control over labour, and
- (ii) More efficient operation and management of the network.

The purpose of the SSSC is to support SSOC for functions such as:

- (i) Co-ordination of maintenance operations for the entire company
- (ii) To make available the fruits of the experiences gained in one SSOC to all SSOCs,
- (iii) Provide specialised expertise and advice. There is only one SSSC per operating company.

As of 28 March 1980 there were 65 SSOCs in operation distributed among the companies as indicated in Fig. 1.

(d) Some Comments Given in Response to Our Questions

- Centralization eliminates duplication of effort.
- The whole scheme was put into operation without consultation with the labour force.
- To increase efficiency crafts specialize.
- The management is still uneasy about security of software and data stored on magnetic tapes.
- SSOC is said to be working well in some areas (eg Florida) and not so well in others: it depends on the operating company.
- At Tampa (Fla) as lines increased from 111,000 to 123,000 in an SSOC area, staff declined from 34 to 22.
- On an average working day there is always someone working on the site.
- There are 3 levels of training and the training provided is for a particular job. There are separate teams for MDF and switches.
- The ratio of supervisory staff to crafts is somewhere between 1:12 to 1:15.
- On job satisfaction, it is said that personnel like SSOC on one account: minimal clerical work for staff. The principal grievance is that management is effectively doing work which previously was done by crafts.
- In GTE there have not normally been OICs in charge of individual exchanges. There used to be a position of 'charge hand' in the older types SXS exchange. This has been "negotiated out".
- With introduction of SPC and SSOC, the labour requirements are reduced. There has not been any real problems concerning lost jobs with the GTE companies in that the growth rate of 4.3% has been sufficient to cushion this effect. "Besides there are plenty of other jobs in the country".

- To ensure that SPC expertise is retained, a typical SSOC* will look after 13 or 16 sites.
- It is believed that the ultimate workable size of SSOC is largely a "function of attitude of mind".
- The management discusses the work problems with Unions first and then makes the new arrangements known through formal channels.
- The management makes it its duty to study efficiency of each of its craftsmen. This is not objected to by the Unions.
- Buzzword "the network".
- With improved software it is believed that ultimately all functions relating to fault clearance and system reconfiguration will be accomplished by remote commands. The only remaining task will be board changes.
- Customer data changes are implemented by a girl from a central office location.
- At present, to protect security, 3 copies of mag. tape are kept: one in central office, one in the exchange and one in company HQs.
- A PDP 11/30 computer is used for fault analysis.
- In comparison with the modern operations methods developed in GTE, the traditional fault analysis and clearance is regarded as inefficient.
- On Job Satisfaction, it was stated that their approach "creates a highly motivating environment". It was also admitted that this was their opinion: there has not been an attempt made at a quantitative assessment of job satisfaction.
- The quality of service to customers has increased. They have figures to support this statement, such as number of customer trouble reports.
- No measurements have been carried out concerning public interest. Only measurements of customer satisfaction.
- There is no service assessment, as this would be regarded by the public as an invasion of privacy.
- Operation practices differ somewhat from one operating company to another. In Illinois, for example, staff are not dispatched from SSOC.

*Typically an SSOC might be responsible for 300,000 lines of which 50% might be connected to em exchanges.

- On average there are 1,900 mh per employee per year.
- The average figures for exchange maintenance have been given as follows:
 - 0.95 mh/EC/year for em equipment
 - 0.34 mh/EC/year for electronic equipmentexcluding MDF work, but including carrier termination.
- Every craftsman employed on SPC equipment is trained, and must pass a test. On return from training he is observed and reported on by this supervisor. There are plenty of volunteers to attend training courses. A proportion of them drop out after the first 3 weeks of the logic course.
- At present there are no engineers employed in SSSC, but in the future they might have some (probably involved with software).
- Automated subscriber loop testing is carried out using their 4-Tel equipment.
- Other relevant statistics are reproduced in Figs. 4 to 13.

SSOC SURVEY
March 28, 1980

Total Number of SSOCs and the Number
of Offices Under Their Control

<u>Company</u>	<u>SSOCs</u>	<u>Offices</u>
California	25	184
Florida	5	32
Hawaii	1	3
Illinois		12
Indiana	3	73
Kentucky	1	10
Michigan	4	192
Midwest	1	21
Northwest	3	10
Ohio	8	264
Southeast	1	8
Southwest	5	428
Wisconsin	<u>4</u>	<u>194</u>
Total	65	1,361

Fig. 1



TOTAL TELEPHONE OPERATIONS

COMPARATIVE GENERAL STATISTICS

YEAR	EMPLOYEES	CUSTOMER LINES IN SERVICE		PROPERTY, PLANT AND EQUIPMENT		PER CUST LINE ADDED (IN DOLLARS)		AVERAGE TOTAL CAPITAL (\$000)	AVERAGE COMMON EQUITY (\$000)	LONG TERM DEBT		AVERAGE INTEREST COST AT YEAR END	GROSS REVENUES (\$000)
		INVESTMENT (\$000)	PER CUST LINE (IN DOLLARS)	EXPENDITURES (\$000)	PER CUST LINE ADDED (IN DOLLARS)	AMOUNT (\$000)	NEW ISSUES						
1976	23	24	25	26	27	28	29	30	31	32	33	34	1976
1977	94,306	8,056,408	11,607,350	1,320	1,186,982	4,082	8,507,718	3,096,896	4,364,625	9,60	7.19	1,176,215	1977
1978	96,158	9,286,004	12,757,012	1,383	1,350,261	3,654	8,956,171	3,282,263	4,274,972	9.22	7.32	1,298,066	1978
1979	100,799	9,641,085	13,907,320	1,443	1,551,197	3,737	9,487,646	3,501,666	4,402,213	8.77	7.37	1,442,294	1979
1980	108,810	10,018,344	15,290,786	1,226	1,924,108	5,127	10,082,314	3,758,112	4,585,226	9.10	7.55	1,645,181	1980
1981	115,257	10,461,217	17,075,308	1,632	2,322,763	5,245	11,004,008	4,097,228	4,922,376	10.85	7.84	1,815,239	1981

* EXCLUDES NON-TELEPHONE OPERATING COMPANIES

GENERAL STATISTICS
December 1979

SELECTED OPERATING STATISTICS BY COMPANY - DECEMBER 31, 1979

COMPANY	TELEPHONES IN SERVICE		EMPLOYEES		OPERATING REVENUES (\$000)		NET INCOME TO GTE (\$000)		PLANT ADDITIONS (\$000)		12 MONTHS TO DATE RETURN ON AVERAGE CAPITAL	
	DEC '79	OVER YEAR AGO	DEC '79	OVER YEAR AGO	1979	OVER YEAR AGO	1979	OVER YEAR AGO	1979	OVER YEAR AGO	TOTAL	COMMON EQUITY
ILLINOIS	901,689	32,018	4,413	111	\$ 239,202	\$ 21,581	\$ 36,979	\$ 3,674	\$ 77,189	\$ (3)	10.9%	15.8%
INDIANA	668,079	21,735	5,703	105	252,601	19,661	34,904	2,073	101,674	9,994	10.2	14.2
MICHIGAN	703,525	32,120	4,149	165	194,578	20,441	21,635	1,512	83,038	9,320	9.5	13.6
MIDWEST	387,876	16,489	1,985	73	88,180	12,262	9,670	1,395	41,890	2,543	9.8	13.6
OHIO	894,642	39,913	5,781	74	250,806	23,918	33,086	1,390	90,554	15,882	10.6	14.7
PENNSYLVANIA	622,004	19,082	3,522	(5)	152,389	14,666	16,350	1,069	60,819	10,209	9.6	13.0
WISCONSIN	505,756	22,890	2,467	176	136,423	13,468	16,582	1,763	60,251	18,432	9.7	13.2
TOTAL NORTH	4,883,526	184,247	28,102	702	1,313,187	124,997	189,308	12,876	515,415	86,387	-	-
FLORIDA	1,605,581	108,276	10,546	384	604,468	66,419	62,653	5,143	244,867	58,199	9.7	12.9
FLORIDA	911,745	22,102	2,988	288	119,565	14,188	13,873	1,660	70,367	22,369	9.7	13.2
SOUTHWEST	1,587,291	102,274	10,462	627	413,398	57,745	47,235	5,852	244,957	32,096	11.0	14.9
TOTAL SOUTH	4,544,124	283,474	29,686	1,798	1,409,248	173,929	159,679	16,059	677,954	141,983	-	-
ALASKA	11,366	660	54	5	4,432	252	704	33	1,971	764	16.7	21.0
CALIFORNIA	3,993,191	221,061	25,802	1,695	1,058,074	137,329	88,284	9,859	552,105	73,454	9.9	10.4
HAWAII	687,517	26,214	4,699	282	259,933	27,244	39,764	1,210	105,624	6,605	11.4	16.0
NORTHWEST	1,019,084	81,716	8,401	1,088	336,091	62,885	42,787	7,002	275,213	88,723	10.2	14.0
TOTAL WEST	5,711,158	329,651	38,956	3,070	1,658,530	227,670	171,039	18,178	934,913	169,546	-	-
TOTAL DOMESTIC	15,138,808	797,372	96,662	5,570	\$ 4,380,963	\$ 527,596	\$ 500,224	\$ 47,039	\$ 2,128,282	\$ 377,916	10.0%	13.3%
BRITCO	1,786,648	103,227	14,705	780	\$ 77,134	\$ 92,828	13,397	3,525	235,850	31,428	9.8*	13.8*
QUEBEC	285,337	11,483	2,209	10	86,513	12,558	3,038	319	30,707	(10,289)	10.9*	14.6*
CIA DOMINICANA	147,636	3,024	1,661	67	-	-	1,458	1,458	-	-	-	-
WEST INDIES	-	-	-	-	-	-	-	-	-	-	-	-
TOTAL TELCOS	17,338,429	915,106	115,257	6,447	\$ 5,044,610	\$ 632,982	\$ 18,106	\$ 7,338	\$ 2,394,839	\$ 389,055	9.7	12.9
DOM. DIR.	-	-	253	27	7,089	940	870	320	26	(7)	40.0	46.7
GEN. TEL.	-	-	3,792	357	159,479	28,455	24,948	5,905	6,470	3,662	30.6	34.0
SATELLITE	-	-	84	4	13,065	(344)	658	(344)	2,396	627	10.2	7.3
MISCELLANEOUS	-	-	(4,480)	-	(521)	(321)	(321)	(349)	-	-	-	-
TOTAL CONTINUING	17,338,429	915,106	119,386	6,835	\$ 5,214,764	\$ 682,526	\$ 544,261	\$ 7,870	\$ 2,403,731	\$ 403,337	9.9%	13.3%
SALE OF N. EAST	-	-	-	-	(41,997)	(5,314)	(5,314)	(5,314)	-	(9,253)	-	-
TOTAL	17,338,429	915,106	119,386	6,835	\$ 5,214,764	\$ 673,579	\$ 544,261	\$ 2,556	\$ 2,403,731	\$ 394,084	9.9%	13.3%

* RATES OF RETURN IN CANADIAN DOLLARS

ISSUED MONTHLY BY TELEPHONE OPERATIONS - BUDGET DEPARTMENT - 4/7/80

FIG. 2

IMPACT OF STORED PROGRAM CONTROL ON COE EMPL.

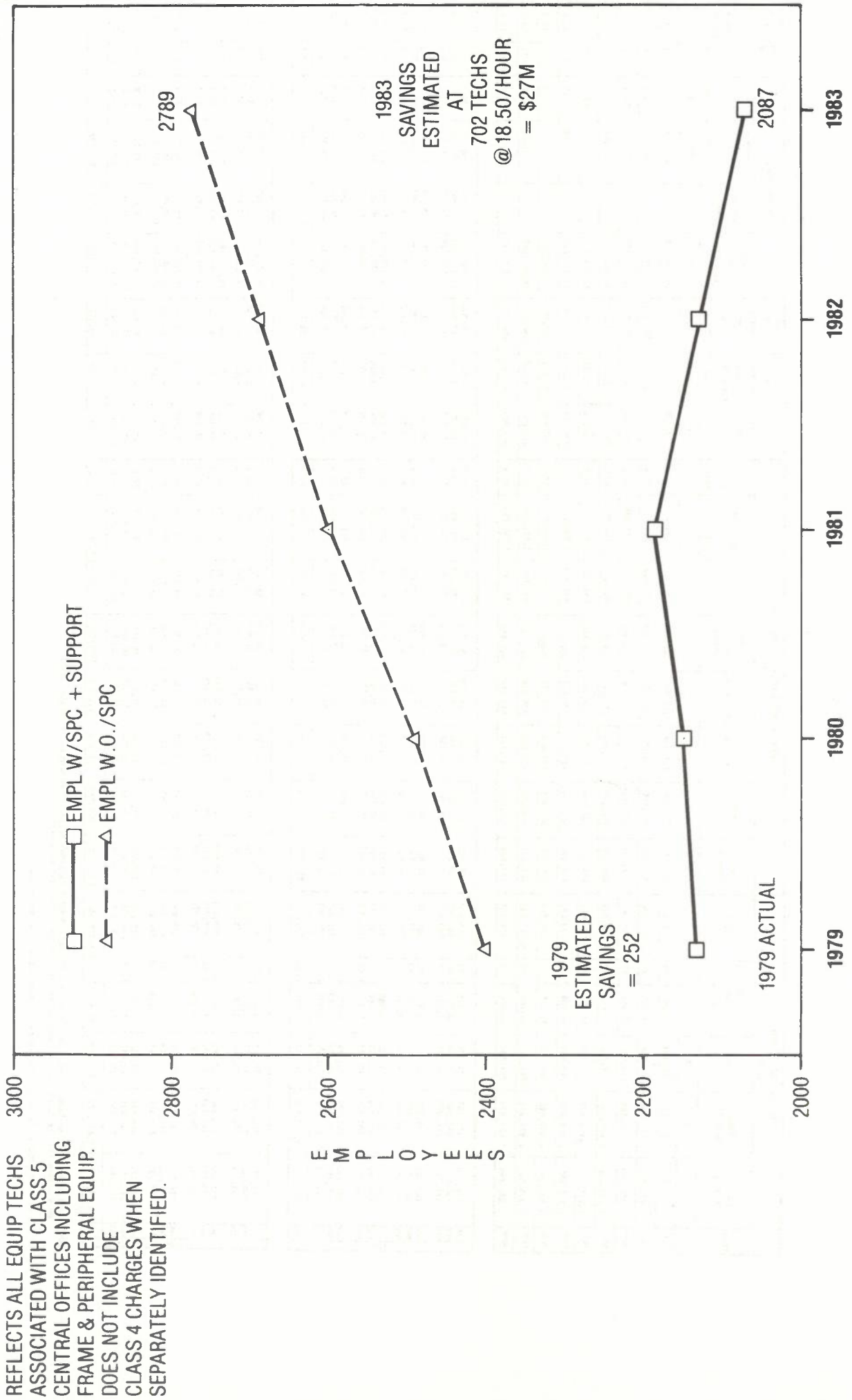
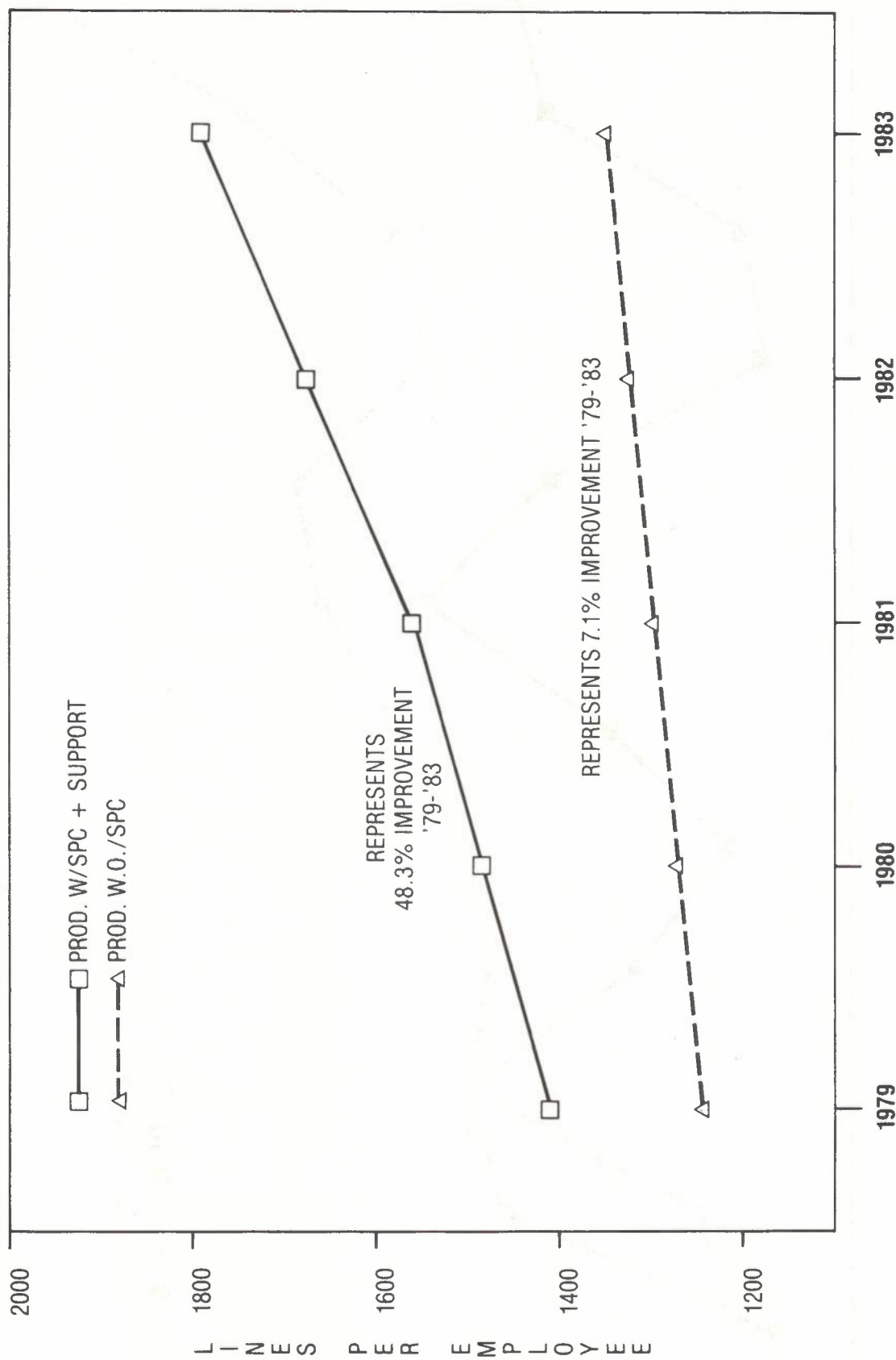


Fig. 4

IMPACT OF STORED PROGRAM CONTROL ON COE PRODUCTIVITY

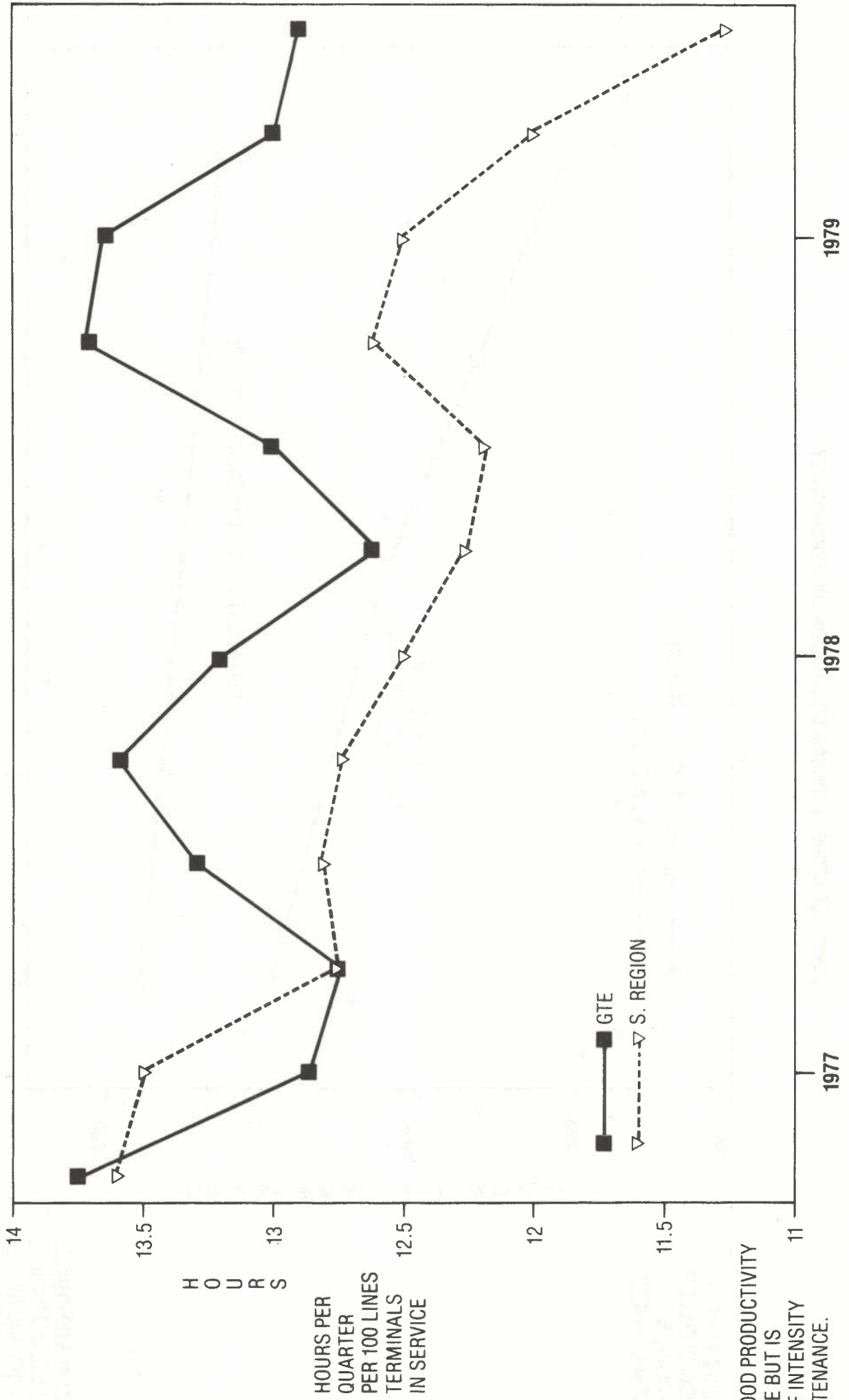


INCLUDES FRAME & ASSOCIATED EQUIP FOR CLASS 5 CENTRAL OFFICES

ASSUMES NO CHANGE IN LEVEL OF FRAME ACTIVITY AND NO IMPROVEMENT IN FRAME PRODUCTIVITY

Fig. 5

CENTRAL OFFICE REPAIR HOURS



HOURS PER QUARTER PER 100 LINES TERMINALS IN SERVICE

NOT A GOOD PRODUCTIVITY MEASURE BUT IS LEVEL OF INTENSITY OF MAINTENANCE.

