Office of Telecommunications Policy

Route Slip

21 OCT 1970

	Clay T. Whitehead	(2) ✓
	~~George F. Mansur~~	(1) ✓
	William Plummer	
	Wilfrid Dean	
	~~Steve Doyle~~	~~✓~~
	William Lyons	
	Eva Daughtrey	✓
	Timmie White	
	Judy Morton	

REMARKS

Who should be invited in OTP-?

Mansur ✓
Dean ✓
Joyce
Hinchman ✓
Olsson
Doyle

THE JOINT TECHNICAL ADVISORY COUNCIL

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. ELECTRONIC INDUSTRIES ASSOCIATION

345 East 47th Street
New York, N. Y. 10017
212-752-6800

H. Edward Weppler
Chairman
Stuart L. Bailey
Vice Chairman
William L. Everitt
Richard P. Gifford
David R. Hull
Dorman D. Israel
Allen M. Peterson
Herbert Trotter, Jr.

John M. Kinn
Secretary
Audrey L. van Dort
Administrative Assistant

October 16, 1970

Dr. Clay T. Whitehead, Director
Office of Telecommunications Policy
1800 G Street, N. W.
Washington, D. C. 20504

Dear Dr. Whitehead:

As I believe you have been kept informed, plans are now complete for an informal meeting of the Joint Technical Advisory Council with yourself, Chairman Burch and the Commissioners of the FCC.

This letter will confirm that the meeting will be held on Thursday, November 5, at 10 AM in the Commission Meeting Room, Room 856, 1919 M Street, N. W., Washington, D. C.

It is our intent to make this meeting as informal and informative as possible. You may wish, as did General O'Connell, to have key members of the OTP staff attend not only for the purpose of obtaining an updating on the subjects to be covered but also, by hearing the ensuing discussion, to obtain a better understanding of the many factors that influence progress in the field of spectrum engineering.

I am attaching an agenda delineating the subjects to be covered. While we will have on hand some documents around which to center the discussion, we do not intend to generate any record of the discussions. It will be for purposes of understanding and background knowledge.

We all look forward to the meeting and are dedicated to making the occasion valuable to all concerned.

Very truly yours,

R. P. GIFFORD
Chairman, JTAC 63.1

RPG:H
attach.
cc: H. E. Weppler

AGENDA

Meeting of JTAC with the FCC and OTP

November 5, 1970
10:00 AM

FCC Meeting Room
Room 856
1919 M Street, N. W.
Washington, D. C.

I	Review of the JTAC Report: "Spectrum Engineering -- The Key to Progress" -- discussion: Updated report on "Activities Related to the JTAC Recommendations on Spectrum Engineering"	-- Chairman, JTAC Committee 63.1
II	The system engineering concept contained in the JTAC Recommendations -- discussion	-- Members JTAC 63.1 + FCC staff + OTP staff
III	Industry research and development re "Future Needs and Uses of the Spectrum" -- discussion	-- Chairman, JTAC Committee 65.1
IV	Spectrum Utilization in Relation to Satellite Communication Services -- preliminary report	-- Chairman, JTAC Committee 67.1
V	Development and Implementation of CATV System Standards -- discussion	-- Chairman, JTAC

- - -

Expected time of adjournment -- Not later than 12:30 PM


RECEIVED
OCT 21 1970

Friday 10/2/70

MEETING
11/5/70
10-12:30

11:55 STEVE:

Mr. Whitehead said he will attend the JTAC meeting on Thursday (11/5) from 10 to 12:30.

I called Capt. Raish and advised him so that the phone calls could be made to start things rolling.

Tom would like to talk to Dean about what he will say in his presentation ---- at some appropriate time "down the road".

Thursday 10/1/70

MEETING
11/5/70
10-12:30 p.m.

9:10 Dick Gifford called to see if you would be available on November 5th to attend the JTAC. Advised that I would check with you and call him back.

They need to know today if at all possible.

Attached is the memo from Dean

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS POLICY
WASHINGTON, D.C. 20504

Date: October 1, 1970

Subject: Participation in JTAC Briefing for FCC/OTP

To: Mr. Clay T. Whitehead
Via: Dr. G. Mansur

1. You will be invited to attend a JTAC briefing for the FCC/OTP tentatively scheduled to be presented November 5 at 10:00 a.m. in the Commission Meeting Room. The briefing will last about two hours, including discussion, questions, and answers. The proposed agenda is attached. Your attendance is recommended.

2. Here is some background. Back in the 1963-1964 time-frame there was considerable concern over spectrum management problems. Dr. Jerome Wiesner, serving as an Acting DTM, sought the advice of "Industry" and the upshot was the establishment of JTAC -- a Joint Technical Advisory Committee of the Institute of Electrical and Electronics Engineers, Inc., and Electronics Industries Association. In March 1968, after four years of study the JTAC published a report on technical policies and procedures recommended for increased spectrum utilization entitled "Spectrum Engineering - The Key to Progress". Last year, a JTAC team briefed the FCC sitting en banc and the DTM on progress of implementation of the recommended actions contained in the report. The JTAC is now preparing a 1970 follow-up type of briefing to be similarly presented to the FCC Commissioners en banc and to the Director of Telecommunications Policy.

3. Note agenda item IB calls for a short presentation by OTP and FCC representatives. Unless you desire otherwise the undersigned will take this on. The FCC speaker will probably be their Chief Engineer - Mr. Watkins.

4. The time and date referenced in para 1 above ~~is~~ are tentative pending confirmation by you and Chairman Burch that these are satisfactory. If so, the JTAC will issue an official letter of invitation direct to you.

W. Dean, Jr.

Tom - This time period is clear on your schedule. SED.

Enclosure
cc: Mr. Plummer/Mr. Doyle

PROPOSED AGENDA (2nd edition)

The JTAC Meeting with the OTP and the FCC

I. Review of the JTAC Report: "Spectrum Engineering -- The Key to Progress" -- Chairman: JTAC Subcommittee 63.1

A. Discussion: updated report on "Activities Related to the JTAC Recommendations in Spectrum Engineering" -- Chairman: JTAC Subcommittee 63.1

*B. Additional discussion on: System Engineering Concept -- Chairman: JTAC Subcommittee 63.1

1. OTP Responsibilities, Actions and Planning -- (Speaker ?) system standards 3 to 5 mo + include man-made noise

2. FCC Responsibilities, Actions and Planning -- (Speaker ?)

3. JTAC Views on Industry's Responsibilities, Actions and Planning -- (Speaker ?)

II. Industry Research and Development re: "Future Needs and Uses of the Spectrum" -- Chairman: JTAC Subcommittee 65.1

III. Spectrum Utilization in "Relation to Satellite Communications Services" -- Chairman: JTAC Subcommittee 67.1

IV. Development and Implementation of CATV Systems Standards -- Chairman: JTAC Subcommittee 63.1

A. FCC Presentation at 63.1 meeting only -- S. R. Lines

B. RAND Corp. Presentation at 63.1 meeting only -- N. E. Feldman

---

*Discussion on systems engineering concept to emphasize review of existing standards and the development and establishment of new ones which would be legally enforceable effective at point of manufacture needed to govern receiver susceptibility and unintended radiation from many classes of devices and equipment.

Wednesday 9/30/70

MEETING
11/5/70
10-12:30 p. m.

10:50 Mr. Plummer advises that Richard Gifford is scheduling a JTAC meeting and hopes to arrange a time that you and FCC people both can make it. FCC would be available on November 5th -- Mr. Plummer asked if you would be free to attend on that day.

They want to explain what they're doing and discuss what we have done to carry out their recommendations.

Steve advises that Will Dean is preparing a staff memo on this subject. The JTAC meeting is scheduled for 10-12:30 on Thursday (11/5). Said you would want to go to this one.

Will be in the FCC Commission meeting room.

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS POLICY
WASHINGTON, D.C. 20504

October 21, 1970

DIRECTOR

Honorable Dean Burch
Chairman
Federal Communications Commission
Washington, D. C. 20554

Dear Mr. Chairman:

The lack of adequate measures in the design and development of receivers, from the standpoint of their susceptibility to interference, has been a matter of concern for some time. The Joint Technical Advisory Committee report "Spectrum Engineering - The Key to Progress" touched on this point, as did the 1968 Task Force Report on Communications Policy.

While the FCC has, perhaps wisely, not ventured into the field of receiver regulation, per se, there are problems arising which point to the need for a systems engineering approach to be taken in the interest of improved spectrum management. The enclosure contains examples of problems in this area. Additional difficulties are to be expected due to the characteristics of certain foreign import radio products.

I consider that given adequate guidelines, the industry might regulate itself in this regard and this is a desirable objective. Some mechanism, however, would appear necessary to afford greater consumer/user protection than afforded at present.

It is suggested that we appoint a joint group to study the matter and recommend procedures and actions which might be taken short of mandatory regulation to ensure that receiver characteristics are given increased consideration. For instance, it might be possible to place greater emphasis on the procedure wherein the allocation of spectrum and authorization of transmitters is made on the basis of assumed receiver characteristics. Also, perhaps a "labeling" system would have merit which would permit the consumer to evaluate the "usability" of receivers prior to purchase.

If you are in agreement that we should jointly explore this area, I designate Mr. W. Dean, Jr. of my staff to represent this Office.

Sincerely,

Clay T. Whitehead

Enclosure

FOR AGENDA

file

Doc. 13509/1-2.7.11

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS POLICY
WASHINGTON, D.C. 20504

October 21, 1970

DIRECTOR

Honorable Dean Burch
Chairman
Federal Communications Commission
Washington, D. C. 20554

Dear Mr. Chairman:

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Sincerely,

Clay T. Whitehead

Enclosure

INFORMATION WITH RESPECT TO THE NEED FOR RECEIVER STANDARDS

Some examples of receiver limitations affecting national frequency assignment practice are referred to in the following text. The implication intended is a need for additional investigation of all system technical factors involved in such examples and in other similar examples which might be cited. It is not intended to imply that the receiver performance is the sole element needing attention. Rather, the need for Systems Engineering is emphasized.

The evaluation of each example is necessarily not exhaustive, since it results from a brief review of material readily available on the case. Supplemental or corrective information with which to more accurately characterize these examples is welcomed.

1. For every UHF TV Channel assignment, 108 MHz (18 channels) are excluded from TV use for a radius of at least 20 miles (area of about 1250 sq. mi.) around the transmitter. The rules setting up these restrictions were established in 1952 on the basis of receiver performance. The restrictions take into account interference from various responses as noted below:

Responses	Amt. of Spectrum Excluded	Min. Trans. Separation
IF Beat Freq.	24 MHz (4 ch)	20 mi.
Intermodulation	60 MHz (10 ch)	20 mi.
Adjacent Channel	12 MHz (2 ch)	55 mi.
Oscillator Rad.	12 MHz (2 ch)	60 mi.
Sound Image Freq.	12 MHz (2 ch)	60 mi.
Picture Image Freq.	12 MHz (2 ch)	75 mi.
Cochannel	6 MHz (1 ch)	155 mi.

The extent of spectrum space so affected by each UHF TV assignment is depicted on the attached chart.

Reference Document: FCC, Sixth Report and Order, April 11, 1952.

Enclosure

2. The FAA has noted that TV receivers tuned to channel 4 (66-72 MHz) or 5 (76-82 MHz) have experienced interference from the primary emission of aeronautical radionavigation systems (Marker Beacons) in the band 74.6-75.4 MHz.

Because of this interference potential, the FAA must make a field analysis of the receiver environment when siting new systems.

Reference: FAA Staff

3. Along the coast, Naval air search radar operations authorized in the band 216-225 are restricted to 222-225 MHz. That is, only 3 MHz of the allocated 9 MHz in the band is useful in certain geographical areas for the allocated primary use. The resulting increased concentration of operations in the 222-225 MHz band has compounded the Navy's EMC problems and reduced its flexibility. The restriction was imposed because of the interference caused to TV receivers tuned to channel 13 (210-216 MHz). The interference was a result of the radar's primary emission being detected by the TV receiver as an adjacent channel response.

Reference Documents:

a) "Report of 'P Band' Radar Interference to Television Receivers", (Confidential). RCA Service Company, January, 1964.

b) "Determination of Fleet Silence Distances to Avoid Interference to Television Services". (Confidential) Jansky & Bailey, September, 1962.

c) OPNAV INSTRUCTION 002410.12D, 20 March 1968.

d) CINCLANTFLT INSTRUCTION 02410.6C, 20 August 1964.

4. In discussing certain proposed high power radar systems, one of the major concerns was the interference potential to the mobile and TV receivers in nearby frequency bands. The anticipated interference to these receivers was not from the spurious emission of the radars at the tuned frequency of the receivers, but from the spurious response of the receivers at the main emission frequencies of the radar.

