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NORTHERN COMMUNICATIONS STUDY

Volume 7: Coordination and Planning

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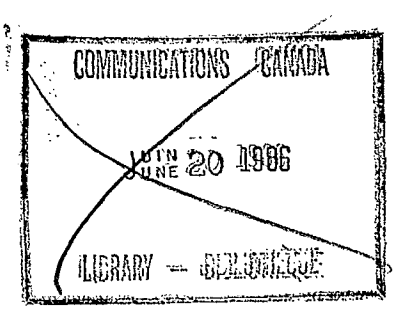
Northern Communications Coordination and Planning



SYNOPSIS

This Volume discusses the broad aspects of northern communications coordination and planning. An attempt is made to show how the work of Telecommission Study 8(c) can be carried forward with a sense of direction and purpose.

TELECOMMISSION DOCUMENTATION

This is Volume 7 of Contribution No. 4 to Telecommission Study 8(c).

The complete documentation for the Telecommission Study is:

Contribution No. 1 - Conference Document: "Communications in the Canadian North"

Contribution No. 2 - Catalogue: (Confidential) "Communications Systems in Northern Canada"

Contribution No. 3 - Report: "Yellowknife Northern Communications Conference"

Contribution No. 4 - Northern Communications Study

- Vol. 1 - Synopsis
- Vol. 2 - Prospects for Northern Development
- Vol. 3 - Northern Communications Requirements
- Vol. 4 - General Information and Broadcasting Services for the North
- Vol. 5 - Terrestrial Systems
- Vol. 6 - Communication Satellite Systems
- Vol. 7 - Northern Communications Co-ordination and Planning.

Volumes 2 to 7 are working documents for the Telecommission Study and are not intended to be published.

D.S. Loftus
Liaison Officer
Telecommission Study 8(c)

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IMPORTANT NOTE

Except for the contents of Chapter III, as prepared by the Trans-Canada Telephone System, the views expressed by the authors are their own and do not reflect the position of their employer organizations.

CHAPTER I

SKYWAY TO THE NORTH

BY

C.P. HUGHES

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"The challenge therefore is to develop a national consensus not only on goals but on the institutional innovations required to meet the emerging objectives."

(Manitoba Economic Consultative Board, Fifth Report)

In this study of communications in "the North" there have been estimates of the economic prospects and the social needs of residents. Suggestions have been offered regarding the ways in which communications can be developed to foster the growth of the economy and stabilize the settlement of people.

Two things emerge at this point, namely that the scale of the problem outruns the financial resources of any individual authority or corporation and that "the North" does not tamely follow political boundaries like the 60^{o} parallel. Perhaps a definition of "the North" should be offered at the outset.

A study of the Province of Manitoba Royal Commission Inquiry Into Northern Transportation (The Mauro Report) reveals a North which is not confined to political boundaries or meridians. The North seems to take shape as a place where men and governments have to pool their efforts.

" The more active and direct involvement of the Federal Government will be timely and appropriate. The Federal Government has accepted certain recommendations of the Carrothers Advisory Commission on the development of government in the Northwest Territories (1966), and more recently has received a report on the Yukon economy outlining the necessary requisites for development and expansion of

> that area to 1985. The Carrothers' Report recommended a Northwest Territories Development Board composed of federal and territorial government administrations and the economic council of Canada. It further recommended that a Northwest Territories Development Corporation be created to give management assistance and advice, make feasibility studies to attract new industry, provide physical and service facilities, and to make loans and guarantees. The principles enunciated in the report on the Yukon economy respecting increased public involvement . . . are applicable to other northern jurisdictions."

This point of view was also expressed in the "Political Economy of the Canadian North" where Professor K.J. Rea at p. 376 wrote:

> " . . . In considering the possibility of establishing a co-ordinated program for the development of the Arctic and sub-Arctic regions of Canada it would be appropriate in terms of economic geography to create as its area of jurisdiction not only the Yukon and Northwest Territories, but also the large Arctic and sub-Arctic northern parts of British Columbia, of the Prairie Provinces, and of Ontario, Quebec and Newfoundland."

It is clear that there is considerable authority for taking a broad stance and in so doing no attempt is being made to interfere with constitutional functions. There is no implication of inadequacy in the past but a desire (which will surely be common to all) to plan realistically for the future. There is simply a recognition of the fact that the development of the North is a war against vast and relentless dimensions.

In the North as we have defined it, there are provincial government agencies such as Alberta Government Telephones, Saskatchewan Telephones, Manitoba Telephone System and the Ontario Northland Commission; the British Columbia Telephone Company, Bell Canada and Quebec Telephones make up some of the commercial operators. Canadian National Telecommunications represent the federal participation. In practice, C.N.T. operate in the Yukon and the Mackenzie **area**s while Bell Canada services the Eastern and Central Arctic.

Each of the groups has accomplished much but no one will deny that much more remains to be done. Indeed the pace of change seems to quicken almost daily and the possibility of going it alone to meet the new world of satellite communication is out of the question for technical and fiscal reasons.

Communications in the Yukon and northern British Columbia have been linked to military operations such as the Alaska Highway or resource activity. We are today confronted by the need for better communications in areas where these stimuli are not present. We have to employ new techniques to further the new technologies. While the Yukon and northern British Columbia derived a communications advantage from the pioneering work of the military units there was no corresponding advantage in the east from such massive undertakings as the DewLine. The military decision to build the DewLine at a cost of approximately $600,000,000 was keyed exclusively to the military requirements. Outside the technical know-how there is almost no legacy of civilian benefits to be looked for in such a one purpose installation. The spin-off is inadequate. In future we must arrange things so that single purpose investment is held to a minimum. The military and civilian plans must be kept in step so that there is no duplication and no incompatibility.

The message of the Mauro Report seems to be that the North calls for a joint effort and joint resources marshalled for an agreed policy. In such a climate there does not seem to be a place for unilateral planning either at the federal or the provincial level.

At page 192 when reviewing the adequacy of existing transportation and communication facilities the Mauro Report speaks directly on the subject of communications.

> "Communication is itself a form of transportation although limited to the movement of intangibles. The availability of adequate communication facilities is as necessary as transport if acceptable standards are to be acheived. In many cases telegraph and postal service throughout the study area does not meet minimum modern requirements. We define such minimum standard as the availability of voice communication on an uninterrupted basis, at reasonable cost. We do not suggest that every resident in the province or in a given area of the province be offered telephone service but it

> is our view that in every community of over fifty persons there should be available facilities for voice communication not subject to vagaries of weather or atmospheric conditions."
>
> " . . . The state has an obligation to provide transportation and communication at minimum standards regardless of cost-benefit considerations. Provision of transportation above the minimum standard must be considered in terms of contribution to the economic development of the region."

Some way must be found to pool plans and co-ordinate effort. Research indicates that there has been little or no interfacing between planning groups in many areas and if such lack of co-ordination continued there would be a danger of incompatible programs blocking national progress. Enough is known of the future to indicate a high capital cost frequently associated with sparse populations and consequently low returns on investments.

