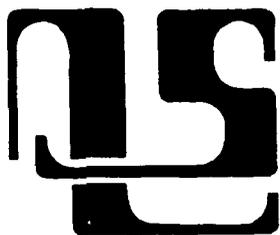


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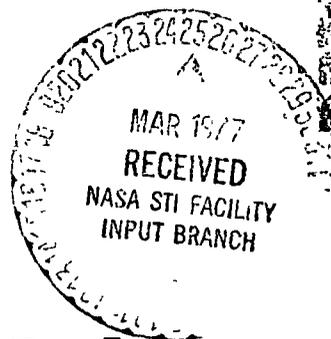


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A REVIEW OF ORGANIZATIONS
INFLUENCING RADIO FREQUENCY
ALLOCATIONS TO DEEP SPACE
RESEARCH

AUGUST 1976

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National Scientific Laboratories

A Division of Systematics General Corporation

Westgate Research Park

McLean, Virginia 22101

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INFLUENCING RADIO FREQUENCY
ALLOCATIONS TO DEEP SPACE
RESEARCH

AUGUST 1976

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Contract No. 954296

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I. INTRODUCTION

NSL has examined the charters and functions of various national and international scientific organizations in order to identify those which have a direct or indirect influence on the allocation of radio frequencies for use in deep space research. Those organizations identified as having the ability to influence frequency allocations are described in this report. A brief description of each organization is provided, and the members who are influential specifically in frequency allocations are listed. The interrelations between the organizations and how they influence allocations are explained.

There are three major ways in which an organization may affect radio frequency allocations. They are:

- a) As a regulatory body;
- b) As an advisor to regulatory bodies, or
- c) As a user of frequencies.

This report has been assembled under these three categories, and the existing and functioning organizations which influence radio frequency allocations are described accordingly. A list of the organizations, and the category in which they fall, is given in Table 1.

TABLE 1

CATEGORIZATION OF ORGANIZATIONS

<u>REGULATORY BODIES</u>	<u>ADVISORS TO REGULATORY BODIES</u>
<ul style="list-style-type: none"> ● Interdepartment Radio Advisory Committee (IRAC) ● Federal Communications Commission (FCC) ● International Telecommunication Union (ITU) <ul style="list-style-type: none"> - International Radio Consultative Committee (CCIR) 	<p><u>UNITED STATES*</u></p> <ul style="list-style-type: none"> ● National Research Council (NRC) ● National Academy of Sciences (NAS) ● National Academy of Engineering (NAE) ● Committee on Radio Frequencies (CORF) ● National Science Foundation (NSF) ● Institute for Telecommunication Sciences (ITS) ● American Institute of Aeronautics and Astronautics (AIAA) ● Institute of Electrical and Electronics Engineers (IEEE) <p><u>INTERNATIONAL</u></p> <ul style="list-style-type: none"> ● International Council of Scientific Unions (ICSU) ● Committee on Space Research (COSPAR) ● International Union for Radio Science (URSI) ● Inter-Union Commission on Frequency Allocation (IUCAF) ● International Astronautical Federation (IAF) ● Intergovernmental Oceanographic Commission (IOC)

*Some U. S. bodies have international counterparts as indicated in Table 3.

TABLE 1 (Cont)

CATEGORIZATION OF ORGANIZATIONS

USERS

GOVERNMENT

NON-GOVERNMENT

Major Users:

- | | |
|---|-------------------------------|
| ● Agriculture | ● Common Carriers |
| ● Air Force | ● Specialized Common Carriers |
| ● Army | ● Safety & Special Services |
| ● Atomic Energy Commission | ● Broadcasting |
| ● Coast Guard | |
| ● Commerce | |
| ● Federal Aviation Administration | |
| ● General Services Administration | |
| ● Health, Education & Welfare | |
| ● Interior | |
| ● Justice | |
| ● National Aeronautics & Space Administration | |
| ● Navy | |
| ● State | |
| ● Treasury | |
| ● United States Information Agency | |

In the future, there will be an Office of Presidential Science Advisor* which may also have an effect on frequency allocation. The President signed legislation in May 1976 to create the Office, in addition to establishing a presidential committee to conduct a two-year study of the federal science, technology and engineering effort. This legislation could pave the way for a cabinet-level department to coordinate and oversee existing government agencies dealing primarily with research and development.

*As of August 2, 1976 Guyford Stever, Director of the National Science Foundation since 1972, has been named for the new post.

II. REGULATORY BODIES

To facilitate a better understanding of how radio frequency allocations are influenced by scientific (and other) organizations, it is necessary to first review the organization and functions of those regulatory bodies which are the "bottom line" in the allocation and reallocation of frequencies. Nationally, these are the IRAC and the FCC. Internationally, allocations and reallocations are made by the ITU.

Interdepartment Radio Advisory Committee

Impact on Frequency Allocations

The Interdepartment Radio Advisory Committee (IRAC) assists the Director of the Office of Telecommunications Policy (OTP) in the assignment of radio frequencies to government agencies, thus having a direct impact on frequency allocations. In addition, IRAC has helped in the formulation of long-range programs for future federal use of the radio spectrum, and development of the U. S. National Table of Frequency Allocations. Also of importance is IRAC's participation in the adoption of policies and positions by the U. S. in international negotiations regarding radio spectrum.

Organization Description

IRAC, organized in 1922, functions in the interest of the United States as a whole, and not in the interest of any

particular department or agency. IRAC's purpose is to formulate and recommend to the OTP objectives, plans and actions, in connection with the management and usage of the radio spectrum in the national interest by the departments and agencies of the U. S. Government. IRAC recommends, for approval by OTP, the assignment of frequencies to government radio stations, including the withdrawal or modification of such assignments. The following agencies or departments are members of IRAC:

- Agriculture
- Air Force
- Army
- Atomic Energy Commission
- Coast Guard
- Commerce
- Federal Aviation Administration
- Federal Communications Commission*
- General Services Administration
- Health, Education, and Welfare
- Interior
- Justice
- National Aeronautics and Space Administration
- Navy
- State
- Treasury
- United States Information Agency

*The FCC is not actually a member of IRAC; however, the Commission has designated an FCC liaison representative to IRAC, who works with IRAC and its subcommittees. This representative to IRAC submits requests on non-government use of frequencies in shared bands, and in other bands where he considers there might be an impact on or from government operations.

The officers of IRAC and the chairmen of its subcommittees are appointed by the Director of Telecommunications Policy. IRAC's main substructure consists of the Frequency Assignment Subcommittee (FAS), the Spectrum Planning Subcommittee (SPS) and the Technical Subcommittee (TSC).

Government agencies planning the use of radio frequencies shall take all necessary measures to ensure such systems will not cause or receive harmful interference to or from authorized users. To assist the government agencies in meeting this responsibility, the SPS reviews the new government telecommunication systems and subsystems. In its systems review, the SPS shall give consideration to the following aspects:

- a) system compliance with existing spectrum management policy, allocations, regulations, and technical standards;
- b) the predicted degree of electromagnetic compatibility (EMC) between the proposed system and the electromagnetic environment; and
- c) the possible need for and evaluation of the results of prototype EMC testing.

Upon assessment of proposed systems, the SPS will make suggestions with supporting data to OTP. IRAC will receive a copy of the suggestions for information and the conclusions made by OTP will also be reported to IRAC.

IRAC representatives shall be responsible for determining within their agencies which systems should be submitted to the SPS for systems review. There is an ever present need for each member agency to keep OTP and IRAC informed of its planned spectrum needs to the extent necessary to avoid conflict with existing systems and to avoid conflict with similar planning of other agencies.

The FAS may effect frequency assignment action for:

- a) additional stations; and
- b) the modification of assignments to stations in existing systems or systems approved under this procedure, provided the operations resulting from the assignment action will not have a major local effect on the electromagnetic environment.

The FAS places emphasis on the careful review of applications involving sharing of the same frequency bands by terrestrial and space services. In some cases the FAS may recommend to IRAC that further EMC analyses be completed prior to the assignment. This analysis is carried out by OTP, Department of Commerce or some other knowledgeable agency. If any matters cannot be resolved which would result in major effects on future use of the frequency band of concern, then these applications shall be referred to IRAC.

The substructure of the TSC consists of five permanent working groups:

- Standards
- Propagation
- Techniques
- Side Effects, and
- EMC

The TSC and its working groups shall provide information from the ongoing programs in standards, criteria for spectrum sharing, propagation, telecommunications techniques trade-offs, radio noise and interference environments, side effects of spectrum use, and EMC. IRAC identifies for the TSC the scope and requirement priorities in its work.

The working groups of TSC evaluate current and proposed efforts, within their respective areas of cognizance, regarding:

- a) the adequacy of the technical bases for spectrum management;
- b) the effectiveness of specific programs with regard to improved use of the spectrum, and
- c) the need for new criteria, procedures, and methodologies for use of the spectrum.

Federal Communications Commission

Impact on Frequency Allocations

Within the United States, frequency allocations are effected by the Federal Communications Commission (FCC) and the Office of Telecommunications Policy (OTP) acting together. The FCC is responsible for administering the Communications Act of 1934, with respect to all non-government interstate and foreign telecommunications. OTP establishes the policy for the federal telecommunication agencies and, the frequency allocations, which these two regulatory bodies jointly determine, are presented as the official U. S. policy at international conferences.

The FCC effects changes to the Table of Frequency Allocations within the provisions of the Communications Act of 1934 and the Administrative Procedure Act, with the advice of industry and interested parties. Thus, the Commission as a regulatory body has a great impact in the area of frequency allocations nationally and internationally. The Commission may initiate an inquiry or Proposed Rulemaking in an allocation matter, on its own motion or in response to an indication of need for change by the public or the OTP. Usually the FCC coordinates draft proposals, originating within the Commission or from the public, with the OTP/IRAC before initiating action.

Organization Description

The FCC was established by the Communications Act of 1934 and its jurisdiction includes the regulation of interstate and foreign communications by wire and radio in the public interest. With the Communications Satellite Act of 1962 the scope of the regulation increased, including radio and television broadcasting; telephone, telegraph and cable television operation; two-way radio and radio operators and satellite communications. Figure 1 gives an overview of the FCC organization.

