TELECOMMISSION

Study 2(h)

Re-appraisal of the Present Management of the Radio Spectrum

The Department of Communications

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Canadian Radio Technical Planning Board

Telecommission Study 2(h)

Re-appraisal of the Present Management of the Radio Spectrum

Part 1 of 2

Description of Study

Summary of Recommendations and Conclusions

Industry Comment

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Ottawa, 1971

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Part 2 of this study (700 pages) contains the detail reports of the four task forces which accomplished this work. Copies in limited quantities may be obtained from

Canadian Radio Technical Planning Board
880 Lady Ellen Place
Ottawa Ontario Canada

Price per copy - $40.00 post paid

Individual briefs which make up Part 2 may be available in limited quantities. Please write the C.R.T.P.B. office for price and delivery information.

Telecommission Study 2(h)

1. Introduction

In July 1969 the Canadian Radio Technical Planning Board was invited to undertake the major responsibility for the industry part of Telecommission Study 2(h). In addition to C.R.T.P.B. sponsor members, it was agreed that various non-member organizations would be invited to participate in order to make the study truly representative of the communication industry thinking in Canada.

2. Canadian Radio Technical Planning Board

The C.R.T.P.B. was established in 1944 for the purpose of giving advice and making recommendations to the Government concerning the development and regulation of radio services in Canada. Its function is to represent the interests of users, manufacturers and other organizations directly involved with telecommunications in Canada and to develop studies, investigations, recommendations, standards and specifications relating to radio services as may be required.

The 22 members of the Planning Board are called sponsor members who are generally national non-profit associations of commercial companies both operating and manufacturing, technical societies or other bodies concerned with the technical use of radio systems in Canada. The Board consists of representatives of the sponsor organizations, with a President, Immediate Past President, Vice-Presidents, Executive Committee, General Council, Standing and Ad Hoc Committees and a Secretary-Manager. It maintains an office at 880 Lady Ellen Place, Ottawa, which is open three days per week (Tuesday, Wednesday and Thursday).

Sponsor Members of C.R.T.P.B.

American Radio Relay League (Canadian Division)
Association of Municipal Electrical Utilities of Ontario
Canadian Association of Broadcasters
Canadian Association of Broadcast Consultants
Canadian Association of Chiefs of Police
Canadian Broadcasting Corporation
The Canadian Education Association
The Canadian Electrical Association
Canadian Electrical Manufacturers Association
Canadian Overseas Telecommunication Corporation
Canadian Trucking Association
Dominion Marine Association
Electronic Industries Association of Canada
Engineering Institute of Canada
Institute of Electrical and Electronic Engineers
Canadian Cable Television Association
Ontario Department of Education
Ontario Provincial Police
The Railway Association of Canada
Royal Canadian Mounted Police
The Telephone Association of Canada
Western Canada Telecommunications Council

3. Steering Committee

In September 1969 a Steering Committee under the chairmanship of J.C.R. Punchard, President of C.R.T.P.B., was established. It consisted of representatives of interested C.R.T.P.B. sponsor members and a number of non-member organizations. Terms of reference were formulated by this committee on September 17th in Ottawa and it was decided to circulate a questionnaire to interested parties before determining the manner in which this committee would be organized to carry out this study.

Membership of Committee

J.C.R. Punchard	- Chairman	
G. Bedingham	- C.R.T.P.B. (Committee Chairman)	
G.G. Bleiler	- Canadian Trucking Association	
C.J. Bridgland	- Railway Association of Canada	
R.O. Cahoon	- C.B.C.	
W.A. Caton	- Canadian Association of Broadcasters	
A.P. Davis	- Canadian Electrical Association	
N.B. Eaton	- American Radio Relay League - Canadian Division	
A.T. Foss	- Ontario Provincial Police	
E.H. Hayes	- Engineering Institute of Canada	
T.E. Hervieux	- Telephone Association of Canada	
W.J. Huget	- R.C.M.P.	
G. Long	- Canadian Association of Chiefs of Police	
J.M. McNichol	- Canadian Petroleum Association	*
P.M.M. Norman	- Telesat Canada	*
R.W. Norman	- Airtel Ltd.	*
H.M. Reid	- Electronic Industries Association	
I.M. Saunders	- R.C.M.P.	
F.G. Stiles	- C.R.T.P.B. (Committee Chairman)	
B.R. Tupper	- West Coast Telecommunications Council	
J.C. Wilson	- Telephone Association of Canada	
H.E. Parsons	- Secretary-Manager - C.R.T.P.B.	
V. Lee Chong	- Dept. of Communications	*
G.P. Dunn	- Dept. of Communications	*
J.C. MacIver	- Dept. of Transport	*
B.J. McIntyre	- Dept. of Transport	*
G.H. Stewart	- Dept. of Communications	*
G.J. Taylor	- Dept. of Transport	*
W.J. Wilson	- Dept. of Communications	*

plus mailing to

P.G. Bowers	- Ontario Dept. of Education	
T.C. Cunningham	- Air Canada	*
K.J. Easton	- Canadian Cable Television Association	
R.M. Hay	- Railway Association of Canada	
H.W. Jackson	- Canadian Education Association	
C.A. Morrison	- Air Transport Association	*
N. Redsell	- Association of Municipal Electrical Utilities of Ontario	
G. Warden	- Canadian Pacific Airlines	*
R.W. Wilson	- C.R.T.P.B. (Committee Chairman)	

T.M. Mimee	- Electronic Industries Association
C. Harris	- Electronic Industries Association
R.E. Santo	- C.R.T.P.B. (Committee Chairman)
D.J. Willows	- Canadian Electrical Manufacturers Association
J. Loader	- Canadian Cable Television Association
I. Switzer	- Canadian Cable Television Association
W.E. Evans	- Canadian Cable Television Association
A.W. Perser	- Airtel Ltd. *
L.F. Bresolin	- Canadian Gas Association *
G. English	- West Coast Communications Council
B.W. Cosman	- Telephone Association of Canada
C.R. McFarlane	- Dept. of National Defence *
E.B. Powell	- Dept. of Transport *

* Non Members of C.R.T.P.B.

4. Terms of Reference

(i) to study and record present allocations and methods of allocation of the frequency spectrum to the various radio services with a view to determining conditions of crowding, interference, availability and actual use.