Reference: IRAC Documents

5. The data gathered on receivers by the Television Allocation Study Organization are evidence of the wide variability in the quality of equipment in the public domain (e.g., UHF receiver 3 dB bandwidth; min. 10 MHz, max. 60 MHz) and the consequential wide range in the susceptibility of such equipment to out-of-band radiation. In making an analysis of the potential interference to these receivers from the main emission of other systems, assuming values for the receiver characteristics of "poor equipment", prohibitive restrictions are indicated for the interfering system. If, in contrast, an interference analysis assumes the characteristics of better equipment, the poor equipment if used may suffer overwhelming interference and associated public relations problems may result (e.g., Air Force Experience with FPS-24 radar in the Pittsburgh area).

A minimum performance standard for receivers would eliminate some of the poorer equipment from the market and would provide an official basis for compatibility analyses.

Reference Document: Report of the Television Allocations Study Organization, March 6, 1959.

6. The requirement for marine radio beacon systems (285-325 kHz; 405-415 kHz) is increasing, but due to the "poor quality" of the many receivers in the hands of the general public, the Coast Guard is unable to activate any more stations from Maine to Cape Hatteras without causing an unacceptable interference potential.

Though the occupied bandwidth of the Coast Guard transmitters is only 1.1 kHz, the receivers in use by the small boat owners have a 3 dB bandwidth of about 4 kHz. Thus, adjacent channel interference is a major problem. Also, since the sensitivity (5μV) of a typical inexpensive receiver is better by 20 dB than the sensitivity of more sophisticated systems (50μV) and the design criteria upon which the Coast Guard based the system, cochannel interference is also a problem.

Presently the Coast Guard is undertaking an in-depth study of this matter with a view to developing an improved overall system for service to the small boat owners.

Reference: Coast Guard-Staff.

7. The Government is generally unable to use land mobile channels in the vicinity of 173 MHz in some areas where TV Channel 7 (174-180 MHz) is in use. This restriction is a result of interference to home TV receivers from the primary emission of mobile transmitters.

The sound-carrier image-frequency of TV Channel 7 is 170.750 MHz and is particularly susceptible to interference. FCC Report R-6306 shows 170.750 ± 0.10 MHz as "taboo".

Reference: IRAC Doc. 8367 and FCC Report R-6306.

8. Frequencies for educational FM stations (88-92) must be carefully selected since television receivers (Ch 6; 82-88 MHz) are susceptible to interference from the FM transmitters. According to information from the FCC staff, educational FM stations cannot be assigned in some areas because of this susceptibility.

9. Military weather radar systems (FPS-77) were built with an image response equal to the primary response and unacceptable interference resulted. The procurer was forced to make extensive modifications to the receivers to ensure that the systems would operate satisfactorily in their intended environment.

Reference: Air Force Staff

10. The Radar Engineering Design Objectives adopted for promulgation by the DTM, and similar radar criteria adopted by DOD in MIL-STD 469, are the earliest established provisions of this kind. As these relate to receiver criteria, the stipulations are minimal; they concern: (1) acceptance bandwidth described only in terms of pulse duration and ignoring pulse rise and fall time; (2) spurious response of 60 dB or better; (3) image response suppression to maximum extent practicable; (4) stability "commensurate" with that of the transmitter; and (5) local oscillator radiation of -10 dBm or less. The program in the Technical Subcommittee (TSC) of IRAC to seek agreed standards for acceptance as requirements, is proceeding slowly, for a number of understandable reasons among which are the following:

a. Agencies are reluctant to encourage promulgation of requirements which impact adversely on expenditures, and the expenditures for radar systems are notably large;

b. Extensive improvements in radar emission characteristics awaits the development of components and techniques not generally associated with the present generation of radar equipments, (e.g., klystrons, Guassian pulse shapes, real interference-suppression);

c. Agreement is lacking on definitions of criteria -- a common laungage is not used; and

d. Stipulation of criteria is of little value because measurement of performance is not adequately developed or uniformily applied.

These difficulties are being dealt with in the TSC in connection with radar as well as other spectrum using systems, but national attention is required in a forum encouraging wider participation because of aspects such as (c) and (d) above.

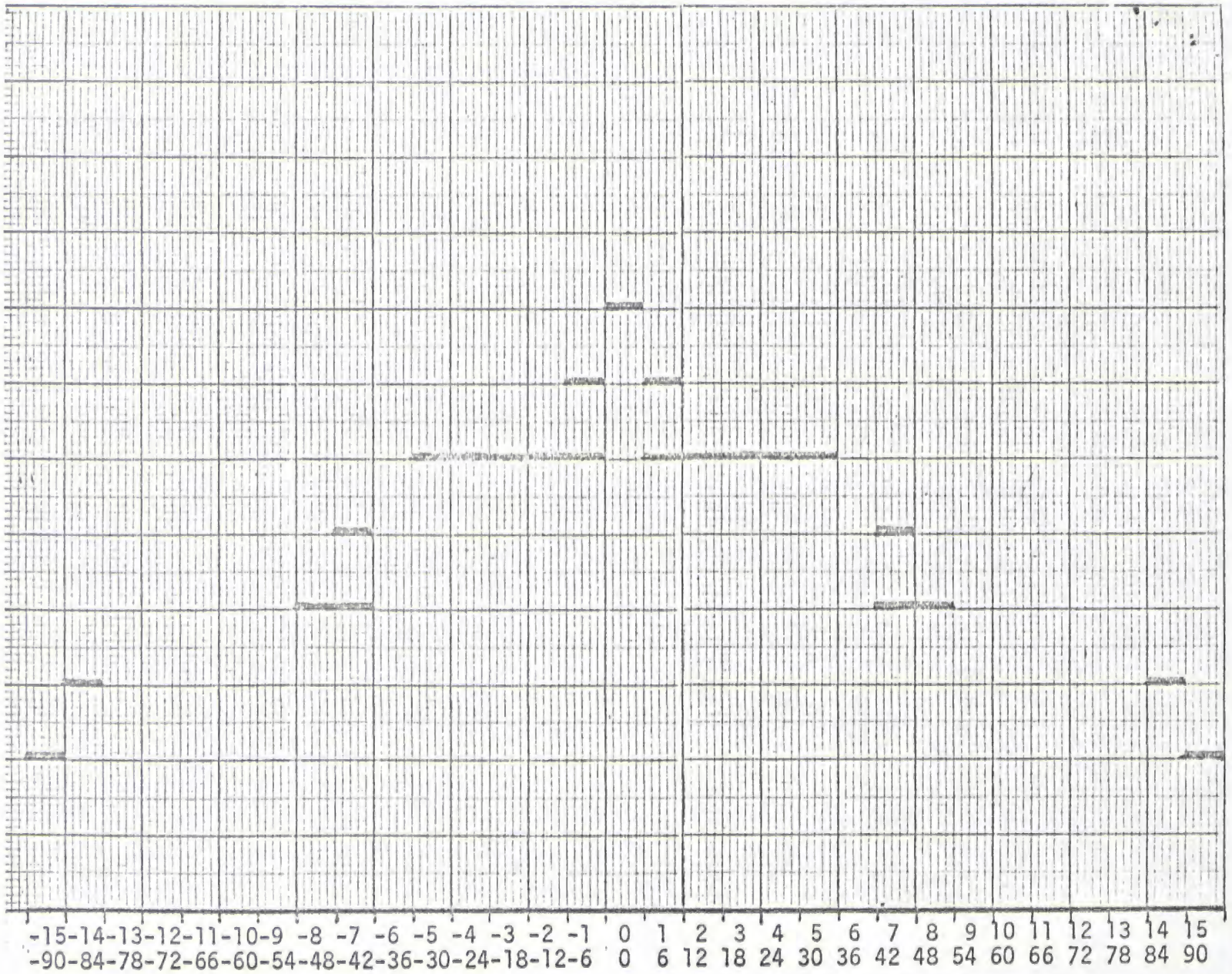
11. The IRAC, in striving to keep pace with the state-of-the-art and to accommodate the ever increasing demand on the radio frequency spectrum, has reduced channel spacing and has required conversion to narrowband technical standards in a number of land mobile bands.

A problem has developed in this regard with respect to local weather broadcasts operated continuously by the Department of Commerce on 162.55 MHz. Although transmitters in this service have been converted to narrowband (16F3) emission and this information has been promulgated with the weather information in repeated broadcasts, the vast majority of receivers in the hands of the public remain inexpensive wideband devices.

This resulted recently in a case of interference between a Government operation (Veterans Administration) on 162.5875 MHz, with 16F3 emission, and the reception by the public on a wideband receiver of the weather broadcasts from 162.55 MHz. The Veterans Administration was forced to move to another frequency. As an additional measure, to minimize the chance of a similar incident in the near future, a number of changes were made in the channeling plan for the band 162-174 MHz. Chief among these were the designation of the frequency 162.575 MHz for Commerce use, with 16F3 emission, and the deletion of the channel centered at 162.5875 MHz.

Although the foregoing action is not considered to bé good frequency management, it was taken as an expedient to assure the implementation of the mandate to the Department óf Commerce to provide the best and widest dissemination of weather information to the public. It is understood that there are 24 transmitters providing service at this time, by the end of 1970 there will be approximately 40 transmitters, and in 3-5 years as many as 300. It is also estimated that there are already 2-2½ million receivers for this service in the hands of the public today. The projected growth illustrates clearly that the receiver difficulty will intensify unless remedial measures are taken. By looking through the ads, one notes that receivers are being made available with wideband characteristics throughout the band 162-174 MHz, although, with but few exceptions, channeling is 25 kHz or less.

Frequency Space Affected by Typical UHF TV Channel Assignment



Office of Telecommunications Policy

Route Slip

23 NOV 1970

		To
	~~Clay T. Whitehead~~	FYI
	George F. Mansur	
	William Plummer	
	Wilfrid Dean	✓
	~~Steve Doyle~~ [redacted]	
	Walt Hinchman	
	Charles Joyce	
	William Lyons	

	Eva Daughtrey	
	Timmie White	
	Judy Morton	

REMARKS

JTAC

THE JOINT TECHNICAL ADVISORY COUNCIL

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. | ELECTRONIC INDUSTRIES ASSOCIATION

345 East 47th Street
New York, N. Y. 10017
212-752-6800

November 20, 1970

Dr. Clay T. Whitehead
Director of Telecommunications Policy
Executive Office of the President
1800 G Street, N. W.
Washington, D. C. 20504

Dear Dr. Whitehead:

It was gratifying to have had such a responsive audience when we recently met with you, Chairman Burch and the Commissioners.

We have held this type of discussion in previous years with your predecessor, Lt. Gen. James D. O'Connell, and we are glad that you concur in this liaison activity. This type of meeting is the best way to find out what we are each doing. We agree with you that such sessions to bring each other up to date will be advisable.

May I again extend our thanks to you and your staff for all the co-operation we receive from your Department.

Sincerely yours,

H. E. Weppler

H. E. Weppler
Chairman, JTAC

HEW:pp


RECEIVED
NOV 23 1970

OFFICE OF TELECOMMUNICATIONS POLICY

ROUTE SLIP

ACTION	☐
Concurrence	☐
Signature	☐
Comments	☐
For reply	☐
Information	☑
Per conversation	☐
Discuss with me	☐

TO C. T. Whitehead

~~Via: C.F. Mason~~

FROM W. Dean, Jr. DATE 11/3/70

REMARKS

(1) Attached in preparation for Nov. 5 FCC/OTP/JTAC meeting.

(2) Suggest undersigned be OTP spokesman on A.I.II (Systems Engineering Concept), using outline paper (Item No. 4) attached.

Will

PARTICIPATION IN JTAC
BRIEFING FOR FCC/OTP

INDEX

Participation in JTAC

Briefing for FCC/OTP

THE JOINT TECHNICAL ADVISORY COUNCIL

THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC. ELECTRONIC INDUSTRIES ASSOCIATION

345 East 47th Street
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I am attaching an agenda delineating the subjects to be covered. While we will have on hand some documents around which to center the discussion, we do not intend to generate any record of the discussions. It will be for purposes of understanding and background knowledge.

We all look forward to the meeting and are dedicated to making the occasion valuable to all concerned.

Very truly yours,

R. P. GIFFORD
Chairman, JTAC 63.1

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November 5, 1970
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Expected time of adjournment -- Not later than 12:30 PM

PARTICIPATION IN JTAC BRIEFING FOR FCC/OTP

In the 1963-64 timeframe, there was considerable concern over the spectrum management problems, particularly with respect to electromagnetic compatibility as a national issue. Dr. Jerome Wiesner, serving additionally as acting DTM, sought the advice of "industry" and the upshot was the establishment of JTAC 63.1 -- a Subcommittee of the Joint Technical Advisory Committee (Institute of Electrical and Electronics Engineers and Electronic Industries Association).

In March 1968, after four years of study, the JTAC published a report on technical policies, procedures and actions necessary for increased spectrum utilization, entitled "SPECTRUM ENGINEERING - THE KEY TO PROGRESS."