The Commission is an independent federal agency composed of seven members appointed by the President, by and with the advice and consent of the Senate. The Chairman, designated by the President, serves as the chief executive officer of the Commission.

The main functions of the Commission are executed by the Commissioners, and, by delegations of authority, to panels of commissioners, individual commissioners, and the following organizations:

Broadcast Bureau

The Bureau licenses and regulates broadcast stations, both radio and television.

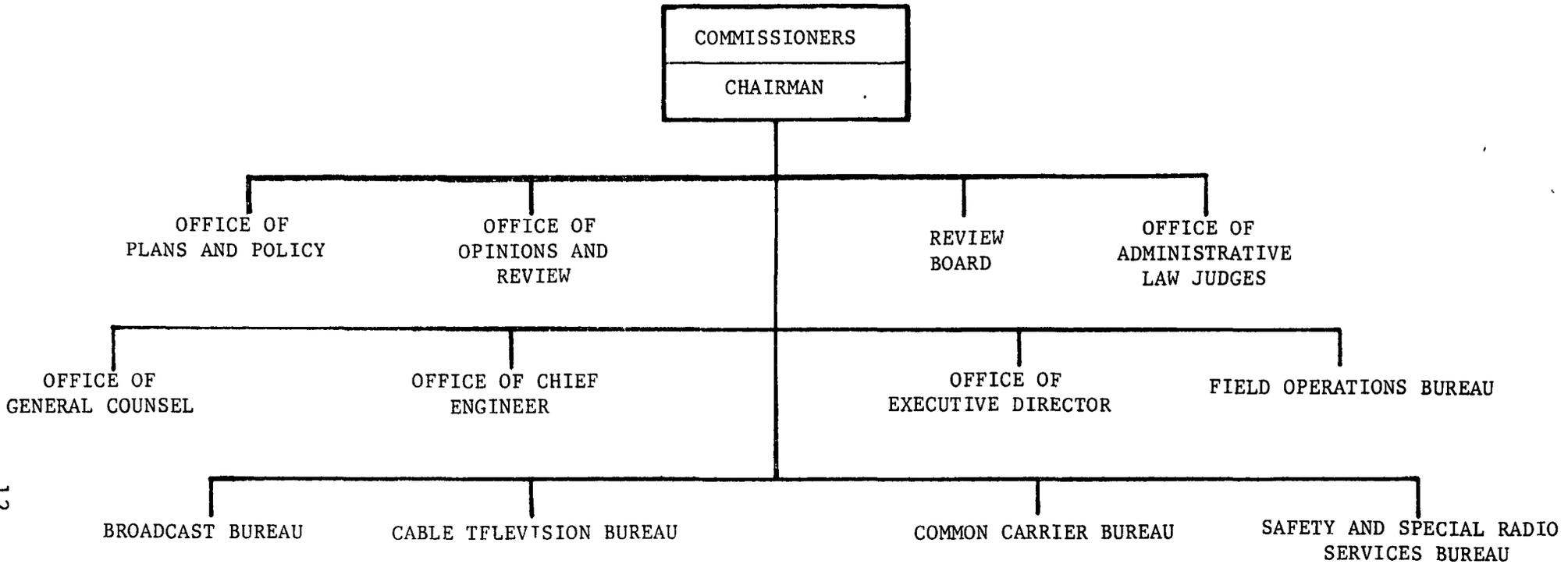


FIGURE 1. FEDERAL COMMUNICATIONS COMMISSION

Cable Television Bureau

The Cable Television Bureau administers the program for cable television relay services.

Common Carrier Bureau

In interstate and international common carrier communications by telephone, telegraph, radio and satellite, the Common Carrier Bureau administers the program of regulation.

Safety and Special Radio Services Bureau

The Safety and Special Radio Services Bureau administers the program of regulating the following radio services: aviation, marine, amateur, public fixed stations in Alaska, public safety (police, fire, etc.), industrial (manufacturers, petroleum, etc.), land transportation (railroad, taxicab, etc.), and citizens (private short-distance radiocommunications, signaling, control of objects, etc.), and implements the compulsory provisions of laws and treaties covering the use of radio for the safety of life at sea.

Office of the Chief Engineer

The Office functions as engineering adviser to the Commission and staff organizations; represents the Commission on interagency and national frequency management and in international telecommunication activities; conducts long-range

planning to accommodate new and expanding national telecommunication requirements; conducts technical and engineering studies and develops and implements technical standards and engineering practices.

Field Operations Bureau

The Bureau through its field offices and stations, performs monitoring, inspection, operator examination, and investigative activities of the Commission.

International Telecommunication Union

Impact on Frequency Allocations

The International Telecommunication Union (ITU) effects world-wide allocation of the radio frequency spectrum, and registration of radio frequency assignments, in order to avoid harmful interference between radio stations of different countries.

Organization Description

The International Telecommunication Union (ITU) is an organization, a Union, of Member countries. The ITU membership is composed of Administrations. All votes in ITU conferences are by Administrations.

1. The purposes of the Union are:
 - a) To maintain and extend international co-operation for the improvement and rational use of telecommunications of all kinds;
 - b) To promote the development of technical facilities and their most efficient operation with a view to improving the efficiency of telecommunications services, increasing their usefulness and making them, so far as possible, generally available to the public;
 - c) To harmonize the actions of nations in the attainment of those ends.

2. To this end, the Union shall in particular:

- a) Effect allocation of the radio frequency spectrum and registration of radio frequency assignments in order to avoid harmful interference between radio stations of different countries;
- b) Coordinate efforts to eliminate harmful interference between radio stations of different countries and to improve the use made of the radio frequency spectrum;
- c) Coordinate efforts with a view to harmonizing the development of telecommunications facilities, notably those using space techniques, with a view to full advantage being taken of their responsibilities;

.

- g) Undertake studies, make regulations, adopt resolutions, formulate recommendations and opinions, and collect and publish information concerning telecommunication matters.

There are four permanent organs in ITU:

- General Secretariat
- International Frequency Registration Board (IFRB)
- International Radio Consultative Committee (CCIR)
- International Telegraph and Telephone Consultative Committee (CCITT)

The ITU works to fulfill its basic purposes in three main ways:

1. International conferences and meetings;
2. Publication of information;
3. Technical cooperation.

There are two kinds of international conferences held by the Members of ITU: world administrative conferences, and regional administrative conferences. The agenda of a world administrative conference may include: the partial revision of the Administrative Regulations (Telegraph Regulations, Telephone Regulations, Radio Regulations, Additional Radio Regulations), the documents which govern the international operation of the three modes of communication, exceptionally, the complete revision of one or more of these Regulations, and any other question of a world-wide character within the competence of the conference.

The agenda of a regional administrative conference may provide only for specific telecommunication questions of a regional nature, including instructions to the IFRB regarding its activities in respect of the region concerned, provided such instructions do not conflict with the interests of other regions. Furthermore, the decisions of such a conference must in all circumstances be in conformity with the provisions of the Administrative Regulations.

Major functions of the International Frequency Registration Board:

- a) To effect an orderly recording of frequency assignments made by the different countries so as to establish the date, purpose and technical characteristics of each of these assignments, with a view to ensuring formal international recognition thereof;
- b) To effect, in the same conditions and for the same purpose, an orderly recording of the positions assigned by countries to geostationary satellites;
- c) To furnish advice to members with a view to the operation of the maximum practicable number of radio channels in those portions of the spectrum where harmful interference may occur, and with a view to the equitable, effective and economical use of the geostationary satellite orbit;

- d) To maintain such essential records as may be related to the performance of its duties.

The International Radio Consultative Committee (CCIR) and the International Telegraph and Telephone Consultative Committee (CCITT) are separate bodies dealing respectively with technical radio problems and technical telegraph and telephone problems. All Member countries of the Union can participate in their work, and also certain private companies operating telecommunication services. The number of companies participating in and advising the CCIR and CCITT is demonstrated in the latest issue of the ITU "List of Addresses", which is attached as Appendix A.

Frequency allocations by the ITU are often influenced by the findings of its advisory bodies, particularly the International Radio Consultative Committee (CCIR). This is another avenue through which scientific and technical organizations can exercise indirect influence on allocations: paragraph 379 of the International Telecommunication Convention (Malaga-Torremolinos, 1973) provides that:

"4. (1) Scientific or industrial organizations, which are engaged in the study of telecommunication problems or in the design or manufacture of equipment intended for telecommunication services, may be admitted to participate in an advisory capacity in meetings of the study groups of the Consultative Committees, provided that their participation has received approval of the administrations of the countries concerned."

International Radio Consultative Committee

Impact on Frequency Allocations

The International Radio Consultative Committee (CCIR) studies technical and operating questions relating specifically to radiocommunication and issues recommendations on them.

Organization Description

As the principal technical advisor to the ITU in the field of radiocommunications, the Recommendations of the CCIR have a profound influence on allocations and other regulatory decisions made at ITU Conferences.

The CCIR shall pay due attention to the study of questions and to the formulation of recommendations directly connected with the establishment, development and improvement of telecommunications in developing countries in both the regional and international fields.

The International Consultative Committee shall have as members:

- a) The administrations of all members of the Union;
- b) Any recognized private operating agency which, with the approval of the member which has recognized it, expresses a desire to participate in the work of the Committee.

The International Consultative Committee shall work through the medium of:

- a) its Plenary Assembly;
- b) Study Groups set up by it;
- c) a Director, elected by a Plenary Assembly and appointed in accordance with the General Regulations.

There shall be a World Plan Committee, and such Regional Plan Committees as may be jointly approved by the Plenary Assembly of the International Consultative Committee. These Plan Committees shall develop a General Plan for the international telecommunication network to facilitate coordinated development of international telecommunication services. They shall refer to the International Consultative Committee questions, the study of which is of particular interest to developing countries and which are within the terms of reference of the Consultative Committee.

