Federal Communications Commission

22d annual report

FOR THE FISCAL YEAR 1956

With introductory summary and notations of important developments

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

For sale by the Superintendent of Documents, U. S. Government Printing Office
Washington 25, D. C. - Price 50 cents

COMMISSIONERS

Members of the Federal Communications Commission

(As of June 30, 1956)

GEORGE C. MCCONNAUGHEY, *Chairman*
(Term expires June 30, 1957)

ROSEL H. HYDE
(Term expires June 30, 1959)

EDWARD M. WEBSTER [1]
(Term expires June 30, 1956)

ROBERT T. BARTLEY
(Term expires June 30, 1958)

JOHN C. DOERFER
(Term expires June 30, 1961)

ROBERT E. LEE
(Term expires June 30, 1960)

RICHARD A. MACK
(Term expires June 30, 1962)

A list of present and past Commissioners appears in the appendix to this report.

[1] Succeeded by T. A. M. Craven, July 2, 1956, for term expiring June 30, 1963.

LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C.

To the Congress of the United States:

In compliance with section 4 (k) of the Communications Act of 1934, as amended, there is transmitted herewith the 22d annual report of the Federal Communications Commission.

Pursuant to amendments of 1952, it offers information and data useful in the determination of questions connected with the regulation of interstate and foreign wire and radio communication and radio transmission of energy; also material concerning the functioning of the Commission as will be of value to Congress in appraising the amount and character of the work and accomplishments of the Commission and the adequacy of its staff and equipment.

Because of the lapse of time between compiling and printing this report, it includes notations of subsequent important developments up to the time of going to press.

Further required biographies of persons taken into the employment of the Commission during the 1956 fiscal year, together with the names of those who have left during that period, are being submitted as a nonprinted supplement.

Respectfully,

GEORGE C. MCCONNAUGHEY, *Chairman.*

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Introductory Summary

RADIO CAPSULES

Radio's ever-increasing impact on the American way of life is attested by over 1.6 million Federal Communications Commission authorizations in that particular field. This is 200,000 more than in 1955.

For every station which actually broadcasts programs there are some 85 radio stations of other kinds. To illustrate:

Water transportation is aided by 57,000 stations.
Air transportation utilizes 49,000 stations.
Land transportation is facilitated by 28,000 stations.
Industry is served by 31,000 stations.
Public protection requires 21,000 stations.
Amateurs operate 150,000 stations.
Common carrier "for hire" services use 2,300 stations.

Some of these stations have up to hundreds of associated mobile or portable units. Thus, the 342,000 authorizations in the nonbroadcast services cover about 1.2 million fixed and movable transmitters.

The number of stations in the broadcast services now exceeds 7,000, including 3,000 auxiliaries.

American homes have more broadcast receivers than bathtubs or running water. This country's 164 million receiving sets is more than 60 percent of the world's total.

Nearly 39 million of these sets receive television. This is nearly 80 percent of the global figure. Four out of every five city homes and half of the farm homes in our country now have TV sets. This almost equals the number of homes equipped with vacuum cleaners, clothes-driers and air conditioners collectively. Over 90 percent of our population is within range of at least one TV station.

Operators who man the Nation's radio transmitters hold more than 1.1 million permits of different grades. In addition, there are almost 147,000 amateur-operator permits of various kinds.

OTHER HIGHLIGHTS

National Defense

In addition to participating in various special defense projects for the military, the Commission is administering the CONELRAD

(*CON*trol of *EL*ectromagnetic *RAD*iation) program. The latter has the dual purpose of minimizing the navigational aid an attacking force of enemy bombers or guided missiles might obtain from our radio stations while, at the same time, permitting limited radio operation in an emergency. CONELRAD plans are now in effect for all but two services.

Common Carriers

Telephone.—The telephone industry continues to establish new highs. Over 3 million telephones were added in calendar 1955 to bring the total to over 56 million. By mid-1956 the number had risen to 58 million—about 1 telephone for every 3 persons. At the close of 1955, the industry's gross investment was $17.5 billion and its annual revenues reached $6 billion for that year. The Bell System does about five-sixths of this business.

The entire industry handled a daily average of 205 million local calls and 7.1 million toll calls compared with 186 million and 6.6 million, respectively, in 1954. Telephone calls average about 146,000 a minute.

The Bell System operates 8.8 million miles of telephone toll circuits over microwave. It also furnishes 73,000 miles of broad-band channels, mostly by radio, to provide network service to about 400 TV stations. Over 600 mobile radiotelephone systems are in operation.

Eighty-seven percent of Bell telephones and 65 percent of independent telephones are dial operated. Sixty-five communities can dial long-distance to 16 million telephones in 17 large metropolitan areas.

On October 31, 1955, the 2 largest independent telephone systems merged to form the General Telephone System, with 2.5 million telephones in 30 States and domestic and foreign manufacturing and other interests.

On March 9, 1956, the Commission ordered an investigation into the lawfulness of tariffs applicable to leased and private line services (except broadcast), including those of Western Union.

On January 20, 1956, it approved, on an interim basis, a revision of the procedures used by telephone companies for allocating investment and expenses between intrastate and interstate operations. This will reduce annual intrastate revenue requirements by $35–$40 million.

Telegraph.—Western Union reported land line revenues of $229 million for calendar 1955, an increase of 10 percent over 1954's all-time high. Most of this increase resulted from private line service. Its gross investment was $311 million.

Domestic telegraph volume increased slightly, to over 153 million messages.

On July 27, 1956, Western Union was permitted to file revised rates which it estimated would produce additional annual revenues of $9,657,000 to help offset increased wage agreements. The new rates became effective August 26.

Automation, to the inclusion of reperforator switching and other refinements, continued to mark Western Union's modernization program. Nearly 26,000 "deskfax" (facsimile) devices connect customers with its central offices. In addition, there are teleprinter-operated direct wires to 22,500 customers. "Intrafax" is used to link departments, offices and buildings for quick communication. "Ticketfax" transmits railroad tickets in 8 seconds. During the year Western Union installed an 18,000-mile electronic network connecting 61 cities for an industrial firm.

Western Union filed to extend its present New York-Philadelphia-Washington-Pittsburgh microwave relay system to Chicago.

International.—Four cable and six radio companies furnish telegraph and telephone service between this country and nearly every point on the globe. They reported $68 million revenues and 549 million words handled in calendar 1955, compared with $63 million revenue and 521 million words in 1954. Although all their business increased, special services to provide direct connection between customers showed the greater gain.

International radiotelephone carriers had a new high of 1.2 million calls.

The first transoceanic telephone cables have been installed for long-distance telephone service to Europe (opened September 25, 1956) and to Alaska. Twin cables to Hawaii are scheduled for completion in 1958.

The Commission made its first grant for an international radiotelephone service between Florida and Cuba using "over-the-horizon" (tropospheric scatter) technique.

Safety and Special Radio Services

The nearly 339,000 authorizations in these services reflect a gain of 39,000 over the previous year. At the same time, the number of associated fixed and mobile transmitters has grown from 768,000 to nearly 1.2 million.

Outside of the amateurs, whose authorizations rose from about 140,000 to over 150,500, the largest authorization increase was in the land transportation group, which added 7,500 to make a total of nearly 28,000. Its transmitters increased from 161,000 to over 251,500.

Next came the industrial group, netting nearly 6,000 to total 30,600 authorizations with over 275,000 transmitters, or 55,000 more than the previous year.

About the same gain brought marine authorizations to about 57,000.

Aviation added nearly 5,000 authorizations, for a total of nearly 49,000.

Over 2,300 new grants brought authorizations in the public safety category close to 21,000, representing nearly 386,000 transmitters, or 184,000 more than in 1955.

Applications in all of the some 50 types of safety and special radio services increased from 151,300 to 170,500.

Radio is being harnessed to industrial and other business operations on a scale never before known. Its uses range from speeding transportation of persons and things to checking production and processes. Less publicized uses include exploring for off-shore oil deposits and surveying highway traffic from the air.

Broadcast Services

The 1956 national political conventions and elections saw the largest radio and TV coverage in history.

On May 21, 1956, the Supreme Court affirmed the Commission's authority to limit the number of broadcast stations which may be permitted any one interest.

The Commission expects to complete its special study of radio and TV network broadcasting by June 30, 1957.

Aural broadcast station sales reached a new high when $3.4 million was paid for a New York station. The TV record was set in 1955 when a Pittsburgh station sold for over $9.7 million.

TV.—A major Commission action was taken on June 25, 1956, when it announced a long-range and interim plan to promote comparable competitive TV facilities and extend TV facilities throughout the nation. It invited comments on the possibility of ultimately shifting all or a major portion of TV operation to the UHF band coupled with an immediate research and development program to increase the range and coverage of UHF stations. Meanwhile, it increased the maximum power of UHF stations from 1000 to 5000 kilowatts and began consideration of petitions to eliminate local VHF channels in order to create improved opportunities for UHF broadcasting, and to assign more VHF channels in other localities.

As a further aid in bringing TV service to small communities, it authorized, beginning July 2, 1956, a new type of economical low-power station called a "translator". Such stations pick up and rebroadcast, on the upper 14 UHF channels, programs of other VHF or UHF stations within range. Three initial grants were made September 6.

Another type of authorization enables so-called "satellite" TV stations—mostly UHF—to duplicate the programs of other stations in order to establish local service.

The Commission is also considering "booster" operation which contemplates the use of low-power transmitters to simultaneously transmit or "boost" programs of another station to areas which otherwise would not get service.

Proposals for subscription TV are still under Commission study. It is likewise considering requests that its jurisdiction over community antenna TV systems be extended beyond present control of excessive radiation.

At the close of the fiscal year (which almost coincided with the 15th anniversary of the start of regular TV service), 609 commercial TV stations held authorizations, 496 were on the air, and 128 applications for new stations were pending. Stations equipped for colorcasts approached 300.

As of the same date, 41 other TV stations held noncommercial educational authorizations, of which number 20 were on the air, and 11 new station applications were on hand. The Commission, for the first time, made an educational VHF channel available for commercial use because there was no prospect of its educational use in the foreseeable future. However, it substituted a UHF channel there for possible educational use. The total number of TV channels reserved for education remains at 258.

AM.—For the first time, AM authorizations topped the 3,000 figure (3,020). Of these, 2,896 were on the air, and 389 new station applications awaited action. Work on TV matters necessitated carrying over disposition of the "clear channel" and "daytime skywave" proceedings.

FM.—As a means of helping FM broadcasters obtain additional revenue, the Commission, effective July 1, 1955, enabled them to render subsidiary program service to subscribers. This is in the nature of "background music" to commercial establishments, "transitcasting" to passengers in public vehicles, and "storecasting" to stores.

Of 546 commercial FM stations authorized, 530 were in operation and 10 applications were pending. This was a net decrease of 6 authorizations and 10 operating stations from the previous year.

On the other hand, noncommercial educational FM stations continued gains, from 129 authorized and 124 operating in 1955 to 136 authorized and 126 operating in 1956. Wisconsin and Alabama have statewide FM educational networks.

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Field Engineering and Monitoring

Besides policing the spectrum for technical violations, the Commission's 18 monitoring stations engage in national-defense projects. This, the only national listening network, took nearly 118,000 bearings during the year.

A total of 147 cases of illegal radio operation were detected and located. This was 42 more than in 1955.

Assistance was given to 117 ships and planes in distress.

FCC field engineers, operating through 24 district offices, made nearly 10,300 inspections of radio stations of all types and served more than 3,600 citations. Nearly 20,000 complaints of interference were received, of which number nearly 11,500 were investigated. The rest were resolved by local cooperative effort.

Commercial operator authorizations issued in the field totaled 219,000 and 52,600 amateur operator examinations were given.

The number of applications requiring consideration of antenna hazard to air safety reached a new high of 13,300. A hearing was held on a proposed 1,933-foot TV tower. The advisability of grouping antennas on "antenna farms" is still under study.

The Commission's six regional field offices were discontinued at the close of the fiscal year.

Research and Laboratory

The Commission's technical research is concerned largely with the study of radio propagation and the development of engineering standards for transmitting and other radiating equipment. Also, under its obligation to promote new uses for radio, the Commission encourages experimentation and, itself, must keep abreast of technical developments in radio and wire communication.

The Commission's laboratory tests certain equipment for type approval prior to its manufacture in order to minimize the possibility of interference when it is put into use.

Frequency Allocations

Domestic implementation of international agreements for the orderly use of frequency bands, as well as finding frequencies within those bands for new or expanding services, poses complicated engineering problems. The master list of FCC frequency assignments for most of the radio services now approximates 157,000 machine record cards. The Commission participated in 11 international conferences during the year and is preparing for 30 projected such meetings. Activity at the national level is reflected by intensified contact with

industry groups, and mounting petitions and other proceedings involving frequency changes.

Commission

On February 26, 1956, the President redesignated George C. McConnaughey as Chairman for the remainder of the latter's term. Richard A. Mack became a Commissioner on July 7, 1955, and T. A. M. Craven (for the second time) on July 2, 1956.

The Commission was appropriated $7,323,000, or $400,000 more than the year previous. Personnel remained about 1,100, with one-third engaged in field engineering work.

PROBLEMS

Radio's growing pains are giving the Commission many regulatory headaches. To mention some:

Expansion of communication facilities is causing acute congestion in some frequency bands, and requests for special frequencies for new services further emphasize the housing shortage in certain parts of the spectrum.

New techniques may make it possible to double-up on some frequencies now in use, while new equipment holds promise of operating on still higher frequencies. However, the complicated problems involved in single sideband, split-channel and over-the-horizon transmission, as well as extension of microwave facilities, require exacting technical consideration.

Meanwhile, the mushrooming growth of transmitters coupled with the mounting popularity of electronic devices is causing an unprecedented volume of interference which must be brought under control.

Kaleidoscopic developments in the various fields of electrical communication keep covering rules and regulations in a stage of continuing revision.

Developments in the telephone and telegraph industries require more attention and study.

The national-defense program imparts particular projects and other responsibilities.

United States concern with global telecommunication matters requires FCC preparation for and participation in many international conferences.

Besides furnishing material to and testifying before various Congressional committees, the Commission is called on for comments on numerous legislative proposals. Some of these requests involve duplication of effort. During the fiscal year the Commission devoted over

900 man-days (3½ man-years) in preparation, attendance and followup work in connection with Senate and House hearings.

An average of 1,800 applications, not to mention many petitions and other filings, are received by the Commission each business day.

Competition and interference considerations require 35 percent of all applications for new AM and TV stations to go to hearing.

Hearings average about two each workday.

The intensity of competition is reflected in the number and volume of pleadings filed in proceedings. Many of the arguments are not only repeated in different filings but are overwritten and unduly clog the Commission's adjudicatory process.

Also, more procedural steps are required of the Commission than of any other Federal regulatory body.

Another obstacle to more efficient functioning is a 1952 amendment to the act which precludes the Commissioners from consulting its own staff experts on legal and technical problems involved in adjudicatory proceedings in which they have participated. Remedial legislation is needed.

Losing applicants continue to fight in the hope that some new circumstance may be developed which will lead to rehearing. The number of court cases involving the Commission has increased nearly 30 percent.

Court dictum requiring the Commission to hear practically all protestants to grants made without hearing has delayed new services and added to the administrative process.

In certain rehearings ordered by the court it is difficult to delineate the scope of the reconsideration involved.

The Commission recently clarified the overall TV situation but in doing so it invited a flood of petitions for channel changes. In consequence, the time required to complete rule making may be increased by one-third and, further, more deintermixture arguments will probably go to court.

Concentration on TV's general difficulties precluded Commission attention to some other weighty broadcast problems, such as subscription TV, TV community antennas, and the AM "clear channel" and "daytime skywave" proceedings.

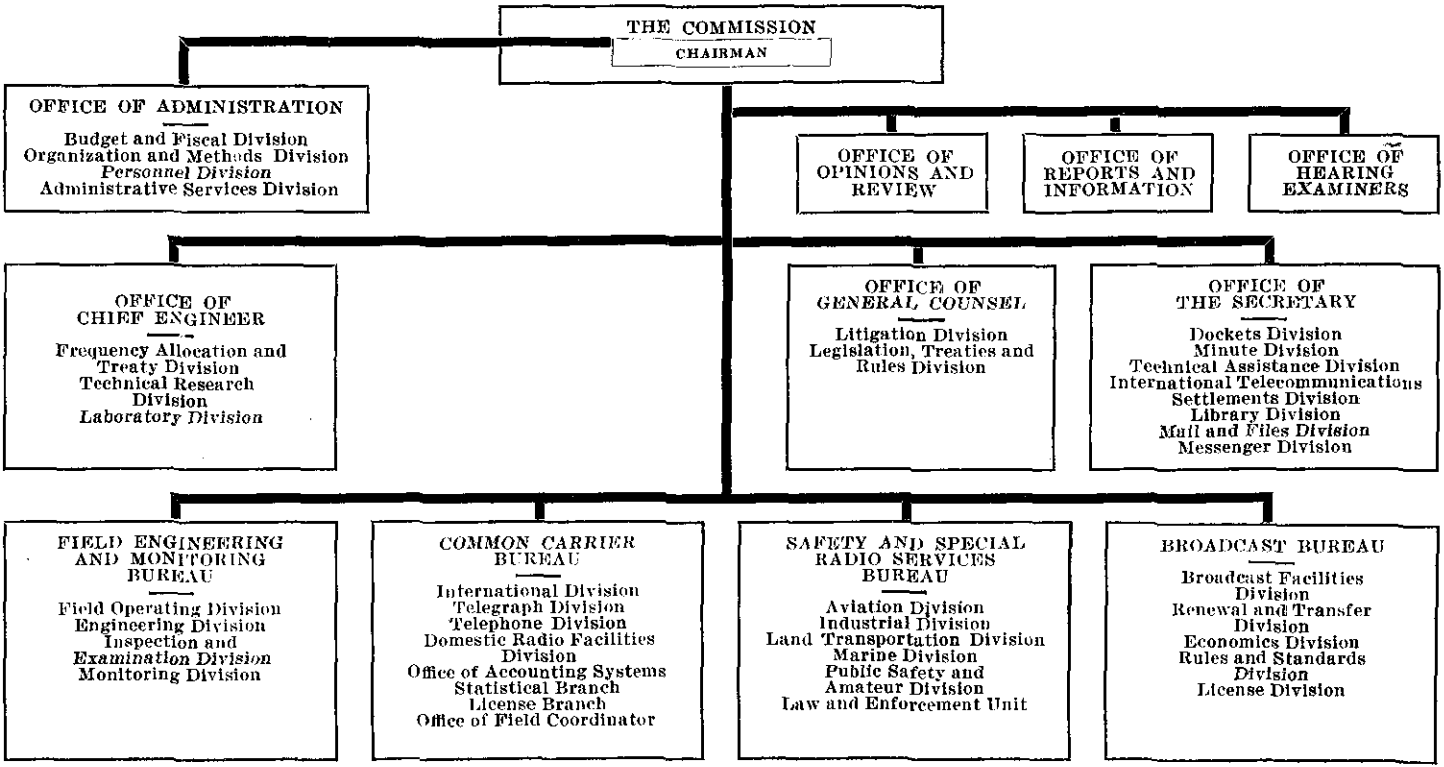
Nearly 25 percent of all pending broadcast applications are over a year old.

Illegal TV "booster" stations and the irresponsible use of radio on small boats are giving the Commission much concern. Enforcement problems, especially in the nonbroadcast services, indicate the need for sterner measures.

In general, insufficient manpower makes it difficult to keep up with the swelling routine, not to mention high-policy problems which require studied consideration and resolution. In consequence, the Commission has had to curtail certain activities, particularly in field engineering and technical research, and to put off some considerations of future import in order to handle more pressing current problems along with its multiplied spot business.

FEDERAL COMMUNICATIONS COMMISSION

Organization Chart as of June 30, 1956



General

COMMUNICATIONS ACT OF 1934

Jurisdiction over wire and radio communications was once exercised, in different aspects, by the Department of Commerce, the Post Office Department, the Interstate Commerce Commission and, later, by the Federal Radio Commission. Developments necessitated centralizing these regulatory functions in a single agency. The Communications Act of 1934, signed on June 19 of that year, created the Federal Communications Commission for this purpose.

The act has been amended at various times, particularly in 1952 when substantial changes were made in the Commission's organizational structure and procedures.

PURPOSES

The stated purposes of the act, as amended, are "regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nationwide, and worldwide wire and radio communication service with adequate facilities at reasonable charges . . . the national defense . . . promoting safety of life and property through the use of wire and radio communication . . ."

APPLICATION

The act applies "to all interstate and foreign communication by wire or radio and all interstate and foreign transmission of energy by radio, which originates and/or is received within the United States, and to all persons engaged within the United States in such communication or such transmission of energy by radio, and to the licensing and regulating of all radio stations . . ."

This authority extends to the territories and possessions of the United States, but not to the Canal Zone.

REGULATION

In discharging these obligations, the Federal Communications Commission

Supervises rates and services of interstate and international telephone and telegraph companies;

Establishes and enforces rules and regulations governing the different radio services, radio operators, and common carriers subject to its jurisdiction;

Allocates bands of frequencies for different radio services;

Assigns particular frequencies and call signals to individual radio stations;

Authorizes and licenses radio transmitters;

Licenses operators of radio transmitters;

Encourages more effective and widespread use of radio;

Promotes the utilization of radio for protecting life and property;

Participates in formulating and administering domestically the wire and radio provisions of international agreements to which the United States is a party; and

Helps coordinate electrical communication facilities with, and gives technical assistance to, the national defense program.

The Commission does not regulate purely intrastate (within-state) wire service which is under the jurisdiction of the respective State utility commissions. However, it does license all radio operation since evidence shows, and the courts have held, that radio transmission has effects beyond State borders.

Communications facilities operated by the Federal Government are not under Commission control.

COMMISSION

As created by Congress, the Federal Communications Commission is an independent Federal agency and, as such, reports directly to Congress. It exercises certain quasi-judicial and quasi-legislative functions in addition to administrative duties. Its practices conform to the Communications Act of 1934, as amended, to the Administrative Procedure Act, and to other applicable laws.

The Commission consists of seven Commissioners appointed by the President by and with the advice and consent of the Senate. One of these Commissioners is designated Chairman by the President without Senate confirmation. The Chairman is the chief executive officer of the Commission.

Commissioners are appointed for 7 years, except in filling an unexpired term. The terms are so staggered that only 1 terminates in a year. Not more than 4 Commissioners may be members of the same political party.

The Commissioners function as a unit, directly supervising all Commission activities, with delegations of responsibilities to Commissioners as individuals or committees, and to staff boards or units.

The Chairman is responsible to the Commission for the general administration of the internal affairs of the Commission. All policy determinations are made by the Commission as a whole.

On February 27, 1956, the President redesignated George C. McConnaughey as Chairman, effective March 22, 1956, when his original designation expired, and throughout the rest of his current term (to June 30, 1957).

On May 18, 1956, the President appointed T. A. M. Craven to succeed Commissioner Edward M. Webster, whose term expired on June 30 of that year. Confirmed by the Senate on June 22, Commissioner Craven took office July 2. He is the first person to receive two separated appointments to the Commission.

As noted in last year's report, Richard A. Mack succeeded Frieda B. Hennock as a Commissioner on July 7, 1955.

A list of Commissioners as of June 30, 1956, with notation of the expiration of their terms, appears on the back of the title page to this report. Past and present Commissioners, and their tenures of office, are listed in the appendix.

STAFF ORGANIZATION

Pursuant to a 1952 amendment to the Communications Act, the Commission staff is organized into integrated bureaus on the basis of the principal workload operations, and other offices essential to its functioning.

In consequence, the four chief bureaus are self-contained operating units with their own engineers, lawyers, accountants, and other necessary personnel. These are the Common Carrier Bureau, which supervises telephone and telegraph matters; the Safety and Special Radio Services Bureau, which administers the nonbroadcast and noncommon carrier radio services (except for common carrier aspects of marine services); the Broadcast Bureau, which superintends the AM, FM, TV, and other broadcast services; and the Field Engineering and Monitoring Bureau, which is responsible for field engineering work, including radio station inspections, monitoring, operator examinations, technical studies, and certain enforcement activities.

In addition there are seven offices; namely:

Office of the General Counsel, whose functions as chief legal adviser to the Commission cover matters involving litigation, legislation, rule making, and administrative practices presenting legal problems.

Office of the Chief Engineer, whose duties deal with the technical aspects of frequency allocations, radio rules and standards, research and experimentation, and problems of interference.

Office of the Secretary, who has charge of official records, processing of correspondence and official documents, and certain functions relating to the internal management of the Commission.

Office of Administration, under the direction of the Chairman, reviews the programs and procedures of the Commission and handles its budget, personnel, and administrative services.

Office of Hearing Examiners, which conducts hearings and prepares and issues initial decisions.

Office of Opinions and Review, which assists the Commission in the preparation of decisions in cases of adjudication pursuant to Commission instructions, and

Office of Reports and Information, which is the central point for issuing public releases and information.

The Commission has delegated authority to its operating bureaus and certain other offices to take routine actions which are largely automatic under the rules and do not involve policy considerations. This has relieved the Commissioners of considerable paperwork.

There was formerly an Office of Chief Accountant, but this was abolished as of October 31, 1955, and its accounting functions integrated into the operating bureaus. The Accounting Systems Division and the Economics Division of that office were, accordingly, transferred to the Common Carrier Bureau and the Broadcast Bureau, respectively.

Commission administrative order of April 25, 1956, defined the authority and responsibility of the Chairman with respect to the internal affairs of the Commission. The functions of the Office of Administration were, accordingly, redefined on May 16 thereafter.

For lack of continued specific appropriation, the Commission discontinued its Field Engineering and Monitoring Bureau regional offices on June 30, 1956. These offices were located at New York, Atlanta, Chicago, San Francisco, Seattle, and Lanikai, Hawaii. District engineering offices are maintained in those domestic cities, as well as in Hawaii.

A Domestic Radio Facilities Division was created in the Common Carrier Bureau, effective July 1, 1956.

On July 2, 1956, new Industrial and Land Transportation Divisions were created in the Safety and Special Radio Services Bureau, at which time the Industry and Commerce Division and the Authorization Analysis Division were abolished.

Other staff changes during the year included creation of the posts of Associate General Counsel and Assistant Chief Hearing Examiner, and the appointment of an Administrative Assistant to the Chairman. In addition to his other duties, this assistant serves as liaison representative with Congress and as Security Officer.

An organization chart of the Commission as of June 30, 1956, appears as a separate page of this chapter.

PERSONNEL

With the exception of a few positions exempted by the Communications Act, employees of the Commission are under Federal civil service.

Its personnel totaled 1,116 at the end of the fiscal year, which was 22 more than the previous year. About one-third (327) were engaged in field engineering work. Distribution was as follows:

	Washington	Field	Total
Commissioners' offices	47	0	47
Office of Opinions and Review	26	0	26
Office of Hearing Examiners	21	0	21
Office of Reports and Information	4	0	4
Office of Administration	81	0	81
Office of Secretary	62	0	62
Office of General Counsel	25	0	25
Office of Chief Engineer	62	22	84
Common Carrier Bureau	83	26	109
Safety and Special Radio Services Bureau	118	0	118
Broadcast Bureau	160	0	160
Field Engineering and Monitoring Bureau	59	305	364
Special Network Study Group	15	0	15

Biographies of employees added during the year, as well as a list of employees leaving during that period, are being furnished Congress as a mimeographed supplement to this printed report. That information is required by a 1952 amendment to the act.

APPROPRIATIONS AND EXPENDITURES

Approximately 90 percent of the Commission's expenses are for personal services.

It received appropriations amounting to $7,323,000 from Congress in fiscal 1956. In addition to the regular appropriation ($6,870,000), $453,000 was required for personnel pay increases previously voted by Congress.

Obligations against the 1956 funds were:

Appropriations		Obligations	
Regular appropriation (salaries and expenses)	$6,870,000	Personal services	$6,625,999
Supplemental (pay increase)	453,000	Travel	76,871
		Transportation of things	14,444
Total appropriations	7,323,000	Communications services	183,050
		Rents and utilities	55,185
		Printing and reproduction	26,649
		Other contractual services	123,120
		Supplies and materials	114,567
		Equipment	87,355
		Land and structures	11,466
		Awards and indemnities	1,419
		Total obligations	7,320,125
		Savings, unobligated balance	2,875
		Total	7,323,000

The sources of these funds and the authority for expenditures thereunder were Public Laws 94, 112, and 533, 84th Congress.

CUTTING PROCEDURES AND PAPERWORK

To keep up with its mounting workload, the Commission is continuing to simplify procedures and paperwork to the fullest extent possible consistent with basic legal requirements. This not only helps speed its own procedures but is a convenience to the industries which it regulates.

The Commission has amended its own rules to cut nonessential administrative corners. This includes abbreviating forms, simplifying and clarifying rules, eliminating reports no longer required, and taking various steps to expedite the hearing process. In some cases it has requested legislation to modify procedural requirements of the Communications Act believed to be outmoded or unduly burdensome.

The application procedure is under continuing review to eliminate steps made unnecessary by the development of new techniques and equipment.

Form simplification is contributing to time and labor saving. For example, in the aviation and marine radio services 2 composite forms now replace 14 separate forms. This is helpful to more than 100,000 license holders, besides reducing paper handling by the Commission.

Another step, which affects well over half a million mobile stations, involves doing away with the practice of treating each of these transmitters as a separate station in favor of licensing them as systems. This means that hundreds of portable transmitters operated by the same party can be licensed on a single piece of paper.

APPLICATION AND HEARING PROCEDURE

Even with application forms and the hearing process streamlined insofar as possible, a contested or otherwise questionable application must go through a time-consuming procedure which is dictated in large part by higher authority. For the Commission's hearing process must not only conform to the general Government practices required by the Administrative Procedure Act, but also to further and more exacting provisions of the Communications Act amendments of 1952.

The latter prescribe that, in general, decisions on noncontested applications be made within 3 months from the date of filing, and hearing cases within 6 months after hearing. With so many cases on its dockets, not to mention cases involved in rule making and litigation, the Commission has difficulty in meeting this schedule in all hearing matters. This is particularly so in broadcasting.

In consequence, a highly competitive case requires at least a year just to go through the prescribed normal application and hearing pro-

cedure, not considering further delays due to crowded dockets and the extra time needed to handle many intervening filings.

To begin with, all applications must be complete in order to be accepted for filing. Omissions and errors on the part of the applicant necessitate an exchange of correspondence before the application is in proper order to be accepted.

Next, no broadcast application can be considered until 30 days after it has been accepted. This is to insure adequate notice to all those who may be interested and to provide time for staff study and processing of applications in their technical, legal, and financial aspects.

Where two or more applications are competitive, a hearing is mandatory. A hearing is usually necessary if an application does not meet the rules, or presents serious interference or other considerations.

However, before any application can be designated for hearing, a 1952 amendment to the act requires the applicant to be notified that he faces a hearing, and why, and he is given 30 days in which to reply.

After that, if a hearing cannot be avoided, the application is designated for hearing. But the exact date of the hearing is usually set later, depending upon finding a place, in turn, on the Commission's crowded docket. When a hearing date is set, the applicant is given 60 days in which to prepare. Most hearings are conducted by hearing examiners.

After the hearing date is set, there is an initial prehearing conference at least 20 days in advance of that time, and a second prehearing conference is held at least 10 days before the hearing actually begins.

The duration of a hearing may vary from part of a day to several days, depending upon the nature of the case.

After the close of a hearing, the parties involved have 20 days in which to file proposed findings of facts and conclusions.

The hearing examiner then reviews all the testimony and exhibits, after which he issues an initial decision. How quickly this can be done depends upon the complexities of the proceeding, consideration of exceptions, and the examiner's prior workload.

Within 20 days after an initial decision, any party can ask for—and must be given—oral argument before the Commission. Here, too, the date of oral argument depends upon the Commission's calendar.

On conclusion of the oral argument, the Commission requires time to study the evidence and to reach a decision. The latter can result in adopting, modifying, or reversing the initial decision.

Within 30 days thereafter, any party to the proceeding may petition for rehearing. Such a petition requires further study and decision and, possibly, a new hearing with all its attendant procedures.

Court appeals can be taken within 30 days following the Commission's final decision.

A particular detriment to finalizing docket matters expeditiously is the flood of voluminous and repetitious filings in highly contested cases. They range from exceptions to examiner's rulings to petitions for reconsideration. These require exacting analysis and disposition because the law provides, and the courts have held, that the Commission must, in effect, consider and dispose of every argument in adjudicating a case. The fact that several hundred exceptions may be embodied in a single petition is one example of the time-and-effort-consuming factors which mitigate against quicker final decisions.

On January 12, 1956, the Commission issued a hearing manual to be used as a guide for its hearing examiners and attorneys and members of the bar in the introduction and use of evidence in comparative broadcast proceedings. In May of that year two examiners sat in certain protracted and complicated hearings.

On May 21 a special FCC committee was appointed to review the Commission's policies in adjudication matters in the light of recommendations of the President's Conference on Administrative Procedures as well as the Commission's own experience. Attention was to be given to reducing the time consumed in hearings and the size of hearing records, also quicker disposition of many appeals from examiners' rulings and the large number of pleadings for various kinds of interlocutory relief. In some instances interminable numbers of papers are filed by parties concerning a single simple issue of fact or law, resulting in a staggering bulk of proposed findings and exceptions.

Docket statistics for fiscal 1956 follow:

Class	Pending June 30, 1955	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1956
TV broadcast	123	37	11	50	99
AM broadcast	122	153	88	22	165
FM broadcast	0	0	0	0	0
Other broadcast	6	5	1	1	9
Total broadcast	251	196	100	73	274
Safety and special	15	44	36	3	20
Common carrier	39	42	11	25	45
Joint and general	51	30	26	5	50
Total nonbroadcast	105	116	73	33	115
Petitions, rules, etc	57	35	19	29	44
Grand total	413	347	192	135	433

During that period 90 initial decisions, covering 133 applications, were issued, including 39 in AM and 24 in TV broadcast; 2 safety and special; 20 common carrier, and 5 joint and general.

At the close of the fiscal year there were 10 hearing examiners, or 2 less than at the same time the previous year.

LITIGATION

Section 401 of the Communications Act confers upon the United States district courts jurisdiction to enforce the act and the orders of the Commission. Judicial review of Commission actions is provided for in section 402 of the act. Section 402 (a) gives jurisdiction to the courts of appeals over suits to enforce, enjoin, set aside, annul or suspend any Commission order with the exception of orders granting or refusing applications for licenses. Section 402 (b) provides for direct appeal from other orders of the Commission to the United States Court of Appeals for the District of Columbia Circuit. Most of the cases involving review of Commission action are instituted in the latter court.

During the fiscal year there were 93 Federal Court cases in which the Commission was a party. Sixty-seven of these were instituted during that period—61 in the court of appeals, 5 in the Supreme Court, and 1 in the district court. The other 26 cases were pending at the beginning of the year.