Fig. 6

General Telephone Company of Illinois

(R20 C.O. Maintenance Hours Only)

<u>Office</u>	<u>Type</u>	<u>Number of Lines</u>	<u>Employees</u>	<u>Lines Per Employee</u>	<u>Hours Per Line Per Year</u>
Normal	SXS	11,000	5.0	2,200	.86
Normal	EAX	12,240	3.5	3,497	.54
Belvidere	SXS	8,900	6.0	1,483	1.28
Belvidere	No. 2 EAX	9,312	4.0	2,328	.81
Mahomet	SXS	2,500	.5	5,000	.38
Mahomet	No. 2 EAX	3,176	.5	6,352	.30
Chatham	SXS	2,600	1.0	2,600	.73
Chatham	No. 2 EAX	3,309	1.0	3,309	.57
Morton	SXS	6,600	3.5	1,885	1.00
Morton	No. 2 EAX	7,936	2.0	3,968	.47
Metropolis	SXS	4,500	1.5	3,000	.63
Metropolis	No. 2 EAX	5,088	1.5	3,392	.56
New Milford	SXS	4,800	3.0	1,600	1.18
New Milford	No. 2 EAX	5,856	3.0	1,952	.97

(1,900 Hours Per Year Per Employee)

Fig. 7

CENTRAL OFFICE MAINTENANCE HOUR COMPARISONS

(R20 - Central Office Maintenance Hours Only)

<u>Study</u>	<u>Electro-Mechanical</u>			<u>Electric</u>		
	<u>Lines</u>	<u>Employees</u>	<u>Hour Per Line Per Year*</u>	<u>Lines</u>	<u>Employees</u>	<u>Hour Per Line Per Year*</u>
A	40,900	20.5	.95	46,917	15.5	.63
B	100,200	49.5	.85	62,000	18.4	.56
C	<u>111,000</u>	<u>34.0</u>	<u>.65</u>	<u>123,248</u>	<u>22.0</u>	<u>.34</u>
Total	252,100	104.0	.78	232,165	55.9	.46

(*1900 Hours Per Year Per Employee)

Fig.8

NO. 2 EAX
REPORTS / 100 STATIONS — ILLINOIS

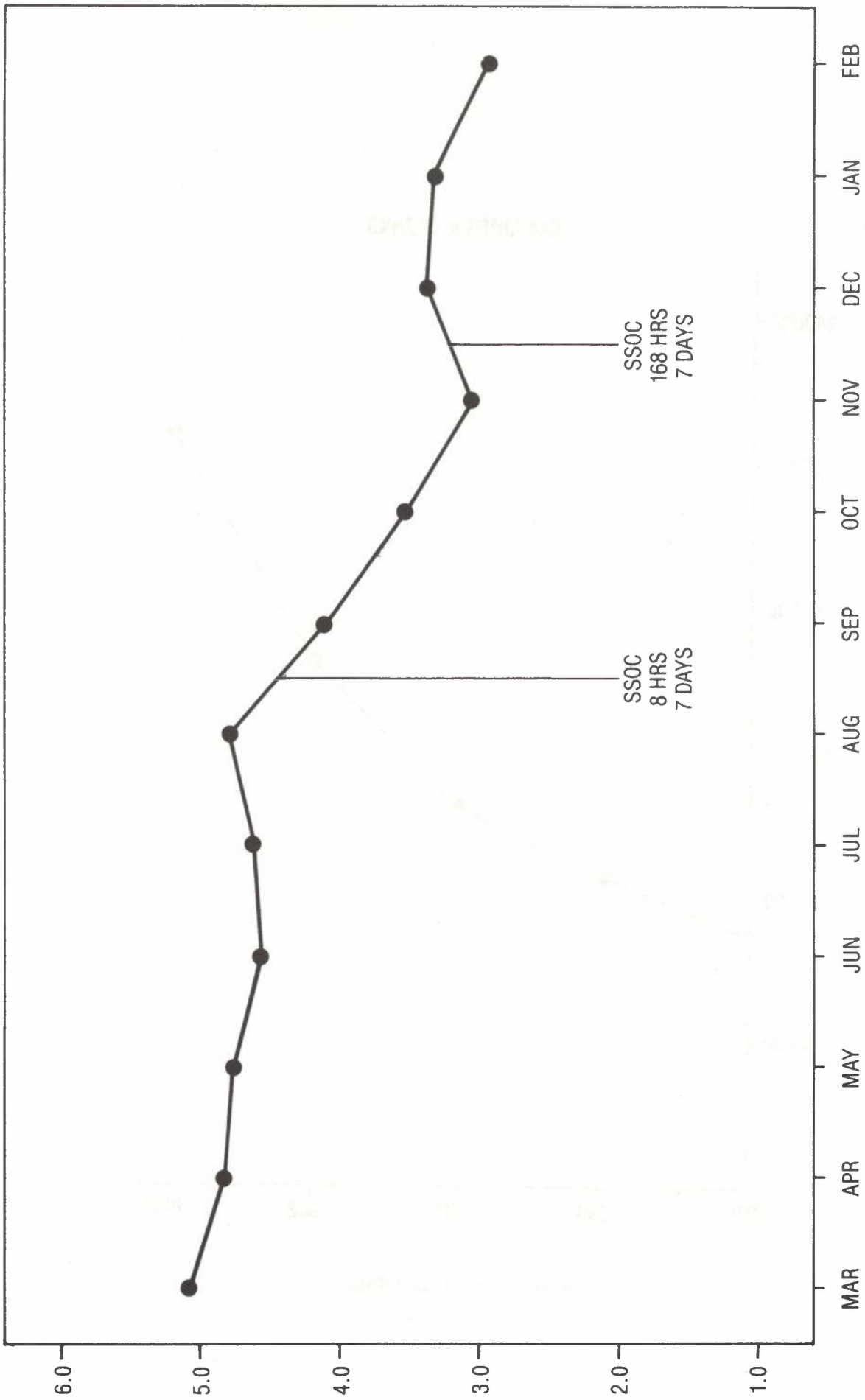


Fig. 9

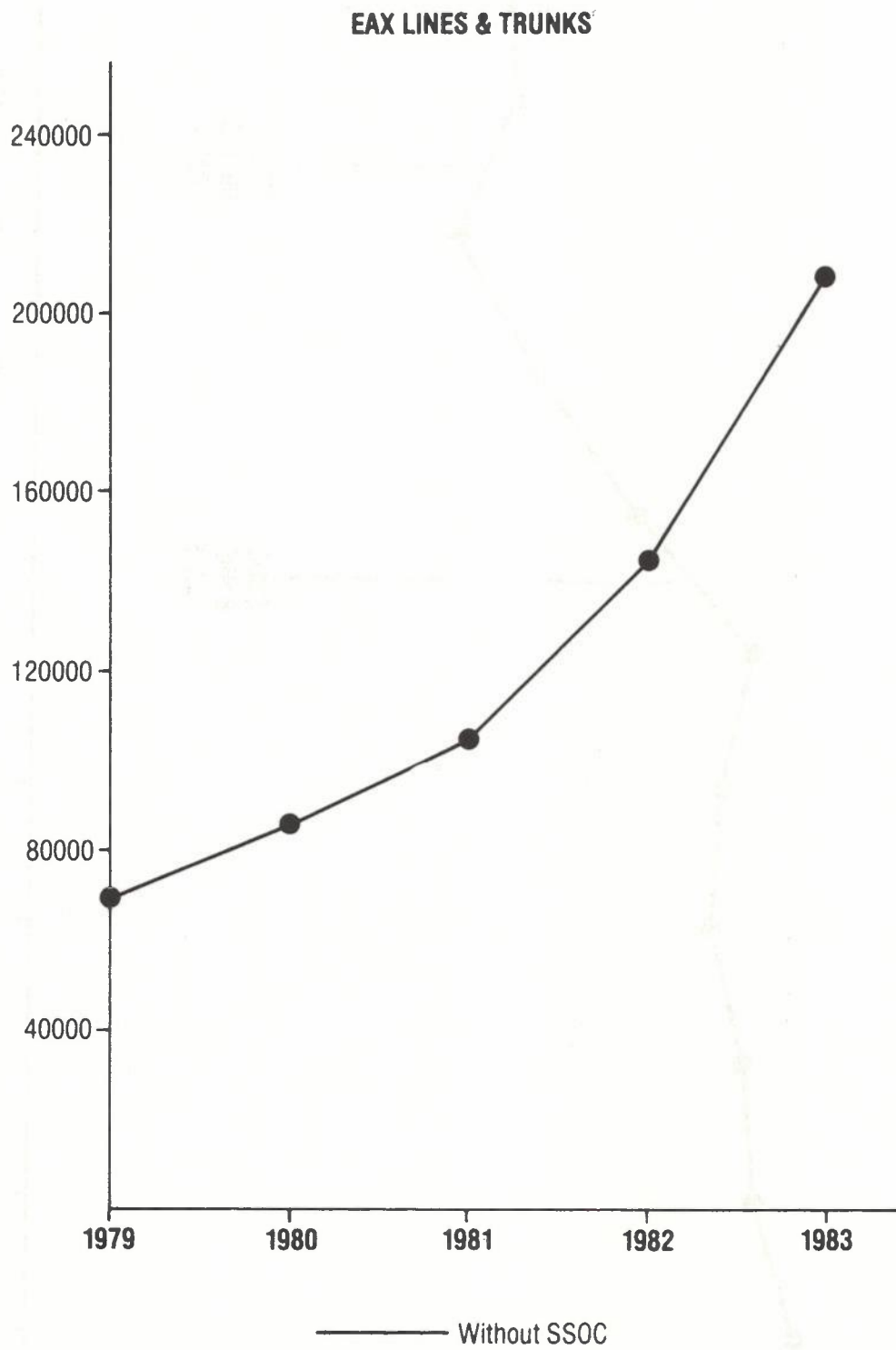


Fig. 10

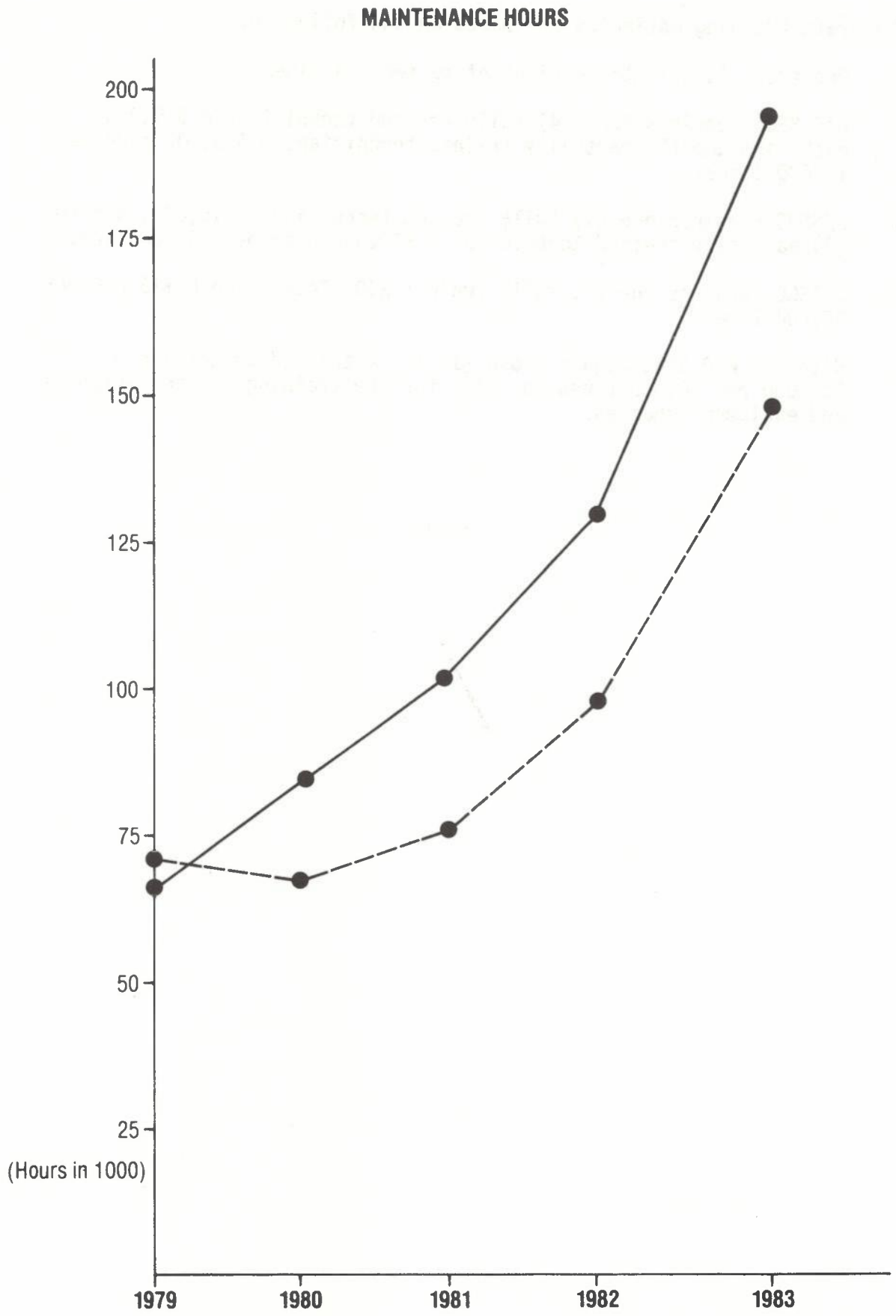


Fig. 11

— Without SSOC
- - - With SSOC

CRAFT TRAINING ESTIMATE

The craft training estimates are based on the following:

1. One trunk is weighted equivalent to two (2) lines.
2. W/O SSOC requires four (4) fully trained technicians @ \$15,000 each, and two (2) partially trained technicians @ \$10,000 each per 10,000 lines.
3. W/SSOC requires one (1) fully trained technician @ \$15,000, and two (2) partially trained technicians @ \$10,000 each per 10,000 lines.
4. W/SSOC requires one (1) fully trained SSOC Technician @ \$15,000 per 30,000 lines.
5. With and W/O SSOC requires one (1) fully trained technician @ \$15,000 per 30,000 lines to allow for (re)training due to personnel and equipment changes.

Fig.12

CRAFT TRAINING ESTIMATE

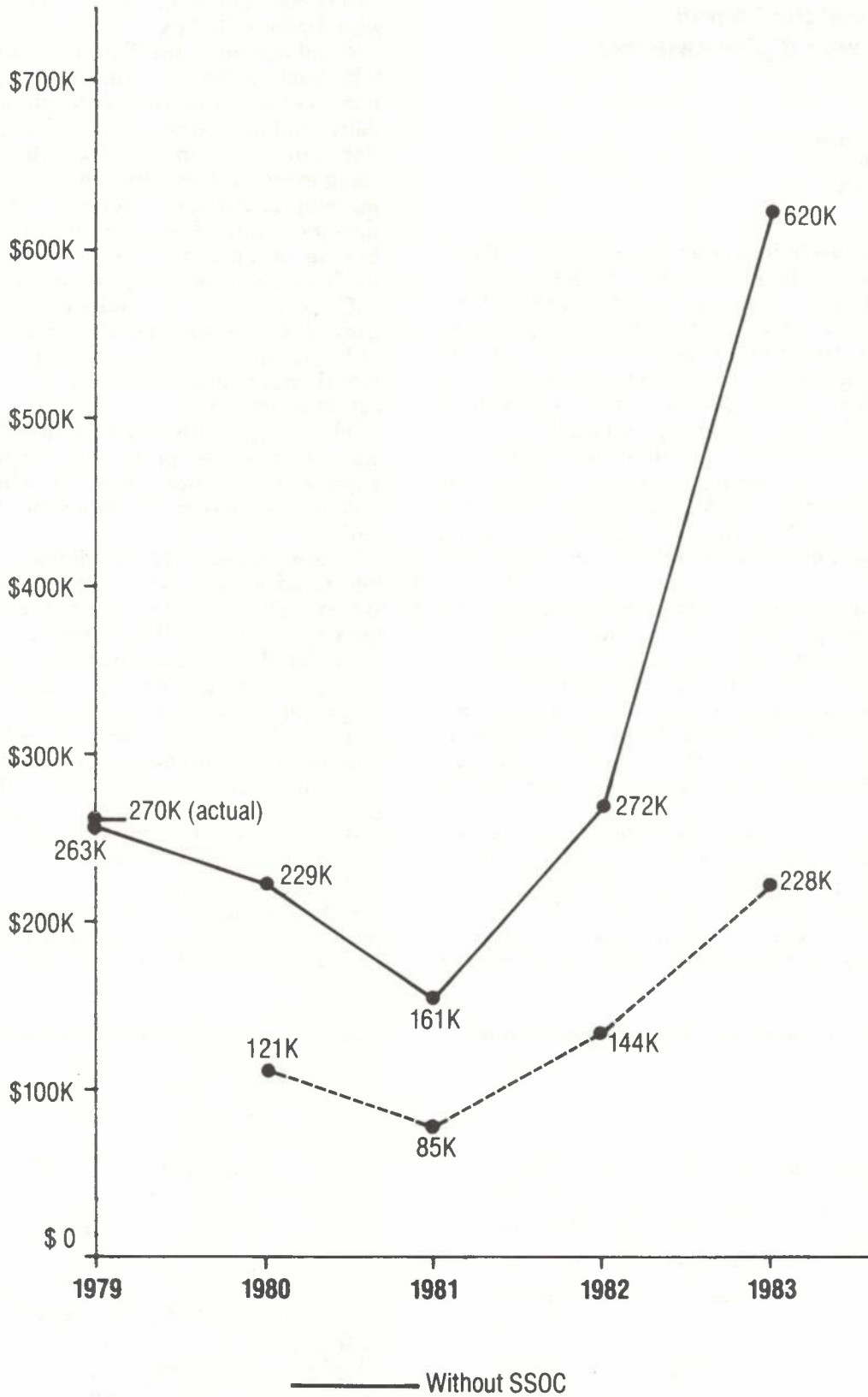


Fig. 13

Protect Your Digital Investment

Automated subscriber loop testing will help assure that loop problems do not offset the benefits expected with digital switches.

By Paul L. Kaliher
Marketing Manager
Teradyne Central, Inc.

Benefits expected from an investment in digital switches include customer service improvements, pair gain economic benefits and maintenance cost reductions. Subscriber loop problems could easily offset those benefits unless automated subscriber loop testing is an integral part of the digital implementation program. This is especially true for telephone companies planning to use some form of remote line switch as shown in *Figure 1*.

Subscriber loops being served by remote line switches are remote and less accessible for testing and maintenance. Yet they are still subject to old problems such as wet cable or high resistance connections.

Without automated routine testing of each remote loop, telephone companies are totally dependent on customers to notice those loop problems and report them. By that time, loop problems have already offset customer service improvements expected with digital switches. The switches may be performing as expected. However, from the customer's viewpoint, quality of service may not be acceptable.

When customers served by remote loops do report problems, each report may require a dispatch unless high quality loop testing is available. Because the loop is remote, each extra dispatch required due to lack of complete and accurate testing will be more expensive than local dispatches. It

also may take longer to locate and clear faults. The added expense of extra, more costly dispatches offsets the maintenance cost reductions expected with digital switches.

A automated subscriber loop test system helps telephone companies find and repair loop problems, before customers are aware of them, through daily routine testing of each loop. Immediate action can be taken based on the prioritized and categorized test results which are available each morning at the repair service bureau. Thus, early detection of trouble can reduce the customer trouble rate and prevent loop problems from absorbing the benefits of using digital switches.

Dispatch accuracy and efficiency also are improved by an automated test system which provides accurate tests of each loop on demand, accurate dispatch statements and fast, efficient fault location assistance.

These capabilities protect an investment in digital switches by preserving expected benefits, especially in remote loops. In addition, they protect an even larger investment in the loop plant itself.

Figure 2 shows a typical digital switching system interfaced with an automated subscriber loop test system. The interface is represented by the test buss and test port lines which are described in more detail later. Loop testing is performed by the line tester which is located either in the central office or at the remote line switch. The line tester consists of a computer portion and a measurement portion. Test commands and data are passed between the computer portion of the line tester and a central test system computer located in the repair service bureau. The transmission path (communications link) between the two is a voice grade dedicated or dial-up line.

Before actual loop test measurements can be performed, the line tester must dial the desired line and gain metallic access to it. There is no

FIGURE 1. A digital switching system, including a remote line switch.

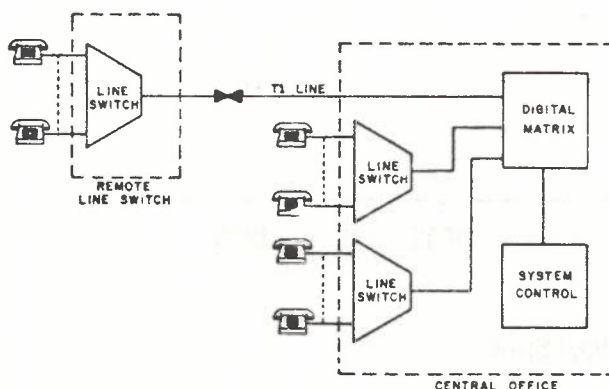
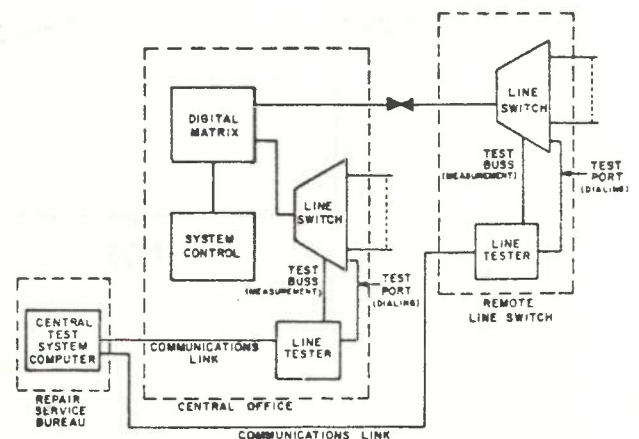


FIGURE 2. Digital switch, interfaced with automated loop test system.



metallic path to the subscriber loop through digital switches. However, most digital switch manufacturers provide metallic access to the loop through a relay switched test buss or similar arrangement.

Figure 3 shows dialing and test access. It represents a generalized interface between a line tester and a digital switching system. Interface details may vary depending on the digital switch manufacturer.

The test sequence is initiated by operating relay C in the line tester. Dialing is accomplished by signaling the number of the line to be tested through the test port. Any of a variety of common signaling formats can be used. The test port is used only to communicate the desired test number to the digital system central processor. Testing is not performed over this port.

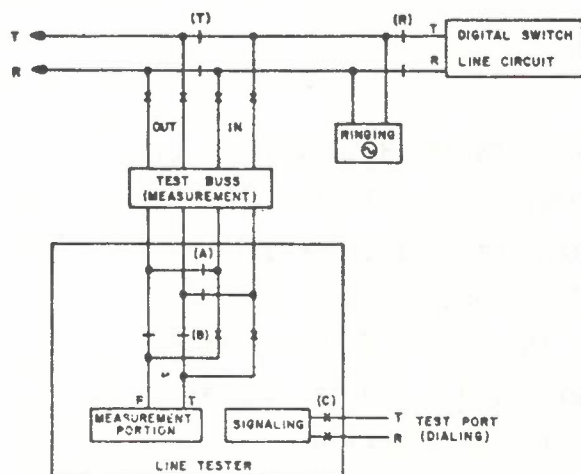
The test port can be implemented in several ways. The test port may be an incoming type trunk or a direct line to the digital system central processor. Or, the test port could be a subscriber line marked for test as indicated in Figure 3. Such a subscriber line would be used only for test related purposes. The digital system controller would receive the dialing signal from the line tester on this line and note that this represents a request for test access. The digital system controller would connect the desired subscriber loop to the test buss by operating relay T, establishing metallic access.

If the line to be tested is busy, the normally closed contacts of relay A prevent interruption of the conversation in process. If the line is idle, relay A is operated and the line is tested through normally closed contacts of relay B. After all tests have been completed, release of relay C disconnects the test port and ends the test sequence.

Most digital switch manufacturers provide access for both inward testing and outward testing. Separate two-wire inward and outward test busses are shown as one means of implementing this access. Other means, including a single two-wire buss, may be used depending on the switch manufacturer. The inward test buss might be used, for example, by the automated loop test system to draw dial tone.

Clearly, automated subscriber loop testing can

FIGURE 3. Test access; subscriber line used only for test.



be applied in digital switching systems to preserve expected benefits and protect the telephone company's investment.

Currently available test equipment located at remote line switches serving relatively few customers may have a high cost on a per line basis. However, future developments in automated subscriber loop testing will significantly reduce that cost.

For example, a new system architecture is being designed by Teradyne Inc. for the 4-TEL Automated Loop Test System specifically to provide more cost effective testing at remote line switches. The revised 4-TEL architecture is intended to match the distributed digital switch architecture in which most of the system intelligence is concentrated in a central system controller. Multiple "slave" line switches with limited intelligence can be served by a single central controller.

Figure 4 illustrates the revised 4-TEL architecture in which the computer and measurement portions of the 4-TEL Central Office Line Tester (COLT) have been separated. Most of the intelligence is concentrated in the computer unit. Several measurement units will be "slaved" to a single computer unit. Thus, the cost of the loop testing capability at each remote line switch is reduced significantly.