In some places there is, as in the outports of Labrador, official encouragement to leave settlements and concentrate in urban centres. From the point of view of a commercial carrier, the development and maintenance of communications is not justified without government encouragement. Even the most socially-oriented boardroom would find it difficult to vote the large sums necessary to give these places the amenity features of southern communications. The provision of reliable all-weather links, however, should not be beyond the range of a carrier if enough time is allowed. An accelerated demand, prompted by resource developments or because of social and political pressures, would strain the resources of the carrier.

It seems that there is a legitimate role for the federal government as co-ordinator and funding source. One obvious stipulations is that there should be no invasion of consitutional function nor threat of federal monopoly in any suggestions for co-ordination that may be put forward.

Two main federal directions, namely participatory and supervisory, might be examined and in the course of this chapter we offer for consideration the idea of the Northern Telecommunications Consultative Committee (NORTEL). We will base our case on the recommendations of the Mauro Report (Province of Manitoba Royal Commission

Inquiry Into Northern Transportation), the Carrothers Report, The Political Economy of the Canadian North by Professor K.J. Rea. We show a need for common planning in the past and will further demonstrate by reference to a report on the Third Northern Research Conference, that a need exists for common direction in the future. We submit that the lessons of the past and the projections for the future force us to one conclusion and one solution.

The subject of federal-provincial consultations must be a matter of deep concern to all Canadians and it is interesting to note that in a report on Intergovernmental Machinery by Queen's University an Appendix showed the many different interfaces where contact exists. The list may not represent an up-to-date statement of the position in 1970 but is believed to be a good starting point for a general enquiry. One notable omission is the virtually complete absence of machinery for development of communications.

The first idea (NORTEL) would be to devise a plenary consultative committee body consisting of appointees representing all governmental authorities and carriers with a northern interest and with members reflecting consumer views and offering a participatory function for ethnic groups. They would be charged with preparing two five year plans for a co-ordinated northern programme. The financing of regionally desirable schemes would be agreed upon on a contributory basis related to the population being serviced and the estimated benefits. No rigid pre-formulation would be written in. If a provincial authority wished to embark on schemes outside the main plans it would do so at its own cost but it would be expected not to lessen its input to the main effort. The ownership of the facilities thus created would be vested in the political authority for the geographical area concerned. Ownership would cease at boundaries. A commercial carrier, wishing to retain control of equipment could build or buy in areas where there is no provincial government agency. Thus Bell could develop in the eastern North but could not expand in, say, Alberta.

This plan for northern telecommunications, which for convenience we have called NORTEL, does at this stage have some objectionable features but co-operative discussion may smooth out the rough spots. One difficulty is the size of the governing body. We should note the comments of Professor Rea regarding the organizational difficulties because it would be foolish to minimize them.

Professor Rea traced some of the practical difficulties of coordination and found it difficult to imagine so broadly based an

agency having much more than an advisory function. He felt it could have little to do with the actual undertaking of particular projects and the administration of a programme of development in any detail. He noted, however, that the advantage of such a broadly based agency would be that it would not only create a more natural area for planning but, ideally it would make possible a much more economical allocation of national resources to the purpose of northern development.

At a later point he wrote:

> " . . . when modern techniques of communication are taken into account, it would appear to be both economically desirable and physically feasible to plan future development of all the Arctic and sub-Arctic regions as a whole."

He suggested that the agency be so organized as to give representation to all the important specialized agencies, private and public, involved in the economic life of the area. And at page 378 he added:

> " . . . Because the fundamental purpose of establishing a regional development agency would be to realize the economies to be gained from co-ordinating all such activities, the structure of the agency would necessarily have to incorporate those involved in its activities."

In practice, however, the work would fall into regional compartments and apart from plenary sessions on the lines of an annual meeting of directors the need for full scale meetings would be infrequent.

Objection might be taken to the idea of a limited life of ten years with two five year plans but this can be pleaded as a device to ensure viable, new-generation thinking and as a necessary feature of this approach would be the requirement that the NORTEL directors in the eighth year lay out a design for a successor form. It may be argued that the prospect of an early demise will only defeat the production of long range plans but not one of the forecasters such as Carr and Carrothers attempts to blue-print the future beyond about ten years. It seems illogical therefore to set up an elaborate legislative structure which will be invested with corporate immortality and may never develop a sense of urgency. A time frame of ten years is almost essential to the NORTEL approach.

As far as corporate mortality is concerned there is a similarity to the Cape Breton Development Board. It is intended to have a limited existence and to deal with a specific problem in a defined area. The Cape Breton legislation, however, did not specify a fixed time limit. We deliberately suggest a time-frame because it discourages the procedural inertia that is inherent in corporate structures which are designed for perpetuity. There must be a sense of urgency if the problems are to be met creatively. We believe too that in our proposals for NORTEL, we will secure a more direct involvement among government, social and industrial groups. Just as the Cape Breton Board was designed to phase out uneconomic forms and replace them by viable industries, NORTEL could be expected to examine and eliminate uneconomic and inefficient communication systems and bring in reliable compatible communications.

Other points of difficulty which NORTEL would meet relate to the participation of "consumer groups" i.e. the public and particularly ethnic groups. The directors would at the outset have to establish regional committees consisting of provincial government (or their agencies) representatives and carrier representatives who have a special interest in the plans for that region. In addition a federal representative would be a member. The directors would also have to make recommendations for the guidance of the regions on the matter of ensuring "consumer" groups have an adequate input. Some plans would manifestly concern consumers and residents while other plans would be dominated by technological questions. It would be a mistake to build public participation into every situation and the NORTEL presentation would leave such decisions to the discretion of the directors and regional committees, subject to observance of the general sentiment that consumers should be able to make a direct contribution to policy recommendations.

Examination of the administrative control intra-provincially shows that there is some lack of consultation with corresponding bodies in other provinces. Not only is this true of planning but it is also true of rate-setting and research.

In order to achieve its designed purpose, NORTEL would obviously require a research input. Perhaps at this point we may refer to a report submitted on the Third Northern Research Conference held May the 27th to the 29th, 1970 at Porte-de-la-Baleine which brought together directors of most of the research institutes in Canadian universities.

" The tone of the conference was that the research in the North was reaching a juncture point. Few of the institutes are considered major activities by their universities and in the last seven years much of their financing has been funded by a grant programme sponsored by IAND.

. . . There is a sense of frustration among a good number of academics who pointed out that at a time when Canadian interest in the North has reached a new peak; when there was an awareness that a number of basic questions about the North remained to be answered; and that a growing shortage of trained scientists to work in the Canadian Arctic is making itself apparent, research programmes were being cut back.