Last year a JTAC team briefed the FCC sitting en banc and the DTM on the progress of implementation of the recommended actions contained in the Report. The JTAC/FCC/OTP meeting on 5 November is to further update this effort. Our input is as set forth in W.D. letter to Al Hiebert of August 26, attached. Also appended is a compilation of the result of integration of JTAC, FCC and OTP inputs in readiness for this meeting.

SUMMARY

SPECTRUM ENGINEERING—THE KEY TO PROGRESS contains the results of over four years of study by many technical experts representing broad and long experience in Telecommunications.

The Report presents a great challenge at an opportune time. It deals with the national goal of maximizing the effective use of the radio spectrum so that present uses, including national security, transportation, conservation, education, business, entertainment and recreation can be adequately accommodated, provision made for future growth and for new uses. It reveals the urgency of this challenge as it documents the strangulation already occurring in some services due to lack of sufficient frequencies.

The work of the JTAC Subcommittee on Electromagnetic Compatibility was directed toward three objectives:

Identification of present electromagnetic compatibility (EMC) problems and existing control techniques.

Establishment of technical approaches that appeared to have promise for improved control of compatibility problems and for development of greater effectiveness in the use of the radio spectrum to provide for continued growth of its total value.

Recommendation of technically-based procedures that would, if implemented, increase effective and efficient use of the radio spectrum.

After exploring the areas to be studied, the Subcommittee organized its work into four main activities:

Survey of EMC practices, capabilities and existing major interference problems.

Analysis techniques that could serve in optimizing spectrum utilization.

Unintentional radio frequency interference and its impact on future utilization.

Electromagnetic-side effects and their role in future spectrum utilization planning.

The first two activities were further subdivided into individual areas where studies of many aspects were conducted in depth. The following are examples

- Urban area radio spectrum usage.
- Antenna Farm Study.
- Spectrum management records.
- Frequency coordination and monitoring.
- EMC in selected government agencies.
- Microwave communications system spectrum usage.
- Spectrum utilization efficiency criteria.

full awareness of the significantly increased funding required, the JTAC concludes and recommends

That allocation and assignment procedures should be based on a spectrum engineering philosophy such as set forth in this Report.

That spectrum engineering capabilities should be established to develop a spectrum management system—test it, improve it, and operate its technical aspects.

That the methods of analyzing the behavior of systems, subject to noise environments and means of predicting noise ambients, need to be developed. This will require agreement on measurement parameters and extensive coordinated data gathering.

That a central interdisciplinary coordinating body for "side effects"—the interaction of man's use of the spectrum with nature's use—should be developed.

In short, SPECTRUM ENGINEERING—THE KEY TO PROGRESS presents the challenge:

Finding present spectrum assignment procedures to be inadequate for meeting the continued growth of demands on the radio spectrum, today's methods must be revised and augmented by a new generation of spectrum engineering techniques.

CONTENTS

CONTENTS (Continued)

CONTENTS (Continued)

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF TELECOMMUNICATIONS MANAGEMENT
WASHINGTON, D.C. 20504

August 26, 1970

Mr. A. L. Heibert
Engineering Sciences Department
The RAND Corporation
1700 Main Street
Santa Monica, California 90406

Dear Al:

Enclosed material for proposed JTAC/FCC/OTP briefing on JTAC 63.1 Report is forwarded per our discussion on 19 August and telephone conversation earlier today.

Sincerely,

W. Dean, Jr.
Associate Director
for Frequency Management

Enc.

cc: Mr. R. P. Gifford
Mr. H. E. Weppler
Mr. Raymond Spence

SUMMARY OF PROGRESS AND CONTEMPLATED ACTIONS OF THE OFFICE OF TELECOMMUNICATIONS MANAGEMENT WHICH ARE RELATED TO THE RECOMMENDATIONS OF JTAC 63.1

Recommendation 1: "Adopt the spectrum engineering philosophy. . . .".

(a) Budgetary Support - The Office of Telecommunications Management sometime ago determined that improved and substantially increased spectrum engineering is imperative to meet the expanding radio frequency requirements of the Nation. The fact that JTAC 63.1 made this its first recommendation after a long and comprehensive study has reassured the office of the soundness of the program on which it is embarked.

The necessity for a higher level of funding is, of course, recognized. Many factors influence budgeting for the Federal Government and the needs of telecommunications are balanced against and compete with all other needs. The following is a recapitulation of the budget history for the entire OTM: (in thousands of dollars)

FY	REQUESTED		APPROPRIATION	
	Personnel	Funds	Personnel	Funds
1966	70	1531	70	1280
1967	88	2809	70	1600
1968	93	4264	70	1945
1969	70	1945	63	1675
1970	78	2238	63	1795
1971	117	3300	*	*

* Awaiting Congressional/Presidential action.

The President's Budget for 1971 included nearly twice the support currently available for the Director of Telecommunications Management. Included in this request was $906 thousand and 40 positions to establish a National Electromagnetic Compatibility Analysis Facility (NECAF) to solve complex frequency management problems. Additionally, contractual research was estimated at $880 thousand to provide for improvements to the Automatic Data Processing capability in the frequency assignment process, to permit continued research in frequency management, and initiate research in the other areas of telecommunications which have been overlooked.

(b) NECAF - The cornerstone of spectrum engineering, so far as the Executive Branch is concerned, is incorporated in the proposed NECAF. The lack of generally available diagnostic engineering capability is recognized as a critical deficiency and there are complex problems which cannot be resolved satisfactorily in the absence of such an engineering tool.

(c) Technical Areas - Additional progress in several technical areas has been realized through such actions as: (i) initiating a program to ascertain a means of certifying that new radio equipments will meet prescribed Executive Branch criteria before procurement; (ii) appraisal and improvement of technical standards based on results of two contract studies (such standards are under coordination for establishment as regulatory requirements); (iii) collection of technical data on the use of LASERS for telecommunications purposes; (iv) development of recommendations for new RADAR spectrum engineering standards; (v) promulgation of revisions to the Government Table of Frequency Tolerances; (vi) development of procedures whereby principal Government agencies using radio undertake inspection activities concerning radio station observance of technical regulations; and (vii) converting over 5000 frequency assignments below 30 MHz from double side band to single side band.

(d) Receiver Improvement - During the past year the OTM has also brought to the attention of several professional organizations (IEEE, EIA, JTAC, etc.) the need for more positive measures to improve equipment characteristics, particularly receivers, so as to minimize the impact on the usable radio frequency spectrum. The Electronic Industries Association has concurred that this item requires early attention and has initiated action accordingly. Progress is being made.

RECOMMENDATION NO. 1

Adopt Spectrum Engineering Philosophy and System Design Concept

RECENT	PLANNED	NEEDED
1. Budget - FY '70 Budget included $500,000 of contract money for continued research in frequency management with particular emphasis on ADP capabilities. FY '71 Budget included a request for $880,000 for extension of such research.	1. Budget - FY '72 Budget planning is for $900,000 to carry on FY '70 and FY '71 projects and initiate new efforts.	1. Endorsement for budgeting support
2. NECAF - Concept has been developed. FY '71 Budget request request was for $906,000 and 40 positions to establish the NECAF. Diagnostic engineering capability of NECAF intended to provide new spectrum engineering tools.	2. NECAF - Anticipate NECAF will be operated by Dept. of Commerce when approved and established. Experience and resources of ECAC will be used to extent possible.	2. Congressional approval, budgeting or legislative action.
3. Technical Areas - Progress realized in several areas, namely (a) Program established to certify that new radio equipment procurements meet spectrum conserving criteria (b) Promulgation of technical standards for communication and electronic equipment. (c) Collection of data on LASERS for telecommunications purposes (d) Development of new RADAR spectrum engineering standards (e) Promulgation of revised and tightened Table of Frequency Tolerances (f) Converting over 5000 frequency assignments from double to single sideband.	3. Technical Areas (a) Continue programs in being as appropriate (b) Develop further monitoring/measuring capability. (c) Develop improved measures to better evaluate of spectrum usage, i. e., Figures of Merit and Standards applications.	3. Continued personnel and budgetary support. Commerce assistance.

RECENT	PLANNED	NEEDED
4. Receiver Improvement - Leadership being exercised to encourage industry to improve receiver design so as to minimize the impact on the frequency spectrum.	4. Receiver Improvement- Continue present efforts.	4. Possible legislation to authorize enforcement of receiver standards.
5. Spectrum Monitoring/Measurement During FY '70 research was started to define an initial monitoring/measurement program	5. Spectrum Monitoring/ Measurement It is hoped that by late FY '71 an initial capability will be developed and will be expanded during FY '72. Based on experience obtained necessary modifications will be made preliminary to operational application	5. Experience with the new techniques involved. Commerce assistance.

Recommendation 2: "Establish the 'Next Generation' Spectrum Engineering System. . . .".

(a) Pilot Project - The OTM assisted the FCC in the development of a specific proposal with respect to local frequency coordination and engineering. As is well known, the Commission has pressed forward with a specific concept oriented basically toward the land mobile frequency problem and is establishing a "test tube" case in the Chicago area. The OTM proposal for making this effort joint Government and non-Government in nature did not survive the budgetary planning process. Nevertheless, the concept of improved local engineering and coordination has been expanded within the Federal Government from the original Southern California area to also include Nevada, Arizona, New Mexico, Florida, Texas, Louisiana, Mississippi, Alabama, and Georgia. Further expansion, in both geographical area and frequency coverage, will be effected as experience is gained.

To assist with the general concept, the IRAC has maintained an updated list of existing mechanisms whereby local coordination of frequencies is effected, together with a "Directory of Field Contacts" (both Government and non-Government) for the coordination and use of frequencies.

(b) Analytical Capabilities - The continued development (first started in 1963) of Automatic Data Processing (ADP) techniques is providing extremely useful aids for spectrum management engineering. Contractual support has been used to develop and improve the data base needed. The same contractual support is being used to develop programming logic and to extend the data base to perform engineering analyses, time sharing arrangements, and statistical analyses. The ultimate objective is an ADP Support Center to engineer assignments and uses of frequencies on a real-time basis for all wishing to utilize this type of service.

Only through the use of improved ADP techniques was it possible for the Executive Branch to process some 60,500 frequency assignments in FY 1970, an increase of 17.7 percent over the previous year.

(c) Usage and Review Program - A frequency usage reporting system applicable to the Federal Government use of radio is now in being. The first increment of this undertaking for the band 4-30 MHz requires the submission of some 120,000 reports per year from the Government agencies reflecting the amount of time that specific frequency assignments have in fact been employed. Further, during the past year, over 35,000 frequency assignments were reviewed to assure continued need and accuracy of assignment details.

(d) Spectrum Monitoring - The OTM has completed the definition of a spectrum monitoring effort capable of diagnostic checking or confirming Government radio spectrum usage data, the degree of compliance with established rules and regulations, and the appropriate technical parameters to insure electromagnetic compatibility. It is hoped that an experimental capability can be activated during FY 71.

(e) Data Base - Priority was recently given within the Executive Branch to the formation of a Federal frequency management data base. The need for input data was carefully evaluated (e. g. channel usage, equipment performance characteristics and standards, propagation statistics, radio assignment information, advances in the state of the radio art, economic and social factors, and side effects), as well as analytical tools (e. g. models of radio channel characteristics, topographical models, monitoring capability, equipment environment and interference models, the use of relative values and models of radiation effects) which form the basic elements of not only the Federal frequency management data base but also are integral components of the NECAF and the Spectrum Usage Reporting Program. Guide plan completed and promulgated to Federal agencies.

(f) Economic and Social Values - The "next generation" spectrum engineering system should also have provision for the inclusion of elements which are not well-defined in present procedures -- Economic and Social Values. As a result of OTM support, the National Academy of Engineering has just completed a two-year study of what might be done to bring such factors into what has heretofore been essentially a technical equation. As a related part of this effort, the OTM is investigating the feasibility of developing Performance Measures, i. e., quantitative means of determining to what extent communications-electronics systems -- (i) meet the state of the radio art and (ii) are capable of being injected into their intended operational environment without adverse results. A contractual effort to explore this matter has been initiated.

(g) New Equipment Application Procedure - A new concept whereby, rather than continuing only the present practice of applying for specific frequencies at the time equipment is available for use, proposed uses of communications-electronics equipments would be processed prior to their manufacture/purchase to ensure that frequency provisions are available. The philosophy would be to provide frequency support at the conceptual stage of equipment development rather than after it has been programmed, budgeted for, and produced. This approach is a major objective in the future of improved frequency management.