(ii) to study in depth the technical problems concerning the use of the radio spectrum.

(iii) to determine how technological advances may best be applied to increasing the efficient use of the spectrum with due regard to the relationship between equipment costs and performance.

(iv) to determine future needs and priorities for frequency assignments and to make recommendations concerning future apportionment of the spectrum to the various radio services.

(v) to make recommendations concerning methods of spectrum management, possibly on a geographical basis, as an improvement over the older method of spectrum administration.

(vi) to undertake some study of the economic worth of the spectrum to Canadians and of costs involved in particular kinds of services with a view to recommending economic factors to be taken into account in the allocation of bands to services and the assignment of frequencies to stations.

5. Questionnaire

(1) Where are we now with regard to the use of the Radio Frequency Spectrum?

(2) What are the current problems concerning use of the Spectrum?

(3) What will your future needs be for frequency assignments for the various radio services?

(4) What current developments in technology will affect the allocation and use of the Spectrum?

(5) How should new technology be applied to the use of the Spectrum?

(6) What principle should be followed in Spectrum Management to ensure meeting future requirements?

After a review of the questionnaire answers by an ad hoc collating committee on November 12, 1969, a plan was drawn up for carrying out this study under five task forces. This plan was presented to the second meeting of the Steering Committee on November 26, 1969, and was modified to four task forces, as follows:

6. Task Forces

(1) Broadcast Service Task Force -- Chairman, R.E. Santo, C.B.C.

(2) Land, Air, Marine, Mobile and Associated Fixed Services Task Force -- Chairman, G. Bedingham, Canadian Motorola.

(3) Microwave Task Force -- Chairman, R.W. Wilson, Maritime Telegraph and Telephone Company Limited.

(4) Other Services Task Force -- Chairman, E.B. Powell, D.O.T.*

*Mr. Powell was unable to continue as Chairman due to absence from Ottawa on government business. His place was taken by Mr. T.E. Devey of the Department of Communications and more latterly by Mr. G.H. Hauch, representing the Telephone Association of Canada.

The Chairmen of these task forces used the technical representation on the Broadcast, Television, Land Fixed and Mobile, Maritime, and Radio Relay Committees of the C.R.T.P.B. augmented by representatives from many other non-member associations and companies, such as Canadian Gas Association, Canadian Petroleum Association, Air Canada, Department of Transport, Department of Defence, etc. The names of the contributors are shown in the reports of each of the task forces.

The reports of the four task force studies are contained in the accompanying Part II volume. This volume was compiled by the C.R.T.P.B. office, but no attempt was made to edit the reports received from the task force Chairmen. The C.R.T.P.B. in no way claims that these studies are complete or unanimous. The industry believes that the task of re-appraising the management of the frequency spectrum is a long and onerous one and that only a broad brush treatment of this subject could be accomplished within the very short time frame of about 10 months. The industry believes that the Department of Communications should give serious thought to requesting that this particular telecommission study be continued, although at a more relaxed pace, over the next few years.

Due to a misunderstanding the Other Services Task Force confined their deliberations to the frequency bands below 30MHz. In so doing, no consideration was given to radar, navigational aids, diathermy, or industrial processing equipment, most of which operates above 30MHz. This represents a definite gap in the information provided. We believe this steering committee should be asked to set up further ad hoc groups to deal with this.

Because it is not possible to obtain unanimous opinion on many aspects of spectrum management, the four sections prepared by the task forces have been reviewed by the sponsor members of C.R.T.P.B. and all the other contributing organizations. Their final comments and observations on the study are contained within this volume. (Part I)

Summary or Recommendations and Conclusions

Each task force report contains a series of recommendations which are summarized here for convenience. For more detail see particular texts. Part 2 of the C.R.T.P.B. Report.

1. Broadcast Task Force - Summary of Recommendations and Conclusions

(a) Frequency Allocation

The allocation and method of assignment of frequencies for broadcasting services in Canada have followed a planned approach on the national and international levels. Flexibility in allocation engineering criteria in Canada has resulted in more efficient use of VHF television and AM broadcast bands.

(b) Receiver Performance

Improvement in receiver performance is required to accommodate the increase in the number of transmitters and the use of receivers in cable systems. It is recommended that a reduction of the excise tax be made an incentive to offset the increased cost of improved receiver performance.

Increased effort should be made to use existing regulatory powers to reduce or at least control steadily increasing electrical noise levels.

(c) Application of Technological Advances

Spectrum usage would be made more efficient by:

(a) improving "operating" selectivity and intermodulation characteristics of receivers.

(b) use of single sideband in short-wave broadcasting.

(c) use of space satellites to make broadcast service available to remote parts of the country.

(d) introduction of channel searching and digital language techniques in the VHF spectrum.

(e) multiplexing of FM channels and TV sound channels.

(f) development and implementation of improved technical standards for cable TV systems.

(g) use of cable transmission as an alternative for TV broadcasting in urban areas.

(d) Future Apportionment of Spectrum

AM Channels -- Saturation of available channels has nearly been reached in the larger cities. Improved channel availability will require a new approach. See Section (e).

Television -- Under present allocation rules, available VHF and UHF channels vary from 4 to 13 per urban area. The minimum needs per bilingual city are 2 English, 2 French and 2 educational programs, a total of six.

FM -- Since all available FM channels have been put in service in the larger cities, there would be a shortage of channels if FM output is made mass-appeal programming with advertising potential.

Auxiliary Services -- Dedicated channels for studio-to-transmitter links, standby, and outside broadcasts should be provided to each station. Licensees in the VHF communication bands should be required to exercise circuit discipline in technical standards and usage.

(e) Spectrum Management

AM -- Consider voluntary reassignments in the AM band.

FM -- FM allocations should be studied with the objective of avoiding allocations which interfere with television channel 6.

Auxiliary Services -- Consideration should be given to sharing rather than duplicating services in the VHF band. Use of digital information for some communication (e.g. dispatching) should be considered.

(f) Economic Worth of Spectrum

The physical worth of the spectrum appears to be:

Radio (AM)	$255 million per MHz per annum
Radio (AM & FM)	$12.8 million per MHz per annum
Television	$ 4.9 million per MHz per annum

Methods of measuring the social value of programs have not yet been developed.