. . . In reviewing the programmes of the various institutes, it is evident that much of the research work that has been going on in the North in past years has been concentrated on a very narrow range of physical sciences; for the most part geophysical and other earth sciences, zoological and entomological. Research groups tend to be small, very poorly integrated and in most universities the institutes are really only shelters for small groups for particular professors who have a specialized interest in their subject as it relates to the North. There has been very little done in the way of co-ordination of programmes and almost nothing with respect to multi-disciplinary or inter-disciplinary research work. Even less attention has been paid to the social sciences."

NORTEL, in the field of communications, would have an exceptional opportunity to correct this spastic approach to funding research. Under the aegis of the directors, a great deal could be done to weld these various research and academic units into an effective, co-ordinated programme working on a financial basis which would not be susceptible to change. A cohesive programme would do away with narrowly oriented, poorly integrated task forces.

Different accounting approaches, different rate philosophies, different emphases and responses to political pressures combine to produce rate differences which may militate against equitable rates

when viewed from a national standpoint. Insofar as national tariffs are referable to C.T.C., it would seem appropriate that any NORTEL arrangements likely to affect national rates should be submitted to C.T.C. for preliminary comment and later, for approval. The directors of NORTEL would have to work towards a standard accounting system so that rate equalization could be achieved.

Obviously, the NORTEL concept is susceptible to criticism. The virtue, however, is that it is designed to bridge the constitutional difficulties which, by common consent, exist in the federal-provincial relationship. Some observers have suggested that the idea is unworkable because a corporate and commercial association between crown federal and crown provincial is unconstitutional, unfeasible, and unthinkable. They ignore the fact that we are witnessing the emergence of new structures. It began with crown corporations. Now we have Polymer and the Panarctic Consortium. The latest evolutionary form is Telesat Canada in which the federal government is engaged in an association with corporations that are the instruments of provincial governments, e.g. Alberta Government Telephones and Saskatchewan Telephones; with commercial corporations such as Bell Canada; and lastly but significantly, with the public. When NORTEL is viewed against these existing models it may be recognized as constitutional, feasible and perfectly thinkable.

The NORTEL approach is but one of a number of possible ways in which the job can be tackled. Thus, consideration must be given to the different aspects of participation, namely consultation, planning and administration. A consultative process is typified by the federal-provincial committee on finances where ministers of finance and provincial treasurers meet every quarter. There is a limit to the amount of detail which can be handled at meetings of this kind. The Canada Water Act offers an example of planning machinery with a joint federal-provincial group charged with responsibility for the formulation of a comprehensive water resource management scheme. An administrative body such as the marketing agency created under the Freshwater Fish Marketing arrangements is typical of yet another form of participation. In their own sphere each is a desirable form and for the northern scene the Canada Water Act planning group offers the advantage of a broad view. It may, however, lack machinery for fiscal support. What seems to be needed is a broad simple form with capacity to respond to problems of different magnitude and which does not threaten a federal invasion of provincial activities.

A suggestion is valuable until a better suggestion is made. What other approaches can be suggested? Fifty years ago the idea of the European Common Market would have been ridiculed. Today the Common Market is a fact. It is not merely an advisory or planning body but has produced agreements and works towards a common end. If the difficulties of national boundaries, conflicting political philosophies, language barriers and local preferences can be overcome in Europe, then it seems reasonable to suppose that Canada can work out a plan for co-ordination of communications. The question perhaps is, are the pressures on Canada great enough, strong enough to bring

about this pooling of energy and resource? We suggest that an examination of the facts of our geography and our financial capacity may leave no logical alternative.

Examination of our geography and finances should not stop at our borders. We are a world nation and have opportunities and responsibilities which extend beyond the limits of this country.

Just as we export our industrial products and raw materials our solutions to problems of government can be an export item. Not only will we offer an exportable communication skill and the technical hardware but a political idea which may help the people of South America, Africa and Asia overcome the classic difficulties of different people, different languages, different countries and indifferent income.

What other approaches can be suggested? What weapons can be employed? How far, for instance, can a rate increase or a reduction be used to stimulate or retard communication development? When used to carry out provincial and federal policy, it could be an effective weapon but when used by uncoordinated regulatory boards, it is a weapon likely to strike more terror in the user than in the target. Perhaps a consultative or co-ordinating panel might offer a palliative, if not a complete answer, to the common problems.

The example of the Crow's Nest Pass agreements suggests that subsidies are tactical weapons and not a plan. If rates are not a complete policy, then how about taxes? Can special tax write-offs and other preferential devices be used to encourage carriers to develop in named areas? Would the governments concerned forego sales taxes or excise levies in order to encourage specific projects? So far the federal government has resisted any suggestion of preferential tax schedules to compensate the northern resident for the cost of living. It is difficult to see how the government could with logic deny preferential taxes to an individual and allow them in favour of a corporation. Under given circumstances, however, a valid case might be made out for the use of such a device. Again, like tariffs and subsidies, it is a weapon. Unless used with discretion it is a weapon which is more likely to "self-destruct" than resolve the problem against which it is launched.

While the example of rates, subsidies and tax preferences might not be too persuasive, they are not the only devices to be examined. An alternative might be a form of investment insurance scheme designed to encourage carrier investment. If for instance a carrier was reluctant to commit itself to a major investment in a high risk undertaking such as a service to an isolated mining community, some guarantee formula might be offered. Thus if the mine development was closed out prematurely, the carrier would be protected against loss of unamortized capital. Yet another approach would be for mining companies or oil companies holding exclusive franchises to make capital contributions for services and for obsolescence allowances to be tied to the allowances for mining equipment.

Another approach which may appeal is the Trans-Canada Highway method. It has a record of success and a whole generation of administrative know-how has been accumulated. Subject to including the territories in the definition of "provinces" and changing the Ministerial reference, the form of the Trans-Canada Highway Act offers a strong flexible base for a 'Skyway to the North'. Observe how easily Section 3 could be fitted to our needs:

> "3. (1) With the approval of the Governor in Council the Minister may enter into an agreement with any province providing for the payment by Canada to the province of contributions in respect of the cost to the province of the construction of a highway within the province as part of a Trans-Canada Highway.
>
> (2) An agreement made under subsection (1) shall prescribe the location, standards and the time and method of the construction of the highway and shall include terms and conditions for
>
> (a) the calling of tenders and the review by the Minister of tenders and specifications,
>
> (b) the inspection by the Minister of the highway during construction,
>
> (c) the method of determining the cost of construction,
>
> (d) the amount of the contribution,
>
> (e) the examination, inspection and audit of all construction costs and accounts, and
>
> (f) such other terms and conditions as the Minister may consider necessary or desirable."

Whether the federal government injects capital by straight grants or makes available loans for selected development, there seems to be no reason why Canada and the provinces cannot continue to draw upon the investment of administrative experience and goodwill that the

Trans-Canada Highway Act provided. The suggestions are not definitive and anyone who examines the schedules of corporations in the Financial Administration Act will realize that Canadian ingenuity and energy has responded successfully to a variety of challenges. We have no reason to think that the challenge of the North will find Canadians deficient in effective ideas and resolution of purpose.