The CCIR holds a Plenary Assembly every few years. The Plenary Assembly draws up a list of technical telecommunication subjects or "Questions", the study of which would lead to improvements in international radio communication or international telegraphy and telephony. These Questions are then entrusted to a number of Study Groups, composed of experts from different countries. The Study Groups draw up Recommendations which are submitted to the next Plenary Assembly. If

the Assembly adopts the Recommendations, they are published. CCIR Recommendations have an important influence with telecommunication scientists and technicians, operating administrations and companies, manufacturers and designers of equipment throughout the world.

In the intervening years, special Administrative conferences will modify the Regulations to solve specific problems. Preparatory work is now being done for the 1979 GVARC and the frequency allocations which will be determined there.

The interplay between various U. S. organizations in preparation for the 1979 GVARC is depicted in Figure 2.

Table 2 gives the CCIR study groups and international and national officers thereof.

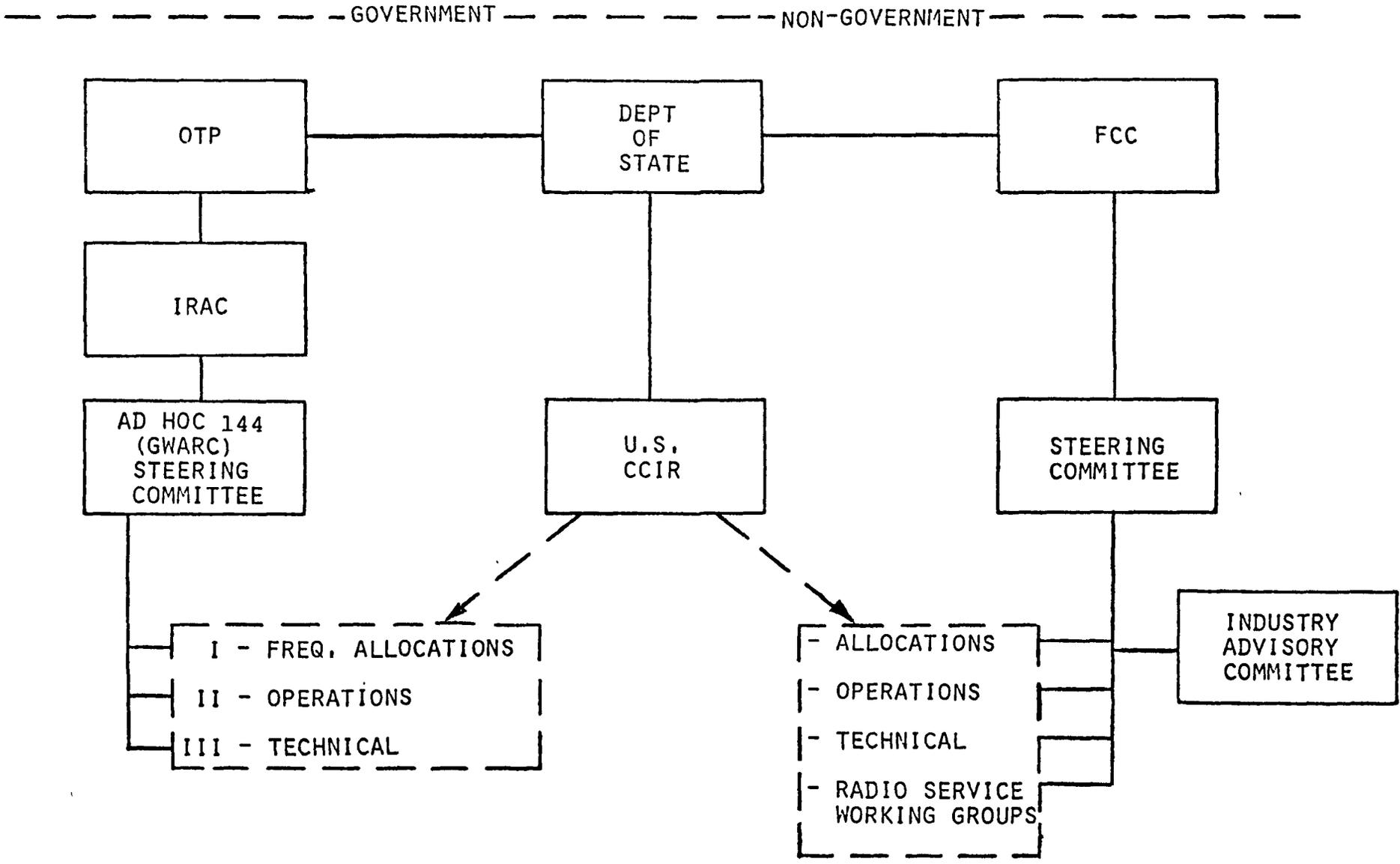


FIGURE 2. U. S. ORGANIZATION FOR GWARC PREPARATION

TABLE 2

CCIR STUDY GROUPS AND OFFICERS

<u>STUDY GROUP</u>	<u>SCOPE</u>	<u>INTERNATIONAL</u>	<u>OFFICERS</u>	
				<u>U. S.</u>
*1	Spectrum Utilization, Monitoring	J. Dixon (USA)	Dr. William F. Utlaut Office of Telecommunications Institute for Telecommunications Sciences Boulder, Colorado 80302 (303) 323-3500	
*2	Space Research and Astronomy	I. Ranzi (Italy)	Mr. E. L. Eaton NASA HQ, Code TN 600 Independence Avenue, S.W. Washington, D. C. 20546 (202) 755-2480	
3	Fixed Service Below 30 MHz	S. Aritake (Japan)	Dr. Thijs de Haas Office of Telecommunications Institute for Telecommunications Sciences Boulder, Colorado 80302 (303) 499-1000 x 3728	
*4	Fixed Service Using Satellites	W. Klein (Switzerland)	Mr. James B. Potts COMSAT Corporation 950 L'Enfant Plaza Washington, D. C. 20020 (202) 554-6770	
*5	Propagation in Non- Ionized Media	J. A. Saxton (United Kingdom)	Dr. Harold T. Dougherty Office of Telecommunications Institute for Telecommunications Sciences Boulder, Colorado 80302 (303) 323-3913	

*These Study Groups most directly deal with matters of interest to Space Research.

TABLE 2 (cont)

CCIR STUDY GROUPS AND OFFICERS

<u>STUDY GROUP</u>	<u>SCOPE</u>	<u>INTERNATIONAL</u>	<u>OFFICERS</u>	<u>U.S.</u>
6	Ionospheric Propagation	D. K. Bailey (U.S.)	Dr. Ernest K. Smith Office of Telecommunications Institute for Telecommunications Sciences Boulder, Colorado 80302 (303) 323-3177	
7	Standard Frequency and Time Signal Services	G. Becker (Federal Republic of Germany)	Mr. Hugh S. Fosque NASA HQ, Code TA 600 Independence Avenue, S.W. Washington, D. C. 20546 (202) 755-2434	
*8	Mobile Services	W. H. Bellchambers (United Kingdom)	Mr. Raymond E. Simonds RCA Frequency Bureau Suite 810 1800 K Street, N.W. Washington, D. C. 20006 (202) 659-3320	
*9	Fixed Service Using Radio Relay	J. Verree (France)	Mr. H. E. Weppler American Telephone and Telegraph 195 Broadway New York, New York 10007 (212) 393-3291	

*These Study Groups most directly deal with matters of interest to Space Research.

TABLE 2 (cont)

CCIR STUDY GROUPS AND OFFICERS

<u>STUDY GROUP</u>	<u>SCOPE</u>	<u>INTERNATIONAL</u>	<u>OFFICERS</u>	<u>U. S.</u>
10	Sound Broadcasting	C. Terzani (Italy)	Mr. Neil K. McNaughten Assistant Chief, Broadcast Bureau FCC 1919 M Street, N.W. Washington, D. C. 20554 (202) 632-6460	
11	TV Broadcasting	M. Krivocheev (USSR)		
CMV	Joint Group for Vocabulary	R. Villeneuve (France)	Professor H. R. Mimno Cruft Laboratory Harvard University Cambridge, Mass. 02138 (617) 495-1000, x2863	
CMTT	Joint Group on TV and Sound Transmission	Y. Angel (France)	Dr. L. S. Golding Vice President, Director of Research Digital Communications Corporation 19 Firstfield Road Gaithersburg, Md. 20760 (301) 948-0850	

III. ADVISORS TO REGULATORY BODIES

In this section we discuss major organizations which have an affect on the allocation of frequencies due to their relationship as advisors to various regulatory bodies. Table 3 below shows some of the principal U. S. scientific organizations with their international complement.

TABLE 3

PRINCIPAL SCIENTIFIC ORGANIZATIONS INFLUENTIAL IN RADIO FREQUENCY ALLOCATIONS

<u>U. S. ORGANIZATIONS</u>		<u>INTERNATIONAL COUNTERPARTS</u>
National Research Council (NRC)	-	International Council of Scientific Unions (ICSU)
Committee on Radio Frequencies (CORF)	-	Inter-Union Council on the Allocation of Radio Frequencies (IUCAF)
U. S. National Committee/URSI - (USNC/URSI)	-	International Union for Radio Science (URSI)
American Institute of Aeronautics and Astronautics (AIAA)	-	International Astronautical Federation (IAF)

National Research Council

Impact on Frequency Allocations

The National Research Council (NRC) provides the working committees for research studies undertaken by NAS-NAE. The studies they undertake deal with issues of national scientific import. In addition, the NRC represents the U. S. in ICSU.

Organization Description

NRC was established under the National Academy of Sciences in 1916 to deal with the great increase in problems of science and technology of importance to the government. The NRC is the "operating" arm of the Academy and currently comprises some 900 committees, panels, and the like, representing about 9000 appointments filled by approximately 7,400 individuals, of whom only a fraction are members of the Academy. Each study made by the Academy is conducted by one or more of these NRC committees or panels.