The process of investing in a digital future should include consideration of the existing investment in outside plant. Though network quality will be improved with digital switches, problems will remain in the loop plant. Subscriber loop problems, especially when they occur in remote loops, offset the benefits expected with digital switches.

Those benefits can be preserved by applying current automated subscriber loop test systems today. Such systems can solve loop maintenance problems through early detection of trouble, accurate craft dispatch and fast fault location.

As implementation of digital switching systems continues, new loop test system architectures, such as the one described for Teradyne's 4-TEL System, can be applied for more cost effective testing of loops served by remote digital line switches. ■

FIGURE 4. New 4-TEL architecture for digital remote line switches.

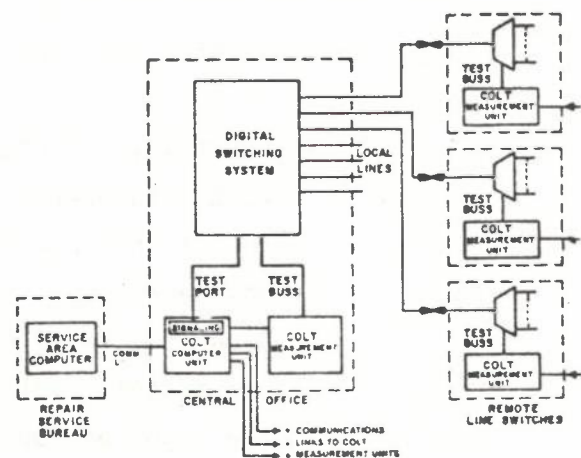


Fig.15

VISIT TO BELL CO.: AT & T, BASKING RIDGE-NEW ENGLAND TEL. CO.,
BOSTON-MOUNTAIN BELL, DENVER, 22-24 APRIL 1980

Pt.1: AT & T Basking Ridge

People met: Mr Andy McCahill, E.M. Switching
Dr John Pilitsis, Human Resources
Mr Dave Rozenzweig, SPC Offices
Mr Carl Holstein, Switching Methods (Head of Dept.)
Mr Dave Mahan, Inter Office Facilities

(a) Equipment

The present network has 50% SPC on an exchange connection basis, less on a station basis, next year it will be 56%.

Sizes: Local #1 15K to 100K EC (largest machine has 300K EC) about 1600 in service
#2 4K to 20K EC - about 500 in service
#3 1K to 4K EC - about 300 in service
#5 Digital 1K to 30K - none in service - digital - to establish in overlay net when introduced

Toll #4 initially X-bar, now SP digital.
Largest switch in operation 500 K calls/hr

Other equipment 30% SXS
15-20% X-bar
Small number of No.5 ETS on SPC upgrade of No.5 X-bar - mostly in Ohio Bell but not persisted with in favour of full SPC

(b) Organisation and Staffing

- SPC trials started in 1965. First field installation went into operation in 1975. In parallel with an intensive study of technical aspects of trials, Bell has carried out an equally intensive study of work organisation to determine the most efficient pattern. The system adopted is flexible and can be adapted in the light of further operational experience.

- At present, a typical Switching Control Centre (SCC) might be responsible for 10 stored program machines (total 150K EC) in addition to em machines, as indicated in Fig.1. The system performs two functions: monitor (includes testing trunks) and control.
- On a normal day, there is usually someone in many of the exchanges carrying out some work.
- Typical SCC might have 35 people in total (assuming three shifts in 24 hrs) and there might be 10 to 12 people in the centre during the day shift. For example in Boston there are 7 ESS No. 1 machines (165K EC) and a total of 28 craft people for maintenance and 7 people for MDF work. Extra staff might be added to deal with carrier work, extra toll work, or extra admin. work.
- In one area in Mass., before conversion from the old SXS machine (165K E.C.), there were 60 people employed. After conversion the work force dropped to 15 people. With full SCC support, the work force will ultimately be reduced to 10 people.
- Comparison with X-bar is less dramatic as the following table indicates with reference to a 25K switch.

	switch	frame
5 X-bar No SCC	5 men	2 men
1 X-bar With SCC	4 "	1 man
1 ESS No SCC	3-4 "	cosmic** frame
1 ESS With SCC	1 man 1.1 to 1.5 (including load from SCC)	cosmic** frame

** The 6 ft high cosmic frame required less labour effort, the final figures are not yet certain.

(c) Some Human Problem (in response to our questions)

- Reaction from the Unions: "Upheaval at the beginning; to-day they like the job".
- It takes time to implement it. Not too many were displaced, and most of the workforce was accommodated by growth and redeployment.
- Staffing profile: assuming 50 people (2 levels of skills: MDF and switch) employed in SCC, there would be one group manager and 7 to 8 first level managers, a ratio of about 8:50. Before centralization this ratio was 1:10. With grouping the profile is better and the span of the group manager has increased.
- There exists a large variety of training courses each one designed in detail to meet the requirements of training for a particular skill. There are tests and certificates at each stage.
- The craft personnel is closely supervised and controlled, but each member is responsible to this manager and the group. The management argues that the organisation is to the worker's advantage in that it produces an environment in which he can get expert assistance, should he need it, and thus increase his competence. It is not primarily designed to make him work faster but, rather, to help him work better and more competently.
- Management's duty is to provide efficient and cost effective service. This, in Bell, as in any other well run business, is axiomatic.
- In principle, one could operate in a decentralised manner but the network could not operate efficiently and the customer would suffer.
- To accomplish complete centralisation and control is not easy. It might take 5, 10 or 15 years of continuous effort of management. It is necessary to be in good and continuous communication with staff to dispel any fears on their part. Staff must understand advantages of centralised control (network performance and greater efficiency and work satisfaction through group operation).
- Some operating companies have made a good job of centralisation, "others have botched it".

- The company must provide appropriate training for group and first line managers. They themselves must understand advantages of centralised control and believe in it. If, in a particular area, strong opposition is encountered, the management carry out a survey and disseminate the results.

(d) Observations on SPC Equipment

- In the beginning the failure rate was high. Mainly due to the type of reed relay used. Now the number of faults is acceptable, though higher than planned.
- At present, depending on the system, the software backup is in disc or mag. tape (1A system) or cassette (2B system).
- The generic programme is produced by Bell. Other programs may be produced by the operating company, which is also responsible for traffic data.
- The billing function comes under a separate vice-president.
- Bell have developed (and are still developing) a simulation packet for the PDP 11/70. This is of value in maintaining expertise.
- Bell maintain that SPC technology is essential for centralisation and, in this sense, has an effect on efficiency. However, principle savings are achieved through effective work management and efficiency can vary significantly from one operating company to another. In other respects X-bar can be as efficient as SPC.
- In the light of 15 yrs. of experience, the down time is estimated to be better than 1 hr/20 yrs.
- Only 3 to 5% of all subscriber complaints might be due to the switch.
- A very important factor in achieving good efficiency and quality of service is effective management training, and management selection, and use of key indices known as key service indicators in managing the network.

- Means of achieving good quality of service:
 - . Automated tests (ATA, TASC, etc, as described in literature)
 - . Measurement on switches
 - . Customer interviews (principally business customers)
 - . Data base on customer complaints.

Bell prefer to produce a "profile" rather than work to a formula using key service indicators.

- Concerning public interest it has been said that:
 - . Centralisation is good for the customer (he will be using a better network)
 - . Cost is controlled by centralisation
 - . Quality of service is principally dependent on quality of trunks, subscriber loops and subscriber equipment: centralised operation ensures that the sophisticated test equipment is available, where needed, for the good of the customer and community. A feature of the Bell scene is massive automatic routing particularly of trunk (toll) network.
 - . The public will be glad to know that every craft person is properly supervised, has first rate equipment at his disposal and that, when needed, higher level skills can be brought in with minimum delay. It would be bad for public image if craft persons were located in individual exchanges whether there was a need or not. It is more efficient to dispatch crafts.
 - . Bell make it their business to advertise that SCC is there to ensure that good quality of service is given to the customer.
 - . Noticeably, the very strong service orientation of Bell people-seems internally generated although Public Utilities Commission and the Federal Communications Commission reinforce.

(e) Miscellaneous Comments on Job Satisfaction and Related Matters

- It is essential to explain fully the potential of centralisation.
- At first concentrate on centralised surveillance. Bring control later on.

- Stop rumours.
- Most craft personnel like best of all "trouble shooting". This they can do best with centralised facilities free from clerical work.
- People stay on board changing of their own volition.
- There is room for specialisation as well as change of environment or type of work, as the individual desires.
- It is essential to have a consultative approach among the managers as well as between a manager and his craft personnel.
- Group operation provides ready help when needed.
- An essential function of the supervisor is to find time to help staff to develop themselves. Supervisors must be deloaded of administrative task to do this - reason for well developed computer supported admin. systems.
- Management cannot guarantee job satisfaction, but can design a job to help people to improve themselves.
- A "participative design mode" should be encouraged, such as "I want you folks to organise yourselves to reach these objectives". They may alter the way of reaching the objectives but they must prove to the "system" that it is better their way. Otherwise they must follow standard practices.
- Style of management is important.
- Decision making process must involve supervisor and first line managers.
- Technology creates a larger spectrum of jobs and skills.
- There must be no exploitation of the workforce.
- Bell will give a craft person all the training he might want. They have never had a person wanting more than Bell would be prepared to give. It is important to spot talent and train the individual to the full. In this way the company can make more money out of the employee and he, in turn, will feel better about his achievements.

Pt.2: New England Bell

North Division SCC

People met: Mr Bill Crawley (New England Bell Hq)
 Mr Paul Sylvester (previous Group Manager)
 Mr John O'Brian (present Group Manager)

(a) General

- 5 of the 6 NE states are services by NE Bell Co.
Total population of 8.9M.
- There are 4.1M stations, 1.2M SPC.
- Under the control of the Brighton SCC, there are 7 exchanges (164K EC). Details are given in Fig.2.
- The operation will be completely centralised by the end of 1980 when there will be 27% SPC.
- By end of 1983 there will be 50% SPC.
- At present the dominant component is SXS. It is this component that will be totally replaced.
- Until 1974, each exchange was running as a separate unit. The network by then was "run down". The arguments for SCC were :
 - (i) Increased productivity and
 - (ii) Improved quality of service.
- The service and productivity improvement over the years 1974 to 1979 have risen on account of factors such as:
 - . Ease of office surveillance
 - . Improved trouble analysis and maintenance
 - . Flexibility with workforce.

The following table summarises improvements achieved:

Improvements	1974	1979
No. of craftsman in field and SCC	56	28
Ave. service results	93	97

Figs. 3 and 4 show variation of performance figures with time.

- There is a Supplementary Income Plan (SIP) for those who retire early because of new technology effects - choice apparently lies with the employee - it operates on a national basis.
- Productivity increases are closely monitored by unions and used in contract bargaining - employees then directly share in the benefits.
- Bell's work force is still growing even though the network growth has declined to below 4% because volume of business in real terms has increased almost 10% in last year mainly due to long distance and international calls (20%)
- Dislocation, reorientation is seen as real nature of change - confident that volume of business will grow faster than productivity - good marketing essential - international market seen as growth potential - indeed, international traffic is the largest route from some east coast cities.
- During the period 1974-1980 NE Bell went through 3 layoffs to reduce the workforce - not entirely due to productivity improvement. Little new business coupled with net loss of population was a factor. Union - Company conflict led to arbitration on some issues using an arbitrator from National Arbitration Board. Arbitrator confirmed Company right to compulsorily transfer staff but prescribed compensatory payments. Layoffs on last on - first off - by discipline - by location.

(b) Organisation of Brighton SCC and Performance

- The work is dispatched through 6 work groups as indicated in Fig.5. There is a foreman in charge of each group.
- The software and Analysis Group is responsible for data processing. (Although all crafts are equal, this group is regarded as an elite).
- There are daily meetings of managers and foremen. There are regular work organisation meetings for night and evening shifts.
- The control group is divided into 3 cells as indicated in Fig.6.

- Originally it was decided to rotate the jobs, but the performance indices went down and they abandoned the scheme.
- Here it is recognised that central control leads to job stress.
- The principal labour saving was in going from the old SXS (panel) equipment to X-bar and a smaller saving in going to SPC.
- Projected figures in mhrs/EC/year (field craftsman only) are:

	1979	1984
No. 5XB	0.36	0.3
SPC	0.22*	0.19

The above excludes MDF work.

(*If this is adjusted to include all SCC staff it equates to approximately 0.26 manhours per station. SCC staff functions include clerical administrative work, budgeting etc., and also MDF work carried out at four exchanges.)

- There are two types in the workforce:
 - (i) Those that think
 - (ii) board changers.
 The management accepts this and tries to get the best out of all people.
- The pay to supervisory staff is 95% to 110% of the nominal, depending on performance.
- At this stage the bulk of the work is still done in the field. Usually the craft person works on his own following a schedule given to him by the dispatching officer. The craft person reports by telephone to the SCC his progress at frequent intervals.
- They have no problems with security of software: there are built in safeguards.
- There is spare space in the mini computer (could be used for staff training and enhancement of expertise).

Pt.3: Mountain Bell Co. (Mr Bob Hubler)

(a) General

- Mountain Bell serves 18M people in 8 States (an area almost one third of the USA), Fig.7.
- The 8 State managers report to the VP (and G.M. State). In each state there are a number of district offices (DOC).
- On an average, there are 23 employees for 10K EC.
- Usually there is only one SCC per DOC, but sometimes there is a separate one for em offices. A number of centres have been provided at various levels to assist in the centralised operation as indicated in Fig.8.
- There is a direct control of Central Offices' (in exchanges) by SCC. The manager in charge of SCC is in charge of operation and is held fully responsible. ESAC monitors the performance of SCC but, except for emergency, does not normally interfere with the running of the operations. However, ESAC must be contacted for all more urgent faults, and there is a 3 hr. limit on clearance of a non-critical alarm.
- The manpower of ESAC is:
 - 7 techs. (ESS)
 - 5 " (EM)
 - 2 "
 - 2 maintenance engineers
(who can reach PECC direct)
and clerical staff.

Should the need arise PECC, on request, will fly an expert to the site to assist with the solution of a complex problem.

- Mr Hubler is responsible for ESAC and MMOC.
- Engineers send trouble reports to PECC. These, in the case of hardware design faults are of direct assistance in improving Bell products.

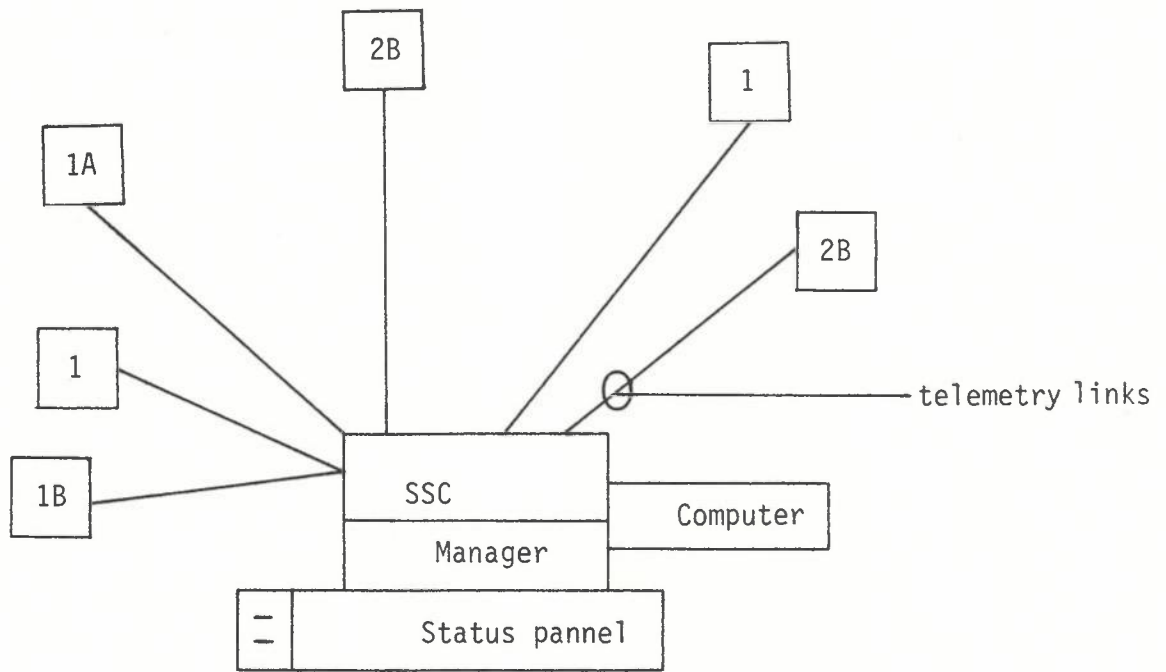
(b) Centralisation and Human Problems

- It is impossible to achieve centralisation in a mere 12 months. It takes many years of sustained effort. Movement to centralisation started in Mountain Bell in 1969 with LCCs.
- The best technique is to establish one SCC in a suitable district and choose best possible staff. Then get it working effectively. Subsequently emulate.
- It is not necessary to insist that every man report to SCC.
- In this state SCCs were introduced from 1973 onwards.
- There were numerous problems with Unions. Management had to deal with 5 to 6 grievances per day.
- In the past the craftsman used to take pride working in a particular office. We are asking him to change his attitudes. This takes time.
- Full training for SPC takes 50 weeks.
- At present there are 7.6M stations. Of this 47% are served using SPC.
- The first SPCs were established in densely populated areas.
- For security and efficient operation, software changes must be strictly controlled. It is absolutely essential to standardise software and documentation. Staff must conform to this requirement.

(c) Miscellaneous Feedback from Discussions with First-line Supervisors and Other Staff

- Rigid centralised control is disliked by many, yet others do not mind it at all.
- The schedule for working in the field is rather tight and "every minute must be accounted for".
- Minor time off is at the discretion of first-line supervisor.
- It is possible for a craft person to clear a fault and then for the fault to reappear. This could be due to faulty procedure or hardware imperfection. In some cases this can lead to dispute.

- The crafts personnel must follow rigid Bell procedures for clearing faults. Sometimes a procedure can be improved upon. In such a case PECC would be informed and the particular member of staff would get the recognition.



SSC CONTROL

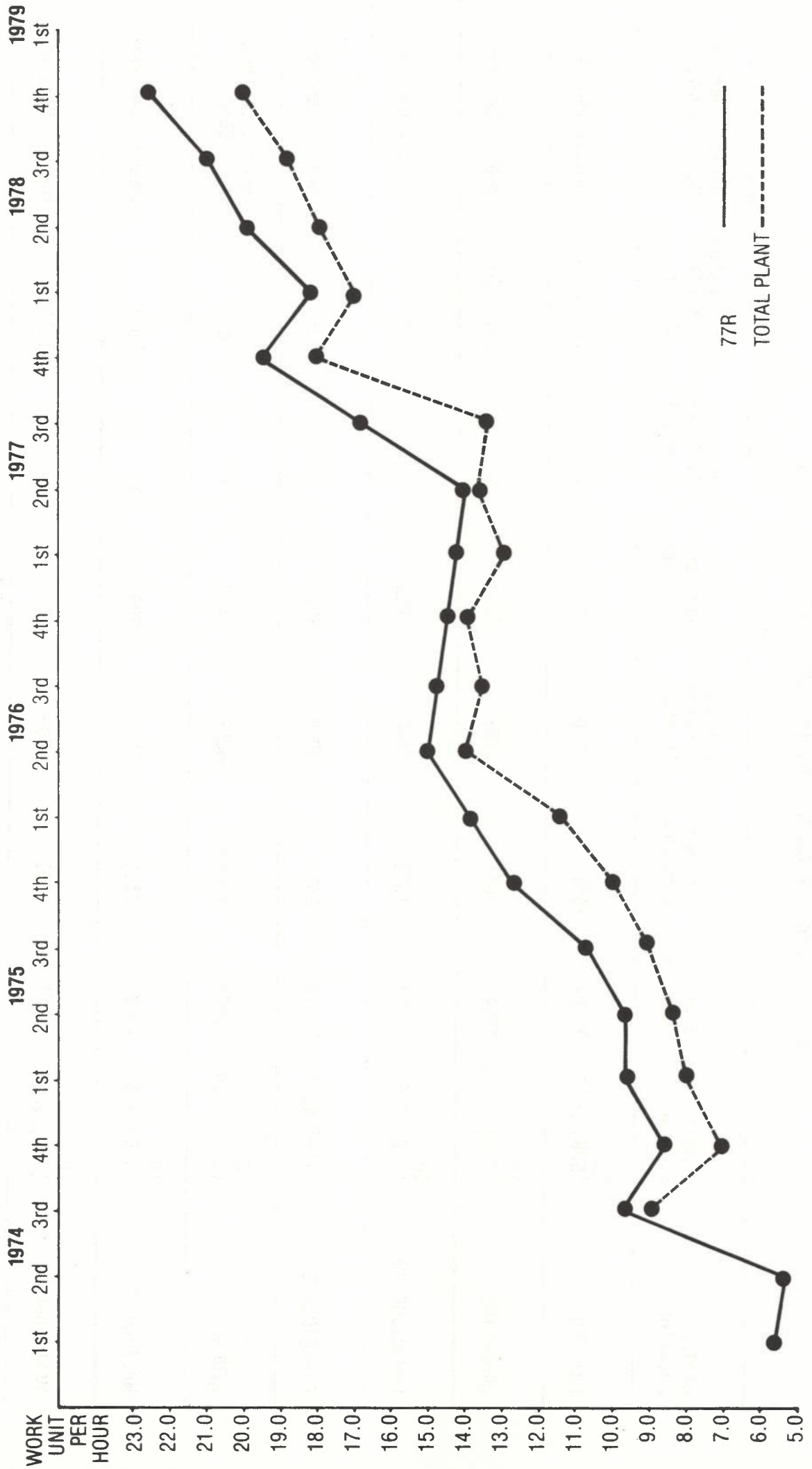
FIG.1

NORTH DIVISION SCC
NO. 1 ESS OFFICE CHARACTERISTICS AS OF APRIL 30, 1979

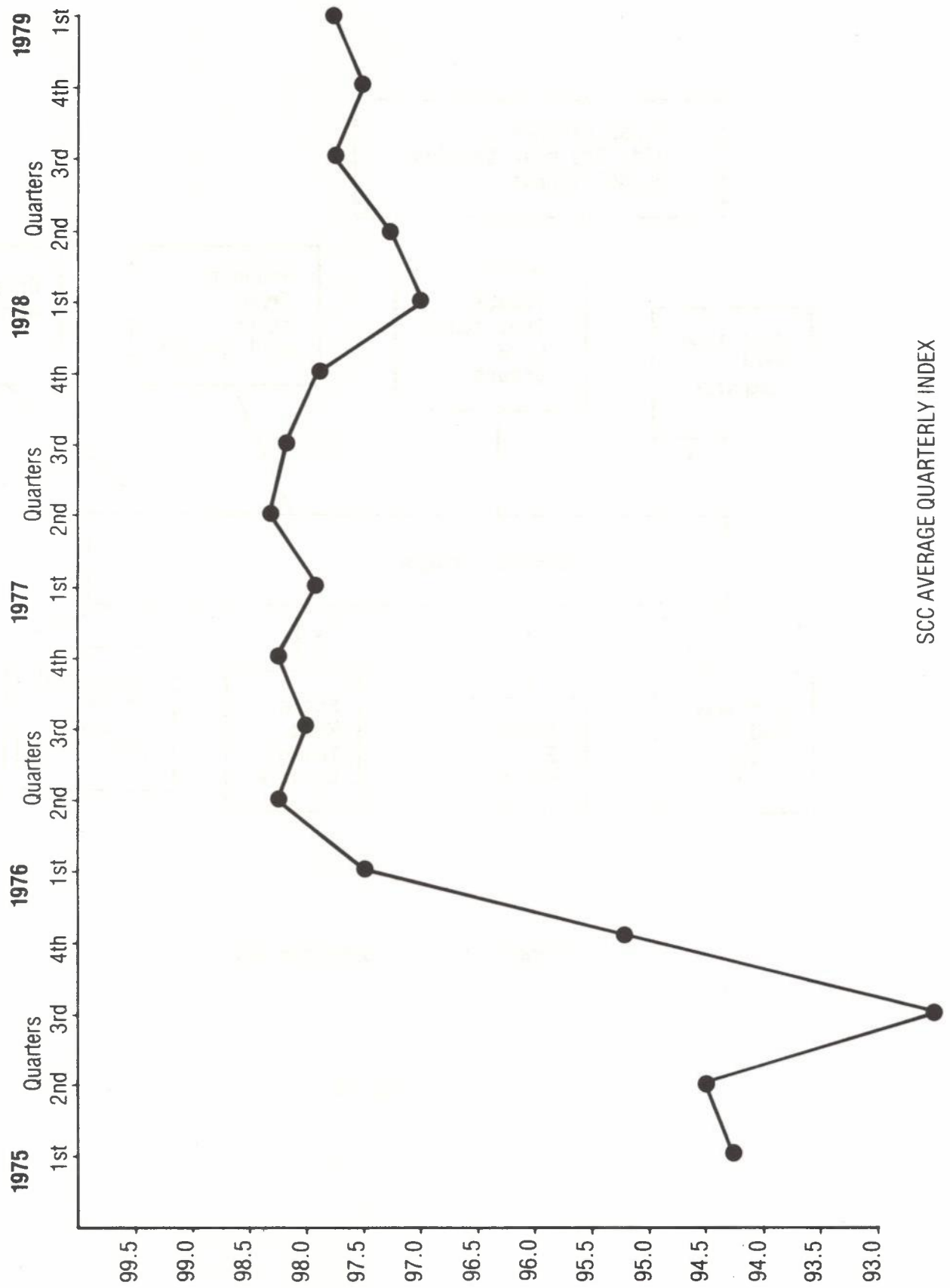
Office Location	Generic & Issue	Main Stations	Centrex Customers	I & CO Working Trunks	Service Circuits	Approx. Distance From SCC	Co-located With (SXS 5XB, Etc.)	Special Features (CCSA, INWATS, Etc.)
BRIGHTON	1B (SPB) 4.14	26304	617	5910	2398	2	Toll	Inwats, Centrex
BROOKLINE	1B (SPB) 5A.13	27845	5658	5787	2430	2	Toll, 5XB	Inwats, Centrex
CAMBRIDGE CGO	1B (SPB) 3.6	53252	10321	6446	3283	3½	Toll	Inwats, Centrex
CAMBRIDGE CG1	1B (SPB) 4.14	11716	248	3000	892	3½	Toll	Inwats, Centrex
KENDAL	1B (SPB) 4.14	12423	10645	5655	2547	4	Toll	Inwats, Centrex AIOD, CCSA
WALTHAM	1B (SPB) 3.6	7903	2104	3544	998	15	Toll	Inwats, Centrex
WATERTOWN	1B (SPB) 5A.13	17671	1201	4089	2297	5	Toll	Inwats, Centrex