2. Land, Air, Marine, Mobile and Associated Fixed Services Task Force -- Summary of Recommendations and Conclusions

(1) The continued growth of land mobile services as a result of its vast economic and social benefits, can be expected to result in an acute shortage of channels by about the year 1980. To meet future needs these channels would be most logically provided as part of an overall North American Plan by re-allocation from broadcasting channels, for example, TV channels 14-20. Considerable spectrum space is wasted due to low efficiency systems.

(2) Within the scope of such a plan there should be maximum flexibility in spectrum allocation to encourage maximum usage of spectrum.

(3) Manufacturers should not be pressured to develop increasingly sophisticated and expensive means to accommodate more users until such time as low efficiency systems such as radar, FM and TV broadcasting have matched up to the standards being achieved in land mobile, HF point-to-point and AM broadcasting services, for example.

(4) Pollution is restricting efficient use of the spectrum.

(5) The radio frequency spectrum should be reserved primarily for those requirements that may not be practical over other means.

(6) In order to speed up licence applications some form of pre-processing of frequencies and stream lining of procedure appears to be needed.

(7) A price should not be put on use of spectrum, as a prime consideration.

(8) When there is a shortage of spectrum, priority in the allocation of frequencies should be given to services essential to the public interest.

(9) Users should be free to choose between leased and privately owned facilities.

(10) Licences should normally be granted for a definite term, preferably corresponding to the period over which radio plant is amortized. In any case the applicant should be made aware of any plans which would unusually limit life expectations.

(11) Telephone companies should offer some form of interconnection to the public telephone network on a mutually agreeable basis and at readily ascertainable rates.*

(12) (a) Modifications to DOC equipment standards specifications are necessary.

(b) Policy level conferences between DOC, EIA, and CRTPB are recommended to re-define the philosophy and policy of equipment technical specifications.*

(13) With increasing diversity of users for mobile communications, user groups representing specific industries or public safety organizations should be encouraged to participate in the activities of the CRTPB.

(14) With a new creative role for DOC for the future, increasing time should be spent with specific user organizations across the country to determine the particular uses of the spectrum and system concepts which will promote efficiency and productivity. There should be additionally increasing efforts in working with EIAC in paving the way for the new technological developments of the future.

(15) Increasing uniformity of technical standards among the various radio services is encouraged.

(16) There should be flexibility to accommodate new technology and needs.

(17) There is a need for spectrum space outside the mobile bands for low capacity (up to 60 voice channels) point-to-point systems in an area not subject to ISM interference.

(18) It is important to recognize, that looking at the entire spectrum, there is an allocation problem upon us rather than a spectrum shortage problem for the next decade or more. It is the Task Force's position that this simple fact renders proposals for charging for use of the spectrum undesirable. Use of the radio spectrum, a natural resource, should be encouraged to the benefit of the country.

*Consensus opinion on these two items only.

3. Microwave Task Force -- Summary of Recommendations and Conclusions

(1) To date there has been no shortage of spectrum space for microwave systems above 1000 MHz in Canada.

(2) Spectrum saturation will occur in urban areas in the near future. Good spectrum management will require close co-operation by the regulating authorities, users and manufacturers.

(3) A permanent committee should be established by the C.R.T.P.B. to analyze growth trends in microwave systems, and general problems with respect to microwave system spectrum management. This committee would be representative of users and manufacturers and would arrive at recommendations for processing to Department of Communications through the normal C.R.T.P.B. procedures.

(4) A procedure should be established by the Department of Communications to provide for the collection of spectrum usage data and its publication on a continuing basis. This would form the basis for forecasting the growth of spectrum usage in Canada.

(5) The present Department of Communications procedure of frequency allocation based on capacity and performance requirements should be retained. The allocation of complete frequency bands exclusively to specific classes of users is not recommended.

(6) All Canadian non-standard frequency plans in use should be identified by the Department of Communications and analyzed to determine if they are affecting new growth. Extensions to a non-standard plan should not be considered except under unusual circumstances.

(7) The Department of Communications should establish a procedure to review, at time of license renewal, or other convenient interval, actual circuit usage of an RF channel, as compared with initial forecast of usage.

(8) Prior to the adoption of a policy or regulation, licensees or other interested persons should be afforded a reasonable opportunity to make representations where such policies and regulations affect use of the radio spectrum.

(9) The committee considers the C.R.T.P.B. to be an effective liaison body between the regulatory body (Department of Communications) and the users and manufacturers. It believes that this liaison should be strengthened.

(10) It is recommended that no attempt be made to place a dollar value on the spectrum. Variation of license fees

related to usage (e.g. power, bandwidth and other indicators) seems to be the most practical means for encouraging efficient use of spectrum.

4. Other Services Task Force -- Summary of Principal Findings and Recommendations

(1) The Committee finds that frequency assignment records of the radio spectrum below 30 MHz do not represent true occupancy or use. Statistics on this are not known. Nonetheless, assuming all recorded assignments are in use, the spectrum below 30 MHz is not congested except in discrete slots and special situations. Utilization below 30 MHz appears to be increasing at the rate of about 10% a year.

The Committee recommends that the DOC determine, on a continuing basis, accurate statistics on spectrum occupancy and use below 30 MHz, since this data is prerequisite to management of these bands.

(2) The Committee finds that the present priorities identified by the International Telecommunications Union table of allocations are satisfactory but recommends that licensing be permitted in Canada on both a shared service and a geographical (regional) basis wherever it can be shown that no interference will result.

(3) The Committee finds that systems engineering below 30 MHz is generally weak and recommends that this be corrected by wider distribution of related information to the user public, and the introduction of a requirement for an appropriate system engineering brief to cover these services and, with respect to specific technology, recommends that the transition to single sideband hardware be accelerated.

(4) The Committee finds that present spectrum management seems to emphasize the equipment radio standards specification and recommends that, while this aspect must always pertain, other elements of the science of spectrum management must be employed in appropriate ratio.

(5) The Committee finds that the level of man-made noise is steadily increasing and recommends that this situation be watched closely so that additional control can be implemented if and when this becomes necessary.

(6) The Committee finds that the present license term (years to renewal) bears no formal relationship to the applicant's system proposal and investment in plant and recommends that this situation be corrected.