The NRC is divided into units called Assemblies and Commissions, as follows:

- Assembly of Behavioral and Social Sciences
Chairman: Robert Adams
- Assembly of Engineering
Chairman: Courtland D. Perkins
- Assembly of Life Sciences
Chairman: James D. Ebert

- Assembly of Mathematical & Physical Sciences
Chairman: Norris E. Bradbury
- Commission on Human Resources
Chairman: Robert A. Alberty
- Commission on International Relations
Chairman: George S. Hammond
- Commission on Natural Resources
Chairman: Gordon J. F. MacDonald
- Commission on Sociotechnical Systems
Chairman: Harvey Brooks

Each of the 900 committees, panels, etc., conducting a study is organizationally located within one or another of these units, as follows:

- Assemblies are concerned with scientific and technical questions of a fundamental nature, with the vitality of the national scientific endeavor, and with questions of national importance that may be addressed by members of scientific disciplines represented within the Assembly.
- Commissions are called upon to deal with large national issues which must be addressed from the standpoints of a variety of scientific disciplines.

Current activities of the NRC include the following roles:

- Scientific oversight of the Radiation Effects Research Foundation, Hiroshima, Japan.

- Represent the United States in the International Institute for Applied Systems Analysis, Laxenburg, Austria.
- Represent the United States in the International Council of Scientific Unions (ICSU) and its constituent Unions.
- Assist the National Science Foundation in the selection of NSF fellows, and of post doctoral fellows to conduct energy-related research.
- Assist 18 federal agencies with selection of visiting research associates to work in their laboratories.

and study projects:

- Environment Decision Making
- Design of a Space Telescope
- Social Research & Development in the Federal Government
- Occupational Cancer
- Transportation Systems Planning
- Measurement of Energy Consumption Data Needs and Methodologies
- Role of Nuclear Power in the Context of Alternative Energy Systems
- Health Effects of Drinking Water Contaminants

- World Food and Nutrition
- Genetic Alterations of Food and Feed Crops
- Ocean Waste Disposal Criteria

The Research Council provides unique means for organizing attacks on scientific and engineering problems which involve many specialized fields and for obtaining disinterested and objective assessments of problems for groups representing dissimilar or conflicting interests. The effectiveness of the Research Council is dependent on the voluntary, personal participation of thousands of American scientists and engineers who collaborate in these undertakings, giving generously of their time and effort without financial compensation.

National Academy of Sciences
National Academy of Engineering

Impact on Frequency Allocations

The National Academy of Sciences (NAS) was chartered with the intent that it be the official technical advisor to the federal government. The National Academy of Engineering (NAE) chartered at a later date, shares this responsibility with NAS. These two agencies provide engineering research in changing areas to meet the needs of the nation, and conduct research in the national interest.

Organization Description

NAS is a private, co-optative society of distinguished scholars in scientific and engineering research, dedicated to the furtherance of science and its use for the general welfare. Its charter, an Act of Incorporation passed by the U. S. Congress and signed by Abraham Lincoln on March 3, 1863, named the first 50 members of the Academy; empowered it to create its own organization and bylaws; and called upon it to serve as an official adviser, upon request and without fee, to the federal government on any question of science or technology.

NAE was established in December 1964, under the charter of the NAS, as a parallel organization of distinguished engineers, autonomous in its administration and in the selection of members,

and sharing with the Academy of Sciences its responsibility for advising the federal government.

Most of the activities undertaken by the two Academies are carried out through the Commissions and Assemblies of the National Research Council, which draws upon a wide cross-section of the nation's leading scientists and engineers for advisory services to government agencies and the Congress.

From the original 50 charter members, the Academy of Sciences has increased its membership to 1,133, as of July 1, 1975; at present, up to 75 new members may be elected at the 1976 Annual Meeting. Comprising all the natural sciences and engineering, the membership of the Academy of Sciences is divided into 19 sections: mathematics, astronomy, physics, engineering, chemistry, geology, botany, zoology, physiology, microbiology, anthropology, psychology, geophysics, biochemistry, applied biology, applied physical and mathematical sciences, medical sciences, genetics, and social, economic, and political science.

③ By authority of its Congressional charter, the membership of the Academy of Sciences is ultimately responsible for the affairs of the overall organization. In practice, this membership responsibility is, in turn, vested in a 17-man Council, consisting of the five elected officers of the Academy and 12 additional members.

Following discussions among representatives of the Engineers Joint Council, Engineering Foundation, Engineers' Council for Professional Development, and the National Academy of Sciences, the National Academy of Engineering was established by the acceptance of its Articles of Organization by the Council of the National Academy of Sciences on December 5, 1964.

This document sets forth the following objects and purposes:

- (1) To provide means of assessing the constantly changing needs of the nation and the technical resources that can and should be applied to them, to sponsor programs aimed at meeting these needs, and to encourage such engineering research as may be advisable in the national interest;
- (2) To explore means for promoting cooperation in engineering in the United States and abroad, with a view to securing concentration on problems significant to society and encouraging research and development aimed at meeting them;
- (3) To advise the Congress and the executive branch of government, whenever called upon by any department or agency thereof, on matters of national import pertinent to engineering;

- (4) To cooperate with the National Academy of Sciences on matters involving both science and engineering;
- (5) To serve the nation in other respects in connection with significant problems in engineering and technology; and
- (6) To recognize outstanding contributions to the nation by leading engineers.

The membership of the Academy of Engineering now stands at 490. New members are elected on the basis of identifiable contributions or accomplishments in one or both of the following categories:

- (1) Important contributions to engineering theory or practice, including significant contributions to the literature of engineering; and
- (2) Demonstration of unusual accomplishments in the pioneering of new and developing fields of technology.

The Council of the Academy of Engineering consists of the president, vice president, and treasurer of the Academy of Engineering; the president of the Academy of Sciences; and 12 members of the Academy of Engineering who are elected by the membership.

Committee on Radio Frequencies

Impact on Frequency Allocations

The Committee on Radio Frequencies (CORF) has a direct influence on radio frequency allocations by working closely with the U. S. Government and serves as the U. S. point of contact in the Inter-Union Commission on Frequency Allocations (IUCAF) of the International Council of Scientific Union (ICSU). In addition, CORF advises and assists the FCC and OTP with regard to the allocation of radio frequencies. CORF is in liaison with the U. S. National Committee for CCIR and its study groups along with committees in various agencies, such as, National Research Council, National Academy of Sciences, and the National Academy of Engineering.

Organization Description

The Committee on Radio Frequencies was established under the National Academy of Sciences in the spring of 1961; in October 1969 the National Academy of Engineering agreed to serve as co-sponsor of the Committee. The functions of the Committee are:

- (1) To serve as a means of coordinating the knowledge and views of the U. S. scientific and engineering communities regarding the radio frequencies for research;

- (2) To work actively with the U. S. Government in securing these frequencies, and
- (3) To work with the International Council of Scientific Union's Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF), and other international organizations as appropriate.

Figure 3 shows the relationship of CORF to other organizations.

The Committee's tasks are:

- (1) To coordinate and define the U. S. needs for radio frequency allocations and assignments for research, including but not limited to (a) Space Science, (b) Radio Astronomy, (c) Meteorology, (d) Oceanography, (e) Life Sciences, and (f) Remote Sensing.
- (2) To maintain liaison with the Federal Communications Commission (FCC), and the Office of the Director of Telecommunications Policy (OTP) and to advise and assist them on matters pertaining to the assignment and allocation of radio frequencies for research.

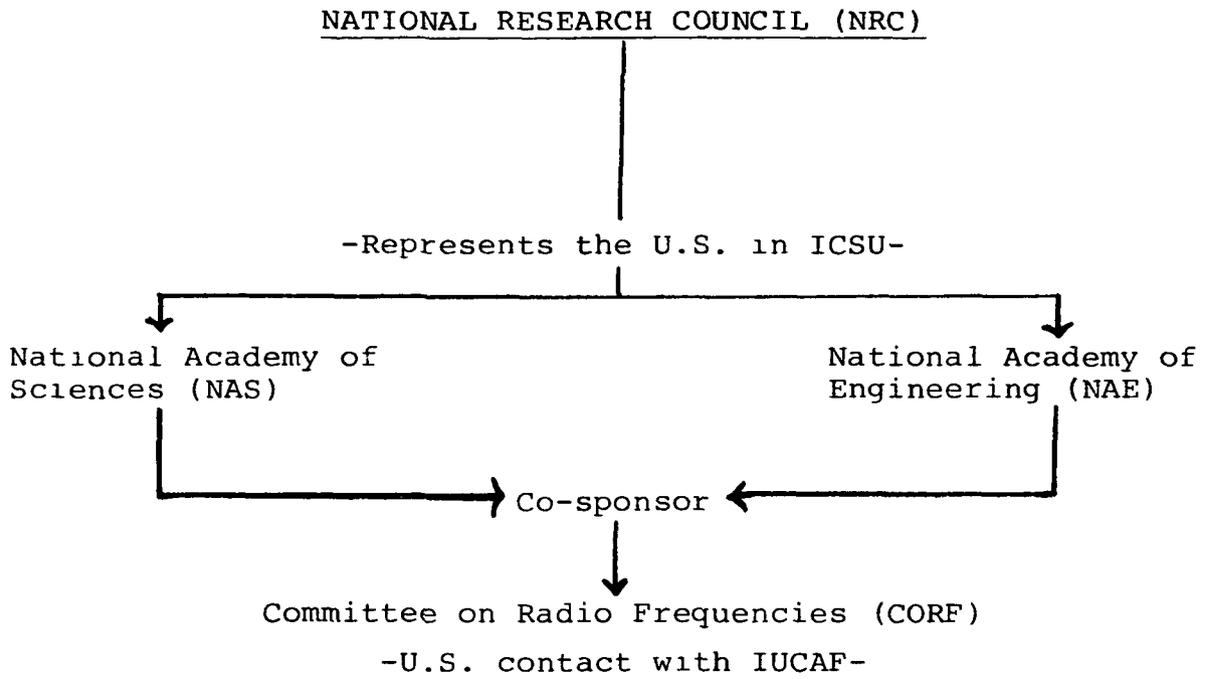


FIGURE 3. NATIONAL RESEARCH COUNCIL

- (3) To maintain liaison with the Department of State Office of Telecommunications and assist it in representing the U. S. in international conferences dealing with the use of the radio frequency spectrum.
- (4) To maintain liaison with appropriate NAS, NAE and NRC Committees and Boards.
- (5) To advise and assist U. S. scientists and engineers in obtaining assignments of radio frequencies for research.
- (6) To assist and advise research users of the radio frequency spectrum on procedures for reporting and resolving radio interference problems.
- (7) To maintain a list of U. S. radio astronomy facilities, and the frequencies that are being used (allocated and unallocated), and to forward the pertinent information to the FCC and other agencies as appropriate.
- (8) To serve as U. S. point of contact with IUCAF and take appropriate actions on proposals for frequency allocations formulated by IUCAF.