We believe that our institutions must survive by adaptability. It is not possible to solve everything with cement. What some deplore as evidence of constitutional instability, we applaud as proof of our democratic vitality. Canadian federalism, despite the jurisdictional friction between the federal and provincial governments, will endure. The Canadian system appears to us as a symbiotic relationship in which the nervous interaction of the components is essential for the survival of the whole. Neither the federal nor the provincial forms can exist alone. Because Canada is a living organism, it will change shape and colour, sensitive to pressure, responding to challenge.

CHAPTER II

COMMUNICATIONS PLANNING FOR THE NORTH

BY

H.J. VON BAEYER

CHAPTER II

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COMMUNICATIONS PLANNING FOR THE NORTH

BY

H.J. VON BAEYER

1. Information Flow and Systems Concept

Telecommunications systems serve the need for information exchange between people. They perform a service function defined by the patterns of information flow within the economic constraints of the particular situation. As these patterns evolve and change, the system must follow, adapting itself to the changing circumstances.

Established communication routes, by their very existence, influence the flow patterns, and create demands beyond those originally accounted for, leading to growing capacity and complexity of the system.

This interaction between demands and facilities can be observed in systems of any size and description. However, forward planning cannot be based on the knowledge of this interaction alone; it requires as an essential ingredient, a sufficiently high degree of predictability of the demands in terms of volume, geographical distribution and economic limitations.

Thus in populated areas the predictability of demand, for example for telephone service, is on sufficiently firm ground to justify economically the establishment of systems which allow any one of millions of subscribers by simple manipulation of his handset to get into instant two-way conversation with his chosen partner. Or, again in populated areas, it may be sufficiently predictable that a one-way paging service is in demand and economically viable, aimed at conveying messages to persons outside reach of a telephone set. Or, again in populated areas, the known demand for dial-up, two-way teletype service may justify the establishment of complex systems.

All such systems are conceived on the basis of specific demand patterns; their growth takes place by increases in number and distribution of subscribers, as can be expected in areas with high population density.

However, once we move into the North all these predictable demand patterns lose their significance. Low population density, vast distances, scattered settlements, confined communities of interest, different work habits, mobility, shifting work centres and many other factors create an environment in which the systems concepts

of the South are not applicable. There may well be some demand for instant two-way dial telephone service, but confined locally to only a few communities. There may be some demand for teletype service, but limited to relatively few, widely scattered places. There are probably patterns of a regional nature with groupings around regional centres, the centres themselves requiring access to the South via "collector" routes. There is probably more demand in the North for asymmetrical types of information flow, such as short signals, enquiries or requests in one direction and lengthy messages, instructions, etc. in the opposite direction, where the response may not have to be instantaneous and where the two directions may be allowed to use totally different media.

We come back to specifics in later sections. The foregoing paragraphs illustrate that information flow and systems concepts in the North are sufficiently different from those in the South to warrant a different approach to Northern planning. In fact, application of southern systems concepts in the North usually encounters such severe economic limitations that comprehensive action is delayed and progress is left to uncoordinated individual efforts. To suggest a rational approach towards a more constructive solution is the purpose of this paper.

Since established systems concepts are not suitable or economical in the North without specific adaptation, the first step in any planning activity must consist of a clear, unambiguous and well defined understanding of the technical and economic characteristics and constraints of a) the traffic requirements and b) the available transmission media. These are the subjects of the following Sections 2 and 3.

2. Traffic Requirements

At the root of all service demands are the needs of the individual customers to communicate. The characteristics of these needs must be properly understood with regard to their urgency (speed of service), their nature (one way, two way, broadcast), their type and performance (telephone, teletype, facsimile, TV, data), their grographic distribution (local, intra-regional, inter-regional, rearward) and finally their financial constraints. Only when sufficient statistics are collected on all these characteristics can the demand patterns be described for the various areas.

This then constitutes the basis for a systems build-up. If there is sufficient demand for a certain type of service in a certain area a special system may be justified. If there is a definite but small demand for some service, its urgency or priority and the economics of the case would decide whether it should be met by substituting alternative services or by designing a special system for it.

With the limited number of locations to be considered (say around 500) and the relatively small number of possible demand characteristics, the data processing task for the establishment of realistic demand patterns appears to be quite manageable. A data base could then be formed as a foundation for systems planning.

3. Transmission Media

There are many different technical transmission media available with widely differing capabilities and economic characteristics. It is essential that these media be fully understood, including their limitations and ramifications, in order to find an economically acceptable match to the demand patterns. To cite a few examples:

-- for HF circuits it must be realized that even sophisticated long range prediction methods are not enough to overcome the effects of the sporadic ionospheric changes in the North, and that investments in at least regional ionospheric sounding methods and frequency agility are necessary to increase propagation reliability. Since the user, for many reasons, cannot be left indefinitely either to be satisfied with pre-assigned frequencies or to search for his own optimum frequencies, the economics of the situation are compounded by the necessity for the superposition of a communication system for distribution of propagation information.

-- for satellite circuits it must be realized that two-way telephone transmission via geostationary satellites requires either 4-wire subscriber connections or echo suppressing equipment. For communities connected through satellite trunks there is a choice then to either convert the usual two-wire telephone plant into a 4-wire plant or accept echo suppressors with their inherent operational problems.

-- terrestrial UHF and microwave systems have great advantages as major trunk lines because of their performance characteristics and the possibility of traffic drops at intermediate stations. One of their main drawbacks in reliability and cost has been their demand on primary power for equipment and tower lighting. Modern solid state devices, new power sources, low power equipment for radio relay and thin route scatter systems, and improvements in auxiliary equipment design such as gas discharge strobe lights for tower illumination will undoubtedly have a strong effect on the suitability of these systems for the North.

-- in considering satellite systems in general, their inherent limitations in the North must be recognized, such as the lack of coverage of the Far North from synchronous orbit, and scintillation and absorption problems due to ionospheric effects at lower than microwave frequencies.

The foregoing examples should illustrate what is meant by "a full understanding" of available transmission media. This understanding must go far beyond the knowledge of the technical characteristics of a particular type of transmission. It must include all technical, operational and economic ramifications which are connected with the introduction of a particular type of service. Often the costs of the initial acquisition and installation are insignificant compared to the costs and efforts required to keep a system in a satisfactory state of operation. It is then a question of organization and coordination between many involved agencies which determines the continued suitability. All this is part of "understanding" the media.

4. The Present Complex and Its Limitations

At present the total telecommunications complex in the North (say above the 55th parallel) consists of a conglomeration of services partly operated by common carrier organizations, partly by Government agencies, and partly by industrial and private groups and individuals. There are the sophisticated military high power tropospheric scatter systems which were designed for linking together the string of radar stations from Newfoundland to Alaska and for providing rearward communication routes. Increasing numbers of channels for civilian use are becoming available on these systems. Then there is the large number of HF systems of a wide variety of type and description; some of them extending radially from a number of more prominent centres, others forming individual point to point links. In the West there are long distance open wire lines (e.g. Mackenzie River) and some microwave radio relay systems (e.g. Alaska Highway) forming direct extensions of the southern microwave networks. Finally there are the individually localized telephone plants in settlements and communities.