In many instances the appeals court and the Commission were confronted with either (1) appeals, brought separately under 402 (a) or 402 (b) or both sections, by one party from Commission orders or decisions which were related from the standpoint of judicial review, or (2) appeals by different parties in the same or very similar situations, or (3) a combination of (1) and (2). In all such instances, the particular group of cases involved were consolidated by the court for argument and a single decision, and were treated by the Commission in a single answering brief. Examples are the *Coastal Bend* cases in which the 402 (a) and 402 (b) appeals of several similarly placed appellants were answered by the Commission in a single brief and were treated by the court in 1 decision; and the *Tampa Times-Orange Television* cases in which the 2 losing TV applicants appealed separately from the Commission's decision awarding the contested permit to a third rival. Since, however, the cases involved were separate actions, they are listed separately hereafter. Such separate consideration has also been given cases of this nature pending before the courts at the close of the fiscal year.

In addition to cases in which the Commission was a party, 51 cases involving possible criminal violations of the act were referred by the Commission to the Department of Justice and were pending in that department at the beginning of the fiscal year. This figure includes 46 cases of possible obscenity, sent to the department for its examination and formulation of a policy as to prosecution of such cases.

Eight other cases were referred to the Department of Justice during the fiscal year. In disposing of 5 of these cases, the courts imposed

1 prison sentence (suspended) and 1 fine of $50, specified probation in another case, and dismissed 2 others. Forty-nine cases were dismissed by the department or the United States attorney as not warranting prosecution. Seven criminal cases were pending at the end of the year.

In the only case in which the Commission sought review by the Supreme Court, the Commission was affirmed by reversal of the lower court's judgment; in 4 other instances petitions for writ of certiorari filed by parties other than the Commission were denied by the high court. In the Court of Appeals, the Commission was affirmed in 18 cases and reversed, with a remand, in 10 others. Three cases were dismissed by the appeals court on jurisdictional grounds, and 9 were dismissed by agreement of the parties or as being moot. The District Court dismissed 2 cases on jurisdictional grounds.

As of June 30, 1956, there were 46 cases pending in the Court of Appeals. Of these, 7 were heard and are awaiting decision.

A tabulation of the litigation situation for the fiscal year follows:

	Supreme Court	Court of appeals (402b)	Court of appeals (402a)	Court of appeals (neither 402a or 402b)	District courts	Total
Total	5	58	26	2	2	93
Cases affirming Commission	1	13	4	1		19
Cases reversing Commission		10				10
Cases dismissed on jurisdictional grounds		1	2		2	5
Cases dismissed by agreement of the parties or as being moot or without decision on merits		8	1			9
Actions denying certiorari petitions by parties other than Commission	4					4
Cases pending June 30, 1956		[1] 26	19	1		46

[1] In *Telecasting, Inc.* v. *Federal Communications Commission*, Nos. 12841 and 12854, the court of appeals has issued a memorandum stating that action will be withheld pending determination of certain pending Commission proceedings.

During the year the Supreme Court handed down decisions in two cases which substantially affected the Commission:

Multiple ownership.—In *United States and Federal Communications Commission* v. *Storer Broadcasting Company*, 351 U. S. 192, the Supreme Court reversed a decision of the appeals court which had invalidated that part of the Commission's multiple ownership rules which provides maximum limitations on the number of broadcast stations in which any person may have an interest. The appeals court had based its decision on the ground that the multiple ownership rules deprived an applicant of the right to a hearing afforded by Section 309 (b) of the act. The Supreme Court upheld the Commission power to promulgate the rules as "reconcilable with the Communications Act", including 309 (b). The Court pointed out that the "hearing", contended for by Storer and required by the appeals court, need only be afforded an applicant who sets out "adequate reasons why the rules should be waived or amended". Accordingly, the judgment of the appeals court was reversed and the case remanded to that court to consider Storer's other objections to the multiple ownership rules.

Monitoring.—In *United States* v. *Sugden et al.*, 351 U. S. 916, the Supreme Court considered the authority of the Commission to monitor radio communications and to turn over to other Federal agencies for criminal prosecution intercepted information indicating violation of laws other than the Communications Act. The Commission had monitored the station licensed to the Sugdens in the special industrial service and had turned the information over to the Immigration authorities. The Court of Appeals for the 9th Circuit upheld the Commission's right to monitor but stated that, under section 605 of the act prohibiting the unauthorized publication of licensed nonbroadcast communications, Commission monitoring relating to violations of laws other than the Communications Act generally cannot be used in prosecutions for violations of those other laws. The appeals court ruled, however, that since the Sugdens were operating their licensed station without the operator license required by the act, they were outside the protection of section 605. In affirming without opinion the decision of the appeals court, the Supreme Court (3 justices dissenting) upheld the Commission's right to monitor, the use of monitored evidence for enforcement of the Communication Act, and its use for other purposes if the station or operators in question are unlicensed. Although the Commission was not a party to this case, it is discussed here because of its pertinency to the communications field.

During the year the court of appeals released decisions relating to six general areas of Commission action:

Comparative TV decisional standards.—Grants made by the Commission in resolution of some of its many postfreeze comparative TV hearings constituted the greatest source of litigation during the year. The losing applicant or applicants in several such cases sought review of the Commission's decision, alleging error on the findings, the comparative criteria employed, or the judgments reached. In seven cases dealing with the merits of the comparative decision (*Columbia Empire Telecasters, Inc.* v. *Federal Communications Commission*, 228 F. 2d 459; *Pinellas Broadcasting Co.* v. *Federal Communications Commission*, 230 F. 2d 204, *cert. den.*, 350 U. S. 1007; *Southside Virginia Telecasting Corp.* v. *Federal Communications Commission*, 228 F. 2d 644, *cert. den.*, 350 U. S. 1001; *Tampa Times Co.* v. *Federal Communications Commission*, 230 F. 2d 224; *WJIV–TV, Inc.* v. *Federal Communications Commission*, 231 F. 2d 725; *International Broadcasting Corp.* v. *Federal Communications Commission*, No. 12749; *Sacramento Broadcasters* v. *Federal Communications Commission*, No. 12854), the court of appeals affirmed the Commission. It pointed out that the issues raised in the cases fall "in that area in which * * * the Commission has been given wide powers of judgment" by the Congress and that "so long as (the Commission) observes all procedural requirements, considers the issues, reaches reasoned conclusions, and renders reasoned judgments, courts cannot superpose their opinions upon these matters." The court found that the Commission had met this test in each of the seven cited cases.

Post hearing changes.—In two cases, *The Enterprise Co.* v. *Federal Communications Commission*, 231 F. 2d 708 and *W. S. Butterfield Theatres, Inc., et al.* v. *Federal Communications*, Nos. 12527, 12528, 12666, 12667, 12752, 12753, the appeals court took up another aspect of the comparative hearing process—the question of the effect of a change in the winning applicant's composition or TV proposal after the issuance of the Commission's final decision and during the pendency of a petition for rehearing filed by the losing applicant with the Commission. In the *Enterprise* case, the court held that the Commission has jurisdiction to reconsider its comparative decision in view of the change and that,

in the circumstances of that case, it would be an abuse of discretion not to do so. In the *Butterfield* case, the Commission had considered the changes in the winning applicant's proposal and found that no cause existed for exercising its discretion to set aside the grant and reopen the comparative proceeding. The court held that this determination was improper in light of the new developments and, accordingly, remanded the case to the Commission for further comparative proceedings. At the close of the fiscal year there were three cases before the appeals court for decision or argument involving, among other matters, the question of the effect of a change in either the winning or losing applicant during the pendency of the appeal. See *Southland Television Company* v. *Federal Communications Commission*, No. 12021; *Anthony Wayne Broadcasting* v. *Federal Communications Commission*, No. 13112; and *McClatchy Broadcasting Co.* v. *Federal Communications Commission*, Case Nos. 12637 and 12470.

Allocation rule-making cases.—The Commission's rule-making activities in the TV field were also the subject of court litigation. Several UHF stations operating in areas then having no existing VHF stations, because of the lengthy time period needed to resolve the comparative hearings involving the VHF channels, appealed from the denial on November 10, 1955, of their rule-making petition to deintermix their respective communities by substituting a UHF channel for the assigned VHF frequency. The UHF operators also appealed from the grants subsequently made to VHF applicants in such communities after denial of their requests for a stay of such grants pending the outcome of a general rule-making proceding instituted on November 10, 1955. The appeals court, in *Coastal Bend Television Co., et al.* v. *Federal Communications Commission and United States*, Nos. 13034, 13035, 13038, 13039, 13056, 13057, 13058, 13065, affirmed the Commission's actions. The court pointed out that the Commission's decision to adhere to its present allocation plan for the time being, as reflected by its refusal to institute the requested "freeze" on VHF grants so as to prevent competition with existing UHF stations, came "well within its statutory authority," and was, in fact, peculiarly the sort of question committed to the discretion of the expert administrative agency.

In ***Van Curler Broadcasting Corp. v. United States and Federal Communications Commission,*** Nos. 12987 and 12989, decided July 9, 1956, the court considered another rule-making matter "closely akin" to that raised in the *Coastal Bend* cases. Appellants in *Van Curler*, also UHF operators, sought review of the allocation of a VHF channel to a community in their area. The court, in affirming the Commission's order, pointed out that the Commission had followed the procedure provided for in its 1952 basic allocation report (sixth report and order), that the basis and purpose of the order were amply stated, and that the reasons given were rational. That being the case, the court stated, its reviewing function was at an end.

Section 309 (c) protect specificity.—In two cases, the court of appeals interpreted that portion of section 309 (c) of the act which requires parties in interest, filing protests to Commission grants made without hearing, to specify with particularity the facts relied upon to show that the grant is not in the public interest. In *Federal Broadcasting System, Inc.* v. *Federal Communications Commission*, 225 F. 2d 560, the Commission had denied a protest as not having sufficient particularity to satisfy the statutory requirement. The court ruled that under the statute "what is required is merely an articulated statement of some fact or situation which would tend to show, if established at a hearing, that the grant of the license contravened public interest, convenience and necessity".

Applying that test, the court found that appellant's protest raised at least one issue with sufficient particularity to require that a hearing on the protest be granted. Similarly, the court remanded a second *Federal* case (*Federal Broadcasting System, Inc.* v. *Federal Communications Commission*, 231 F. 2d 246) to the Commission, finding on the basis of the above standard that the Commission had again erred in its determination of lack of sufficient particularity as to this protest.

Intervention.—In *Elm City Broadcasting Corporation* v. *Federal Communications Commission*, Case No. 13002, the court of appeals was called upon to determine whether the Commission may, consistent with the newly amended section 309 (b) of the act, deny a petition for intervention timely filed by a party in interest to a Commission proceeding. The Commission had denied intervention because the appellant had made no showing that its intervention would be of assistance to the Commission in determining whether the public interest would be served by the grant. The court ruled that the Commission erred in its interpretation of 309 (b); that, if a person establishes that he is a party in interest, the Commission has no discretion but to grant a timely request for intervention.

Comparative common carrier decisional standards.—In *Telanserphone Inc.* v. *Federal Communications Commission*, 231 F. 2d 732, the court ruled that the Commission, in determining which of two mutually exclusive applications for a one-way radiopaging signal station should be granted, must consider the rates each applicant proposed to charge for its service, since the relative costs to the public are pertinent to the selection of the better applicant from the viewpoint of the public interest. Inasmuch as the Commission had not considered the rate factor, or in any event had not adequately set out the basis for its conclusion that no preference between the applicants existed on this score, the case was remanded to the Commission.

LEGISLATION

Seven bills directly affecting the Commission were enacted by the 84th Congress during the fiscal year. Two of these had been recommended by the Commission.

Public Law 391, approved January 20, 1956, provides that the Commission may deny a protest, after oral argument, without a full evidentiary hearing, where the Commission finds that the facts alleged by the protestant even if proved true would not be ground for setting aside the grant. This, in effect, permits the Commission to consider a protest as on demurrer, a procedure which heretofore has been of doubtful legality. The law also permits the Commission to keep a protested grant in effect pending the outcome of the protest hearing when the Commission finds that the public interest so requires.

Public Law 914 approved August 2, 1956, amended sections 212, 219 (a), 221 (a), and 410 (a) of the act relating to the Commission's regulatory authority over communications common carriers. The law provides for procedural flexibility in the former hearing requirements in the cases of interlocking directorates and consolidation of common carriers, and clarifies the powers of Commission representatives on joint boards.

The other five laws enacted were:

Public Law 947, as originally introduced, and passed by the House, would require the installation of an automatic radiotelegraph call selector on certain

cargo vessels. As enacted August 3, 1956, the bill requires this Commission, the Maritime Commission, and the Coast Guard to study the need for and feasibility of installing such devices and to report to Congress by March 1, 1957.

Public Law 985, approved August 6, 1956, amends the act so as to require certain vessels, carrying more than six passengers for hire, be fitted with a radiotelephone installation.

Public Law 688, approved July 11, 1956, amends section 1343 of title 18, United States Code, to prohibit fraud by wire or radio in foreign as well as interstate commerce.

Public Law 854, approved July 31, 1956, in adjusting the rates of compensation of the heads of the executive departments and of certain Federal agencies, increases the salary of the FCC Chairman from $15,000 to $20,500 and of the other Commissioners from $15,000 to $20,000.

Private Law 878, approved August 6, 1956, authorizes the Commission to license, as an operator, one Miroslav Slovak, an alien.

The following proposal was submitted to Congress but died in committee:

Amendment of sections 503 and 504 (b) of the act, to give the Commission authority to impose small monetary forfeitures for violations of the rules and regulations relating to nonbroadcast radio stations. This proposal was introduced as S. 1549 and H. R. 5613. Both the Senate and House Interstate and Foreign Commerce Committees held hearings.

In addition to proposals by the Commission, numerous other legislative matters affecting communications law were submitted to Congress. Among the more important of these were:

Several bills that dealt with amending section 315 of the act dealing with political broadcasts of presidential, vice presidential, and congressional candidates.

Five bills introduced in the House which sought to require the Commission to license TV booster and VHF translator stations.

Four bills (3 in the House and 1 in the Senate), to amend section 307 of the act so as to limit multiple ownership of TV broadcast facilities on the basis of percentage of population served by the multiple licensee.

The Commission submitted comments to Congress and the Bureau of the Budget concerning 19 legislative proposals which had been referred to the Commission for comment, and testified at several committee hearings on various legislative proposals affecting the Commission's work. The Commission also participated in extensive investigative hearings concerning the communications field by the Senate Committee on Interstate and Foreign Commerce and the House Committee on the Judiciary.

The Commission is drafting legislative proposals with respect to the functions of its review staff and the extent of separation of functions between the Commission and its staff in adjudicatory proceedings, and to make illegal the possession of an unlicensed radio transmitter in a vehicle as a further aid to law enforcement.

During the fiscal year the Commission devoted nearly 7,500 man-hours of work in preparation, attendance and followup in connection with congressional hearings—nearly 4,600 for the House and 2,900 for the Senate.

FEES

On November 14, 1955, the Commission advised the Senate Committee on Government Operations that the FCC does not plan to proceed with rule making looking toward charging fees in connection with its licensing and regulatory functions. In compliance with a provision in the Independent Offices Appropriations Act of 1952, augmented by a Budget Bureau circular, the Commission had proposed a schedule of fees for such services. However, this proceeding was subsequently suspended by resolution of the Senate Interstate and Foreign Commerce Committee.

AUTHORIZATIONS

The Commission closed the fiscal year with more than 1,600,000 radio authorizations outstanding, which was 200,000 more than at the end of fiscal 1955. Radio operator authorizations accounted for the largest group—more than 1,100,000 commercial and nearly 147,000 amateur. Safety and special service authorizations approached 339,000, broadcast authorizations exceeded 7,000, and there were over 7,000 common carrier radio and over 700 experimental radio authorizations. These radio grants collectively represented the use of about 1.2 million fixed and mobile transmitters.

APPLICATIONS AND OTHER FILINGS

More than 451,000 applications of all kinds were received by the Commission during the year. Of these 266,000 concerned commercial radio operators. Over 170,000 involved the safety and special services; 8,600 were broadcast; 4,800 common carrier, and 1,500 miscellaneous.

In addition, the Commission had to consider thousands of petitions and other legal filings in hearing and rule-making proceedings; also more than 17,000 tariffs and 1,600 annual and monthly reports of common carrier and holding companies, and various reports by broadcast and nonbroadcast stations.

CORRESPONDENCE

About 1,200,000 pieces of mail were received or dispatched by the Commission's Washington office during the year. Of this number, nearly 840,000 were incoming and nearly 362,000 were outgoing. These figures do not include mail handled by the Field Engineering and Monitoring Bureau.

The Commission's payment to the Post Office Department for the use of penalty mail during this period amounted to $33,750.

RELEASES AND PUBLICATIONS

The Commission reports its business by means of public notices made available each workday at its Washington office. It does not maintain public mailing lists for such issue. Copies of formal documents (orders, decisions, opinions, etc.) are served on the parties involved. Commission rule making, both proposed and finalized, is published in the Federal Register. The Commission's printed publications (reports, rules, and regulations, etc.) are sold by the Superintendent of Documents. A list is contained in the appendix.

The Commission's regulatory and administrative procedure required some 47,600 stencils, over 9,000,000 sheets of paper, and over 13,500,000 mimeographed impressions during the year.

TECHNICAL ASSISTANCE ACTIVITY

The Commission works closely with the International Cooperation Administration, the Department of State, the United Nations organization, and various foreign embassies in carrying out the technical aid provisions established as an integral part of our country's overall foreign policy. It accomplishes this through planning programs of study and observation in domestic industry for experts and technicians from friendly foreign governments selected to participate in developing their own telecommunications systems. Upward of 40 countries have thus far participated in programs arranged by the Commission in the varied fields of radio, telephone, and telegraph communication.

As of July 1, 1955, 8 projects were in operation including participants from 6 countries. During the year, 33 additional projects were commenced, 8 of which represented additional countries. At the year's close, 18 projects had been completed, 16 others were in operation for nationals of 6 countries, and 28 additional applications from 8 countries were on hand for future programming and placement.

National Defense

COMMISSION PARTICIPATION

The Commission participates in three phases of national defense activity; namely:

1. *It links its own licensees to the military and civil defense programs;*
2. *It provides defense agencies with monitoring and other technical assistance; and*
3. *It is itself a party to local and national civil defense plans.*

To coordinate this work, the Commission has a Defense Steering Committee headed by three Commissioners—Robert E. Lee, as Defense Commissioner, and Robert T. Bartley and John C. Doerfer, as alternate and second alternate Defense Commissioner, respectively.

The staff members comprise a Defense Coordinator and alternate; and representatives of the Broadcast, Common Carrier, Safety and Special, and Field Engineering and Monitoring Bureaus; also the Offices of General Counsel, Chief Engineer, and Administration.

PRESIDENTIAL DELEGATION OF POWERS

The Communications Act provides for the control of communication facilities in time of national emergency. It gives the President special powers in that connection. In 1951 this authority was extended to include radiations from devices which, though not used for communication purposes, are capable of emiting energy which might serve as "beams" to guide enemy aircraft, guided missiles, and other weapons of sky attack. Under Presidential delegation of that same year, the Commission promulgated and is enforcing regulations in this connection with respect to services and apparatus under its jurisdiction.

CONELRAD PROGRAM

CONELRAD is the convenient abbreviation given to the national program for controlling electromagnetic radiation by Government and civilian radio services in an emergency. The Federal Communications Commission is responsible for tying into this undertaking the radio services which it licenses.

In consequence, the Commission has effected CONELRAD plans for the broadcast, aviation, public safety, amateur, land transportation, citizens, and disaster radio services. Other services are complying with a voluntary plan, adopted September 22, 1954, until covered by respective mandatory plans. The first extension of the CONELRAD plan to a territory was to Hawaii, on May 29, 1956.

The purpose of CONELRAD is to provide a system whereby, in the event of real or imminent hostile action, all radio stations may be alerted to an attack or its conclusion, and certain classes of stations enabled to continue essential operation under controlled conditions.

Generally speaking, broadcast stations will be alerted by the Air Force Defense Command; other radio stations will receive the alert by monitoring broadcast stations in air defense divisions in which they are located or by monitoring other designated stations.

As far as broadcasting is concerned, a "radio alert" would cause FM and TV stations to leave the air, until the "all clear" signal, but designated AM stations would broadcast official news, other pertinent information, and civil defense instructions. This would be done on 640 and 1240 kilocycles, which would deter an enemy from getting a bearing on any particular station. About 1,300 AM stations are voluntary participants in this program, at their own expense.

Radio silence would be maintained by nonbroadcast stations except for transmisisons of extreme emergency affecting the national safety or the safety of people and property. Such transmissions would be as short as possible, with the stations' carrier off the air when not transmitting, and no station identification would be given.

A special staff of 18 persons supervises FCC participation in CONELRAD.

CLASSIFIED DEFENSE ACTIVITIES

The Commission is assisting in various defense projects for and at the request of military and civil Government bodies. These cannot be reported here because of the security classification given them by their originating agencies. In brief, however, they may be said to be the joint effort of the Government and the communications industry to cope with all foreseeable emergencies, to harness radio media to the defense effort, to provide essential circuits under any eventuality and, further, to see that our vital communication facilities are adequately safeguarded.

OTHER DEFENSE ACTIVITIES

At the request of the Office of Defense Mobilization, the Commission has established a precedence system for telephone and telegraph

communications essential to the national defense which are transmitted by common carrier facilities. Three priority groups are set up for emergency telephone or TWX calls. Telegrams filed under such circumstances would be classed as "emergency", "immediate", or "rapid" as the case may be. There is also being put into effect, on a voluntary basis, a priority system for resuming intercity private line telephone and telegraph services which might be disrupted by war or other disaster.

There are defense aspects in the normal operation of wire, cable, and radio services.

Practically all of the existing nonbroadcast services help in protecting life and public property on the land, water, and in the air. Special radio services are dedicated to disaster and emergency relief, civilian defense, State Guard, civil air patrol, and kindred purposes. These services are described in the chapter of this report dealing with the safety and special radio services.

For its part, the Commission patrols the radio spectrum around the clock with the Government's only national monitoring system. Besides keeping a technical eye on the transmissions of authorized radio stations, it is on the watch for illicit radio operations, interference to radio services from radio and other electrical equipment, and furnishes bearings on lost or disabled sea and aircraft. This is detailed in the chapter on field engineering and monitoring.

In 1954 the Commission initiated rule making, and heard oral argument, on a proposal to deny amateur and commercial radio operator licenses to members of the Communist Party or of any organization which is required to register as a Communist front or which advocates the overthrow of the Government. No decision has yet been made. Under the Communications Act, FCC licensing is limited to citizens.

In November of 1955 the Commission authorized three radio stations to transmit subaudible tones for the purpose of activating air-raid sirens in Los Angeles County. They were the first grants of this kind.

In connection with defense plans for the Government at Washington, the Commission is prepared to function outside of the capital in event of armed attack. It activated its relocation center in 1955, and functioned there from July 20 to 26 in connection with "Operation Alert—1956". The latter began with the first nationwide daytime CONELRAD drill, when all commercial broadcast operations ceased for 15 minutes.

The Commission has established a line of succession for its officials to act under conditions which bring about its relocation or otherwise disrupt normal operations when higher authority is not present or is unable to act.

The Commission is represented on the Telecommunications Advisory Board, which was established April 23, 1956, under Office of Defense Mobilization chairmanship.

Radio Marches On

THE ELECTRONIC AGE

This age of electronic marvels is advancing radio to an extent undreamed of a decade ago. By traveling with the speed of light, radio communication has shrunk both time and distance and has united places and people as never before. The convenience and efficiency of space transmission is opening new avenues to public and private service. And, at the same time, technical improvements are revolutionizing radio operation in general, whether it is telegraph, telephone, or broadcast.

Scientific refinements have ushered in a pushbutton era of operation. The simple pressing or turning of a knob contributes to ground, sea, and air protection; opens circuits for domestic or international communication; connects farflung business and industry operations; and brings visual and aural news, music, education, and entertainment into the home.

Radio's uses are fast multiplying. Indeed, radio developments have become so kaleidoscopic that covering rules and regulations are, of necessity, in a constant state of revision.

Business is showing an unprecedented interest in utilizing this modern messenger to serve a variety of its needs. This is particularly so in the nonbroadcast and common carrier services.

Many existing safety and special radio services are "bursting at the seams" and seek additional frequency space. Included are those engaged in manufacturing, distributing, and servicing products; in construction and building-supply operations; and in agricultural and other commercial pursuits. Others, which do not want to fit into established services, would like frequencies for new and more specialized services. In addition, many of these same interests—to the inclusion of stores, banks, etc.—are clamoring for their own microwave systems, frequencies for which are in short supply because of priority consideration to the public safety services—such as police, fire, and other protective agencies—and to public utilities which serve the masses.

In the common carrier field there is urge for more elbow room for such radiotelephone operations as long-haul microwave relay by the telephone industry, short-haul point-to-point service by private con-

cerns, mobile communication extension, and added public coastal facilities.

As for broadcasting, the AM band is, generally speaking, so crowded that only local daytime stations, for the most part, are now able to shoehorn in. The VHF portion of the television bands is practically used up in populous areas, and the only room for commercial TV expansion on a national basis is in the UHF range. On the other hand, both commercial and educational FM frequencies are going begging, and educators are finding it difficult to obtain funds to avail themselves of the TV channels which have been reserved for them.

POSTWAR EXPANSION

It is in the aggregate that radio's progress can be best measured.

Ten years ago the Commission's radio authorizations of all kinds (stations and operators) totaled less than 550,000. That figure has since more than doubled—to over 1,600,000.

At that time there were 40 different classes of radio services. Today the number is around 65, notwithstanding some consolidations for administrative purposes.

In 1946, broadcast authorizations were less than 2,500; today they have more than doubled—to over 7,000.

In the nonbroadcast field, authorizations in the aviation, marine, land transportation, public safety, industrial, amateur, and other services have in those 10 years increased from less than 92,000 to nearly 340,000, a gain of nearly 400 percent.

Within that same period the number of commercial operator authorizations to man these stations has multiplied more than threefold—from 315,000 to well over 1.1 million.

Within a decade the gross investment of the telephone industry has increased from $6 billion to over $17 billion; its gross revenue has risen from $2 billion to $6 billion; the number of telephones has grown from less than 28 million to more than 58 million; and the number of annual domestic calls from 50 billion to over 77 billion. In that same period the number of international telephone calls has jumped from 526,000 to nearly 1.2 million, and related revenue from $6 million to $13 million.

At the same time, land line telegraph revenue has risen from $175 million to $228 million, while investment in international telegraph operations is up from $129 million to $135 million, and revenues from $44 million to $68 million.

HIGHLIGHTS OF A DECADE

Radio has made particular strides since 1946. That was the year when radiotelephone service to isolated communities was being pio-

neered; when the first common carrier urban mobile radiotelephone service went into operation; when railroads and public utilities began radio communication on a regular basis; when radio was being tested for directing the movement of taxicabs, trucks, and buses; when microwave relay was still a subject for experimentation; when ship radar was a novelty; when the number of homes having broadcast receivers was less than 60,000,000; when there were only 30 commercial TV station authorizations and no educational TV; and when color TV was still in the laboratory stage.

In 1947 radio became available for power, transit, and petroleum pipeline operations; radar became a regular marine service; frequencies were provided to absorb the excess emissions of medical diathermy and heating equipment which otherwise would interfere with radio communication; an international telecommunications conference rewrote the world's radio agreements in the light of developments spurred by the war; telephone and telegraph companies were constructing their first microwave links; radio was becoming a modern divining rod in exploring for hidden oil deposits; and preparations were being made to open radio to uses by individuals.

The year 1948 saw the start of public radiotelephone service to and from moving trains; an international requirement that ships of 1,600 gross tons carry radio direction-finding apparatus; FM broadcast stations authorized to engage in regular facsimile service; and development of the transistor. The latter, about the size of a shoelace tip, uses about one-tenth the power of a flashlight bulb and amplifies about 100 times. It is supplanting vacuum tubes for many purposes.

The following year (1949) witnessed the establishment of the industrial, land transportation, and citizens radio services; joining of the eastern and midwestern coaxial cable systems; the first harbor-shore radar installation; and the initial type approval of an arc welder meeting the noninterference rules.

In 1950 aeronautical advisory land stations were established; the State Guard radio service reactivated; two new classes of commercial radio operators created; operation of remote radio control devices proposed; the first TV color system approved; and initial toll-TV tests authorized.

Telephone service and TV relay were inaugurated over the coast-to-coast microwave and coaxial-cable system in 1951. In that year long-distance telephone dialing started; radiotelephone service was opened to Guam; disaster communications and industrial radio-location services were authorized; and a novice class of amateur radio-operator license was provided for the beginner.

In 1952, as a result of a proceeding extending from 1948, UHF was opened to TV broadcasting and VHF and UHF channels were

assigned to communities throughout the Nation, some of which were reserved for noncommercial educational use. Also in that year, the radio amateur civil emergency service became operative; international agreement was reached to bring into world force revised allocations of spectrum space to the various radio services; territories received their first FM and TV broadcast grants; and local committees began organizing to cope with TV's growing interference problems.

Under presidential authority, the CONELRAD plan for control of electromagnetic radiation in time of war was made effective for broadcasters in 1953, with provision for its later extension to other services. In that same year new TV color standards were adopted, substituting a "compatible" system for the "incompatible" system of 1950; and the 50 millionth telephone was installed.

The 20th anniversary of the FCC (1954) saw radio's uses extending "from the cradle to the grave" (i. e., from expediting medical aid to expectant mothers to directing funeral processions in cemeteries); radio interference assuming new proportions; first grants to private microwave systems for relaying TV programs; and international radiotelephony, born in the 1920's, exceeding a million calls for the first time.

Testing of "tropospheric scatter" (over-the-horizon transmission) was authorized in 1955; in which year the Commission proposed greater frequency utilization through the use of "single side-band" transmission in the fixed radiotelephone service, and "split channel" operation by vehicular radio in certain bands; and FM broadcast stations were enabled to engage in supplemental activities typified by "functional (background) music" service.

Developments in 1956 are detailed elsewhere in this report.

PUBLIC BENEFITS

Collectively, and apart from the broadcasting phase, radio's developments of the past decade have direct public benefits. They increase the efficiency of navigating and protecting ships and aircraft; aid police and fire protection; expedite emergency calls by doctors, ambulances, and tow trucks; control the movement of streetcars, buses, delivery trucks, and taxicabs; speed commercial communication; facilitate industrial operations, and abet the functioning of pipelines, power and other utilities. Radio utilization by business ranges from small, portable equipment for directing warehouse crews to large communication systems for supervising particular operations.

Public dividends from radio's safeguards of travel, private property, and natural resources cannot be tabulated in dollars. Nor can the radio industry's contribution to the national defense. And there is no monetary yardstick for evaluating the convenience and timesaving benefits of expediting official, business, and private correspondence.

Common Carrier Services

DOMESTIC TELEPHONE

General

The domestic telephone industry continued its accelerated expansion program during calendar 1955, with the Bell System expending about $1.2 billion for additional plant facilities to bring its total gross plant investment to about $15.3 billion. The independent telephone companies also continued to expand their services to bring the industry total to about $17.5 billion. An indication of the industry's tremendous expansion is the fact that the gross plant investment has almost tripled in the past decade. The major developments during fiscal 1956 include the further expansion of customer and operator toll dialing facilities, beginning of construction on a number of microwave radio relay express routes to bypass congested areas, and a further expansion of facilities to bring live color TV programs to additional cities.

By the end of calendar 1955, there were over 56 million telephones in service throughout the Nation, of which about 46 million were operated by the Bell System and over 10 million by independent telephone companies. By the end of fiscal 1956 the total number of telephones exceeded 58 million. The Bell System added a near record 2.8 million telephones during the year, as compared with 1.9 million during the previous year, and reported 207,000 orders for main service and 781,000 requests for upgrades in existing service as of June 30, 1956.

For the calendar year 1955 there was a daily average of approximately 205 million local and 7.1 million toll telephone calls. Local and toll calls increased 5.6 and 12.0 percent, respectively, over the previous year. During the same period, Bell System TWX and private line service revenues increased 8.17 and 12.33 percent, respectively.

Dialing of both local and long-distance calls continued to increase, with 87 percent of the Bell telephones and 65 percent of the independent telephones being dial operated by the end of the year. Half a million subscribers in 65 different communities can now dial long-distance calls to about 16 million telephones in 17 large metropolitan areas. Bell operators are dialing about 60 percent of all toll calls directly to destination, and 4,300 cities and towns are connected to the toll-dialing network, a gain of about 950 during the year. The number of large traffic centers equipped for toll dialing increased to 39.

Gross operating revenues of the Bell System reached a new high of $5,297,500,000 for the calendar year 1955, an increase of about 10.7 percent over the previous year. The total gross revenue for the telephone industry was about $6 billion. Consolidated net income applicable to American Telephone & Telegraph Co. capital stock amounted to $664,243,416, an increase of 20.8 percent over 1954. Earnings per share increased from $11.92 in 1954 to $13.10 in 1955, while the number of outstanding shares increased about 6 million.

The following table illustrates the expansion of the Bell System:

Year	Telephones	Plant book cost	Revenues	Employees
1945	22,445,519	$5,702,056,557	$1,930,889,452	387,360
1950	35,343,440	10,101,521,562	3,261,528,032	523,251
1954	43,321,849	14,131,277,000	4,784,500,000	578,436
1955	46,218,000	15,340,495,000	5,297,043,000	615,895

Services and Facilities

Construction of facilities.—The bulk of the $1.2 billion spent by the Bell System during calendar 1955 went for additional central office equipment, buildings, outside exchange plant, and other facilities to serve additional customers. Commission authorizations during fiscal 1956 for Bell facilities to be used in connection with interstate and foreign services totaled $127.2 million in estimated expenditures. The Commission granted 178 applications for authority for construction, lease, or acquisition and operation of wire and cable toll facilities, involving estimated construction costs of $84.5 million. Included in this total was the annual blanket application of A. T. & T. and its associated companies totaling about $32.9 million. A supplement to the 1956 blanket application, filed toward the close of the fiscal year and approval for which is pending, involves additional expenditures estimated at $23.8 million.

The estimated amounts and cost of wire and cable construction authorized by the Commission since 1951 are tabulated below:

Fiscal year	Number of projects	Cost	Sheath miles of cable	Tube miles of coaxial units	Conductor miles of open wire
1951	218	$45,795,686	957	2,704	5,641
1952	323	107,533,688	1,388	2,972	5,998
1953	358	89,228,416	1,494	5,678	2,006
1954	234	62,985,906	730	564	1,837
1955	126	82,947,707	2,669	2,375	185
1956	178	84,573,125	2,606	1,562	765

The above totals include 6 authorizations during fiscal 1956 for the acquisition or lease by telephone companies of facilities owned by other companies, and an estimated expenditure of about $3.1 million

for the conversion of existing coaxial cable facilities to increase their capacity. The reduction in the number of applications filed during the past 2 years has resulted, in part, from a change in the Commission's rules under which carriers may undertake small projects without securing prior approval. For fiscal year 1956, 240 such projects aggregating about $1 million in construction costs were reported by carriers.

