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COMMUNICATIONS RESEARCH ADVISORY BOARD

REPORT TO THE DEPUTY MINISTER
DEPARTMENT OF COMMUNICATIONS

MAY 1977

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THE COMMUNICATIONS RESEARCH ADVISORY BOARD

This is the second report to the Deputy Minister of Communications by the Communications Research Advisory Board (CRAB). The Board met on April 5 and 6, 1977, to hear presentations by departmental officers. It met again in camera on May 11 and 12, 1977, to finalize this report which represents a consolidation and a consensus of members' views expressed at the meetings and in their very extensive written submissions to the Chairman.

The Deputy Minister's response to the first report was greatly appreciated by members of CRAB. We felt that our efforts were accepted with the same sincerity with which they were offered. There were differences of opinion, of course. But on balance, the response gave us assurance that our efforts had been beneficial to the Department and that the Deputy Minister takes seriously his creation of an independent and very heterogeneous board to advise him on the research activities of his Department.

From the tenor of the Deputy Minister's response and from the tacit acceptance in our meetings and deliberations with departmental officials, we have continued to interpret our mandate very widely, both in definitional scope and in time horizon. Thus we take research to include the natural and human sciences as reported by the Department of Communications to Statistics Canada, and we take the time horizon to include the near past, the present and, in some cases, the ponderable future.

Last year's assignment included the gamut of departmental research activities. This was intended to provide an overall picture within which the various research components could be placed. This year's assignment concentrated on a few selected research programs of particular significance to the Department. Therefore this report will mirror this emphasis. If we depart from time to time, it is because we are responding to broader issues raised in our discussions or to the fact that, in offering advice to the Department, we want to be as precise as possible about the context of our thinking.

This report will also be seen to reflect the composition of the Board. In looking around at each other, members commented that a somewhat different composition should be considered by the Department for next year. It was suggested in particular that there be CATV and broadcasting representatives and an increased orientation towards the human sciences. And, without wishing to

discriminate on the basis of sex, we point out that statistical considerations suggest the Board should not be composed exclusively of men.

We are grateful for the full co-operation and assistance accorded CRAB by the many officials who participated with us. Our thanks, also, for the personal participation and hospitality of the Deputy Minister.

BRIEFINGS

As a result of the voluminous information which had to be assimilated last year, members of CRAB suggested that the Department should, on an annual basis, or more frequently as appropriate, prepare a concise briefing package. This would set out the mandate, history, goals, objectives, activities, priorities and major concerns of the Department and place the research programs within this context.

This year's briefings were sharply focused on specific programs and were well prepared, well conceived and, indeed, well received. Missing, however, was a concise account of last year's overall story, and new members of CRAB did not have the benefit of knowing the fuller story. At the same time, continuing members of CRAB would have liked to have been able to compare last year's figures with this year's, and last year's intentions with this year's. It would have been of very great interest to learn about changes in emphasis, about the principal preoccupations of the space sector and of the general scope of the research activities of the Senior ADM Policies. We would, therefore, once again encourage the Department to prepare such a briefing package. It would serve two purposes for CRAB. First, it would inform new members in the way described. Second, it would enable the full Board to make better judgements about the relative scope and direction of individual research activities. We assume that this would be of equivalent benefit within the Department.

Members of CRAB, while appreciating the idea of concentrating on a few specific programs, expressed disappointment that space research, which dominates the research resources of the Department, was not specifically mentioned, nor was research in the human sciences, which is estimated by the Department to amount to some

\$3.4 M for 1977-78. Admittedly, the specific programs under review had a substantial multidisciplinary aspect and included the human sciences. But space was very conspicuous by its absence, and we would have preferred to have seen it included.

We would like to emphasize, however, that we were very favourably impressed with this year's briefings and with the supporting material furnished by the Department such as Dr. Madden's discussion paper on a "Basis for R&D in DOC".

GULF BRIDGING

Concern was expressed last year about an apparent gulf between departmental research programs having a basically "hard" science orientation (the natural sciences, including engineering) and those having a "soft" science orientation (the human sciences, including economics).

These two cultures appeared to be organizationally and functionally removed from each other, which indicated a potential for communication improvement at the middle-management level and below.