- (9) To maintain liaison with the U. S. National Committee for CCIR and its study groups.
- (10) To keep the U. S. scientific and engineering committees informed of actions being taken or being considered in regard to the allocations of radio frequencies affecting research by memorandum and newsletter.
- (11) To carry out or to arrange for participation in pertinent studies on the use of the radio frequency spectrum.

Subcommittees

Subcommittees will be established to advise the main Committee on the requirements for specific areas of research. The following three Subcommittees have been established:

- (1) Subcommittee on Radio Astronomy
- (2) Subcommittee on Space Science
- (3) Subcommittee on Earth and Life Sciences

Members of CORF

An update of the membership list became available in early July 1976 and has been added to this report as Appendix B.

Liaison Representatives

National Science Foundation
Department of Commerce
National Aeronautics and Space Administration
Federal Communications Commission
Office of Telecommunication Policy
Department of Defense
Additional representatives of Federal Agencies as
appropriate

Any Academy Board or Committee with an active interest in radio frequency requirements for scientific purposes can request representation on the Committee. The Committee would consider such requests and determine the disposition to be made in each instance including the class of Membership to be accorded, if any.

National Science Foundation

Impact on Frequency Allocations

The National Science Foundation (NSF) has a dual interest in frequency allocations as both an advisor to regulatory bodies and as a frequency user. NSF is the principal agency involved in radio astronomy.

Organization Description

In 1950, the National Science Foundation was created to help people find, exchange, and teach scientific knowledge. As NSF has progressed, it has begun to search for ways to apply scientific knowledge to help solve national problems and to strengthen technological innovation.

The purposes of the NSF are to: increase the nation's base of scientific knowledge and strengthen its ability to conduct scientific research; encourage research in areas that can lead to improvements in economic growth, energy supply and use, productivity, and environmental quality; promote international cooperation through science; and develop and help implement science education programs that can better prepare the Nation for meeting the challenges of the decades ahead.

NSF is guided by policy set by the National Science Board. This Board has 25 members who are appointed by the President, with the consent of the Senate, and includes the Director of NSF who is also responsible for management and operation of NSF activities.

The Director of the Foundation carries out functions previously assigned to the Office of Science and Technology.* These functions include providing advice and assistance to help in achieving coordinated federal policies for the promotion of scientific research education in the sciences, energy research and development, and evaluating scientific research programs undertaken by agencies of the federal government.

Presently the Director of the National Science Foundation performs the duties of the Science Advisor.* In this capacity, he advises and assists the White House, Office of Management and Budget, Domestic Council, and other entities within the Executive Office of the President on matters where scientific and technological expertise is called for, and acts as the President's representative in selected cooperative programs in international scientific affairs, including chairing such bodies as the U.S.-U.S.S.R. Joint Commission on Scientific and Technical Cooperation. The Director of the National Science Foundation also serves as Chairman of the Federal Council for Science and Technology.

* It is expected that these functions and those of the Science Advisor will be assumed by the newly established Office of Science and Technology (See Page 4).

The staff of the NSF is divided into four main operating groups called:

- Research
- National and International Programs
- Research Applied to National Needs
- Science Education

To help find scientific knowledge, NSF encourages scientists to come to the agency with their most promising ideas. There is stiff competition for available funds in each of the scientific disciplines and less than half of the proposals received can be funded. Most of the scientific work supported by NSF is aimed primarily at adding to man's fund of knowledge with the expectation that the use of this knowledge may be many years in the future. NSF also undertakes applied research so as to focus research capabilities on selected problems of current national importance.

NSF also helps improve science instruction at all levels of education. In addition to its programs in science education, the Foundation also supports a small number of projects designed to enhance the understanding of the public on the substance of science and technology and its role in our complex society.

Among its other activities in support of science, the Foundation sponsors efforts to ensure that all research workers can readily find out what other research workers are doing or

have done in their field of interest. To accomplish this, NSF leads a national effort to improve existing scientific information services. In its role as a leading federal supporter of science, NSF also has an important role in national science policy planning. It conducts planning and policy studies, and collects and analyzes data on research and development and scientific manpower in the United States.

Supplementing its domestic activities NSL has many responsibilities in international science activities. The United States shares talent and expenses with other countries in undertaking research of mutual interest.

Institute for Telecommunication Sciences

Impact on Frequency Allocations

The Institute for Telecommunication Sciences (ITS) provides the technical assessment for the Office of Telecommunications (OT) in the area of frequency allocation. Engineering analyses and evaluation are provided for OT which works in cooperation with IRAC in its spectrum management work.

Organization Description

ITS located in Boulder, Colorado is the science and engineering arm of OT in the Department of Commerce. ITS does the bulk of OT's applied scientific research as well as some spectrum analysis. The more specific goals of ITS within OT's framework are:

- Increase the availability of usable spectrum by engineering methods;
- Increase the likelihood of satisfactory telecommunications system performance, as affected by natural, engineering and economic factors.

ITS strives to realize these goals through implementation of three major program elements:

- Efficient use of the spectrum
- Electromagnetic-wave transmission research and services
- Engineering and evaluation of systems

About 70 percent of ITS's research is done for Federal agencies other than the Department of Commerce.

OT's research deals with the application of technology and because of the pervasive nature of telecommunications, the research's usefulness redounds to the benefit of all. In the area of international telecommunications, most decision-making concerning the allocation of international radio frequencies takes place at the conferences of the International Telecommunications Union (ITU). Years of technical preparation precede these conferences, and this is where OT makes its contribution. The Office contributes to 13 U. S. CCIR study groups and to corresponding international study groups. Last year staff members headed three of these groups.

The organization of OT within the Department of Commerce is illustrated in Figures 4 and 5. At the end of fiscal year 1975, OT's staff totaled 247 full-time, permanent employees. Approximately half of these are stationed in Boulder, Colorado with the remainder in Washington, D. C. The direction of the Office is provided by the Director and Deputy Director. An in-house Executive Advisory Board, composed of the heads of