In addition to wire and cable authorizations, the Commission granted 496 microwave radio applications in fiscal 1956. A. T. & T. received authority to construct additional microwave radio relay channels on existing and new routes to provide an additional 28,329 broad band radio channel-miles which are estimated to cost approximately $42.7 million. During the same period, the Commission authorized 13 independent telephone company microwave projects costing an estimated $2 million.

By the end of fiscal 1956, the Bell System coaxial cable and microwave radio facilities in use for nationwide TV service totaled about 73,000 channel-miles, with about 400 stations in 270 cities interconnected. Color TV service was available to 283 stations in 162 cities. The Bell System also increased the use of microwaves for telephone service, with about 8.8 million telephone toll circuit miles in use by the end of the fiscal year.

Bell facilities were also expanded to provide "off-air" reception and transmission of programs to TV stations, with 7 systems costing an estimated $380,575 being placed in service during the fiscal year.

Discontinuance of service.—During fiscal 1956, the Commission granted 25 applications to discontinue telephone service, including 4 held over from the previous year. Each involved the substitution of one telephone carrier for another. Three applications filed toward the fiscal year end had not been acted upon.

Speed of service.—The Bell System reported that the average time for completing toll calls was 1.4 minutes in 1955 and that 97 percent of all toll calls were completed while the calling party held the line.

Acquisitions and consolidations.—The Commission received 25 applications from domestic telephone carriers for authority to acquire the property of another carrier. After public hearings, 12 were granted, together with 10 held over from the previous year. The approved applications represented a gross acquisition cost of about $2.2 million. Of the 13 applications pending at the close of the fiscal year, initial decisions recommended grants in 5 cases, hearings had been held on 3 others and were scheduled on 5 more.

Interlocking directorates.—The Commission received 25 applications for authority to hold positions of officer or director of more than

1 domestic telephone carrier. All but 1 were granted by the fiscal year's end.

Reclassification of companies.—No petitions were received from telephone companies requesting classifications as "connecting carriers" under section 2 (b) 2 of the act which would render them subject only to sections 201 through 205, inclusive.

Merger.—On October 31, 1955, Theodore Gary & Co. was merged into General Telephone Corp. A review is being made to determine whether this occasioned changes in the jurisdictional status, for regulatory purposes, of any of the operating telephone companies. The General Telephone System now provides telephone service in parts of 30 States and in some foreign countries. The system also includes domestic manufacturing, sales, and telephone directory companies and foreign manufacturing and sales companies. As of December 31, 1955, it had 2,548,000 domestic telephones in service.

Foreign attachment case.—On December 23, 1955, the Commission released its final decision in the case of *Hush-A-Phone Corp.*, et al. v. *American Telephone and Telegraph Co.*, et al. (Docket 9189). It upheld the reasonableness of the so-called "foreign-attachment" provision of the Bell companies' tariffs as that provision is applied to the Hush-A-Phone device, and dismissed the complaint of Hush-A-Phone Corp. and Harry C. Tuttle against the Bell companies. A court appeal is pending.

Domestic public land mobile radio service.—The number of radio systems licensed for one-way signaling (radiopaging) operations increased by 21 percent. At the close of the fiscal year 69 such systems were licensed and 22 others were under construction.

Due to the lack of frequencies to accommodate all applicants for such systems, it was necessary to hold a comparative hearing for the Detroit area. A final decision was issued in this case (Docket 11055), and also in a similar comparative case involving the Cleveland-Akron area (Dockets 11372 and 11373). Construction permits issued without hearing to applicants at Allentown-Bethlehem, Pa., and Bakersfield, Calif., were protested by existing stations furnishing a like service in these areas. After hearings, initial decisions were issued in both cases (Dockets 11500 and 11596).

The number of miscellaneous (nontelephone company) common carrier land mobile radio systems for 2-way communication service increased by eight percent. As of June 30, 1956, there were 325 such systems authorized in the United States, Puerto Rico, Alaska, and Hawaii. An application seeking to renew a construction permit in the Rochester, N. Y., area, which was authorized for several years but never constructed, was denied (Docket 11184).

During fiscal 1955, the Commission renewed for 1 year only, in lieu of the usual 2-year license period, the licenses of 22 miscellaneous common carrier stations in the domestic public land mobile radio service, because their annual reports indicated that they are not rendering service to the general public. Of these, 14 had failed to render public service by renewal time and submitted their licenses for cancellation; 6 others had commenced serving the public and their licenses were renewed for the balance of the 2-year term, and 2 more were unable to show that public service had been rendered and their renewal applications were designated for hearing (Dockets 11706 and 11707).

General communications common carriers (telephone companies) expanded the number of land mobile radio systems for 2-way communications by 11 percent. At the end of the fiscal year, there were 319 such systems authorized.

On June 13, 1956, the Commission completed its rule-making proceeding (Docket 10821) and adopted a new part 21 of its domestic public radio services rules consolidating the various provisions relating to domestic use of radio by communications common carriers (other than aeronautical, maritime, and certain Alaskan and special emergency services). This was accomplished by transferring from part 6 to part 21 the rules governing the domestic public land mobile radio services, which have been revised and expanded in various particulars to meet the growth of these services, and by setting forth in part 21 new rules for regulating certain other domestic common carrier radio services previously authorized under part 5 of the rules governing experimental radio services. The revised part 21 became effective September 4, 1956.

The more detailed nature of the new part 21 will be of material assistance to the public in properly executing all types of applications for domestic common carrier radio authorizations and in guiding the operational aspects of their radio systems. At the same time, the new rules will permit the Commission to process applications more expeditiously. However, conversion of the extensive domestic common carrier operations, currently licensed on an experimental basis, to a regularized service under part 21 is expected to be a substantial task during the next fiscal year. Regularizing the status of these services is also expected to overcome reluctance on the part of the smaller independent telephone companies to enter the common carrier radio field while it was still on an experimental basis. Generally, the new part 21 also provides license terms of 3 to 5 years in lieu of the 1-year term in the experimental rules.

Rural subscriber and short-haul toll radiotelephone services.— These experimental radio services are intended to furnish domestic public communication service to points where it is impracticable to

provide wireline communication. They showed an increase of 12 percent in rural subscriber stations and a decrease of 4 percent in short-haul toll radiotelephone stations. As of June 30, 1956, there were 101 rural subscribers stations and 73 short-haul toll stations authorized.

TV pickup and studio-transmitter links.—At the end of June 1956, there were 367 transmitters authorized to common carriers in the experimental TV-pickup service for use in connection with TV broadcast operations. There were also 41 transmitters authorized in the experimental TV-STL service for use by common carriers in providing video transmission facilities to broadcasters between studios and transmitters.

Community TV antennas.—During fiscal 1956 the Commission authorized 13 microwave systems aggregating about $450,000 to provide off-air pickup and relay service for community antenna TV systems. Pending at the close of the year were applications for 6 additional systems, including 1 to serve Rapid City, S. Dak., mentioned in the previous annual report, concerning which a joint hearing was held in fiscal 1956. During the course of that proceeding 1 of the applicants withdrew and an initial decision favored a grant to the remaining applicant.

On April 6, 1956, a "complaint" was filed by a group of TV broadcasters against 288 operators of community antenna systems. The group seeks to have the Commission exercise jurisdiction over such systems as common carriers. Copies of the "complaint" were sent to the systems for comment on the questions raised. After studying the replies, the Commission will determine what further action may be required.

Tariff filings.—At the close of the fiscal year tariffs or concurrences were on file for 466 telephone carriers. During the year, 15,412 tariff publications consisting of new or revised pages, supplements, concurrences, revocations, or adoption notices were received.

Private line service rates.—On September 23, 1955, the American Telephone & Telegraph Co. filed a new tariff applicable to multiple private line services and channels. This tariff provides for a declining rate per channel as the number of private-line channels of all types (except program transmission) used by a single customer between a given pair of points increases. Western Union protested. On October 19, 1955, the Commission suspended the effectiveness of the tariff and ordered an investigation into its lawfulness. Subsequently, on March 9, 1956, it ordered an investigation into the lawfulness of the effective tariffs applicable to all private line services (excluding program transmission) of A. T. & T. and Western Union. Revised A. T.

& T. tariffs for multiple-line service, which became effective September 1, 1956, were included in the general proceeding.

TV transmission charges.—On April 11, 1956, Community Television Systems of Wyoming, Inc., filed a complaint with the Commission alleging that the charges of Mountain States Telephone & Telegraph Co. for certain TV transmission facilities furnished the complainant are unjust, unreasonable, and discriminatory. Defendants filed an answer generally denying this. At the close of the fiscal year, the complaint and answer were under consideration.

Other Regulatory Matters

Depreciation.—During fiscal 1956, the Commission revised depreciation rates previously prescribed for 5 major Bell companies, including 2 multistate companies serving 14 States. The revised rates resulted in depreciation charges aggregating $186,338,000 for the year ended December 31, 1955, representing an increase of approximately $6,000,000, or 3.2 percent over the charges for that year based on the depreciation rates previously in effect.

It was noted in the 21st annual report that, due to anticipated significant changes in the telephone art and other changes taking place currently as a result of the continued rapid expansion of telephone plant facilities, there might soon be a reversal in the downward trend of depreciation rates. Studies conducted during the year with respect to the Bell companies indicate that the current trend is toward higher depreciation rates. The major reasons are: (*a*) Expectation that electronic switching systems, to be in commercial production by 1960 or 1961, will result in premature retirements of some of the electromechanical types of dial central office equipment currently in service; (*b*) growing popular demand for the improved types of telephone instruments which is beginning to shorten the service lives of many older types of apparatus in use; (*c*) increased rate of rearrangements and resulting retirements of outside plant due to the continuing rapid expansion of telephone facilities in general, and (*d*) increased cost of removal associated with plant retired.

Depreciation expense charges of telephone companies continued to increase. In the case of the 23 Bell companies, these charges aggregated more than $523,482,000 for the 1955 calendar year, an increase of $44,171,000, or 9.2 percent over 1954. The major part of this was due directly to the expansion of telephone plant facilities (from $14.2 billion on January 1, 1955, to $15.4 billion on December 31, 1955, or 8.1 percent). Some of the increase, however, was attributable to the upward adjustments in depreciation rates which the Commission approved during fiscal 1956 for five Bell companies.

Separation procedures.—On January 20, 1956, the Commission approved the use, on an interim basis, of the so-called "Modified Phoenix Plan", a revision of the procedures used by telephone companies to separate and apportion their investment and expenses between interstate and intrastate operations. The plan is an outgrowth of the continuing studies of telephone separation procedures conducted by the Commission cooperatively with the National Association of Railroad and Utilities Commissioners. The Bell companies are incorporating the revised procedures in their division of revenue contracts as of July 1, 1956. The plan will have the effect of allocating increased amounts of plant investment and expenses from Bell's intrastate telephone operations to its interstate operations. Thereby, Bell's annual revenue requirements applicable to its intrastate operations will be reduced by an estimated $35 million to $40 million.

Western Electric earnings and prices.—The Commission, also in cooperation with NARUC, continued its review of the prices, earnings, and costs of Western Electric Co. Data developed are reported quarterly and annually to the various telephone regulatory commissions to assist them in their consideration of Western's prices insofar as they affect the revenue requirements of the Bell companies affiliated with Western.

Pensions and relief.—Pension plans of most Bell companies continued in effect without change. However, some of the companies changed the maximum permissible accident death benefit payment from $10,000 to $30,000 and the maximum death benefit payment for burial expenses from $250 to $500. The Bell companies, including those engaged in manufacturing and research, paid out or set aside $287,000,000 in 1955 to cover pensions and other benefits costs (including Federal taxes for social security benefits). The pension funds of all of these companies aggregated about $2,168 million at December 31, 1955. At that time, 20,301 men and 18,220 women were receiving service pensions.

The annual study of Bell pension factors was made. The earnings of the pension fund continued at about 3 percent, as in 1954. The rate of interest assumed for actuarial purposes remained at 2¾ percent.

Uniform systems of accounts.—Proceedings commenced in fiscal 1955 on whether amounts of contributions for charitable, educational, social, and community welfare purposes should be permitted to be charged to operating expenses instead of "below the line" were terminated. The Commission decided against making any change. Other proceedings led the Commission to broaden somewhat its rule as to what small construction project costs can be charged directly to telephone plant in service accounts. At the same time, the rules regarding plant retirement accounting were clarified.

Restatement of plant accounts on basis of original cost.—Further review and a field study have been made of a pending non-Bell company original cost matter looking towards its final disposition. Also, several current acquisitions of plant were handled during the year, including the disposition of amounts in excess of original cost of plant. As mentioned in the 1955 report, consideration continues to be given to the applicability of original cost accounting to acquisitions of plant from certain nontelephone public utility companies where the acquired plant is integrated into the telephone system of the purchaser.

Continuing property records.—Limited reviews were made of certain phases of the continuing property records of several Bell companies and one non-Bell company. Particular attention was given to the development of retirement unit costs of outside plant and the pricing of partial retirements of buildings, central office equipment, and large private branch exchanges.

General and limited audits.—A general review was made of the accounts of one Bell company. In general, the accounts of the company were in substantial compliance with regulations. However, several minor adjustments were required in the accounts as well as certain changes in the company's accounting practices and procedures. Problems common to the Bell System are under separate consideration.

Limited reviews were made of certain of the accounts and related records of several other Bell companies and one non-Bell company. They were related primarily to plant accounting and accounting for operating revenues and expenses in the light of the Commission's accounting regulations.

NARUC Committees on Accounts and Statistics and Depreciation.—The Commission participated in the work of these committees on questions of mutual concern to State and Federal regulatory bodies.

DOMESTIC TELEGRAPH

General

The Western Union Telegraph Co. provides practically all of the domestic message telegraph services in the United States by means of some 23,000 public offices and a nationwide interconnecting communication system of wire lines, radio facilities and terminal equipment representing a gross investment of $311 million. Western Union also owns and operates a large international ocean-cable system.

Although Western Union is furnishing increasing amounts of private line telegraph services, the Bell telephone system continues to handle the great bulk of such services, including teletypewriter exchange service (TWX), which are directly competitive with the telegraph services of Western Union. Bell's telegraph services

account for nearly one-third of all domestic record communications revenue.

Western Union's gross land line operating revenues for the calendar year 1955 reached a new peak of $228,816,000 although traffic volume increased less than one percent to a total of 153,023,000 messages handled. In 1954, operating revenues amounted to $209,635,000. Its systemwide net income, including ocean-cable operations, was $11,686,000 after providing $10,476,000 for Federal income tax. Comparable 1954 systemwide net income amounted to $6,471,000 after $7,725,000 for Federal income tax.

Gross revenues for land line operations for the last half of fiscal 1956 remained at approximately the same level as in the previous six months—$116,324,000 as compared with $115,850,000. Increases in private line revenues were offset by declines in message revenues as reflected by a volume of 80,606,000 messages as compared with 79,529,000 for the first half of fiscal 1956. Systemwide net income for the last half of fiscal 1956 amounted to $6,671,000 after $4,707,000 for Federal income tax.

In July 1955, Western Union completed an extensive recapitalization, with the sale of slightly over a million shares of previously authorized stock. The proceeds, approximately $20,800,000, were intended for additional plant expansion in the private wire, facsimile, and microwave fields.

Early in June 1956, the company concluded wage agreements with its unions which increased expenses on an annual basis by $10,544,000, effective June 1, 1956, and by $4,192,000, effective January 1, 1957. In consequence, Western Union requested increased rates for certain services which is discussed under "Domestic Telegraph Rates".

Western Union still faces strong competition from toll telephone service and from the telegraph services of the telephone companies. Despite substantial savings in operating expenses flowing from mechanization, office closures and service curtailments, repeated wage increases since 1945 and increased prices have resulted in message telegraph rates being nearly double those in effect during World War II. The combination of increased rates, expansion of the private wire services, and operating economies, however, have resulted in improved earnings in recent years.

Services and Facilities

Reperforator switching.—Western Union serves the Nation through a network of high-speed transmission facilities built around 15 strategically located reperforator switching centers providing automatic and semiautomatic relay of telegrams between cities. Each

center serves from one to six states and each is provided with direct channels to other centers. Reperforator switching eliminates manual retransmission, thereby effecting substantial economies and faster service.

The principal modifications effected in the reperforator switching system during fiscal 1956 included equipment reassignments to distribute message load more evenly between manual switching positions, termination of additional originating message circuits in automatic switching equipment, and the interconnection of additional customer tielines with the company's reperforator switching system.

So-called "small office reperforation" was tried successfully at Passaic, N. J., for terminal handlings. The company plans to extend this to other cities where load conditions are similar to those at Passaic, the effect of which will be to reduce the number of manual relays and thereby to speed up service. Traffic destined to Brooklyn, N. Y., is scheduled to be handled by similar methods from the New York main office.

Carrier equipment.—As of June 30, 1956, telegraph channel mileage in operation approximated 3,840,000 for message services, including 324,000 miles added during the year. Two-thirds of the total mileage was derived through use of carrier equipment on leased voice frequency channels and on company-owned microwave and other facilities.

Radio beam.—The New York-Washington-Pittsburgh and the New York-Philadelphia microwave relay systems were rearranged during fiscal 1956 to achieve their full capacity. The number of telegraph channel miles in operation on these facilities has increased to 220,150, as compared with 124,850 at the end of fiscal 1955. On May 29, 1956, Western Union filed to extend its microwave relay routes from Pittsburgh to Cincinnati via Columbus and from Cincinnati to Chicago via Indianapolis. The extended system, expected to be in service early in 1957, is designed for 48 voice frequency bands and will increase the availability of telegraph facilities generally in the Midwest area.

Private wire systems.—Western Union's sales of leased private wire systems continued to expand rapidly. The company's revenues from leased private wire and facsimile systems have grown fivefold in the past seven years, and increased approximately 21 percent during fiscal 1956 compared with the preceding year. Facilities used by Western Union for private wire services totaled 2,202,000 miles at the end of the year, an increase of 439,000 miles or 25 percent over 1955.

Increasing application of automation to various business operations, frequently called "integrated data processing", is a further stimulant

in the private wire field. Many Western Union private-wire systems have been specially engineered to handle the rapid transmission of statistical data in perforated tape or punched card form. The most comprehensive of these IDP systems, an 18,000-mile electronic network connecting 61 cities, was installed during fiscal 1956 for an industrial firm. Also among Western Union's new private-wire systems is a transcontinental network for an investment brokerage firm. This automatic custom-built system, designed to meet maximum speed requirements, links 20 cities.

During the last half of fiscal 1956, Western Union was awarded a contract by the Air Materiel Command, as the initial step in a plan to unify and improve the efficiency of the domestic and global communications systems of the United States Air Force. In the new system, each message will be typed only once, at the place of origin, and transmitted automatically to the desired Air Force base in any part of the world. The contract involves the leasing of automatic equipment to replace pushbutton equipment now used at 5 main communications centers. These new centers will be a part of the 200,000-mile network linking more than 200 Air Force bases throughout the country.

Facsimile.—Western Union continued to provide increasing numbers of its customers with deskfax (facsimile) connections to telegraph central offices. The deskfax, installed on the customer's desk, speeds the delivery and pickup of messages and stimulates telegraph usage. During fiscal 1956, deskfax was extended to 5,600 additional customers' offices, bringing to nearly 26,000 the total number of such units in use. Thousands more are scheduled for installation in the ensuing year. In addition to deskfax units in service, teleprinter-operated direct wires to customers number approximately 22,500, making a total of nearly 49,000 direct customer conections. The continuing expansion in these direct connections improves service and materially reduces the need for messenger handling.

Western Union continued its development of a wide range of specialized facsimile equipment. These new leased facsimile systems, which the company calls "intrafax", are used to link departments, offices, and buildings for fast, efficient internal communication. Intrafax reproduces a complete letter-sized document in less than 3 minutes, while the new "ticketfax", leased to railroads to speed passenger reservation and ticket handlings, transmits Pullman or reserved-seat coach tickets in 8 seconds.

Modernization expenditures.—During calendar 1955, Western Union expended $3,250,000 on its modernization program, bringing total expenditures for this purpose of $63,000,000. The company

estimates that projected future expenditures will total $33,800,000. Estimated savings in operating expenses resulting from this program currently aggregate $33,500,000 a year.

Construction of wire facilities.—The Commission received 8 Western Union requests for wire telegraph construction and extensions. Five were granted and 3 were pending at the end of the year. Those granted covered the leasing of 642,126 telegraph channel miles of line at an annual rental of $684,983 and the construction of 64,124 telegraph channel miles of line and associated equipment at a cost of approximately $4,983,500. The larger portion of these facilities was proposed for meeting the needs for expected growth of private leased telegraph services, while the remainder was allotted for extension of lines and improvement in message telegraph service.

Curtailment of service.—A total of 710 applications for reduction in hours of service or closure of public telegraph offices were filed by Western Union as compared with 924 the previous year. In addition, 100 such applications were pending at the beginning of the year. Of the total, 704 applications were granted, 15 were withdrawn, 3 were denied, 1 was dismissed, and 87 were pending. Generally, where hours were reduced or offices closed, alternate service was made available.

Western Union estimates that savings of more than $7½ million a year have been effected by office closure and hour reductions, 1947 through 1955. Although the number of applications declined in fiscal 1956, when compared with 1955, current applications present increasingly complex service problems which have resulted from extensive changes in the pickup and delivery methods used in cities, by closing and relocating branch offices, installing thousands of facsimile tielines on customers' premises and substituting agency offices and messenger stations for company-operated offices. These problems have necessitated more on-the-spot investigations and detailed studies to appraise the company's coverage surveys, to determine the adequacy of proposed substitute service and to insure compliance by the company with commitments in the ensuing applications filed pursuant to section 214 of the act.

Speed of service.—Western Union is required to conduct daily studies of the speed of service accorded messages at the 25 largest telegraph cities and to report monthly summaries. The reports show the average origin to destination speed (interval between the time a message is filed by sender and the time it is delivered to addressee, or first attempt) and the average office relay drag (time required for a message to pass through a large message center). The following

table compares the average speed of service in minutes reported for the past 6 fiscal years:

Fiscal year	Message center [1]	Origin to destination delivered by—		
		Telephone	Tieline	Messenger
1951	8.7	41.2	37.9	45.4
1952	8.5	41.6	37.5	45.1
1953	8.4	43.0	37.8	46.2
1954	8.4	43.7	37.9	47.2
1955	7.3	39.6	34.4	43.0
1956	7.5	39.1	34.1	43.0

[1] Message center speed of service included in origin to destination service.

This summary shows that the average service for the 25 cities combined was faster in all categories in fiscal 1955 and 1956 than for the previous years. The so-called "quality control" program initiated by Western Union in 1954 may be largely responsible for this improvement. The program was instituted on a system-wide trial basis in an effort to eliminate longer delays than average. The overall speed of service objective has been a maximum of 60 minutes from time filed to time delivered for messages sent by tieline or telephone, or a maximum of 60 minutes from time filed to time routed out for messages requiring physical delivery.

In view of certain changes in operating practices, which have resulted from technological developments, a proposed amendment of part 64 of the rules relating to domestic telegraph speed of service studies is in preparation.

During the year, investigations of on-the-ground service conditions were limited principally to inspections of some 170 Western Union offices and agencies located in or near San Francisco, St. Louis, and New York, where Commission common carrier field offices are located. Routine inspections of the service preformance of 11 other Western Union offices and agencies were made by Commission field engineers.

Although experience has shown that field investigations have had a salutary effect on the offices visited and on service generally, only a small minority of Western Union offices and agencies have every been inspected by the Commission. It is planned to make more field investigations to determine the adequacy of service and facilities at telegraph message centers and offices throughout the country, the desirability of establishing adequate service standards and criteria, and the effect of technological developments in telegraph operations and how their application may best serve the public interest.

Proposed private telegraph network to serve TV industry.—The TelePrompTer Corp. requested a Commission ruling on whether a contemplated nationwide private line telegraph network to serve TV stations, networks, and others in the industry with communication

relating to programming would be a communications common carrier subject to Commission jurisdiction. After an informal study, the Commission, in November 1955, advised that such an operation would be subject to its jurisdiction.

Telecar pickup and delivery service.—During the latter part of fiscal 1956, Western Union discontinued operation of its telecar facilities because experience showed that their continued use was uneconomical. The system, which was in operation in Baltimore, was a radio facsimile transmission facility between the central telegraph terminal and messenger vehicles in residential areas for the rapid delivery and pickup of telegrams.

Rates and Tariffs

Domestic telegraph rates.—Western Union, on June 29, 1956, filed revised tariff schedules contemplating increased charges and regulations changes for interstate messages and money orders and various miscellaneous services. Increased rates, according to Western Union, are necessary to offset higher wages resulting from recently negotiated labor contracts. On July 19, the Commission suspended the proposed tariffs and instituted an investigation (Docket 11800). Western Union later obtained special permission to substitute schedules containing somewhat lower charges. The latter, effective August 26, 1956, are estimated by the company to increase annual revenue by $9,657,000 after allowing for traffic shrinkage due to increased rates. According to Western Union, the substitute schedules will produce about $1.8 million a year less than the suspended schedules.

The new schedules further liberalize Western Union's discount plan, which saves 20 cents a message for customers who have direct-wire connections with telegraph offices. The discount applies to all such messages in excess of 50 (currently 100) filed by a customer in a month.

Following Commission suggestions of long standing, the new schedules discontinue collection of telephone toll charges for messages delivered by telephone to points where telegraph offices are closed for the day and eliminate so-called "other-line" charges (additional telegraph message delivery charges) at certain places served only by messenger, telephone, or agent. The imposition of such charges has been a recurring subject of complaint to the Commission by telegraph users.

In an effort to measure the effect of reduced rates on the volume of messages, Western Union established special rates for certain Christmas and New Year messages during the period October 10 to December 22, 1955. It concluded that the increased revenue therefrom was not sufficient to offset the increased costs in handling the increased volume.

Western Union filed revised tariffs, effective September 28, 1955, establishing new and revised rates and regulations for interstate

private line facsimile (intrafax) service. This service contemplates the leasing of channel facilities and station equipment which are suitable for facsimile, telephotograph, and other purposes having similar transmission requirements.

Leased facilities services.—In March 1956, the Commission instituted an investigation (Docket 11646) into the lawfulness of the charges, classifications, regulations, and practices in connection with the leased facilities services of Western Union. This investigation has been consolidated with investigations (Dockets 11518 and 11645) of all private line services of the Bell System (except broadcast transmission) noted under "Domestic Telephone".

Tariff schedules.—During fiscal year 1956, carriers filed 884 pages of tariff material affecting charges and regulations applicable to domestic telegraph service.

INTERNATIONAL TELEGRAPH AND TELEPHONE

General

Worldwide wire and radio communication service is available in the United States through carriers offering facilities for the transmission and reception of international communications by means of cable-telegraph, radiotelegraph, and radiotelephone.

Telegraph service between the continental United States and foreign and overseas points is offered by 4 cable and 6 radio carriers. Telegraph and telephone service to ships at sea and aircraft is furnished by several of the radio carriers as well as by others exclusively engaged in such service. Radiotelephone service to more than 100 foreign and overseas points as well as to ships at sea is offered by the American Telephone & Telegraph Co. Territories and possessions of the United States are provided with similar international telegraph and telephone service.

Gross operating revenues of the 10 cable and radio carriers rendering telegraph service between the continental United States and overseas and foreign points totaled $68,049,543 for calendar 1955. This represented a new high for the postwar period and was $4,238,427, or 6.6 percent more than in 1954. Gross operating revenues from message telegraph traffic increased $2,737,810 (5.1 percent) over calendar 1954 to reach $55,965,528. The balance of gross operating revenues resulted from various special services such as leased channels, international teleprinter exchanges, and other nonmessage services. These rose by $1,500,617, or 14.2 percent, from the previous year. International teleprinter exchange service showed a marked rise (56 percent), due to its greater availability to senders in the United States and its expansion to new areas as well as its increased use to previously established points.

Gross operating revenues from marine message service to ships and aircraft, in calendar 1955, was $1,554,269 and represented an increase of $104,392, or 7.2 percent, from the 1954 level.

As a result, industry-wide net operating revenues before Federal income taxes rose to their highest point since 1945, for a total of $9,683,839. This was $526,642 (5.8 percent) more than the comparable 1954 figure, despite a rise of 6.8 percent in operating expenses for 1955. The companies providing telegraph service to foreign and overseas points and ships at sea as of the close of the calendar year had gross investment in plant and equipment of $135,178,336, while their net investment after depreciation allowances was $58,746,965.

The volume of cablegrams and radiograms flowing between the United States and other countries during calendar 1955 rose to 548,574,177 paid words. This was 26,746,518 (5.1 percent) more than in 1954 and represented an increase for the second successive year. Likewise, the volume of international radiotelephone calls showed a continued steady rise so that chargeable calls reached a new level of 1,193,785 for the year, an increase of 13.6 percent from 1954. Corresponding revenues (including associated land line charges) rose by a similar percentage over 1954 to a total of $13,001,159 for the year.

Latest available reports indicate that the upward trend in both telegraph and telephone traffic volumes and revenues has continued into calendar 1956.

International Conferences

The Commission was represented at meetings of two subcommittees of the International Telegraph Consultative Committee (CCIT) held at London during April to resolve several technical questions relating to phototelegraphy and facsimile. (The functions of the CCIT, pursuant to the International Telecommunications Convention of Buenos Aires, 1952, are to study operating, technical and tariff questions relating to telegraphy and facsimile and to formulate recommendations.) The positions reached on the questions considered by the study groups were in accord with those advocated by the United States delegation.

The Commission also participated in a telecommunications meeting between officials of the United Kingdom and the United States at Washington during May. The discussions consisted of an exchange of views relating to plant modernization, utilization of new facilities and techniques, and methods of utilizing communications facilities to serve the mutual interests of the two nations. There was no intent to arrive at any specific agreements.

International Services

Telegraph.—Direct telegraph service by means of submarine cables is provided by United States companies with various Latin American and European points. No overseas cables from the United States to

Pacific points are in operation at present. United States companies were operating from the continental United States direct radiotelegraph circuits to 88 foreign and overseas points at the end of fiscal 1956. Through interconnection between the United States cable and radio facilities and those of foreign carriers, telegraph traffic is relayed to practically every country in the world not served by direct circuits.

Provision of international "customer-to-customer" type of service as offered by the telegraph carriers, of which "TEX" or "TELEX" (international teletypewriter exchange) and "IMCO" (international metered communication) are representative, showed an increased trend during the year. Communication channels between the United States and world points are provided by the international carriers enabling customers to communicate directly by means of equipment installed on their premises. The charge for this type of service is on a per-minute or per-letter basis. A similar and widely used type of service; namely, "leased line", provides customers with direct communication service for various periods of time, usually on a monthly basis with a minimum daily use.

During the year arrangements were concluded between Bell System companies on the one hand, and RCA Communications, Inc., Mackay Radio & Telegraph Co., and Globe Wireless, Ltd., on the other hand, for the interconnection of Bell's domestic TWX facilities with the international teleprinter exchange system maintained by each of the latter companies. These arrangements permit a TWX user anywhere in the United States to communicate directly with a teleprinter exchange subscriber abroad. TWX charges to the point of interconnection are borne by the international carriers without an additional charge to the users.

Each country is required by international agreement to provide for the settlement of accounts, of vessels under its registry, of tolls for radiotelegraph traffic exchanged with coastal stations of foreign administrations. In the United States this function is performed by the Commission which, in fiscal 1956, accounted for the following messages and made the following disbursements:

Messages on hand beginning of period	14,004
Messages received during period	163,434
	177,438
Messages processed during period	147,141
Messages on hand June 30, 1956	30,297
Cash on hand at beginning of period	$59,359.32
Cash received from United States companies	215,147.19
	274,506.51
Cash disbursed to foreign governments	205,928.90
Cash on hand for disbursements June 30, 1956	68,577.61

Telephone.—International telephone service from the continental United States is provided by direct radio circuits with 64 foreign and overseas points. Wire lines interconnect the continental United States with Canada and Mexico, and submarine cable with Cuba. The Alaska Communication System wire and radio facilities connect with the continental United States. Relay through various foreign facilities provides service to approximately 50 additional countries.

Laying of the transatlantic telephone cable, via Canada, was completed August 14, 1956, and it was placed in service September 25 of the same year. Laying of the Alaskan cable system between Port Angeles, Washington, and Ketchikan, Alaska, is being completed for service by the end of the calendar year. Plans are progressing toward the laying of the Hawaiian twin cables, expected to be completed during the summer of 1958.

During the latter part of the fiscal year, the first grant for an international radiotelephone service using "over-the-horizon" or "scatter" technique in the ultra high frequency range was made to the American Telephone & Telegraph Co. for communication between Florida and Cuba. An application by another company for TV transmission service from Florida to Cuba by the same technique is under consideration.

Applications.—Licenses in the International Fixed Public Services filed a total of 210 applications for additional frequencies, points of communication, installation of additional equipment, program service, etc., as compared with 264 applications the previous year. The Commission acted upon 195 applications. Sunspot cycle disturbance has increased the licensees' needs for additional frequencies at the high frequency part of the 3 to 30 megacycle spectrum and the need for these higher frequencies will probably continue during fiscal 1957.

Docket Cases

Circuits to The Netherlands and Portugal.—The 1955 annual report noted that the Commission had reaffirmed its grant of applications by Mackay Radio & Telegraph Co. [Docket 8777] to establish radiotelegraph circuits to the points named which would compete with circuits operated by RCA Communications, Inc. (RCAC). This proceeding was remanded to the Commission when the Supreme Court held that a grant could not be based upon a finding that national policy favored competition in this field. The reaffirmation was based upon a finding that competition by Mackay was reasonably feasible and that there was reasonable expectation that it would have a beneficial effect. A petition by RCAC for reconsideration was denied, following which, on December 16, 1955, RCAC went to court. Oral argument was held September 12, 1956.

Western Union divestment.—As reported last year, an initial decision was issued as a result of Commission investigation into the requirement of section 222 of the Communications Act and related orders that Western Union divest its international telegraph operations [Docket 10151]. Oral argument on exceptions filed to the initial decision was set for November 19, 1956, and Western Union motion to reopen the record was denied without prejudice to later filing.

Negotiations for the sale of its international operations mentioned in the last report were terminated by Western Union because of certain obstacles. However, negotiations with another possible purchaser are being conducted. Any definitive agreement reached will be subject to Commission approval.