The preparation of a computer based comprehensive systems catalogue would be highly desirable. Using and augmenting already available information this would require not more than a modest data processing effort. By applying from the start proper indexing and numbering methods, facilities and services could be entered, changed, removed at liberty, and answers obtained to any question of coverage and type of service. As a counterpart to the data base for traffic demand (described in section 2) this would form a second data base for use in system planning.

As far as the limitations of the present complex are concerned - - pending a more detailed analysis - - some general comments can be made as follows:

Reports from many sources, users as well as operators, indicate that the HF mode of communication is inherently satisfactory, but that there are a number of specific problems which prevent these systems from providing the desired grade of service. Firstly there is the frequency problem where spectrum congestion on one hand, and

need for greater frequency agility on the other hand oppose each other, with the added difficulty that the user seldom has the means for establishing his best operating frequency even if a sufficient choice of frequencies were available. Secondly there are the problems of inadequate systems design, too much influenced by cost saving, and not geared towards the best utilization of the HF medium. And thirdly there is the serious problem of equipment maintenance. The difficulties of having trained personnel, components and spare parts in reach at the right place within reasonable time are prevalent in the North for all types of communications except where specialized civilian or military establishments can be supported.

Where military trunk routes are not available for civilian use, most long distance trunk connections are established by HF. If in such cases the requirements on degree of service availability and trunk utilization are high, limitations in propagation and equipment reliability are serious handicaps. This applies to a much lesser degree to the HF links connecting smaller settlements or individual customers, where much lower standards of trunk utilization and service availability are acceptable. Thus it appears that one of the limitations of the present complex lies in the scarcity of reliable, high performance long distance trunks which can serve as main routes between larger centres and into the southern networks. Another limitation appears to be caused by the lack (usually for economic reasons) of adequate attention to the typical problems of HF systems, namely choice of operating frequency, and equipment design and maintenance. Underlying these specific limitations is the lack of overall planning, aimed at coordinating the many disjointed activities.

5. Concept of Augmentation of Present Complex Towards Higher Systems Effectiveness

The foregoing sections show that the first requirement in any planning exercise is the establishment of the demand patterns. Next there is the identification of specific inadequacies and weaknesses of the present complex. This amounts to an analysis of how well the presently available facilities and services (data base described in section 4 above) match the demand patterns (data base described in section 2 above). Once this is established a process of synthesis can begin, aimed at improving this match, and based on the knowledge of the economic and technical characteristics of up-to-date transmission facilities (section 3 above).

It is, of course, tempting to start from scratch and consider replacing all existing facilities by more modern means, for example, a comprehensive multiple access satellite communication system which would virtually establish a telecommunication network

in the North equivalent to southern networks, where each subscriber has access to the whole national and international communications grid. The costs of such an undertaking would without doubt be completely incommensurate with the actual traffic demands, i.e. the system as a whole would be grossly underutilized and would have capabilities far in excess of actual needs.

Following a more practical course of identifying the present systems' inadequacies, planning can be aimed at a gradual elimination of problem areas and augmentation of present facilities towards greater effectiveness.

It has already been mentioned (section 4) that the scarcity or inadequacy of long distance multiple trunk routes is one of the limitations of the present arrangements. This would be considerably aggravated if operation and maintenance of the military systems would cease to be justified on military grounds so that the associated costs would have to be borne by the civilian users. With all probability this would create an economically untenable situation, and the closing of the military systems would become inevitable. In that case the whole load would fall on HF trunks which -- even when properly engineered and equipped -- are inherently limited in channel capacity. Satellite circuits are the obvious answer in this case because of their independence from terrestrial distance and their bandwidth capabilities. In addition, for shorter distances, terrestrial radio relay and thin line scatter systems will play an increasing role in providing high performance trunk connections particularly in the form of branch extensions from existing southern networks, or as extensions from centres served by satellite circuits.

Assuming then that regional centres and places of special importance are provided with trunk lines for inter-regional and southward traffic by radio relay, scatter, satellite or HF, the intra-regional distribution systems are next to demand attention: again, only the analysis of actual demands can decide to what extent existing systems require replacement or augmentation. However, the noticeable satisfaction with HF as a medium indicates that more sophisticated systems, for example a multitude of small satellite earth terminals with demand access providing "Southern" systems performance, would exceed the actual needs, thereby lacking economic justification. It appears -- again based on various reports -- that HF for a long time to come is a suitable and cost-effective medium, provided that the service reliability can be improved. This then raises the question of finding economical solutions for frequency selection and other means to enable the operators to establish communications according to their needs. Ruling out -- on economic grounds -- user operated ionospheric sounding methods, and replacement of all existing equipment by up-to-date design, a departure from conventional systems concepts is called for.

To show that there are indeed various so far unexplored possibilities, is the purpose of the following paragraphs. It would be premature -- pending the availability of sufficient information on traffic demands and existing facilities -- to make definite recommendations. Therefore, what follows is merely an illustration of what could be done rather than a prescription for what should be done.

We assume that a domestic satellite system is in existence and that a certain capacity is reserved for Northern communications purposes notwithstanding the question of financial support and division of operational responsibilities. It is then likely that certain regional centres of sufficient size will have earth stations for receiving and transmitting, and competent staff to fulfill the role of a communications centre. They may also have means to establish regional ionospheric conditions and short term MUF predictions. These larger stations could then originate via satellite links uni-directional messages to a multitude of satellite earth stations with receive-only voice bandwidth facilities. If necessary selective calling features could be included similar to conventional paging methods. The use of a receive-only teleprinter for recording of the messages might be considered; several types of such compact teleprinters have recently been developed for such use as in police cruisers. Through these facilities outlying stations could be paged and requested to get into two way communication with the central station by existing HF means; they could be provided with information on HF propagation conditions and optimum frequencies; they could be given broadcast and news services and generally kept in touch with the world. Extending the services, they may have facsimile attachments so that technical plans, weather maps, drawings, newspaper material could be transmitted for print-out and local distribution. From published information (ICC 1970) it appears that a fixed frequency, receive-only, voice bandwidth facility including a 7 ft demountable dish antenna, suitable to receive signals from a geostationary satellite radiating at 4 GHz with an EIRP around +19 dbW per channel, could be built in quantities for a few hundred dollars. To this would have to be added selective calling, teleprinter, and any other required ancillary equipments.

The total systems concept would then consist of:

1) a number of centres, interconnected and connected to the South via terrestrial or satellite trunk lines,

2) networks of two-way HF links grouped around the centres and provided with one-way teletype, voice and facsimile message service via uni-directional satellite circuits. (Beyond 75° latitude the domestic satellite links would not

be functional, and -- when demand justifies it -- VHF communications via polar orbit satellites may become desirable, providing services similar to those described above.)