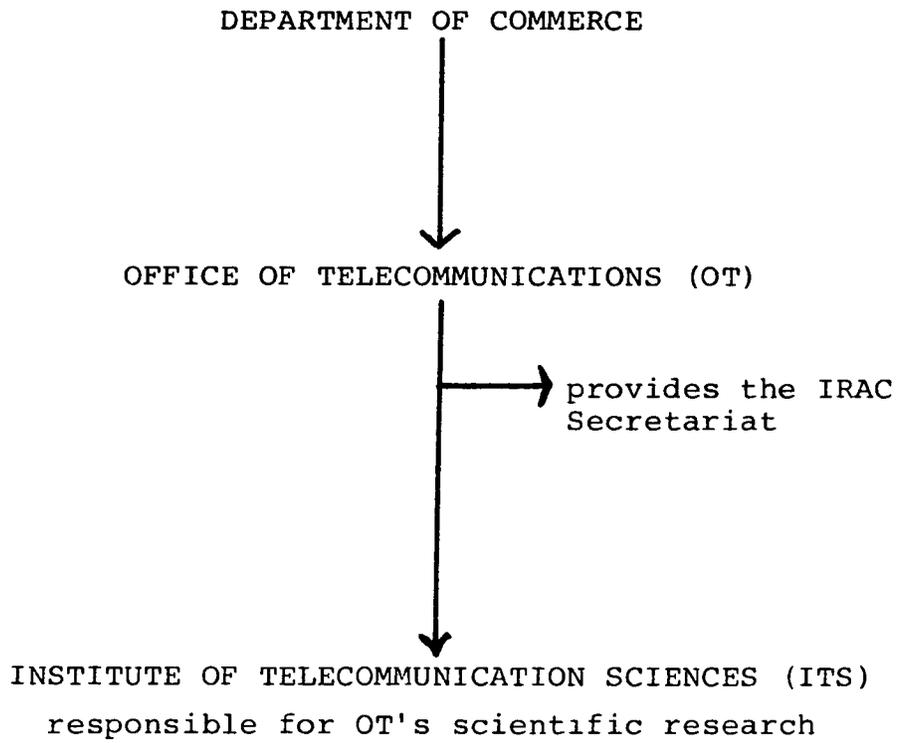


FIGURE 4. INSTITUTE OF TELECOMMUNICATION SCIENCES

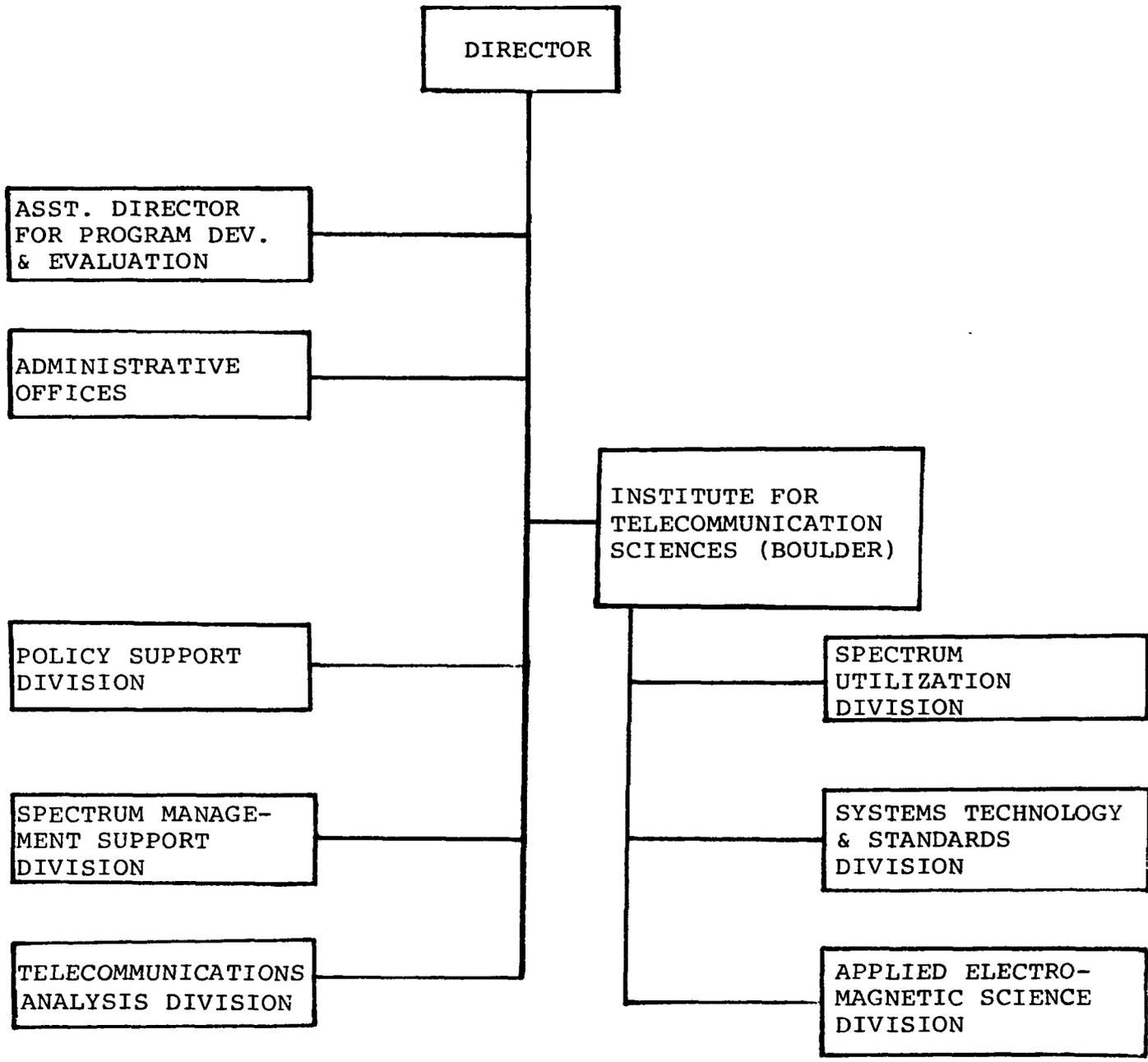


FIGURE 5. U. S. DEPARTMENT OF COMMERCE OFFICE OF TELECOMMUNICATIONS

program entities and other major office figures, coordinates the execution of the program development and evaluation unit. This unit performs overall planning and then oversees and assesses accomplishments. In this manner the work force who make up OT - physicists, electronic engineers, mathematicians, communications specialists, policy analysts, computer programmers, economists, information experts - can be directed in such a way as to obtain the best use of their individual skills.

Among other tasks, OT engineers and scientists perform the complicated systems analyses and applied research needed by policy-makers trying to improve the government's use of its share of the frequency spectrum. The Office also furnishes a reservoir of data that can be drawn from when required. During the fiscal year 1975, staff expertise and data files were used to analyze 19 proposed major telecommunications systems. The systems that came under this scrutiny are associated with diverse programs. OT identified what spectrum space is available for these systems and to what extent they would be compatible with others in the same band. In its spectrum management work, OT cooperates with the Interdepartment Radio Advisory Committee (IRAC) and provides the IRAC Secretariat, which sees to the preparation of all the Committee meetings including those of its many special and ad hoc committees.

American Institute of Aeronautics and Astronautics

Impact on Frequency Allocations

The American Institute of Aeronautics and Astronautics (AIAA) presents to the public through conferences and papers the operational aspect, in addition to the scientific and technological point of view. Although not a lobbyist, the AIAA is influential in its exchange of information with Congress and executive agencies providing inputs available to regulatory bodies.

Organization Description

AIAA is the largest American technical society devoted to science and engineering in the fields of aeronautical and astronautical technology, rocket systems, aeronautics and marine systems. It was formed in 1963 by the merger of the American Rocket Society and the Institute of the Aeronautical Sciences, which date back to 1930 and 1932 respectively. It is composed of professionals who themselves provide the energy and ideas to make the society work.

The purpose of the AIAA is to advance the arts, sciences and technology of aeronautics and astronautics, and to nurture and promote the professionalism of those engaged in these pursuits. In addition, the AIAA strives to serve the needs and professional interests of members and to improve public understanding of the profession and its contribution.

There are 68 local sections throughout the country. Sections are AIAA's local precincts, each with its own officers, and its own program of activities, including technical meetings, field trips, lecture series, professional education programs and opportunities for interaction.

The AIAA is involved on the international scene in many ways. Its international Activities Committee makes policy and reviews all international involvements. AIAA is a member of the International Council of the Aeronautical Sciences and participates in its biennial Congresses. AIAA also participates in and co-sponsors other international meetings in specialized areas. It keeps close contact with the United Nations Outer Space Affairs Division and contributes to the work of the United Nations Committee on the Peaceful Uses of Outer Space.

The AIAA maintains an office in Washington, D. C. to facilitate the exchange of information between members of the Institute and the Congress and executive agencies of the U. S. government. The Institute also presents relevant testimony on behalf of aerospace programs and NASA and R&D budgets, and, joined with other societies, presses legislative reform, in such areas as pensions, manpower and energy planning.

Each year, the AIAA sponsors an average of 30 national meetings in different parts of the country at which AIAA members have an opportunity to hear and to discuss the advancement of aerospace science and engineering.

Institute of Electrical and Electronics Engineers

Impact on Frequency Allocations

The Institute of Electrical and Electronics Engineers (IEEE) is concerned with providing scientific and technological information to the scientific community. The IEEE does not lobby, but provides the public with vast amounts of information which in itself is influential in directing the course of scientific advancement.

Organization Description

The Institute of Electrical and Electronics Engineers has as its purpose scientific and educational goals directed toward the advancement of theory and practice of electrical engineering, electronics, radio and the allied branches of engineering and the related arts and sciences. The means of achieving these goals consist of holding meetings for the reading and discussion of professional papers, and the publication and circulation of works of literature, science and art.

In addition, the IEEE has a professional goal directed toward the advancement of the standing of the members of the professions it serves and; hence, the IEEE initiates the conduct and publication of surveys and reports on matters of professional concern to the members, collaboration with public bodies, and with other societies for the benefit of the engineering professions and the establishment of standards of qualification and ethical conduct.

The IEEE strives to enhance the quality of life for all, through the constructive application of technology in its fields of competence. It endeavors to promote understanding of the influence of such technology on the public welfare.

The principal participants in IEEE activities are as indicated in the organizational directory given in each issue of "Spectrum".

The International Council of Scientific Unions

Impact on Frequency Allocations

The International Council of Scientific Unions (ICSU) has as members 17 international Scientific Unions. Three of these members of ICSU are the International Astronomical Union (IAU), International Scientific Radio Union (URSI), and the Committee on Space Research (COSPAR). These three members make up the Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF). IUCAF is the subgroup of ICSU which is most concerned with radio frequency allocations. ICSU is represented in the International Telecommunication Union (ITU) by IUCAF.

Organization Description

ICSU is an international non-governmental scientific organization composed of 17 international Scientific Unions, 64 National Members, eight Scientific and one National Associates. Since its creation in 1931 ICSU has adopted a policy of non-discrimination, affirming the rights of all scientists throughout the world.

The Council provides advice and assistance to scientists who are not included in its membership. Its principal objective is to encourage international scientific activity for the benefit of mankind. It does this by initiating, designing and coordinating international scientific research projects; the International Geophysical Year and the International Biological Programme are probably the best-known examples. ICSU acts as a focus for the exchange of ideas, the communication of scientific information and the development of standards in methodology, nomenclature, units, etc. The various members of the ICSU family organize in many parts of the world conferences, congresses, symposia, summer schools, and meetings of experts, as well as General Assemblies and other meetings to decide policies and programmes. In 1975 more than 200 were organized. A wide range of publications is produced, including newsletters, handbooks, proceedings of meetings, congresses and symposia, professional scientific journals, data, standards, etc.

Committees or Commissions of ICSU are created to organize programs in multi- or transdisciplinary fields which are not completely under the sponsorship of one of the Scientific Unions, such as Antarctic, Oceanic, Space and Water Research and Problems of the Environment. Activities in areas common to all the Unions such as Teaching of Science, Data, Science and Technology in Developing Countries are also coordinated by Committees. The current Commissions of ICSU are listed in Appendix C.

ICSU maintains close relations and works in cooperation with a number of international governmental and non-governmental organizations, and in particular United Nations Education, Scientific and Cultural Organization, UNESCO, (with which ICSU has taken the initiative in launching a number of international programs such as the International Indian Ocean Expedition, the World Science Information System, International Geological Correlation Project, etc.) and with the World Meteorological Organization, WMO, (with which ICSU has taken the initiative in launching the Global Atmospheric Research Programme).

Committee on Space Research

Impact on Frequency Allocations

The Committee on Space Research (COSPAR) in its advisory capacity is a Special Committee of ICSU.

Organization Description

The Committee on Space Research was set up by the Eighth General Assembly of ICSU, meeting in Washington, D. C. in 1958, for an initial period of one year. The Executive Board of ICSU unanimously agreed that COSPAR should continue as a Special Committee of ICSU.