RECOMMENDATION NO. 2

Establish "Next Generation" Spectrum Engineering System

RECENT	PLANNED	NEEDED
1. Pilot Project - Although the OTM proposal to make this truly a joint project did not survive the budgetary process, assistance was provided to the FCC in their planning for a "pilot project" in the Chicago area.	1. Pilot Project - monitor progress and results of FCC efforts, assisting as requested.	
2. Local Area Government Frequency Coordination Originally established in the Southern California area. Now expanded to include Arizona, Nevada, New Mexico, Florida, Louisiana, Mississippi, Texas, Alabama, and Georgia.	2. Local Area Government Frequency Coordination Continue present efforts despite budgetary cutbacks.	2. Continued effort, particularly in certain shared bands.
Analytical Capabilities Continued development since 1963 of ADP techniques has made it possible to process some 60,500 frequency assignments during FY '70.	3. Analytical Capabilities Continued contractual support in developing program logic and to extend the data base to perform engineering analysis, time sharing arrangements, and statistical analysis.	3. Continued budgetary support of the program.
4. Usage and Review Program First increment in effect for 4-30 MHz band requires 120,000 reports per year from Gov't agencies. Also, 35,000 frequency assignments were reviewed during FY '70.	4. Usage and Review Program Continue to collect data, improve, and expand the spectrum usage reporting system up to 420 MHz.	4. Increased agency support.
5. Federal Frequency Management Data Base A guide plan has been adopted for the establishment of Federal Frequency Management Data Base. It includes provisions for data files on equipment characteristics, terrain files, usage information, and refinement of current data files. Also included is a phased implementation plan.	5. Federal Frequency Management Data Base To proceed with expanding and improving the data base, noting that much of it will be related to progress with NECAF.	5. Get NECAF established as soon as possible

RECENT	PLANNED	NEEDED
6. Economic and Social Values Two year study of National Academy of Engineering just completed. Also OTM is studying the feasibility of establishing a "Relative Value Index".	6. Economic and Social Values Continue the effort with contractual/consultative assistance.	6. Continued support
7. New Equipment Application Procedure The DOD has a procedure for coordination proposed uses of C-E systems prior to manufacture to assure frequency provisions can be made. FCC has its "approved equipment list".	7. New Equipment Application Procedure To extend the DOD concept to the Executive Branch on the theory that it is better to provide frequency support at the conceptual stage of equipment development than after it is programmed and produced.	7. Further development and implementation of the concept.
8. Relating Spectrum Needs to Operational Requirements Need for a study has been established.	8. Relating Spectrum Needs to Operational Requirements FY '72 Budget planning provides for a study to investigate the possibility of developing a systematic approach to link more effectively spectrum needs with particular information transfer needs.	
9. Standardized Methodology for Application of Sharing Criteria There is recognition that effective spectrum development will require increased sharing by radio services in the same frequency bands.	9. Standardized Methodology for Application of Sharing Criteria FY '72 Budget planning provides for a research effort to develop the methodology for establishing better technical criteria for intra and inter-radio service sharing throughout the spectrum, e. g., means for predicting spectrum saturation assessing means for accommodating new and additional co-spectrum users.	

RECENT	PLANNED	NEEDED
10. Evaluation Measures Studies to date reveal the lack of adequate measures as to what constitutes efficient spectrum use by electronic devices.	10. Evaluation Measures FY '72 Budget planning provides for development of techniques that might be used to evaluate and achieve efficient spectrum utilization, e.g., "Figures of Merit" or "EMC Performance Measures".	
11. Impact of New Technology in 100 - 1000 MHz Spectrum Demand for and potential use of this portion of the spectrum have increased over that anticipated in the original allocation structuring. Need for study of techniques to obtain greater use of this spectrum is foreseen.	11. Impact of New Technology in 100 - 1000 MHz Spectrum FY '72 Budget planning provides for a study of the possible impact of new technology, looking toward possible revision of the allocation structure in the 100-1000 MHz band.	11. FCC/OTP joint undertaking recommended.

Recommendation 3: "Increase Knowledge of Man-Made Noise and its Effects Some . . . . . ".

Due to budgetary limitations the OTM has not been able thus far to explore in-depth the matter of noise. Further action in this regard is contemplated during FY 71. Steps have been taken to call to the attention of the Government agencies engaged in development of devices which may have an adverse effect on the spectrum, e. g., electrical cars, the need for ensuring that in "unpolluting" one resource we do not "pollute" another. This effort on the part of OTM has been well received. Further, a letter has been forwarded to the FCC proposing a joint undertaking to determine what actions are necessary to reduce the over-all cumulative effect of devices which unintentionally radiate radio noise.

RECOMMENDATION NO. 3

Increase Knowledge of Man-Made Noise and Its Effects

RECENT	PLANNED	NEEDED
1. Impact of Man-Made Noise Study efforts undertaken to understand the growth and control of radio noise.	1. Impact of Man-Made Noise Continue present efforts, in cooperation with FCC.	
2. Coordination of "Spectrum Pollution" Abatement Attention of Gov't agencies engaged in development of devices that may have an adverse impact on the spectrum has been called to ensure that "unpolluting" one resource does not "pollute" another.	2. Coordination of "Spectrum Pollution" Abatement Continue monitoring and further in-depth exploration of the problem is contemplated during FY '71.	

Recommendation 4: "Lead in the Establishment of a Central, Interdisciplinary Coordinating Body for "Side-Effects" for Stimulation of Measurement. . . . ".

The Electromagnetic Radiation Management Advisory Council (ERMAC) of the OTM has been in existance for a little over a year to develop recommended policy guidance with respect to the possible impact of "side effects". The ERMAC is currently in the final stages of defining the research and development necessary to remove some of the vagaries currently prevailing in the "side effects" area. Upon availability of this defined program, it is planned to coordinate the recommendations therein with the Office of Science and Technology and those Federal agencies involved in the protection of the environment (Cabinet Committee on the Environment, Council on Environmental Quality, etc.).

RECOMMENDATION NO. 4

Establish Interdisciplinary Coordinating Body on "Side Effects"

RECENT	PLANNED	NEEDED
1. ERMAC - established to develop recommended policy guidance with respect to "side effects".	1. ERMAC - ERMAC is defining research & development necessary to identify better problems in the "side effects" area. Recommendations from this effort will be coordinated with the Office of Science & Technology and Federal agencies involved in protection of the environment.	ERMAC to report on needed programs agency participation in budgetary support.

ACTIVITIES RELATED

TO

THE JTAC RECOMMENDATIONS IN SPECTRUM ENGINEERING

November 1970

Subcommittee 63.1 on Electromagnetic Compatibility

Joint Technical Advisory Committee

Second Annual Review

CONTENTS

RECOMMENDATION NO. 1

ADOPT SPECTRUM ENGINEERING PHILOSOPHY AND SYSTEM DESIGN CONCEPT

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
JTAC	1. Briefings, Papers, Technical Services provided in promoting Spectrum Engineering Concept and JTAC Recommendations 2. Technical Reviews; FCC, OTP, OST, BoB, White House Staff	1. Continue to provide technical advisory services and briefings 2. Annual technical reviews	1. Determine form of continued JTAC support, i.e., a. annual reviews b. establish standing JTAC group on Spectrum Engineering to provide technical advisory services of overall program or selected topics and specialists, c. discontinue JTAC 63.1 subcommittee & functions
OTP	1. Budget - FY '70 Budget included $500,000 of contract money for continued research in frequency management with particular emphasis on ADP capabilities. FY '71 Budget included a request for $880,000 for extension of such research. 2. NECAF - Concept has been developed. FY'71 Budget request. Request was for $906,000 and 40 positions to establish the NECAF. Diagnostic engineering capability of NECAF intended to provide new spectrum engineering tools. 3. Technical Areas Progress realized in several areas, namely a. Program established to certify that new radio equipment procurements meet	1. Budget - FY '72 Budget planning is for $900,000 to carry on FY '70 and FY '71 projects and initiate new efforts. 2. Analysis Capability - Anticipate analysis capability will be operated by Dept. of Commerce when approved and established. Experience and resources of ECAC will be used to extent possible. 3. Technical Areas - a. Continue programs in being as appropriate. b. Develop further monitoring/measuring capability. c. Develop improved measures to better evaluate spectrum usage, i.e., Figures of Merit and Standards applications.	1. Endorsement for budgeting support 2. Congressional approval, budgeting or legislative action 3. Continued personnel and budgetary support Commerce assistance.

RECOMMENDATION NO. 1 (Continued)

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	spectrum conserving criteria b. Promulgation of technical standards for communication and electronic equipment. c. Collection of data on LASERS for telecommunications purposes d. Development of new RADAR spectrum engineering standards e. Promulgation of revised and tightened Table of Frequency Tolerances f. Converting over 5000 frequency assignments from double to single sideband. 4. Receiver Improvement Leadership being exercized to encourage industry to improve receiver design so as to minimize the impact on the frequency spectrum.	4. Receiver Improvement-Continue present efforts.	4. Possible legislation to authorize enforcement of receiver standards.
FCC	1. Spectrum Management Group organized. Later re-organized as the Spectrum Management Task Force (see also Recommendations 2(a), 2(b), 2(c), and 2(d).	1. Research and Spectrum Planning in general covering: a. Present use and Future Needs. b. Evaluation of current and future ad-	1. Extension of the improved spectrum management concept to other services and areas. 2. Continue close coordination with OTP and

RECOMMENDATION NO. 1 (Continued)

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
FCC	2. Frequency Assignment Techniques for Microwave Radio Systems (CSC Contract). Phase I - Following tasks completed: a. Review of Present FCC Frequency Assignments Policies and Procedures. b. Study and Review of User Requirements. c. Frequency Sharing Study. d. Methodology for System Engineering. 3. Broadband Communications Technology project completed in part. Report due in October. 4. Report and Order issued in Docket 18261, covering sharing by Land Mobile and UHF-TV of the TV frequencies extending from 470 to 512 MHz. 5. Report and Order issued in Docket 18262, allocating frequencies for common user type mobile systems. 6. A R&D study contract awarded to CSC in June to provide information on forthcoming WARC in June 1971.	vances both from technological and socio-economic viewpoints. c. Investigation of new techniques and developments. d. Establishment of a frequency management data bank for Commission and Industry wide use.	other agencies. 3. Research into all methodologies applying to Land Mobile Radio Services, including Cellular, Spread Spectrum Multi-channel, etc., (FY 1972).

RECOMMENDATION NO. 1

ADOPT SPECTRUM ENGINEERING PHILOSOPHY AND SYSTEM DESIGN CONCEPT

JTAC

1. Briefings, Papers, Technical Services provided in promoting Spectrum Engineering Concept and JTAC Recommendations:

Chairman: JTAC Subcommittee 63.1 on EMC: R. P. Gifford

July 29, 1969 - Meeting of 63.1 with members of the President's Office of Science and Technology - The Bureau of the Budget and White House Staff.

August 18, 1969 - Briefing: To Dr. Myron Tribus, Assistant Secretary for Science and Technology, Department of Commerce, on the JTAC 63.1 report and spectrum engineering philosophy.

September 23, 1969 - Talk before the Virginia Section of the IEEE on the subject of spectrum engineering -- using many of the visual aids prepared for other briefings.

Chairman: Task Group 63.1.1 - Survey: A. L. Hiebert

July 10, 1969 - Briefing: "Spectrum Engineering, The Key to Progress": To the S. California Land Mobile Radio Users Committee, Los Angeles.

October 10, 1969 - Consulting Services: To OTM & FCC staff - Planning on Spectrum Engineering Programs.

October 17, 1969 - Briefings: "Spectrum Engineering - The Key to Progress": To the Governor's Communications Advisory Board, State of California, Sacramento.

October 29, 1969 - Consulting Services: Supplemental Technical data on Spectrum Engineering Concepts," Submitted to OTP & FCC.

November 19, 1969 - Consultant Services: To OTP & FCC staff - Planning meeting on Spectrum Engineering Programs.

February 1970 - Briefing: Regional Spectrum Engineering Concepts: To S. California Land Mobile Radio Users Committee, Los Angeles.

June 2, 1970 - Consultant Services: Review & submission of technical inputs to OTP on the design of a "National Frequency Data Base."

June 9, 1970 - Consultant Services: To OTP & FCC staff - Planning Meeting on Spectrum Engineering Programs.

June 11, 1970 - Briefing: "Spectrum Engineering Concepts": To Hq USAF and DDR&E staff.

July 6, 1970 - Short paper on: Statements in Support of Establishing a Regional Spectrum Engineering Capability in the S. Calif. area. Submitted to: Mr. Kenneth Goodwin, Planning Officer of the FCC and copy to OTP.

Chairman: Task Group 63.1 - Unintended Radiation: G. W. Haydon

September 9, 1969 - Talk before IEEE, Philadelphia Section, on JTAC 63.1 work as reported by JTAC in "Spectrum Engineering - The Key to Progress" with emphasis on application to and parallel effort being conducted by a Metropolitan Spectrum Congestion - Task Group of the President's Task Force on U.S. Communications Policy.

October 24, 1969 - Talk before IEEE, Vehicular Technology Chapter Meeting, Washington, D. C. Subject: "The Radio Spectrum -- Crisis or Opportunity" and discussion of conclusions reached by the JTAC and by the Metropolitan Spectrum Congestion Task Group of the President's Task Force on Communications Policy.

March 21, 1970 - Talk before the 1970 IEEE International Convention New York City on subject: "Current Telecommunication Opportunities for Compatibility" stressing the importance compatibility between systems in various services and within each system.