Puerto Rico application.—Reference was made in a previous report to the postponement of oral argument on exceptions to an initial decision in Docket 10058. The initial decision proposed denial of applications of Mackay Radio & Telegraph Co. and All America Cables & Radio, Inc., to operate a radiotelegraph circuit between the United States and Puerto Rico on a regular instead of emergency basis. On August 29, 1956, after denying one petition to reopen the record and after holding oral argument, the Commission granted a second petition to reopen the record to reflect current data.

Western Union-Globe and Tropical contracts.—The previous report noted that the court of appeals had reaffirmed the Commission decision [Docket 9292] that certain contracts between Western Union and Globe Wireless, Ltd., and Tropical Radio Telegraph Co. covering the exchange of particular international telegraph traffic violated section 222 of the Communications Act and the international formula for the division of international traffic filed with Western Union's domestic land line system. Reference was also made to the fact that, pursuant to Commission order, the parties were negotiating an agreement on the damages due the complainants (Commercial Pacific Cable Co., Mackay Radio & Telegraph Co., the Commercial Cable Co., All America Cables & Radio, Inc., and RCA Communications, Inc.) and a plan of reparations.

On December 7, 1955, the parties (except for Commercial Pacific) requested approval of an agreement for settlement of damages by transfer of traffic from the cable division of Western Union to the complainants. The Commission advised the parties on June 13, 1956, that it could not approve the agreement but afforded them opportunity to present an acceptable alternative proposal prior to designating the damages question for further hearing.

Far East traffic.—The 1955 annual report noted that RCA Communications, Inc., had petitioned for reconsideration of denial of

request that action be initiated under the decision in Docket 9292 (described previously) to require Western Union to cease handling traffic to various Far East points over its cable system via London and, instead, distribute such traffic to international telegraph carriers entitled to share in area C traffic under the terms of the international formula.

After pointing out on March 28, 1956, that the original request was denied because the Commission did not consider the matter appropriate for action on its own motion, the Commission interpreted the petition as containing in essence a formal complaint and set the matter for hearing (Docket 11663) with the previously filed formal complaint of RCAC requesting reparations for such allegedly illegal Western Union handling (Docket 11364). The American Cable & Radio Corp. companies and Globe Wireless, Ltd., filed notices of participation. Hearing began September 11, 1956.

Washington area tieline service.—In July 1955, the Commission suspended in part a tariff amendment filed by Press Wireless, Inc., extending an offer of tielines at its expense to include customers located outside Washington, D. C., within 10 miles of its Washington office [Docket 11441]. Hearings, in which Western Union was permitted to intervene, were held during September 1955 to determine whether such extension was a just, reasonable, and nondiscriminatory practice, and if it would be lawful under the act. On September 20, 1956, the Commission held the tariff amendment unlawful in certain respects but indicated that a modified tariff would be lawful.

Nonchargeable tieline designations.—In June 1956, the Commission suspended a tariff proposal by American Radio & Cable Corp. to permit a sender to insert a nonchargeable designation of a tieline number on telegrams addressed to persons connected by tieline to its operating companies [Docket 11761]. An investigation was ordered into the lawfulness of such a provision. A. C. & R. was permitted to cancel the suspended tariff, and hearing was postponed indefinitely.

Tariff Schedules

During fiscal 1956, international and marine carriers filed 718 tariff schedules, 26 applications for permission to file tariff schedules on less than 30-days' notice, 326 division of tolls statements, 118 reports of negotiations with foreign administrations and carriers, 322 contracts, and 945 amendments to contracts.

Noteworthy were contracts filed by Western Union and The Commercial Cable Company which set forth the conditions under which Portugal renewed the rights of the companies to land, operate, and maintain cable facilities in the Azores.

Rate Level and Structure

No changes occurred during fiscal 1956 in the level of rates for telegraph traffic outbound from the United States. There were several changes of a minor nature in inbound rates. None of the international carriers requested any revision of the existing rate level.

Other Regulatory Matters

Relief and pensions.—Four carriers instituted changes in their pension arrangements during fiscal 1956, primarily to effect liberalization of benefits. The plan proposed in fiscal 1955 by one large carrier to adopt a partial pension funding program was set up on a permanent basis. The Commission pursued its general studies of the carriers' pension arrangements, particularly with the view of determining the effect, for rate-making purposes, of pension costs upon allowable expenses.

Reclassification of plant.—Certain cost adjustments applicable to the plant and equipment of several carriers, found in fiscal 1955 to be essential to the proper restatement of plant cost, have not been completed by the carriers. With the advice and assistance of the Commission, final restatement of the plant of these carriers on the basis of original cost, as required by the Commission's rules, is expected to be consummated during the ensuing year.

Depreciation.—On the basis of cooperative studies with the carriers, pursuant to section 220 (b) of the act, the Commission, for the first time, prescribed annual depreciation rates for the depreciable radiotelegraph plant of All America Cables & Radio, Inc., and Mackay Radio & Telegraph Co., effective January 1, 1955; and for the plant of Press Wireless, Inc., effective January 1, 1956. Depreciation rates are expected to be prescribed during fiscal 1957 for other carriers. Studies to determine, for rate-making purposes, the reasonableness of the depreciation rates and charges, the recorded depreciation reserves, and the propriety of the depreciation practices of the carriers were continued.

Continuing property records.—Considerable progress was made by the one remaining international telegraph carrier in the restatement and final installation of its property record on a satisfactory basis. Completion should be effected within fiscal 1957. Remedial measures have been taken by those carriers whose property records in fiscal 1955 were found not to be in substantial compliance with the Commission's rules. The Commission gave advice and assistance to the carriers and further pursued the verification of the form and content, and the evaluation of the effectiveness, for regulatory purposes, of these property records.

Miscellaneous accounting matters.—Continuing consideration was given to the accounting practices and procedures of the several

international telegraph carriers to assure required accounting and adequate reporting. Studies were continued relative to (*a*) expunging from the carriers' rate base all plant and equipment not used and useful in public service, (*b*) classification of operating revenues, (*c*) plant installations and retirements, and (*d*) ocean-cable maintenance.

STATISTICS

General

Annual reports were filed by 410 common carriers and 7 controlling companies for the calendar year 1955. Considerable financial and operating data taken principally from these reports are published annually in a volume entitled "Statistics of the Communications Industry in the United States". (See appendix list of Commission publications sold by the Superintendent of Documents.) The larger telephone and telegraph carriers also file monthly reports of revenues and expenses, and summaries of these data are published monthly by the Commission.

Telephone Carriers

Annual reports by common carriers included those from 61 telephone carriers and 339 carriers rendering mobile radiotelephone service. Selected financial and operating data concerning telephone carriers for 1955 as compared to 1954 are shown in the following table. Reports from 318 miscellaneous (nontelephone company) land mobile radiotelephone carriers show that their operating revenues for 1955 totaled $1.9 million. More than two-thirds of these carriers reported operating losses for 1955.

Telephone carriers [1]

Item	1954	1955	Percent of increase or (decrease)
Number of carriers	53	53	
Book cost of plant (as of Dec. 31)	$14,931,532,092	$16,224,353,815	8.66
Depreciation and amortization reserves	$3,846,759,757	$4,097,691,470	6.52
Net book cost of plant	$11,084,772,245	$12,126,662,345	9.40
Local service revenues	$2,990,565,302	$3,252,550,258	8.76
Toll service revenues	$1,799,595,013	$2,048,867,811	13.85
Total operating revenues	$5,024,554,465	$5,501,530,307	10.69
Operating expenses and operating taxes	$3,837,203,519	$4,136,598,484	7.80
Provision for Federal income taxes	$538,267,658	$660,937,939	22.79
Net operating income after all taxes	$649,082,688	$763,993,284	17.70
Net income	$570,727,785	$694,118,510	21.62
Dividends declared	$450,493,873	$497,725,786	10.48
Company telephones:			
Business	13,934,092	14,708,802	5.56
Residence	32,179,432	34,489,994	7.18
Number of calls originating during the year:			
Local [2]	73,196,555,370	77,265,410,169	([3])
Toll [2]	2,384,882,035	2,628,959,050	([3])
Number of employees at end of October	616,277	648,827	5.28
Male	220,198	241,526	9.69
Female	396,079	407,301	2.83
Total compensation for the year	$2,501,666,332	$2,692,871,491	7.64

[1] Data shown relate to telephone carriers whose annual operating revenues exceed $250,000. Intercompany duplications, except in minor instances, have been eliminated.
[2] Partly estimated by reporting carriers.
[3] The number of calls shown are not comparable, as many calls were reclassified from "Toll" to "Local" during 1955, due to enlargement of numerous local calling areas.

Telephones by States

More than 56,200,000 telephones were in use in the United States at the start of the calendar year 1956. Of the total 46,200,000 were owned by the Bell System and 10,000,000 by independent companies.

A tabulation follows:

State	Total number of telephones	Distribution of telephones by—			
		Ownership		Type of service	
		Bell System	All other	Business	Residence
Alabama	583,400	511,700	71,700	158,600	424,800
Arizona	259,900	252,000	7,900	94,100	165,800
Arkansas	314,400	243,300	71,100	96,100	218,300
California	5,435,600	4,479,900	955,700	1,727,200	3,708,400
Colorado	574,100	556,000	18,100	184,000	390,100
Connecticut	1,024,500	21,000	1,003,500	284,000	740,500
Delaware	165,300	165,300		49,800	115,500
District of Columbia	552,000	550,100	1,900	261,600	290,400
Florida	1,131,400	778,000	353,400	410,200	721,200
Georgia	820,600	718,500	102,100	249,700	570,900
Idaho	173,900	137,400	36,500	48,200	125,700
Illinois	3,682,800	3,104,300	578,500	1,135,600	2,547,200
Indiana	1,434,400	885,300	549,100	366,700	1,067,700
Iowa	960,600	595,700	364,900	203,400	757,200
Kansas	731,200	572,400	158,800	177,200	554,000
Kentucky	613,000	408,900	204,100	161,500	451,500
Louisiana	744,400	709,700	34,700	206,700	537,700
Maine	258,900	233,500	25,400	69,300	189,600
Maryland	945,100	925,400	19,700	261,200	683,900
Massachusetts	1,910,500	1,906,800	3,700	548,700	1,361,800
Michigan	2,662,000	2,403,700	258,300	694,600	1,967,400
Minnesota	1,097,300	849,400	247,900	273,600	823,700
Mississippi	308,100	296,200	11,900	88,300	219,800
Missouri	1,402,000	1,167,800	234,200	385,300	1,016,700
Montana	194,500	169,700	24,800	55,100	139,400
Nebraska	477,300	242,700	234,600	117,900	359,400
Nevada	76,600	38,400	38,200	31,900	44,700
New Hampshire	175,200	166,200	9,000	45,300	129,900
New Jersey	2,264,700	2,222,300	42,400	620,200	1,644,500
New Mexico	188,900	157,300	31,600	75,100	113,800
New York	7,169,200	6,662,100	507,100	2,365,500	4,803,700
North Carolina	810,800	451,900	358,900	234,600	576,200
North Dakota	150,100	99,500	50,600	37,900	112,200
Ohio	3,316,500	2,191,300	1,125,200	844,500	2,472,000
Oklahoma	705,900	614,600	91,300	209,800	496,100
Oregon	576,800	462,100	114,700	164,700	412,100
Pennsylvania	4,041,800	3,409,600	632,200	1,038,000	3,003,800
Rhode Island	287,300	278,500	8,800	81,300	206,000
South Carolina	378,400	290,400	88,000	112,500	265,900
South Dakota	179,800	135,500	44,300	44,200	135,600
Tennessee	839,500	734,600	104,900	227,600	611,900
Texas	2,578,000	2,161,400	416,600	810,800	1,767,200
Utah	266,300	251,600	14,700	76,000	190,300
Vermont	108,100	94,700	13,400	29,000	79,100
Virginia	965,300	783,600	181,700	285,800	679,500
Washington	952,700	761,700	191,000	274,600	678,100
West Virginia	433,200	382,800	50,400	110,200	323,000
Wisconsin	1,218,900	890,300	328,600	328,200	890,700
Wyoming	102,000	93,100	8,900	32,400	69,600
United States	56,243,200	46,218,200	10,025,000	16,388,700	39,854,500

Land Line Telegraph

The following table sets forth financial and operating data relating to the domestic land line operations of the Western Union Telegraph Co. for the calendar year 1955 as compared to 1954. The data pertaining to its cable operations are included in a later table relating to ocean-cable carriers.

The Western Union Telegraph Co.[1]

Item	1954	1955	Percent of increase or (decrease)
Book cost of plant (as of Dec. 31)	$300,125,917	$310,967,883	3.61
Depreciation and amortization reserves	$130,182,872	$135,826,081	4.33
Net book cost of plant	$169,943,045	$175,141,802	3.06
Message revenues	$173,819,586	$188,854,951	8.65
Total operating revenues	$209,634,899	$228,816,199	9.15
Operating expenses, depreciation and other operating revenue deductions	$194,657,236	$206,024,140	5.84
Net operating revenues	$14,977,663	$22,792,059	52.17
Provision for Federal income taxes	$6,207,167	$9,613,288	54.87
Net income	[2] $4,479,468	[3] $10,330,982	130.63
Net income (land line and cable systems)	[2] $6,470,898	[3] $11,686,415	80.60
Dividends (land line and cable systems)	$3,730,406	$5,695,383	52.67
Number of revenue messages handled [4]	152,581,589	153,910,153	0.87
Number of employees at end of October	37,009	37,785	2.10
Total compensation for the year	$137,520,793	$143,289,324	4.19

[1] Represents data for land-line operations. Figures covering cable operations are included in the table below relating to ocean-cable carriers.

[2] After allowance for a charge of $3,119,000 ($6,498,000 less $3,379,000 tax saving) due to establishment of an estimated liability for vacation pay and other employee benefits.

[3] After allowance for charges of $978,030 ($1,980,030 less $1,002,000 tax saving) representing bond refinancing expenses and call premiums and $594,083 expenses of issuing additional capital stock.

[4] Includes domestic transmission of transoceanic and marine messages (about 8,502,000 in 1954 and about 8,996,000 in 1955).

Radiotelegraph and Ocean-cable Carriers

There are shown in the accompanying tables financial and operating statistics selected from the annual reports filed by the United States radiotelegraph and cable carriers furnishing international communications services. These tables compare the figures for the calendar year 1955 to those for the previous year.

Radiotelegraph carriers

Item	1954	1955	Percent of increase or (decrease)
Number of carriers	7	7	
Book cost of plant (as of Dec. 31)	$40,265,004	$41,952,129	4.19
Depreciation and amortization reserves	$17,774,111	$18,459,646	3.86
Net book cost of plant	$22,490,893	$23,492,483	4.45
Message revenues:			
Domestic [1]	$1,868,433	$2,053,155	9.89
Transoceanic	$21,810,481	$23,780,911	9.03
Marine	$1,449,877	$1,554,269	7.20
Total operating revenues	$31,204,268	$34,590,802	10.85
Operating expenses, depreciation and other operating revenue deductions	$28,117,065	$29,207,577	3.88
Net operating revenues	$3,087,203	$5,383,225	74.37
Provision for Federal income taxes	$2,236,552	$3,473,747	55.32
Net income	$2,262,287	$3,533,997	56.21
Dividends declared	$400,000	$650,000	62.50
Number of revenue messages handled:			
Domestic [2]	54,735	50,971	(6.88)
Transoceanic	10,838,085	11,853,461	9.37
Marine	940,715	1,010,338	7.40
Number of employees at end of October	5,940	5,925	(0.25)
Total compensation for the year	$24,014,980	$24,623,599	2.53

[1] Includes revenues from the domestic transmission of transoceanic and marine messages outside of points of entry or departure in the United States and revenues from domestic-classification messages (primarily Canadian and Mexican).
[2] Represents domestic-classification messages (primarily Canadian and Mexican).

Ocean cable carriers (including Western Union cable operations)

Item	1954	1955	Percent of increase or (decrease)
Number of carriers	3	3	
Book cost of plant (as of Dec. 31)	$93,401,673	$93,226,207	(0.19)
Depreciation and amortization reserves	$58,213,461	$57,971,725	(.42)
Net book cost of plant	$35,188,212	$35,254,482	.19
Message revenues:			
Domestic [1]	$190,320	$196,432	3.21
Transoceanic	$23,240,617	$22,908,230	(1.43)
Total operating revenues	$32,606,848	$33,458,741	2.61
Operating expenses, depreciation and other operating revenue deductions	$26,536,854	$29,158,127	9.88
Net operating revenues	$6,069,994	$4,300,614	(29.15)
Provision for Federal income taxes	$2,617,833	$2,854,712	9.05
Net income	$3,070,941	$1,486,516	(51.60)
Dividends declared [2]	$883,670	$883,670	
Number of revenue messages handled:			
Domestic [3]	98,729	105,081	6.43
Transoceanic	10,446,064	10,489,882	.42
Number of employees at end of October	5,874	5,919	.77
Total compensation for the year	$15,226,644	$15,924,564	4.58

[1] Includes revenues of two carriers from the domestic transmission of transoceanic messages outside of points of entry or departure in the United States, and revenues from domestic-classification messages (primarily Canadian).
[2] All dividends declared by Western Union Telegraph Co. have been reported in the table above relating to the domestic land-line operations of that company and are excluded from this table.
[3] Represents domestic-classification messages (primarily Canadian).

International Telegraph Traffic

A total of 548,574,177 paid words were handled into and out of the United States during calendar 1955 by the international cable and radiotelegraph carriers. In the outbound direction 277,398,370 words were transmitted, while 271,175,807 words were received in the inbound direction. The number of words handled by the 6 radiotelegraph carriers totaled 296,607,837, or about 54.1 percent of the total, while the remaining 251,966,340 words, or 45.9 percent, were handled by the 4 cable carriers. The volume of international telegraph traffic, in words, exchanged between the United States and each of the principal countries of the world during calendar 1955 is set forth in the following table.

United States—International telegraph (radio and cable) traffic in words, 1955 (includes traffic transiting the United States)

Country	Number of words	
	Outbound from the United States	Inbound to the United States
Europe, Africa, and the Near East		
Algeria	163,707	150,321
Arabia	974,589	922,533
Austria	1,349,900	1,196,949
Belgian Congo	344,568	266,510
Belgium	4,911,554	3,996,990
British East Africa	390,171	336,815
British West Africa	267,835	255,386
Czechoslovakia	622,309	729,301
Denmark	1,824,412	1,208,026
Egypt	2,015,576	1,669,785
Ethiopia	268,919	177,416
Finland	598,822	560,074
France	14,879,188	13,978,888
French West Africa	129,672	127,623
Germany	14,417,864	13,532,448
Greece	1,835,551	1,361,963
Hungary	372,419	601,139
Iceland	279,499	296,887
Iran	906,283	1,139,479
Iraq	439,576	589,308
Ireland	804,172	904,558
Israel	2,500,841	2,171,624
Italy	10,500,862	8,073,617
Lebanon	963,188	902,203
Liberia	557,353	623,077
Libya	132,863	72,578
Luxembourg	125,359	101,617
Madagascar	109,919	105,281
Morocco—French	574,898	572,833
Morocco—Tangier	509,418	383,210
Netherlands	7,756,433	6,464,616
Norway	2,790,270	1,948,312
Persian Gulf	402,600	482,766
Poland	866,820	964,805
Portugal	1,077,884	897,381
Rhodesia	127,875	134,781
Roumania	272,106	139,451
Spain	3,215,014	2,172,338
Sweden	3,541,722	3,187,690
Switzerland	7,894,699	6,395,013
Syria	240,647	189,018
Transjordania	335,951	259,161
Trieste, Free Territory of	107,235	83,177
Turkey	1,429,618	1,321,148
Union of South Africa	2,623,863	2,762,013
U. S. S. R.	5,089,994	3,235,760
United Kingdom	47,117,340	50,154,132
Yugoslavia	1,110,705	1,000,027
All other places	962,990	1,668,096
Total	150,735,053	140,467,524
West Indies, Central, North, and South America		
Argentina	5,707,431	8,115,839
Bahamas	1,032,442	1,120,423
Barbados	276,149	193,268
Bermuda	929,947	836,952
Bolivia	732,904	866,836
Brazil	9,042,063	8,910,584
British Guiana	215,199	207,175
British Honduras	154,448	164,011
Canada [1]	10,107,510	11,939,218
Canal Zone	748,029	520,287
Chile	2,374,064	2,342,389
Colombia	5,518,049	4,807,845
Costa Rica	1,133,442	987,434
Cuba	6,330,430	8,949,978
Dominican Republic	1,580,265	1,372,097
Ecuador	1,628,587	1,002,357
Guatemala	1,700,346	1,413,734
Haiti	927,355	770,209
Honduras Republic	762,683	728,340
Jamaica	1,087,262	846,553
Mexico [2]	1,883,888	1,046,605
Netherlands West Indies	1,075,908	1,146,036
Nicaragua	1,041,962	775,102
Other British West Indies [3]	228,639	161,028
Panama	1,408,842	1,125,558
Paraguay	272,985	338,290
Peru	2,349,661	2,036,530
Puerto Rico	4,439,223	4,022,623
Salvador	1,047,006	871,897
Surinam	148,341	127,837
Trinidad	861,226	615,214
Uruguay	2,117,992	2,263,422
Venezuela	8,523,915	9,887,739
Virgin Islands	285,760	267,659
All other places	218,466	150,843
Total	77,892,419	80,931,912

Footnotes at end of table.

United States—International telegraph (radio and cable) traffic in words, 1955 (includes traffic transiting the United States)—Continued

Country	Number of words		Country	Number of words	
	Outbound from the United States	Inbound to the United States		Outbound from the United States	Inbound to the United States
Asia and Oceania			*Asia and Oceania*—Con.		
Afghanistan	288, 450	93, 474	Korea	1, 079, 352	1, 364, 797
Australia	3, 759, 611	3, 398, 560	Malaya, Federation of	1, 724, 523	1, 377, 791
Burma	719, 701	108, 386	New Zealand	1, 201, 611	1, 009, 873
Ceylon	461, 775	387, 743	Okinawa	509, 993	780, 100
China (excluding Hong Kong)	134. 028	82, 867	Pakistan	1, 144, 725	1, 427, 200
Formosa	1, 428, 783	1, 907, 390	Philippines	4, 978, 820	6, 073, 086
Guam	409, 608	566, 953	Thailand (Siam)	1, 075, 501	1, 214, 398
Hawaii	5, 122, 305	4, 389, 750	All other places	284, 856	261, 278
Hong Kong	1, 865, 729	1, 725, 578	Total	48, 692, 778	48, 685, 715
India	4, 644, 066	4, 007, 401	Unknown destination or origin	78, 120	1, 090, 656
Indochina	499, 918	864, 291			
Indonesia	1, 824, 812	2, 886, 362	Grand total	277, 398, 370	271, 175, 807
Japan	15, 534, 611	14, 758, 437			

[1] Represents international-classification traffic which originated at overseas points and was destined to Canada (outbound from the United States), and international-classification traffic which originated in Canada and was destined to overseas points (inbound to the United States). This traffic was handled between such points and Canada by United States carriers via the United States.

[2] Represents international-classification traffic which originated at overseas points and was destined to Mexico (outbound from the United States), and international-classification traffic which originated in Mexico and was destined to overseas points (inbound to the United States). This traffic was handled between such points and Mexico by United States carriers via the United States.

[3] Points not listed separately.

Common Carrier Applications

Nearly 4,800 common carrier applications (exclusive of marine mobile and Alaskan services) were received by the Commission during the year in the following categories:

Class	Pending June 30, 1955	Received	Disposed	Pending June 30, 1956
Radio facilities				
Domestic public land mobile	50	876	874	52
Fixed public telephone (international)	3	24	25	2
Fixed public telegraph (international)	5	171	170	6
Canadian registration	0	37	37	0
Developmental	2	28	28	2
Subtotal	60	1, 136	1, 134	62
Wire facilities				
Telephone extensions	6	192	188	10
Telegraph extensions	0	37	36	1
Telephone reductions	4	24	25	3
Telegraph reductions	85	712	712	85
Subtotal	95	965	961	99
Miscellaneous				
Interlocking directorates	0	29	24	5
Submarine cable landing licenses	0	1	1	0
Petitions or motions (nondocket)	0	3	3	0
Experimental common carrier	66	1, 565	1, 444	187
Experimental renewal	0	1, 070	1, 070	0
Subtotal	66	2, 668	2, 542	192
Total	221	4, 769	4, 637	353

Safety and Special Radio Services

GENERAL

The Safety and Special Radio Services embrace those radio services which help protect life and property and contribute to industrial and business operations. They fall into four general categories:

Safety services such as marine, aviation, police, fire, forestry-conservation, highway maintenance, special emergency, state guard, and point-to-point in Alaska.

Industrial services such as power, petroleum, forest products, special industrial, low power industrial, relay press, motion picture, and radiolocation-land.

Land transportation services such as railroad, motor carrier, taxicab, and automobile emergency.

Miscellaneous services such as amateur, disaster communications, and citizens.

Radio has become an essential tool of industry, but its use is now confined primarily to frequency bands allocated for this purpose 10 year ago. Since then there has been a tremendous expansion in industrial usage. Present allocations and rules must be revised drastically to obtain a more efficient use of available frequencies. It will be necessary to make a fundamental review of available data, both engineering and economic, as a basis for effecting these changes. This program could be begun at relatively modest cost and might be completed in about 3 years.

The demand for radio in the safety and special services continues unabated. More than 170,000 applications were received in fiscal 1956. It is estimated that this number will exceed 181,000 in 1957 and 186,000 in 1958.

Because of limited personnel, it has been impossible to keep current on this application flow. Even with a rather superficial examination, it has not been possible to act on them within less than approximately 2 months of their receipt. This fact has created not only administrative difficulties, but also an unsatisfactory situation from the point of view of the applicants and the public. Inability to act expeditiously on applications generates numerous telephone and letter inquiries which, in turn require extra work to answer. The result is that the time for application processing is further reduced.

The number of stations is an index to the activity and regulatory workload in these services. The nonbroadcast services (exclusive of amateur operators) had less than 10,000 authorized stations in 1940, increased to more than 154,000 in 1950, and exceeded 300,000 in 1955. Today these authorizations exceed 338,000, representing the use of more than 1,100,000 fixed and mobile transmitters.

PRIVATE MICROWAVE SYSTEMS

Considerable strides have been made by the Commission toward establishing a permanent licensing policy for private microwave systems. However, many questions remain to be resolved—such as who shall have prior rights in congested areas, and how to deal with the potential interference problems created by many microwave point-to-point systems operating in or converging upon a single large metropolitan area. The question of paralleling common carrier microwave facilities and the facilities of private industry needs to be settled in a manner that will be equitable to those concerned and yet make the most efficient use of frequencies to avoid unnecessary duplication and unused circuit capacity.

Because of the public domain nature of radio frequencies, restrictions must not be lifted to the point where the situation becomes chaotic and mutual interference prevents satisfactory use of this public property.

MARINE RADIO SERVICES

Safety at Sea

International Convention and Communications Act.—Approximately 50 United States passenger ships and 1,200 United States cargo ships of more than 1,600 gross tons which navigate in the open sea are compulsorily equipped with radiotelegraph installations as required by Title III, Part II of the Communications Act and the International Convention for Safety of Life at Sea (1948).

Amendments to these law and treaty provisions have recently added a group of cargo ships between 500 and 1,600 gross tons which are required to carry radio installations for safety purposes. This group has a choice of either radiotelegraph or radiotelephone, but all have elected to carry radiotelephone. During the fiscal year radiotelephone installations on 43 vessels in this group were inspected and certificated, the majority for the first time. In most instances the ships were able to comply by using radiotelephone equipment previously voluntarily installed.

Safety at sea legislation.—H. R. 7536, introduced in July 1955 and signed in August 1956, adds a new part III to title III to require United States vessels transporting more than 6 passengers for hire

while navigating in the open sea or on domestic tidewaters to carry radiotelephone by March 1, 1957. The new law does not apply to vessels compulsorily equipped with radio installations by prior law or treaty, or to vessels on the Great Lakes. About 3,000 ships are affected.

H. R. 4090, introduced in February 1955, would amend part II of title III to require installation of an automatic radio call selector on United States cargo ships carrying less than two qualified radio operators. The Commission tested a specimen device offered by one manufacturer and did not support adoption of the bill. Congress requested the Commission, the Coast Guard and the Maritime Administration to make a further study of the subject and report by March 1, 1957.

H. R. 7249, introduced in July 1955, would amend part I of title III to provide a maximum fine of $10,000 or imprisonment for not more than 10 years, or both, for transmitting false distress signals by radio, which is now prohibited by section 325 (a) of the Communications Act.

Great Lakes agreement.—On November 13, 1954, the Agreement for the Promotion of Safety on the Great Lakes by Means of Radio (a treaty between the United States and Canada) came into force. This agreement compels several hundred United States ships, as well as ships of Canada and other countries, to carry radiotelephone for safety purposes. Thus, many Great Lakes vessels for the first time had to pass a radio inspection to obtain the required certification. Most of the vessels were able to comply without obtaining new equipment or substantially modifying existing installations. However, in a few instances, transmitters were replaced in order to meet power requirements and, in several cases, installations had to be moved to a higher location on the ship before they could be certified.

Exemptions from compulsory radio requirements.—The Commission is authorized to grant exemptions from the ship radio requirements of the Safety Convention, the Communications Act, and the Great Lakes agreement. Under this authority, it renewed blanket exemptions for one year to all passenger vessels of 15 gross tons and under which are navigated in the open sea within 20 nautical miles of the nearest land, and to all passenger vessels of less than 100 gross tons when navigated within prescribed coastal areas.

Forty-four formal applications for exemptions of individual ships were received during the year, of which 18 were granted. In addition, some informal telegraphic applications for emergency exemption were granted which, in most cases, allowed vessels to operate until defective radio equipment could be repaired.

Applications for exemption which were denied included those for several radiotelegraph-equipped lumber-carrying cargo vessels navigating along the Pacific coast, and for several radiotelephone-equipped cargo ships of between 500 and 1,600 gross tons navigated along the Atlantic coast. No exemptions from the requirements of the Great Lakes agreement had been granted as of June 30, 1956, and 2 applications for exemption from such requirements were denied.

A procedure was established during the year whereby vessels, exempted from compulsory radiotelegraph requirements because of their size or for other reasons, would be required, in lieu thereof and insofar as practicable, to comply with the rules requiring radiotelephone installations on cargo ships. Vessels of more than 500 gross tons were required to comply with all of these rules while those of less than 500 gross tons were required to comply only with the more basic rules.

Distress studies.—Heretofore, studies of distress communications have been made in compliance with section 4 (o) of the Communications Act. However, during the fiscal year it was necessary to all but discontinue these studies due to the lack of personnel. Consequently, there are no summaries of distress signals in this report.

Radio aids to navigation.—Shore-based radar stations are being used on a developmental basis primarily to (1) assist in the piloting of ships entering and leaving major harbors, and (2) assist in the navigation of vessels in connection with construction projects and oil well drilling in the Gulf of Mexico area.

The 4 stations in the first group are located at Long Beach, Los Angeles Harbor, San Francisco, and Port Angeles, on the Pacific coast. There are 6 stations in the second group.

At the close of the fiscal year, 2,980 United States ships were authorized to use radar.

Equipment and Technical Advancement

Type-acceptance program.—The Commission's type-acceptance program was extended to cover shipboard radiotelephone transmitters operating on frequencies below 30 megacycles. Such transmitters licensed after June 1, 1958, are required to be type accepted. Subject to certain conditions, transmitters licensed before that date are not required to be type accepted until subject to relicensing after June 1, 1963.

Technical standards concerning overmodulation prevention and limitation of spurious emission become applicable with type acceptance. The same standards of limitation of spurious omission applicable to ship radiotelephone transmitters have been extended to ship radiotelegraph transmitters (with the exception of lifeboat trans-

mitters) with the same time schedule. At the close of the year there was pending a request of the American Merchant Marine Institute, Inc., to ease the application of the requirement for radiotelegraph transmitters.

Radio Technical Commission for Marine Services (RTCM).—The RTCM is a cooperative association of Government and non-Government agencies organized in 1947 to study marine telecommunication problems and related matters for the purpose of providing guidance to and coordinating the efforts of all organizations concerned. The Commission is represented on the executive committee and participates in the technical studies.

During the year, the RTCM was active in connection with the following problems:

Special committee 19 completed its study of a "Reliable Short Range Radiotelephone System" for intership (bridge-to-bridge) communication.

Special committee 25 continued its preparation of recommendations for minimum design and operational specifications for 2-megacycles radiotelephone equipment.

Special committee 30 is undertaking a basic review of the application of modern electronics to the marine industry.

Special committee 31 is studying the specific operational and equipment problems which would be involved in the event aircraft stations would be permitted to communicate with ship stations in the VHF band.

Special committee 32 completed a report and recommended rules to recognize the proposed international radiotelephone alarm signal.

Special committee 33 is studying the proposed early and progressive use of single sideband radiotelephone operation in the maritime mobile services.

Special committee 34 is working on a ship telephony educational program directed to more efficient use of ship stations by the many thousands of nonprofessional radio operators.

Single sideband radiotelephone system.—Considerable interest in the possible use of single sideband type of transmission for maritime radiotelephone services in the medium and high frequency bands has resulted from the development of low power single sideband suppressed carrier communication equipment. The Commission gave special temporary authorization to an established coast station to conduct ship-shore tests. The use of this technique in the maritime radiotelephone service would improve spectrum utilization. This subject is being studied by special committee 33 of the RTCM.

International standardization of VHF bands.—The Commission has indorsed action to promote international standardization of VHF bands for the maritime mobile service. As soon as manpower permits, a special study will be undertaken of the problem of transferring all short distance maritime telephony to VHF within a reasonable period of time.

Marine Radio Communication Systems

Coast stations.—As of June 30, 1956, the number of coast stations, other than Alaska, providing communication service to ships is shown in the following table:

Frequency band and range	Public coast	Limited coast
Telephony in 2–3 megacycle band (medium range)	49	4
VHF telephony (short range)	43	194
HF telephony (long range)	5	1
Telegraphy, LF, MF, HF (medium to long range)	28	2

Coast stations operating in the VHF bands increased substantially during fiscal 1956. One reason is that VHF limited coast stations are usually established to meet the needs of an ever-expanding domestic economy. In contrast, the number of coast stations operating on telegraph and telephone frequencies having long-range characteristics for communication with oceangoing vessels has remained substantially the same.

Marine fixed stations.—The number of marine fixed stations has increased to 66. These stations are primarily for safety purposes. On a secondary basis, the frequencies are used for communication with off-shore oil-well drilling operations.

Great Lakes weather transmissions.—A service of special importance rendered by public coast stations on the Great Lakes employing radiotelephony is the transmission of weather data to ships during the navigation season, and to vessels operating on Lakes Superior and Michigan during the winter season.