Various working groups in COSPAR are:

1. Tracking, Telemetry and Dynamics
Chairman: Dr. L. Sehnal (Czechoslovakia)
2. Experiments in Interplanetary Space and in the Magnetosphere
Chairman: Dr. A. Galeev (USSR)
3. Space Techniques as Applied to Astrophysical Problems
Chairman: Dr. Z. Svestka (USA)
4. Experiments in the Upper Atmosphere
Chairman: Dr. K. S. W. Champion (USA)
5. Space Biology
Co-Chairman: Dr. D. Grahn (USA)
Acad. N. P. Dubinin (USSR)
6. Application of Space Research to Meteorology and Earth Surveys
Chairman: Dr. M. Tepper (USA)
7. Space Related Studies of the Moon and Planets
Chairman: Dr. A. D. Kuzmin (USSR)

Inter-Union Commission on Frequency Allocations

Impact on Frequency Allocations

The Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science (IUCAF), composed of member unions of ICSU, makes an assessment of the needs of radio astronomers and space scientists and presents to the international community its views on frequency allocations.

Organization Description

IUCAF was established by the International Council of Scientific Unions (ICSU) to represent science in the ITU since non-government organizations, such as the scientific unions under ICSU, have no voice in the International Telecommunications Union (ITU). IUCAF has the international responsibility for making realistic assessments of the needs of radio astronomers and space scientists, and for taking all practicable steps to ensure that these receive sympathetic consideration by the national administrations which, collectively, make the final decisions at the General World Administrative Radio Conference to be held in 1979.

To facilitate its task, IUCAF works closely with the International Radio Consultative Committee (CCIR). Additionally, contact is maintained with the scientific community through a network of correspondents in countries concerned with radio

astronomy or space science, and these correspondents are encouraged to discuss their interference problems with their administrations. IUCAF represents IAU, URSI and COSPAR which are the three organizations in ICSU most concerned with the use of the radio spectrum (see Figure 6). IUCAF is authorized on behalf of ICSU and its unions, to communicate with the ITU, to participate in its conferences, and to propose matters to be placed on the agenda of a meeting. Table 4 lists the member unions of ICSU. Representatives of two ITU bodies, the International Frequency Registration Board (IFRB) and the CCIR, attend meetings of IUCAF in an advisory capacity.

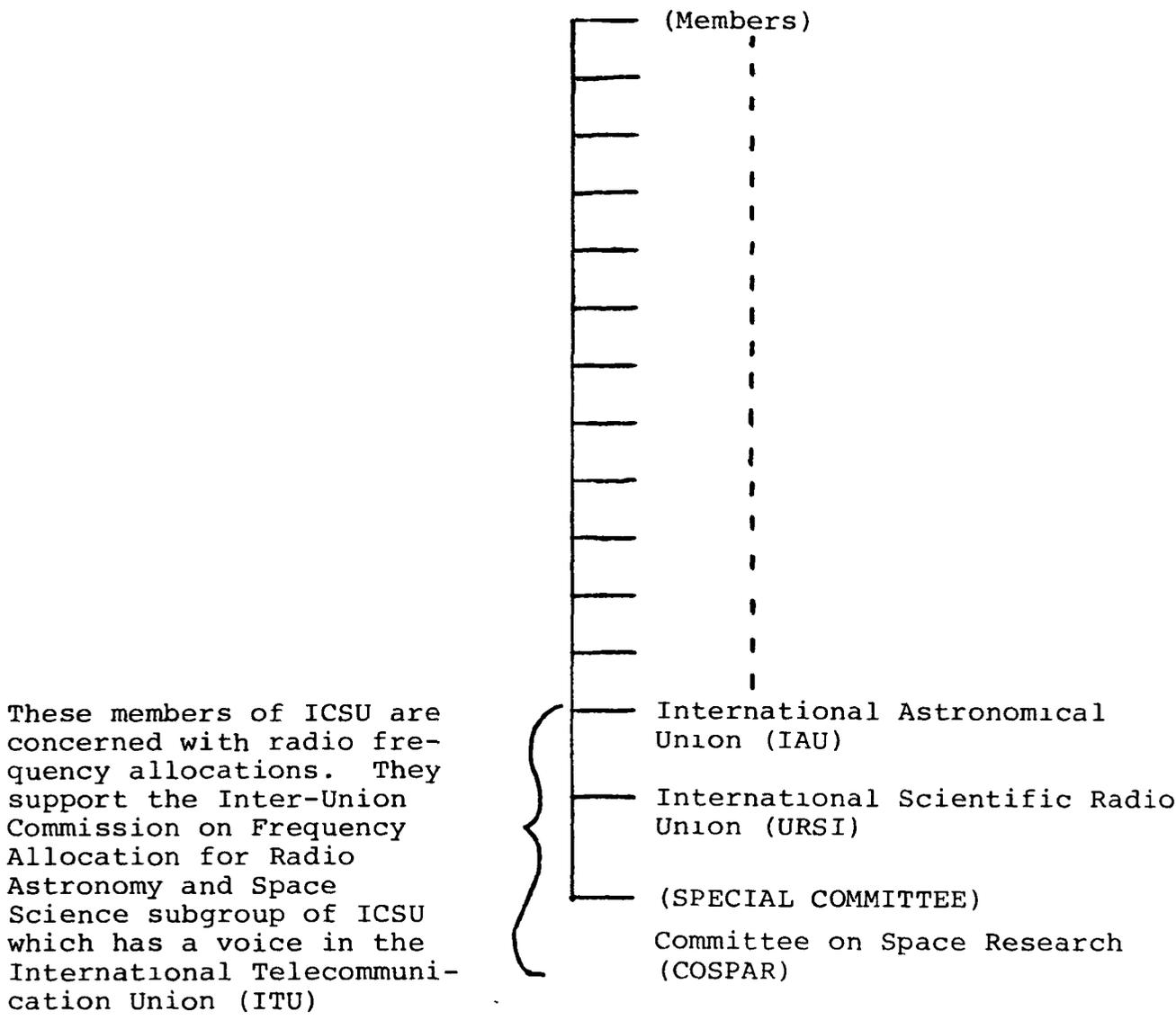


FIGURE 6. INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS (ICSU)

TABLE 4

INTERNATIONAL COUNCIL OF SCIENTIFIC UNIONS (ICSU)
MEMBER UNIONS:

*International Astronomical Union

International Union of Biological Sciences

International Union of Pure and Applied Chemistry

International Union of Crystallography

International Union of Geodesy and Geophysics

International Union of History and Philosophy in Science

International Geographical Union

International Union of Theoretical and Applied Mechanics

International Union of Pure and Applied Physics

*International Scientific Radio Union

International Mathematical Union

International Union of Physiological Science

International Union of Biochemistry

International Union of Geological Survey

*Member unions who affect radio frequency allocations.

International Astronautical Federation

Impact on Frequency Allocations

The International Astronautical Federation (IAF) maintains a close relationship with the regulatory agency, ITU, partially by the fact that a number of areas of concern to the ITU are of great importance to the IAF, such as allocation of radio frequencies. Reciprocal representation is regularly assured at their meetings and conferences. In addition, the IAF advises international and national organizations on issues related to astronautics.

Organization Description

The International Astronautical Federation is an association of astronautical societies founded in 1950 by a small group of rocket pioneers representing astronautical societies in eight countries. In the 26 years since then the IAF has grown into a major international organization whose members represent a vast range of talent. The IAF is an international interdisciplinary, non-governmental body devoted to fostering the development of space technology and exploration. It has as its purpose to cooperate and advise with appropriate international and national, governmental and non-governmental organizations and institutions on all aspects of the natural, engineering and social sciences related to

astronautics and the peaceful uses of outer space. Through its annual congresses, its committees and its publications, the IAF and its two associated bodies, the International Academy of Astronautics (IAA) and the International Institute of Space Law (IISL) have made a very tangible contribution to the cause of international cooperation.

There are three categories of membership in the IAF: National Member, Institution Members and Associated Members. The IAF has two main governing bodies: the General Assembly and the Bureau. The General Assembly is the policy making instrument with the tasks of electing new members, reviewing budgets and annual reports, appointing committees, electing officers and adopting by laws and rules. In addition it gives direction to the IAF.

The General Assembly meets once a year in plenary session during the annual congress. Between General Assembly meetings, the Bureau carries on the business of the IAF. The Bureau comprises the President and four Vice Presidents who are elected each year by the General Assembly, and the immediate past President.

The IAF provides representatives to the following international organizations:

- United National Economic and Social Council (ECOSOC)
- United Nations Education, Scientific and Cultural Organization (UNESCO)
- World Health Organization (WHO)
- World Meteorological Organization (WMO)
- International Telecommunications Union (ITU)
- International Civil Aviation Organization (ICAO)
- International Atomic Energy Agency (IAEA)
- International Council of Scientific Unions (ICSU)
- Commission on Space Research (COSPAR)

Intergovernmental Oceanographic Commission

Impact on Frequency Allocations

The Intergovernmental Oceanographic Commission (IOC) makes recommendations and provides technical guidance for UNESCO in addition to interested international organizations.

Organization Description

The Intergovernmental Oceanographic Commission is established within the United Nations Educational, Scientific and Cultural Organization for the purpose of promoting scientific investigation with a view to learning more about the nature and resources of the oceans.

The functions of the Commission shall be to:

- (a) define those problems the solution of which requires international cooperation in the field of scientific investigation of the oceans and review the results of such investigations;
- (b) develop, recommend, and coordinate international programmes for scientific investigation of the oceans and related services which call for concerted action by its members;

- (c) develop, recommend and coordinate with interested international organizations, international programmes for scientific investigation of the oceans and related services which call for concerted action with interested organizations;
- (d) make recommendations to international organizations concerning activities of such organizations which relate to the Commission's programme;
- (e) promote and make recommendations for the exchange of oceanographic data and the publication and dissemination of results of scientific investigation of the oceans;
- (f) make recommendations to strengthen education and training programmes in marine science and its technology;
- (g) develop and make recommendations for assistance programmes in marine science and its technology;
- (h) make recommendations and provide technical guidance as to the formulation and execution of the marine science programmes of the United Nations Educational, Scientific and Cultural Organization (UNESCO);

- (i) promote freedom of scientific investigation of the oceans for the benefits of all mankind, taking into account all interests and rights of coastal countries concerning scientific research in the zones under their jurisdiction.