(7) The Committee finds that while it could identify instances where the spectrum does have considerable material value, it was unable to develop an economic formula appropriate to every case and to the spectrum as a whole.

(8) The Committee finds that the radio spectrum is a National resource belonging to all Canadians who, consequently, have the right to know Government spectrum policy and the obligation to participate in its formulation.

The Committee recommends that the Minister of Communications continue to be the public custodian of this National resource with primary responsibility for the formulation of policies relating to management of the radio spectrum in Canada.

(9) The Committee finds that the flow of information between the spectrum managers, the technologists, and the end users is somewhat archaic and inhibiting and recommends that these activities be modernized as quickly as possible.

(10) The Committee finds that the need for modern below 30 MHz hardware and systems suitable for the Canadian North is not being fully met and recommends that Canada exploit this unique opportunity for world prominence in Northern telecommunications science.

Telecommission Study 2(h) Re-Appraisal of the Present Management of the Frequency Spectrum

July 1970

President's Remarks

J.C.R. Punchard

Within the short time span of the Telecommission, (less than one year), it is believed that Part II of this study conveys a fairly comprehensive picture of the use of the radio spectrum in Canada with suggestions for improved spectrum management. By request of the Department of Communications, no attempt has been made to go into extensive detail concerning actual frequency assignments. The task forces doing this work were asked to provide descriptions of existing conditions and to discuss principles having a bearing on efficient spectrum management.

Summarizing a 700 page document in a few words is a difficult task, but a few comments on the work of each task force can probably reveal most of the important issues.

From a technical standpoint, the regulation of the spectrum for AM, FM and TV broadcasting has been well planned, allocated and administered. Local spectrum congestion and interference are of course present in varying degrees, mainly due to rapid growth. It is becoming apparent that receiver quality standards have fallen behind transmitter standards. The introduction of cable systems between transmitters and receivers must inevitably require improvements in receiver quality and the imposition of cable quality standards. New techniques are available which will improve efficiency of spectrum use for broadcast purposes, but since these require special transmitting and receiving equipment, their introduction will be quite slow.

Saturation of available channels for AM, and FM broadcasting has nearly been reached in the larger cities. Provision of significant increases in the number of stations in the next ten to thirty years to match expected population growth will call for some radical solutions. The obvious technical solution for the conservation of spectrum in urban areas is the use of paired cable for radio type (audio) broadcasting and coaxial cable for television. The economics involved may well be staggering and will undoubtedly be the limiting factor.

The physical worth of the use of the spectrum for broadcasting can be fairly readily calculated, but methods for measuring the true social value of programming are not yet available. Research in this area is badly needed before the techniques for planning new telecommunication systems can be fully comprehensive by taking into account all of the important factors involved.

The most startling factor in spectrum use has been the phenominal growth of mobile services in the last twenty years. Every indication points to continued growth and increasing pressures for more and more mobile services of many kinds. Since such services can only be provided by means of radio, it seems obvious that the existing mobile radio bands must be used with the utmost efficiency. This will entail the best possible spectrum management and improvements in equipment for conservation of bandwidth. Much has already been done to minimize bandwidth, but complexity and cost is rapidly bringing about a condition of minimum return on the investment for development. Within ten to twenty years the presently allocated spectrum will become overcrowded in many areas and some means must be found to increase the amount of spectrum available for mobile services. It is of course obvious to look to spectrum now allocated to services which could function, at least in part, through future systems which do not use the radio spectrum. Although there are many economic, political and technical implications involved, it is suggested that serious study be given now by D.O.C. to determine the best overall solution to this problem which will be fair and equitable to all concerned.

No discussion of efficiency of spectrum use would be complete if it ignored the amount now allocated for military purposes. Since Canada's military forces are declining and assuming new roles, their need for frequency space should be re-examined. Obviously, Canada's national security must in no way be jeopardized or compromised, but since frequency spectrum is a national resource, its use should be considered on a practical, holistic basis if the nation is to prosper. Perhaps some of the spectrum now allocated to the military could be used on a temporary basis in peace time by commercial interests, to be cancelled when a contingency arises. Planning for such an arrangement should begin now, before such requirements are imperative.

Spectrum saturation in the microwave bands is being approached in some urban areas in Canada. To make best future use of spectrum available, very careful and intelligent planning, founded upon accurate data of present usage and forecast data of future usage, will be required on the part of both the D.O.C. and the users. The industry recommends the establishment of a permanent committee sponsored by C.R.T.P.B. to continually review and analyse problems of microwave spectrum management in Canada. The principle of flexibility, taking into account

changing needs, actual and forecast usage and new technology must be applied and will be essential to efficient spectrum management.

About half the members of the Microwave Task Force were not in favour of including Table 2, page 55 of Microwave Task Force Report on the grounds that it could be taken out of context with consequent impression of poor performance.

In Part II of the study the Other Services Task Force, which was to have considered all services other than broadcast, mobile and microwave, only covered services below 30 MHz. There is therefore no comment referring to radar, navigational aids, diathermy, industrial processing equipment or VHF point-to-point services. It would seem desirable to have this task force continue its work in the Fall of 1970 and submit a supplementary report in 1971.

While there are increasing requirements for licensing in the High Frequency spectrum year by year, the extensive development of reliable services in the region above 30 MHz has undoubtedly reduced the overall demand for services below 30 MHz. The main problems of interference and congestion below 30 MHz seem to stem from the continued use of double sideband equipment, poor receiver selectivity and frequency control. The introduction of single side band equipment should materially improve these factors and the efficiency of use of this part of the spectrum. Poor system design of small HF systems in Canada's isolated areas gives cause for concern. It would seem reasonable for D.O.C. to tighten system requirements to insure that such stations are properly engineered.

Since the radio noise level is gradually rising all over the country, it is imperative that the importance of this type of man-made spectrum pollution be recognized now. Steps should be taken immediately by D.O.C. to study and assess this condition on a continuing basis so that more severe steps may be taken before noise pollution reaches intolerable levels in the future.

Analysis has shown that spectrum between 7 and 30 MHz is only lightly used commercially in Canada. It is thought that more widespread dissemination of ionospheric propagation knowledge by D.O.C. will bring about greater use of these frequencies through improved system reliability.