This year there is clear evidence that the gulf is being bridged. We learned of multidisciplinary research programs having the highest departmental priority. We heard from a number of individuals who spoke with one voice about the aims of their project team though their backgrounds were in markedly different disciplines. In the briefings and the Deputy Minister's response we learned of intra-departmental mechanisms now in place for consultation, priority setting and cross information flows. We were impressed.

CRC ISSUES

The status of CRC within the Department was one of the subjects we were asked to consider, but only on a sort of by-the-way basis. The question was addressed in Dr. Madden's discussion paper as well as in a note provided by Mr. Parkhill in which he discusses

the Not-For-Profit (NFP) model. It was also implicit in much of the discussion associated with the Spectrum Management program. But of course it really could not be dealt with in any detail in isolation from the Space Program of the Department.

There was, nevertheless, strong reaction among the Board. We were surprised and dismayed that the dilemma is not yet resolved, for this kind of uncertainty itself creates a problem. This is a very large question indeed, consideration of which ought to be deferred until or unless the case for change has been clearly established by the Department. We recommend that, as a matter of stated policy, the Department should declare its intentions of maintaining the status quo. CRC should therefore expect that, apart from the normal adjustments for gradually changing priorities, stability will be the main feature of DOC's intentions for CRC for at least the next several years. We feel that removal of uncertainty would elicit a welcome response from the staff of this very important national facility. This should, of course, be accompanied by a general statement of purpose - of the objectives for the Centre - which would enable the Centre to function in the integrated fashion with the rest of the Department exemplified by the Rural Communications and Spectrum Management Programs.

It was noted that a persistent problem associated with budgetary restraint is that of sharply reduced opportunities for staff enrichment. The staff population tends simply to age, few new people are hired and career progression depends on outliving one's boss. While budgetary restraint is obviously going to be with us for quite some time, there are steps which can be taken to ameliorate this problem, given a strong sense of direction and a long enough planning horizon for the concept of a career to be meaningful. We recommend that staff be moved between CRC and the industry and university sectors by means of the Interchange Canada Program of the Public Service Commission. We would encourage using every possible strategy to augment or interchange staff. We would recommend that continuing positions be filled in some cases on a term basis, that some positions be reclassified downwards, that variety of work experience become a clear objective of the staffing process.

It was also suggested within CRAB that staff enrichment would be accomplished economically by opening up their budgets for professional development. As a matter of Departmental policy, national and international contacts should be strongly organized, both with communications operators and technical centres.

We have noted in the Deputy Minister's reply his general observation of the difficulty of matching existing skills to new needs. We are confident, nevertheless, that, given a clear statement of the needs of the Department, a surprisingly large proportion of the staff would rise to the challenge and exceed all conventional expectations.

THE RESEARCH PROGRAM

The format of the research budget, as presented to CRAB on April 5, 1977, did not lend itself to an easy comparison with the expenditures allocated to each of the research sectors as presented in the 1976/77 budget. As mentioned earlier, comparisons with last year's activity levels in the research sectors would have been a useful analytical tool. An updated statement of the Department's long term goals and objectives would also have been useful in analysing the scope and magnitude of this year's proposed activities.

From the figures presented we noted that the non-space research portion of the budget has increased from about \$7.0 M in 1976/77 (after a transfer of \$2.1 M) to \$7.8 M in 1977/78.

This increase appears minimal, at best, since it actually represents a declining proportion of the Department's overall budget and a declining proportion of the research budget including space.

Although the reduction in relative magnitude of the research budget could be viewed as disappointing, we were pleased to see a changing emphasis of the research program from its historical linkages with DND-related projects into areas oriented more towards the total spectrum of telecommunications needs in Canada.

Judging from the specific programs comprising this year's assignment for CRAB, the Department appears to be engaged in a theme-setting exercise which serves to define and combine areas of particular promise and areas of high departmental expertise. We feel that this is an excellent way of managing the very minimal resources allocated for research.

We wonder, however, given an extended period of tight budgets combined with a steady or growing need for research in support of departmental objectives, if there is any duplication of effort

with other Federal Departments, in such areas as statistical data collection, urban/rural affairs, the transportation/communications interface, futures studies and so forth? Is it conceivable that increased reliance could be placed on the services of such agencies as Statistics Canada or such departments as Urban Affairs, CMHC, Agriculture and others? If this aspect has not been explored recently, we would suggest that a fresh look be taken at departmental activities with this in mind. Perhaps there is further scope for capitalizing on the efforts of others in order to concentrate further on those activities which are best done within the Department of Communications.