Intership frequencies.—The Commission clarified its rules with respect to the use of the 2-megacycle intership frequencies, limiting their use to communication pertaining to safety, operational, or business purposes. The rule as previously written resulted in misunderstanding by many users. The safety aspect of the system should be enchanced by the specific listing of permissible communications on these frequencies.

Implementation of Geneva frequency plan.—The Atlantic City (1947) frequency allocations and the Extraordinary Administrative Radio Conference, Geneva, 1951 (EARC) agreement covering frequencies below 27 megacycles for the maritime mobile service have been implemented with a few exceptions. All ship and coast stations licensed for telegraphy are on their new internationally approved frequencies. All ship stations utilizing telephony in the bands between 4000 and 23000 kilocycles are operating in accordance with the new assignments. Public coast stations utilizing telephony in the HF band

are on the new frequency assignments with the exception of the new 8-megacycle frequencies for Hawaii.

Telephone frequencies allocated to the maritime mobile service in the 2–3-megacycle band were made available for ship and coast stations as rapidly as police assignments were removed from maritime frequencies to suitable police frequencies. All of the ship-shore frequencies in the 2–3-megacycle band are now available for assignment, either on a day only or a 24-hour basis, except 1 frequency pair for the Los Angeles-San Diego area for which no availability date has as yet been designated.

Operation in 152–162 megacycle band.—The Lake Carriers' Association petitioned the Commission to repeal the rule prohibiting assignment of certain VHF frequencies to persons not actually operating the vessels on which the ship radio stations are located. As a result of the rule, vessels whose stations were licensed in the name of a communication company were not taking advantage of the availability of the business and operational frequency 156.5 megacycles and, consequently, the full development of the Great Lakes VHF system was impeded. The petition was made the subject of a rule-making proceeding which resulted in repeal of the rule.

Special communications for laying of deep-sea cable.—The Commission authorized the American Telephone and Telegraph Company to establish a class II–B limited coast station at Port Angeles, Wash., for communication with the cable ship *Albert J. Meyer* (a United States Government vessel) to safeguard lives and coordinate testing of a submarine telephone cable laid in the summer of 1956 between Port Angeles and Ketchikan, Alaska, a distance of approximately 750 miles.

New VHF public coast stations.—Applications of the Wisconsin Telephone Co. and the Ohio and Michigan Bell Telephone Cos. for new VHF public class III–B coast stations on the Great Lakes were designated for consolidated hearing on protests of the Lorain County Radio Corp. and Central Radio Telegraph Co.

Developmental control and relay microwave system.—Tug Communications, Inc., was granted 4 developmental marine control and marine relay stations operating on microwaves (900-megacycle band) in the San Francisco area in conjunction with the grant of 2 VHF limited class III–B coast stations providing a communications system tailored to the needs of the vessels involved. The microwave stations are located at San Francisco, Grizzley Peak, and Mount Vaca.

Ship-shore radiotelephone public correspondence.—As of June 30, 1956, rule-making proposals were outstanding to extend the hours of the Seattle frequency pair 2482 kilocycles (coast) and 2430 kilo-

cycles (ship) and to make the Miami daytime frequency pair 2490–2031.5 kilocycles available on a 24-hour basis. They were adopted August 30.

Comment was invited on the need for a class I public coast station in the Gulf of Mexico area in addition to the class I stations already established on the east and west coasts for telephone communication with oceangoing vessels.

To implement the Atlantic City table of frequency allocations, rule making was finalized on July 6, 1956, deleting the frequencies 6240 and 6455 kilocycles from those available to the Mississippi River system for ship-shore public correspondence. This action terminated a series of proceedings instituted in 1953.

Various rule-making proceedings were finalized making available 2 or 4 megacycle frequencies at Baltimore, New York, Boston, and Kahuku, Hawaii.

Interim licenses.—The interim ship station licensing procedure, which originally embraced only the 2 Mc intership frequencies and certain public ship-shore frequencies, was expanded to include frequencies below 30 Mc and above 156 Mc for public ship-shore correspondence, the VHF intership frequency 156.3 and the VHF calling and safety frequency 156.8 Mc. Ship stations subject to compulsory radio requirements were included in the procedure.

2182 kilocycle working frequency.—A new marine radio rule adopted during the year requires public coast stations to have 2182 kc transmitting and/or receiving equipment installed at each location when transmitting and/or receiving equipment, respectively, is installed and regularly used by the particular station to provide service on one or more working frequencies within the band 1600 to 3500 kilocycles. The requirement must be met unless a satisfactory showing is made that, for purposes of maritime safety, all or any portion of the apparatus for operation on 2182 kilocycles is not necessary for effective transmission and reception to and from mobile stations within the working frequency service area of the coast station.

Improvements of facilities and frequencies.—The following improvements in marine facilities and frequencies were accomplished:

New 2-megacycle public coast stations employing telephony were established at Baltimore and Point Harbor (N. C.) to provide better service in these areas. Baltimore was formerly served by facilities at Wilmington (Del.) and Point Harbor by facilities at Norfolk.

To further improve the service in Los Angeles-San Diego area, station KOU at Los Angeles was authorized to add two new 2-megacycle daytime channels.

New VHF public coast stations (152–162-megacycle band) were established at Seattle, Tacoma, Port Townsend, and Bellingham, Wash., to augment the present 2-megacycle service in the Seattle area.

The frequency 512 kilocycles for telegraphy was made available for assignment to ship stations for use in Regions 1 and 3 for working and as a supplementary calling frequency when 500 kilocycles is being used for distress purposes.

Public Fixed and Maritime Stations in Alaska

Radio communication in Alaska.—Because of the limited wire line facilities, Alaskan communities, except the larger cities served by Alaska Communication System (ACS) trunk lines, depend largely on radiotelephone and radiotelegraph for safety and business communication. Frequencies are allocated for communication between communities, between communities and the ACS, and between coast and ship stations. The main intra-Alaska communication trunk lines are operated by ACS under the Department of Defense. The Commission maintains liaison with ACS in coordinating Alaskan communication facilities to serve the public interest.

On July 27, 1955, the Commission issued a blanket temporary authorization to enable licensees of public coast, Alaska-public fixed stations, and ship stations to make necessary modifications to their facilities to meet the new Alaskan rules without making formal application to the Commission. This was done so that the change-over could be effected before winter.

Provision was made for the use of frequencies assigned to Federal Government stations for communication between non-Government Alaskan public fixed stations and Federal Government stations where this arrangement is necessary for intercommunication with the Government stations or required for coordination with Government activities. Such assignments may be made whenever the Commission determines, after consultation with the appropriate Government agency, that it is in the public interest.

Study of duplicate public facilities in Alaska.—A committee of Commissioners was appointed to study the problem of duplication of public facilities in the fixed service in Alaska, particularly with respect to those established by the ACS. In some cases, industrial companies claim a need for their own private systems in cities and towns where public facilities, either non-Government or Government (ACS), are already established. Normally, these established stations serve the communities adequately and under the Commission's rules other public stations are precluded from operating at such locations, since only one station may be authorized to serve a particular area or community.

The study is for the purpose of determining whether the public interest would be served by modifying this policy or making some other provision for nonpublic communication facilities in Alaska.

Fixed and coast stations.—At the close of the fiscal year, there were, exclusive of Government stations, 919 public fixed stations and public coast stations authorized in Alaska.

AVIATION SERVICES

General

The Commission is responsible for the regulation and licensing of all non-Government aviation radio facilities. These include aeronautical enroute, aeronautical operational fixed, airdrome control, flight test, flying school, aeronautical advisory, radio aids to navigation, Civil Air Patrol, and all communications equipment and navigation aids aboard private and commercial aircraft of United States registry. In addition, the Commission authorizes and regulates non-Government aeronautical fixed communication circuits between the United States and overseas terminals.

Aviation Organizations and Conferences

The Commission participated in the work of various interagency coordinating and policy groups during the year as a part of its continuing effort to find solutions to the many new problems created by the expanding needs of the user-public, and in order to accommodate its rules and policies to the rapid technological advances taking place in the field of aviation. The Air Coordinating Committee (ACC), the International Civil Aviation Organization (ICAO), and the Radio Technical Commission for Aeronautics (RTCA) are examples of these interagency groups.

Air Coordinating Committees

The ACC is a Federal interdepartmental committee established for the purpose of coordinating and recommending aviation policies which affect more than one agency of the Government. In view of the Commission's direct responsibilities in the field of aviation communication, it is a member of the ACC and is represented on its subordinate components. These include the Technical Division; Airspace Panel; Aeronautical Communications and Electronic Aids Subcommittee; Search and Rescue Subcommittee; Aerodrome, Air Route, and Ground Aids Subcommittee; Airmen Qualifications Subcommittee, and the Air Traffic Control and Navigation Panel. Some of the major activities of the ACC in which the Commission participates, are:

The continuing implementation of the "common system" all-weather air traffic control program. This involves considerations relating to the utilization of

VOR/DME and TACAN in air navigation, including their effect on the future air navigation "common system".

The formulation of guidance for the United States representatives to the ICAO on international telecommunications aeronautical problems.

Considerations affecting the United States policy and program for long distance aids to air navigation.

Action bearing on the formulation and revision of United States aeronautical telecommunications policy.

Aeronautical consideration of applications for antenna towers involving joint use of the airspace by aviation and radio-television interests.

A matter of particular concern to the FCC, now pending within the ACC, relates to the United States policy for handling so-called class B messages over the United States portion of the Aeronautical Fixed Telecommunications Network (AFTN). Class B traffic, which is internationally understood to embrace airline administrative messages, is acceptable for transmission over AFTN circuits operated by Federal agencies (notably by the CAA) only in those cases where adequate non-Government communications facilities are not available. In the interest of assuring maximum utilization of existing and proposed non-Government aeronautical fixed communications facilities linking the United States with overseas terminals, and in the spirit of helpful cooperation between the Government and non-Government entities, the Commission, in fiscal 1956, suggested to the ACC a procedure to be followed when determinations of non-Government circuit adequacy are made by the FCC. The Commission proposal contemplates the orderly transition of Class B message traffic from Government to non-Government circuits, where and when appropriate.

An example of the work done in connection with radio antenna towers may be found in the actions of the Joint Industry-Government Tall Structures Committee (JIGTSC), established in 1955 under the aegis of the ACC. During fiscal 1956, this committee made a number of recommendations to the responsible Federal agencies concerning joint use of airspace by the aviation and broadcast industries. These recommendations were prompted by the concern felt in aviation circles—both Government and non-Government—over the steadily increasing number of TV antenna towers, particularly those above 1,000 feet in height which, under some circumstances, may constitute a hazard to aircraft. In response to JIGTSC recommendations, the Commission is drafting legislation for submission to Congress which, if approved, would require the continued lighting and marking of abandoned antenna structures. In addition, rule making has been initiated to require the grouping of tall towers, insofar as possible, within areas designated for that purpose. See also "Antenna" Obstruction Marking".

Radio Technical Commission for Aeronautics

The RTCA is a permanent Government-industry advisory body composed of more than 100 aeronautical telecommunications agencies. Membership in the RTCA Assembly, which is voluntary, is open to any domestic organization actively identified with any phase of aeronautical telecommunications. Illustrative of the problems referred to the RTCA for study are: high altitude grid plan for VOR/DME frequency pairing; minimum performance standards for airborne electronic equipment for the transition period "common system"; reevaluation of VOR lateral separation procedures; helicopter air navigation, communication and traffic control; and continuing evaluation of frequency utilization in the VHF band.

A matter of particular interest to the flying public during fiscal 1956 was the announcement by the CAA that messages such as those requesting ground transportation and meals from pilots of aircraft in flight would no longer be accepted by CAA facilities. This action resulted in a strong public demand for air-to-ground telephone service beyond that presently available through Aeronautical Public Service radio stations licensed by the FCC. The problem is receiving consideration by a special committee established within the RTCA.

International Conferences

The special requirements of commercial jet aircraft operation along international air routes were first considered at international meetings during the past year. The impact of increased airspeeds on existing communication facilities and radio navigation aids, together with the limitations of existing equipment and operating procedures, has been the immediate concern to the International Civil Aviation Organization (ICAO).

In discharging its responsibilities in international civil aviation, the Commission participated in the preparation of a coordinated United States position regarding communications and radio aids to navigation for a number of international aviation conferences and was represented on delegations to such conferences. Examples are the Pacific Regional Air Navigation Meeting, Manila; the Third Caribbean Air Navigation Meeting, Ciudad Trujillo; and the Canada-United States Radio Communication Meeting, Washington.

Special problems under consideration as a result of these meetings include improved teletypewriter and voice communication channels for the North Atlantic air routes and the possibility of utilizing transhorizon (VHF forward scatter) techniques to attain this objective.

Requirements exist for new and improved long range radio navigation aids on the North Atlantic, North Pacific, and Caribbean air

routes. Installation of new radio navigation facilities has been planned for the North Atlantic Region and studies regarding the best means of satisfying existing operational requirements for the other two regions are continuing.

There has been a notable acceleration in the transition from the HF to the VHF, from manual teletype operation to multiplexing with automatic teletypewriter equipment, and from telegraph to telephone operations on the air-ground channels. During the past year, provision was made for the frequency requirements of new and expanded operations in the North Atlantic, Pacific, and Caribbean areas.

Rule Making

In addition to the general recodification of the aviation rules, accomplished during fiscal 1956, rule making was carried forward on a variety of subjects, including implementation of additional radionavigation frequencies, technical standards for single sideband operation, technical standards for type-acceptance of aeronautical radio equipment, revision of Alaskan aeronautical and aeronautical fixed frequency assignments, and waiver of the radio operator requirement in connection with airborne radionavigation transmitters. Current technological developments which may result in rule making include transmission of radio energy by means of ionospheric scatter, development of radar safety beacons, tone signaling, and new equipment capable of operation with 50-kilocycle channel separation.

Aircraft Radio Stations

Air-ground safety communications and navigational information are provided aboard private and commercial airplanes by means of aircraft radio stations. Approximately 3,000 air carrier and 30,000 private aircraft stations are presently licensed by the Commission.

Aeronautical Enroute and Aeronautical Fixed Stations

Aeronautical enroute stations provide a nonpublic safety and operational en route communication service, on a nondiscriminatory basis, to aircraft station licensees making cooperative arrangements with appropriate ground station licensees.

Aeronautical fixed stations furnish aeronautical point-to-point service, notably in Alaska and between the United States and overseas terminals. Owing to the limited number of available frequencies, aeronautical fixed stations are not authorized where land line facilities are adequate.

There are about 2,000 stations of these classes.

Civil Air Patrol Radio Stations

The Civil Air Patrol is a civilian auxiliary of the United States Air Force. Members of the patrol are organized, trained and equipped to

assist in meeting both local and national emergencies, including vital search and rescue operations. More than 12,000 CAP stations are authorized by the Commission.

Airdrome Control Stations

These stations are primarily used to transmit control tower instructions to arriving and departing aircraft. This function is especially critical at busy airports, where adequate separation of approaching and departing aircraft must be maintained in order to prevent collision. Airdrome control stations are required to maintain a continuous listening watch on specified aircraft calling and working frequencies during authorized hours of operation. There are about 60 such stations.

Aeronautical Utility Mobile Stations

These stations enable control tower operators to direct the movement of emergency and maintenance vehicles at airports. There are approximately 160 stations in this group.

Radionavigation Stations

These facilities transmit radio signals which enable aircraft in flight to determine their positions with reference to the particular station or stations being received. Instrument flying assumes major importance during periods of limited visibility, when visual contact with the ground cannot be established. Ground stations in the radionavigation service include radio beacon, radio range, localizer, glide path, marker beacon, and ground control approach stations. Over 300 such stations hold licenses.

Flying School Radio Stations

Flying school radio stations are used to transmit instructions to students and pilots during flight practice periods. They number about 20.

Flight Test Radio Stations

Flight test radio stations are used by manufacturers of aircraft and major components to communicate with test pilots in connection with aircraft testing programs. Nearly 250 such stations are licensed.

Aeronautical Advisory Radio Stations

These stations are used at landing areas, not served by airdrome control stations, to provide private aircraft with radio advisory communications concerning the condition of runways, types of fuel available, wind conditions, weather data, and other information necessary to aircraft operation. They approximate 500.

Aeronautical Public Service Radio Stations

These stations are used aboard aircraft to provide an air-ground telephone service for the convenience of the passengers and flight

crew. Contact is made with telephone subscribers on the ground through public coast stations, which in turn interconnect with the national telephone land-line system. They number about 350.

Aeronautical Operational Fixed Stations

These stations—numbering about 30—provide aeronautical point-to-point service for link or control circuits, as well as other aeronautical fixed operations.

PUBLIC SAFETY RADIO SERVICES

General

The public safety radio services include the police, fire, forestry-conservation, highway maintenance, special emergency, and the State Guard radio services. These services are used by the various municipal and State governments for radio communication essential to the discharge of functions relating to public safety or the alleviation of an emergency endangering life or property. There are more than 20,000 such stations with nearly 386,000 transmitters.

It is these services which continually provide complex and ever expanding communication networks extending outward from cities, across the counties, and throughout the states. These stations are manned by trained personnel utilizing modern equipment. Installations oftentimes include auxiliary power supplies and transmitters to insure emergency communication in the event the main transmitting equipment fails or the power systems become inoperative.

The individual public safety services have maintained a rapid growth which has been assisted by matching funds furnished by the Federal Government to provide new or expanded radio facilities as a civil-defense measure. The police services have installed duplicate base stations in civil-defense headquarters to be used when the main base station is inoperative. In addition, these stations are used as auxiliary base stations. The fire service has been greatly augmented by civil-defense funds supplied to provide warning systems to aid communities.

The use of microwave equipment to enforce speed limits has expanded throughout the Nation. In addition, the control of traffic at intersections by microwave in certain areas is replacing the former system of treadles inserted in the roadbed to change traffic lights.

An interesting developmental operation is being conducted in Los Angeles to determine the service problems involved in the traffic light controls installed in emergency vehicles. The object is for the speeding emergency vehicle to, by remote control, clear a path en route and minimize the danger of traffic tieups and accidents.

Rule Changes

Regulatory changes in the public safety rules have been relatively few. Major changes in the frequency allocations have been considered to permit a limited expansion and consequent relief from cochannel interference now tolerated due to an insufficiency of channels.

An adopted rule change makes the frequency 39.46 megacycles available for assignment to all police licensees under certain operating conditions. The use of this frequency is necessary for surveillance, patrol, and detective operations.

Five proposed rule amendments to part 10 are outstanding. Probably the most important proposal is to provide 2 frequencies—1 in the 39-megacycle band and the other in the 45-megacycle band—for intersystem operation in the police service. The use of intersystem frequencies permits a simple means for intercommunication by the various police departments.

A proposed amendment of section 10.103 (a) would permit the use of tone signals by stations licensed for voice emissions to actuate sirens or other warning devices in civil defense preparations.

In addition, there are 2 proposed amendments to section 10.101. One is to provide for the use of the aeronautical universal emergency and distress frequency 121.5 megacycles by public safety stations. The second proposal reflects the conditions relating to the availability of frequencies below 27 megacycles to these stations. Its purpose is to advise applicants that the frequencies below 27 megacycles which are allocated to the public safety services are not generally available in all areas due to the existence of already established systems. When such a condition is found to exist, a substitute frequency would be sought by the Commission.

Police Radio Service

The police radio service is available to States, counties, cities, towns, and other instrumentalities of government to provide radio communication facilities primarily for the police departments and, secondarily, for other departments where there is a need for coordinated operations with the police department. Police radio stations number nearly 20,800.

Fire Radio Service

The fire radio service is available not only to the various governmental entities but also to organizations established to provide a fire protection service not otherwise provided by local government. There are over 3,000 fire radio stations.

Volunteer fire departments constitute the largest group of nongovernmental licenses in this service. It has been possible for these

organizations to develop mutual-aid plans extending over an entire county as well as into adjacent counties. When fires occur which are beyond the capabilities of the local fire department, additional equipment may be dispatched from adjoining counties. Additional fire-fighting units may be summoned from more distant locations. Under these conditions the areas from which the local fire-fighting units are withdrawn receive service from units moved forward from distant points. The plan whereby fire-fighting equipment is concentrated at the scene of the fire and adjacent units realigned is defined as a mutual-aid plan.

Forestry-Conservation Radio Service

The forestry-conservation radio service, with 2,700 stations, provides radio communication to combat forest fires and implement conservation projects such as water control, soil conservation, animal preservation, and conservation of other natural resources.

Authorizations for these stations are issued only to States, territories, possessions, and other governmental subdivisions including counties, cities, towns, etc., and persons or organizations charged with specific forestry-conservation activities.

Forest fire protection is usually accomplished by establishing a network of fire towers equipped with radio throughout the forests. When the location of a fire is reported by a tower observer, fire fighters and equipment are dispatched by aircraft, automobile, trailers, and bulldozers to the scene. The men and equipment transported by aircraft are dropped on location and oftentimes extinguish the fire. In the event further aid is needed, lightweight "handi-talkie" or portable radio sets are used to communicate with a local fire headquarters.

The unique flexibility inherent in radio communication has enabled many cooperative arrangements to be made between adjoining States. It is not uncommon for two States with a common forest area to patrol and assist in the fire-fighting assignments associated with such areas.

These cooperative arrangements now exist between groups of States. For example, Florida, Georgia, and South Carolina have expanded their radio facilities to enable each State to interchange fire fighting equipment as needed and to change the operating frequencies of the radio equipment accordingly.

Highway Maintenance Radio Service

This service is available only to States, territories, possessions, and lesser governmental subdivisions. Its 1,700 stations are used to transmit communications directly relating to public safety and the protection of life and property.

This service heretofore has been employed primarily by the various State governments; however, more and more counties and cities are

establishing radio facilities to assist in the maintenance of their road systems.

Special Emergency Radio Service

Over 2,300 stations in this service provide emergency radio communication for a number of activities all of which in one way or another involve the safety of life and property. Eligible groups include physicians and veterinarians who have a regular practice in rural areas; organizations established for disaster relief purposes; persons or organizations operating an ambulance service or rescue squad; beach patrols; school buses having regular routes into rural areas, and persons or organizations maintaining an establishment in isolated areas where public communication facilities are not available and where the use of radio is the only feasible means of communicating with a center of population or other point from which emergency assistance might be obtained, if needed.

Common carriers are eligible in this service for radio stations to be used in effecting expeditious repair to interruptions of public communication facilities. Also, persons or organizations operating communication circuits are eligible for standby radio facilities in this service.

State Guard Radio Service

Authorizations in this service are issued only to the State Guard or comparable organization of a State, territory or possession, and only where such organization has been duly created by law and is completely subject to the control of the Governor or highest official of the governmental entity. This service is virtually dormant at this time as the State Guard usually is inactive until such time as the State National Guard is mobilized.

DISASTER COMMUNICATIONS SERVICE

This service provides radio communication in times of emergency, such as war or natural disaster, in relief of normal communication facilities which may be destroyed or overloaded.

Civil defense and other disaster and emergency relief organizations are eligible in this service upon submission of a satisfactory communications plan. Federal Government stations may also be authorized to operate in the 1750- to 1800-kilocycle band allocated to the disaster service.

During normal times, communication is limited to drills and tests; whereas during emergencies all necessary types of relief or civil defense communications may be handled.

Thirty-five approved plans include more than 327 disaster station authorizations.

INDUSTRIAL RADIO SERVICES

General

Part 11 of the Commission's rules provides for licensing and regulation of radio facilities for various types of industrial users. These individual services include power, petroleum, forest products, motion picture, relay press, special industrial, and industrial radiolocation. Each has its own eligibility requirements and radiofrequency assignments. There are approximately 30,600 authorizations in the industrial services, covering the use of over 275,000 transmitters.

During fiscal 1956, various subparts of the industrial rules were amended to better regulate the individual services as well as to meet new and additional industrial requirements. One general amendment provides for a single application and authorization for two or more units of base or fixed stations at temporary locations, thus eliminating the issuance of many identical authorizations, except for call signs, thereby reducing the clerical burden on both applicants and the Commission.

A general study and evaluation of industrial radio has been continued in view of its ever increasing need in this field. Various means of augmenting the number of frequencies available are being explored in order to accommodate not only many new applicants under the present rules but for the influx of additional applicants expected under revised rules planned for fiscal 1957. Interference between present licensees who have to share the same frequencies in congested areas adds to the problem of authorizing new licensees. However, improved equipment, narrow channeling and more rigid technical and operational requirements presently under study may provide some measure of relief.

Power Radio Service

This service is for those engaged in the generation, transmission or distribution of artificial or natural gas by means of pipeline; or the distribution of water or steam by pipeline, or of water by canal or open ditch—in all cases for use by the general public or by members of a cooperative organization. This service has grown to nearly 9,900 authorizations. Its covering rules (Subpart F, of Part 11) were not changed during fiscal 1956, but section 11.251 was amended to make common carriers having maintenance and construction requirements eligible in the power radio service on certain frequencies. However, this action was later stayed.

Petroleum Radio Service

Persons engaged in prospecting for, producing, collecting, refining, or pipeline transportation of petroleum or petroleum products (in-

cluding natural gas) are eligible for authorizations in this radio service. The number of its stations has increased to over 6,700.

Forest Products Radio Service

This service is for those engaged in logging, tree farming, or related woods operations. There are over 1,300 authorizations. Many persons have expressed a desire for tone signaling to cause a whistle to blow on a donkey engine used to pull logs through the woods by a long chain. The signals from a "whistle tooter" activates the whistle to indicate when starting or stopping the engine is desired and also warns people to watch out for the dragging chain and log. This additional use of radio is being studied to determine the feasibility of amending the rules to permit it.

Motion Picture Radio Service

Persons engaged in the production or filming of motion pictures are eligible to operate radio stations in this service. Fifty such authorizations are outstanding.

Relay Press Radio Service

This service is available to newspapers or press associations. Its authorizations have increased to 95.

Special Industrial Radio Service

The rules governing this service, originally making it available to persons "engaged in an industrial activity the primary function of which is devoted to production, construction, fabrication, manufacturing, or similar processes as distinguished from activities of a service or distribution nature" and meeting certain supplemental requirements, were revised September 7, 1955, effective November 1, 1955. These revisions make the special industrial rules more definite and detailed. They provide for licensing radio-communication equipment for use in connection with various activities in the following general categories: Agriculture, heavy construction, building construction, manufacturing, mining, specialized industrial service and trade activities, engineering service, and miscellaneous public service activities, the details of which are spelled out in the revised rules. Special industrial authorizations exceed 11,000.

Low Power Industrial Radio Service

Over 1,200 authorizations in this service cover radio facilities used in conjunction with commercial or industrial activities. A proposed rule amendment (Docket 10964) would prohibit the use of a transmitter as a base station to communicate with vehicles on public streets

or highways in order to protect the users of hand-carried or pack-carried radio equipment at on-the-job locations from excessive interference.

Industrial Radiolocation Service

This radio service is available to (*a*) any person engaged in a commercial or industrial enterprise who has a substantial need to establish a position, distance, or direction by means of radio-location devices for purposes other than navigation, or (*b*) a corporation or association furnishing a radiolocation service to eligible persons. Its authorizations have increased to 168.

During fiscal 1956 the rules governing this service were amended to permit the use of frequencies 230, 250, and 310 megacycles by land and mobile radiopositioning stations (SHORAN) at locations within 150 miles of the shorelines of the Gulf of Mexico and California. The rules were also changed to continue the developmental status beyond July 1, 1956, for (1) stations authorized on frequencies below 1800 kilocycles to expire on July 1 of the year following that in which action is taken on the license application, and for (2) stations authorized on frequencies above 1800 kilocycles to expire 1 year from the date of final action on the license application. Another amendment authorizes frequencies in the band 10500–10550 megacycles for CW [continuous wave] emission only for land mobile radiopositioning stations including speed-measuring devices.

LAND TRANSPORTATION RADIO SERVICES

General

Part 16 of the rules cover licensing and regulation of four classes of land transportation radio services—motor carrier, railroad, taxicab, and automobile emergency. Each has its own eligibility requirements and radio frequency assignments. Their composite authorizations approximate 27,600.

During fiscal 1956 some of the subparts of the land transportation rules were amended to better regulate the individual services as well as to grant additional privileges. A general amendment provides for a single application and authorization for two or more units of base or fixed stations at temporary locations.

The problem of sufficient radio frequencies to cope with the demand for more land transportation stations has become extremely pressing, especially in the motor carrier and taxicab services in and near large metropolitan areas. This has necessitated a study of ways and means to relieve the present congestion and provide for the continuing influx of new applications. It is expected that rules revisions to be proposed

during fiscal 1957 will provide some relief by narrowing the frequency channels and requiring improved transmitting and receiving equipment for new licensees and, within a reasonable authorization period, for existing licensees.

Motor Carrier Radio Service

This radio service is available to persons primarily engaged in providing a common or contract motor carrier service for (*a*) passenger transportation between urban areas; (*b*) passenger transportation within a single urban area; (*c*) property transportation between urban areas, and (*d*) property transportation within a single urban area in connection with intercity, interstate, or international shipment. Motor carrier authorizations exceed 1,000.

During the year the motor-carrier rules were amended to change eligibility from "solely" to "primarily" engaged for persons providing a common or contract carrier transportation service for the local distribution or collection of property in intercity, interstate or international shipment; also to permit the use of their radio facilities to communicate with vehicles used to supervise, tow, repair, or maintain their radio-equipped trucks.

The American Trucking Association petitioned to permit the use of the 44-megacycle band frequencies without certain restriction now in effect when it is shown that the carrier serves an area in excess of 15 miles from its terminal base station and provides at least daily service to a noncontiguous urban area. That association desires further to have carriers whose operations are confined to a single urban area eligible for 43–44-megacycle band frequencies when the size or shape of the urban area or the terrain conditions or both preclude the use of a frequency in the 450–460-megacycle band.

Railroad Radio Service

Public passenger and freight service are aided by the more than 1,700 authorizations.

During the year, part 16 of the rules was amended to provide for the assignment of additional frequencies to mobile relay stations in railroad point-to-train mainline operations, for which only two frequencies were previously available. This amendment redefined "mobile relay station" in section 16.6 (q).

The Atcheson, Topeka & Santa Fe Railway Co., supported by the Association of American Railroads, petitioned to permit the use of tone signals on railroad radio frequencies (presently limited to voice) for the actuation of road crossing protection facilities by yard locomotives, warning signals to track gangs and to stopped trains. Inas-

much as such a requirement might be very extensive, the proposals must be studied to insure that any rule change in this connection would not permit operations which would cause harmful interference to voice communication and deterioration of the present service.

Taxicab Radio Service

This service is available to persons regularly engaged in furnishing a public "for hire" nonscheduled passenger land transportation service not operated over a regular route or between established terminals. There are over 4,800 taxicab authorizations.

Automobile Emergency Radio Service

Associations of owners of private automobiles and public garages which provide private emergency road service hold 571 authorizations in this service. The covering rules were amended during the year to provide for limited use of radio by private automobile associations for the secondary purpose of reporting on traffic conditions from aircraft and from vehicles on the ground.

CITIZENS RADIO SERVICE

This fixed and mobile service is for private or personal radio communication, radio signaling, control of objects or devices by radio, and other purposes not specifically prohibited. Any citizen 18 years of age or over is eligible for a license.

This is a fast-growing service in that it is being used by more and more industrial concerns and business enterprises who are not eligible in some other service for the uses to which they desire to put radio. Some of the organizations now operating citizens radio are ice or fuel delivery service to consumers within the limits of cities of 50,000 or more population; heavy construction and building activities within metropolitan areas of 500,000 or more population when a fixed base station is needed; department store delivery trucks; radio and TV servicing, etc.

Aside from class C stations for controlling model aircraft, the majority of the 18,600 citizen licensees use their radio facilities for purposes in connection with their businesses. Revisions of these rules are contemplated.

AMATEUR RADIO SERVICE

The amateur radio service is the one radio service where a person may engage in radio communication as a hobby solely with a personal aim and without pecuniary interest as defined in national and international law.

While to some the term "personal aim" might indicate a selfish use of valuable radio space, those who are familiar with the service know that the radio "ham", in the pursuit of his hobby, has contributed much to the public benefit and the service of his country. That this represents a good investment is evidenced by the amateurs' continual contribution of new theoretical and practical advances in the field of electronics.

Communication service is provided voluntarily by amateurs during hurricanes, floods, and other natural and man-made disasters and emergencies when normal avenues of communication are often destroyed or severely overloaded. As an example, during the disasters caused by hurricanes Connie through Janet in 1955, a group of 146 amateurs spent a total of over 1,200 hours on the alert. In this period they handled 395 urgent Red Cross and weather messages which could not be carried over normal circuits.

Civil defense organizations are furnished a corps of skilled amateurs ready and willing to lend themselves and their equipment in preparation for, and in the service of, their communities in a time of war or other civil emergency.

Amateurs relay thousands of personal messages between overseas GI's and their families at home.

The self-training achieved by the amateur is a valuable national asset in furnishing a reservoir of skilled personnel in time of war.

In their daily contacts with their fellows all over the world, American amateurs are continually making new friends and, thus, imparting a better understanding of our way of life to the citizens of other countries. After a trip to several foreign countries in which he was greeted with open arms by amateurs with whom he had become acquainted by radio, one amateur remarked that there would be no war if all people were radio amateurs.

Relatively easy entry into amateur-radio activity is provided through the novice-class license which requires only an elementary knowledge of code, radio theory, and regulation. Experience as a novice encourages progress to higher classes of amateur licenses and broader operating privileges.

The popularity of amateur radio is indicated by the issuance of some 10,000 new operator licenses during the year. A total of over 146,000 amateur operator licenses of all classes and more than 150,000 amateur station licenses were on the Commission's books at the end of the fiscal year.

During the year, 210 radio amateur civil emergency service (RACES) plans were approved, making a total of 491 such plans

with 3,461 stations and an estimated 8,100 transmitters authorized in that service. The RACES is the means whereby the radio amateur may provide a vitally important communication service for his local or State civil defense organizations. Each such organization operates under a plan which has been approved by local, State, and Federal civil-defense authorities and the Federal Communications Commission. By this means the amateur may not only serve his community in civil emergencies but may continue to do so during time of war when other amateur-radio activity is shut down.

As with any large group, the problems involved in the regulation of the amateur service are numerous. They range from international considerations, such as frequency allocation and regulations on permissible communications with foreign amateur stations, to domestic problems concerned with rules promulgation and licensing.

The year-by-year increase in the number of amateur stations and the accelerating rate at which applications are received poses a continuing administrative problem of maintaining adequate regulation and efficient application processing.

Fortunately, serious violations of the rules are few in number. This stems generally from the fact that amateurs take pride in policing their own service. During the year, only 17 violations were of such nature as to result in suspension of license.