The industry fully recognizes the privilege it has enjoyed over the past 25 years in working with the radio regulation branch of the Federal Government through the C.R.T.P.B. Although there are, and always will be, interference and performance problems, it is believed that the procedures developed for the fullest co-operation of the telecommunication industry with the government have added immeasureably to the efficient technical use of the radio spectrum in Canada. The "review"

function of the Board must continue and be enlarged in capacity and speeded up. The "planning" function, which is exemplified in Part II of this study, has seldom been exercised in the past, mainly due to the fact that it has not been organized. Sponsor members are becoming increasingly aware of the urgent need for closer co-operation with D.O.C. for the future administration of such a vital and important national resource as the frequency spectrum.

The financial assistance given by D.O.C. to C.R.T.P.B. has resulted in a very considerable step up in the volume of work handled by this organization over the past few years. Since the volume and complexity of the work will continue to increase in future, it is obvious that further work in both review and planning areas will require increased financial support of C.R.T.P.B. by D.O.C. and by its own sponsors. The C.R.T.P.B. is a unique organization in its relationship with the Federal Government. It has been and can continue to be a most effective instrument for sounding the telecommunication industry on spectrum management matters of national interest.

It is evident from a review of Part II 2(h) that many of the problem areas covered by the four task forces differ considerably as evidenced by their respective conclusions and recommendations. Although it may seem self-evident, we believe it is important to point out that future government policies, regulations and procedures concerning the management of the frequency spectrum will have to vary to fully accommodate the differing characteristics of the frequency bands and/or services.

Canadian Electrical Association

Comments on Telecommission Study 2(h)

Report of Task Forces I to IV; Part II of Two Parts

The C.E.A. agrees in general with the conclusions of the task forces, including the conclusions of the Microwave Task Force but does not agree with the implications of "efficiency" in the second of the conclusions (page 20 of the Microwave Task Force Report).*

This implies that all equivalent voice channels are of the same value to the public. When proper operation of just one telecontrol channel can prevent a widespread power black-out, with all the accompanying public hardship, we cannot see how all E.V.C.'s can be considered to be of the same value to the public.

We feel that the end use to which a spectrum assignment is put is an essential factor in judging the value of the public, and cannot be left out or averaged.

We would suggest that the last sentences should be re-worded to read:

> "There is and will be a need for these systems. It is important that the spectrum required for them be related to both the amount of spectrum available, and the value of the signals that they carry."

With the above comments in mind, the Canadian Electrical Association agrees with the report.

APD
August 11, 1970

* See page 72.

COMMENTS OF THE CANADIAN ASSOCIATION OF BROADCASTERS TO THE CANADIAN RADIO TECHNICAL PLANNING BOARD RE NOTICE 908/70 OF JULY 17, 1970

THE RE-APPRAISAL OF PRESENT MANAGEMENT OF THE FREQUENCY SPECTRUM
REPORT OF TASK FORCES I TO IV PART TWO OF TWO PARTS
TELECOMMISSION STUDY 2(h)

The Canadian Association of Broadcasters have examined the forementioned Task Forces reports and is impressed with the extent and the amount of research and work that has gone into their preparation. It is believed that the Department of Communications studies of thisdocument will be of great value in their technical administration of radio.

There are, however, several points raised in the various reports where the Canadian Association of Broadcasters feels comment would be appropriate.

In the comments of the Canadian Cable Television Association appended to the report of the Task Force on Broadcasting, a statement is made that "Broadcasting is without doubt the one radio service which is the most wasteful user of the frequency spectrum". The implication of this same statement appears also in the principle conclusions and recommendations of the Land, Air, Marine, Mobile and Fixed Task Force.

The Canadian Association of Broadcasters feels that it must comment in respect to the technical implications implied in these statements. When it is considered that the transmission of a television signal comprises not only the dynamic visual information, but the colour information and the audio components of the signal, it is believed that the present system of a 6 megahertz bandwidth is one of compatibility with the state of the art. We are sure that it is realized that the 525 line system used in the United States and Canada provides what may be considered an adequate picture, nevertheless, certain other countries feel that a greater number of lines must be used to gain a finer texture for the picture re-production and the use of 625 lines is not uncommon in Europe and requires an 8 megahertz bandwidth. It is our understanding that even those European countries which may have used and still use a lower number of lines are looking towards the incorporatic of 625 line minimum standards to improve picture definition.

Our submission to Telecommission Study 1(d) contained as part of its voluminous documentation a copy of an article by Dr. Franz Josef In Der Smitten on the "possible developments in radio and television techniques in the next few decades". This article was re-printed with the permission of the author and the European Broadcasting Union. We are sure that the Telecommission will benefit from the contribution in this connection. It is our belief that the foregoing statement is coupled with the presumption that cable systems will in the future supplant broadcasting over the air. Our experience in the Television Committee in the Canadian Radio Technical Planning Board when it was considering Broadcast Procedure 23 during the early part of this year clearly demonstrated to us that the status of CATV systems at this time is such as to preclude the complete carriage of television programming particularly of local stations without deterioration of the signals thereof. It may be some considerable time before equipment capable of carrying television signals without degradation is in use in cable and in community antenna television systems and it would be indeed unfortunate if the impression was left that such a change could take place over night. In any case, it is not our belief that CATV systems can possibly supplant television broadcasting and the public of Canada which is served by the present system will require on-the-air broadcasting for many years to come.

Far from being an inefficient system of transmission of intelligence to the public of Canada, broadcasting does in fact serve more people simultaneously than any other form of radio communication in use at this time.

The aforementioned Land, Air, Marine, Mobile and Fixed Task Force has made many worthwhile recommendations in its report, nevertheless, the Canadian Association of Broadcasters must express the firm conviction that the recommendations number 1 and 3 pertaining to the use of television broadcasting channels for land mobile service would work to the detriment of Canadian Broadcasting in the future in Canada.

We are pleased to observe that in the recommendations of the forementioned Task Force no reference is made to a present extreme congestion of the frequencies examined by this group which would warrant immediate action in this respect and it is our belief that continued studies by the Department of Communications may well bring solutions to the problems now facing the industry without recourse to the use of broadcasting channels.