3) conventional local telephone plants augmented by mobile radio services in settlements and communities, interconnected with other communities either by HF or terrestrial or satellite trunk lines, depending on size and location.

The extensive utilization of HF in such a scheme raises the question of equipment modernization and maintenance. A general improvement plan appears to be desirable including the improvement of personnel training, as for example proposed in Telecommission Study 8(c), Volume 4, General Information and Broadcasting Services in the North - Chapter II, where operator training for the Eskimo and Indian population is discussed.

As mentioned before, the main purpose of describing in this report a concrete example is to illustrate the principal recommendation: that planning should proceed by gradual adaptation of the existing situation to the increasing demands, and by a step-by-step improvement program based on an economico-technical match between realistic user demands and justifiable systems implementation -- free from conventional systems concepts which have evolved from the demand patterns and economics prevalent in the more populated areas of the world.

6. Recommendations

1. Establish data base for information flow demand (local, intra-regional, inter-regional, rearward).

2. Establish data base for existing facilities and services.

3. Collect systematically information on economic, technical, and operational characteristics of all transmission media applicable to communications in the North.

4. Investigate shortcomings of present facilities and services.

5. Develop long range plan for trunk lines connecting regional centres.

6. Plan for improvements in HF equipment reliability, including training of wider cross section of population.

7. Investigate feasibility and costs of receive-only voice bandwidth satellite earth stations for teletype, audio and facsimile transmission.

8. Investigate the possible role which unidirectional satellite links, per para. 7, could play in carrying HF propagation and other information to scattered stations which rely on HF for two-way communications.

CHAPTER III

NORTHERN COMMUNICATIONS

COORDINATION AND PLANNING

BY

TRANS-CANADA TELEPHONE SYSTEM

NORTHERN COMMUNICATIONS

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TRANS-CANADA TELEPHONE SYSTEM

In any study of the need for development of undeveloped regions, we are apt to speak of "new frontiers" in a physical or geographical sense.

When we refer to the north as a "new frontier" in the telecommunications context, we do so not in terms of latitude and longitude, of millions of square miles of uncharted territory -- but in terms of the new frontiers of technology, of techniques and of approach needed to provide facilities on a planned and integrated basis to accommodate -- and indeed to spur -- the future development of the northern regions of Canada.

For the member companies of the Trans-Canada Telephone System -- and in fact for all Canadian telecommunications systems -- facing new frontiers has been a way of life for many years: the establishment of the coast to coast long distance network, the building of Canada's defence communications systems, the provision of communications in rural areas, the development of telecommunications systems in the more isolated areas of the provinces and the establishment of those communications facilities that have served the north adequately for so long.

The new frontier we face today is the challenge of providing the kinds of telecommunications services needed to foster the development of the economy of the north country and, as the Minister of Communications puts it, to bring the residents of the north "into the mainstream of Canadian life", in a totally new technological, social and financial environment.

Essentially, the technologies for meeting the telecommunications needs of the north already exist. The challenge of the next few years will consist of selecting the right technologies and techniques to suit pre-determined social, economic and political objectives, within the known financial limitations.

Future telecommunications must be visualized against a demographic, social and economic background.

First, the needs must be identified -- taking into account all aspects of life in the north, and the probable social and economic changes that will take place.

Second, those technologies that seem best able to meet the needs must be selected and integrated into the total system.

Third, the problem of providing the capital required to initiate and sustain such a development program must be faced squarely, and practicable plans devised to solve it.

Integration

There is no doubt that increased activity in the development of mineral and other resources will have a profound effect on the existing demographic pattern of the north. All of us with a responsibility to the residents of the north need to have a clear understanding of the trends and probable direction of such changes. There must be a far greater exchange of information between all agencies who are active -- or plan to become active -- in the economic life of the north.

We must also accept that no one technology -- however new and revolutionary -- represents an instant panacea. New telecommunications technologies are merely a continuing series of advancements in the state of the art which must take their place as integral parts of the existing system. Commonsense demands it -- financial considerations demand it. The purpose of new technology is to add additional capability to the existing network so that new and improved services can be provided efficiently and economically.

The Challenge of Northern Development

In his Paper at the Yellowknife Conference in September, 1970, Z.H. Krupski, Chairman of the Trans-Canada Telephone System said:

"The challenges ... can be classified as technical, social and economic.

"The technical challenge is to build and operate facilities that will provide residents of the north with the kind of telecommunications services that they require. The telecommunications industry must know how this region is to develop so that future needs can be anticipated, and provided for. We must not only take advantage of all available new technology, but we must be prepared to innovate, to develop the new technologies we expect will be required to meet future needs. We must meet this challenge with a systems approach, integrating all new developments into the existing network.

"The social challenge is an intangible, which doesn't really lend itself to definition. Here, it is necessary to look at the total picture of life in the north -- not only as it is today, but as it might be in the future.

"The economic challenge is obvious. Telecommunications in the north involves massive amounts of capital. Communications, like everything else in these isolated areas, is extremely expensive, and revenues from the north alone cannot cover their cost -- not for a long time, anyway."

Policies, Planning, Participation

The challenges can best be met through what the carriers have called the "Three-P Program" -- requiring:

- sound, practical policies as guidelines for orderly development
- far-sighted, well-thought-out plans for implementation, and
- total participation by everyone concerned, so that there is complete understanding of the goals.

Policies

Mr. Kierans, in a speech to the Vancouver Board of Trade in November, 1970 referred to the role of the federal government in establishing policies designed to satisfy the needs of northern communities:

"...government must take the leadership in seeking a definition of needs in the public interest."

The telecommunications carriers regard it as essential to the success of any development program for the north that the federal government accept this leadership role in defining the needs and objectives, and take immediate steps to establish the necessary policies. The carriers are ready and willing, now as in the past, to cooperate with the government by providing and operating those telecommunications facilities required to fulfill the broad public policies for the region.

Of the utmost urgency is the question of financing. It is obvious that no single participant in the program is in a position to provide the tremendous amounts of capital needed to fully develop the north's communications network. It is obvious that some acceptable formula is needed to enable the telecommunications companies to make the contribution they are required to make. Some system of government financial participation will be required.

Planning

Planning, both short and long range, is the cornerstone on which the Canadian telecommunications network was built, and a vital basis of its operation. A fundamental aspect of the activities of all Canadian telecommunications systems is the formulation and continual up-dating of plans to broaden and develop telecommunications in Canada.

Such plans incorporate the use of new technologies, such as the domestic satellite system. In fact, TCTS recently developed, and presented to the Department of Communications, a concept on the use of a domestic satellite in northern communications. Called "New Concepts in Northern Communications using 'ANIK' Satellite", the submission resulted from a study of ways in which northern communications services, including CBC programming, could be developed through the integration of satellite technology with the existing terrestrial facilities.