Because of his ingenuity and scientific curiosity, the radio amateur is continually raising technical and operating questions not covered by regulations.

During the year the amateur rules were amended in several respects to bring them more in line with recent technical and operational developments. These amendments include:

The permissible frequency shift for teleprinter operation was changed so that there is no longer a minimum frequency shift requirement.

The code practice rule was clarified.

Petitions to increase the permissible power which may be used in the 420–450-megacycle band to 1 kilowatt were denied. However, the rule was amended to permit 50-watt input power instead of the former 50-watt peak output power limitation in this band.

A further limitation on amateur sharing of the 1800–2000-kilocycle band was imposed because of a frequency change in the Loran navigation system in the Caribbean area.

Except for the matter of amending the amateur rules to make persons who are members of the Communist Party and persons who are not of good moral character ineligible for operator licenses, no unfinished amateur rule-making proceedings were on hand at the end of the year.

ENFORCEMENT

The rapid acceptance of radio as an essential element in almost every field of business endeavor has resulted in such congestion of frequency occupancy that a policy of strict enforcement of Commission technical regulations and procedural rules is required if maximum benefit is to be realized from such private communication systems. An even more rigorous enforcement program is considered essential and justified to enable the Commission to extend the availability of radio communication to a larger proportion of the public. However, the law does not at present provide a suitable penalty.

Because of the very large number of transmitter units involved in these private operations, the enforcement problem may be said to be analogous to that of traffic control, where it has proved necessary to assess promptly a small penalty commensurate with the seriousness of the particular violation. Accordingly, the Commission proposed in the last Congress a bill providing a small forfeiture ($100) for violations of its regulations collectable in the Federal courts. The bill would permit a compromise or remission of the forfeiture by the Commission.

The same objection was offered to the bill as has been made to the manner of handling traffic violations; namely, that the procedure is too arbitrary. The answer, of course, is the same as it is with traffic regulation. The method is effective, the need for enforcement is obvious, and the economics of the situation does not justify a more elaborate procedure.

Enforcement action during the year, in addition to correspondence in situations not warranting formal measures, included the issuance of 84 orders to modify licenses to delete frequencies which were used improperly, 5 forfeiture notices against compulsorily radio equipped vessels, 17 orders suspending amateur licenses and 13 orders to show cause why station licenses should not be revoked.

STATISTICS

Stations in Safety and Special Radio Services

At the close of fiscal 1956, there were 338,886 stations in the safety and special radio services (exclusive of experimental, which are included in a separate chapter). This is an increase of 38,659 over the 300,227 authorized at the close of the previous year.

Each separate license, construction permit, or combination construction permit and license is counted as one station. Therefore, a station might include a base transmitter and many mobile units.

The following table shows the number of stations in each service at the close of fiscal 1956 compared to 1955:

Class of station	June 30, 1955	June 30, 1956	Increase or (decrease)
Amateur and disaster services:			
Amateur	139,993	150,549	10,556
Disaster	317	327	10
RACES	2,077	3,461	1,384
Total	142,387	154,337	11,950
Aviation services:			
Aeronautical and fixed group	2,082	2,445	363
Aircraft	30,228	33,689	3,461
Aviation auxiliary group	150	188	38
Aviation radionavigation land	287	316	29
Civil air patrol	11,108	12,107	999
Total	43,855	48,745	4,890
Industrial services:			
Agriculture	9	0	(9)
Forest products	1,144	1,316	172
Industrial radiolocation	143	168	25
Low power industrial	933	1,269	336
Motion picture	43	50	7
Petroleum	6,178	6,754	576
Power	8,132	9,874	1,742
Relay press	82	95	13
Special industrial	8,190	11,071	2,881
Total	24,854	30,597	5,743
Land transportation services:			
Automobile emergency	411	571	160
Citizens	12,334	18,602	6,268
Highway truck	1,084	842	(242)
Interurban passenger	64	68	4
Interurban property	42	680	638
Railroad	1,405	1,731	326
Taxicab	4,526	4,830	304
Urban passenger	105	111	6
Urban property	31	157	126
Total	20,002	27,554	7,572
Marine services:			
Alaskan group	786	919	133
Coastal group	243	301	58
Marine auxiliary group	74	91	17
Marine radiolocation land	17	19	2
Ship group	49,594	55,585	5,991
Total	50,714	56,915	6,201
Public safety services:			
Fire	2,337	3,062	725
Forestry conservation	2,967	2,704	(263)
Highway maintenance	1,330	1,699	369
Police	9,725	10,819	1,094
Public safety (combined)	29	70	41
Special emergency	1,839	2,344	505
State guard	188	20	(168)
Total	18,415	20,718	2,303
Grand total	300,227	338,886	38,659

Transmitters in Safety and Special Radio Services

As of January 1, 1956, there were 1,176,500 transmitters authorized in the safety and special radio services as compared to 767,893 at the beginning of the previous calendar year. Of these, 208,175 land and fixed stations represent an increase of 36,032, and 968,325 mobile units represent an increase of 372,575, or a total increase of 408,607 transmitters during the calendar year.

Class of station	Land or fixed transmitters	Mobile station transmitters	Total transmitters
Amateur and disaster services:			
Amateur	142,819		142,819
Disaster	556	707	1,263
RACES	5,134	7,701	12,835
Total	148,509	8,408	156,917
Aviation services:			
Aeronautical and fixed group	2,985		2,985
Aircraft group		31,097	31,097
Aviation auxiliary	27	1,008	1,035
Aviation radionavigation land	286		286
Civil air patrol	4,680	8,630	13,310
Total	7,978	40,735	48,713
Industrial services:			
Agriculture	18		18
Forest products	1,049	12,400	13,449
Industrial radiolocation	99	285	384
Low power industrial		13,887	13,887
Motion picture	35	478	513
Petroleum	6,694	33,442	40,136
Power	6,925	95,764	102,689
Relay press	56	1,184	1,240
Special industrial	8,229	94,825	102,954
Total	22,987	252,265	275,252
Land transportation services:			
Automobile emergency	477	4,541	5,018
Citizens		54,700	54,700
Highway truck	714	12,969	13,683
Interurban passenger	51	913	964
Interurban property	576	10,486	11,062
Railroad	1,413	57,611	59,024
Taxicab	4,709	98,782	103,491
Urban passenger	103	2,733	2,836
Urban property	26	722	748
Total	8,069	243,457	251,526
Marine services:			
Alaskan group	1,475		1,475
Coastal group	394		394
Marine auxiliary group	217	7	224
Marine radionavigation land	20		20
Ship group		56,258	56,258
Total	2,106	56,265	58,371
Public safety services:			
Fire	2,262	36,679	38,941
Forestry conservation	3,145	20,290	23,435
Highway maintenance	1,304	15,607	16,911
Police	8,342	287,855	296,197
Public safety (combined)	1,233		1,233
Special emergency	2,054	6,511	8,565
State guard	186	253	439
Total	18,526	367,195	385,721
Grand total	208,175	968,325	1,176,500

Applications in Safety and Special Radio Services

During fiscal 1956, nearly 170,500 applications for stations in the safety and special radio services were received. This is an increase of 19,156 applications over the previous year.

The following table compares the number of applications received in each service during fiscal 1955 and 1956:

Class of station	Received 1955	Received 1956	Increase or (decrease)
Amateur and disaster services:			
Amateur	77,263	89,093	11,830
Disaster	40	22	(18)
RACES	1,568	1,638	70
Total	78,871	90,753	11,882
Aviation services:			
Aeronautical and fixed group	2,121	1,642	(479)
Aircraft group	17,438	19,358	1,920
Aviation auxiliary group	107	149	42
Aviation radionavigation land	180	160	(20)
Civil Air Patrol	3,037	2,200	(837)
Total	22,883	23,509	626
Industrial services:			
Agriculture	10	0	(10)
Forest products	538	757	219
Industrial radiolocation	155	177	22
Low power industrial	524	663	139
Motion picture	29	37	8
Petroleum	3,482	4,403	921
Power	3,964	4,340	376
Relay press	48	49	1
Special industrial	5,419	7,449	2,030
Total	14,169	17,875	3,706
Land transportation services:			
Automobile emergency	289	373	84
Citizens	1,280	2,178	898
Highway truck	645	90	(555)
Interurban passenger	20	29	9
Interurban property	271	817	546
Railroad	562	859	297
Taxicab	2,248	2,592	344
Urban passenger	54	67	13
Urban property	74	223	149
Total	5,443	7,228	1,785
Marine services:			
Alaskan group	1,130	376	(754)
Coastal group	448	210	(238)
Marine auxiliary group	72	32	(40)
Marine radiolocation land	20	15	(5)
Ship group	18,331	18,948	617
Total	20,001	19,581	(420)
Public safety services:			
Fire	1,434	1,916	482
Forestry conservation	1,110	1,199	89
Highway Maintenance	1,000	1,081	81
Police	5,200	6,038	838
Public safety (combined)	37	120	83
Special emergency	1,119	1,194	75
State guard	73	2	(71)
Total	9,973	11,550	1,577
Grand total	151,340	170,496	19,156

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Broadcast Services

GENERAL

At the close of the fiscal year there were more than 7,000 broadcast authorizations, of which number over 4,300 were for regular program stations and the remainder for auxiliary and experimental stations.

Of more than 3,000 authorized AM stations, nearly 2,900 were on the air.

Of over 600 authorized commercial TV stations, nearly 500 were on the air.

Of 41 authorized noncommercial educational TV stations, 20 were on the air.

Of nearly 550 authorized commercial FM stations, 530 were on the air.

Of 136 noncommercial educational FM stations, 126 were on the air.

TELEVISION (TV) BROADCAST SERVICE

Growth of TV

Since the issuance of the Commission's Sixth Report and Order in April of 1952 promulgating a new TV allocation plan and lifting the "freeze" on new TV stations, the expansion of this service has been phenomenal.

In mid-1952 only 108 (all commercial VHF) TV stations were in operation; only 63 communities had 1 or more local stations, and only 23 had 2 or more. About 15 million sets were then in use.

On July 1, 1956, over 500 commercial and educational TV stations were on the air. Nearly 300 communities had 1 or more stations in operation, and of these 173 communities had 1 station, 79 had 2, 28 had 3, and 9 had 4 or more. These figures do not reflect the additional service which certain communities, particularly those in more densely populated areas east of the Mississippi River, receive from stations in nearby communities.

It is estimated that over 90 percent of the Nation's population is now within range of at least 1 TV station, that over 75 percent is within range of 2 or more stations, and that nearly 39 million TV sets are now in use. Estimates indicate that around $15 billion have been

invested by the public in TV receiving equipment and that the annual volume in TV advertising, set sales, and servicing exceeds $4 billion a year.

These figures make it evident that TV is now well established. However, they also show that further expansion of TV service is necessary to achieve the Commission's 1952 stated objectives for the full development of a nationwide competitive system. These basic aims include (*a*) at least 1 service to all areas, (*b*) at least 1 station in the largest possible number of communities, and (*c*) multiple services in as many communities as possible to provide program choice to the public and to facilitate competition among broadcasters, networks, and other elements of the industry.

The first objective has been substantially met, but serious problems impede realization of the second and third objectives. Many of the smaller communities are without a first local outlet and the expansion of multiple, competing services in the larger economic and population centers is lagging. Difficulties in successfully operating stations in the UHF band have been a significant factor.

During the past fiscal year, as well as the previous one, the Commission gave particular attention to ways and means of strengthening and advancing TV service throughout the nation.

TV Problems

The obstacles to continued expansion of TV service spring from the limitation to 12 channels in the VHF band and the difficulties which have been experienced in achieving a fuller utilization of the 70 UHF channels. They are due chiefly to the large number of VHF-only receivers in use and the high proportion of VHF-only receivers which continue to be manufactured; certain performance deficiencies of UHF transmitting and receiving equipment, particularly in the initial use of UHF for video, and the consequent preference of program and revenue sources for VHF outlets.

Some of the obstacles to further TV expansion, however, are due to causes beyond the control of the Commission. To an appreciable extent these problems are basically economic and arise out of inability, at the present stage of TV development, to obtain sufficient economic support to meet the high costs of construction, programming, and operation of stations. On other aspects of the problem, relating for example to the improvement of transmitting and receiving equipment, valuable contributions must come from the industry. However, recent developments indicate that rapid strides are being made in improving UHF equipment.

During the past 2 fiscal years the Commission received numerous proposals, petitions, and suggestions from TV broadcasters and other elements of the industry for alleviating these and other growing pains

of the TV service. They varied widely, ranging from channel reassignments affecting a single city to major revisions affecting the entire country. The proposals included such diverse and mutually inconsistent approaches as conversion to an all VHF system, conversion to an all UHF system, and continued use of both bands under a wide variety of methods. Some envisaged the use of new VHF channels, the use of present VHF channels under reduced spacings, or both. Others contemplated the substitution, locally, of UHF for VHF channels. Some proposals were based on revising existing engineering standards and policies, notably with respect to minimum spacings, maximum antenna heights and power, the directionalizing of antennas and the use of cross-polarization. Other proposals advocated the maintenance of present standards.

Since none of these proposals appeared to warrant adoption without extensive study and evaluation, on November 10, 1955, the Commission initiated a general rule-making proceeding (Docket 11532) to determine the realistic possibilities for improvement through revision of existing TV allocations, and to examine and compare the proposals and comments on an overall basis. The Commission stated that it would be premature at the outset to consider proposals affecting only single communities or local areas since piecemeal measures neither promised significant overall relief nor would necessarily be consistent with such action as it might take in the general situation.

Accordingly, the Commission terminated pending rule-making proceedings for deintermixture of five individual communities and denied a number of similar petitions requesting departures from the present table of channel assignments or standards. The Commission stated, however, that when general determination had been made, it would be in a position to consider questions concerning specific channel assignments in individual communities or limited areas.

On June 26, 1956, the Commission, after studying the 12 volumes of proposals and comments on file, delineated the course which it considered to offer the best possibilities for providing more competitive TV services and for both the immediate and long-range expansion of TV.

While stating that it would be premature to adopt final conclusions concerning the feasibility of ultimately shifting all or a major portion of VHF operations to the UHF band, it determined that this proposal was the only one of the many it considered which gave promise of achieving, through the operation of the allocation processes, the long-range goal. It was of the view that if suitable means could be found to overcome the difficulties inherent in such a major move, and if UHF could be developed sufficiently to permit the elimination of VHF channels without an overall loss of services, a number of basic

advantages would result. All stations would be able to compete on a much more nearly comparable basis technically, since there is much less disparity between the lower and upper UHF channels than between the VHF and UHF television channels, and thus the coverage of competing stations would be more comparable than at present, and competitive opportunities among broadcasters, among networks and other program and revenue sources would be considerably enhanced. As a result, the establishment of numerous additional stations would be encouraged in communities where a first or additional service is needed. These achievements would be aided by the fact that broadcasting in a single band would, after a suitable transition period, eliminate the present crucial problem of UHF receiver incompatibility.

The Commission invited all interested parties to submit comment and data by October 1, 1956, and subsequently, on the basic problems involved in such a shift, particularly those concerning UHF's capacity to provide a complete TV service and the best means of minimizing cost and dislocation both to the industry and to the public by the transition. The Commission was of the view that it would be premature at this stage to examine possible uses for the VHF channels which would be vacated. It noted that since neither it nor the industry has complete control of getting UHF sets into the hands of the public, it may be essential for Congress, contemporaneously, to examine the advisability of legislation, such as special tax relief or more drastic remedies, to relieve the receiver situation.

The Commission also concluded that no immediate judgment could be made as to whether conversion to all-UHF operation would or would not result in the loss of present or potential services from VHF channels until the extent to which UHF transmission and reception can be improved is determined. It, therefore, proposed that an expedited program of research and development be launched without delay to achieve the maximum possible improvement in UHF transmitters, receivers, and receiving antennas. Comments were invited concerning the most effective methods for conducting and expediting this suggested research and development program. The first FCC-industry conference for the purpose of expediting research and development of UHF technical operation was held on September 20, 1956.

Since consideration of the long-range UHF conversion plan may involve a considerable period of time, the Commission decided to take certain interim steps to improve the opportunities for effective competition among a greater number of stations. Among these was the decision to proceed with consideration of pending or subsequent petitions for channel reassignments to further competition among stations in particular areas. Accordingly, the Commission proposed

rule making with respect to proposed channel reassignments in a number of individual communities and limited areas which appeared to merit consideration. In general, such proposals are those which would remove VHF assignments in areas where there already is considerable UHF service or add new VHF channels in communities where VHF is already established and the addition will result in a third or fourth VHF service.

The Commission also decided that, as an immediate measure, its minimum city-to-city mileage separation requirements for channel assignments should be relaxed in order to permit new VHF assignments in appropriate instances at shorter mileage spacings between cities than required by the present rules so long as the present minimum requirement of spacings between transmitters is met. Its rules were so amended July 19, 1956.

Another interim step to improve competitive TV was to increase maximum power limits for UHF stations from 1000 to 5000 kilowatts, the object being to make UHF coverage more comparable to VHF. UHF equipment now in use yields effective radiated power of 1000 kilowatts, and encouraging tests have been made with UHF transmissions at 4500 kilowatts and even higher power.

Another decision was that it would be undesirable to alter VHF antenna height and power ceilings in Zone 1 as contemplated July 20, 1955. Upon further review, the Commission determined that in light of its objective of getting more TV stations in both large and small markets that no alteration of the antenna height and power maxima for VHF in Zone 1 was warranted.

Translator Stations

On May 23, 1956, the Commission amended its rules effective July 2, to authorize the operation of a new type of TV broadcast station called a UHF "translator" station. This provides another means for bringing TV service to small communities and sparsely settled areas—particularly in the West—where direct reception of the signals of existing TV stations is impossible or unsatisfactory because of distance or intervening terrain barriers and where, in many such places, establishment of a local TV station is not economically feasible even though channel may be available.

The first three translator stations were authorized September 6, 1956.

Translators are low-powered, relatively inexpensive stations designed to pick up the signals of existing stations (VHF or UHF) within range. They then convert these signals, amplify, and rebroadcast (translate) them on the upper 14 UHF channels (Channels 70–83) with sufficient strength to permit adequate reception on UHF receivers. By confining translator operation to this less congested

portion of the TV band, the Commission is able to make translator operation affordable in small communities and still insure dependable service and protection of other services.

Low-power transmitters not exceeding 10 watts may be used by translator stations and they will, in most cases, supply an effective radiated power of 100 watts or more. While only one channel may be assigned for each translator station, additional stations may be authorized on other channels to provide multiple services in an area. Each translator station is given its own call letters. In addition, translator stations are not required to adhere to any specified hours of operation, and remote control operation is permitted. No limit is placed on the number of translator stations which may be operated by the same interest.

Satellite Operation

Since the high cost of facilities for local programming has deterred many parties otherwise interested in constructing and operating new TV stations, the Commission on August 5, 1954, enabled TV stations to be authorized even though they do not propose to originate local programs and would limit their broadcasts to duplicating programs of another station when it appears that this type of operation is necessary to the establishment of a local outlet.

Stations authorized on this basis are commonly called "satellites" because of their dependence on another station for all or a large proportion of their programming. Except for the absence of local program originations, these stations must comply with the same rules and operating requirements that govern regular TV stations. It is expected that in time most of them will find it feasible to add local programming and thus become full-fledged TV stations.

Sixteen stations, most of them UHF, have been authorized to operate as satellites. Thirteen applications are pending.

Low Power Operation

Supplementing its policy to lower the high cost of station operation in the smaller communities, the Commission on June 22, 1955, reduced the minimum power requirements of both UHF and VHF stations from 1,000 watts to 100 watts and eliminated the minimum antenna height requirements. This makes possible the construction of TV stations in the smaller communities at reduced cost, particularly if such stations are also authorized to operate as satellites.

Booster Operation

The use of amplifying transmitters, sometimes called "boosters", as another means of providing TV service to unserved areas is being considered in a rule-making proceeding instituted on March 30, 1955.

As distinguished from "satellites" and "translator" stations which operate on different channels, a "booster" operation contemplates the use of a low power amplifying transmitter operating on the same channel as an established TV station to simultaneously transmit or "boost" the signal broadcast by the principal station to areas which might not otherwise be able to receive service.

The Commission is particularly exploring the possibility of authorizing the use of "boosters" to furnish service to "shadow" or unserved areas lying within the normal service area of UHF stations. Since UHF stations experience more difficulty than VHF stations in getting their signals into places which, because of intervening terrain, are not in direct line of sight with their transmitting antenna, certain spots in their coverage area may be deprived of service.

Experimental booster operations have been authorized in the past, but none has, as yet, been authorized as a regular service. During the year several cease and desist orders were issued against operators of unlicensed booster operations.

Community Antenna TV Systems

In addition to the service provided by TV stations directly, it is estimated that over 500 community antenna systems bring TV programs to over 600,000 homes in communities which, for the most part, either because of their distance from, or their particular geographic location, are unable to get satisfactory TV service. The largest number of such systems is in Pennsylvania; many are also operating in West Virginia and the Pacific Northwest, particularly in Oregon and Washington.

Cooperative groups organized without profit or companies organized for profit operate these systems. The usual installation consists of a master antenna located at some advantageous location, usually on a high hill or mountain, which picks up the signal of one or more distant TV stations. By means of amplifying equipment and wire transmission lines, the signals are then distributed by cable to the TV sets of customers or subscribers. Several different programs may be furnished simultaneously, and usually a conventional TV receiver is used to tune to each program in the same manner as if it were being received directly from a TV broadcast station. An installation charge and a monthly service charge are generally paid by each subscriber for the service.

The Commission does not license or regulate the installation and operation of community antenna systems at the present time. However, it does impose limitations on their radiations which may interfere with authorized radio services. Formerly, the general prohibitions in part 15 governing the use of incidental radiation devices were

applicable to community antenna systems, but on July 12, 1956, the Commission amended these rules to specifically prescribe radiation limits for community antenna systems. All such systems whose construction begins on or after October 1, 1956, must comply. Systems in existence on or before September 30, 1956, have until December 31, 1959, to comply. However, all systems are required to take immediate steps to eliminate any interference which may be caused during the interim period.

The Commission has under consideration a number of requests urging that it exercise more jurisdiction over community antenna systems, and it is exploring the question of whether such operations constitute common carrier or another kind of operation subject to its jurisdiction.

Subscription TV

There are several different proposed systems of subscription ("pay-as-you-see" or "toll") TV, but they are alike in fundamental respects. All involve methods for scrambling the transmitted program so as to produce a distorted picture and unintelligible sound at any TV receiver not equipped with an unscrambling device. These systems contemplate that the owners of receivers must pay for the programs they wish to see.

The various systems differ principally in the techniques used to scramble and unscramble the programs and in the manner in which payment would be collected. Experimental testing of several systems has been permitted in the past, but the Commission's present rules do not authorize subscription operations on a regular basis.

In February of 1955 the Commission instituted a proceeding to determine whether its rules should be amended to permit TV stations to furnish a subscription service. Comments were invited on petitions filed by proponents of subscription TV and on certain legal, policy, and technical questions involved. These questions relate to such matters as the authority of the Commission to authorize toll TV, its possible impact on the broadcasting industry and the public, regulatory controls which may be needed, and factual data relating to technical operation, program resources, types of programs contemplated, and the plans of organizations intending to engage in subscription operations.

More comments were received than in any other docket case of the Commission. They fill about 70 reference volumes and number more than 25,000 formal pleadings, letters, postcards, etc. The comments express views both for and against the subscription TV, take different positions as to the circumstances for authorization and the limitations which should be imposed, and propose different technical means for operation.

The voluminous record and the difficult questions involved do not permit ready analysis and prompt decision. Study of the record is not yet completed. Before a final determination is reached by the Commission as to whether the public interest would be served by authorizing such a service, it may be necessary to schedule further proceedings, including oral hearing and demonstrations.

Color TV

During the year the TV industry launched its biggest color drive since the standards for the present system of compatible color TV were adopted in December of 1953. Many technical improvements were made in transmitting equipment and receivers. The networks expanded their color facilities and stepped up their color broadcasts, and they have scheduled a greater amount of color broadcasting for the ensuing year. One network plans to include a major color program nightly on a regular basis in addition to its daytime color schedule.

By midsummer of 1955, the number of TV stations equipped to colorcast network color programs tripled the number of stations so equipped at the same time in 1954—from some 60 to nearly 200—and the number now approaches 300. Of these stations, more than 60 are able to broadcast color slides and films locally, and about 30 have equipment for local live colorcasts. In April of 1956 WNBQ, Chicago, began telecasting all of its local studio programs in color, devoting about 7 hours a day to color. The industry also reports that advertisers are spending more than $45 million a year on color TV.

A noteworthy step was taken by several manufacturers when they announced in the spring of 1956 that they would have 21-inch color sets on the market before the end of 1956 selling in the $500 range. The industry has long contended that the public would not buy color sets in quantity until the retail price could be brought down to $500 or less, and that thereafter color TV growth would accelerate greatly.

The number of color TV sets in circulation is expected to reach about 300,000 by the end of 1956.

Dual Main Studios and Station Identification

TV stations are now licensed to serve only a single "principal" community, and the rules require that the main studio be located in the principal community served except where, on a showing of good cause, the Commission waives this requirement. While stations may establish auxiliary studios outside the principal community to better serve portions of their service area, these rules are intended to insure that stations will be primarily concerned with the needs and interests of the principal communities they are licensed to serve.

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On March 21, 1956, in response to 2 petitions, the Commission instituted rulemaking to consider whether there are any situations where it would be in the public interest to permit TV stations to maintain more than 1 main studio to serve more than 1 community and to include more than 1 principal community in station identification announcements.

Among the situations under consideration are those where a station is authorized to use a channel in 2 or more hyphenated cities in the table of assignments. Hyphenated cities are adjoining cities or cities in the same general area which have been allocated the same channel. Another situation involves stations located in a community within 15 miles of the principal community to be served under the 15-mile rule. Comments were invited also on such questions as whether dual main studios and identification should be permitted, only upon a basis that a sufficient community of interest exists between the communities in question, and what criteria could be used to determine such interest, and what percentage of programming should originate from each main studio.

Noncommercial Educational TV

During the year 8 additional stations commenced operation on channels reserved for educational use, bringing the total to 20. At the year's end there were outstanding construction permits for 21 additional noncommercial stations, and pending applications for 11 more.

It is estimated that 50 million persons live within service range of educational TV stations now on the air. They operate an aggregate of 500 hours per week.

Soon after the close of the fiscal year, the Commission for the first time granted a petition to make a VHF reserved channel assignment available for commercial use, exchanging it for a UHF channel. This action, affecting channel 3 at College Station, Tex., will bring a first local TV outlet to the area, and was taken after the Commission determined that there was no realistic prospect for noncommercial educational use of the VHF assignment in the foreseeable future.

At the same time, the Commission, after a rule-making proceeding, denied a petition requesting that channel 11, reserved for noncommercial education use at Des Moines, Iowa, be made available for commercial use in that community. It was noted that the Des Moines area receives service from 3 stations operating on commercial VHF channels, and that local educational and civic groups were pursuing active efforts to utilize the channel.

The total number of channels assigned for educational use remains unchanged at 258.

STANDARD (AM) BROADCAST SERVICE

AM stations continue increase.—During the year, the number of authorized AM broadcast stations, for the first time, passed the 3,000 mark. Their net gain was 180 for the year. Most of the newcomers engage in low power daytime-only operation. At the year's close 2,896 AM stations were on the air and 274 applications for new stations were pending.

"Clear Channel" and "Daytime Skywave" Proceedings

Work on TV allocation problems necessitated carrying over disposition of two major AM allocation proceedings.

One of these, the "clear channel" proceeding (Docket 6741), encompasses reexamination of the basic allocation of AM frequencies among major "clear channel" outlets and other classes of AM stations, with particular reference to the degrees of protection afforded to high-powered clear channel stations, which are intended to serve wide areas, against interference from the secondary users of clear channels, which render a more localized service.

The purpose of the second major AM proceeding, which relates to "daytime skywave" (Docket 8333), is to determine the existence and extent of AM skywave transmissions during daylight hours and, on the basis of these findings, to consider appropriate changes in the rules and standards. This proceeding, at one time combined with the more basic clear-channel proceeding, is now separate.

The basic problems arise from the fact that "skywave" transmissions achieve a range far exceeding that of groundwave transmission, a much more restricted but steadier form of radio transmission. Hitherto, the FCC limitations on transmissions of secondary users of clear channels have taken cognizance only of skywave transmissions between the hours of sunset and sunrise, when sykwave transmission is most effective. Because skywave transmissions sustain a gradual increase during the 2 hours preceding sunset and a corresponding decrease during the 2 hours following sunrise, the question has arisen as to whether further limitations should be placed on secondary users of clear channels during these 4 transitional hours.

In March 1954, the Commission announced its conclusions, on which comments were received in oral argument heard July 15, 1954, with regard to the suitability of the allocation standards as applied to certain classes of new stations. Separate written comments were subsequently received on the desirability of applying these standards to existing stations. In its report of March 1954, the Commission established standards for determining the intensity of station radiation during the 2 hours preceding sunset and following sunrise.

On December 9, 1955, the Daytime Broadcasters Association, Inc., petitioned for relaxation of the present limitations imposed upon daytime AM stations, which would permit them to operate from 5 a. m. to 7 p. m. as a minimum, plus additional hours between actual sunrise and sunset. The Commission is also considering a petition requesting an increase of maximum power of local AM stations from 250 watts to 1 kilowatt.

Of 3,020 authorized AM broadcast stations at the close of the year, 2,896 were on the air.

FREQUENCY MODULATION (FM) BROADCAST SERVICE

Functional Music

The promotion of FM broadcasting and the need of FM licensees for additional revenue prompted the Commission to adopt new rules, effective July 1, 1955, authorizing FM stations to engage in a non-broadcast, specialized type of programming service for commercial and other subscribers, restricted to news, music, time, weather, and similar subjects. Functional music is a general term describing the new type of FM service whereby subscribers are furnished programming predominantly musical in nature. It includes such services as background music to commercial establishments, "transitcasting" to passengers in public vehicles, and "storecasting" to stores. Only FM broadcast licensees obtaining a supplemental authorization, called a Subsidiary Communications Authorization (SCA), may furnish such specialized programming.

SCA holders may be authorized to transmit either on a simplex or multiplex basis. In simplex operations, a station transmits the special programming on the same carrier which it uses for FM broadcasting, and the programs may be received on an ordinary FM receiver. Subscribers to this service, however, are furnished with special receivers which are activated by an inaudible supersonic or "beep" signal transmitted by the station at various times to cut out or amplify certain portions of the programs, such as the commercial announcements which are received on ordinary home receivers. In muliplex operations, a station transmits programs by special means on the same carrier used for FM broadcasting, but the programs cannot be received on ordinary FM receivers. Special multiplex receiving equipment must be used.

No restrictions as to time are placed on SCA multiplexing since it may be conducted simultaneously with regular FM broadcasting. The Commission contemplated that all SCA operations should be conducted on a multiplex basis and, therefore, authorized SCA simplexing only until July 1, 1957, and only during the time not devoted to required FM broadcasting, which is no less than 36 hours per week

and not less than 5 hours daily, except Sunday. It is expected that by that time multiplex equipment is available, simplex operations can be converted to multiplex.

As of June 13, 1956, 61 SCA authorizations were outstanding. Twenty-five of these are for simplexing, 30 are for multiplexing, and 6 for both. Most of the authorizations are for background music and storecasting operations. However, an SCA was granted to the City of New York Municipal Broadcasting System (WNYC–FM) to multiplex weather broadcasts without cost to anyone within the area having the necessary receiving equipment.

Commercial FM

At the end of the year there were 546 authorizations outstanding for commercial FM broadcast stations. During the year 30 new stations were authorized while 36 existing stations were deleted, resulting in an overall loss of only 6 for the year. This compares with overall losses of 17 and 32 for the 1955 and 1954 fiscal years, respectively. Independent operators received grants for 14 of the new stations while AM station licensees received the other 16.

One new FM broadcast station was authorized in the Virgin Islands — the first for these islands. Another was authorized in Puerto Rico. Although several FM authorizations were granted previously for stations in Puerto Rico, none has yet been constructed. The one now authorized there will be situated on a mountain top and should provide a good FM signal to most of the island. With the high level of atmospheric noises existing in Puerto Rico, FM should provide a superior type of broadcast service.

There are no commercial FM broadcast authorizations in 7 States or Alaska. Six of these States once had commercial FM broadcast stations: Montana has never had any. There is a commercial station in Hawaii.

Noncommercial Educational FM

Thirteen new noncommercial educational FM broadcast stations were authorized, bringing their total number to 136, or a net gain of 9 for the year. Of these, 57 are authorized to operate with power of 10 watts or less and the remaining 79 with power ranging from 250 watts to 50 kilowatts. One station, using a 50-kilowatt transmitter, obtains an effective radiated power of 300 kilowatts.

Noncommercial educational FM stations are now authorized in 34 States and Hawaii. Wisconsin and Alabama have statewide FM educational networks.

Facsimile FM

Fascimile or "fax" broadcasting by FM stations has been authorized since 1948. This involves the transmission of still pictures, graphs,

and printed or written matter on a simplex or multiplex basis. Simplexed facsimile can be transmitted only when an aural program is not being broadcast, but multiplexed facsimile can be transmitted at the same time as an aural program.

A few FM stations have been authorized for facsimile transmission in the past, but during the past few years they have shown little interest in its use. No FM station is now broadcasting facsimile.

INTERNATIONAL BROADCAST SERVICE

The Commission on October 19, 1955, extensively amended its rules governing non-Government stations engaged in international broadcasting.

The revised rules establish a basis for assigning frequencies to those stations within the internationally allocated high frequency broadcasting bands between 5950 and 26100 kilocycles. Frequencies are assigned for use during specified hours for transmissions to specified distant areas for the reason that such long-range broadcasting is subject to seasonal and other radio propagation changes, as well as other technical considerations. New technical standards are based upon those required by international rules and regulations, as well as engineering developments.

While the Commission's rules are not applicable to international stations operated by the Government, and most such stations are now Government operated, provision is made for the continued operation of non-Government stations which may engage in either private operations or contract operations for a Government agency.

Only two international non-Government broadcast stations are now licensed by the Commission on a regular basis—KGEI, Belmont, Calif., and WRUL, Boston, Mass.

AUXILIARY BROADCAST SERVICES

Licensees of all classes of broadcast stations (aural and video) are eligible for authorizations to use transmitters of relatively low power for sending programs from originating points to the main transmitter for broadcasting. Some of this apparatus is portable or mobile; other apparatus is installed at fixed locations. Its employment permits a high degree of flexibility in programming, as evinced in the elaborate coverage of the 1956 national political conventions and campaign.

Remote Pickup Stations

More and more broadcasters are using remote pickup stations for live "on-the-spot" coverage of local news events. During the year the rules were amended to enable the use of cueing transmitters for studio direction of persons who wear tiny hearing-aid type receivers.