Chairman: JTAC Task Group 63.1.4, Electromagnetic Side Effects: R. Daniels

July 1969 (Continuing) - Developed interest in establishing in a Central Interdisciplinary Information Exchange by the Bureau of Radiological Heal for radiation hazard control.

1969 (continuing) - Fostered organization of: Spectrum Study Committee of the IEEE EMC Group and the joining by members of JTAC Task Group 63.1.4 to continue efforts introduced by the JTAC report:

1969 (continuing) - Fostered continued work on Frequency Spectrum chart by Luther Monell, member of JTAC Task Group 63.1.4. Expansion of chart from DC to 3 MHz and 3GHz to infinity. Installation of new charts has been commissioned for Los Angeles Science Museum, Technological Museum and Research Institute of Electrical Industry, Mexico City, Mexico. Interest expressed by Department of Health, Education and Welfare.

July 1970 - Presented paper - "The Key to Interdisciplinary Communication," - to IEEE EMC Seminar University of Pennsylvania, based on interest generated by JTAC report.

July 15, 1970 - Presented paper: "New Horizons in EMC" to International Symposium on EMC, Anaheim, Calif.

October 7, 1970 - Paper to be presented on: The Key to Interdisciplinary Communications" to EMC Southwest Symposium, San Antonio, Texas.

Member: JTAC Subcommittee 63.1 on EMC: W. R. Vincent

August 7, 1969 - Presentation to International Industrial Development Conference of Stanford Research Institute entitled "Communication Technology in 1980" which delt with implications of Radio Spectrum Resource Management problems in the 1980 time frame.

October 15, 1969 - Review of measurement techniques, results, and implications of FCC Land Mobile Radio Spectrums Study for Land Mobile Committee of Electronic Industries Association.

October 22, 1969 - Presentation to IEEE Vehicular Communications group, San Mateo, California, on "Land Mobile Radio Spectrum Utilization," its measurement and definition.

January 16, 1970 - Participated in oral arguments on dockets, 18261 and 18262. Participation was not as an advocate but emphasized the need for a factual engineering basis for Spectrum assignment processes.

April 21, 1970 - Presentation to the Petroleum Industry Electronics Association, at Tulsa, Oklahoma, by T. I. Dayharsh and W. R. Vincent, entitled "Frequency Management Not Coordination."

May 27, 1970 - Participated in Panel discussion on "Todays Radio Spectrum Management Problems" held by IEEE Vehicle Communications group, Los Angeles, California.

May 27, 1970 - Presentation to the IEEE Vehicular Communication group, Los Angeles, California, on "Spectrum Engineering for Land Mobile Services"

August 20, 1970 - Briefing to the FCC staff on practical techniques to measure and define the population of signals in the radio spectrum.

August 21, 1970 - Briefing to IRAC members on practical techniques to measure and define the population of signals in the radio spectrum.

2. Technical Reviews:

June 19, 1969 - Joint meeting: FCC Commissioners and FCC Staff, Director OTM and OTM Staff

July 29, 1969 - Office of Science and Technology, Bureau of Budget and White House Staff

November 5, 1970 - Joint meeting: FCC Commissioners and FCC Staff, Director OTP and OTP Staff.

RECOMMENDATION NO. 1 (Continued)

OTP

1. Budgetary Support - The Office of Telecommunications Management sometime ago determined that improved and substantially increased spectrum engineering is imperative to meet the expanding radio frequency requirements of the Nation. The fact that JTAC 63.1 made this its first recommendation after a long and comprehensive study has reassured the office of the soundness of the program on which it is embarked.

The necessity for a higher level of funding is, of course, recognized. Many factors influence budgeting for the Federal Government and the needs of telecommunications are balanced against and compete with all other needs. The following is a recapitulation of the budget history for the entire OTM: (in thousands of dollars)

FY	REQUESTED		APPROPRIATION	
	Personnel	Funds	Personnel	Funds
1966	70	1531	70	1280
1967	88	2809	70	1600
1968	93	4264	70	1945
1969	70	1945	63	1675
1970	78	2238	63	1795
1971	117	3300	*	*

*Awaiting Congressional/Presidential action

The President's Budget for 1971 included nearly twice the support currently available for the Director of Telecommunications Management. Included in this request was $906 thousand and 40 positions to establish a National Electromagnetic Compatibility Analysis Facility (NECAF) to solve complex frequency management problems. Additionally, contractual research was estimated at $880 thousand to provide for improvements to the Automatic Data Processing capability in the frequency assignment process, to permit continued research in frequency management, and initiate research in the other areas of telecommunications which have been overlooked.

2. NECAF - The cornerstone of spectrum engineering, so far as the Executive Branch is concerned, is incorporated in the proposed NECAF. The lack of generally available diagnostic engineering capability is recognized as a critical deficiency and there are complex problems which cannot be resolved satisfactorily in the absence of such an engineering tool.

3. Technical Areas - Additional progress in several technical areas has been realized through such actions as: (i) initiating a program to ascertain a means of certifying that new radio equipments will meet prescribed Executive Branch criteria before procurement; (ii) appraisal and improvements of technical standards based on results of two contract studies (such standards are under coordination for establishment as regulatory requirements); (iii) collection of technical data on the use of LASERS for telecommunications purposes; (iv) development of recommendations for new RADAR spectrum engineering standards; (v) promulgation of revisions to the Government Table of Frequency Tolerances; (vi) development of procedures whereby principal Government agencies using radio undertake inspection activities concerning radio station observance of technical regulations; and (vii) converting over 5000 frequency assignments below 30 MHz from double side band to single side band.

4. Receiver Improvement - During the past year the OTM has also brought to the attention of several professional organizations (IEEE, EIA, JTAC, etc.) the need for more positive measures to improve equipment characteristics, particularly receivers, so as to minimize the impact on the usable radio frequency spectrum. The Electronic Industries Association has concurred that this item requires early attention and has initiated action accordingly. Progress is being made.

FCC

1. The Commission's long-range approach to the critical shortage of radio frequencies has been to start toward the implementation of a new frequency management system that will deal first with the land mobile frequencies in a small area and then, at a later date, expand the effectiveness of the system into other frequency bands and other geographic areas.

A Spectrum Management Task Force has been formed. This group will form the nucleus of a new National Spectrum Management Center at Washington, D. C. This center will be responsible for the development of the policies for regional spectrum management centers.

The first regional area will be Chicago, Illinois. This center will be equipped with a computer for processing authorizations in the Land Mobile Services, and for processing the computer tapes of frequency occupancy developed in the mobile monitoring van. The establishment of the first regional area in Chicago and the new National Spectrum Management Center in Washington, D. C. will require the recruitment and training of new personnel with specialties which are not now fully developed in the Commission.

The Spectrum Management Task Force will provide the necessary expertise for the establishment and staffing of both the new National Spectrum Management Center as well as the regional center. Additional information pertaining to the new frequency management system appears under Recommendations 2(a), 2(b), 2(c), and 2(d).

2. The Computer Sciences Corporation under Contract RC-10090 has completed Phase I of their work and submitted a draft Final Report, Volume I and II, in the study "Frequency Assignments Techniques for Microwave Radio Systems." Preliminary indications are that the final report may be a useful source of background material for:

(a) establishing equipment standards
(b) developing data elements (for microwave)
(c) providing timely regulations for microwave radio systems.

3. A $50 K study of broadband communication technology by the Institute of Telecommunication Sciences (ITS), Office of Telecommunication, Department of Commerce, is nearing completion. This study considers future uses and requirements on the radio spectrum including, but not limited to noise, cable systems, cellular systems, and broadband technology.

4. A start was made several years ago in the direction of improved frequency management for the land mobile services. The problem was separated into an investigation of the feasibility of providing more frequency space and by studies to devise methods of more effective spectrum utilization. Both of these efforts have been productive.

In Docket 18261, additional frequencies presently used by television broadcast stations on the lowest 7 UHF television channels are being provided for use in the land mobile services on a shared basis, selecting the two best channels in the 10 largest metropolitan areas.

5. In Docket 18262, the following frequency bands were allocated for the use of new techniques in the land mobile services (May 20, 1970).

806-881 MHz Land Mobile (Domestic Public)
881-902 MHz Land Mobile
928-947 MHz Land Mobile

The inquiry in Docket 18262 is continuing with respect to the types of systems to be developed for private and common carrier use of their newly allocated bands.

6. A Research and Development Study Contract entitled "Sharing Between the Communication Satellite and Terrestrial Radio Systems - A Technical Study" was awarded to the Computer Sciences Corporation in June 1970. This study looks toward providing information for use in connection with the forthcoming World Administrative Radio Conference (WARC) of the International Telecommunications Union on Matters pertaining to the radio astronomy and space services.

RECOMMENDATION NO. 2a

Establish Spectrum Engineering System
a. PILOT PROJECT: FIELD STATION PROTOTYPE

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. Pilot Project - Al - though the OTM proposal to make this truly a Joint Pilot Project in the JTAC sense did not survive the budgetary process, assistance was provided to the FCC in their planning for a "limited regional center" in the Chicago area. 2. Local Area Government Frequency Coordination Originally established in the Southern Calif. area. Now expanded to include Arizona, Nevada, New Mexico, Florida, Louisiana, Mississippi, Texas, Alabama & Georgia	1. Pilot Project - Monitor progress results of FCC efforts, assisting as requested 2. Local Area Government Frequency Coordination. Continue Present efforts despite budgetary cutbacks.	1. Continued Coordination. 2. Continued effort, particularly in certain shared bands.
FCC	1. Study contract awarded to SRI to define spectrum management parameters. 2. Chicago selected as the area for the first regional center.	1. Spectrum Management Task Force will be the nucleus for both the National and the first regional center. Initial efforts are being concentrated on land-mobile. Programs will expand as experience is gained.	1. Additional personnel 2. Computer for Regional Center.

RECOMMENDATION NO. 2a

Establish Spectrum Engineering System
a. PILOT PROJECT: FIELD STATION PROTOTYPES

OTP

1. Pilot Project - The OTP assisted the FCC in the development of a specific proposal with respect to local frequency coordination and engineering. As is well known, the Commission has pressed forward with a specific concept oriented basically toward the land mobile frequency problem and is establishing a "test tube" case in the Chicago area. The OTP proposal for making this effort joint Government and non-Government in nature did not survive the budgetary planning process. Nevertheless, the concept of improved local engineering and coordination has been expanded within the Federal Government from the original Southern California area to also include Nevada, Arizona, New Mexico, Florida, Texas, Louisiana, Mississippi, Alabama, and Georgia. Further expansion, in both geographical area and frequency coverage, will be effected as experience is gained.

To assist with the general concept, the IRAC has maintained an updated list of existing mechanisms whereby local coordination of frequencies is effected, together with a "Directory of Field Contacts" (both Government and non-Government) for the coordination and use of frequencies.

FCC

1. It is planned to establish a developmental prototype center near the Washington office that will evolve into the Chicago Regional Office. Initially the functions of the Chicago regional office will be to process requests for spectrum utilization in the private land mobile services regulated under Parts 89, 91 and 93. (These are the Public Safety, Industrial Radio Services and the Land Transportation Radio Services). As experience is gained in providing this limited de-centralized frequency management, function, the improved frequency management concept can be extended to other radio services and to other geographic areas.

Liaison will be maintained with users and industry frequency coordinators particularly regarding a set of tentative loading standards that will be developed for the various services.

RECOMMENDATION NO. 2b

Establish Spectrum Engineering System
b. ANALYSIS CAPABILITIES - NATIONAL AND FIELD SUPPORT

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. Analytical Capabilities Continued development since 1963 of ADP techniques has made it possible to process some 60,500 frequency assignments during FY'70. 2. Economic and Social Values. Two year study of National Academy of Engineering just completed. Also OTP is studying the feasibility of establishing a "Relative Value Index." 3. New Equipment Application Procedure. The DOD has a procedure for coordination proposed uses of C-E systems prior to manufacture to assure frequency provisions can be made. FCC has its "approved equipment list" 4. Evaluation Measures. No new programs initiated. 5. Impact of New Technology in 100-1000 MHz Spectrum. Demand for & potential use of this portion of the spectrum have increased over that anticipated in the original allocation structuring. Need	1. Analytical Capabilities Continued contractual support in developing program logic and to extend the data base to perform engineering analysis, time sharing arrangements, and statistical analysis. 2. Economic and Social Values. Continue the effort with contractual/consultative assistance. 3. New Equipment Application Procedure. To extend the DOD concept to the Executive Branch on theory that is better to provide frequency support at the conceptual stage of equipment development than after it is programmed and produced. 4. Evaluation Measures FY '72 Studies to date reveal the lack of adequate measures as to what constitutes efficient spectrum use by electronic devices. Budget planning provides for development of techniques that might be used to evaluate and achieve efficient spectrum utilization, e.g., "Figures of Merit" or "EMC Performance Measures." 5. Impact of New Technology in 100-1000 MHz Spectrum. FY '72 Budget planning provides for a study of the possible revision of the allocation structure in the 100-1000 MHz band.	1. Continued Budgetary support required for all elements of the program; additional development effort to be applied that would expedite implementation of the concept; expanded joint FCC/OTP undertaking of the program.