FIG. 2

NEW ENGLAND TELEPHONE CO., MASSACHUSETTS AREA, NORTH DIVISION SCC

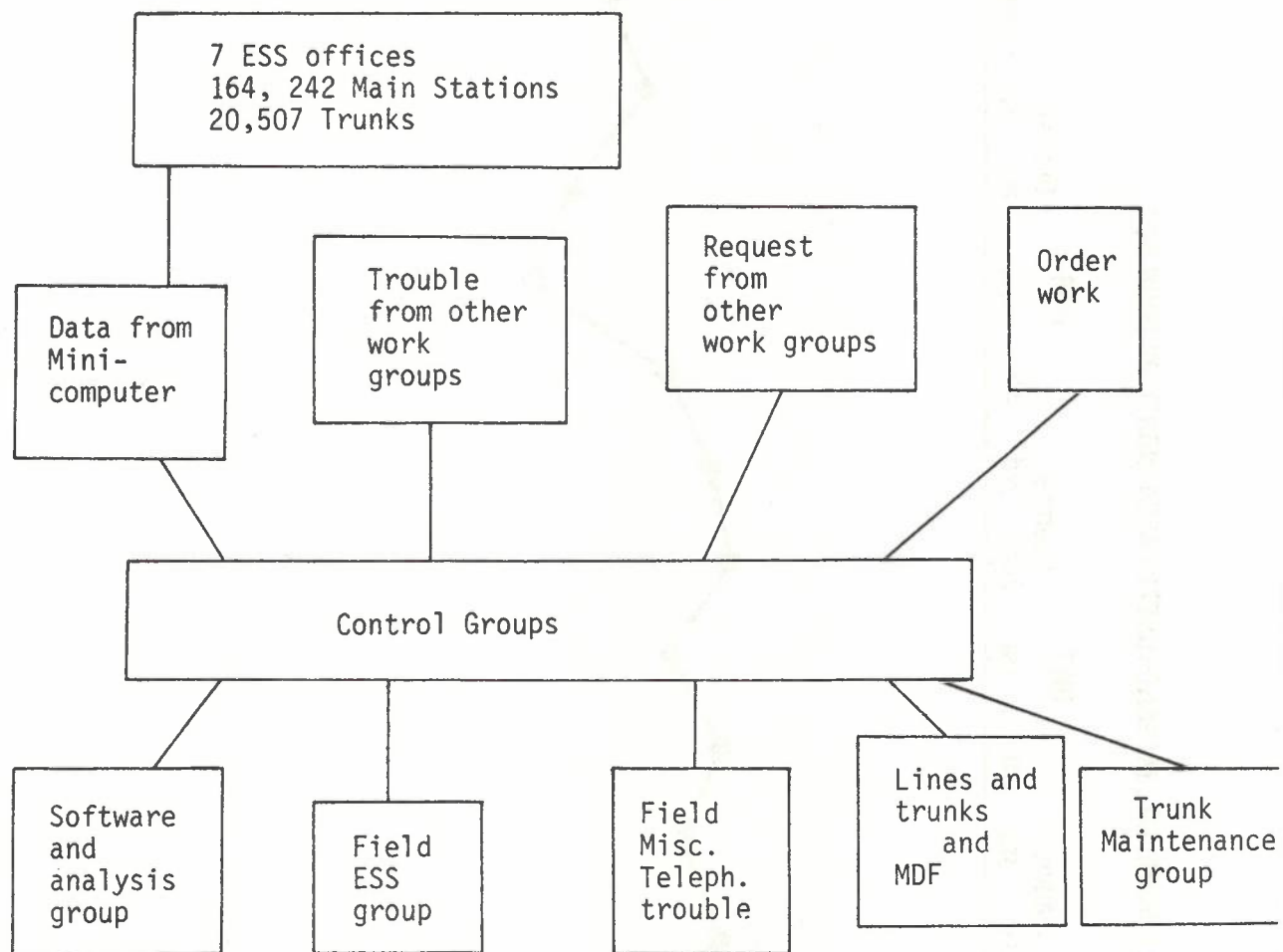


NEW ENGLAND TELEPHONE CO., MASSACHUSETTS AREA, NORTH DIVISION SCC



SCC AVERAGE QUARTERLY INDEX

Fig. 4



Organisation of Brighton SCC

FIG. 5

Control and Administration	Software and Analysis	Trunks
Administration of tickets	Use of support system	Detection of faults and protection of trunks
Pricing	Long term analysis (Computer print out)	TOS processing
Priority of jobs	Generate tickets	TTME (Trunk Transmission Maintenance Index)
Loading	Monitor after repair	Trunk installation
Dispatch		
Detection and protection		

Brighton SCC Control Group

FIG.6

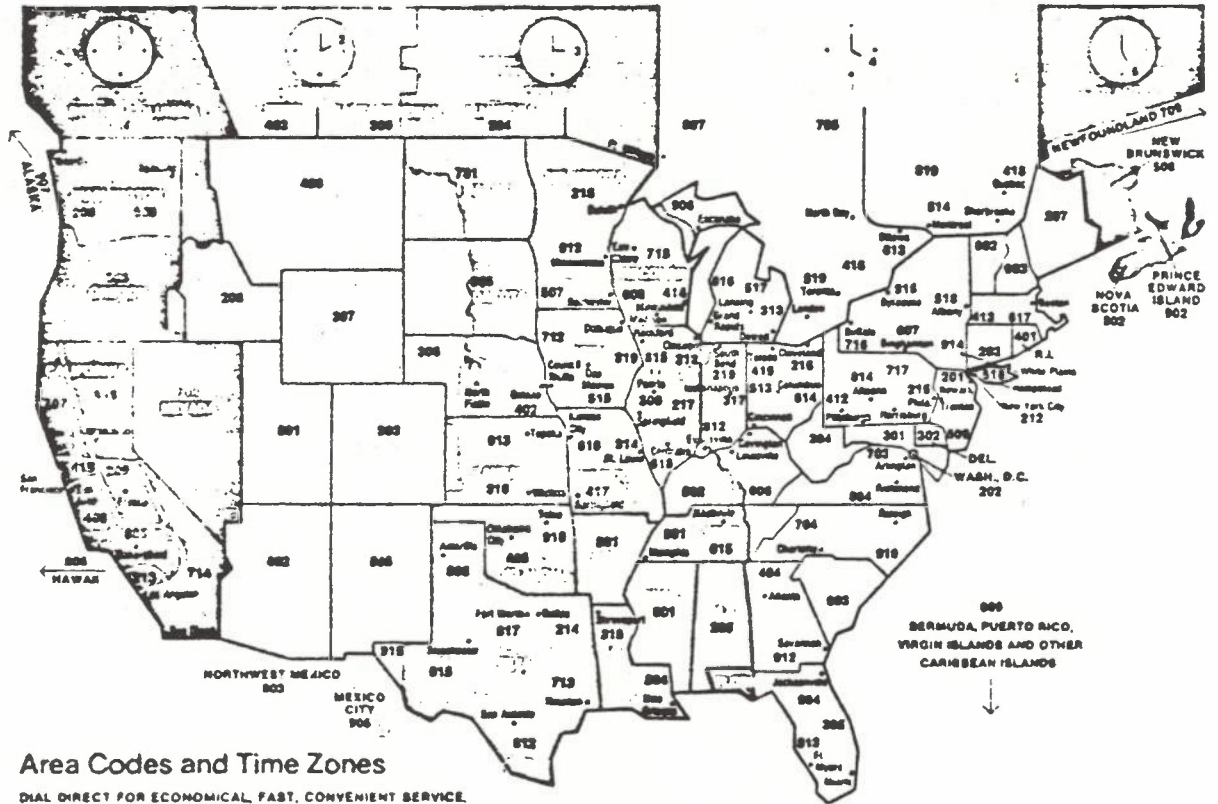
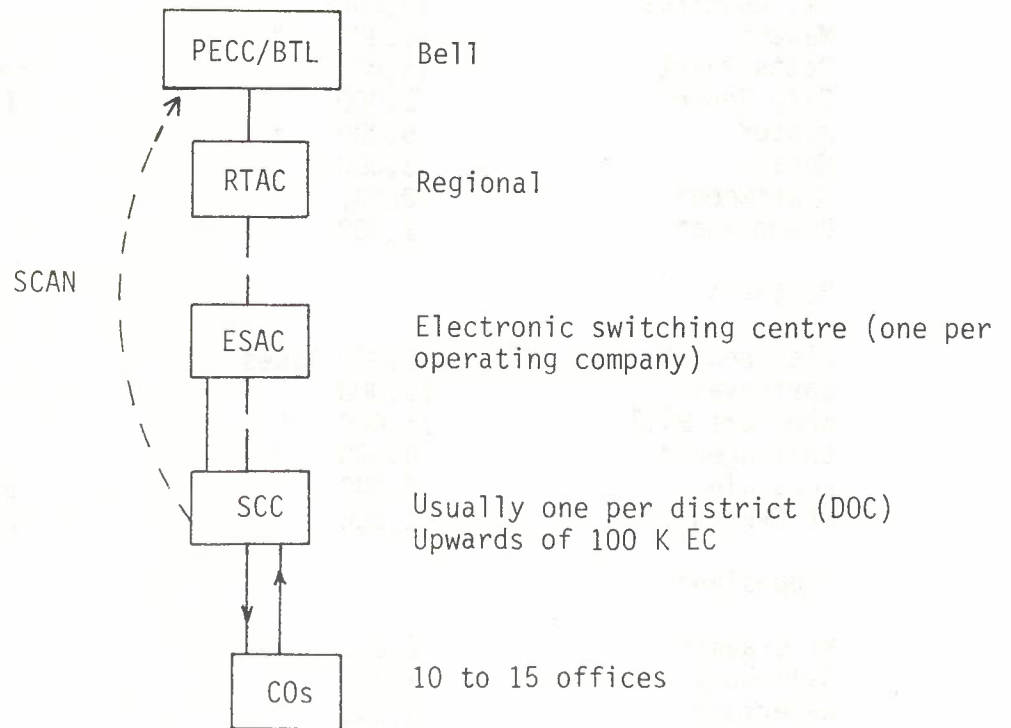


Fig.7



Mountain Bell Centralised Control Organisation

FIG.8

8.2 REPORT ON OPERATION OF EXCHANGES IN NEW SOUTH WALES, QUEENSLAND
SOUTH AUSTRALIA, VICTORIA AND WESTERN AUSTRALIA

A. Schedule of Cutover Dates (up to 30 June 1980)

New South Wales

Glebe	10,000 lines	April 1979
St. Leonards	14,000 "	June 1979
Mascot	6,000 "	August 1979
Potts Point	13,000 "	September 1979
City South	2,000 "	February 1980
Minto*	5,000 "	March 1980
Menai*	3,000 "	May 1980
Chatswood*	10,000 "	May 1980
Drummoyne*	1,000 "	May 1980

Victoria

Elsternwick	6,000 lines	June 1976
Springvale	19,000 "	March 1979
Whealers Hill	16,000 "	June 1979
Collingwood	8,000 "	July 1979
Lonsdale	4,000 "	February 1980
Mt Evelyn	2,600 "	February 1980

Queensland

Mt Gravatt	6,000 lines	June 1979
Salisbury	7,000 "	July 1979
Waterford	8,000 "	March 1980
Wacol	2,000 "	April 1980
Wellington Pt.	2,600 "	April 1980
Edison (229)	6,000 "	April 1980
Paddington*	8,000 "	June 1980

South Australia

Salisbury	13,000 lines	February 1977
Unley	11,000 "	February 1979
Elizabeth	11,000 "	June 1979
Waymouth	7,000 "	November 1979
Henley Beach	15,000 "	December 1979

Western Australia

Bulwer	8,000 lines	May 1979
Mullaloo	8,000 "	October 1979
Cottesloe	12,000 "	March 1980
Hamersley	15,000 "	May 1980

*Not in trial report.

B. Technical Profile of Trial Exchanges Visited

New South Wales

Chatswood Exchange (ESC)

Equipment: 7K lines SXS
10K lines ARE
Cutover of X-bar to ARE 11, L.3, May 1980.
Step replacement ARE 11, L.4 (7K lines), in September 1980.

Note: Because of the late date of cutover the exchange cannot be regarded as having "settled" to normal level of operation during the period of the trial.

Staff: ST03, ST02, ST01(4), T01(5) and 18 other staff.

City South Exchange (EMC)

Equipment: SXS tandem, SXS terminal to be completely replaced with 14K lines L.4, ARE 11 late in 1980. 2K lines cutover in February 1980.

Note: - High calling rate area. 24 hour operation. A large proportion of the equipment is pre-2000 step.
- This Exchange is in a busy area and there has been a lot of constructional activity and other disturbance during the trials.

Staff: 54 people in total including PT0, ST02, T02(4) and T01(9) Tech (16), AT(9), cleaners (12) clerical (2). 5 people with full ARE 11 training.

Glebe Exchange (EMC)

Equipment: 10K lines of X-bar, with power and MDF occupies 3 floors.
Total number of stations 19,2K. Cutover to ARE 11 Lev.1
in April 1979. Conversion Lev.1 to Lev.3-May 1980.

Note:

- This exchange is one of a few exchanges equipped solely with ARE 11.
- High NEX workload.
- MDF handles about 40 orders/day.
- 50/50 residential-industrial area.
- There were some significant major equipment upgrades and equipment problems. This factor is to some extent responsible for the higher than average staff workload. There were delays in supply of mod kits and some difficulties in implementation of new mods.

Staff: Pre ARE 11: ST02, T01, Tech, A.Tech and cleaner.
Post cutover: Same plus two Tech on projects.
The staff numbers have varied somewhat during the trial on account of the problems indicated above.

Mascot Exchange (ESC)

Equipment: ARF to ARE Lev.1: 5.8.78, 6,000 lines
SRB/ARE Lev.1: 13.10.79, 4,300 lines
ARE Lev.1 to ARE Lev.3: early 1981(proposed).

Note: There are two buildings. MDF in each building. The old building contains 4,300 lines of SXS and 5,000 lines ARE.
New building contains 1000 lines ARE.
MDF activity: about 50 orders/day. High NEX load.
Airport area. High public telephone content.
High ISD penetration.
75% industrial and 25% residential area.

Staff: ST02, T02, T01(2), Tech(4), AT, cleaner (2).
Same after cutover.

Liverpool

Includes Minto exchange (EMC)

Liverpool is the head station for:

Liverpool, 18K lines ARF
 Austral, 2K lines ARF
 Kemps Creek, 1K lines SXS
 Leppington, 2K lines ARF
 Holsworthy, 800 lines SXS
 Minto, 5K ARE 11, Ompos 2, L.4 cutover March 1980
 Cecil Park, Radio Repeater Station.

Staff (nominally in Liverpool):

ST03, ST01, T01(5), Tech (6), AT (2), cleaners (4)

Note:

- Minto is maintained from Liverpool exchange with one T01 and one Tech. attending as required.
- There are about 10 telephone orders per day.
- Low NEX load.
- Mixed residential/business area.
- The impact of ARE 11 is minimal. (Small component of the total).

Potts Point Exchange (ESC)

Equipment: Mixed age X-bar component.
 14k lines cutover to ARE 11 in Sept. 1979.
 Conversion to Level 3 in April 1980.

Note: There are four floors. Exchange contains X & Y tandem of 3K inlets requiring about 1½ men for maintenance.
 Mixed residential/business (60/40%).
 MDF activity: about 40/50 orders per day.
 High NEX load.

Staff: ST02, T02, T01(2), Tech(3) AT, cleaner 1 (for exchange)
 The same as before cutover.

St. Leonards Exchange (EMC)

Equipment: Accommodated on four floors.
14K ARE Lev.1, 6.4K SXS.

Note: MDF activity: about 60/70 orders/day.
High NEX load.
50/50 residential/business.
Computer industry located in exchange area.
Old step equipment needing preventive maintenance.
Some ARF components of the ARE equipment are not in a very good condition. There has been some movement of staff in and out of the exchange during the trials.

Staff: Before cutover: ST03, ST01, T01(3), Tech(6), AT(4).
Cleaner (4) (Pt. time)
After cutover: as above plus 1 AT.

Sutherland (EMA)

Sutherland is the head station for:

- Como, ARF, 7K lines
- Sutherland, ARF, 10K lines
- Sylvania, ARF, 7K lines
- Menai, 3K lines of ARE 11 Lev.4, cutover in April 1980.
Menai is to be attached to Newtown EMC.

Staff (nominally in Sutherland):

ST02, ST01 (2), T01 (2), Tech (3), AT (3) Cleaner (2)

Note: - Menai services a predominantly residential area (90%).
Expected to grow rapidly.
- One MDF, about 10 orders per day
- Low NEX workload
- The exchange is normally unstaffed
- The impact of ARE 11 on Sutherland EMA is minimal.

Queensland

Beenleigh Multi Function District

Includes Waterford Exchange (EMC)

Beenleigh (2.6K lines ARF) is the head station for:

- Waterford, see below
- Loganholme, 1.4K lines ARK
- Woongoolba, 400 lines ARK
- Ormeau, 400 lines ARK
- Wolffdene, 200 lines ARK
- Logan Village, 200 lines ARK

Waterford Exchange (EMC)

The equipment consists of the following:

- 2K lines of ARE 11, Ompos 2, L.4 cutover in April 1980.
- 1K lines ARK.

Staff (Nominally at Beenleigh Exchange):

- ST02, T01 (2), Tech (6), AT (2), CA, Cleaner
- The staff has not changed from pre-cutover.

- Note:
- The area is now developing as an outer suburban one
 - Quiet area, low traffic
 - No redevelopment has taken place:
 - (1) Waterford is a small component of the total activity of the MFD.
 - (2) There is sufficient growth in the district to make up for staff savings resulting from ARE 11.
 - The exchange cutover recently and Ompos 2 facilities are not being used to the full.

Cleveland Multi Function District

Includes Wellington Pt. Exchange (EMC)

Cleveland (3K lines ARF) is the head exchange for:

- Wellington Pt., 3K lines, ARE Ompos 2, L.4, cutover April 1980
- Thornlands, 1K lines ARK
- Victoria Pt, 1K lines ARK
- Mt. Cotton, 400 lines ARK
- Redland Bay, 1K lines ARK

- Russell Island, 200 lines ARK
- Dunwich, 400 lines ARK
- Amity Pt., 90 lines ARK
- Pt. Lookout, 150 lines ARK

Staff (Nominally at Cleveland): ST02, T01 (2), Tech (8), AT (2), CA.
Same as before cutover.

- Note:
- The area is totally urban
 - New building
 - ARE 11 equipment is short of a number of items. To accommodate the traffic 1K lines ARK has been left in situ.
 - The impact of ARE 11 is small
 - The Wellington Pt. exchange will not settle to normal operation for some time yet. Its relevance to the trial is therefore negligible.

Edison Exchange (ESC)

A large exchange housing a variety of equipment. OIC has wide responsibilities. 6 floor exchange building.

- Equipment:
- ARE equipment consists of 1K lines on 1st floor and 7K lines on 3rd floor
 - Tandem of 7K inlets X+Y
 - Minor switching centre (outer Brisbane)
 - Radio pagers
 - Queueing circuits
 - After hours control for DTM (later for the whole Brisbane metro area)

Staff: PT0, ST02, ST01 (5), T01 (7), Tech(18). A Tech(14), CA, Cleaners (2.2). The same as before cutover.

- Note
- Very heavy traffic
 - Heavy NEX load
 - In view of heavy demands in other areas of activity the real impact of ARE 11 is relatively small.
 - The staff is organised (in 9 cells) in such a way as to permit the staff to rotate through a variety of exchange activities, but not all avail themselves of this opportunity.

Mt. Gravatt Exchange (EMC)

Mt. Gravatt is a single district exchange.

Equipment: - 6K lines ARE 11, Ompos. 1.5, L.1, cutover June 1979
 - ARF 6K lines, 9K stations.
 - SRB 3K lines, 4K stations.

Staff: ST02, T01, Tech (3), A.Tech (2), CA (0.5), Cleaner.
 No change from pre-cutover.

Note: - The ARE 11 equipment serves a residential area
 - The ARF and SRB equipment services residential/business area. There are large shopping complexes in the area.
 - Relatively low traffic exchange with moderate growth.
 - Recently there has been a substantial MDF load due to cable rearrangements in the area.
 - There has been no redeployment as originally planned. The manhour figures therefore do not show the anticipated improvement.

Salisbury EMA (ESC)

Salisbury is the head station for:

Acacia Ridge, ARF 2.6K lines
 Browns Plains, ARK 1K lines
 Calamvale, ARK 1K lines
 Greenbank, ARK 400 lines.

Equipment in Salisbury:

- 7K lines ARE 11, Lev.1, cutover July 1979.
 - 2.5K lines ARF

Staff: ST02, T01 (2), Tech (3), AT (4), CA (0.5) before cutover.
 One less assistant tech after cutover.

Note: - Covers suburban and outer suburban areas.
 - High traffic during the day.
 - No changes in staff during the trial.

Sherwood, (EMA)

Sherwood is the head station for:

- Wacol (EMC), ARE Lev.4, 2K lines cutover in April 1980
- Darra (SXS), 1.8K lines
- Jamboree Heights, ARF, 5K lines
- Sherwood ARF, 3.6K lines
- SRB, 3.8K lines.
- Inala ARF 5.4K lines.

Staff (nominally in Sherwood):

ST02, ST01, Ag ST01 (2), Tech (5), AT (3), CA (0.5).

- Note:
- Wacol Exchange cutover in April 1980 and full facilities were not used at time of visit.
 - ARE component is small in the EMA, and so is the impact.