Remote pickup stations share frequencies in the 153-megacycle region with several classes of industrial users. The rapid expansion of the industrial services has created serious interference problems which must be resolved.

Aural STL Stations

Considerable latitude is provided in selecting the best sites for aural broadcast stations by virtue of opportunity to use program transmission circuits between studios and transmitters. Suitable transmitting sites, even though difficult of access, therefore may be used in conjunction with studios conveniently located in the community served. The Commission initiated an inquiry into the desirability of making some adjustments in the allocation of frequencies used by aural STL stations, but it is expected that a sufficient number of frequencies will continue to be available for this service.

FM Intercity Relay Stations

Aural STL frequencies may be used by FM broadcast stations for the operation of intercity program transmission circuits where suitable high quality circuits are not available from communication common carriers. It is not anticipated that such private relay circuits will be widely used, but their availability prevents delays in inaugurating FM network service due to the lack of adequate common carrier facilities.

TV Pickup Stations

The use of this class of station, which corresponds to the remote pickup station in aural broadcasting, has expanded rapidly as more and more TV stations program events which cannot be staged in studios. This is perhaps the most valuable tool the station operator has for realizing the full potential of TV, for he can go to the place where things happen and broadcast these events while they are happening.

Congestion has developed in some areas because of the increased use of the limited number of microwave channels available for TV pickup stations, but licensees have exercised considerable ingenuity in solving these technical problems and are obtaining satisfactory operation under conditions which have heretofore been considered impractical.

The past year saw the inauguration of operation in the 13000-megacycle band by TV pickup licensees. Such a development may point the way to greater use of this comparatively neglected portion of the spectrum, not only by TV licensees but by licensees in other microwave services.

TV STL Stations

To an even greater extent than in aural broadcasting, desirable sites for TV stations are usually at isolated places. Stations provide more extensive coverage from high locations and, consequently, many of the TV transmitters are on mountain tops. Radio transmitting apparatus operating in the microwave portion of the spectrum is the least expensive and most satisfactory method of providing a program transmission circuit between the studio of a TV station, which must be located at an accessible place, and the often inaccessible transmitter.

TV STL stations share the same bands as the TV pickup stations. As they are usually in use when the associated TV station is broadcasting, the same channel cannot usually be shared between broadcasters in a given area, or used by the mobile pickup stations. With the trend toward a common transmitting site for all TV stations in a given area, the problem of obtaining an adequate number of frequencies may eventually become acute. In places such as Los Angeles, where most of the TV stations are already located at a single site, the licensees have achieved an efficient utilization of the available microwave channels.

TV Intercity Relay Stations

The present growth of TV network systems has been made possible largely by the rapid expansion of intercity transmission facilities operated by communications common carriers. These facilities are designed and built to provide the degree of reliability and quality expected of communications common carrier systems and include duplicate equipment and alternate circuits. Consequently, they are costly to build and maintain.

TV broadcast stations in the smaller cities with limited revenues often find it impossible to meet the cost of obtaining network service via common carrier facilities. Privately operated TV relay systems, although admittedly less reliable than common carrier circuits, may be built and operated at a fraction of the annual cost of common carrier facilities. Consequently, many TV licensees seek Commission permission to operate private relay systems. The common carriers oppose this on the grounds that further expansion of national TV network systems depends on such circuits being operated by common carriers.

The Commission has instituted proceedings looking toward relaxing its present requirements, which permit privately operated intercity television transmission systems only when common carrier facilities are not available and then only until such common carrier facilities can be constructed. A special committee of Commissioners is studying the problem.

EXPERIMENTAL BROADCAST SERVICES

The Commission's rules encourage operation of experimental stations for the purpose of developing new equipment and techniques for use in the broadcasting services. The data obtained is used by the Commission in determining the practicality and desirability of amending its rules to keep pace with advancements in the art. Manufacturers of broadcasting equipment utilize such stations to develop and test broadcast equipment.

Experimental TV Stations

Extensive experiments conducted by a private group at Manson, Wash., resulted in the development of an inexpensive and reliable system which could be operated in the UHF band with minimum technical supervision. The technical data obtained from these experiments were utilized by the Commission in formulating rules providing for translator operation.

Experiments are continuing with TV "boosters" in the UHF band and with low-powered TV transmitters. There were no significant developments in the technical aspects of experimental "subscription TV" systems. Manufacturers continued their use of experimental TV stations for developing and testing new transmitting equipment.

Developmental Stations

Manufacturers continued to use developmental authorizations for evolving and testing aural broadcast equipment.

SPECIAL NETWORK STUDY

During fiscal year 1956 the Commission initiated a study to determine whether the present operation of television and radio networks and their relationships with their affiliates and with other components of the industry tend to foster or impede the growth and maintenance of a nationwide, competitive broadcasting system.

The study encompasses the organization, operations, practices, and economic basis of networks, broadcasting stations, independent program producers and all other components of the broadcasting industry. It will provide the Commission with a basis for a reappraisal of the chain broadcasting rules, for comments on bills before Congress bearing on broadcasting, and for determining whether the Commission should recommend legislation relative to broadcasting.

The Commission delegated the study to a Network Study Committee composed of four Commissioners headed by the Chairman of the Commission. The committe defined the initial scope of the study in its Order No. 1 of November 21, 1955, and organized a special staff to make the study.

As provided in that order, the study will consider those factors which tend to limit the number of networks and opportunities for competition between them; factors which tend to limit service by non-network organizations and opportunities for competition between networks and non-network organizations; relationships between networks and their affiliates, with particular reference to the efficacy of the chain broadcasting rules in freeing broadcast stations to carry out their programming responsibilities in the public interest; and the effect on opportunities for competition in the industry of various circumstances and practices, including joint ownership of TV and radio networks, network ownership of stations, related interests, such as manufacture of sets, multiple ownership of stations, long-term talent contracts, the "must buy" and "option time" arrangements, and rates for interconnection line charges.

The network study staff held meetings with representatives of most components in the industry. At these meetings the component concerned outlined its organization and functions, submitted economic data, and explained the problems in the industry from its point of view. One purpose of these meetings was to establish a background for the formulation of questionnaires requesting significant data and information.

Questionnaires have been sent to TV networks and stations requesting data and information on most of the issues outlined in Study Order No. 1, and a substantial portion of the requested data has been collated and supplied.

In addition to data from questionnaires, pertinent data has been obtained from Commission files and from various hearings on problems in the TV industry held by committees of Congress during fiscal 1956. Also, members of the staff have spent time in various components observing their operations.

Congress has appropriated funds to continue the study during fiscal 1957, and the target date for its completion is June 30 of that year.

During the remainder of the study it is planned to send questionnaires to additional components of the industry; to have members of the staff observe component operations as an aid in the appraisal of the data collected; to survey two or three selected markets with a view to obtaining public opinion on pertinent matters and information on access of local advertisers; to evaluate the data collected; to appraise the efficacy of the chain broadcasting rules in the light of the data; to decide whether rule-making proceedings should be recommended and, if so, in what respects the rules should be changed; to consider whether the Commission has the power to make applicable rules in the public interest and to recommend legislation which may be deemed necessary; and to prepare a general report summarizing

the data on the organization, functions, and economic base of the industry, the problems resulting from current operations, and any recommendations for change of the Commission's rules or the Communications Act.

MULTIPLE OWNERSHIP RULES

The Commission amended its multiple ownership rules in September of 1954 to increase the number of TV broadcast stations any one interest could own from 5 to 7, provided that 2 of the 7 are UHF. This was intended to attract more multiple station licensees to UHF. UHF stations have since been acquired by such groups as the National Broadcasting Co., Columbia Broadcasting System, and Storer Broadcasting Co.

The multiple ownership rules also preclude ownership by any one interest of more than 7 commercial AM or 7 commercial FM stations, and they bar the same person or group from operating more than one network, or more than one commercial AM, FM or TV station in the same service area.

The validity of numerically limiting the number of stations that may be owned by any one interest was placed in doubt by the decision of the United States Court of Appeals for the District of Columbia on February 24, 1955, in *Storer Broadcasting Company* v. *United States and Federal Communications Commission*, holding that the multiple ownership rules were invalid to the extent that they impose maximum limits on interests in broadcast stations. However, this doubt was removed by the decision of the Supreme Court on May 21, 1956, in affirming the Commission's authority to adopt rules limiting the number of stations which may be licensed to any interest.

POLITICAL BROADCASTS

As a guide for licensees and interested parties, the Commission on September 8, 1954, issued a pamphlet entitled "Use of Broadcast Facilities by Candidates for Public Office". It quotes the law and related rules and summarizes the more important Commission rulings pertaining to licensee obligations. Its availability during the 1956 election year proved to be of value to those concerned and reduced the number of inquiries from broadcasters and other interested parties.

With the increased use of TV for presenting political broadcasts since the issuance of this pamphlet, new questions have been raised which required Commission determination. Accordingly, steps have been taken to supplement the pamphlet with subsequent Commission rulings.

LOTTERIES

In May of 1955, the Commission ordered an individual station licensee to show cause why a certain program, "Play Marco", did not

violate the prohibition on broadcast of any advertisement or information concerning any lottery or gift enterprise. The station petitioned the Commission to dismiss the order on the basis that it would refrain from broadcasting the program in the future. Subsequently, on March 19, 1956, the copyright owner of the program requested a declaratory ruling as to whether the program constituted a lottery.

Although, as a matter of general policy, the Commission refrains from rendering advance advisory rulings, it was pursuaded by the nationwide prevalence of bingo or lotto-type broadcast programs to, on May 23, 1956, notify the petitioner the lottery elements of chance and prize were in the program and that, in the Commission's opinion, the additional element of consideration sufficient to constitute a lottery was also present in the requirement, either explicit or practical, that all or most persons who desired to participate in the program visit the sponsor's store, or other establishment where the products of a sponsor are sold, in order to obtain game cards as a condition precedent to participation. The petitioner, on June 22, 1956, appealed the Commission's ruling to the courts.

LOUD COMMERCIALS

As a result of complaints from the general public and inquiries from members of Congress alleging that excessive volume is used by broadcast stations when making commercial announcements, the Commission conducted an inquiry. Special monitoring observations were made during April 1956. The results disclosed, in substance, that of the 659 stations checked, there was only 1 instance of overmodulation exclusively during the commercials. There were 14 instances of overmodulation during both program and announcements, but during the same period there were 15 instances of undermodulation, 4 of which occurred during the commercials. The Commission will continue to be sensitive to any changes in the operating practices of broadcast stations.

BROADCAST COMPLAINTS

In its review of applications for renewal of licenses the Commission considers all matters that bear on the overall operations of broadcast stations, including complaints and expressions of views received from the general public. The complaints and expressions relate, in the main, to excessive commercialization, false and misleading advertising, lotteries, horse racing broadcasts, beer advertising, technical interference, editorializing and political broadcasts. These matters are usually resolved by correspondence with the stations involved. The Commission also cooperates with the Federal Trade Commission in its efforts to protect the public from deceptive broadcast advertising.

Discussions have been held with a representative of that agency concerning a possible procedure whereby the FCC would be advised by the FTC of instances of deceptive advertising on broadcast stations.

BROADCAST STATION SALES

There has been increasing activity in the broadcast industry in acquiring stations by purchase. During fiscal 1956, there were 1,085 applications for Commission consent to station transfers, an increase of about 10 percent over the year previous.

A review of these applications indicates a trend in the types of purchasers. For example, there appears to be a tendency on the part of large investment and other interests to acquire stations. Another trend is reflected in the substantial sums being paid for AM and TV stations. During the year WNEW, New York City, was sold for about $3,400,000, the highest price yet paid for a single aural station. A record for an individual TV station sale was made in 1955 when WDTV, Pittsburgh, sold for $9,750,000. Also, there have been cases of applicants who were unsuccessful in competitive hearings being able to later purchase the desired facilities without going through another hearing process.

Sales of broadcast stations not yet built sometimes raise questions as to whether a permittee is "trafficking" in construction permits; i. e., obtaining a permit without intending to construct and seeking to dispose of it at substantial profit. The Commission endeavors to discourage such practice and, in one instance, designated a transfer application for hearing on that issue.

Considerable opposition to station purchases is evidenced by the filing, under section 309 (b) of the act, of protests against Commission grants of transfers without hearing. Generally, the protestants are competitors of the stations being sold who claim they will be economically injured by the change.

On September 27, 1956, the Commission announced a new policy of not issuing tax-relief certificates under the Internal Revenue Code in future cases where broadcast stations are disposed of involuntarily.

REVISION OF RENEWAL APPLICATION FORM

In general, broadcast licenses are issued for a period of 3 years. Applications for renewal are required to be filed on FCC Form 303. Section IV of that form calls for certain information relating to the past and future programming of the licensees. There has been considerable discussion within the broadcast industry with respect to revising this form. In this connection, one of the advisory groups of the Bureau of the Budget is the Advisory Council on Federal Reports which has as one of its committees the Committee on Radio

and Television Broadcasting. The Commission is working with that committee on possible revisions. Consideration is also being given to changing the act to extend the broadcast license period to 5 years, the same as in other radio services.

OTHER BROADCAST RULE CHANGES

In addition to the rule making reported elsewhere in this chapter, other important broadcast rule changes finalized or under consideration were:

Amendment of TV Assignment Table

Sixty-four petitions were received requesting amendments to the TV channel assignment table. As of July 31, 1956, only 5 of these petitions awaited action. The backlog of some 50 like petitions pending consideration at the beginning of the year were disposed of. The Commission's decision to consider proposed channel changes has brought an increasing number of such petitions.

Revision of Part 3

Part 3 of the rules was revised, effective January 2, 1956. The revision combines in a single edition all the rules, regulations and technical standards for the AM, FM, TV, and international broadcast services. Engineering charts and graphs included therein may be purchased as a separate publication. (See list of publications in appendix.)

"Umbrella" Protection

On December 21, 1955, the Commission amended its rules to change the "umbrella" protection afforded mutually exclusive broadcast applicants. The change provides that a mutually exclusive application will be consolidated for hearing with such other application or applications only if it has been filed not later than 10 days after public notice has been given of designation of a prior application or applications for hearing. The rule formerly provided that an application to be considered mutually exclusive with previously filed applications for the same broadcast facility must be filed at least 60 days prior to the date of hearings on such other applications.

Posting AM and FM Station and Operator Licenses

On July 22, 1955, the Commission clarified its AM and FM rules governing the posting of station and operator licenses. The original station license and any other instrument of authorization should be posted at the point the licensee considers to be the main control point, and a photo copy should be posted at all other control points. A restricted radiotelephone operator can post either his operator's permit or FCC Form 759 in the room in which he is on duty.

Processing of AM, FM, and TV Applications

The Commission on March 8, 1956, revised its AM, FM, and TV rules to provide a 30-day waiting period from the date on which public notice is given of the acceptance for filing of an application for a new station or for major changes in the facilities of authorized stations before acting on such applications.

Repetitious Applications

On October 19, 1955, the Commission amended its rules to make clear that it will not consider, before the lapse of 12 months, a like application for a new station, or for any modification of services or facilities, whenever a previous application has been denied or dismissed with prejudice for any reason. This may be waived when good cause is shown.

Remote Control

Under consideration in a proceeding, instituted April 11, 1956, is a proposal for relaxing the AM, FM, and noncommercial FM rules to authorize those stations with directional antenna systems and with powers in excess of 10 kilowatts to operate by remote control. The present rules permit remote operation, subject to certain conditions, only by AM nondirectional and FM broadcast stations with power not in excess of 10 kilowatts. Among the questions which must be resolved are whether the development of transmitting and remote control equipment is such as to make present limitations on remote control operation unnecessary, whether relaxation would result in any degradation of the technical standards, and under what conditions further remote control operations should be permitted.

Identification of Recorded Programs

Rulemaking instituted November 17, 1955, and made effective November 7, 1956, further relaxed and made uniform identification requirements for recorded aural and video programs. In effect, the modified rules require only one identifying announcement either before or after the broadcast of a long program, at the option of the licensee, and none for a program of one minute or less duration.

STATISTICS

Current Broadcast Authorizations

Broadcast authorizations rose to more than 7,000 by the close of fiscal 1956. This was a net gain of 785 for the year.

For the first time, AM authorizations exceeded 3,000, and commercial TV 600. ~~Educational~~ FM showed a net decline of 6 stations. Educational FM and TV gained 9 and 7 stations, respectively.

Commercial

Broadcast auxiliaries accounted for over 2,600 authorizations. Year-end authorizations for the different classes of broadcast services were:

Class	June 30, 1955	June 30, 1956	Increase or (decrease)
Commercial AM	2,840	3,020	180
Commercial TV	582	609	27
Educational TV	34	41	7
Auxiliary TV	516	682	166
Experimental TV	15	17	2
Commercial FM	552	546	(6)
Educational FM	127	136	9
International [1]		3	3
Remote pickup	1,546	1,936	390
Studio-transmitter link	43	50	7
Developmental	2	2	0
Total	6,257	7,042	785

[1] Not tabulated in 1955. International broadcast stations are now counted by individual licensees, not by the number of their transmitters. Present figures include 1 experimental operation.

Status of Broadcast Authorizations

Of 4,352 authorized AM, TV, and FM broadcast stations at the close of the 1956 fiscal year, 4,068 were operating and 284 others held construction permits. A breakdown follows:

Class	On the air	Not on air
Commercial AM	2,896	124
Commercial TV	496	113
Educational TV	20	21
Commercial FM	530	16
Educational FM	126	10
Total	4,068	284

Broadcast Authorizations by States

The State with the most number of AM, FM, and TV authorizations collectively continues to be Texas (289), according to a mid-May tabulation. Next, in turn, are California (248), Pennsylvania (226), and New York (202). Puerto Rico (32) has more authorizations than each of 11 States.

Texas (222) also tops the AM list, followed by Pennsylvania (137), North Carolina (127), and Florida (114). Every State and territorial possession have AM facilities.

All States and territories except the Virgin Islands have commercial TV authorizations. Here Texas (41) likewise leads, with California (38), Pennsylvania (37), and New York (31) coming next. New York (7) holds the most educational TV grants.

Seven States (Idaho, Montana, Nebraska, North and South Dakota, Vermont, and Wyoming) have no FM authorizations. The States with the most commercial FM authorizations are New York (45), Pennsylvania (43), and California (40). In the educational FM van are California (11) and Indiana and Ohio (10 each).

A breakdown of broadcast authorizations by States and territories follows:

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
Alabama	98	16	1	10	3	128
Arizona	33	3	1	9	0	46
Arkansas	57	6	0	8	0	71
California	158	40	11	38	1	248
Colorado	47	5	1	9	1	63
Connecticut	26	7	0	8	3	44
Delaware	9	2	0	1	0	12
District of Columbia	7	7	0	5	0	19
Florida	114	21	4	22	1	162
Georgia	109	16	1	15	1	142
Idaho	27	0	0	7	0	34
Illinois	90	30	6	20	2	148
Indiana	59	21	10	16	0	106
Iowa	61	8	4	12	0	85
Kansas	45	1	5	9	1	61
Kentucky	69	14	3	10	0	96
Louisiana	69	10	1	12	2	94
Maine	20	1	0	7	0	28
Maryland	33	8	1	6	0	48
Massachusetts	54	15	7	11	1	88
Michigan	85	22	4	18	2	131
Minnesota	56	6	1	8	0	71
Mississippi	65	2	1	7	0	75
Missouri	74	9	1	16	1	101
Montana	31	0	0	5	0	36
Nebraska	29	0	0	9	0	38
Nevada	15	1	0	5	0	21
New Hampshire	13	4	0	2	0	19
New Jersey	23	8	2	5	1	39
New Mexico	35	3	1	7	0	46
New York	112	45	7	31	7	202
North Carolina	127	33	3	16	1	180
North Dakota	17	0	0	8	0	25
Ohio	84	34	10	28	2	158
Oklahoma	52	1	5	12	2	72
Oregon	65	8	3	9	0	85
Pennsylvania	137	43	7	37	2	226
Rhode Island	12	5	0	3	0	20
South Carolina	62	14	1	10	0	87
South Dakota	18	0	0	3	0	21
Tennessee	91	12	2	13	1	119
Texas	222	18	7	41	1	289
Utah	23	3	2	3	0	31
Vermont	14	0	0	1	0	15
Virginia	79	17	3	14	0	113
Washington	70	6	4	13	1	94
West Virginia	44	11	0	11	0	66
Wisconsin	73	14	9	16	1	113
Wyoming	20	0	0	1	0	21
Alaska	13	0	0	5	0	18
Guam	1	0	0	1	0	2
Hawaii	14	1	2	6	0	23
Puerto Rico	27	2	0	5	1	35
Virgin Islands	3	1	0	0	0	4

Broadcast Authorizations by Cities

New York City (37) has more AM, FM, and TV authorizations together than any other city. Chicago (33), Los Angeles (28), and Philadelphia (26) follow.

New York City and Chicago (15 each) head the AM list, followed by Los Angeles (13) and Denver and New Orleans (11 each).

Los Angeles (8) has the most commercial authorizations; New York City and Chicago (7 each) team for second place. Under the

TV channel-allocation plan, no city has more than 1 educational TV grant.

In the commercial FM field, New York City (12) leads, followed by Chicago (9) and Philadelphia and Washington (7 each). Boston, Philadelphia and Madison (Wis.) each have 3 educational FM stations.

Following is a tabulation of the number of broadcast stations authorized in the particular cities listed. It does not include neighboring stations which also serve those cities.

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
New York	15	12	2	7	1	37
Chicago	15	9	1	7	1	33
Los Angeles	13	6	1	8	0	28
Philadelphia	10	7	3	5	1	26
San Francisco	10	3	1	5	1	20
Atlanta	9	4	1	4	1	19
Boston	8	4	3	4	0	19
Cleveland	7	6	1	5	0	19
Washington	7	7	0	5	0	19
Denver	11	2	0	4	1	18
Minneapolis-St. Paul	10	3	1	4	0	18
New Orleans	11	3	0	3	1	18
Pittsburgh	7	4	1	5	1	18
Portland (Oreg.)	10	4	0	4	0	18
Dallas	8	3	3	2	0	16
Detroit	5	5	1	4	1	16
Houston	8	2	1	4	1	16
Miami	6	4	1	4	1	16
San Antonio	9	4	0	3	0	16
Seattle	9	3	1	2	1	16
Baltimore	7	2	1	5	0	15
Birmingham	8	3	0	3	1	15
Buffalo	6	4	0	4	1	15
Richmond	8	4	0	3	0	15
Cincinnati	6	3	0	4	1	14
Fresno	7	3	0	4	0	14
Jacksonville	8	3	0	3	0	14
Memphis	9	1	0	3	1	14
St. Louis	8	1	1	3	1	14
Columbus (Ohio)	5	2	2	3	1	13
Louisville	7	0	2	4	0	13
Milwaukee	7	1	0	5	0	13
Providence	6	4	0	3	0	13
Rochester	6	2	0	4	1	13
Salt Lake City	7	3	0	3	0	13
Honolulu (T. H.)	6	1	2	3	0	12
Knoxville	6	1	2	3	0	12
Madison (Wis.)	4	3	1	3	1	12
Oklahoma City	7	0	1	3	1	12
Shreveport	7	3	0	2	0	12
Tampa	6	3	1	2	0	12
Tulsa	6	0	1	4	1	12
Des Moines	6	1	1	3	0	11
Syracuse	5	2	1	2	1	11
Albuquerque	5	1	1	3	0	10
Baton Rouge	5	2	1	2	0	10
Columbia (S. C.)	5	2	1	2	0	10
Grand Rapids	6	2	0	2	0	10
Kansas City (Mo.)	6	1	0	3	0	10
Nashville	7	1	0	2	0	10
Savannah	6	2	0	2	0	10
Scranton	5	1	1	3	0	10
Spokane	6	1	0	3	0	10
Toledo	4	3	1	2	0	10

Broadcasting Since 1949

The following table shows the number of authorized, licensed, and operating broadcast stations, and pending applications, at the close of each of the past 8 fiscal years; also the number of stations deleted during those years:

Year	Grants	Deletions	Pending applications	Licensed	CP's on air	Total on air	CP's not on air	Total authorized
COMMERCIAL AM								
1949	200	55	382	1,963	43	2,006	173	2,179
1950	194	70	277	2,118	26	2,144	159	2,303
1951	116	35	270	2,248	33	2,281	104	2,385
1952	60	25	323	2,333	22	2,355	65	2,420
1953	187	23	250	2,439	19	2,458	126	2,584
1954	148	29	226	2,565	18	2,583	114	2,697
1955	161	18	304	2,719	13	2,732	108	2,840
1956	197	18	389	2,871	25	2,896	124	3,020
COMMERCIAL FM								
1949	57	212	65	377	360	737	128	865
1950	35	169	17	493	198	691	41	732
1951	15	91	10	534	115	649	10	659
1952	24	36	9	582	47	629	19	648
1953	29	79	8	551	29	580	21	601
1954	27	54	5	529	24	553	16	569
1955	27	44	6	525	15	540	12	552
1956	31	37	10	519	11	530	16	546
EDUCATIONAL FM								
1949	18	7	9	31	3	34	24	58
1950	25	4	3	61	1	62	20	82
1951	19	6	2	82	1	83	12	95
1952	12	2	2	91	1	92	12	104
1953	13	1	3	106	0	106	10	116
1954	9	2	1	117	0	117	6	123
1955	7	3	1	121	3	124	3	127
1956	13	4	5	126	0	126	10	136
COMMERCIAL TV								
1949	15	7	338	13	56	69	48	117
1950	0	8	351	47	57	104	5	109
1951	0	0	415	81	26	107	2	109
1952	0	1	716	96	12	108	0	108
1953	381	6	572	101	97	198	285	483
1954	174	81	200	104	298	402	171	573
1955	67	58	127	137	321	458	124	582
1956	60	25	128	186	310	496	113	609
EDUCATIONAL TV								
1952	0	0	1	0	0	0	0	0
1953	17	0	29	0	1	1	16	17
1954	13	0	17	0	6	6	24	30
1955	5	1	14	1	10	11	23	34
1956	7	0	11	1	19	20	21	41

Any seeming discrepancy in the relation of grants and deletions during the year to total authorizations at the close of the year is due to reinstatement of some deleted authorizations and other considerations impossible to detail in this general table.

Broadcast Applications

Broadcast applications totaled more than 8,600 in fiscal 1956, which was nearly a thousand more than the year previous. Applications for new TV stations increased from 58 to 91, those for new AM stations from 330 to 384, and new FM stations from 37 to 57. Of the applications for new AM stations, 109 were designated for hearing, or 5 less than in 1955. The same number of new TV applications were designated for hearing as in the previous year—26.

Nonhearing broadcast application statistics for fiscal 1956 follow:

Class	On hand June 30, 1955	Received	Granted	Dismissed, denied or returned	Designated for hearing	On hand June 30, 1956
AM						
New stations	222	384	196	77	109	274
Major changes	152	225	152	50	33	154
Transfers	52	590	525	32	3	84
Renewals	299	1,068	1,010	55	4	300
Licenses	76	476	439	43	0	72
Other	35	1,002	889	67	4	80
AM total	836	3,745	3,211	324	153	964
FM						
New stations	7	57	44	5	0	15
Major changes	5	76	75	0	0	6
Transfers	8	81	77	0	1	12
Renewals	64	195	208	6	0	45
Licenses	10	85	87	1	0	7
Other	1	204	183	8	0	14
FM total	95	698	674	20	1	99
TV						
New stations	30	91	36	14	26	54
Major changes	35	164	131	26	6	37
Transfers	13	109	100	3	5	18
Renewals	11	57	49	1	0	18
Licenses	103	167	83	4	0	183
Other	53	871	777	27	0	120
TV total	245	1,459	1,176	75	37	430
Miscellaneous						
New stations	67	831	719	75	0	104
Major changes	20	220	225	4	0	11
Transfers	54	305	307	3	2	49
Renewals	101	549	493	9	0	131
Licenses	409	731	474	50	0	596
Other	7	92	94	3	0	2
Miscellaneous total	658	2,728	2,332	144	2	910
Grand total	1,834	8,630	7,393	563	193	2,403

FM and TV figures include noncommercial educational stations. Miscellaneous includes relay and studio links, experimental, etc.

Pending Broadcast Applications

The number of pending nonhearing broadcast applications increased from about 1,800 at the close of fiscal 1955 to some 2,400 at the end of 1956. The age of the currently pending applications is indicated in the following table:

Service	Under 3 months	3 to 12 months	12 to 24 months	Over 24 months	Total
AM					
New stations	63	140	15	56	274
Changes	39	69	6	40	154
Renewals	188	97	3	12	300
Other	172	44	6	14	236
AM total	462	350	30	122	964
FM					
New stations	12	2	0	1	15
Changes	4	1	0	1	6
Renewals	39	6	0	0	45
Other	23	8	0	2	33
FM total	78	17	0	4	99
TV					
New stations	26	15	5	8	54
Changes	27	7	1	2	37
Renewals	17	0	0	1	18
Other	150	121	18	32	321
TV total	220	143	24	43	430
Miscellaneous					
New stations	73	16	4	11	104
Changes	10	0	1	0	11
Renewals	125	12	5	6	148
Other	167	171	159	150	647
Miscellaneous total	375	199	169	167	910
Grand total	1,135	709	223	336	2,403

Receiving Sets

The manufacture, sale, and use of receiving sets are not subject to Commission licensing. The Commission does, however, have jurisdiction over radiation from all apparatus which interferes with radio communication. New rules, effective February 1, 1956, for the first time, put limitations on the amount of permissible radiation from receivers operating between 30 and 890 megacycles, which include FM and TV sets.

The Commission does not tabulate the number of receiving sets. Industry estimates that aural broadcast receivers in use now exceed 125 million. Sets in automobiles number 35 million. The same sources count nearly 39 million TV sets in operation, 33 million of which are VHF only. A July 1956 survey by the Census Bureau reveals that 4 out of every 5 city homes and half of the farm homes now have TV sets.

Broadcast Industry Financial Data

In the calendar year 1955, the radio and television industry's total revenues (which are derived from the sale of time, talent and program materials to advertisers) were reported at $1,198.1 million.

Total radio revenues rose 0.9 percent to $453.4 million while TV revenues reached $744.7 million, or 26 percent above 1954.

Total radio and TV profits of $196.2 million in 1955 were 48 percent above 1954. Television broadcast profits of $150.2 million were 66 percent higher and radio profits of $46.0 million were 10 percent higher.

The following tables show the comparative calendar 1954–55 financial data for the radio and television broadcast industries:

All Networks and Stations, 1954–55

Item	1954 (millions)	1955 (millions)	Percent increase or (decrease) in 1955
Total broadcast revenues	$1,042.5	$1,198.1	14.9
Radio [1]	449.5	453.4	.9
Television	593.0	744.7	25.6
Total broadcast expenses	910.4	1,001.9	10.1
Radio	407.7	407.4	(.1)
Television	502.7	594.5	18.3
Broadcast income (before Federal income tax)	132.1	196.2	48.4
Radio	41.8	46.0	10.0
Television	90.3	150.2	66.3

[1] Radio includes AM and FM broadcasting.

Note. 1955 radio data cover the operations of 4 nationwide networks and 3 regional networks, 2,704 AM and AM–FM and 38 independent FM stations. 1954 data are for the same networks and 2,554 AM and AM–FM and 43 independent FM stations. 1955 TV data cover the operations of 4 networks (3 networks after Sept. 15, 1955, when DuMont ceased network operations) and 437 stations. 1954 TV data cover the operations of 4 networks and 410 stations.

Nationwide Networks only, 1954–55

[Including owned and operated stations]

Item	1954 (millions)	1955 (millions)	Percent increase or (decrease) in 1955
Total broadcast revenues	$448.5	$391.2	14.6
Radio	74.5	84.5	(11.8)
Television	374.0	306.7	21.9
Total broadcast expenses	375.4	347.2	8.1
Radio	69.4	77.0	(9.9)
Television	306.0	270.2	13.2
Broadcast income (before Federal income tax)	73.1	44.0	66.1
Radio	5.1	7.5	(32.0)
Television	68.0	36.5	86.3

Note 1. Radio data include the operations of 16 network-owned stations in 1954 and 1955.
Note 2. Television data include the operations of 16 stations in 1954 and 1955.

AM Radio [1] Broadcast Revenues, Expenses, Income and Investment, 1954–55

[In thousands]

Item	4 nationwide networks and their stations [2]		3 regional networks and their stations [2]		All other stations [3]		Industry total	
	1954	1955	1954	1955	1954	1955	1954	1955
Total broadcast revenues	$84,484	$74,511	$4,109	$3,814	$360,192	$374,013	$448,785	$452,338
Total broadcast expenses	76,981	69,449	3,462	2,968	325,890	333,565	406,333	405,982
Total broadcast income (before Federal income tax)	7,503	5,062	647	846	34,302	40,448	42,452	46,356
Investment in tangible broadcast property:								
Original cost	21,714	17,196	1,737	1,440	255,331	266,157	278,782	284,793
Depreciation to date	11,701	9,198	1,074	987	120,557	130,082	133,332	140,267
Depreciated cost	10,013	7,998	663	453	134,774	136,075	145,450	144,526

[1] Excludes independently operated FM stations, 43 in 1954 and 38 in 1955.
[2] Includes the operations of 21 network owned stations in 1954 and 19 network owned stations in 1955.
[3] Includes 2,533 stations in 1954 and 2,685 stations in 1955.

FM Broadcast Revenues, Expenses and Income, 1954–55

Item	1954		1955	
	Number of stations	Amount (millions)	Number of stations	Amount (millions)
Total FM broadcast revenues				
FM stations operated by:				
AM licensees:				
Reporting no FM revenues	355		332	
Reporting FM revenues	130	$1.1	123	$0.9
Non-AM licensees	43	.8	38	1.0
Total FM stations	528	1.9	493	1.9
Total FM broadcast expenses				
FM stations operated by non-AM licensees	43	1.4	38	1.4
Industry total		(1)		(1)
FM broadcast income (before Federal income tax)				
FM stations operated by non-AM licensees	43	(.6)	38	(.4)
Industry total		(1)		(1)

[1] In view of the difficulty in a joint AM-FM operation in allocating FM operation expense separately from AM station operation expense, licensees of such stations were not required to report FM station expense separately. As a result, FM industry totals for expense and income are not available. AM-FM licensees, however, were requested to report separately the revenues, if any, attributable to FM station operation if such data were readily available. In only a few instances did AM-FM licensees state they were unable to segregate the FM revenues.
( ) Denotes loss.