RECOMMENDATION NO. 2b (Continued)

	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	for study of techniques to obtain greater uses of this spectrum is foreseen. 6. Relating Spectrum Needs to Operational Requirements. Need for a study has been established.	6. Relating Spectrum Needs to Operational Requirements. FY'72 Budget planning provides for a study to investigate the possibility of developing a systematic approach to link more effectively spectrum needs with particular information transfer needs.	
FCC	1. Digitized terrain elevation magnetic tapes covering approximately one half of U.S. are now available from the U.S. Army Topographic Command. 2. Computer program, for implementing NBS Technical Note 101 received. 3. FREAVY updated. 4. Computer terminal (UNIVAC 9200 II) installed. 5. Computer program, to define areas of required coordination between proposed domestic satellite earth stations and terrestrial frequency assignments. 6. GE computer program, (joint OTP, NASA, FCC contract) evaluating economic/technical tradeoffs for Space Radio utilization being debugged and tested.	1. Implementation of many computer programs on the new computer terminal including those relating to space communication, land mobile, and terrain elevation retrieval, to name a few using FORTRAN and COBOL programming languages. 2. A new computer to serve the National Spectrum Management Center and the rest of the FCC headquarters staff is planned.	1. Modernization of field strength measurement and recording truck. 2. Implementation of an effective system for converting the strengths to computer printouts and graphs, without the use of keypunching.

RECOMMENDATION NO. 2b

Establish Spectrum Engineering System
b. ANALYSIS CAPABILITIES - NATIONAL AND FIELD SUPPORT

OTP

1. Analytical Capabilities - The continued development (first started in 1963) of Automatic Data Processing (ADP) techniques is providing extremely useful aids for spectrum management engineering. Contractual support has been used to develop and improve the data base needed. The same contractual support is being used to develop programming logic and to extend the data base to perform engineering analyses, time sharing arrangements, and statistical analyses. The ultimate objective is an ADP Support Center to engineer assignments and uses of frequencies on a real-time basis for all wishing to utilize this type of service.

Only through the use of improved ADP techniques was it possible for the Executive Branch to process some 60,500 frequency assignments in FY 1970, an increase of 17.7 percent over the previous year.

2. Economic and Social Values - The "next generation" spectrum engineering system should also have provision for the inclusion of elements which are not well-defined in present procedures -- Economic and Social Values. As a result of OTP support, the National Academy of Engineering has just completed a two-year study of what might be done to bring such factors into what has heretofore been essentially a technical equation. As a related part of this effort, the OTP is investigating the feasibility of developing Performance Measures, i.e., quantitative means of determining to what extent communications - electronics systems - (i) meet the state of the radio art and (ii) are capable of being injected into their intended operational environment without adverse results. A contractual effort to explore this matter has been initiated.

3. New Equipment Application Procedure - A new concept whereby, rather than continuing only the present practice of applying for specific frequencies at the time equipment is available for use, proposed uses of communications - electronics equipments would be processed prior to their manufacture/purchase to ensure that frequency provisions are available. The philosophy would be to provide frequency support at the conceptual stage of equipment development rather than after it has been programmed, budgeted for, and produced. This approach is a major objective in the future of improved frequency management.

FCC

1. A new UNIVAC 9200 II data terminal was installed in the FCC building during September 1970 and is presently being used for the testing and running of computer programs of many different types. Many aspects of data processing are to be developed in support of the national and regional spectrum management centers. The computer terminal is coupled to the Bureau of Standards UNIVAC 1108 in Gaithersburg, Maryland.

2. Part 1 of a 2 part GE study of orbit Spectrum Utilization was completed and a report dated 30 June 1970 has been delivered. This was jointly funded by the FCC, OTP, and NASA. Part 2 consisting of a computer program has been delivered and is being debugged and tested on the UNIVAC 1108 at the Bureau of Standards. Hopefully, the computer program will be a useful tool in studying the utilization of space communication.

RECOMMENDATION NO. 2c

Establish Spectrum Engineering System

c. SPECTRUM MONITORING - FIELD SUPPORT & INTERFERENCE

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. Spectrum Monitoring/ Measurement. During FY '70 research was started to define an initial monitoring/ measurement program 2. Usage and Review Program. First increment in effect for 4-30 MHz band requires 120,000 reports per year from Gov't agencies. Also, 35,000 frequency assignments were reviewed during FY'70.	1. Spectrum Monitoring/ Measurement. It is hoped that by late FY'71 an initial capability will be developed and will be expanded during FY'72. Based on experience obtained necessary modifications will be made preliminary to operational application. 2. Usage and Review Program. Continue to collect data, improve, and expand the spectrum usage reporting system up to 420 MHz.	1. Experience with new techniques involved Commerce assistance. 2. Increased agency support
FCC	1. Modernization of mobile investigation units completed. 2. Waipahu station equipped with wide frequency range DF. 3. First mobile spectrum monitoring unit ordered. It will be designed to have the capability for recording and analyzing signal strengths of all stations in a broad frequency band.	1. Plan to extend frequency range of monitoring van to about 1 GHz and to provide receivers for aural monitoring in the van.	1. Additional mobile spectrum monitoring units.

RECOMMENDATION NO. 2c

Establish Spectrum Engineering System
c. SPECTRUM MONITORING - FIELD SUPPORT & INTERFERENCE

OTP

1. Spectrum Monitoring - The OTP has completed the definition of a trum monitoring effort capable of diagnostic checking or confirming Government radio spectrum usage data, the degree of compliance with established rules and regulations, and the appropriate technical parameters to insure electromagnetic compatibility. It is hoped that an experimental capability can be activated during FY '71.

2. Usage and Review Program - A frequency usage reporting system applicable to the Federal Government use of radio is now in being. The first increment of this undertaking for the band 4-30 MHz requires the submission of some 120,000 reports per year from the Government agencies reflecting the amount of time that specific frequency assignments have in fact been employed. Further, during the past year, over 35,000 frequency assignments were reviewed to assure continued need and accuracy of assignment details.

FCC

1. A contract has been awarded (June 29, 1970) to the Fairchild Electromagnetics Corporation for the construction of a measurement van that can monitor radio spectrum occupancy from 25-470 MHz at the rate of one millisecond for each frequency monitored.

The receiver will be specially designed to minimize third order intermodulation components (that can be critical in this application) and will have a sensitivity comparable to the best land mobile receivers (about -130 dBm for a 3 kHz bandwidth).

The frequencies to be scanned can be prepunched on a paper tape or fed directly by a teletype keyboard. All of the tuning arrangements are accomplished automatically by an on board H.P. 2116B computer.

The output of the receiver can be viewed directly on a cathode ray tube showing the amplitude of the received signals versus frequency. The output will be simultaneously stored on magnetic tapes for later processing by the regional computer. It is planned to extend the frequency range to 1 GHz and to provide one or two receivers for aural monitoring.

The spectrum monitoring unit will provide a very useful tool for assessing frequency occupancy of the bands to which it can be tuned within the range 25-470 MHz. At a later date its design can be modified to accommodate other frequency bands as needed.

RECOMMENDATION NO. 2d

Establish Spectrum Engineering System
d. COMMON DATA BASE

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	RECENT	SCHEDULED OR PLANNED	NEEDED
OTP	1. Federal Frequency Management Data Base A guide plan has been adopted for the establishment of Federal Frequency Management Data Base. It includes provisions for data files on equipment characteristics, terrain files, usage information, and refinement of current data files. Also included is a phased implementation plan.	1. Federal Frequency Management Data Base To proceed with expanding and improving the data base, noting that much of it will be related to progress with analysis capability. 2. Continued Coordination of data base and data processing procedures.	1. Get analysis capability established as soon as possible.
FCC	1. Group formed and working with OTP to establish data base, beginning with Land Mobile Radio Service. 2. File established on technical parameters of microwave stations. 3. CSC contract will result in additional information on microwave data base.	1. Data base to be expanded to cover other services. Plan to obtain part of data as a by product from the computer program that processes authorization.	1. Extension of initial effort (in land mobile) to an effective data file for use throughout the industry. One that has been coordinated with the OTP and all other pertinent groups and is capable of meeting the stringent design requirements of modern frequency management procedures.

RECOMMENDATION NO. 2d

Establish Spectrum Engineering System
d. COMMON DATA BASE

OTP

1. Data Base - Priority was recently given within the Executive Branch to the formation of a Federal frequency management data base. The need for input data was carefully evaluated (e.g., channel usage, equipment performance characteristics and standards, propagation statistics, radio assignment information, advances in the state of the radio art, economic and social factors, and side effects), as well as analytical tools (e.g., models of radio channel characteristics, topographical models, monitoring capability, equipment environment and interference models, the use of relative values and models of radiation effects) which form the basic elements of not only the Federal frequency management data base but also are integral components of the analysis capability and the Spectrum Usage Reporting Program. Guide plan completed and promulgated to Federal agencies.

"Designs are not sufficiently advanced but compatibility with the data bases used by other agencies in their frequency management systems will be one of the requirements."

FCC

1. An accurate data base consisting of radio users will be developed. Information for this data base will be obtained as a by product from the computer program that processes applications for radio frequency authorizations.

2. It is planned that the data base will be designed to be compatible with those of other spectrum management agencies, to the extent possible. Standards for the exchange of this type of information are to be developed and recommended to all agencies concerned.

RECOMMENDATION NO. 2e

Establish Spectrum Engineering System
e. STANDARDS

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. Standardized Methodology for Application of Sharing Criteria. There is recognition that effective spectrum development will require increased sharing by radio services in the same frequency bands.	1. Standardized Methodology for Application of Sharing Criteria. FY'72 Budget planning provides for a research effort to develop the methodology for establishing better technical criteria for intra and inter-radio service sharing throughout the spectrum, e.g., means for predicting spectrum saturation assessing means for accommodating new and additional co-spectrum users.	
FCC	1. Present FCC Rules provide standards for unwanted emissions. 2. Technical Guidelines on Domestic Satellites published in proposed rule making in Docket 16495. 3. Rule making in D-18894 proposes Technical Standards for CATV.	1. Review of present TV taboos. 2. Technical standards for communication satellites and earth stations	1. Receiver standards. 2. Antenna standards.

RECOMMENDATION NO. 2e

Establish Spectrum Engineering System
e. STANDARDS

OTP

1. For discussion on Standards, see Paragraphs (b), (d) and (e) of Recommendation No. 1 (page 3).

FCC

1. The Commission's present regulations, of course, deal primarily with transmitters, their wanted and unwanted emissions, and their powers, etc.

2. Standards for receivers have heretofore been promulgated by implication rather than by direction. Such matters as 10.7 MHz I.F. for FM receivers and 41-47 MHz I.F. for television receivers do not appear directly as requirements anywhere in the Commission Rules, and there are few requirements implied or otherwise on receivers used in most services.

3. As the spectrum becomes more congested, it will be necessary to review the relative factors of receiver and antenna standards in the light of possible improved spectrum utilization.

4. A draft final report (previously referred to under Recommendation No. 1) by the Computer Sciences Corporation on "Frequency Assignment Techniques for Microwave Stations" may provide background information on such standards for microwave stations. This is an area that again will require close cooperation with the OTP, JTAC and other pertinent entities.

5. A report and Order has been issued in D-18689 that provides for a standardized method for measuring the radiation from UHF television receivers. In this method compliance with the limitation of 350 microvolts per meter at 100 feet is determined by averaging 10 measurements over different frequencies between 470 and 1000 MHz with no single measurement exceeding 750 microvolts per meter.

RECOMMENDATION NO. 3

ESTABLISH PROGRAMS ON MAN-MADE NOISE

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. Impact of Man-Made Noise. Study efforts undertaken to understand the growth and control of radio noise. 2. Coordination of "Spectrum Pollution" Abatement. Attention of Gov't agencies engaged in development of devices that may have an adverse impact on the spectrum has been called to ensure that "unpolluting" one resource does not "pollute" another.	1. Impact of Man-Made Noise Continue present efforts in cooperation with FCC. 2. Coordination of "Spectrum Pollution" Abatement. Continue monitoring and further in-depth exploration of the problem is contemplated during FY'71.	
FCC	1. Report and Order issued in Docket 18426 prescribes regulations pursuant to amendment of Communications Act that are designed to lessen problems of man-made noise by controls at source.	1. Present procedures pertaining to equipment approval being revised. 2. Research into man-made noise sources with view toward establishing: a. Uniform method of measurement b. Methods and techniques of noise reduction (FY 1972).	1. Consolidated methodology defining man-made as opposed to natural radio noise.