Canada has followed a frequency allocation program for a number of years based on the concept of flexibility, and avoided the strict regulated form of control as used by the Federal Communications Commission in the United States. It is our belief that this action in Canada has resulted in greater access to frequency usage for Canadian station operators than that possible under the system used in the country south of us. It would be unfortunate if Canada were to tie her allocation principles into those applied in the United States. Our rate of implementation is lower and our flexibility has permitted the licensing of many more stations in proportion. It should also be emphasized that much of the orderly growth resulting in Canada has arisen from the application of sane and sensible technical specifications designed with the objective of protecting the users and affording maximum use with minimum frequency occupation. It is hoped that this trend will continue in the future.

The Canadian Association of Broadcasters is fully aware of the extensive studies and submissions made to the Federal Communications Commission of the United States in relation to land mobile congestion and has noted with interest that the Federal Communications Commission have proceeded with great caution and have not on a wholesale manner adopted the original proposals before them. It is our understanding that continued submissions are being made to the Commission in relation to the use of broadcasting frequencies by land mobile systems and that considerable and extensive testing and experimentation may be necessary to ascertain whether such operations are in fact practical. It is our earnest hope that the Canadian authorities will not by precipitant action apply a system of sharing on the broadcasting channels without an extensive and thorough study of all the factors involved.

It is our belief that such a study could only be undertaken effectively by an independent scientific organization. If the Department of Communications feels that such study is beyond the scope of their resources we would then strongly recommend that the National Research Council with its extensive facilities undertake such an examination of spectrum usage.

We do not believe that the Canadian Radio Technical Planning Board which for years has served a most useful and constructive purpose in bringing to the attention to the Government the views of manufacturers and users of the spectrum is the proper body to carry out such an investigation because obviously as evidence through the years, the CRTPB can only express to the D.O.C. the diversified opinions which may arise under certain circumstances.

The CAB wishes to reaffirm its position of being definitely opposed to permit sharing by the Land, Fixed and Mobile Services of the UHF or any other channels allocated in Canada to broadcasting.

It is believed that such action is contrary to the intent of the will of Parliament as specifically expressed by the Broadcasting Act of 1968 and will curtail the freedom of action of the Canadian Radio Television Commission in implementing its mandate to ensure adequate broadcasting service to Canadians. In any case it is doubtful that such sharing could be contemplated without serious consideration by the CRTC and no doubt public hearings.

We might add that the escalating demand for broadcast services, which is really being enhanced by CATV developments, likely will result in the U.H.F. channels being used on an increasing scale in the next few years. As viewers become used to a variety of channels, the desire for domestic service grows and the realities of an ultimate ceiling for CATV saturations of some 50-60% is reached, the have-nots will make their voice heard and demand more broadcast service.

We are aware of the position of the FCC in the USA and wish to urge that the Canadian authorities take all necessary action to forestall interference to Canadian use of the full potential of our UHF broadcasting channels in border areas.

It is noted that in particular the FCC propose higher levels of interference in certain population centers than in others and some of these high interference levels are being permitted in communities adjacent to the Canadian border.

It would seem inappropriate at this time to jeopardize the future of Canadian broadcasting when there exists frequency capacity within the spectrum for Fixed and Land Mobile use outside the broadcasting allocations and which is unused or relatively lightly used at present.

T.J. Allard,
Executive Vice-President.
August 12, 1970.

Telecommission Study 2(h)

Report of Task Forces I to IV

Comments By

The American Radio Relay League, Canadian Division

This organization has no real argument with any of the findings or recommendations of the four Task Forces involved in the study. Many of these of course do not involve the Amateur Experimental Service, and are not applicable in many cases to Canadian Amateurs.

There are, however, certain comments contained in the various reports which do apply, and the following paragraphs deal with four of these.

1. Poor AM and FM and TV Receivers

In several places throughout the various reports reference is made to the deficiencies of domestic AM, FM and TV receivers, with particular reference to susceptibility to interference from other services. With this, any amateur would agree heartily. Since most amateur transmitters are of their very nature located in residential areas, perhaps no service has had so many complaints of interference with domestic receivers as the Amateur Service. A very large proportion of this interference is caused by design deficiencies in the receivers themselves, and no amount of work at the transmitter can cure the interference. While appreciating that economic factors are involved to a very great extent, the League's Canadian Division would heartily endorse any effort made to improve the quality of domestic receivers sold to the non-technical public.

2. Spectrum Pollution

Throughout the various reports there is frequent reference to pollution of the radio spectrum, primarily from man-made noise, but also to a lesser extent from unauthorized operation of radio transmitters in portions of the spectrum assigned to other services. While the Department of Communications has the authority to seek out and force the cure of man-made interference, it has neither the finances nor the personnel and equipment to deal with the problem on anything like an adequate basis. It would appear to be much more logical to require the suppression of interference from such devices at the time of manufacture,

when it could be done much more cheapily than effecting a cure at a later date. Dealing with unauthorized radio transmitters is of course more difficult, since these are in many cases located in Countries who are not members of the International Telecommunications Union, although broadcast interference, particularly on the 7 Mhz band often originates in some of the major European Countries. While amateur organizations both in Canada and abroad have had some success in having their Governments complain of such interference, there still remains a great deal to be done in ridding our internationally assigned frequencies of these "intruders".

3. Economic Value of Spectrum Space

All four Task Forces which took part in this study attempted in one way or another to place an economic value on frequency assignments with little or no success. With the general conclusion that evaluating spectrum space is difficult, if not impossible, there can be little argument, and with the general recommendation that such a yard stick should not be applied to license fees, this organization would agree. In addition, it should be pointed out that the Amateur Experimental Service is by international and national regulations prohibited from deriving any financial remumeration from the use of spectrum space. Of its very nature, the Amateur Service has no means of deriving financial benefit from the frequencies assigned to it, and it would, therefore, appear to be virtually impossible to evaluate such allocations.

4. Longer Term Licenses

With the suggestion made in several places that longer term licenses should be made available, the League's Canadian Division, must agree. In fact, such a suggestion has been made more than once to the Department of Transport and it's successor the Department of Communications. This would result in much less paper work, within the Department itself, and greatly reduce their cost of operation.

TELECOMMISSION STUDY 2(h)

Report of Task Forces I to IV

Comments by

Association of Municipal Electrical Utilities of Ontario

This document represents a great deal of effort on the part of the participants and in the areas of concern to the A.M.E.U. we are pleased with the report as compiled.