South Australia

Elizabeth Exchange (ESC)

Elizabeth is the head station for:

Smithfield 4K lines ARF

One Tree Hill 400 lines ARK

Virginia 400 lines ARK

Equipment in Elizabeth:

11K lines X-bar, cutover to ARE 11 Ompos 1, L.1 in June 1979.

Programmed for upgrading to L.3 by June 1981.

Staff: ST02 (1), T01 (2), Tech (5), AT (1), CA, Cleaner, same as before cutover.

Note:

- Mixed residential/industrial area, some heavy industry (including General Motors Holden). There were some post cutover problems otherwise equipment was stable throughout the trial.
- For other relevant notes see Salisbury exchange.

Franklin/Waymouth Exchange (EMC)

There are virtually 3 exchanges in one building.

Equipment:

- 7K lines ARF cutover to ARE 11, Ompos 1, L.1, in November 1979. Due for upgrade Ompos 2, L.3 in July 1980.
- Tandem, outer metro tandem
- SXS trunk tandem
- Service code exchange
- Power supply for the carrier centre
- Siemens and trunk exchange
- ARM and local service centre.

Staff: Pre ARE - ST03, ST02, ST01 (6), T01 (9), Tech (14), AT (6), CA (2), Cleaners (2),
Post-cutover - less 1 ST01, 2T01, 1 cleaner plus 1 Tech
1 AT.

- Note:
- Large MDF activity
 - Exchange staff also attend to other duties such as assistance to FDC (afterhours)
 - The ARE component is small and the effect on staff numbers is therefore minimal.

Henley Beach Exchange (EMC)

Single district exchange.

Equipment: 15K lines X-bar cutover to ARE 11 Ompos 1.5, L.1 in December 1979.
To be converted to Ompos 2 L.3 in September 1981.

Staff: ST02, T01 (2), Tech (3), A Tech, Cleaner.
The staffing has not changed since cutover due to local difficulties with redeployment.

- Note:
- One of the oldest exchanges in SA.
 - Quite suburban area with a growth of about 800 lines p.a.
 - Due to problems with redeployment the figures for efficiency are not as good as planned.

(SA) Salisbury Exchange (ESC)

Salisbury is the head station for: Golden Grove, 4K lines
ARF Reg. LP and Waterloo Corner, 400 lines ARK.

Equipment in Salisbury:

There have been considerable modifications. At present there are:

- 15K lines of ARE 11, Ompos 1 Lev.4 were progressively cutover since 1977. This has been updated to 16K lines ARE 11 Ompos 2, Lev.4 in June 1980.
- seven line concentrators
- three-24 channel telegraph system
- thirteen-12 channel telephone systems at the exchange
- thirteen-12 " " " at a remote repeater location
- thirteen-30 " PCM (Oct/Nov. 1979)

Staff: Currently there are: ST02, TO (2), Tech (4), A. Tech. CA Cleaners (1.5). Same staff after cutover. There have been staff changes. Five of the staff have full training in ARE 11.

- Note:
- One of the fastest growing exchanges in Adelaide (Mixed residential/industrial area).
 - Penfield PABX (WRE) connected to the Group Sel.
 - High construction branch activity
 - Salisbury area suffers from substantial unemployment which might affect staff attitudes to redeployment. There were other unsettling events in the history of Salisbury exchange which need to be considered (see below).
 - At least four members of the existing staff have been long enough in the Salisbury exchange to have experienced the whole of the history as below.
 - As of June 1980, the exchange has not settled to the Ompos 2 operation.
 - There was a major outage.

- History:
- Before 1965 the area was served by a CB multiple exchange not on the site.
 - In 1965 the CB exchange was closed and 2K lines of ARF-102 was commissioned.
 - In 1969 Salisbury and Elizabeth exchange districts were amalgamated (Salisbury 3K lines, Elizabeth 2.6K lines).
 - In 1974 Salisbury and Elizabeth exchange districts were deamalgamated. Salisbury exchange was equipped with 7K lines.
 - Installation of ANA-30 equipment started, necessitating building modifications and causing inconvenience to staff.
 - June 1977 ARE 11 Ompos 1, Lev.4 was cut over and later simulated remote operation to test the effectiveness of EMC maintenance organisation was tried.

- ATEA industrial action in August 1978 led eventually to a dispute during which most of the maintenance staff were stood down for refusing to work as directed (to connect data lines to EMC in Adelaide). Immediately after the cessation of industrial action, the four staff members to be redeployed from Salisbury exchange were notified. A month later the exchange was brought under EMC control (first in SA). The redeployment plans, however, were not fully implemented.
- In July 1979 the trials commenced and the exchange operation was changed from the EMC to the ESC scheme.

Semaphore EMA

Three exchanges make up the EMA with Semaphore as the head exchange.

Equipment: Semaphore - 8K lines ARF-102
 Pt. Adelaide - 6K lines ARF-102
 Osborne - 2K lines ARF-102

Staff (at nominal locations):

ST02, ST01, T01(2), Tech (7), AT (2) CA Cleaner (1 + part time).

- Note:
- Commercial, industrial and residential area.
 - The distances between the exchanges are 3, 5 and 8 km
 - The district is also responsible for provision of shipping services (at a short notice) at Pt. Adelaide/Outer Harbour.
 - The ST02 deploys the staff on a "needs basis" subject to consultation/discussion as required.
 - The scheme is on a 3 year trial to conclude with EMC/ESC trial.

Unley Exchange (EMC)

Single district exchange.

- Equipment: 3K lines SRB
 3K lines SXS pre-2000
 12K X-bar cutover to ARE 11 in February 1979.
 The equipment is arranged on two floors. There is one MDF.
- Staff: Pre cutover - ST02, T01 (3), Tech (5), AT (3), CA, Cleaner (1.5).
 Post cutover - less 1 Tech and 0.5 Cleaner plus 1 AT.
- Note:
- The covered area is almost entirely residential.
 - Medium growth.
 - There have been changes in staff as well as OIC, and the originally envisaged redeployment figures have not been reached due to local problems. The efficiency figures are therefore not as good as planned. Some allowance needs to be made for the step component.
 - The day-to-day work is organised in three cells and staff are rotated around.
 - There were two major outages - one on 15 March 1980 due to a design fault in MUX (unprovoked) the other on 22 March 1980 due to inadequate procedures (provoked).

Victoria

Collingwood Exchange (ESC)

Equipment: - 5K lines SXS
 - 8K lines of ARE 11, L.1 were cutover in July 1979, later updated to Omp. 2, L.3.
 - Step tandem, 24 hrs shift operation.

Staff: Pre-cutover - ST03, ST02, ST01 (5), T01 (2), Tech (9), AT (7), CA (1), Cleaners (2).
 After cutover - less 1 Tech and 1 AT, plus 0.5 CA.

Note: - The exchange is located in an industrial area.
 - The SXS equipment consists of 2000 type step and pre-2000.
 - The 24 hour shift work absorbs 10 people.

Elsternwick Exchange (EMC)

Equipment: 5K lines of pre-2000 SXS.
 6K lines of ARE 11 Ompos 1, L.4, was cutover in June 1976.

Staff: ST02, T01, Tech (2), AT, CA (0.5), Cleaner at June 1980.
 - No staff changes since the commencement of the trial.

Note: - Predominantly residential area.

Lilydale Exchange

Lilydale exchange is the head station for Mt. Evelyn Exchange (ESC).

Equipment in Mt. Evelyn Exchange:

2.6K lines ARE 11 Ompos 2, L.4 cutover in March 1980.

Staff (Nominally in Lilydale Exchange):

ST02, T02, T01 (3), Tech (3), AT (2), ATT (1).

- Note:
- Residential area.
 - Mt. Evelyn exchnage, normally unstaffed. There is a VDU in Lilydale exchange.
 - ST02, TOs and 2 Techs had full training on ARE 11 equipment.
 - At the time of visit the ARE 11 facilities were not used to the full.

Springvale Exchange (EMC)

Equipment: 19K lines ARE 11, L.1, cutover in March 1979.

- Staff:
- Pre ARE 11 - ST02, TO1 (2), Tech (3), AT (3), CA, Cleaner (2)
 - Post ARE 11 - less 1 TO1, 1 AT and 1 Cleaner.
 - Further redeployment of 1 TO1 and 1 Tech proposed after L.3 conversion.

- Note:
- This is one of the largest ARE 11 exchanges.
 - Mainly residential area. High ISD penetration.
 - High traffic, evening peak.
 - High number of NEX lines.
 - High MDF workload (cable rearrangements).
 - Since the beginning of the trial there has been a lot of construction activity. In effect the equipment has not had time to settle down. Consequently there is higher than average maintenance effort affecting the returned manhour figures.
 - This exchange is one of several which are pure ARE 11.

Whealers Hill Exchange (ESC)

Equipment: 16K lines X-bar cutover to ARE 11, Lev.1 in June 1979.

Staff: ST02, T01, Tech (4), AT, CA, Cleaner, the same as pre cutover.

Note:

- A large metro exchange.
- Industrial area. Some ISD.
- High number of NEX lines.
- Since cutover there has been no construction activity. Consequently the equipment had plenty of time to settle down.
- ESC assistance has been requested on only one occasion.
- This is a pure ARE exchange of particular interest in the trial.

Western Australia

Attadale (EMA)

Attadale is the Head station for: Apple Cross
 Bateman
 Palmyra

Equipment: Attadale - 6K lines ARF) ARE 11 cutover not until
 Apple Cross - 8K lines ARF) after 1981
 Bateman - 5K lines ARF)
 Palmyra - 5.6K lines ARF

Staff: ST02 - 1 at Attadale
 ST01 - 1 at Attadale and 1 in Apple Cross
 Tech - 2 at Attadale

Note: - The staff regard variety as being good for staff development.
 - The productivity figure is good (0.4 mhrs/st)
 - The performance of the exchanges is within the standard
 - The distribution of work is in the proportion of: 20%
 MDF, 50% switching maintenance, 30% clerical and cleaning.

Bulwer (E'IC) Exchange

This is a single district, city exchange.

Equipment: 8K X-bar lines, plus 60 high calling rate (PBX/PABX) and
 400 large groups lines. Nearly 17K stations. ARE 11
 Ompos 1.5, L.1 was cutover in May 1979.

Staff: Before cutover - ST0, Tech, A Tech and 0.8 cleaner.
 After cutover - ST0, Tech & 0.3 cleaner.

Note: - Slow growth area (2½% pa)
 - Fairly high NEX load.
 - Mixed small business and suburban area.
 - The work load is high, sufficient to keep both staff very
 busy.

- High productivity figure (0.27 mh/st)
- There is good co-operation between the exchange and the EMC.
- The performance of the exchange is within the standard.
- Some problems with air-conditioning.
- Staff are not satisfied with arrangement for cleaning.

Central Exchange (Not in trial)

Equipment: 13K SXS lines*, 24 hrs exchange, control station for Metro area.

Staff: ST03, ST02, ST01 (4), T01 (2), Tech (12), A Tech (6).

- Note:
- The need for a large staff is on account of shift operation.
 - Considering that the switching equipment is SXS the productivity of 1.1 mhrs/st is good.
 - The exchange performance is within the standard.
 - The exchange is not due for upgrading for some time yet. The staff observations are of particular interest in that they are not directly involved with new technology.

Cottesloe Exchange (EMC)

Single district exchange.

Equipment: 12K lines X-bar cutover to ARE 11, Ompos 2, L.3 in April 1980.

Staff: Pre ARE 11 - ST02, T01, Tech, A Tech, Cleaner (0.5).
Post ARE 11 - ST02, A Tech, Cleaner (0.5). One Tech reports to Cottesloe exchange (pending redeployment) and then works at Rottnest Island if required, or carries out work specifications at Cottesloe.

- Note:
- Efficiency is not as high as planned (see staffing above): 0.36 mhrs/st.
 - Staff claim that cutover was premature, without adequate tests. Problems existed after cutover.
 - There have been problems with staff, including Rottnest Island c.f. record of ATEA action.

* Includes 5K services which will be working via Wellington.

Mullaloo Exchange (ESC)

Equipment: 8K lines cutover ARE 11, L.1, Ompos 1.5 cutover in Oct. 1979.

Staff: The exchange is unstaffed, and is maintained from the EMA head station in Wanneroo. There is a data link to a terminal in Wanneroo. The staff at Wanneroo EMA is: ST02, ST01, Tech (2), A. Tech, 0.5 cleaner. During the trial one technician was promoted to T01. Otherwise no changes in staff from pre-cutover. Four of the staff are fully trained in ARE 11.

Note:

- Two major failures have occurred. No reason has been found for the second failure.
- The area around the exchange is principally residential with a low calling rate.
- High growth area (approx. 1000 lines per annum).
- The performance of the exchange is within the standard.

Tuart Hill (EMA)

Tuart Hill is the Head Station for: Hamersley (ESC) exchange and Girrawheen (ESC) exchange.

Equipment: Tuart Hill - 12K lines X-bar. Y tandem. VDU for ARE 11 is installed in exchange.
 Hamersley - 14K lines ARE 11 cutover in May 1980, L.3, Ompos 2.
 Girrawheen - 7K lines ARE 11 cutover in June 1980, L.3, Ompos 2.

Staff (at nominal locations);

T/Hill - ST03, ST01, T01, Tech (3), AT, cleaner.
 Hamersley - ST02, Tech, A. Tech, cleaner (0.4).
 Girrawheen - Tech.

Note:

- A fast growth area (15% pa)
- There have been changes in staff.
- With one exception all ST0, T0 and Tech staff have full ARE 11 training.
- ST02 from Hamersley spends some time in T/Hill using VDU and the Terminet.
- Girrawheen cutover late in June. Had not settled down at time of visit.
- Major disruptions to traffic occurred during conversion. Hamersley can be said to have "settled"
- The performance of the exchange is within the standard.

8.2.C FEEDBACK ON INTERVIEWS WITH STAFF IN EXCHANGESC.1 State "A"

"Give me the liberty to know, to utter, and to argue freely according to conscience, above all liberties".

John Milton

(i) Observations on Telecom

- It is not what Telecom is doing but how it goes about it that is of primary importance.
- Telecom is making us "feel as idiots" (STO in an EMC exchange, referring to the board change procedure under instructions from EMC).
- Telecom gave assurances to the effect that "you are not going to be retrenched" and yet "we were stood down" (STO commenting on events during the recent industrial action).
- Criteria for staffing of exchanges were never discussed with the people involved - this is bad (STO).
- All DTMs and IPMs should be trained in management and human relations.
- Telecom PR is poor.
- Telecom has a poor public image, at least not as good as it used to be (STO).
- Those who complain about Telecom do not know what it is like outside (OIC).
- Technicians in Telecom have easy life (STO).
- "Telecom is rushing into new technology".
- Lots of money is wasted in Telecom because of bad planning. For example ... "the silly equipment extensions in small units".... Surely this must be uneconomic and causes problems for maintenance staff. (OIC of several years of service).
- "They find excuses but I don't believe them".
- "I quietly go along with the system".
- Principal advantages of working for Telecom are:
 - (a) security of employment (frequent comment)
 - (b) free training
- Relation with management is poor. It used to be better (referring to APO days).
- "No complaints" (TO).
- There is no involvement of staff in decision making (frequent comment).

- "Management does not talk. But there are staff meetings in other districts".
- "Lots of paper information but no human contact" (STO).
- Telecom should enter new areas of activity and thus absorb surplus labour (TO with many years of service).
- Telecom has visions of economy but has "no idea where to shift people".
- Many of Telecom promises and assurances have not been met.
- They (Telecom) have not explained reasons for centralization.
- Staff information bulletins are confusing: this is the reason why staff are not reading them. But they are more likely to read them now.
- "I've joined Telecom (APO then) because at the time I was offered a secure and better paid job. This has changed".
- (In response to my enquiry) "... consultative meetings in the district: they're dying ... Sectional meetings are irregular (STO)".
- The recent industrial action was "bullheaded". It did more harm than good.
- "It's easy to talk about redeployment. In this State people have nowhere to go ..."
- "I've joined Telecom with one ambition in my mind: to be an OIC. With the way things are going now I don't think I will ever be one..."
- "Telecom is out to get money!!" (TO).
- There is a lack of trust in Telecom planning.
- "There is fear of business - organisation".
- "Telecom never stood down anyone before. In 1978 they did. Can we trust them in the future?"
- Telecom is not as good as APO was (meaning that the management policies are now tougher).

(ii) Interaction Between Telecom & Unions

- "The trial is a smoke screen".
- "Why can we not get together and work it out?"
- "Telecom management and ATEA by their actions are undermining trust".
- During the industrial dispute "things got a bit out of hand".
- Telecom makes a better case. ATEA have not the expertise or the resources to make a sound proposal.
- ATEA should not mix itself in politics but should look after its members.
- Militant unions destroyed communication with membership (STO).
- Major decisions should be by vote...
- Communication between staff on one hand and the management and the unions on the other is poor. "Neither seem to have the time to talk to you" (TO).

- ATEA paints a gloomy picture but Telecom does little to dispel the fears (OIC).
- There are negative attitudes on both sides.
- People don't understand the decisions made. Someone should explain it to us. As it is, management and ATEA executive are too busy fighting their battles rather than caring for us. (OIC of an EMC exchange).
- We think some decisions are foolish.
- Too much bureaucracy. eg, the clerical work is getting people down. (OIC).
- There is a "paper warfare" between Telecom and Unions, which does not help anyone ...
- There is lots of paper information on both sides, but little human contact (STO).
- "We now lack the skill... of what to talk about" (STO).
- "ATEA written information may be correct but leaves me cold: I do not know these people..." (STO).
- "Unions have just as big problems in communication as Telecom management (STO)".
- "They (ATEA) say that membership is lethargic, but they have to come out and talk to the people (STO)".
- "Local branch of ATEA better than the executive".
- "There is lots of gossip, ignorance and fear".
- "The two sides must talk to each other" (several comments to that effect).
- "There is lots of bickering between management and ATEA but no one cares for us" (STO).
- There is dogmatic approach on both sides.
- Unions have only themselves to blame: lots of internal squabbling and little action for our good.
- "I think that proper training should be provided for Telecom management and for union executives" (STO).
- "ATEA have not got the capacity". (Meaning they are at a disadvantage in that they do not have the necessary expertise) (TO).
- "ATEA do not know where they are going: they vary their stance".
- "They (ATEA) write a lot and people switch off: not enough verbal communication."
- "I don't believe all this published information".
- "We had a visit from the (ATEA) executive members, but they were in a great hurry...."

- "It would be much better for all if they (Telecom and ATEA) worked together".
- "ATEA is concerned with too many things".
- "On technical side ATEA lacks expertise on some issues. They are not really concerned with people for peoples' sake".
- "... while all this is going on, the image of Telecom is going down and so is staff morale.." (OIC).
- Telecom is trying to do too many things at the same time.
- Not what you do but how you do it that matters most. (Other comments in the same spirit).
- "Some are aggressive and driven by fear..."
- "I had a wish to be an OIC. Now there is no humanity in the organisation. I no longer wish to be an OIC...." (STO).
- I view the statements in the recent Telecom circular with suspicion. I do not believe the statements on redundancy ("... immediate and substantial improvement...."). It's all politics. The same goes for ATEA (STO).

(iii) EMC/ESC

- "I like EMA and the team approach best of all. It is more challenging ..." (OIC).
- Our relation with ESC is good (OIC of an ESC exchange).
- EMAs are good but there is a security problem with unattended exchanges. It also takes longer to clear a fault in an unattended exchange.
- I would be for EMAs had it not been for the fact that, with EMAs, there are fewer OICs and therefore the chances of promotion are less.
- The principal thing that is wrong is the way it was implemented.
- Staff here would like to have full control of the exchange (STO in an EMC exchange).
- To have a VDU in the exchange and at least implement category changes would improve the morale of staff (STO in an EMC exchange).
- In an EMC exchange the job enrichment is in the negative.
- In an EMC exchange the staff have not the full training and thus they are made to feel inferior (TO in an EMC exchange).
- I see nothing wrong with the EMC organisation (STO).
- Some problems with EMCs will sort themselves out.

- Our relation with EMC is good except for one man there (STO in an EMC exchange).
- There is a hierarchical system here. I am not allowed to ring up EMC except with the consent of the OIC (TO in an EMC exchange).
- Rules for interaction between the exchange and its EMC are not clear.
- I believe the customer gets a better service from an ESC exchange. (It was a personal belief of a technician in an ESC exchange).
- I think the best solution for the future might be the EMA where the head station has responsibility for the ARE 11 component. (Other comments in this spirit).
- EMA could be a mini-EMC. This would be acceptable (OIC of an EMC exchange).
- The ESC people have not enough involvement with the equipment to retain their expertise for long (STO in an EMC exchange).
- With EMC there are demarcation problems.
- ESC staff do not have enough to do to retain their expertise (OIC. Other comments in this spirit).
- EMA would give flexibility. It would be better than EMC or ESC. There would need to be provision for rotation of staff (STO).
- Every EMC exchange should be fitted with a terminal so that information on, for example, subscribers could be obtained. (STO in an EMC exchange. There were other comments to that effect).
- What is wrong with EMC is the poor communication that there is between EMC and this exchange. There should be regular meetings of exchange OICs and EMC staff. We hardly ever see them (OIC of an EMC exchange).
- I would like to work in the EMC itself (TO in an EMC exchange).
- Chances of promotion under the EMC organisation are not as good as with the ESC.
- One of the problems with the EMC is that the responsibility for the switching equipment is divided in a not too well defined way. In addition, the "EMC does not care" for the state of the equipment not directly under its control. There is not much of a team spirit.
- "I am thinking along a compromise.... perhaps an EMA. Then we all get a look in..."
- "I think people in an ESC exchange are happier ..." (Tech in an EMC exchange).
- A multifunctional district is a viable alternative to EMC/ESC.

- "We are losing all the supervisory equipment: it's a traumatic experience" (OIC of an EMC exchange).
- "Subscriber category changes should be carried out in the exchange or the business office and not in the EMC. Anyhow they don't want it." (OIC of an EMC exchange).
- The solution is to have an EMA with a cell responsible for the ARE 11 component.
- I believe that an EMC exchange is more likely to get into real trouble than an ESC exchange. (Opinion of an ESC exchange OIC).
- EMC is sometimes too busy to attend to problems which the exchange staff bring to their notice.
- I can see the reason of having alarms extended to the EMC but what is the purpose of removing the alarms and supervisory equipment from exchanges?
- "Some of us have personality difficulty with the EMC staff..."
- "Some of us no longer care about the outcome of the trial. We just want it to end as soon as possible...."
- "There's got to be a compromise" (STO).
- EMA provides for better efficiency. (TO).
- To my mind the trial has shown that one can operate an exchange in either the EMC or the ESC mode. (TO in an ESC exchange).
- "An expert team fixes things better and quicker" (TO in an exchange without the ANA 30 equipment).

(iv) Comments on ARE 11 Equipment

- Manuals are deficient.
- Level 1 makes no more than 5% difference in exchange activity.
- The ANA 30 equipment makes some difference to the exchange activity, but not very much. (The exchange was at the time operating at Level 1. There were similar observations coming from other exchanges).
- I am particularly interested in the ARE 11 equipment and would like to gain more knowledge (TO).
- Anyway AXE will come soon so what's the fuss about?
- "I think that centralised operation is a foregone conclusion..."
- The old registers were a nuisance. ANA 30 equipment is far superior.

(v) Comments on Work Practices

- We keep no record of blocking activities (OIC).
- "Don't like the extra paper work" (OIC referring to the extra documentation required for the trial. Other comments in the same spirit).
- In a large exchange there should be several OIC positions.
- On the whole most people specialise (OIC).
- "With the pressure of work which we have here, some things just don't get done, but the customer would not know. We do get the occasional complaints, usually from a doctor....." (OIC).
- Normally it is necessary to have someone in the exchange.
- Workload here is less (than in my other place of employment). One is not under pressure here to do a lot of work as in (my other place of employment). (TO who previously worked elsewhere).
- I believe the level of staffing in an EMC exchange is adequate. Some exchanges are overstaffed. (OIC of an EMC exchange).
- In this exchange we work in cells. (Staff specialise but the cell leaders rotate on a monthly cycle. (OIC).
- MDF work should not be done by a TO. Young girls could be trained to work on an MDF in a matter of few weeks. In some places this is done. The girls are good at it (OIC).
- In this district we were asked to get rid of 30 people, but in this state they have nowhere to go....
- Bureaucracy (referring to clerical work associated with the trials) is getting me down. (STO in an EMC exchange).
- In this district there is a consultative group. But there is little information on redeployment.
- "Tests are disappearing to NPAC. We don't like it. But, there are promotional opportunities in NPAC so the Unions are for it".
- I believe the remote testing is less efficient (STO).
- They (meaning EMC) know what's going on. We don't. That's one of the reasons why our job satisfaction had decreased.
- Some of us would get greater satisfaction from looking after several exchanges (referring to EMA) but it would not suit others (STO).
- Decisions affecting the workforce should be made by us through the medium of the district consultative group and not by Management or the Unions. Neither EMC or ESC organisation provides for this.