THE UNIVERSITY RESEARCH PROGRAM

We were asked whether we could provide any suggestions with respect to this program. Though small in dollar terms (700K), it looms large in terms of decision-making in order to achieve a regional balance, an appropriate coverage of disciplines and a correlation with departmental research priorities. It seemed to members of CRAB that this little program was important and should be protected but that purpose and method might be clarified.

1. The Purpose of the University Research Program

The purpose for university research should be to serve the technical objectives of the Department. In so doing, the independence, the academic variety, the systems approach, the freshness and vitality of university research can all be brought to bear on needs articulated by the Department.

Thus this program would represent a proportion of departmental contract funds earmarked for the university sector on a continuing basis. In this way, universities would be assured of a certain level of participation in departmental research activities. At the same time, the Department would be relying to this extent on the expertise to be found in universities in support of its objectives.

Members of CRAB viewed this program as an important, if not crucial, interaction between the Government and the university sector. The opinion was also expressed that, through the mechanisms of sub-contracts, whether as prime or sub-contractor, universities could usefully participate with

industry and government in research activities aimed at DOC needs. Inter-sectorial collaboration was viewed as extremely important.

Unless or until it is the responsibility of the Department to foster scholarship, or university research and research expertise per se, it is not the purpose of this program to be a bandaid for perceived gaps in the programs of the granting councils. The Department should, however, strongly encourage the National Research Council or its planned successor to establish an associate committee on communications for this purpose.

By viewing the University Research Program as a component of the extramural contract program in support of departmental objectives, a rationale is provided automatically for incrementing the funding to keep pace with cost increases. It becomes an integrated part of the long term planning concepts of the Department. As a "grants" program, its budget is much less likely to receive positive treatment. This is especially true under the present review process associated with budgetary restraint.

2. Method

Many of the problems associated with this program stem from the present method of evaluating proposals and distributing contracts. In the opinion of members of CRAB, this is because technical objectives have largely become lost sight of. Thus, to satisfy the maximum number of people, the contracts have tended to be small and widely distributed, whereas technical objectives might well dictate fewer, larger and longer-term contracts. This could lead to imbalanced statistics for the Department of Communications alone. But this would not be a problem if the contracts under the Make-or-Buy Policy are distributed appropriately to all regions by the Government as a whole.

We would therefore suggest that the method of selecting and awarding contracts be modified and that DSS become the agent for this purpose, just as for DOC's industrial contracts. The technical specifications and objectives would continue to be set by DOC and technical authority and control would remain as before. DSS would ensure that the general policy objectives of the Government and Department would continue to be met, but in a way that would likely give greater latitude to DOC in setting technical objectives.

It would also make it easier to contract on a longer-term basis, the need for which was raised by a number of members of the Board.

There will frequently be cases for sole-source or directed procurements on account of particular, recognized expertise at certain institutions. This should continue to be an accepted aspect of the Department's University Research Program.

We view this idea of separation of purpose and method as having the potential for freeing up one or more man-years in the Department, at the same time as strengthening the University Research Program.

We have dwelt here on the DSS route for this purpose. Several Board members drew the EMR model to our attention and recommended it for DOC's consideration. We therefore recommend that the experience of other departments such as EMR also be taken into account when the decision is being taken by the Department of Communications concerning future courses of action for its University Research Program.

THE RURAL COMMUNICATIONS PROGRAM

General

This program was warmly praised by members of CRAB. Aside from its technical merits and the underlying scientific accomplishments, the rural communications program is seen by members of CRAB to be an excellent model of how a scientific activity can be organized and directed to serve the longer-term objectives of the Department. As mentioned earlier, we were impressed by the balance struck between hard and soft science in the Program and the ease with which the staff related their activities to each other and to their common purpose. This was quite clearly the sort of thing the Deputy Minister was referring to in his response to last year's report from CRAB in connection with the bridging of the gap between the two cultures.

As an example of interdisciplinary research on a specific theme, the Rural Communications Program elicited a number of comments from members about the timing and intensity of research on the social, jurisdictional and policy questions associated with the technical side. It was pointed out that, unless the climate is

right for commercial exploitation of the results of a research program, then even the most technically exciting project is like a Roman Candle in a fireworks display - a moment of excitement but of no long term significance.