In particular we believe the Land, Fixed & Mobile Service should receive a very high order of priority in spectrum assignments.

ELECTRONIC INDUSTRIES ASSOCIATION OF CANADA
COMMENTS ON TELECOMMISSION STUDY 2(h)
REPORT OF TASK FORCES I TO IV; PART II OF TWO PARTS

TASK FORCE I
BROADCAST SERVICES TASK FORCE

1. We take serious exception to the suggestion made under the heading Auxiliary Services (Conclusion (e) P. 8) that taxis, trucks, ambulances, etc., represent low utilization services. These services are among the heaviest channel users, particularly the taxis and trucks which do share frequencies wherever it is practical. The useage by broadcast stations for remote pick-up and other non-scheduled requirements represents an extremely low useage in contrast with other services mentioned.

2. To suggest that sharing could most effectively be done by assigning channels to a "common carrier" which would use the channel "searching" process, is contrary to the experience of the Land Mobile Industry as described in the EIA of C report section VII, 3.3. This method of obtaining service may suit the Broadcasters but it would not suit the thousands of users making up the Land Mobile Service in Canada.

3. The Telephone Association of Canada makes a flat, unsupported statement that all potential users should be encouraged to obtain their services from the common carriers. We disagree with such an approach as it would reduce free competition and remove the progressive forces of innovation and new technology from providing the direct benefits possible at the earliest possible time. Industry has shown itself capable of dealing effectively with complex users' needs and pushing technological development to the full when unfettered by a monopalistic system of distribution of services.

4. We would support the suggestion that minimum standards be established for receivers to help reduce interference experienced by users of current equipment.

5. The C.B.C. report on Auxiliary Services is an objective approach which seems to touch on the broad spectrum of the services needed and problems encountered.

TASK FORCE II
LAND AIR MARINE MOBILE AND ASSOCIATED
FIXED SERVICES TASK FORCE

As EIA of C has been involved in this part of the study, we have no further comments.

TASK FORCE III
MICROWAVE SERVICES TASK FORCE

As EIA of C has been involved in this part of the study, we have no further comments.

TASK FORCE IV

This report is quite comprehensive of the situation today which involves International Regulations and Agreements. The report is a good source of data and makes many suggestions of value to the management of the spectrum.

THE TELEPHONE ASSOCIATION OF CANADA/TRANS-CANADA TELEPHONE SYSTEM

COMMENTS ON PART II OF TELECOMMISSION STUDY 2(h)

Although the four Task Forces approached the subject in somewhat different manners using the same terms of reference, the conclusions reached have some common form. Perhaps the most important common conclusion is that spectrum management and allocation in the past have been sufficiently good that no shortage of spectrum now exists. Therefore, many of the existing policies and procedures are satisfactory and wholesale changes need not be introduced.

Each of the Task Forces has studied certain aspects of the subject in varying depths of detail and hence the absence of comment in one section does not imply acceptance of any recommendation by any other Task Force or even acceptance by a Task Force of a statement in a contribution by a specific organization. In particular, the report of the Land, Air, Marine, Mobile and Fixed Task Force is so voluminous and portions of it were introduced so late that not even adequate time was available to properly reflect on the conclusions of that Task Force. The conclusions and recommendations therefore relate only to the appropriate subject and portion of the frequency spectrum involved. Within this context, we agree with and support the conclusions and recommendations of the various Task Forces, with the exceptions noted below concerning the Land, Air, Marine, Mobile and Fixed Task Force.

The use of terms appears not to be necessarily consistent throughout the whole report and in many cases remain undefined or unusually vague. A prime example is the term "efficiency" which appears frequently. The Microwave Task Force has introduced an efficiency factor which would be misleading if not taken in its proper context. For example, the theoretical formula results in an efficiency factor for the land mobile using 30 khz spacing of only 4/30 or 13%.

The following comments apply specifically to the Land, Air, Marine, Mobile and Fixed Task Force Report. The Telephone Association of Canada feels that the section on principal conclusions and recommendations should reflect the opinions of all the Task Force and that diverging views should be clearly identified. The explanation of the asterisk footnote "consensus opinion only" suggests general agreement on these items which we feel did not exist, and we would recommend that this footnote be changed to "views of some members of the Task Force only on these items".

As an alternative, the following wording for these items would be acceptable to us and are suggested as a replacement:

Item II - Certain owners and/or operators of private telecommunication facilities feel that Telephone Companies should offer some form of interconnection to the public telephone network. The Trans-Canada Telephone System view-

point is expressed in the contribution to Telecommission 8(b), "Study of Interconnection of Systems, Circuits, Devices", and elsewhere.

Item 12B - Conferences between DOC and CRTPB are recommended to discuss the philosophy and policy of equipment technical specifications.

In addition, to support the other items in the summary, we believe that the minor wording changes shown below better reflect the thoughts and ideas contained in items 3, 5, 9 and 14.

Item 3 - Consideration should be given to the use of increasingly sophisticated and expensive means to accommodate more users in different bands of the spectrum with particular emphasis on such systems as radar, FM and TV broadcasting.

Item 5 - Priority in the use of the radio frequency spectrum should be given to those requirements which may not be practically provided by other means.

Item 9 - Users should be free to choose between leased and privately owned facilities provided the choice is consistent with public interest.

Item 14 - DOC should spend increasing time with specific user organizations and manufacturers across the country to determine the particular uses of the spectrum and system concepts which will promote efficiency and productivity. There should be additionally increasing consultation with the R&D segment of the industry in paving the way for the new technological developments of the future.

Also, we note an error on page 21 of the Report where under section 2.3, Public Radio-Paging, Highband VHF, it should read, "There are approximately 30 systems with 1600 subscribers on the 150 Mhz band. There is rapid expansion." These figures applied at the time of preparation of the Report, although they are undoubtedly exceeded now.

ERA/hl
24 Aug 1970

COMMENTS

ON THE

TELECOMMISSION STUDY 2(h)

BY THE

WESTERN CANADA TELECOMMUNICATIONS COUNCIL

JUNE 1970

VANCOUVER B. C.

Introduction

The Western Canada Telecommunications Council (WCTC) is an organization composed of users, manufacturers and organizations concerned with the use of telecommunications in Western Canada. A membership list is attached as Appendix I.