- "(Years ago) when we went through the training, the instructors kept telling us that the purpose of the training was to prepare us for STO positions. In those days one expected to become an STO in about 8 years and an OIC after about 10 years. This has changed leading to dissatisfaction" (OIC).
- Implementation of the redeployment policies is done in an unsatisfactory way.
- We are not allowed to work on the ANA 30 equipment to the extent that we would like to.
- With the many faults left behind, we were let down by the installers.
- "We aim above the target figures" (STO).
- When we were young and still in training the instructors had encouraged us to take interest in the equipment and to keep maintaining it in first class condition. Now we are told to leave the equipment alone (TO).

(vi) Comments on Training

- "Good but difficult...." (TO).
- Course quite good but not enough emphasis on the practical side of maintenance.
- Theory is easily forgotten.
- Best way to learn is to use the equipment (OIC).
- Too much depth and detail in the course. (A frequent observation).
- On-site learning is effective.
- Not enough training (Tech in an EMC exchange).
- I would like to have full training, just so as not to feel inferior to others. (OIC of an EMC exchange. Other similar comments).
- "I would take any course offered to me" (TO).
- No need for full training. There is no opportunity to use the knowledge. (STO in an EMC exchange).
- I think most of us would prefer full training (STO).

(vii) New Technology

- We are concerned about the possibility of retrenchment.....
- What's going to happen about "the jobs for our kids....?"
- I have never been consulted on redeployment matters. Some people get only a few day's notice. (OIC).
- Industrial Relations are not doing a proper job of redeployment.
- Redeployment was not discussed with those affected. (Other comments of this nature).

- Those who are ambitious and are able are likely to benefit from new technology. But what about others?
- "If you volunteer for redeployment you get nothing. Obvious answer is not to volunteer". (There seems to be an irregularity here or a mis-understanding due to poor communication. Under the circumstances described to me the people involved should have had the usual compensation. However, comments in this spirit came from more than one source).
- "I believe that with the new technology the quality of service is decreasing". (This was a personal belief of the man interviewed. He held that belief in spite of the fact that the performance of this particular exchange was within the standard).
- Uncertainty of the future has a major effect on the young.
- Redeployment is particularly worrying since there is no alternative employment.
- "The problem is that I have never learnt how to study..." (A Tech).
- I am too old to be trained for ARE 11. (There were other comments to that effect. It is not clear to what an extent this is a real problem or a rationalisation).
- With VDUs, boredom could be a real problem.
- Basically there is nothing wrong with the new technology except the rate of its introduction.
- New technology should be discussed in consultative groups first. One should make people feel that they are involved in the solution to the problems. (In discussion it became clear that the issue was basically that technology affects the workforce directly and therefore they should have a say in its introduction and the matter should not be left for management or the unions to decide).
- "Government should be creating jobs".
- "SPC is a threat". (T0).

(viii) Comments on Job Satisfaction (JS)

- "JS is synonymous with pride in what you are doing". (Several comments of this type).
- I like acting for the OIC (ST0).
- Working on step-by-step equipment gives you little JS. (OIC). (There were other comments to that effect).
- Jumpering on MDF is a job with low JS (OIC).

- MDF and test desk are boring jobs (OIC).
- X-bar fault tracing is a satisfying job.
- EMA provides flexibility and thus a better environment in which a greater variety of people, each reaching JS, can be accommodated. But to be an OIC of an EMA calls for higher degree of finesse.
- Our exchange is particularly busy and we work harder than most but we get praise from no one. (There were other comments to that effect).
- FDC might be useful, but they take some fun out of our work,
- JS is something within you that you receive as a result of a well-done job.
- Fixing faults gives high JS. (Frequent comment).
- Being an OIC gives you a high job satisfaction. (There were other comments in this spirit).
- Ever since the beginning of my training I had one aim: to be an OIC. In my case I have reached this aim. Others might not be so lucky.

(ix) Some Additional Points Arising from a Visit to an EMA

- If staff profile can be maintained then there is no fundamental objection to EMA.
- Some points in favour of EMA:
 - . flexibility of staff movement
 - . easy to cover for unforeseen absences
 - . schedule need not be tight
 - . can cater for larger range of personal likes and dislikes
 - . with ARE equipment, staffing problems could be easily overcome
 - . quality of service unaffected.
- Reservations concerning EMA:
 - . additional time has to be spent in travelling
 - . feeling that "you cannot always be there when needed"
 - . some people prefer a small environment
- The local consultative committee works well. Topics discussed include safety, EMA performance, grievances, etc.

8.2.C FEEDBACK ON INTERVIEWS WITH STAFFC.2 State "B"(i) Observations on Telecom

- Can never get the right information from Telecom as regards future development and its effect on staff.
- Telecom seems to have an unbending attitude.
- No means of knowing what is going on.
- Principal advantage of working for Telecom is the permanency of employment.
- Personally I would prefer ESC (STO in an EMC exchange).
- One reason I joined Telecom was that in those days (PMG) the chances of promotion were good. But this is no longer so (OIC).
- I believe there are more complaints from customers now. (This was the opinion of this STO but no quantitative data was given).
- Telecom offers reasonably good service to customer (Tech).
- The large profit made by Telecom is irritating. (In discussion the Technician referred to the \$190M profit reported for the last financial year, but could not recall what percentage of the total invested capital this figure represented).
- They (Telecom) are after as much money as they can get in the shortest possible time. Telecom should instead give customers better service for less money or employ more staff (Tech).
- They (Telecom) are cutting down on everything possible.
- "We would like to know what is going on; no one tells us" (STO).
- The subscribers are getting a fair service (OIC).
- "Staff information bulletins don't mean much".
- Promotion will be limited in the future: I see no solution to it (Tech).
- I fear that Telecom will transfer me out of the area (Tech).
- Redeployment is carried out badly.
- I could not complain about work conditions (Tech).
- I would willingly go to lines section but nobody even asked me.
- Does ARE 11 = MIRP (Management Initiated Retirement Programming)? (An observation by a Tech.)
- Profit motive leads to human conflict.
- I believe that Telecom should have three objectives in the following order of priority: (1) High standard of service

to customer, (2) Staff training and welfare, (3) Profit.

Instead they (Telecom) put profit first (STO).

- More effort (by Telecom) should be put into personal development of OICs. Now it is done to a limited extent.
- Little things matter.
- Remove the feeling of threat.
- Spoken word is the only effective way of communication.
- IPM should have more time to spend with staff.
- Telecom has not done enough concerning human problems. There is a job for a psychologist or an independent assessor/advisor.
- Some believe that the morale among managers is not very good.
- Why not anticipate problems and meet them before they grow bigger.
- Years ago, when engineers were in charge, consultative approach was working fairly well, but not now (STO).
- The profit theme is played too hard to be stomached (OIC).
- In Telecom there is a tendency to be more efficient now.
- "In spite of its shortcomings, on the whole Telecom has a better management now" (OIC of an ESC exchange).
- Redeployment should be better planned.
- Telecom does not show concern for social obligations.
- Telecom's first objective seems to be profit: this gives it a bad image (frequent comment).
- Staff information bulletin should help to build up confidence in Telecom. It is doing just the opposite (OIC).
- - "Hear this attitude...." in Telecom is disliked by many.
- Originally I've joined Telecom (APO) because it was the easy way out (TO).
- "Nobody has real control over Telecom..." (TO).
- "Telecom has profit as number one objective. It should be good quality of service to customer...." (OIC).
- "Originally consultative meetings were good. They have now been largely dropped".
- "Everyone is after the almighty dollar". (TO).

(ii) Interaction between Telecom & Unions

- Unions (ATEA) on the whole are reasonably responsible compared with others (Unions).
- On the whole, job conditions are good with Telecom. ATEA is a bit too radical (OIC).
- "They (referring to Telecom management and ATEA executive) should cool-off first, then talk" (OIC).
- Work conditions should be discussed at workplace by those who are affected by the decisions made and not somewhere in distant offices (referring to Telecom HQs and ATEA offices).
- The written communication from Telecom or ATEA looks like propaganda literature.
- Squabbling between Telecom and Unions must stop; it is doing everyone a lot of harm (OIC). (There were other comments in this spirit).
- "The literature produced by both sides (Telecom and ATEA) is not very good, but is of some help in making my mind up" (TO).

(iii) EMS/ESC ISSUE

- It is unsatisfactory for a TO in the EMC to direct an OIC (ST02) as to what should be done in his exchange. (OIC in charge of an EMC exchange).
- In an EMC exchange "they are board changers" (OIC of an ESC exchange).
- EMA would be acceptable but not EMC (OIC of an ESC exchange).
- EMC is more efficient and they (EMC staff) have greater expertise than the ESC staff. But, because of its remoteness, EMC will take longer to fix faults than the ESC exchange would (Tech in an ESC exchange).
- We could look after subs' classification. Anyhow EMC don't want the job (OIC of an EMC exchange). Or better still, District Office could do it for the whole district with one VDU. We should have a VDU in the exchange.
- On balance, we are not better off with EMAs or EMCs (Tech in an EMA working in the EMC mode).
- I prefer ESC (to EMC) because my promotion prospects are better there. (ST01 in an EMC exchange having hopes of becoming an OIC).
- I see no advantage in ESC (OIC of an EMC exchange).
- There are no problems now while the knowledge is fresh. But after 5 or more years, there could be problems with retention of expertise. Should this happen, then Telecom could provide retraining courses (OIC of an ESC exchange).

- An EMA could be a solution. But there is a limit on size, and travelling is a problem.
- There is confusion as to which account a particular job should be booked to (OIC).
- To me ESC is more satisfying (OIC of an ESC exchange).
- With ESC there is the advantage of being on the job.
- With ESC you have a higher JS: you are in charge of your own exchange (OIC of an ESC exchange).
- There are sometimes problems in locating precisely the faulty board (TO in an EMC exchange).
- There is not very often a need for them (EMC) to come to the exchange.
- ADR and Stats meters should remain here (the exchange) even at the level 3/4. The equipment might be a help in diagnostics and nothing is achieved by removing it. (OIC of an EMC exchange).
- There is confusion about which work should be booked to which account (OIC).
- Originally EMC controlled exchanges. Now they have too much to do to interfere. (TO in an EMC exchange).
- "Ompos was off the air. EMC did not even know..." (TO in an EMC exchange).
- "I think there is poor co-operation with the EMC".
- EMA might be the best solution (several comments in this spirit).
- "We don't go to every station each week" (OIC in charge of an EMA operating in the EMC style).

(iv) Comments on ARE 11 Equipment

- "Our equipment was cut-over too early for political reasons. Thus we continue to have problems which could have been avoided if only there was less hurry".
- "There are too many types of equipment in operation now...." (Meaning that servicing is getting more demanding: STO in an ESC exchange).
- So far we had no faults in ARE 11 (OIC).
- With modern equipment it is better to have specialised staff to operate certain equipment, such as VDU (OIC of an EMC exchange).
- The written information is of limited use. To understand one must work on the equipment.
- With the new equipment I believe that the service to the customer has improved (Tech).
- One board change so far. No faults otherwise (OIC of an EMC exchange).

- I believe that the decision to introduce ARE equipment is a political one that will benefit only the manufacturers (TO).
- Lots of errors in manuals (frequent comment).
- Installers must keep to the timetables. As a result they may leave an exchange with faults and some equipment blocked and then move to another site.
- With the limited knowledge available here, the Ompos 2 operation is not easy to implement. Some exchanges are not using many of the facilities (frequent remark to that effect).
- Fault manuals for Ompos 2 incomplete (several remarks to that effect).
- Installers sometimes do not do a good job. In one instance they even left a fuse out. Some fellows are like that (OIC).
- In some cases the exchange was left by the installers with programmes untested (OIC).
- "ARE 11 is so reliable that people don't think what can happen with difficult faults".
- "No problem with ARE 11 equipment, except at the beginning" (TO of EMC exchange).

(v) Comments on Work Practices

- "The consultative meetings in our EMA work alright, but those in the district do not" (STO).
- In practice there must be a limit on the size of an EMA on account of travelling time (STO).
- There should have been a survey of work practices and associated problems as is now being done as part of the present trial (referring to the present interview).
- In this EMA we are short of staff (below FYEOP). Travelling takes significant amount of time (OIC).
- In this EMA we work in cells and share jobs in rotation. I believe this is best (OIC).
- These days, there is a great variety of equipment and some of it is quite complicated. It would not be practicable for every one to do all jobs in turn. We must specialise otherwise we lose expertise. (STO).
- In the recent years efficiency went up but this is mainly due to greater proportion of modern equipment and the introduction of better work organisation (OIC).

- In this exchange things work out smoothly. This is so because we are reasonable people.
- FDC is doing a good job (Tech).
- Greater attention should be given to lines and subs equipment. This is more directly relevant to quality of service. Caring for customer must show (Tech).
- Work has increased not the staff.
- Not enough to do to keep up expertise. Looking after 3-4 exchanges might be better (STO of an ESC exchange).
- One should design the job to match the personality of the worker.
- There are very few human induced faults.
- Sub. category changes should be executed from the exchange or the Business Office. (OIC of an EMC exchange. Comments to that effect are quite frequent).
- Level 1 operation makes little difference to work load in an exchange. Better diagnostics facilities is an asset (OIC).
- If the ARF equipment were brought up to standard then it could function without attention for a considerable time (several comments in this spirit).
- I believe area operation (EMA) is satisfactory but to be effective one must try alternative work organisations (STO).
- EMAs seem to work quite well (frequent observation).
- Have not used all facilities available with ARE 11 Ompos 2 (OIC of an ESC exchange).
- Some people like moving around, others don't.
- "Our consultative meeting is informal, in the tea room" (OIC).
- In this exchange the OIC keeps arguing with staff. This is bad for morale (TO).
- A married woman is by far a better worker (OIC).
- ADR not really useful, takes a lot of time (TO).
- "Telecom is creating problems with customers: subs should communicate direct with technicians" (TO).
- "There is always a need for someone in an exchange".
- "One man cannot comprehend or service a wide variety of equipment. We have to specialise" (TO).

- "The quality of maintenance has declined because of staff shortages", (OIC).
- "Our EMA is not large enough to be viable" (OIC).
- "No one to do preventive maintenance. This is unreasonable".
- Too much paperwork, leaving little time for technical work (T0).
- The relation with the OIC in our exchange is not very good.
- "With all the work pressure I am mentally exhausted at night" (T0).

(vi) Comments on Training

- Appreciation course adequate as introduction, but would like to have further training (ST0).
- I consider the appreciation course sufficient for our needs but others would like a full course (OIC of an EMC exchange).
- I would like a chance to learn more (ST01).
- Involvement in installation activity the best training of all.
- The course was rushed (OIC of an ESC exchange).

(vii) Comments on New Technology

- Computers are taking over from people. It frightens me what is going to happen to the workforce (Tech).
- "What are they trying to do" (referring to those who run the country).
"More efficient to what end?"
- I am concerned about the future.
- "New technology is deskilling".
- The human component must be considered (ST0).
- "Unless human component is considered, new technology will lead to conflict".
- A solution to problems generated by new technology is to show more concern for people.
- "Some of the problems we have in the country are due to new technology but more often it is due to a changed attitude in the young. We have spoiled our children and this is the result". There have also been changes in the policy of Telecom which are not for the good of the country (OIC).

(viii) Comments on Job Satisfaction (JS)

- "Finding and fixing faults under minimum supervision" (Tech).
- If there are too many jobs to do, the JS goes down.
- "Personally I prefer to stay put". (Meaning that he dislikes being moved around as directed from time to time).
- No one likes working on step-by-step equipment (OIC).
- JS = personal pride in the job.
- You make your own opportunities (STO).
- Wider responsibility leads to enhanced JS (STO).
- If one works to a plan, then JS is enhanced.
- Happy doing the work = high JS.
- As the years go on, there are fewer people who like MDF work (OIC).
- Finding faults and fixing them gives high JS (frequent comment).
- Feeling good after work.
- At least half of JS comes from being in position of authority.
- "Being able to say: My exchange" gives you high JS (OIC of an ESC exchange).
- To be OIC is most important in JS (TO).
- To have responsibility for something big.
- "Being off the air is a disgrace".

C.3 State "C"(i) Observations on Telecom

- "Management and us are miles apart" (OIC).
- "The management course was good" (OIC commenting on a course which he was asked to attend).
- Not enough human contact (frequent comment).
- In our district human communication is poor. In some other districts it is better.
- Principal reason why I work for Telecom is security (frequent comment).
- "I am just annoyed with Telecom" (AT).
- "The older you get the more you appreciate Telecom."
- ARE is used by Telecom as a way of reducing staff (TO).
- Staff shortages are annoying (OIC).
- Relation with management and clerical staff leaves much to be desired.
- "They" do not know what is going on in exchanges.
- "The IPM does not help". He is just a "yes-man". (STO).
- "What are they trying to prove?" (With reference to staff information bulletin).
- I am quite happy with Telecom (Young tech. Other comments in the same spirit).
- I dislike the recent trend in "indiscriminate" reduction of staff in exchanges (OIC).
- Some of us would be quite happy to be redeployed to either software or to electronic PABXs, but Telecom has not said what the opportunities are.
- Telecom should stay a monopoly.
- There is poor verbal communication between management and staff.
- Telecom news is presented in a poor way: it gives impression that management is "covering up".
- Telecom is not putting enough effort into PR Image of Telecom needs to be improved.
- I believe that Telecom has always responded to Ericsson's propaganda in buying equipment that does not come up to expectation.
- The management does not understand human problems in exchanges.
- The principal complaint is not about what Telecom does but rather how it goes about it. (Similar comments have been made in other states).
- In this exchange the staff regard the IPM as the ideal man for the job but they do not see much of him. Good communication with management is important.

- The retirement in Telecom is good.
- I think "Telecom is a marvellous place to work in". (Female A. Tech).

(ii) Interaction Between Telecom & Unions

- There is a dislike of "bickering" that goes on between the management and the unions (c.f. similar comments in other states).

(iii) EMC/ESC Issue

- There are imperfections with ESC, but there are more "things wrong" with EMC.
- ESC staff will have problems with retaining expertise. (Several comments to that effect).
- A better way might be to group several exchanges, say 3 or 4, about 50K lines in all, and nominate one of the exchanges as the head exchange to which the alarms from the other exchanges, VDUs etc. could be brought in. In this way the needs of the ARE 11 equipment and staff could be better met than with either the EMC or the ESC. The details of the organisation should not be dictated by the H.Q. but be left for the District to decide. In this scheme one cell could be made responsible for the ARE 11 work. (STO 2 of several years of service).
- The rules of ESC have changed since the beginning of the trial.
- There are problems with ESC and EMC. It should be possible to find a better compromise (STO).
- Our exchange is due for cut-over soon. We feel we are already losing expertise.
- EMC is disliked for three reasons:
 - . opportunity for promotion is small
 - . little involvement with equipment
 - . difficulties are seen in relation to shiftwork.
- ESC/EMA combination is acceptable.
- No one from this exchange would like to work in an EMC exchange. (OIC of an ESC exchange).
- This exchange has good communication with ESC.
- Some of us would like to work in the EMC but not in an EMC exchange (STO in an ESC exchange).
- Should the exchange "come off the air" I could not be certain I could "bring it on" again in a short time. It has never happened to me (TO in an ESC exchange).

- I see little difference in fact between ESC and EMC method of operation. The ARE 11 component is quite small.

(iv) Comments on ARE 11 Equipment

- At level 1, ARE 11 equipment makes little difference to the activity in the exchange.
- Changes in subscriber categories take little time and are easy to implement.
- The novelty has already worn off.
- I consulted ESC on only one occasion (OIC of an ESC exchange).
- Little problem with the equipment.
- For the future, refresher courses should be planned.
- We feel that ESC people might need a refresher course in a few years time.

(v) Comments on Work Practices

- Telecom is determined to do away with preventive maintenance. We feel preventive maintenance must be better because it causes less workstress.
- Contact with District is inadequate. (OIC sees IPM 3-4 times a year. He sees this as inadequate).
- I preferred the old APO days. The present operations management does not know how to go about the job. I would like a closer liaison with engineering (OIC with many years of service).
- There are no District meetings. This is bad.
- Subscriber category changes could be done from the Business Office.
- Best people to work on the MDF are selected older people. One cannot separate MDF work from switching activity.
- Some believe that it is best to have only small exchanges each controlled by an OIC. (The implied belief is that this would maximize one's chances of promotion).
- In this exchange the TOs and Technicians would be only too glad to part company with MDF, but not with any other part of the exchange.
- Some faults are human induced. This is inevitable. But this does not happen very often.
- Some people like working in a large exchange and like the opportunity of being in charge of a shift. Others dislike shift work.
- "Here there are a number of square pegs in round holes".

(vi) Comments on Training

- The ARE 11 course was above the heads of half the students.
- Theory course was rushed through.
- The material is soon forgotten.
- Practical course in Annandale was very good. (frequent comment).
- There should be a follow up course in some 3 years.
- Theoretical course was much too detailed (Yet others felt there was not enough material).
- Not enough emphasis on maintenance practices. (The course is common to installers and maintenance people).
- The course should be designed specifically for maintenance people. (Other comments in this spirit).
- The students in the course form a heterogeneous group. They range in skills from those who are experienced in electronics and with computers to those who have not even seen a transistor.
- Many of the participants have never seen a VDU, yet others are proficient with a micro-processor.
- Much of the theory course is above the heads of the students.
- "I could benefit from the theory course much more now".
- Working with installers is a good way to learn.

(vii) Comments on New Technology

- New Technology is good for the country and Telecom must go along with it (OIC).
- There is fear that technology will inevitably reduce the number of jobs available. Telecom is in a position to improve the situation.
- With new technology "a few of the Techs will make a go of it, others will fall by the wayside".
- Those keen on new Technology will soon "invent games to play with the equipment and in this way maintain their expertise even if there is not enough to do".

(viii) Comments on Job Satisfaction (JS)

- Good promotional opportunities enhance JS.
- Must not be made to feel that you are in a dead end job.
- "My JS is low because of the personality difficulties which I have with some of my staff" (OIC).
- JS is largely up to the man himself (STO of many years of service).

- Some people "are browned off" because of lack of promotional opportunities.
- JS is in the man himself. I see some of them leaving at 4.45 pm and not caring about the job. I know they have low JS, but it is really up to the man himself. Others do the same job well and are happy (OIC).
- In the past years anyone was accepted for training and most of them completed the courses. There should be a better selection of people for the various jobs.
- 75% of JS comes from being in authority. (Other observations in similar spirit).
- I would like to be an OIC. (A young ST0).
- My ambition is to be in charge of an exchange.
- "Being a boss, means high JS" (OIC).
- Right human relations lead to high JS.
- "It's within you" (ST0).
- High JS is promoted through good management.
- No satisfaction from working on step-by-step equipment (c.f. similar remarks in other states).
- "It comes from common sense".
- Must not have too much to do.
- Must have enough to do.
- The equipment must go wrong from time-to-time. You cannot be happy staring at a machine that does not go wrong.
- "OIC must be in full control of the exchange in all its aspects".
- An important component of JS comes from exercise of authority over people. I would rate it as the most important component (OIC).
- Fixing faults is a most satisfying activity (Young T0).
- Having responsibility for a clearly defined area of activity. In this exchange we have a number of cells. A particular ST0 with interest in ARE 11 is in charge of the relevant activity.
- OIC should delegate specific areas of activity to enhance JS among his senior staff.
- "It's running, the way I want it".
- "Being active".
- "Running my own exchange".