The carriers feel that plans for northern development should now be crystalized as a formal total systems plan based on sound established policy.

Participation

Mr. Kierans, in many public statements, has recognized the responsiveness of Canada's telecommunications companies to the social, political and economic needs of the country.

> "The degree to which telephone companies, with what amounts to minimal regulation, have deployed their services to virtually every household in Canada is a case in point." (Vancouver Board of Trade, November 16, 1970).

The companies are equally responsive to the needs of the north. However, they feel that this project requires the participation of all organizations concerned with the north country, each playing their part in meeting national objectives for the region.

It is felt that the government, in its leadership role, should consider the creation of an organization representative of all northern interests, to plan and co-ordinate an overall northern development program.

There may be no precedent in Canadian history for the kind of organization needed to tackle this enormous task. But that should not deter us. Canada has an enviable record of adapting policies and procedures to unique circumstances, and of using ingenuity and resourcefulness in solving unique problems.

This capability is needed in full measure in the development of our north country.

Summary

1. It is necessary to

   - identify the communications needs of the north, taking into account probable demographic, social and economic changes;

   - select, and integrate into the total system, those technologies that are judged best able to meet the needs.

2. The task requires

   - sound, practical policies for the orderly development of the north;

   - plans for implementation of the program;

- total participation by all concerned;

- financial participation by the government, in view of the inordinately large amounts of capital required to ensure the success of a program of this magnitude. The formula could perhaps take the form of a system of deficiency payments, or a special tax arrangement;

- the immediate establishment of a national co-ordinating body, representing all agencies having an interest in the north, including representatives of governments, territorial administrations and the native peoples.

CHAPTER IV

APPRAISAL AND PERSPECTIVES

BY

D.S. LOFTUS

NORTHERN COMMUNICATIONS

APPRAISAL AND PERSPECTIVES

by

D.S. Loftus

Introduction

This concluding chapter of the Telecommission Study on northern communications attempts to place the contributions and findings of the Study in relief and indicate some directions for the future.

Requirements and Priorities

Volume 3 of the Telecommission Study 8(c) has supplied preliminary information on northern communications requirements. This work and debate at the Yellowknife Communications Conference clearly established the priorities for improved services in the North as follows:

(a) There is an urgent requirement to provide reliable point-to-point two-way telephone and teletype services to communities in the Territories and the northern parts of the Provinces. The prime need is to support emergency and health operations. Government administration is seriously frustrated by the lack of reliable communication facilities. Reliable facilities should be available on a 7-day 24-hour basis.

(b) The regions requiring attention in order of priority are (1) the Districts of Franklin and Keewatin (2) northern Manitoba and Saskatchewan (3) northern Ontario and Quebec (4) northern Alberta, British Columbia and Newfoundland.

(c) A basic radio broadcasting service is needed by each community for education, information, entertainment, and social action purposes. This service might be established by low-power community operated radio stations. Ultimately these community stations should be connected by intra and inter trunk networks and to the CBC national radio network.

(d) Industry requires reliable telephone and data services to support exploration activity, and toll quality telephone and wideband data services for north-south communications when major enterprises are under way.

(e) Northern residents want the trunk facilities for distribution of live television services. Programming should be orientated towards the northern environment and culture; industry wants southern television programming to reduce the chronic turnover of imported labour.

(f) There is an increasingly important need to provide communication networks for the support of air and marine navigation in the North. Communication networks are also needed for the dissemination of meteorological information and to support the northern role of the Canadian Armed Forces.

(g) Northern residents want some cheap means of communication to their resident settlements when they embark on hunting or trapping expeditions. Unlike the above needs this is for private facilities not requiring connection into the national telephone system.

Status of Existing Services

There is general dissatisfaction with the quality of telecommunications services provided by the common carriers using High Frequency (HF) radio. Complaints about the quality of service have been received from (a) the Government of the Northwest Territories, (b) air transportation companies, (c) federal agencies such as the Ministry of Transport and the Department of National Health

and Welfare, (d) mining and retail companies, (e) Members of Parliament, and (f) the general public. Survey trips have confirmed that HF radio services as presently operated are inadequate.

There are several reasons given for the dissatisfaction with HF radio systems, such as limited availability of service due to time scheduling, queueing for channels which are shared by too many communities, lack of a general call system, no advantage taken of ionosphere sounding techniques and error correcting equipment, auroral zone fades and flutter, equipment mal-function, communication black-outs for days at a time, and insufficient attention given to proper maintenance of the systems.

Where public facilities are provided by microwave, and troposcatter systems the service provided is generally rated as excellent. There were complaints about outages in service on the poleline and open wire systems during the winter months when ice builds up on the lines and degrades performance.

The proliferation of private radio systems attests to the finding that public telecommunications services are unsatisfactory as presently operated. Many organizations point out the real economic penalties to them of not having reliable communications. The Canadian Broadcasting Corporation states that radio-programming service could be extended to many communities if the trunk facilities were available. The Ministry of Transport operates their own HF radio facilities that could in many cases be redundant if reliable commercial services were available. The RCMP and Hudson's Bay Company have extensive northern HF radio networks but would also consider the use of commercial facilities if they were sufficiently reliable at economic service rates. Recently the Department of National Health and Welfare has commissioned common carriers to install HF systems in the northern parts of Manitoba, Saskatchewan, and Ontario, to compensate for the lack of public facilities.

Telecommunications and Economic Development

The regions of the north where communications are lacking are precisely those areas where economic development has been slow or stagnant. Industrialization has proceeded rapidly in the Yukon and the western regions of the Northwest Territories. Excellent general communications are available. Live television is the only telecommunications need that has not been met. Oil developments promise even more intensified activity particularly if gas pipelines are installed from the High Arctic to Edmonton following the Mackenzie route.

Development prospects in the eastern and central Arctic, and the northern extremities of the prairie provinces, are not so bright. The environment and prospects are less conducive to development here. Settlements are isolated and strings of communities are not the pattern. The tree line is below the 50^{o} parallel while in the west it is well above the 60^{o} parallel. Nevertheless the eastern and central areas are potentially rich in oils and minerals as indicated by the gradual shift eastward by the resource development companies. The pace of development has not been sufficient to ensure that telecommunications services for social and government administrative purposes will evolve without stimulus. Similar conclusions can be drawn for the northern extremities of the provinces, particularly the Provinces of Saskatchewan, Manitoba, and Ontario.

Coordination

No concerted attempt has been seriously made to coordinate requirements and planning by agencies concerned with northern communications. Nor has sufficient attention been given to the real needs of northern residents in planning systems for their benefit.

There are many facets to coordination. First there is the need for consultation with and participation by northern residents in the determination of requirements. Then there is the task of assessing what the communications requirements are for all federal agencies and industries that have major roles to play in the North. Next, there is the interpretation of communications requirements and the formulation jointly by the common carriers and the Department of Communications of system plans and programs to meet priorities. Finally, there is the funding of programs and the plans for their implementation.