RECOMMENDATION NO. 3

ESTABLISH PROGRAMS ON MAN-MADE NOISE

OTP

1. Due to budgetary limitations the OTP has not been able thus far to explore in-depth the matter of noise. Further action in this regard is contemplated during FY '71. Steps have been taken to call to the attention of the Government agencies engaged in development of devices which may have an adverse effect on the spectrum, e.g., electrical cars, the need for ensuring that in "unpolluting" one resource we do not "pollute" another. This effort on the part of OTP has been well received. Further, a letter has been forwarded to the FCC proposing a joint undertaking to determine what actions are necessary to reduce the over-all cumulative effect of devices which unintentionally radiate radio noise.

FCC

1. A Report and Order in Docket 18426 was adopted on May 13, 1970, which will become effective in October that will provide a new subpart I "Marketing of Radio Frequency Devices" in Part 2 of the Commission's rules. The rules are designed to achieve a lessening of the harmful interference problem by control measures applied at the source of the offending devices.

It is planned to institute a further rule making to amplify the procedural rules for equipment approval. (A present revision of the type acceptance rules is presently outstanding in Docket 17869.)

RECOMMENDATION NO. 4

ESTABLISH INTERDISCIPLINARY COORDINATING BODY ON ELECTROMAGNETIC SIDE EFFECTS

AGENCY	EXAMPLES OF RELATED ACTIVITIES		
	INITIATED	SCHEDULED OR PLANNED	NEEDED
OTP	1. ERMAC - Establish to develop recommended policy guidance with respect to "side effects."	1. ERMAC - ERMAC is defining research & development necessary to identify better problems in the "side effects" area. Recommendations from this effort will be coordinated with the Office of Science and Technology and Federal agencies involved in protection of the environment.	1. ERMAC to report on needed programs agency participation in budgetary support.
FCC	1. Participating in ERMAC. Three representatives chosen. 2. Joint efforts with HEW on measurement of devices submitted for type approval.	1. Participation continuing.	

RECOMMENDATION NO. 4

ESTABLISH INTERDISCIPLINARY COORDINATING BODY ON ELECTROMAGNETIC SIDE EFFECTS

OTP

1. The Electromagnetic Radiation Management Advisory Council (ERMAC) of the OTP has been in existence for a little over a year to develop recommended policy guidance with respect to the possible impact of "side effects." The ERMAC is currently in the final stages of defining the research and development necessary to remove some of the vagaries currently prevailing in the "side effects" area. Upon availability of this defined program, it is planned to coordinate the recommendations therein with the Office of Science and Technology and those Federal agencies involved in the protection of the environment (Cabinet Committee on the Environment, Council on Environmental Quality, etc.). The ERMAC actions included:

    a. An extensive review of programs and literature.
    b. Detailed draft of programs for research into Biological Effects.
    c. Draft report was distributed to large number of concerned agencies and extensive comments have been received.
    d. Comments being compiled and being reviewed for final reporting.

FCC

1. It is planned to continue participation in ERMAC.

SUMMARY CHART

RECOMMENDATION	AGENCY	ACTIVITIES RELATED TO THE JTAC RECOMMENDATIONS ON SPECTRUM ENGINEERING		
		INITIATED	SCHEDULED OR PLANNED	NEEDED
NO. 1 ADOPT SPECTRUM ENGINEERING PHILOSOPHY AND SYSTEM DESIGN CONCEPT	JTAC	1. Briefings, papers, technical services 2. Technical reviews — FCC, OTP, OST, BoB, White House Staff	1. Continue technical advisory services 2. Annual reviews	1. Determine form of continued JTAC support a. Annual reviews b. Establish Standing JTAC Group c. Discontinue JTAC 63.1
	OTP	1. Budget — FY '70 included $500,000 2. NECAF — planning 3. Technical areas 4. Receiver improvement	1. Budget — FY '72 planning for $900,000 2. Analysis capability 3. Technical areas 4. Continue present effort	1. Endorsement for budgeting support 2. Congressional approval 3. Commerce assistance 4. Possible legislation for receiver standards
	FCC	1. Spectrum Management Task Force 2. Frequency Assignment (CSC Contract) 3. Broadband communications technology 4. D-18261, sharing Land Mobile and UHF-TV 5. D-18262, allocating frequencies mobile systems 6. R&D study provide information on WARC	1. Research and spectrum planning a. Present use and future needs b. Evaluation current & future advances c. Investigation of new techniques d. Establishment frequency management data bank 2. Broadband communications technology 3. D-18261, sharing Land Mobile and UHF-TV 4. D-18262, allocating frequencies Mobile Systems 5. R&D study provides information on WARC	1. Extension management concept other services 2. Coordination with OTP and other agencies 3. Research methodologies, including cellular, spread spectrum, etc.
NO. 2.a Establish Spectrum Engineering System a. PILOT PROJECT: FIELD STATION PROTOTYPE	OTP	1. Pilot Project 2. Local Area Government Frequency Coordination	1. Pilot Project 2. Local Area Government Frequency Coordination	1. Continued coordination 2. Continued effort
	FCC	1. Study contract to define management parameters 2. Chicago selected	1. Spectrum Management Task Force will be nucleus for National/Regional center	1. Additional personnel 2. Computer for Regional Center
NO. 2.b. Establish Spectrum Engineering System b. ANALYSIS CAPABILITIES—NATIONAL AND FIELD SUPPORT	OTP	1. Analytical capabilities 2. Economic and social values 3. New equipment application 4. Evaluation measures 5. Impact of new technology in 100-1000 MHz 6. Relating spectrum needs to operational requirements	1. Analytical capabilities 2. Economic and social values 3. New equipment application 4. Evaluation measures FY '72 5. Impact of new technology in 100-1000 MHz 6. Relating spectrum needs to operational requirements	1. Continued budgetary support 2. Additional development effort entire concept
	FCC	1. Digitized terrain elevation tapes now available 2. Computer program NBS Technical Note 101 3. FREAVY updated 4. Computer terminal (UNIVAC 9200 II) installed 5. Computer program coordination between earth stations and terrestrial assignments 6. Computer program economic/technical tradeoffs Space Radio	1. Implementation computer programs space communication, land mobile, terrain elevation retrieval 2. A new computer is planned	1. Modernization of field strength truck 2. System for converting field strengths
NO. 2.c. Establish Spectrum Engineering System c. SPECTRUM MONITORING—FIELD SUPPORT AND INTERFERENCE	OTP	1. Spectrum monitoring/measurement 2. Usage and review program	1. Spectrum monitoring/measurement 2. Usage and review program	1. Experience with new techniques 2. Increased agency support 3. Commerce assistance
	FCC	1. Modernization mobile units completed 2. Waipahu station equipped with wide frequency 3. First mobile spectrum monitoring unit ordered	1. Extend frequency range 1 GHz provide aural monitoring	1. Additional mobile monitoring units
NO. 2.d. Establish Spectrum Engineering System d. COMMON DATA BASE	OTP	1. Federal Frequency Management Data Base	1. Federal Frequency Management Data Base	1. Get analysis capability established
	FCC	1. Group working to establish data base 2. File established on technical parameters microwave stations 3. CSC contract will result in additional information microwave data base	1. Data base to be expanded to other services	1. Extension of initial effort to an effective data file
NO. 2.e. Establish Spectrum Engineering System e. STANDARDS	OTP	1. Standardized methodology for application of sharing criteria	1. Standardized methodology for application of sharing criteria	
	FCC	1. Present FCC Rules 2. Technical guidelines on Domestic Satellites 3. Rule making in D-18894 proposes technical standards for CATV	1. Review TV taboos 2. Technical standards communication satellites earth stations	1. Receiver standards 2. Antenna standards
NO. 3 ESTABLISH PROGRAMS ON MAN-MADE NOISE	OTP	1. Impact of man-made noise 2. Coordination of "Spectrum Pollution" abatement	1. Impact of man-made noise 2. Coordination of "Spectrum Pollution" abatement	
	FCC	1. Report and Order D-18426 prescribes regulations man-made noise	1. Present procedures equipment approval being revised 2. Research into man-made noise sources	1. Consolidated methodology man-made radio noise
NO. 4 ESTABLISH INTERDISCIPLINARY COORDINATING BODY ON ELECTROMAGNETIC SIDE EFFECTS	OTP	1. ERMAC established	1. ERMAC defining research development necessary	1. ERMAC to report on needed programs
	FCC	1. Participating in ERMAC 2. Joint efforts with HEW on devices submitted for type approval	1. Participation continuing	

SUMMARY CHART

RECOMMENDATION	AGENCY	ACTIVITIES RELATED TO THE JTAC RECOMMENDATIONS ON SPECTRUM ENGINEERING		
		INITIATED	SCHEDULED OR PLANNED	NEEDED
NO. 1 ADOPT SPECTRUM ENGINEERING PHILOSOPHY AND SYSTEM DESIGN CONCEPT	JTAC	1. Briefings, papers, technical services 2. Technical reviews — FCC, OTP, OST, BoB, White House Staff	1. Continue technical advisory services 2. Annual reviews	1. Determine form of continued JTAC support a. Annual reviews b. Establish Standing JTAC Group c. Discontinue JTAC 63.1
	OTP	1. Budget — FY '70 included $500,000 2. NECAF — planning 3. Technical areas 4. Receiver improvement	1. Budget — FY '72 planning for $900,000 2. Analysis capability 3. Technical areas 4. Continue present effort	1. Endorsement for budgeting support 2. Congressional approval 3. Commerce assistance 4. Possible legislation for receiver standards
	FCC	1. Spectrum Management Task Force 2. Frequency Assignment (CSC Contract) 3. Broadband communications technology 4. D-18261, sharing Land Mobile and UHF-TV 5. D-18262, allocating frequencies mobile systems 6. R&D study provide information on WARC	1. Research and spectrum planning a. Present use and future needs b. Evaluation current & future advances c. Investigation of new techniques d. Establishment frequency management data bank 2. Broadband communications technology 3. D-18261, sharing Land Mobile and UHF-TV 4. D-18262, allocating frequencies Mobile Systems 5. R&D study provides information on WARC	1. Extension management concept other services 2. Coordination with OTP and other agencies 3. Research methodologies, including cellular, spread spectrum, etc.
NO. 2.a Establish Spectrum Engineering System a. PILOT PROJECT: FIELD STATION PROTOTYPE	OTP	1. Pilot Project 2. Local Area Government Frequency Coordination	1. Pilot Project 2. Local Area Government Frequency Coordination	1. Continued coordination 2. Continued effort
	FCC	1. Study contract to define management parameters 2. Chicago selected	1. Spectrum Management Task Force will be nucleus for National/Regional center	1. Additional personnel 2. Computer for Regional Center
NO. 2.b. Establish Spectrum Engineering System b. ANALYSIS CAPABILITIES—NATIONAL AND FIELD SUPPORT	OTP	1. Analytical capabilities 2. Economic and social values 3. New equipment application 4. Evaluation measures 5. Impact of new technology in 100-1000 MHz 6. Relating spectrum needs to operational requirements	1. Analytical capabilities 2. Economic and social values 3. New equipment application 4. Evaluation measures FY '72 5. Impact of new technology in 100-1000 MHz 6. Relating spectrum needs to operational requirements	1. Continued budgetary support 2. Additional development effort entire concept
	FCC	1. Digitized terrain elevation tapes now available 2. Computer program NBS Technical Note 101 3. FREAVY updated 4. Computer terminal (UNIVAC 9200 II) installed 5. Computer program coordination between earth stations and terrestrial assignments 6. Computer program economic/technical tradeoffs Space Radio	1. Implementation computer programs space communication, land mobile, terrain elevation retrieval A new computer is planned	1. Modernization of field strength truck 2. System for converting fie strengths
NO. 2.c. Establish Spectrum Engineering System c. SPECTRUM MONITORING—FIELD SUPPORT AND INTERFERENCE	OTP	1. Spectrum monitoring/measurement 2. Usage and review program	1. Spectrum monitoring/measurement 2. Usage and review program	1. Experience with new techniques 2. Increased agency support 3. Commerce assistance
	FCC	1. Modernization mobile units completed 2. Waipahu station equipped with wide frequency 3. First mobile spectrum monitoring unit ordered	1. Extend frequency range 1 GHz provide aural monitoring	1. Additional mobile monitoring units
NO. 2.d. Establish Spectrum Engineering System d. COMMON DATA BASE	OTP	1. Federal Frequency Management Data Base	1. Federal Frequency Management Data Base	1. Get analysis capability established
	FCC	1. Group working to establish data base 2. File established on technical parameters microwave stations 3. CSC contract will result in additional information microwave data base	1. Data base to be expanded to other services	1. Extension of initial effort to an effective data file
NO. 2.e. Establish Spectrum Engineering System e. STANDARDS	OTP	1. Standardized methodology for application of sharing criteria	1. Standardized methodology for application of sharing criteria	
	FCC	1. Present FCC Rules 2. Technical guidelines on Domestic Satellites 3. Rule making in D-18894 proposes technical standards for CATV	1. Review TV taboos 2. Technical standards communication satellites earth stations	1. Receiver standards 2. Antenna standards
NO. 3 ESTABLISH PROGRAMS ON MAN-MADE NOISE	OTP	1. Impact of man-made noise 2. Coordination of "Spectrum Pollution" abatement	1. Impact of man-made noise 2. Coordination of "Spectrum Pollution" abatement	
	FCC	1. Report and Order D-18426 prescribes regulations man-made noise	1. Present procedures equipment approval being revised 2. Research into man-made noise sources	1. Consolidated methodology man-made radio noise
NO. 4 ESTABLISH INTERDISCIPLINARY COORDINATING BODY ON ELECTROMAGNETIC SIDE EFFECTS	OTP	1. ERMAC established	1. ERMAC defining research development necessary	1. ERMAC to report on needed programs
	FCC	1. Participating in ERMAC 2. Joint efforts with HEW on devices submitted for type approval	1. Participation continuing	

Attachment A

SPECTRUM ENGINEERING -- AN OVERVIEW OF PROGRESS
THROUGH THE EYES OF JTAC 63.1

The members of JTAC 63.1 offer the following comments with regard to the reported activities of the FCC and the OTP relative to the JTAC Recommendations for spectrum engineering appearing in "Spectrum Engineering -- The Key to Progress":

Copies of a flow chart on: "An Approach to Implementation of a National Spectrum Engineering System," and a map of the United States of "Equipment Density Areas with (Hypothetical) Spectrum Engineering System Regional Centers" have been reproduced from the June 19, 1969 report on "Activities Related to the JTAC Recommendations in Spectrum Engineering," as background material for this review.