- With an average size EMA there will not be enough activity to keep up expertise in the ARE 11 component. On the other hand a much larger EMA, 60 or 80K lines, might not be manageable. (OIC)
- There is confusion about the rules pertaining to the trial. The men do not like the paperwork.
- I consult with ESC if it is necessary. (STO in an ESC exchange).
- If we had "the exchange off the air we could bring the service on again" in 10 or 15 minutes. If we could not, we would get in touch with the ESC. (STO in an ESC exchange).
- I am concerned about my lack of knowledge of the ARE 11 equipment. (STO in an EMC exchange).
- EMC provides centralised control which may be better for "the system".

(iv) Comments on ARE 11 Equipment

- Level 1 operation makes little difference to the workload.
- Some "step-by-step people" have no interest in X-bar equipment. Similarly some people are not interested in the ARE 11 equipment. One should not generalise and expect people to follow one pattern (STO).
- ANA 30 equipment is good. There are very few problems.
- Level 4 faults are very challenging.
- Level 4 equipment is "deskilling".
- Level 4 equipment takes fun out of the work. In the end the customer will suffer. (Meaning that he finds the work now less interesting and this will be reflected in the way he will apply himself to the job).
- "In any case the NSC should have been put on alert..." (STO commenting on an ESC exchange that went off the air. Not his exchange).
- "No faith in the facilities available". (STO in an EMC exchange).

(v) Comments on Work Practices

- I think that the performance figures which we achieve in our EMA are among the best, if not the best in Australia. I ascribe this to the following factors:
 - (a) Dedication of staff
 - (b) In case of shiftwork the practice of allowing the shifts to overlap
 - (c) Good work organisation and maintenance routines (OIC of an EMA. Similar comments received from another area).

C.4 State "D"

(i) Observations on Telecom

- Principal reason for working for Telecom is security of employment.
- The management is insensitive to human needs.
- Staff Information Bulletins are not good enough. The upper level management should talk to people.
- PR is inadequate.
- Work problems should be solved at District level and not as a national issue.
- There should be a consultative committee in every District.
- We do not understand how selection committees operate.
- The high profits which Telecom is making is disturbing (In response to my question whether he (TO) would like to work for a company that made a loss he said "No").
- I would like to know "how Telecom works". (Other observations to that effect).
- Manning of exchanges is now a political issue not a technical one.
- The requirements for TO training are quite arbitrary. For example "all this mathematics and physics is quite unnecessary".
- The examinations are too hard.
- FYEOP is used to push people for more work.
- I appreciate the help which I am getting from Telecom in respect of training which I undertake at my own request (a young TO).
- It is a pity that now the engineering component does not identify itself with the District. Engineers have enjoyed the confidence of technical staff (OIC).

(ii) Interaction Between Telecom and Unions

- Technicians' grade should not be determined by reference to responsibility or seniority but be based in part on skill and ability.

(iii) EMC/ESC Issue

- I would have liked to have full training. As it is I feel deficient in comparison with others. (TO in an EMC exchange).
- An EMA where the head station has responsibility for the ARE 11 component is a good solution.
- EMA is preferable to EMC or ESC, but we do not wish to be exploited (by Telecom) (STO).

- I acknowledge the benefits of EMA-type organisation but I would still like to see a greater number of small independent exchanges because, in this way, I would have a good chance of becoming an OIC (T0).
- Some STOs are underemployed. This is particularly so in a small exchange. (T0).
- EMA is a more efficient way to provide service to customers. (OIC).
- We like EMA; it provides flexibility and a variety of jobs for those who want it.
- In an EMA it is easy to provide for special staff requests such as RDO.
- "EMA is a good concept but Telecom exploited it to its advantage".
- The principle of EMA is great but one needs to examine the way in which it is implemented.
- I believe an average X-bar exchange could be left with no staff for 3 to 6 months at a time with no detrimental effects.
- An EMA could be as large as 30K lines or more.
- An EMA could be 50K or even 75K lines; it depends on local conditions and work organisation (OIC).
- I think an EMA larger than 50K lines might not be manageable. (T0)
- I like EMA. Telecom should experiment with perhaps bigger EMAs. I know it is not everyone's choice but I like it.
- Our EMA works well. We have a consultative committee and we discuss work problems with the OIC. (T0).
- EMAs are good. The opposition comes from people not involved with them.

(vi) Comments on Training

- The material presented should have a greater relevance to maintenance.
- There are side benefits of training, eg, improved chances of promotion (several similar comments).
- Refresher courses will be needed in the future. (Comment from an ESC exchange).
- I would like to do a full course just so I would not feel inferior to others. I think everyone benefits from training. (STO in an EMC exchange. Several comments in this spirit).
- Good training has a positive effect on staff competency and staff morale.

- Full training should be offered to those who can benefit from it. Some had full training just because they happened to be in an ESC exchange but they are not really interested in ARE 11. Others had no training because they happened to be in an EMC exchange but they are eager to learn.
- "Annandale was very good" (frequent comment).
- "Should have Annandale in every state".
- I think there is too much talk about training. "Some are already overtrained". (Meaning that they have little opportunity to use the knowledge gained).
- Telecom should provide retraining courses from time to time. (STO)

(vii) Comments on New Technology

- I see myself committed to Telecom but I see little chance of promotion to a higher grade even though I am more than willing to adapt my interests to new technology. (STO 1).

(viii) Job Satisfaction (JS)

- It is necessary to have a sufficient amount of work to maintain skills and interest.
- Be praised for well-done work.
- Staff should be promoted on merit: "Many techs are browned off" in that they see less able people promoted on account of years of service.
- Feeling good on account of a well-done job.
- "Some get enhanced JS by working with new equipment, eg, ANA 30. It depends on the person".
- We get satisfaction from getting good performance and from showing high efficiency. (OIC).
- Knowing that you are providing good service to customers. Particularly if the praise comes from the customer.
- Sense of belonging.
- Doing something useful.
- Being in authority. (frequent comment).
- Having opportunity for self development.
- Liking what you are doing.
- "Personal satisfaction: it is within you". (OIC).
- Happy doing what you are supposed to be doing. Unfortunately some Techs have too high expectations. (OIC).

- If you have a desire to go to work your JS is high. (STO)
- The JS of an OIC in an exchange which is made to work under an EMC is decreased. (Because his authority has been reduced)
- Being able to work with other people.
- Working on a common problem, eg, consulting NSC, can give you enhanced JS.
- "Having right work load".
- Not being screwed for more effort with less staff.
- People must work at a level appropriate for their temperament.
- Sense of personal accomplishment.
- If I can finish the job unaided I get enhanced satisfaction.
- Being active.
- Working in a happy environment. (Difficult to define)
- Happy doing the work.
- Working to full capacity. Other comments in this spirit.
- Being an OIC. (He has been acting for the OIC. Other comments along this line).
- OIC should state the problem but not the solution. (Tech)
- To have variety.
- "When you specialise and become a real expert and you know that others know it too". (There was another comment along this line).
- When you understand what you are doing.
- Being able to finish the job unaided.
- Having challenge, being active...
- Getting enjoyment from doing the job.
- Sense of personal accomplishment.
- JS is enhanced if you specialise.
- Working in a happy environment.
- JS has little to do with "the best way of achieving an objective" or the most efficient way". Sometimes if you do a job "your own way" you get higher JS than when you do it according to the book.
- "Standing on your own feet".
- "Each of us has his own idea what JS is".
- It is best to pick "the right person" to do a job. To do that effectively one has to "understand human nature". (STO).
- Acting on your own initiative.
- Once I acted for the OIC I liked it even though it was for half a day. (Tech).
- "You can tell when an exchange runs smoothly".

C.5 State "E"(i) Observations on Telecom

- Profits are disturbing
- Poor human relations.
- The real problems must be higher up than the District.
- IPM visits the exchange from time to time. We feel he cares.
- Management is a bit tougher now than it was in the old APO days.
- In meetings with the IPM's switching committee, the discussion always concerns equipment. There is no time to discuss people.
- Railways have debts but people are paid better.
- "We shall have a Working Committee".
- For conversion to ARE 11 Telecom has chosen exchanges with a bias in their favour.
- Telecom must become more aware of social issues.
- Telecom should make concessions to disadvantaged people.
- "I am satisfied. The working conditions are really good".
- There should be greater delegation.
- I meet IPM 2-3 times a year. He does not normally meet staff (OIC).
- Security of the job is the main advantage of working for Telecom. But if you really want a job you can get one always in this state.
- Telecom is now more efficient. However, there are fewer people working for more subscribers.
- "Telecom cares for people" (A. Tech).
- Fair place to work in.
- I dislike the way they (HQs) will quibble just to take half-Tech away (OIC).
- Some of us would like to be redeployed but there is no real discussion on the matter.
- Telecom should provide training in social and industrial matters.
- Telecom should project a better image. Not "the silly TV advertisements".
- Telecom should encourage young technicians to be self-starters.
- The supervisory staff should be taught better management skills and better ways of dealing with people.
- Telecom should advertise the customer side. Several techs would like to go over to the customer side, others might follow.
- Most would prefer working for Telecom rather than for private enterprise.
- In Telecom decisions are made without prior consultation.

- The last industrial action could have been avoided, and Telecom could have had its way, if only there had been adequate consultation (STO).
- I would be in favour of an effective consultative body in the District.
- Staff information bulletin is equated with a propaganda bulletin.
- "Industrial relations are doing a poor job".
- Telecom should explain to the public its long term plans.
- We do not think that Telecom appreciates "the good work which we are doing in our exchange".
- On the whole working conditions in Telecom are good.
- "They have tightened up on staffing too much".
- It appears that maintenance costs have decreased but we believe that simultaneously the quality of service has decreased. (However, the district exchanges were within the standard).
- There should be an investigation to examine the effect of decreased staffing on quality of service.
- "They (Telecom) have one aim in mind: Profit!"
- The organisation is bad. There are too many STOs and not enough A.Techs (OIC).
- Effective communication by word is most important. It does not exist in Telecom. (STO of many years of service).
- Personal communication is important because the men do not read and some have limited horizons (OIC).
- Most problems are because of misunderstanding rather than intent.
- There is a lack of coherent policy of moving people around (OIC).
- Monthly meetings did not get anywhere.

(ii) Interaction between Telecom/Unions

- Unions might not be well informed but it is also the Department's fault on account of their negative attitudes".
- "There's got to be give and take".

(iii) EMC/ESC Issue

- EMC is alright, but some of the staff do not like attending to equipment they do not understand. (OIC of an EMC exchange).
- Ultimately it has to be EMC, but not everybody likes the idea.
- "I have no idea how EMC operates". (TO in an EMC exchange).

- With EMC it is "them and us". (TO in an EMC exchange).
- EMC on the whole is not liked. (comment from EMC exchange).
- EMC people get best experience of all. Ultimately they will be a most competent group. But what about us? (TO in an EMC exchange).
- EMA where the head station performs functions of EMC might be acceptable.
- EMC seems to work in our place but some would prefer a different organisation.
- We prefer ESC. People in an EMC exchange are like puppets. (Comment from an ESC exchange).
- I believe that ESC staff will lose their skills in time due to lack of involvement with the equipment. EMC is better in this respect. (STO in an ESC exchange).
- Staff in an ESC exchange have higher JS than those in an EMC exchange. But the staff in the ESC itself are not very happy. The people in the EMC get lots of JS.
- "A watered down" EMC, like an EMA, would be acceptable so long as we have a say on how to run it.
- We offer a better service to customers than an EMC exchange would. (Meaning that they, being on the site, can fix a fault quicker).
- We can achieve a performance better than set by the standard. EMC would not trouble (STO in an ESC exchange).
- "An ESC exchange is better staffed and thus we can give better service to subscribers" (STO in an ESC exchange).
- We do not think that an EMC can analyse a fault remotely as well as we can in an ESC exchange. (Comment from an ESC exchange).
- If the EMC was part of the District then the concept would be more acceptable. As it is I prefer ESC organisation. (OIC of an ESC exchange).

(iv) Comments on ARE 11 Equipment

- There is difficulty in obtaining "the correct information". One can get it "by special effort". (Comment from an ESC exchange).
- As of to-date we have received no information on Ompos 2 (May 1980) but ESC have got it. (Comment from an ESC exchange).
- Since last January we had no faults in ARE 11. (4 months period) (comment from an ESC exchange).
- In this exchange we have only just received manual on Ompos 2 (March 1980)
- There have been delays in delivery of the equipment (EMC exchange).
- There has been a considerable disturbance due to installation activity.

(v) Comments on Work Practices

- Co-operation with EMC is very good (OIC of an EMC exchange).
- In this exchange we are organised in cells and take duties in rotation as far as possible (EMC exchange).
- "I have to work largely on my own. I don't like it".
- "I do not take stats meters and TRT runs very seriously. The results are open to any interpretation" (STO).
- Co-operation with EMC is very good (EMC exchange).
- Pushed for time because of politics of the trial.

(vi) Comments on Training

- The course was rushed through (ESC exchange).
- The training could be longer (ESC exchange).
- Appreciation course adequate for what it is intended (EMC exchange).
- The course was hard going (ESC exchange).
- Working with installers was good experience (frequent comment).
- I would have preferred full training (EMC exchange).
- Not having had a full course I feel inferior to others (EMC exchange).
- Should have had training in the EMC itself.
- The course in Annandale was very good (c.f. comments from other states).
- "Much of what they teach you don't need".
- "Too much theory and too little time."
- The course was not particularly suitable for maintenance people.
- The ARE course was on the whole good. Can suggest no improvements.
- At the end of the course I still did not understand the architecture of the ARE 11 equipment.
- Theory component on OMPOS 2 was rushed through. Really of little value.
- There should be more emphasis on practical aspects of maintenance.

(vii) Comments on New Technology

- I believe the new technology will affect Australia in the negative.
- We have to join the rest of the world and carry on with technology.
- There will be a gradual acceptance of new technology.

- So long as there is an honest evaluation I will go along with modern technology.
 - I think modern technology is wonderful (female A. Tech).
 - I accept modern technology and I go along with it, but I do not see why I should pay, in taxes or otherwise, for those that do not work.
- In this world you have to fight for yourself in the best way you can (Young T0).
- With new technology we must specialise.

(viii) Comments on Job Satisfaction (JS)

- Complete a job and have no complaints.
- Not every one welcomes new technology.
- I like being busy.
- I like jumpering on the MDF (A. Tech)
- Do not like MDF and test desk (T01).
- I like X-bar best of all (T0).
- Servicing a number of exchanges is good, but wastes time on account of travelling.
- Lots of work to do - high JS (T0).
- I must have challenge (T0).
- "I like things to go wrong so that I can fix them".
- If at the end of the day I feel I had a good day the JS must have been high.
- Being 'in charge' gives you a lot of satisfaction (T0).
- Money is important.
- Amenities help.
- I dislike the uncertainty of being moved around.
- I dislike "clerical work".

C.6 Comments from staff in EMCs

(i) Observations on Telecom

- Career opportunities are as good as ever. You make your own opportunities.
- Complaints about Telecom are unrealistic.
- PR is poor.
- Staff information bulletin was justifying economics, but showed little concern for people: this upset most people.
- Managers in Telecom are not very good in human relations.
- Communication is definitely a problem.
- People must feel they are part of the system.
- There is only one way: communicate.
- Most decisions are made without consultation with staff.

(ii) Interaction between Telecom and Unions

- One of the problems we have is that lines people belong to a different union.

(iii) EMC/ESC Issue

- EMC staff are in favour of EMC.
- (In response to my question) No advantage in having EMC attached to an exchange.
- Changes in rules are confusing.
- EMC provides a centralised control which is better all round.
- In every respect we prefer to be in the EMC.
- Ultimately there might be a need for a software specialist in EMC.
- OMPOS 2 facilities are not used to the full except in the exchanges connected to EMC.
- On the whole, because of human pride, people will not consult even if they need help. That's why the ESC exchanges do not consult the ESC as often as they should.
- It is true that if EMC staff have to come to an exchange to help with the solution of a problem then there is some time delay. But this is of little consequence.

(iv) Comments on ARE 11 Equipment

- Installers say they do a good job. But there are no figures.
- Installers left part of the equipment blocked.
- We spend a significant amount of time putting right what installers left undone.
- Manuals incomplete.
- There is confusion. Different exchanges book the same job to different accounts.
- Settling down period for ARE 11 is about 3 months as against 18 months for X-bar.
- There are not many faults, may be one or two per month.
- There are not enough people with training and experience.

(v) Comments on Work Practices

- "Ompos 2 is a bit chaotic".
- "NSC told us 'work it out yourselves'. "(With reference to an advice sought)".
- EMAs seem to work quite well.
- Have not been able to show us how to operate Ompos 2 with full facilities.
- One advantage of being here (city) is being close to engineering and library.
- 6 or 7 staff are quite sufficient to look after 8 exchanges.
- Not enough to do....
- Subs category changes are a drudge: give it to the exchange or the District office.
- We feel that the delay of 20 min. or so involved in travelling to an exchange does not affect quality of service in the slightest.
- There are a number of outstanding faults in the various exchanges. The exchange staff have no time to attend to them.
- Work patterns are affected by human characteristics such as pride and conflict.

(vi) Comments on Training

- Course material completely new.
- The course does not give you confidence...
- Staff should be selected on merit.

(viii) Comments on Job Satisfaction (JS)

- Praise for well-done work.
- Feeling good about a well-done job.
- We have high JS.
- Ompos 2 enhances JS.
- I understand that, in the EMC exchanges, the staff feel inferior because they do not have the full training.
- Sometimes the exchange staff need help. However, professional pride is in the way of calling for assistance from outside.
- Being in authority is of fundamental importance in JS.
- On the whole people enjoy "being in charge".

C.7 Comments from Staff in ESCs

(i) Observations on Telecom

- We are being pushed for more effort.
- Quality of staff is not considered.
- The problem is that it is relatively easy to measure the output of maintenance staff. Others get away with a lot.
- People must be chosen for their tasks in the light of their strengths and skills.
- Telecom must make a massive effort to talk to people. This might be expensive but so is ARE 11.
- To put things right will take a long time. A task force, study group, must be established before things get too far ...

(ii) Interaction Between Telecom and Unions

- We are not equal. Yet we are treated as if we were all equal
- There are problems on both sides:
 - (a) Management tends to make broad unsubstantiated statements which evoke mistrust. In Telecom News there are some blunt statements.
 - (b) ATEA is uninformed and is opposed on principle to anything that Telecom proposes.
- "What's wrong with Telecom is the way they do things".
- There is an urgent need for management to talk to people.
- "People have a habit of not listening".
- I am not happy with the guidelines for the trial, even though it was agreed between Telecom and ATEA.
- It would be much better if they worked together. (Meaning Telecom and ATEA)

(iii) EMC/ESC Issue

- Both EMC and ESC have problems.
- "We now have, effectively, lost touch with all the exchanges".
- We like EMA: it provides flexibility and variety of jobs.
- I think EMC people have higher JS than we have.
- Mini EMC/EMA might be best.
- "I would prefer EMA...."
- I would rather have EMA than EMC or ESC.

- I think working in an ESC is boring. (Another member of the same ESC disagreed with this view).
- ESC should be attached to an exchange. (Meaning that staff would like more involvement with the equipment).
- Those who oppose EMA do not understand the advantages.
- ESC is not consulted as often as it would have been had it not been for the trial.
- The quality of service is likely to be the same whether the exchange is ESC or EMC.
- We only had 4 calls for assistance so far (that is when the ESC was visited in March 1980).
- What is so very unfair is that the decision whether you will go on full training depends on luck. That is whether the exchange is ESC or EMC, irrespective of your abilities.
- "In the ESC we have little or no responsibility: it's terrible".
- EMC is not realistic.
- ESC has no access to data. It needs to have more involvement.
- In principle ESC would be capable of providing better service to customers.
- With EMC all testing is done remotely. I cannot see how this can be efficient....
- I know of an EMC exchange that went off the air for 1½ hours. I don't think this could happen in an ESC exchange.
- There would be more justification for EMC with AXE equipment.
- I cannot say that we are doing something worthwhile or useful.
- We cannot go on site unless we are specifically invited.
- ESC and SSC could be one.
- The staff in ESC would like more responsibility. (Several comments to that effect).
- What was objectionable is the way in which Telecom tried to introduce EMC.
- Little opportunity for discussion.
- A viable alternative to ESC might be an EMA with an ARE 11 cell in the head exchange. Thus, giving a degree of centralised control and at the same time giving an opportunity for local decisions.

(iv) Comments on ARE 11 Equipment

- "Installers did not have overlay tapes".
- "A fuse went and we lost all outgoing calls". (Commenting on an ESC exchange).
- "Only a few faults in STUs...."
- "We have to work on faults that are outside the manual".
- ARE 11 equipment is reliable.
- We have only just received OMPOS 2 manuals (that was in March 1980).
- We had lots of problems with Ompos 2
- Documentation is incomplete: Yet EMC have got it all.

(v) Comments on Work Practices

- "No time to do research during cut-over".
- "Our approach is to talk to the OIC and offer information, if they want it..."
- "One exchange has invited us to come...."
- "Installers do not seem to have had much Ompos 2 training".
- "At the moment we spend most of the time studying".
- As load increases we spend more time helping exchanges.
- We are not working to full capacity.
- We should be involved in District consultative meetings.

(vi) Comments on Training

- Assisting with installation activity is very good training. (Other observations along this line).
- "On the job training not good enough".
- Ompos 2 course: could have read it from a book".
- So far we did not need much of the material given to us in the training.
- Some of us have attended the course a long time ago and have had time to forget much of it. The training course should be followed immediately by field experience.
- The problem with training is that in one course you might have a supervisor and a trainee.
- It was good.

(vii) Comments on New Technology

- The promotion prospects are better for those that get involved with new technology.
- Whether one is willing to accept new technology or not depends on one's education.
- New technology should be discussed in consultative groups. We should all be involved in the decision processes.

(viii) Comments on Job Satisfaction (JS)

- Doing the job you like doing.
- Working in a large exchange is soul destroying.
- Working in a small exchange can give you great satisfaction.
- Sense of belonging, doing something useful.
- Being in charge.
- Opportunity for self development.
- Being able to work with other people. (Several comments along these lines).
- Receiving pleasure from doing the job.

8.3 A SURVEY OF JOB SATISFACTION (JS)

8.3.1 Introduction

In the first round of visits to a number of exchanges in NSW, Vic, Qld, SA & WA, it became clear that staff held a range of views on JS. In subsequent visits, this aspect was explored further and, from the responses recorded in Section 8.2.C, it transpires that there is a whole spectrum of views on JS and that frequently the responses need to be qualified by the preceding and following observations of the respondent.

Thus it became clear that it might be desirable to carry out an extensive survey of various aspects relating to JS and to examine the results on a more precise quantitative basis using well-established statistical methods of inference. This was raised in discussions with Telecom Management and it was agreed to engage Dr. Godfrey Gardner of the Department of Psychology, University of Melbourne to carry out a suitable survey. Dr. Gardner was assisted in his task by a team of his colleagues and students and the results, as they became available, were discussed at length at a number of meetings. Furthermore, to assist in gaining a better insight into the various factors affecting the survey, I accompanied Dr. Gardner during some of the informal interviews.

The broad problem was to establish whether differences, if any, in the range of JS levels perceived by staff in telephone exchange maintenance, as reported in the various centres were significant and, if so, to estimate the difference. We need to know not only whether the EMC or ESC type of organisation is seen by staff as providing higher JS, but whether either is superior in this respect to any other known system.

To contain the amount of work to be carried out and to fit the programme with the time scale available for the trial it was decided to carry out a survey in:

- (a) the Melbourne area and
- (b) in the Perth area.

Melbourne was chosen as a convenient location typical of the eastern States. A separate survey was carried out in Perth to examine the attitudes of staff to the group organization, the EMA.

In Melbourne as in Perth, the structured interviews were preceded by exploratory field work including the informal interviews. The purpose of this was to gain a degree of familiarity with the problems relating to the work environment and to gather material for the structured interviews.

The structured interviews from which the quantitative data was obtained were carried out in confidence with only the interviewer and the interviewee present. This was done to ensure anonymity and uninhibited responses.