The Advisory Committee on Northern Development provides the machinery for inter-departmental coordination among federal agencies. Its present constitution could be extended to permit participation by carriers such as Bell and Telesat Canada in sub-committee work. Clearly it must be more effectively used by the Department of Communications to achieve closer coordination within the federal apparatus and to generate support for major telecommunications expansion programs.

No formal machinery exists for the joint development of system plans by the Department of Communications and the

telecommunications common carriers. By necessity there is ad hoc consultation between the Department and individual telephone companies when common systems are close to licensing stages. It is essential to improve this informal consultation by establishing an interface between the Department and the common carriers to evolve a conceptual framework to plan the growth of communication services. To effect this coordination a group might be formed of representatives of the Trans Canada Telephone System, Canadian National Telecommunications, Telesat Canada, Canadian Broadcasting Company, and the Department of Communications which would meet regularly and be able to draw on the manpower resources within these organizations to do its work.

Some means has to be found to permit this latter group to be sensitive and appreciative of the needs of northerners for improved communications. The first stage would be to establish liaison with the native associations to involve them in the planning process. This might be achieved by having the joint government-industry group meet in the North with the presidents or leaders of the northern communities. At the very least it would be possible to meet with native leaders since the centre of their operations is Winnipeg, Manitoba.

Other papers in this volume have carried the coordination arrangements beyond the above elementary stages. (see Chapters I and III)

Funding

No major expansion of northern communications can proceed without the funding of initiatives on a large scale. Several questions require a response: How much capital should be set aside for the expansion of northern communications relative to other infrastructure e.g. transportation, housing, education, etc? What amount is required to bring the level of existing services up to satisfactory levels? What should be the proportion of federal, provincial, common carrier and private industry contributions?

An appreciation of the amount of capital that should be invested in communications is a matter of judgement related to tangible returns and the attainment of strategic objectives. It is interesting to note the magnitude of expenditures and revenues in a related field to communications - transportation - as funded by the federal government. The annual federal expenditures for air, marine, roads, and meteorological services in the territories and extreme

northern parts of the prairies were $31 million in 1965-66. This increased steadily to $56.7 million in 1969-70. Corresponding revenues were $6.02 million and $10.8 million. An extrapolation of amounts spent in this period shows that transportation expenditures are increasing steadily and the gap between expenditures and revenues is widening.

For comparison purposes a tentative plan submitted by the Trans Canada Telephone System for utilizing the ANIK satellite and providing ground distribution systems puts annual costs at about $10.5 million. Such a plan would effectively resolve most telecommunications problems in the Districts of Franklin and Keewatin, and the Provinces of Quebec and Newfoundland. About $6 million of this amount is for the annual rental of satellite transponders for Telesat Canada. This order of expenditure is not out of line if communications are to be brought to the level of transportation services.

The proportion of funding capital to be contributed by (1) the federal government, (2) the provincial governments, (3) the telecommunications common carriers, and (4) industries active in the North, cannot be satisfactorily answered by the Telecommission Study. But some principles can be suggested. First, it is apparent that all these agencies must contribute a share to the expenses of northern communications. Second, the telecommunications common carriers must bear losses through cross subsidization and as the price for their franchise and the extension of the capability of their networks. Third, the Department of Communications might contribute a share to compensate for the difference between annual operating expenses and revenues where facilities are provided at a loss to meet social or non-commercial objectives. Fourth, user charges above standard rates might in some way be borne by agencies who obtained special advantage from the stimulated expansion of northern services, e.g. Canadian Broadcasting Company and the Ministry of Transport. Fifth, the provinces must contribute to improved communications in the northern extremities of their regions if they require accelerated programs to serve their communication needs. Sixth, private industrial communication requirements should be met by these concerns and not require subsidies unless the overall economic development of a region is envisaged. Seventh, the extent of shared funding will be of interest to the C.T.C. for rate determination.

The advantages of distributing funding responsibility cannot be over-stressed because major programs can be tackled with less risk and trepidation if the costs are shared.

Northern Franchise Division

North of 60° latitude C.N. Telecommunications serve the Yukon and that part of the Northwest Territories west of 102° longitude. Bell Canada provides public telecommunications services to the east of the 102° longitude in the District of Franklin and Keewatin.

This division was apparently made to avoid destructive competition in areas where revenue was low. But it is an unusual division for the circumstances. On the one hand a Crown Corporation operates in an area which is rapidly becoming economically self-supporting while a private corporation serves an area where such a situation will not occur for a long time. Is this arrangement impeding the realization of improved telecommunications services throughout the Territories? The Telecommission Study did not address the optimum common carrier arrangements for northern telecommunications but the question does require examination.

Military Systems

Two major systems operated by the U.S. Air Force operate in the Canadian North. There is the DEW Line which runs laterally along the Arctic Coast and the Polevault (North) system for rearward communications to southern Canada. This latter system commences at Cape Dyer and proceeds down the East Coast of Baffin Island and Labrador to Goose Bay.

A finding of the Telecommission Study is that the DEW Line and Polevault systems can be used for the benefit of communities that are adjacent or close to stations of these systems. Communities could be tied into these excellent trunk facilities if simple and inexpensive VHF links were installed. The main stumbling block is the cost of renting circuits for long distances in the DEW Line and Polevault systems. It is estimated that the annual cost of providing the inter-connection equipment and rentals is between $50,000 and $100,000.

But it is the long term future of these military systems that must be studied more carefully. There is speculation that the DEW Line will be phased out in the next five years. This possibility could be considered and the potential of a re-equipped and re-organized civilian system investigated.

The Polevault (North) troposcatter system is a first class trunk system that might be better operated by our telecommunication common carriers. Recently the Polevault (South) system was acquired and a similar take-over of the Polevault (North) system should be carefully considered. A decision to take over this system would depend on favourable lease back terms for the rental of U.S.A.F. military traffic on the system.

Conclusions

The Telecommission Study has provided detailed information on the magnitude of the problem of expanding northern telecommunications in economic, social, and technological terms. The areas of further work and decision have been identified. It will be necessary to

(a) verify and authenticate the information collected on communication requirements by survey trips and traffic analysis for each region of the North. This work must take into account probable demographic, social, and economic trends.

(b) Compare, select, and integrate the various technologies into the national telecommunications system and develop a timetable for implementation of planned initiatives.

(c) Investigate the feasibility of a national coordinating body to synthesize the position and views of all agencies active in the North, and to encourage participation by the northern people in the preliminary planning process.

(d) Plan major programs for the expansion of general communication systems for the next five and ten year periods. Particular attention should be given to identifying the necessary research and development to meet anticipated operational requirements in the 1970-80 period.

(e) Determine the magnitude and the sources of funding that are needed to embark on a program of substantial and progressive improvements in northern communications.

(f) Study the adequacy of present institutions for serving the North and consider alternative arrangements to achieve most expeditiously the necessary advances in telecommunications services.