The Council has been in existence 14 years and holds regular meetings to discuss and advise the Department of Communications, formerly the Department of Transport, and the Canadian Radio Technical Planning Board (CRTPB) on matters concerning equipment specifications and the efficient use of the radio spectrum. The Council also performs a liaison between the Department of Communications and many user members who are not technically staffed to liaise on a direct basis.

What has the WCTC done towards the preparation of this submission? Five task forces were established from the membership of the WCTC and non-members with an interest in the future of spectrum management. These task forces, under the direction of the WCTC Executive, had meetings and developed recommendations and observations which were presented to a public meeting and discussed on an open forum basis. This submission is intended to relate to the Telecommission the recommendations and observations of these interested parties.

The WCTC task forces used the guide lines for study established by the CRTPB. The WCTC's findings and conclusions are in line with those of the CRTPB and its report is endorsed by this Council as submitted. In addition the WCTC wishes to bring to the attention of the Telecommission the

following observations which are considered salient to the subject and to the industry in Western Canada.

Background

At the meetings and discussions conducted, those involved in the Telecommunications industry in Western Canada have expressed serious concern as to the full intent behind the Telecommission study and its implication on the future availability of spectrum as it was originally provided for under the terms of the Radio Act. We, the members of the WCTC, would like to re-affirm our understanding of the Radio Act - "THE RADIO SPECTRUM IS A RESOURCE BELONGING TO THE PEOPLE OF CANADA".

The spectrum is not like a resource such as timber or minerals which can be reserved for future use. It is like time. It must be used or it is wasted and the benefit lost forever.

The policies and regulations that have guided the industry in the past number of years have very successfully stimulated development of the spectrum. The Department of Transport, whose responsibility it was to manage this development, did its job well as referenced by the very few spectrum problems in evidence today. However, this is not to say that the needs of the future can be effectively met by these same policies and regulations but must adapt to new needs as they arise without becoming restrictive to the continued orderly development of the spectrum.

Radio services have played a major role in the development of the rich natural resources located in the sparsely populated areas of Western Canada. These natural resources are an essential part of the economy and future of Canada and their development should not be inhibited by a restrictive spectrum management policy.

Recommendations & Observations

The following comprise the essence of the recommendations and observations made by the WCTC task forces and the general public meeting:

1) Canada, a developing country, is often regarded as an international leader. Due to the past knowledgeable and sensible approach to spectrum management, and in representations internationally, Canada is held in high regard within the International Telecommunications Union.

   The growth of satellite communications, and the increasing number of users employing the low frequencies with international propogation characteristics, suggest that Canada will have an even larger international role to play in the future. Will Canada be able to maintain its leadership image with the new policies and organization of the Department of Communications? Technical knowledge and the ability to sensibly manage the spectrum in Canada, within the framework of the Radio Act, were the criteria in the past.

2) Who should be permitted to use the spectrum? Government, business and individuals (the people of Canada) who have a need and who can

meet the technical requirements as established to ensure good spectrum management should be permitted to use it. It has been suggested that two further criteria for judgment be employed - social and economic. In a free enterprise, democratic country, it is difficult to conceive any communication facility provided to bring people closer together or to improve the safety and/or efficiency of our business and people as not being a social asset. Justification relating to economics is a decision always made by the investor prior to the requisition and installation of a communications system. Who is best equipped and responsible to make this decision? It is surely not a Government Department!

If new Government policy is needed to control capital investment by Canadian industry, the WCTC does not agree that the lever of restrictive licensing should be employed. A spade should be called a spade!

3) The WCTC agrees, it must deal with the situation as it is. It would not be necessary to outline such obvious factors governing the radio spectrum if it were not for recent situations which have developed under the Department of Communications in which:

- Large responsible public utilities have been denied use of spectrum for power control and regulation.
- Provincial Government agencies have been denied use of spectrum to provide television service for their population.

- A Provincial Railway has been denied use of spectrum for system expansions.
- Major Canadian electronic manufacturing companies are being denied their market due to restrictive licensing policies.

The reasons given for denial are not lack of spectrum, but questionably, for economic and social reasons. Who is the best judge of economic justification - the investor or a newly formed Government Department? What are the social implications of not allowing these projects to proceed? The Department of Communications should consider this aspect which would be a more positive approach.

4) Regulations developed for spectrum management should relate to the actual Canadian situation. The vast majority of Canada is rural and undeveloped, in particular, Western Canada. In rural Canada there is no spectrum congestion nor is it anticipated in the foreseeable future. Communications is a vital ingredient in pushing back the frontier and should be encouraged by the Government. It is proposed that this be done through intelligent application of specifications and through economic incentives.

5) Nobody owns the spectrum - the Government manages it by licensing frequencies on one to five year intervals - not in perpetuity.

It has been noted that the Department of Communications has shown reluctance to assign frequencies on the basis that withdrawal of the assignment may be necessary at some future date.

To develop the spectrum, the Department of Communications should feel free to allocate existing spectrum, and to exercise its power to cancel or re-allocate frequencies, as new technology or as higher priority needs arise. On the same basis, prospective users should be given the opportunity to make the decision whether to employ the spectrum based on possible future cancellation of license or changes in frequency allocation.

6) The past ability of Canadian industry to install custom communication systems has resulted in major cost savings over leased facilities and substantial improvements in time required to obtain service.

There is no technical or operating requirement whereby private operating systems should be built at extra cost to a standard that would allow them to interconnect with Common Carrier facilities unless it is the desire of the user to interconnect.

7) Technological developments in the electronics industries have made possible new ways to provide communication facilities which are more efficient in the use of the spectrum. The current and projected growth of such development is rapid. To ensure that maximum benefit is derived, there is a continuous need for close liaison between the Government regulating bodies, users and manufacturers. The WCTC provides such a liaison and it is hoped its future relationship with the Department of Communications will be encouraged and allowed to grow.

Conclusion

Reappraisal of the legislation and regulations governing the management of the radio spectrum is both desirable and necessary as new needs develop and technology changes.

Any body that undertakes formulation of new policy should include working representation from those who have built a resource of skill and experience in this highly technical assignment - namely the engineers within the Department of Communications and user-supplier bodies, such as the CRTPB and the WCTC.

The WCTC does not believe the changes now evident under the Department of Communications are in the best interests of the people of Canada.