Re Recommendation #1 -- "Adopt Spectrum Engineering Philosophy and System Design Concept.

There has been continued good progress.

The FCC has been putting considerable effort behind an early and, hence, limited trial of the regional spectrum engineering center concept, including the development of headquarter-regional center procedures.

The OTP has put its major efforts behind the planning for a "headquarter" spectrum engineering facility that would ultimately maintain complete records of spectrum utilization and be capable of providing extensive evaluative procedures.

We do, however, have one overriding concern. While the two pronged approach now makes effective use of in-house talent within limited funds and while we note that each group continues to seek coordination with the other, we are concerned lest the two efforts be permitted to drift apart. The JTAC urges that management at the very top of these activities continue to push for common formats, language definitions, etc., so that the results of their efforts will be wholly compatible and, hopefully, integrated someday into one overall spectrum engineering system.

Re Recommendation #2 -- "Establish Spectrum Engineering System."

a. Pilot Project - Field Station Prototype.

The first exploratory steps are underway in the FCC's regional center program for Chicago. But the experiences here will not provide a full measure of the potential contribution from the regional approach.

Hopefully, funds will be available to grow this or an additional effort into a full pilot program which would involve all types of spectrum use within the region. To do this, we would note again that background work on format, language, and definitions by both the FCC and the OTP must be compatible.

In view of our considered judgment of the success of the regional spectrum engineering concept and to gain experience on inter-regional-national functions, we strongly encourage formation of additional regional centers on the earliest practical date.

b. Analysis Capabilities.

There has been much commendable activity in this area; however, the extent of progress in attaining the recommended capabilities was affected in part by budgetary delays and the interim developments. We urge continued planning to establish joint national/regional analytic capabilities.

c. Spectrum Monitoring.

Progress here is being limited by funding. We note, however, that the potential contribution from this field cannot be fully realized until some of the headquarter and regional center activity has moved further along.

d. Common Data Base.

Some progress has been made but it is slow. We would urge more attention be paid to this very basic challenge, particularly in developing a commonness in format, language, definitions, etc., at the national and regional levels.

e. Standards.

Here again some progress has been made, but it is slow. This is an area in which a great deal of lead time is needed to obtain meaningful benefits. We also would note that only relatively small funding would be required to push these efforts along more rapidly.

Re Recommendation #3 -- "Establish Programs on Man-Made Noise."

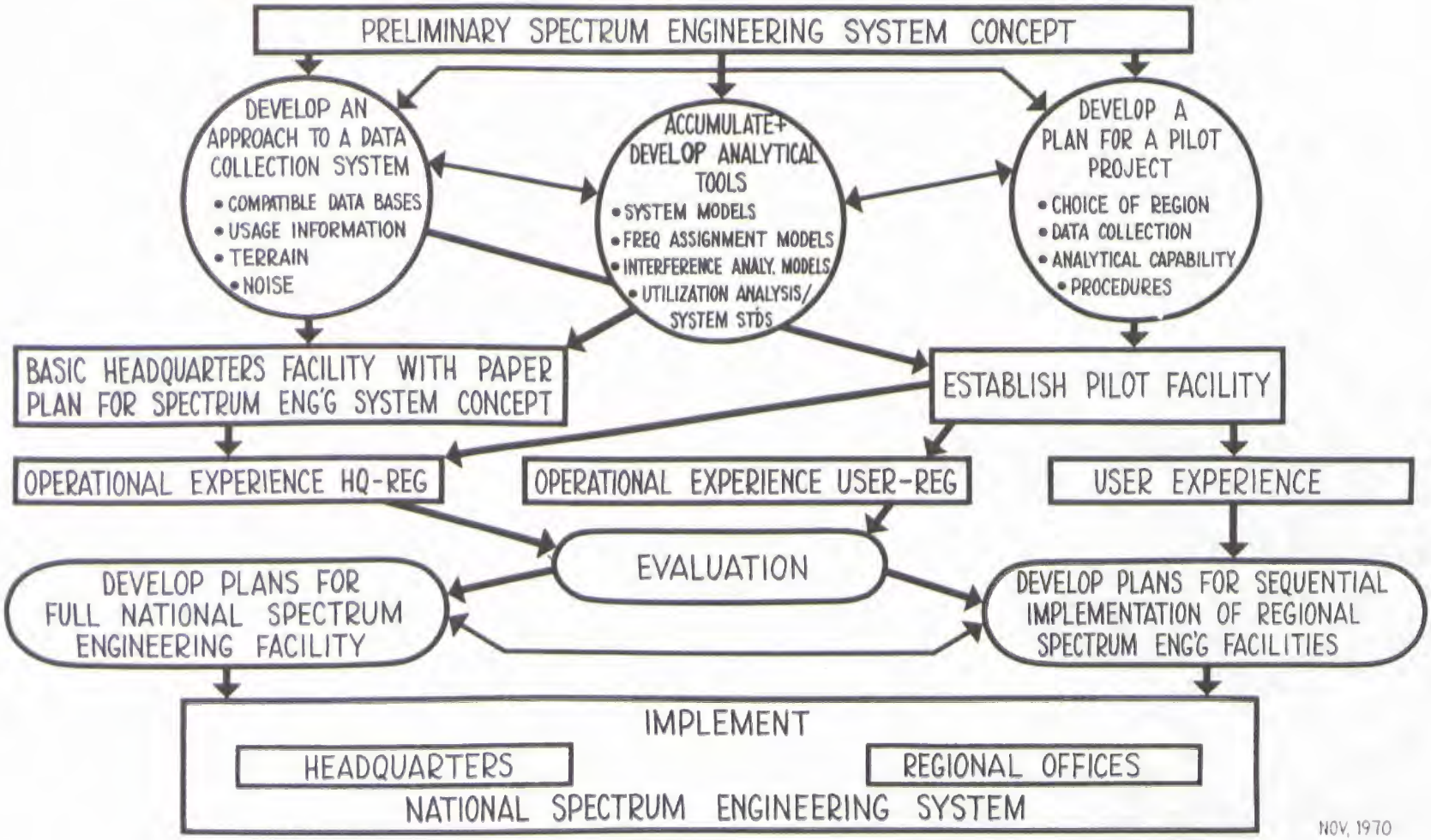
Virtually no progress has been made on this. Here is an area in which we can tackle environmental pollution (pollution of a resource) before the remedial costs are overwhelming. Work is needed on measurement procedures and on-site monitoring for short and long-term trends. The resulting data would equip spectrum engineers with the background knowledge necessary to preserve the resource for maximum public service.

Re Recommendation #4 -- "Establish Interdisciplinary Coordinating Body on Side Effects."

This recommendation has been followed; the Electromagnetic Radiation Management Advisory Council (ERMAC) has been established, and a comprehensive report on desired research and development to gain needed understanding in this area is in preparation. We urge publication of their report and continued aggressive support to ERMAC objectives.

AN APPROACH TO IMPLEMENTATION OF A NATIONAL SPECTRUM ENGINEERING SYSTEM

(PER JTAC REPORT "SPECTRUM ENGINEERING-THE KEY TO PROGRESS")



NOV. 1970

REGIONAL INSTALLATION SCHEDULE
(Hypothetical)

SIGNIFICANT EFFECTIVE EQUIPMENT DENSITY AREAS IN THE U.S.

1. PORTLAND/SEATTLE
2. BILLINGS
3. MINNEAPOLIS/ST PAUL
4. CHICAGO
5. SYRACUSE/ROCHESTER
6. NEW YORK CITY/BOSTON
7. WASHINGTON D.C./NORFOLK
8. MEMPHIS
9. KANSAS CITY
10. DENVER
11. SALT LAKE CITY
12. SAN FRANCISCO
13. LOS ANGELES
14. PHOENIX
15. ALBUQUERQUE
16. SAN ANTONIO
17. NEW ORLEANS
18. ATLANTA
19. MIAMI

SCHEDULE

NUMBER 1. —INITIATE 1970

NUMBER's 2, 3, 4 —INITIATE 1973

NUMBER's 5 through 11—INITIATE 1974-80

D-59-27

3. Suggested Remarks for DTP Use

SUGGESTED REMARKS FOR DTP USE AT
NOVEMBER 5 JTAC/FCC/OTP MEETING

Although in office only a short time, I am familiar with the JTAC 63.1 Report "Spectrum Engineering - The Key to Progress" and would like to add, although belatedly, my congratulations to the IEEE and EIA for their outstanding contribution.

There can be no question, with the ever expanding application of communications-electronics devices, that electromagnetic compatibility will remain a very real problem which will increase in complexity.

As you may be aware, the Executive Order which establishes my Office contains several provisions bearing on the use and management of the frequency spectrum resource:

a. Assigning, amending and revoking assignments to Government entities in foreign Government stations at the seat of Government.

b. Providing direction to the Interdepartment Radio Advisory Committee.

c. Providing guidance to the Department of Commerce in the conduct of their support role as a principal source of technical research and analysis.

We are currently going through what might be termed a "shake down" period, getting our objectives defined and charting a course" which will hopefully be most responsive to these needs. While still in the early stages of program definition, I can assure you that the problems of spectrum use and management are high on my list of action items. In the area of electromagnetic compatibility, we are working closely with the Department of Commerce, who, in their support role, are being charged with development of a data base and analytical capability to permit us to diagnose electromagnetic compatibility problems in the conceptual stages of system development. Such a capability is a prerequisite to the treatment and prevention of radio frequency interference in its broadest sense.

Other areas of spectrum management which require and will receive attention are --

- o - side effects
- o - value of the spectrum
- o - improved standards
- o - alternative or improved spectrum management concepts
- o - the development of allocations more responsive to future needs.

It is a pleasure to be here with you today and I look forward to continued close relationships with the Commission and the JTAC in improving the manner in which the nation uses the spectrum resource.

4. Proposed Outline
Paper

PROPOSED OUTLINE PAPER

SUBJECT: Systems Engineering Concept

1. Background -

a. JTAC Report -- "Spectrum Engineering - The Key to Progress" - "Legally enforceable standards effective at point of manufacture are needed to govern receiver susceptibility and unintended radiation from many classes of devices and equipment." Chapter V of Supplement 8 - "A considerable quantity of electrical and electronic equipment being manufactured or now in use does not meet any or adequate performance standards." The text continued to explain that problem areas can be grouped into one or more categories, the first being "Radio Receiving Equipment." Section C of Chapter V, Supplement 8 -- deals with radio receiving equipment and states "Probably the widest variation and performance standard is found in radio receiving equipment."

b. FMAC -- Item referred to FMAC early part of 1970. As a result, EIA took matter under advisement and concluded -- "Television and radio receiver standards represent one of the major impediments to the attainment of efficient use of the radio spectrum."

2. Problems -

a. TV Receivers -- Marker beacons, radars, and land mobile restrictions.

b. Mobile (small boats) -- marine MF beacon systems

c. Imports -- 162.55 MHz weather broadcasts.

3. Actions Taken -

a. Radar Design Criteria

b. Government -- Certain receiver standards in effect, particularly for HF SSB and VHF/UHF mobile operations.

c. Joint effort with FCC recommended--OTP letter of October 21, 1970, to Chairman, FCC, recommended that a joint group be established to study the matter and recommend procedures and actions which might be taken short of mandatory regulation to ensure that receiver characteristics are given increased consideration.

4. Summary - OTP is convinced that:

a. There is a problem which needs attention.

b. The problem is solvable and the situation should be in the form of affording greater consumer/user progection than offered at present.

c. The industry should be able to regulate itself in this regard but must have adequate guidelines.