Questions were also raised concerning the extent to which futures studies were being carried out by the Department or elsewhere to assist in developing a vision of the future of Canadian communications. And because rural planning implies an interface with urban planning and is a subject that cuts across the interest of many departments and jurisdictions, the question was raised as to whether an adequate mechanism currently exists by which the Department of Communications can obtain the advice of, say, CMHC and MSUA in areas of common interest.

We would like to acknowledge the progress made in the past year in regards to the Rural Research Program and reaffirm our support of what we see to be a very significant undertaking. One of the major financial burdens facing telephone companies and their customers today is the tremendous capital resources being consumed in providing an acceptable grade of communications to the rural and remote areas of the country.

Millions of dollars annually are being invested in existing copper wire paired plant technology to provide and improve service in rural areas. Hence the time for research into the new technologies of subscriber carrier, rural radio, fibre optics, etc. is now, before the carriers are forced to commit millions of dollars to current technology. As customer expectations increase and new telecommunications services proliferate, the probability increases that a total integrated communications delivery service carried by fibre optics, coaxial cable or some other broad spectrum medium, will be the most economical alternative provided that the legal and jurisdictional obstacles have also been dealt with.

To provide rural and urban Canadians alike with a similar choice of communications services is a worthwhile goal. Approaching it requires that a suitable balance be struck between demand for such services on the one hand and social and economic constraints on the other. Thus we stress the importance of these social aspects of the Department's research program which will lead to the development and testing of models to demonstrate both the need for and the feasibility of expanded rural communications services. In addition to its contribution towards the goal of greater equality of communications services, the Rural Research Program should assist in the development of a leadership position for Canadian research and manufacturing for service in the thinly populated areas.

No such research for all of Canada has been undertaken before. At present, carriers across the country have a wide variety of policies and priorities towards rural service. Technological requirements have varied between carriers and there appears to be no concerted effort towards looking at the rural communications problem for Canada as a whole. This fragmented approach has slowed or even precluded development of a suitable rural technology by Canadian manufacturers, especially in the light of regulatory policies in certain areas against the concept of an integrated service.

The Rural Program has now brought active participation of carriers and in particular MTS into play. This is recognized as an important step in the right direction and effort to expand participation of the carriers and other interested parties in influencing the direction of research should be encouraged.

Many of the projects associated with the Rural Program have been allocated to industry and the universities. In the case of industrial research, it would seem that BNR is being allocated a large majority of the projects. Although their leading position as a telecommunications research facility is recognized and DOC's knowledge of their capabilities is appreciated, consideration should be given to ensuring the participation of other Canadian organizations who have shown interest and capabilities in rural carriers systems.

The Rural Research Program is aimed at developing the technical solutions and determining the financial impacts of improving rural service. This stage of the process is best carried out with Federal Government involvement, but, as soon as the appropriate policies have been decided and details of the necessary financial conditions determined, the implementation should be quickly turned over to the carriers.

Fibre Optics Field Trial

The Fibre Optics Field Trial promises to be a worthwhile and timely undertaking. Any delays in commencing with the trial will, however, reduce its overall effectiveness and we therefore suggest that the trial be implemented as quickly as possible. Operators continue to pour millions of dollars annually into exchange cable distribution plant and a trial of this nature will serve to demonstrate the feasibility of an integrated distribution system using fibre optics technology. Also from the point of view of Canadian manufacturers, if we are to establish a position of leadership in the technology of fibre optics, it is essential that the trial begin without delay and

that planning for this take into account the necessary consultation with industry to ensure that Canadian advantage is maximized and that the market is not lost.

As the trial is an experiment in both service and technology, the time required to complete it will undoubtedly exceed that of a field trial of a known, viable product. As the experiment progresses, there should be consideration given to utilizing technology evolved from other areas such as toll and urban.

We strongly support the concept that the field trial be carried out in conjunction with a carrier to ensure that the experimental system which is developed will be both practical and attuned to the needs of our present and future telephone subscribers. Carrier involvement will bring the benefits of their existing construction and maintenance skills to the project and allow these skills to be upgraded to include the fibre optics technology which they ultimately must administer.