The IOC consist of an Assembly, an Executive Council, a Secretariat and such subsidiary bodies as it may establish. Member states each designate a representative of that state to serve on the Executive Council.

IV. FREQUENCY USERS

Since NASA uses frequencies designated "Government" in U. S. domestic allocations, this competition comes primarily from the user Agencies which are members of OTP's Interdepartment Radio Advisory Committee (IRAC). For the sake of completeness, these Agencies (listed in Section II of this Report) are again listed below:

- Agriculture
- Air Force
- Army
- Atomic Energy Commission
- Coast Guard
- Commerce
- Federal Aviation Administration
- General Services Administration
- Health, Education and Welfare
- Interior
- Justice
- National Aeronautics and Space Administration
- Navy
- State
- Treasury
- United States Information Agency

The FCC also has membership in IRAC, to provide liaison between government and non-government uses and users of the spectrum. In the event that NASA might wish to use non-government frequencies, for some aspect of space research, the FCC member of IRAC would be consulted.

In the day to day operations the frequency user, who desires a frequency assignment or new allocation, contacts the appropriate regulatory body. IRAC recommends, for OTP approval, the assignment of frequencies to government radio stations. Frequency assignment matters are referred to OTP by IRAC when policy guidance is needed, when agreement cannot be reached within the IRAC/FCC liaison office, or when requested by any agency.

When non-government organizations have a frequency allocation request, the FCC may initiate an inquiry or Proposed Rulemaking and public responses to these are then reviewed. The FCC then coordinates draft proposals originating within the Commission or from the public, with OTP/IRAC before taking any action.

Key Members of Organizations

With respect to the radio frequency allocation needs of scientific and technical organizations, there are surprisingly few key people who are versed in all aspects of frequency allocation requirements. These people, the organizations which they represent, and a point of contact are given below:

NRC, NAS-NAE, CORF

Richard Y. Dow
National Research Council
2101 Constitution Avenue, N.W.
Washington, D. C.
Telephone: (202) 389-6478

URSI-IUCAF-COSPAR

Dr. John P. Hagen
613 West Park Avenue
State College, Pa. 16801
Telephone: (814) 455-0410

NSF

Dr. Marcus Price
National Science Foundation
1800 G Street, N.W.
Washington, D. C. 20006
Telephone: (202) 632-5999

IAF

Mr. Leonard Jaffe
Deputy Associate Administrator, Applications
Office of Space Science and Applications
NASA HQ, Code SA
600 Independence Avenue, S. W.
Washington, D. C. 20546
Telephone: (202) 755-8606

Addresses for the other organizations are listed below:

Federal Communications Commission
1919 M Street, N.W.
Washington, D. C. 20554

International Telecommunication Union
Place des Nations
1211 Geneve 20
Suisse

International Council of Scientific Unions
51, Bd. de Montmorency
75016 Paris, France

American Institute of Aeronautics and
Astronautics
1290 Avenue of the Americas
New York, New York 10019

Institute of Electrical and Electronics
Engineers
345 E. 47th Street
New York, New York 10017

Office of Telecommunications
Institute for Telecommunication Sciences
Boulder, Colorado 80302

Intergovernmental Oceanographic Commission
UNESCO
7 Place de Fontenay
75700, Paris
France

V. SUMMARY AND CONCLUSION

The preceding Sections have dealt with domestic and international scientific organizations and their potential for influencing the availability of frequencies for space research. The matter of competition by other users has also been mentioned, particularly in view of the fact that CCIR findings can and do influence allocation decisions, and because private operating agencies can hold membership in CCIR Study Groups, and because scientific and industrial organizations can participate in CCIR in an advisory capacity. The extent to which these organizations exercise these privileges is indicated by the entries in the latest issue of the ITU "List of Addresses" (Appendix A) which, among other things, identifies CCIR participants in these categories.

APPENDIX A
ITU "LIST OF ADDRESSES"

APPENDIX B
COMMITTEE ON RADIO FREQUENCIES

MEMBERSHIP

Chairman: Bernard F. Burke - MIT (12/76)

<u>Members</u>	<u>End of Term</u>	<u>Organization</u>
Alan H. Barrett	12/79	- MIT (SC-RA)
Elbert L. Eaton	12/79	- NASA (SC-SS)
John P. Hagen	12/79	- Pennsylvania State University (SC-SS)
William E. Howard III	12/76	- NRAO (SC-RA, USNC-CCIR-SG-2)
Hein Hvatum	12/79	- NRAO (USNC-URSI)
Frank J. Kerr	12/79	- University of Maryland (USNC-IAU)
John R. Tester	12/79	- University of Minnesota
 <u>Liaison Representatives</u>		
James E. Ogle	Ind.	- Department of Commerce
Bernard J. Pankowski	"	- Department of Defense
Robert L. Cutts	"	- Federal Communications Commission
Allen M. Peterson	"	- Joint Technical Advisory Council
Elbert L. Eaton	"	- National Aeronautics & Space Administration
Paul A. Price	"	- National Aeronautics & Space Administration
R. Marcus Price	"	- National Science Foundation
E. Probst	"	- Office of Telecommunications Policy
 <u>Ex-Officio Members</u>		
Philip H. Abelson	6/76	- Chairman of USNC-International Union of Geodesy and Geophysics
Louis J. Battan	6/76	- Chairman of Committee on Atmospheric Sciences
Bernard F. Burke	12/77	- Chairman of USNC-International Astronomical Union
John W. Findlay	Ind.	- Member IUCAF
Richard M. Goody	8/76	- Chairman of Space Science Board
John P. Hagen	Ind.	- Member IUCAF
Rita Colwell	6/78	- Chairman of USNC-International Union of Biological Sciences
John V. Evans	12/78	- Chairman of USNC-International Union of Radio Science
John V. Byrne	12/76	- Chairman of Ocean Science Board
Richard J. Reed	12/77	- Chairman of USC Global Atmospheric Research Program
Gart Westerhout	Ind.	- Member IUCAF

Secretary: Richard Y. Dow

SUBCOMMITTEE ON RADIO ASTRONOMY

Chairman: William E. Howard III - NRAO (12/76)

<u>Members</u>	<u>End of Term</u>		<u>Organization</u>
Alan H. Barrett	12/79	-	MIT
Thomas A. Clark	4/78	-	NASA Goddard Space Flight Center
Michael M. Davis	4/78	-	Arecibo Observatory
William C. Erickson	12/79	-	University of Maryland
Carl E. Heiles	4/78	-	University of California, Berkeley
Patrick Palmer	4/78	-	University of Chicago
George W. Swenson, Jr.	12/77	-	University of Illinois

Secretary: Richard Y. Dow

SUBCOMMITTEE ON SPACE SCIENCE

Chairman: John P. Hagen - Pennsylvania State University (12/79)

<u>Members</u>	<u>End of Term</u>		<u>Organization</u>
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APPENDIX C
COMMISSIONS OF ICSU

The aims of the Union are largely achieved through the work of the following forty current Commissions:

4. Ephemerides
President: Dr. R. L. Duncombe (USA)
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14. Fundamental Spectroscopic Data
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15. Physical Study of Comets, Minor Planets and Meteorites
President: Dr. A. H. Delsemme (USA)
16. Physical Study of Planets and Satellites
President: Dr. C. H. Mayer (USA)
17. The Moon
President; Prof. S. K. Runcorn (UK)
19. Rotation of the Earth
President: Dr. C. Sugawa (Japan)
20. Positions and Motions of Minor Planets, Comets and Satellites
President; Dr. L. Kresak (Czechoslovakia)

21. The Light of the Night Sky
President: Dr. J. L. Weinberg (USA)
22. Meteors and Interplanetary Dust
President: Dr. B. A. Lindblad (Sweden)
24. Photographic Astrometry
President: Prof. P. Lacroute (France)
25. Stellar Photometry and Polarimetry
President: Prof. M. Golay (Switzerland)
26. Double Stars
President: Dr. S. L. Lippincott (USA)
27. Variable Stars
President: Dr. M. W. Feast (South Africa)
28. Galaxies
President: Prof. E. Holmberg (Sweden)
29. Stellar Spectra
President: Dr. A. A. Boyarchuk (USSR)
30. Radial Velocities
President; Dr. R. F. Griffin (UK)
31. Time
President: Dr. H. Enslin (B.R.D.)
33. The Structure and Dynamics of the Galactic System
President: Prof. L. Perek (Czechoslovakia)
34. Interstellar Matter and Planetary Nebulae
President: Dr. H. van Woerden (Netherlands)
35. Stellar Constitution
President: Prof. L. Mestel (U.K.)
36. The Theory of Stellar Atmospheres
President: Dr. R. Cayrel (France)
37. Star Clusters and Associations
President: Dr. I. R. King (USA)
38. Exchange of Astronomers
President: Dr. P. M. Routly (USA)
40. Radio Astronomy
President: Dr. Y. N. Parisky (USSR)

41. History of Astronomy
President: Dr. O. Gingerich (USA)
42. Close Binary Stars
President: Prof. T. Herczeg (B.R.D.)
44. Astronomical Observations from outside the Terrestrial Atmosphere
President: Dr. A. Code (USA)
45. Spectral Classifications and Multi-band Colour Indices
President: Dr. C. O. R. Jascheck (Argentina)
46. The Teaching of Astronomy
President: Dr. D. McNally (U.K.)
47. Cosmology
President: Dr. M. S. Longair (U.K.)
48. High Energy Astrophysics
President: Dr. M. J. Rees (U.K.)
49. The Interplanetary Plasma and the Heliosphere
President: Dr. W. I. Axford (B.R.D.)
50. Protection of Existing and Potential Observatory Sites
President: Dr. M. F. Walker (USA)