8.3.2 Exploratory Fieldwork

This consisted of:

- (a) Study of reports relevant to the ARE 11 and EMC/ESC trials.
- (b) Visits to and discussions in ATEA offices.
- (c) Visits and familiarisation discussions held with staff in the following Melbourne locations:

CITY ESC	219 Elizabeth Street, Melbourne
CLAYTON EMC	
CLAYTON	Internal Plant Manager (IPM)
CLAYTON EXCHANGE	
SPRINGVALE EXCHANGE	
WHEELERS HILL EXCHANGE	
FRANKSTON	District Telecom Manager (DTM)
FRANKSTON EXCHANGE	
SEAFORD EXCHANGE	
NETWORK PERFORMANCE AND OPERATIONS (NP & O, HQ)	
ELSTERNWICK EXCHANGE	
STATE SUPPORT CENTRE	199 William Street
STATE HQ	255 Bourke Street
NATIONAL SUPPORT CENTRE	Argus House, La Trobe St.

- (d) Informal interviews with 55 staff members selected at random at 16 exchanges in the Melbourne Metropolitan Area and the Clayton EMC and City ESC.
- (e) Group discussions in Perth exchanges.

Subsequently, material from all the informal interviews was pooled anonymously and used for Content Analysis. The resulting categories gave an indication of the range of topics that could be related to JS in the way that staff saw them. This provided the basis for item selection and a trial scale as discussed below.

8.3.3 Interview Schedule

The informal interviews described above, and the ensuing Content Analysis revealed aspects of work that were of importance to staff and whether these aspects were spoken of favourably or unfavourably.

Many of the questions in previous surveys carried out elsewhere in the world were relevant to the same issues raised by Telecom staff themselves. In particular the questionnaire schedules used, for example, by the University of Sheffield's Department of Social and Applied Psychology seemed relevant and appropriate. The schedules were tested in a variety of work situations and the reported reliability was high. A few of the items were adapted with slight modifications to make them more relevant to the present study. With these adaptations the final structured Interview Schedule emerged:

- (a) The Melbourne schedule contained six sections as follows:

(i)	Job Satisfaction	(17 items)
(ii)	Job Characteristics	(10 items)
(iii)	Job Importance	(10 items)
(iv)	Intrinsic Motivation	(6 items)
(v)	Job Anxiety	(10 items)
(vi)	General Anxiety	(6 items)

- (b) For the Perth interview schedule, the sections (iii), (v) and (vi) were omitted to allow time for three new sections specially designed for EMAs. They were:

- | | | |
|--------|---|------------|
| (vii) | Attitudes to Working in a Group of Exchanges | (19 items) |
| (viii) | Attitudes to variations in Exchanges, ie, in equipment layout, etc. | (11 items) |
| (ix) | Attitudes to Team Work | (15 items) |

In all other respects the procedures in Melbourne and Perth were the same.

JS was measured by nine relevant items which were imbedded in a larger set of 17 items. Similar procedures were adopted for the remaining sections.

In the case of the Melbourne Area numerical results were obtained for six exchange groups:

EMC exchanges, ESC exchanges, Pre-EMC exchanges, Pre-ESC exchanges, EMA and REFERENCE BASE exchanges.

The Pre-EMC exchanges refers to exchanges which were due to cutover in the EMC organisation and similarly for Pre-ESC exchanges. The REFERENCE BASE exchanges refer to numerical data obtained from exchanges not included in the trial.

Each section was analysed statistically as follows:

- (a) Analysis of Variance (ANOVA) was used to test the hypothesis that the means obtained for the various groups are not significantly different at the usual level of significance of $p=0.05$.
- (b) Tests were performed to separate the groups into homogeneous subsets using the Scheffe test.

In total 262 maintenance staff were interviewed. Of these 96 were at or above T01 level and 166 were at the level of Technician or below. The response rate in Melbourne was 92% (179 out of 194) and for Perth it was 87% (83 out of 95). Except for one person who declined the interview, the rest, making up the 8% in Melbourne and 13% in Perth shortfall was due to staff absences.

Five EMAs were visited in Melbourne and eleven EMAs in Perth.

The data was also tested for reliability using Crenbach's co-efficient $\alpha = 0.8$. The analysis shows that the reliability of scales can be regarded as satisfactory.

Analysis of the data for Perth shows that the features relating to the EMC/ESC issue are similar to those found in Melbourne. The Scheffe Test applied across all groups shows that, concerning the EMC/ESC issue, there are no significant differences between Perth and Melbourne results.

8.3.4 Results and Conclusions

(a) Summary of Results - Melbourne

Referring to the six sections contained on the Melbourne schedule (see 8.3.3(a)), the statistical analysis of the results obtained shows that:

- (i) Job Satisfaction: The mean scores range was from 4.41 to 5.16. The Scheffe group test shows that there are no significant group differences in the perceived job satisfaction in the two organisations (EMC/ESC).
- (ii) Job Characteristics: The mean score range was from 3.08 to 3.4. There is no significant difference between any of the groups.
- (iii) Intrinsic motivation: No significant differences.
- (iv) Job importance: as (iii) above.
- (v) Job anxiety: as (iii) above.
- (vi) General anxiety: as (iii) above.

At the accepted level of significance ($p=0.05$) the only observed group difference is that between ESC exchanges and pre-EMC exchanges.

However, one must accept that there is a difference, though not significant, between the measured mean for JS in EMC exchanges (4.41) and ESC exchanges (5.16) and one could enquire why this should be so. Is there some evidence, perhaps in the interviews, that there are differences in Job Characteristics that could account for different levels of JS? With this in mind a whole range of analyses of the interview data was carried out using the 't' test ($p=0.02$).

Dr. Gardner has found features in the Intrinsic Motivation Scale which suggest the possibility that part of the lower JS in EMC exchanges could be due to higher intrinsic motivation. Satisfaction is partly a function of the discrepancy between expectations and aspirations, what one looks for in the job on the one hand, and perceived fulfilment on the other. The greater expectation and motivation, the greater the disappointment is likely to be if the expectations are not met.

In summary, it can be said that the results obtained seem to indicate a trend, but the difference is not statistically significant ($p=0.05$).

(b) Summary of Results - Perth

It should be noted that the Perth sample is not as large as the Melbourne one. In the Perth sample, (11 EMAs), there were only 5 men operating in an ESC exchange and 10 in the pre-ESC exchanges. No EMA staff were working in an EMC exchange or a pre-EMC exchange. ARE 11 equipment in the Midland EMA will cutover in 1981/82 but, at present, the future EMC/ESC status is unknown.

Examination of features common to Melbourne and Perth on the basis of Scheffe Tests across all groups shows that there are no significant differences between the two areas. Conclusions reached for Melbourne EMC/ESC issue are substantially the same as for Perth.

As described in section 8.3.3(b) the schedule for Perth included the extra three sections (vii), (viii) and (ix) to test attitudes to working in a group of exchanges (EMAs).

The results obtained by Dr. Gardner indicate a favourable attitude towards working in a group of exchanges. A majority of items in the schedule received an above average score in favour of group work.

On the positive side, EMAs are seen as:

- . Providing more flexibility for days off
54% agree 30% disagree 16% uncertain
- . More flexibility in arranging holidays
53% agree 36% disagree 11% uncertain
- . More flexibility in work allocation
66% agree 27% disagree 7% uncertain
- . Giving access to more types of faults
57% agree 37% disagree 6% uncertain
- . Having access to more types of faults is seen as helping them to develop skills more rapidly
88% agree 8% disagree 4% uncertain
- . Helping them to learn more adaptability
82% agree 10% disagree 8% uncertain
- . More stimulating than working in a single district exchange
71% agree 20% disagree 8% uncertain
- . More challenging
71% agree 23% disagree 6% uncertain

The respondents disagreement with two of the negative items also showed a favourable response towards working in a group of exchanges.

- . Limits their range of experience
78% disagree 13% agree 8% uncertain
- . Would be more frustrating
65% disagree 29% agree 6% uncertain

Only one item produced a clearly unfavourable response. Only 27% saw working in a group of exchanges as improving their chances of promotion. This appears to be an issue which is of concern to technical staff in general and is not confined to EMAs. This response is a significant item of feedback and is taken up again in discussion in Section 5.

The responses to two other items are also revealing:

- . Job satisfaction depends more on your own personality than on the type of organization itself
57% agree 5% unsure 39% disagree
- . Job satisfaction depends more on the personalities of the people you work with than on the type of organization itself
61% agree 5% unsure 34% disagree

On other problems covered in the survey (eg, working in a group of exchanges helps us to gain more confidence) the results indicate an evenly balanced polarisation of agreement and disagreement with an uncertain category exceeding ten percent in all but one case.

In summary, it is concluded that staff are favourably disposed to the EMA type of organisation and indeed some would like Telecom to try larger EMAs. However, the survey also shows that staff are concerned about their chances of promotion. This latter aspect clearly needs attention. There is also evidence that

greater attention should be given to staff selection and training, in that staff feel that the personality of individual members of staff can play a more important role in reaching self-fulfilment and JS than the organisation itself.

(c) Post Script

This report would not be complete without a reference to the personal impressions of the writer.

One cannot help being impressed by the positive attitudes exhibited by the staff and by their willingness to co-operate. There was an attitude of concern to ensure that the fruits of this study be as beneficial as possible. I believe staff were freely and willingly volunteering information to ensure that those who make recommendations and decisions will be better informed and the decisions that follow will not be made in the "dark".

"All colours will agree in the dark"

Bacon

8.4 ITEMISED LIST OF ACTIVITIES WHICH HAVE PROVIDED MATERIAL FOR THIS REPORT

- 4.9.79 - Examine material related to the trial
- 5.9.79 - Discussions in HQs, Melbourne, trial aspects
- 11.9.79 - Meeting with ATEA Executive
- 13.9.79 - Discussions in Telecom House, Sydney
 - Visit:
 - . EMC, Stanmore
 - . Glebe Exchange
 - . ESC, Elizabeth Tower
- 20.9.79 - Visit NSC, Argus Building, Melbourne
- 26.9.79 Meeting with Mr. P. Robson, Uni. NSW, Sydney
 - Examine material related to the trial
- 27.9.79 - Visit:
 - . Mascot exchange
 - . St. Leonards exchange
 - . Potts Point exchange
- 4.10.79 Visit ESC, 219 Elizabeth St, Melbourne
- 5.10.79 - Visit:
 - . Clayton DTM
 - . Springvale exchange
 - . Wheelers Hill exchange
- 9.10.79 - Examine material related to the trial
- 11.10.79 - Discussions in HQs, Melbourne
 - Visit Elsternwick Exchange
- 16.10.79 - Discussions with ARE 11 Operations and Maintenance Working Party, Sydney
- 17.10.79 - Examine material related to the trial
 - Prepare draft notes
- 23.10.79 - Examine material related to the trial
- 30.10.79 - Meeting with the ARE 11 Working Party, Melbourne
- 1.11.79 - Discussions with Telecom Senior Officers, Sydney
- 5.11.79 - Examine material related to the trial
- 15.11.79 - Meeting with Dr. Gardner
- 22/23.11.79- Visit to Adelaide
 - . Meeting in Advertiser Building, State HQs
 - . Discussions in BP House, State HQs.
 - . Visit Salisbury Exchange
 - . Visit Elizabeth Exchange
 - . Visit ESC, Western Building
 - . Visit EMC.
 - . Visit Weymouth Exchange
 - . Visit Unley Exchange

- 26/29.11.79- Visit to Perth
- . Visit State Office
 - . Visit EMC
 - . Visit Bulwer Exchange
 - . Visit Cottesloe Exchange
 - . Visit ESC
 - . Visit Wanneroo EMA (Containing Mullaloo ARE exchange)
 - . Visit Tuart Hill EMA
 - . Visit Attadale EMA
 - . Discussions with DTMs and IPMs Central and North
 - . Discussions on training
 - . Visit training centre
- 30.11.79 - Meeting with Mr P. Robson, Uni. of NSW, Sydney
- 3.12.79 - Discussions with Dr. Gardner concerning a survey of Job Satisfaction.
- 11.12.79 - Examine material relating to ARE 11 Trials, Sydney
- 12/13.12.79- Visit to Canberra
- . Discussions in Canberra offices
 - . Visit Civic CEM
 - . Visit Deakin CEM
- 14.12.79 - Discussions with Mr P. Robson, Uni. NSW, Sydney
- 17.12.79 - Visit training centre, Annandale
- . Discussions with staff
- 19.12.79 - Discussions in HQs, Melbourne, on trial aspects
- 20.12.79 - Examine material relating to the trial
- 21.1.80 - Discussion in HQs, Melbourne, on trial aspects
- 23.1.80 - Examine material relating to the trial
- 25.1.80 Discussion in Argus building, Melbourne
(Model exchange)
- 30.1.80 - Discussions with ARE 11 co-ordinator, Vic.
- Discussions in NPAC
 - Visit Russell exchange
- 31.1.80 - Visit Operation Analysis Cell (Footscray)
- Visit training centre, South Melbourne
- 1.2.80 - Discussions with Planning Services Branch, HQs.
- 2.2.80 - Argus building: Hands-on familiarity with ARE 11 equipment.
- 6.2.80 - Discussions in HQs, Melbourne, on trial aspects.

- 11.2.80 - Examine material related to the trial
- 20/23.2.80 - Visit to Brisbane
 - . Meeting in Communications House, State HQs
 - . Visit ESC
 - . Visit EMC
 - . Visit Salisbury Exchange
 - . Visit Mt. Gravatt Exchange
 - . Visit Edison Exchange
- 25.2.80 - Write up notes on visits to exchanges
- 27.2.80 - Discussions with Dr. Gardner on Job Satisfaction
- 28.2.80 - Visit Tullamarine EMA
- 29.2.80 - Discussions in HQs, Melbourne, on trial aspects
- 3.3.80 - Visit Wheelers Hill Exchange
 - Visit ESC, Melbourne
- 4.3.80 - Visit Lilydale district (Mt. Evelyn exchange)
- 5.3.80 - Visit Collingwood exchange
 - Visit Northcote exchange
- 6.3.80 - Visit Canterbury exchange
 - Discussions in HQs, Melbourne
- 11.3.80 - Visit Liverpool exchange
 - Visit Liverpool EMC
 - Visit Sutherland EMA
- 12.3.80 - Examine material related to the trial
- 18.3.80 - Visit ESC, Sydney
 - Visit Mascot exchange
 - Visit St. Leonards exchange
- 19.3.80 - Visit Potts Pt. exchange
 - Visit City South exchange
- 20.3.80 - Visit EMC, Stanmore
 - Visit Glebe exchange
 - Visit Chatswood exchange
- 21.3.80 - Write up notes on visits to exchanges
- 24/26.3.80 - Visit to Perth
 - . Discussions in HQs, Perth
 - . Visit EMC
 - . Visit Central exchange
 - . Visit Wanneroo exchange
 - . Visit ESC
 - . Visit Bulwer exchange

- 27.3.80 - Arrangements for overseas visits
- 28.3.80 - Prepare draft notes on visits to exchanges
- 29.3.-28.4.80- Visit to study practices in overseas administrations
 - . UK
 - . France
 - . Sweden
 - . Denmark
 - . Netherlands
 - . West Germany
 - . GTE, USA
 - . Bell, USA
- 30.4-2.5.80- Prepare draft notes on overseas visits
- 5-6.5.80 - Prepare draft notes on overseas visits
- 7-9.5.80 - Discussion with members of ATEA executives
 - Visit Argus building, Melbourne, for discussions
- 12.5.80 - Prepare draft notes on overseas visit
- 13-15.5.80 - Visit to Adelaide
 - . Discussions in state HQs
 - . Visit EMC
 - . Visit Weymouth exchange
 - . Visit Unley exchange
 - . Visit Henley Beach exchange
 - . Visit ESC
 - . Visit Salisbury exchange
 - . Visit Elizabeth exchange
 - . Visit Semaphore EMA
- 16.5.80 - Prepare notes on overseas visits
- 19.5.80 - Discussions with Dr. Gardner on Job Satisfaction survey
- 20-23.5.80 - Visit to Brisbane
 - . Discussions in State HQs
 - . Visit EMC
 - . Visit Edison exchange
 - . Visit Mt. Gravatt exchange
 - . Visit Beenleigh exchange
 - . Visit Cleveland exchange
 - . Visit Salisbury exchange
 - . Visit Sherwood exchange

- 26.5.80 - Examine material related to the trial
- Prepare draft notes
- 27.5.80 - Visit Annandale training centre. Discussions with staff and students.
- 28.5.80 - " " " " " "
- 29.5.80 - Discussions with Dr. Gardner on Job Satisfaction survey
- 3.6.80 - Write up notes on overseas visits
- 4-5.6.80 - Discussions in HQs, Melbourne, on trial aspects
- 6.6.80 - Write up notes on overseas visits
- 10.6.80 - Visit Potts Point Exchange
- 11.6.80 - Examine material related to the trial
- 12.6.80 - Complete draft of report on the overseas visits
- 16.6.80 - Examine material related to the trial
- 17-18.6.80 - Visit Adelaide
 - . Discussions in Salisbury Exchange
 - . Discussions in State HQs
- 18-19.6.80 - Discussions in HQs, Melbourne, on trial aspects
- 23-25.6.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 26-27.6.80 - Discussions in HQs, Melbourne, on trial aspects
- 30.6.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 1-3.7.80 - Examine material related to the trial
- 15.7.80 - Examine material related to the trial
- 16-17.7.80 - Discussions in HQs, Melbourne, on trial aspects
- 18.7.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 23-24.7.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 30.7.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 6.8.80 - Examine material related to the trial
 - Prepare draft of sections for the final report
- 7-8.8.80 - Discussions in HQs, Melbourne, on trial aspects
- 12-14.8.80 - Examine material related to the trial
 - Prepare draft of sections for the final report

- 18-19.8.80 - Examine material related to the trial
- Prepare draft of sections for the final report
- 20.8.80 - Discussions in HQs, Melbourne, on trial aspects
- 13-14-15-18-9.80 - Prepare draft of sections for the final report
- 23-26.9.80 - Examine material related to the trial
- Prepare draft of sections for the final report
- 28-30.9.80 - Examine material related to the trial
- Prepare draft of sections for the final report

9. LIST OF COMMON ABBREVIATIONS

1 GV	Originating Group Selector in Crossbar Exchanges
7 E	ITT (BTM Europe) Rotary Switching System
10C	BTM SPC Switching System for both trunk and local switching (used in Australia for trunk switching only)
11F (Metaconta)	ITT alternative trunk switching machine used in Spain
204 Crossbar	Crossbar equipment used by Televerket (Sweden)
ACTEL	Unit for dealing with business office aspects of Customer Services (France)
ACTU	Australian Council of Trade Unions
ADR	Automatic disturbance recorder
ADX	ADR switching system
AGF 500	Early version of electromechanical switching system (Europe)
AHC	After hours control
ANA 30	Stored program control system used to upgrade an ARF exchange to ARE 11.
ANOVA	Analysis of variance (statistical analysis)
AOM	LME message switching system for inter-connecting exchanges with other centres
API	Australian Post-tel Institute
APO	Australian Post Office (pre Australian Telecommunications Commission, i.e. Telecom Australia)
ARE 11	LME SPC crossbar local switching system using ANA 30
ARF	LME electromechanical local crossbar switching system
ARF 100	LME early electromechanical crossbar local switching system
ARK	LME electromechanical crossbar rural switching system
ARM	LME electromechanical crossbar trunk switching system
AT (A. Tech)	Assistant technician
ATT (AT&T)	American Telephone and Telegraph Company (Bell).
AXB	LME SPC telex switching system
AXE	LME SPC exchange switching system
BPO	British Post Office
BTM	Bell Telephone Manufacturing Co., Antwerp. (Subsidiary of ITT)
CA	Clerical Assistant
CAGEO	Council of Australian Government Employees Organisations
CB	Central Battery (manual exchange)
CEM	Centralised Exchange Maintenance

CENTREX	Indial and inter-office PABX system (USA)
CGM	Chief General Manager
COM	Chief Operations Manager
CPE	Main Operations Centre responsible for Switching Systems (France)
C Wire jumper	Control wire in crossbar exchanges for customer classification/identification
DB	Deutsche Bundespost (Germany)
DNC	District Network Centre
DORT/EMA	District organisation review team report/Exchange Maintenance Area.
Dst-Leitung	Deutsche Bundespost equivalent of Internal Plant Manager
DTM	District Telecommunications Manager
EAX	GTE SPC switching system
EC	Exchange Connections
EDAS	Exchange Data Acquisition System
em (EM)	Electromechanical
EMA	Exchange Maintenance Area
EMC	Exchange Maintenance Centre
EMD	Motor Driven Selector Exchange
EM Register	Electromechanical register
EMU	BPO Equivalent of EMA
EPM	External Plant Manager
ELLEMTEL	A Swedish Development Co. owned 50/50 with L.M. Ericsson and STA (Televerket)
ESC	Exchange Support Centre
ESAC	Higher level support centre (AT&T)
ESS No. 1	SPC switching system developed in USA by AT&T
EWS	German Bundespost Switching System SPC electronic in both local and trunk switching
EWSD	Digital version of EWS
FDC	Fault Despatch Centre
FTR	ARE 11 Exchange EMC/ESC Field Trial Report (Aug 1980)
FTZ	Deutsche Bundespost Telecommunications Research and Technical Development Unit
FYEOP	Five Year Engineering Operations Programme
GTE	General Telephone & Electric Corporation & Subsidiaries (USA)
IDN	Integrated Digital Network

INWATS	Inward Wide Area Telephone Service
IPM	Internal Plant Manager
ISD	International Subscriber Dialling
ITT	International Telephone & Telegraphs Co.
JS (js)	Job Satisfaction
JT	Jutland Telephone Co. (Denmark)
KAN strapping	Strapping of KAN Block in ARF/ARE Exchanges to alter subscribers' categories
Level 1 operation	Applies to ARE exchanges and covers local register replacement only
Level 3 operation	Applies to ARE exchanges and covers SPC control of group switching stages
Level 4 operation	Applies to ARE exchanges and covers SPC control of all group and subscriber switching stages
LME	L.M. Ericsson (Swedish manufacturer of telecommunications equipment)
LTR	London Telecommunication Region
MD	Managing Director
MDF	Main Distribution Frame
MFD	Multi-function district
MUX	Multiplexor
NEX	Non exchange service
NOC	Network Operating Centre
NODE	AXE exchange serving remote switching stages
NPAC	Network Performance Analysis Centre
NSC	National Support Centre
OIC	Officer in Charge
OMC	Operation Maintenance Centre (Sweden)
OMPOS 2	Operation and Maintenance Processor Operating System No. 2 (used in ARE)
OTC	Overseas Telecommunications Commission (Australia)
PABX	Private Automatic Branch Exchange
PBA	Printed Board Assembly
PBX	Private Branch Exchange
PCB	Printed Circuit Board
PCM	Pulse Code Modulation
PECC	Higher order support centre (AT&T)
POU	British Post Office Union
PR	Public Relations
Pre-2000	Step by step equipment (early version)

PROM	Programmable Read Only Memory
PTO	Principal Technical Officer
Reg I	Incoming Register used in crossbar exchanges (ARF)
Reg L	Local Register used in crossbar exchanges (ARF)
Reg LP	Improved local register used in crossbar exchanges (ARF)
RSS	Remote Switching Stage used with AXE
SxS	Step-By-Step Exchange Switching System
SCC	Switching Control Centre (USA)
Siemens F	Old Type Siemens electromechanical switching system
SPC	Stored Program Control
SRB	Hybrid exchange using both SxS and crossbar equipment
SSC	State Support Centre
SSOC	Switching Services Operation Centre (USA)
SSSC	Switching Services Support Centre (USA)
STA	Swedish Telecommunications Administration (Televerket)
STD	Subscriber Trunk Dialling
STN	Telephone Stations (one instrument)
STO	Senior Technical Officer
System X	New BPO SPC Switching System
System 12	ITT SPC Switching System
TBO	Telecom Business Office
Tandem Exchange	Switching Exchange for Interconnecting circuits between Local Exchanges
TERMINET	Teleprinter
TACONET	Telecom Australia Computer Network
TO	Technical Officer
TRT	Traffic Route Tester
TSTF	Tandem Study Task Force
TXE	BPO development of partial electronic SPC systems
VDU	Visual Display Unit
XAM	Plant account used for total exchange maintenance manhours
XAM 6	Plant account sub-division used for ARE 11 switching maintenance manhours
X-bar	Crossbar switching equipment