SPECTRUM MANAGEMENT PROGRAM

As the demand for telecommunications continues to grow and as new technologies are developed and proliferated, utilizing ever increasing portions of the available frequency spectrum, the need for efficient utilization or reclamation of this spectrum becomes increasingly important.

Communications
This research program is, therefore, of fundamental importance. It is the essence of what has to be done by the Department of Communications. It ensures that Canadian interests are protected by having adequate and pertinent scientific and technical knowledge in this area.

Members of CRAB were as enthusiastic about this program as they were for Rural Communications. It is well conceived and has a good sense of direction and purpose.

There were certain aspects of this subject which individual members of CRAB cited as needing further emphasis. Some of these are as follows:

- (a) There is inadequate public awareness of the problems of spectrum crowding and pollution in the face of ever increasing demands for information transmission. Like energy, this is an important utilization/conservation issue.

- (b) Although the needs of the carriers and the telecommunications industry in the area of spectrum planning have, up to this time, been met quite adequately, we foresee a rapidly escalating requirement in the next few years. We would therefore suggest that the Spectrum Management Program be reassessed to ensure that the problems we shall face by 1980 and beyond are adequately addressed, i.e. that long-term planning becomes an explicit and integral part of the program.
- (c) With the emergence of digital and fibre optics technology, carriers are demanding answers to many new questions, e.g. will the new digital technology allow us to vacate and re-use the existing 2, 4 and 6 GHz analogue bands, or will the huge investment in analogue technology prevent such an occurrence. Will fibre optics provide relief in the VHF and SHV bands or will the present economies of paired plant and microwave radio that make their use attractive continue indefinitely?
- (d) As the Department is only too painfully aware, perhaps the most urgent situation in the area of frequency spectrum planning is that of mobile radio. The demand for mobile communications service is now growing at a faster rate than any other area of telecommunications service. Already frequency-congestion is seriously affecting the quality of service for existing customers and limiting the ability of carriers to provide service to potential new customers.
- (e) Carriers are now moving into medium and high capacity mobile systems and questions of frequency allocation and channelization plans require immediate answers. Naturally the manufacturers of mobile sets and terminal equipment are most anxious for planning to be finalized in these areas. Again the question of shared mobile systems combining public, private, dispatch, etc. should be closely examined.
- (f) The overtaxing of existing resources appears to have prevented DOC from formulating a comprehensive long-range plan for their frequency utilization, modulation and propagation mode research. An ability to replace scarce dollars by ingenuity has, however, managed to rescue a good portion of the programme. This approach, though

highly commendable, has its limitations. Long-range planning cannot be expected in an environment where exploratory research is viewed as a luxury. It is the key instrument for looking into the future and without it little can be accomplished.

Therefore, it is recommended that the role of exploratory research be examined as a component of long-range planning and that the existing resources be examined to determine whether they are adequate to perform their function.

- (g) Consideration should be given to increasing the resources for this program in view of its central importance to the function of the Department. Longer term projects of an exploratory or anticipatory nature are needed in order to be able to provide balanced support to current departmental priorities. Otherwise technical advice can only be based on a short-term view of a technology and science that are as dynamic in time as they are vast in scope. This need not be a major component of the Spectrum Management Program, say only 25%, but it should be given official status and carefully nurtured. What is more, the research staff of this and similar departmental programs should be encouraged to show initiative in recommending projects along these lines.

THE RECURRING THEME

In these concluding sentences, we wish to highlight a theme that threads its way through our earlier comments. It concerns the future. We sense that the Department is very concerned about the future but is setting its research priorities more with an eye on present exigencies than with a vision of the future. On the other hand, we note an increasing sensitivity to the need for longer term planning as evidenced, for example, in the Rural Communications and Spectrum Management Programs.

We cannot emphasize too strongly that, while substantial progress has been made, this remains a pressing issue. We have alluded to the correlation between morale and the sense of participation that results when an officer feels his efforts are in the

direction intended by his leaders. It is not our intention to moralize here but rather to stress the great progress we believe the Department has made in those areas where such direction has been clarified. Therefore we wish to reiterate our belief that the Department should redouble its efforts in planning for the future of its research programs. There will continue to be limits to the feasibility of complete and detailed long-term planning. But the climate for creative research, for research aimed at meeting the future as well as the present needs for communications in Canada, will depend on departmental leaders convincing their staff that their efforts are needed; that the research program is part of an integrated program directed at departmental goals and national needs.

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