TV Broadcast Revenues, Expenses and Income, 1955

Item	4 networks and their 16 owned and operated TV stations [1]	421 other TV stations (millions)	Total 4 networks and 437 TV stations [1]
Revenues from the sale of time:			
Network time sales:			
Nationwide networks	$225.7	$83.0	$308.7
Miscellaneous networks and stations	----------	.2	.2
Total network time sales	225.7	83.2	308.9
Nonnetwork time sales to:			
National and regional advertisers	47.6	174.8	222.4
Local advertisers	24.8	125.0	149.8
Total nonnetwork time sales	72.4	299.8	372.2
Total time sales	298.1	383.0	681.1
Deduct—Commissions to agencies, representatives, etc.	[2] 57.9	50.8	108.7
Net time sales	240.2	332.2	572.4
Revenues from incidental broadcast activities:			
Talent	102.1	10.4	112.5
Sunday broadcast revenues	31.8	28.0	59.8
Total incidental broadcast activities	133.9	38.4	172.3
Total broadcast revenues	374.1	370.6	744.7
Total broadcast expenses of networks and stations	306.0	288.5	594.5
Broadcast income before Federal income tax	68.1	82.1	150.2

[1] 3 networks after Sept. 15, 1955, when DuMont ceased network operations.
[2] Of this amount 47.0 million is applicable to the total sale of network time.

Interference—Its Cause and Cure

GENERAL PROBLEM

One problem that is plaguing radio communication in general and the Federal Communications Commission in particular is the extent and magnitude of the interference situation. This is brought about by a combination of developments among which are the mushrooming of transmitters (now more than 1,100,000 in non-Government use); the expansion of radio operations in the higher frequency regions; the widening use of industrial, medical, and household devices which, though not used for communication, emit radiations which disrupt radio services; multiplying closed circuit and carrier current systems, and inadequately shielded TV and other receivers which not only receive but also release annoying signals.

GENERAL REMEDIES

It is no longer sufficient to control and regulate the transmissions of radio stations. It has become necessary to impose some degree of regulation on all factors responsible, particularly the nonradio users of radio frequency energy.

The Commission is tackling this problem through rules governing the emissions of nonradio apparatus, approving certain types of equipment before it is put into use, and enlisting the cooperation of all concerned to repel these vexatious, and often dangerous, intruders upon our airwaves.

INDUSTRIAL, SCIENTIFIC, AND MEDICAL EQUIPMENT

Part 18 of the Commission's rules governs the use of industrial heating, medical diathermy, arc welding and other equipment which generates radio frequency energy. The waste emissions from some of this apparatus have been known to skip-jump clear across the country to blot out safety messages in transit thousands of miles away. Besides the hazard it presents, this is energy lost to the user.

Regulation of these devices is based on the principle of providing particular frequencies to absorb excess radiation without harm and, at the same time, imposing curbs on invasion of any other frequency. The frequencies on which unlimited radiation is permitted are called

"ISM" (from the initials of the words "industrial, scientific, and medical") and are available for communication use on a secondary basis subject to accepting ISM interference.

Interference from industrial heaters and diathermy equipment has lessened to some extent, but the problem of radio frequency stabilized arc welders remains unresolved. These welders, which operate in an inert gas atmosphere to prevent oxidation of the metal being welded, are used in the fabrication of stainless steel and certain nonferrous metals such as aluminum. They are operating under temporary regulations until a general method can be devised for reducing their radiation. In May 1956 the Commission invited specific information needed to formulate permanent rules.

INCIDENTAL AND RESTRICTED RADIATION DEVICES

As originally promulgated in 1938, part 15 of the Commission's rules was intended to control the radiation of certain unlicensed low power devices, such as wireless phono-oscillators and equipment used for remote control purposes. These rules were also applied to curb the leakage radiation from carrier current systems which transmit radio frequency signals over wire lines. They were revised on December 22, 1955, in the light of many recent developments.

Devices subject to part 15 are separated into two categories—those involving "restricted" radiation and others involving "incidental" radiation.

"Restricted" radiation devices are those which intentionally generate and use radio frequency energy, such as radio receivers and devices for very short-range contact. This category also includes radiation which leaks from carrier current systems and a wide variety of gadgets that have become household conveniences.

"Incidental" radiation devices are those which radiate radio frequency energy unintentionally. Examples are electric motors, switches, automotive ignition systems and, in fact, any electrical contrivance that produces arcing. Considering the almost infinite variety of incidental radiation devices and present lack of knowledge as to what limitations should be applied, the Commission is, for the time being, regulating them on the basis that any harmful interference they cause to the regular radio reception must be promptly eliminated.

The rules pertaining to radio receivers mark the entry of Commission regulation into a new field. They are the result of a concerted effort by the Government and industry to find a practical solution to the widespread interference caused by radiating receivers, especially TV and FM sets. They are primarily directed to make new receivers less prone to radiate. Since it is not feasible to suppress radiation from the millions of existing receivers, their interference will continue to be handled on an individual basis.

On July 12, 1956, the Commission added rules specifically applicable to radiation of community antenna TV systems.

It also anticipates adopting rules concerning other types of restricted radiation devices as soon as related problems are resolved. Chief among these is the group of low power communication devices, essentially miniature transmitters, which radiate for distances up to 50 to 100 feet, such as controllers for garage-door openers, wireless microphones, and the like.

Another group of restricted radiation devices which requires additional consideration is the various types of carrier current systems used for industrial and broadcast purposes. One example is electrical transmission systems used by power utility companies for telemetering, for load control and for voice communication between the generating plants and the control centers. The problem here is how to curb the leakage while permitting the system to continue its primary service.

TYPE APPROVAL AND TYPE ACCEPTANCE

As a means of preventing interference before its starts, the Commission requires certain equipment to be "type approved" or "type accepted" prior to its manufacture, distribution, sale, and use. The distinction between "type approval" and "type acceptance" is that the former is given after laboratory tests by the Commission, while "type acceptance" is based upon Commission evaluation of test data submitted by the manufacturer.

MONITORING FOR INTERFERENCE

One of the Commission's monitoring functions is to identify sources of actual or potential radio interference, make engineering measurements and observations to determine the reason for it, and help locate the source.

During the year, in addition to its own airwave surveillance, it received more than 5,700 requests for monitoring service in connection with interference complaints. This was 2,000 more than in 1955. A breakdown follows:

	Fiscal 1955	Fiscal 1956
U. S. Air Force	287	337
U. S. Army	139	112
U. S. Navy	60	66
U. S. Coast Guard	64	61
Civil Aeronautics Administration	65	42
Other Government agencies	38	66
Law enforcement agencies	24	28
Commercial airlines	177	119
Commercial concerns	462	769
Foreign governments	38	20
Total major cases	1,378	1,620
Miscellaneous (minor cases)	2,348	4,144
Grand total	3,726	5,764

The following examples illustrate the effectiveness of the monitoring network in quickly resolving widespread interference complaints:

The Air Force reported interference to some of its airway communication stations caused by a steady unmodulated signal. Within 5 minutes the FCC pinpointed the source at a military installation near the nation's capital. Within another few minutes the defective transmitter was singled out and removed from service.

The Commission was successful in identifying a number of interference sources at the request of foreign countries. In one instance the cause was determined to originate in the same European country making the request; one of its radio navigation stations was interfering with overseas reception of one of its fixed point-to-point stations.

Closer home, the FCC net quickly directed the mobile direction-finding car of the Chicago district office to the Chicago Midway Airport, enabling it to find a defective aeronautical transmitter which had been causing serious disruption to communications of another airline. This interference was heard as far away as the FCC monitoring station in Hawaii, which furnished one of the bearings used to locate the malfunctioning transmitter.

Another airline reported widespread interference from an unidentified signal which frequently drifted across one of its busy frequencies. The FCC net speedily fixed the general area, and a mobile unit from the Norfolk district office completed the search by locating a radiating industrial heater in a manufacturing plant at Bristol, Va.

Weak SOS distress signals heard over the midwestern and eastern part of the nation caused concern to the Air Force and Coast Guard. They were found by the FCC net and mobile units to be originating from a factory at Kokomo, Ind., which was bench-testing small automatic distress transmitters used in planes and boats. The company promised to confine future testing to screened rooms.

INTERFERENCE COMPLAINTS

During fiscal 1956, the number of interference complaints requiring field investigation amounted to 19,345, an increase of 1,383 as compared with 1955. Of these, 15,042 involved interference to TV reception, while 2,520 related to interference to AM and FM broadcasting. Only 5 complaints concerned interference to color TV.

The other 1,783 complaints covered a wide range as to types of non-broadcast cases, including serious interference to important communications or radio navigation facilities on land, on sea, and in the air.

Although improved sensitivity of receivers to permit utilization of very weak signals may permit reception at greater distances than might otherwise be possible, dependency upon such weak signals simultaneously increases the probability of interference, inasmuch as many

stray man-made electrical disturbances which would not bother a strong signal will result in devastating interference to receivers which must depend on very weak signals.

By helping individuals and stations to help themselves, the Commission's limited investigative field staff was able to concentrate on cases involving interference to safety services, to investigate the more difficult interference cases, and to inquire into illegal radio activity.

The 522 Commission-sponsored Television Interference Committees established in 491 communities throughout the country proved to be of outstanding assistance to TV viewers by promptly investigating local interference complaints, facilitating correction or referring cases to the Commission's nearest field office for further possible investigation.

A Cooperative Interference Committee organized in the Los Angeles area, comprised of persons associated with interference-conscious electronics and radio communications industries, has set a pattern for coordinated self-help in resolving a wide range of interference problems. Like groups are active in New Orleans, San Francisco, Philadelphia, and Atlanta. Interest expressed in other parts of the country in forming similar committees is being encouraged by the Commission. By such means, many interference complaints can be resolved locally without referral to the Commission field offices.

The following case illustrates an instance in which self-help effort might have effected speedier relief, at the same time permitting a Commission engineer to work on more serious matters:

Near San Francisco, a complaint of interference to reception at a coast station, referred to the Commission, was traced to one of the company's own transmitters about 15 miles away.

Though still well below the figure of 576 for fiscal 1954, the number of complaints of interference from industrial, scientific, and medical equipment increased to 247 in 1956, as compared with 223 in 1955. This may have been due in part to inability, because of personnel limitations for the FCC field staff to engage in any appreciable "interference-prevention" efforts. The number of "interference-prevention" visits to offices with diathermy machines that were possible in fiscal 1956 was less than 600 compared with 5,093 in 1955.

Among safety services experiencing interference from electric arc welders were the Civil Aeronautics Administration, Northeast Airlines, Northwest Airlines, United States Weather Bureau, Third Naval District Training Center, United States Engineers, an Air Defense group and the Portland, Oreg., police.

Radio services interfered with by errant radiation from electronic industrial heaters were AM and TV broadcast; municipal, county and State police; fire departments; airlines and the military.

In addition to excessive radiation from industrial electronic equipment, spurious radiation from improperly operating radio transmitters can also cause serious interference as indicated by the following cases:

Spurious radiation from a Navy transmitter disabled fire department communication, causing serious interference to at least 10 fire stations in Hawaii and rendering reception from fire trucks almost impossible.

Spurious radiation from an FM broadcast station at Elmwood Park, Ill., fell on an aircraft instrument landing frequency. The broadcast station remained off the air most of a day until adjustments and tests showed the potential hazard to aircraft safety had been eliminated.

Interference to taxicab radio reception throughout a Virginia city was traced to a police transmitter which was imposing a strong hum on the taxicab frequency.

At Miami, interference to police radio reception was caused by harmonic radiation from an FM broadcast station.

Spurious radiation from a new radar being installed at a Chicago airport resulted in interference to airline and AM and TV broadcast reception.

Interference to an aircraft emergency and distress frequency at Pearl Harbor and Hickam Field, near Honolulu, was traced to a transmitter which had accidentally been left on.

Some examples of the sometimes serious interference that can be caused by low-power devices not intended to transmit radio signals were:

At Martinez, Calif., a defective TV receiver booster amplifier was found to be causing interference to about 500 receivers in an area of about 130 square blocks, with interference to other persons living as far as 5 miles away.

At Dallas, channel 8 TV reception was practically obliterated in a 2-block area due to a radiating TV receiver. A peculiarity in this instance was that the trouble in the TV set resulted in its rebroadcasting channel 4 programs on channel 8 in a distorted form.

A coast station at Martinsville, N. Y., reported severe interference on the marine distress frequency 2182 kilocycles. The culprit was found to be an electric fence where sparks were jumping to a chicken-wire coop in which a number of dogs were kept.

Persistent and annoying interference to radio reception by patients in a Honolulu hospital was traced to fluorescent lights used in the hospital.

A potential interference source found at Nevada City, Calif., was electrical power line leakage to trees, as visually evidenced by burned or singed leaves where branches had brushed against the wires.

SMALL BOAT INTERFERENCE

The Commission's program of inspection, harmonic certification, and monitoring in connection with the use of small boat frequencies has accomplished a degree of improvement, but the surface has only been scratched due to the large number of radio-equipped small vessels and their wide dispersion both as to areas of operation and the locations of outfitting or headquarters points, as well as to the fact that the vessels are in port for such brief periods. The Commission continues its efforts in identifying and notifying owners of vessels whose transmitters emit harmonics which play hob with the frequencies used in the aviation service. The licensees of these ship radio stations are required to eliminate the trouble, and to obtain a certification to this effect from radio experienced maintenance personnel.

The Commission is still trying to remedy the chaotic condition which exists on the distress frequency 2182 kilocycles, caused, principally, by the personnel of some of the thousands of small vessels engaged in commercial operations or for pleasure. To them, apart from the safety aspects provided, radio communication is an interesting and convenient method of exchanging idle "chit-chat" which is not connected with safety matters or boat operations.

Also, the Commission is doing everything possible under its budgetary limitations to cope with the special problem presented by indiscriminate use on small boat frequencies of obscene and profane language. These law violators avoid identification by a form of "underground operation", using nicknames, previously agreed upon, but consistently avoiding the use of their call signs which are required by Commission rules and international treaty.

In spite of efforts by the Commission field staff through talks to small-boat operators and "user committees," distribution of hundreds of thousands of pieces of information, and continuous liaison with the various small boat operators, there still remains a serious problem in apprehending boat operators who cause instability and outright malicious interference on these vital safety frequencies.

FCC-GOVERNMENT INTERFERENCE CASES

During the past year, approximately 400 cases of harmful interference between United States Government stations and FCC licensees were referred to top Federal level for settlement. Detailed procedures have been developed for handling such cases. Consequently, regardless of who is at fault, agreement ordinarily can be reached quickly once all of the factual details have been set forth. Developing these details, however, is a difficult and frequently time-consuming task because the stations involved often are thousands of miles apart. Cases in-

volving safety of life and property, such as interference on international distress frequencies or on aviation traffic control frequencies, are given special handling.

The majority of serious interference cases of this nature result from human error or ignorance rather than equipment malfunction.

INTERNATIONAL INTERFERENCE AND INFRACTIONS

Indications are that the rapidly increasing sunspot activity is affecting radio propagation in such a way that more international interference conflicts have to be resolved than ever before. This work involves considerable research and engineering evaluation, but in spite of this many cases are adjusted in a short time. Cases which cannot be settled at technical levels are handled by the Department of State.

Of considerable importance to the interference-prevention program was the forwarding to foreign administrations of over 3,500 reports of technical treaty infractions by foreign stations in the past year. These reports of observed off-frequency operations, spurious emissions, etc., serve to remind the responsible authorities of the importance of keeping their radio "highways" open. The procedure for reporting such infractions is agreed to internationally. The United States receives its share of similar infractions by its licensees noted by other countries. Such reports are referred to the proper enforcement authorities for disposition.

A highlight of the interference-control program during the year was trial of a uniform procedure for processing the official data which must accompany international interference negotiations. Cooperation of the communication companies involved has been an important asset to this trial. Permanent institution of this procedure in revised form is planned for the coming year.

Field Engineering and Monitoring

GENERAL

The Commission's enforcement and "grass roots" contacts are accomplished largely through its field engineering and monitoring staff. The latter performs licensing functions for radio operators and certain classes of radio stations. It inspects all types of radio stations. It locates and closes unlicensed radio operation. It investigates and solves thousands of interference complaints. It monitors the spectrum for technical violators, and assists in locating lost or disabled aircraft and ships. It renders particular services to governmental agencies, station licensees, and the public.

This is made possible by a field organization of 23 district offices, 6 suboffices, 1 ship office, and 18 monitoring stations. The latter are connected to Washington headquarters through a rapid communication system. Six regional offices were discontinued at the close of the fiscal year.

MONITORING

Monitoring Facilities

The monitoring and direction-finding network comprises 10 primary and 8 secondary stations. (See list in appendix of this report.)

The Muskogee, Okla., and the Anchorage, Alaska, secondary monitoring stations were relocated during the past year. The former was moved to a site near Ambrose, Tex., and the Anchorage station to Point Campbell, still in the vicinity of Anchorage. Both are now on Government-owned land and in new buildings erected especially for monitoring purposes.

It is planned to move the Twin Falls secondary station, now on inadequate leased property, to a new site obtained by the Commission near Douglas, Ariz. This will further improve the long-range direction finder network through backup support to the Santa Ana primary station and by coverage of border territory in the southwest.

The Commission has obtained Government land near Chillicothe, Ohio, for its secondary monitoring station, now on leased property near there.

Unfortunately, even the sites of some of the larger primary monitoring stations are outgrown or have become progressively unsuitable

due to encroachments by residential and industrial expansion. In consequence, the Commission is seeking better sites for eventual moves of three primary stations.

All monitoring stations are now equipped with remote-controlled, long-range high-frequency direction finders. In addition, seven stations near the seacoasts have medium-frequency direction finders. During the year higher-powered radio transmitters were installed at some stations. Development of radioteletype communication between stations is dependent on the availability of funds. Long-range plans contemplate the eventual conversion of all CW radiotelegraph alerting and net-control radio circuits to radioteletype for increased efficiency and speed of operations.

Monitoring for Defense

The Commission continued to give requested monitoring and direction-finding service to the Department of Defense research programs. The FCC's coordinated network is the only one capable of providing this specialized service. Military agencies contract with the Commission for the work at a considerable saving compared to the cost of establishing duplicate facilities.

The largest contract ($143,000) provided for direction-finder tracking and monitoring interception of telemetering information relating to high-altitude weather balloons launched by the Air Force Cambridge Research Center. Similar work for the Navy Bureau of Aeronautics and the Naval Research Laboratory amounted to $74,750. Included in work for the Navy was assistance in tracking free-floating radio-equipped buoys planted in the ocean in the expected path of hurricanes. The monitoring portion of special ionospheric propagation studies of field intensity recordings for the Army accounted for $16,775. Collectively, these monitoring contracts totaled $234,525.

Monitoring Surveys

The United States is obligated under international agreements to furnish frequency usage and band occupancy monitoring data to the International Frequency Registration Board (IFRB) of the International Telecommunication Union (ITU) at Geneva, Switzerland. This information assists in efficiently allocating the scarce radio frequencies useful for international communications and thereby directly benefits the United States commercial and Government users of these radio channels.

The Commission's monitoring stations continue to be the principal United States source of this monitoring data. However, five large domestic commercial companies now participate in the program. The data they obtain are included with that forwarded by the Commission.

In fiscal 1956, 178,300 monitoring items were forwarded to the IFRB

by the United States. Of these about 154,300 were obtained by FCC monitoring stations and 24,000 by commercial companies.

The Commission made 22 special monitoring surveys during the year compared with 36 last year. On the surface this appears to be about a 35-percent reduction but actually the work decreased only slightly because 6 of these cases were continued throughout the entire year for the purpose of placing particular emphasis on observation of certain frequency bands where detailed occupancy data were required by the Commission in allocating frequencies and in determining the extent of interference resulting from new or modified allocations.

Direction Finding

Without its effective 18-unit long-range direction finder network, the Commission's monitoring service would be operating "blind" in attempting to locate signals that do not transmit call signs or other identification. Also, it would not be able to render the "fixing" service that it does in search and rescue operations involving planes and ships. Its monitoring network is also a strong deterrent to illegal transmission because such operations can be quickly run down by radio bearings once they are detected. FCC monitoring stations reported a total of 117,726 bearings during the year, although many more unrecorded bearings were taken as aids in local monitoring work.

A considerable portion of the direction-finder workload is accounted for under the balloon-tracking contracts for the military agencies. Such bearings totaled 62,280 during the year, which was an increase of 19,290 from the year previous.

A total of 1,700 bearings were taken in the air-sea search and rescue program of assistance to lost or disabled planes and boats. There were 117 separate emergency cases of this type during the year compared to 110 last year. Some typical cases were:

Emergency assistance to planes.—A Pan American Stratoclipper carrying 60 persons was prevented by an overcast from using celestial navigation and by a magnetic disturbance caused by sunspots from relying on its compass and other navigational aids. It was off course in the Pacific en route from Australia to Honolulu and was trying to find Canton Island before it ran out of gasoline. The CAA requested FCC assistance. The resulting fix assisted in guiding the plane to a landing at British Samoa with 90 minutes fuel left.

The CAA requested assistance to locate an Air Force plane having engine trouble while en route to Travis Air Force Base from Hickam Field, Hawaii. Three FCC fixes assisted a Coast Guard plane in making contact with the disabled craft about 175 miles off San Francisco and escorting it to base.

A Navy plane over the Pacific heading for Pescadero, Calif., was down to only 700 feet due to engine trouble. Aided by 2 FCC fixes,

a Coast Guard plane found the faltering craft 200 miles out at sea and guided it into a safe landing at Alameda.

A military plane was reported by CAA to be in need of direction-finder assistance because of a damaged wing and uncertain position in the Gulf of Mexico. The FCC positioned the craft 450 miles southeast of New Orleans. It was brought into a safe landing at Brookley Air Force Base.

Another instance concerned a military plane in the Atlantic with a fire on board but under control. As a precaution, a Coast Guard plane used an FCC fix to confirm the plane's reported position. It was able to escort the other plane 600 miles to a safe landing in Bermuda.

Emergency assistance to ships.—The Coast Guard asked FCC assistance to locate a balsa raft, named the *Cantuta*, carrying 4 men and 1 woman trying to duplicate the *Kon-Tiki's* feat of sailing from Peru to the Polynesian Islands. The crew of the raft had radio equipment and sent out a distress call after their food supply became low and a current stalled their progress. The Navy Hydrographic survey ship *Rehoboth* was enabled to pick up the raft about 1,000 miles northwest of the Galapagos Islands.

The FCC also assisted the Coast Guard in tracing unidentified distress signals which appeared to come from a small hand-cranked emergency transmitter known as a "Gibson Girl". Two fixes indicated a point in lower Chesapeake Bay at which a Navy plane found a rubber liferaft carrying 5 persons from the 68-foot auxiliary yawl *Torbatross* which had hit a submerged object and sunk while en route to Florida. There was no loss of life and the raft passengers were rescued by helicopter.

Other instances of FCC assistance furnished at the request of the Coast Guard included positioning the fishing vessel *M-E Second* lost in a fog off California; the fishing vessel *Skilligolee* caught in heavy seas and leaking off Cape Cod; the disabled vessel *Carlyle Bay* off Bermuda carrying a crew that had been without water for 3 days, and the trawler *Jean Lafitte* lost in the Gulf of Mexico with engine trouble.

Other Monitoring Cases

In addition to interference-type monitoring cases, others involved the detection and location of illegal transmitters, enforcement of the Communications Act and radio regulations, and special projects to assist the Commission and other Government agencies. The number of such cases totaled 1,301 compared to 1,127 last year. In addition, 6,548 local monitoring cases involving subjects unrelated to interference were handled in the field. This compared with 4,315 such cases in 1955.

Additional monitoring statistics follow:

	Fiscal 1955	Fiscal 1956
Alerts, unknown or suspicious signals	6,730	10,104
Identification file slips	154,739	187,236
Monitoring citations served	11,192	13,674
Requests for monitoring coverage (noninterference cases):		
Field Engineering and Monitoring Bureau originations	138	137
Other FCC Divisions/Bureaus	50	45
Other Government agencies	133	167
Amateurs	79	77
Commercial concerns	23	22
Foreign governments	20	26

Monitoring Training Program

Pursuant to Presidential directive of January 11, 1955, requiring the training of Government employees, a training program was started to provide class instruction to supplement on-the-job training for monitoring observers and monitoring-control watch officers.

The course is designed to train monitoring personnel to perform their duties at the highest level of efficiency and individual usefulness, particularly as they must work the larger part of the time without close supervision. Furthermore, because of budgetary limitations on staffing, each man may be called upon to assist in almost every phase of monitoring station operation and maintenance.

Because of the specialized nature of the Commission's monitoring operations, there are few sources for recruiting adequately trained persons for staffing its stations. It must, therefore, depend heavily on its own resources for training its monitoring observers.

The coverage of this training program includes approximately 130 employees engaged in monitoring activities in the field and in Washington. Instruction consists of one hour per week class work supplemented by study assignments. The program has been coordinated with the Civil Service Commission.

INSPECTIONS

Fewer inspections of radio stations could be accomplished during fiscal 1956 than in 1955 due to continued budgetary limitations.

Broadcast Station Inspections

Accurate maintenance of important operating characteristics is essential to assure that broadcast stations render a service of high technical quality to the public. Inspections of the stations are necessary to make these determinations and to assure that certain safety requirements such as the painting and lighting of extremely high towers are of a quality to afford proper safeguard to air navigation and that automatic devices for the flashing or rotating beacon function in accordance with requirements. Observations of the station's transmissions are

also essential at intervals to assure that interference is not caused to other stations, including those in the vital safety service, through actual or imminent misadjustment. It is also necessary to see that the station is operated at all times by the appropriate grade of radiotelephone operator as required by Commission regulations.

A total of 1,059 broadcast station inspections was made during fiscal 1956 as against 661 in 1955. At the same time, 615 citation notices were issued to the licensees pointing out discrepancies. This constituted an increase of 50 percent over the year previous.

Ship Radio Inspections

In order to maintain, at the highest possible level of reliability, the radio equipment on board passenger vessels and certain freight-carrying vessels and to assure that this equipment will be ready for communication in times of emergency, regular inspections are made of the radio equipment on board these vessels under the provisions of the Safety of Life at Sea Convention 1948, and the Communications Act.

Geographically, the FCC's marine-inspection activities encompass the continental United States, territories, and possessions. Approximately 52,000 vessels ranging from the largest ocean liners to small pleasure boats are subject to inspection of their radio equipment at intervals.

Drastic curtailment of the Commission's ship inspection program has been mandatory since 1953, following a decrease of 50 percent of field personnel available for this work. As a result, inspections of radio installations on American passenger ships can be made not oftener than at 6-month intervals and those of American cargo ships only once per year. On the Great Lakes, once-a-year inspections are made as provided under the Great Lakes Treaty. On voluntarily equipped vessels, inspections can be made only infrequently; inspections of ships of convention countries are made only upon request, while those of nonconvention countries are not inspected. During 1955 and 1956 ship inspections were as follows:

	United States Ships		Foreign Ships	
	1955	1956	1955	1956
Compulsory ship stations				
Number of stations	1,635	1,653	0	0
Number of inspections [1]	1,708	1,697	381	315
Number of deficiency notices served	1,089	1,127	191	109
Number of violations corrected during inspections [2]	2,149	2,481	330	375
Voluntary ship stations				
Number of stations	47,959	50,952	----------	----------
Number of inspections	163	495	----------	----------
Number of deficiency notices served	122	453	----------	----------

[1] Not including "call backs" to verify correction of violations.
[2] For which deficiency notices were not served.

Portable radiotelegraph lifeboat equipments totaling 1,390 were inspected at the request of the Coast Guard in order to facilitate the certification of this equipment for issuance of safety equipment certificates.

Issuance of Great Lakes agreement radiotelephony certificates, which began on November 13, 1954, continues. During 1955 a total of 95 were issued, which increased to 457 in 1956.

The issuance of safety radiotelegraphy and safety radiotelephony certificates commenced on December 13, 1954, in accordance with provisions of the International Convention for the Safety of Life at Sea. These certificates had formerly been issued by the United States Coast Guard based upon inspection made by the Commission.

During fiscal 1956 about 1,100 safety radiotelegraphy certificates were issued to United States ocean-going ships as compared with 1,186 in 1955. The number of such certificates issued to foreign vessels during 1956 and 1955 was 285 and 315, respectively.

Forty safety radiotelephony certificates were issued in 1956 as compared with 11 during 1955.

Other Radio Station Inspections

During fiscal 1956 there were 7,073 inspections of radio stations in other services while 4,202 such inspections were made in 1955. Discrepancies of a technical nature totaling 1,444 were found in 1956, as compared with 722 in 1955.

INTERIM SHIP STATION LICENSES

The Commission continues to assist small vessel owners in obtaining radio operating authorizations promptly. This is accomplished through field issuance of "90 day" interim ship radiotelephone station licenses and authorizations (to those who must sail promptly) without the delay which would otherwise be occasioned by awaiting the regular full-term radio operating authorization or full-term license from the Washington office.

In making these interim requests, it is necessary that the applicant also apply for the regular (new or modified) ship station license. A total of 5,292 such interim ship radiotelephone licenses were issued in the field during fiscal 1956, or 1,606 more than in 1955.

INVESTIGATIONS

Investigation of Unlicensed Stations

During the year 147 unlicensed stations were located by mobile investigative units, an increase of 42 over those located in 1955.

A hoax distress transmission responsible for an extensive but futile search by air and sea for a vessel purportedly afire and sinking off the

Atlantic Coast resulted in an undetermined term of up to 6 years in a Federal correctional institution for one participant and 2 years probation for his younger associate.

Willful operation of an unlicensed station in amateur radio bands resulted in indictment of a 37-year-old operator near Los Angeles and a $50 fine.

A false statement in an application for a radio operator license, affirming that he was a citizen, led to an alien receiving a suspended sentence of 3 years, being placed on probation, and facing possible deportation.

An illegal station signing as the "Phantom of Fairlawn" was quickly traced to Fairlawn, N. J., where the culprit was found to be a man who apparently had been imbibing too freely.

Perhaps the most widespread instance of deliberate interference occurring during the year involved the jamming of reception at an unattended TV relay point on a mountaintop in Idaho, thus preventing a planned TV rebroadcast throughout the State on the first day of the world series baseball game.

The potential hazard to safety and other radio communications which can result from operation of unlicensed stations was illustrated when an unlicensed TV "booster" station in the mountainous West was found also to be "accidentally" picking up an aviation radio navigation (fan marker) signal and retransmitting it on another frequency.

COMMERCIAL RADIO OPERATORS

General

Except for those operated by the Federal Government, all radio stations in the United States and territories are required, in general, to be operated by citizens holding Commission issued operator licenses. Examination is required for the higher grade licenses, but certain operating "permits" are obtainable upon a simple showing by the applicant that he is properly qualified.

The grade of each operator license testifies to the skill and qualifications demonstrated by the possessor. License-holding requirements are determined by the class of station, type of operation, or complexity of the equipment to be operated, as well as the degree to which the station contributes to the promotion of safety of life and property.

Normal duties of radio operators are diversified, ranging from manipulation of high-speed sending equipment at certain types of powerful stations in the international services to the operation of shipboard stations installed and continuously manned while the vessel is at sea.

Radio operators must, in general, be familiar with all aspects of radio station operation through training and experience since they are often the only available persons with radio knowledge and ability, as for example on certain vessels or at outlying stations. Frequently their duties include the keeping of station records and the accomplishment of technical maintenance or even construction duties. In all cases the qualifications which the operator must possess are taken into account in the examination questions for that class of operator license. Operator requirements for certain semiautomatic or pushbutton type of station transmitters have been waived by the Commission.

Rule Changes

The Commission amended its rules to require operators of aircraft radiotelephone stations with antenna powers ranging from 50 through 250 watts to hold radiotelephone third class operator permits. This permit is 1 grade higher than the operator permit heretofore held and is considered necessary in order to meet treaty requirements (Intenational Radio Regulations, Atlantic City, 1947). This amendment was intended to become effective August 1, 1956; however, petitions for rehearing were filed by aviation industry groups and these were under consideration at the end of the year.

The Commission instituted further rule-making proceedings looking toward a requirement of third-class operator permits for ship radiotelephone stations with antenna power not exceeding 250 watts. This proposal would discontinue the authority under the restricted radiotelephone operator permit with respect to ship stations. It goes beyond the minimum operator license requirements of treaty. It was considered necessary to deal with chaotic conditions in the medium frequency ship radiotelephone channels resulting from widespread disregard of established operating procedures and regulations. This proposal was still pending.

The Commission amended its rules so that third-class radiotelegraph operators applying for a radiotelegraph second-class operator license during the first year of the third-class license term are given credit for and need not repeat the code test.

The Commission also amended its commercial radio operator rules to place an age limit on applicants for the restricted radiotelephone operator permit. This grade of operator license is issued upon a signed declaration by the applicant, without requiring proof of qualifications. The amendment requires that applicants be at least 14 years of age.

The Commission still has under consideration the question of denying radio operator licenses to members of subversive groups, following oral argument held March 7, 1955, on this proposal.

Operator Suspensions and Denials

The Commission took remedial action against 10 commercial radio operators through suspension of their licenses. In 2 of these cases, hearings were requested and suspensions were meanwhile held in abeyance.

Five commercial radio operator applications were dismissed without prejudice for failure of the applicants to furnish information requested by the Commission.

Renewals requested by three operators have not been granted pending inquiry into their present or past affiliations.

One operator had the issuance of his high-grade license deferred pending an investigation into his prior conduct and misrepresentation of the operating authority which he then possessed.

Another operator's permit was declared void on the grounds that he had obtained this permit by falsely stating that he was a citizen.

Operator Examinations

Radio-operator candidates are offered examinations at points throughout the United States and territories at regular intervals, based on the extent of the demand in each case. On this basis, quarterly, semiannual or annual examinations are offered at various places, while at 30 FCC offices examinations are available daily, biweekly, or upon special arrangement with the engineer in charge. The dates on which these examinations are held at the respective cities are published semiannually in a Radio Operator Examination Schedule available at any of the district engineering field offices listed in the appendix to this report.

In addition to commercial-type radio operator examinations, amateur examinations of the general and extra classes are also offered at the several examining points.

Radiotelephone operator examinations continue to be given on board Great Lakes vessels, as well as on coastwise or other oceangoing vessels from 500 to 1,600 gross tons. This examination is nontechnical, is written, and based on practice, procedure, and regulations applicable to radiotelephone communication in the mobile service.

There was an increase of 13.8 percent in the number of amateur operator examinations in 1956, when there were 52,657 examinations as compared with 46,238 in 1955.

Commercial Radio Operator Authorizations

Out of 265,968 applications in 1956, 218,768 commercial radio operator authorizations were issued. This constituted an increase of 16.2 percent over the 188,504 figure for 1955. Thus, outstanding commercial operator licenses of all classes total more than 1,113,158

at the end of the year, or more than 126,795 in excess of those at the close of 1955. Comparative figures by grades of licenses follow:

Class of license	June 30, 1955	June 30, 1956	Net increase or (decrease)
Radiotelegraph:			
1st class	6,183	6,756	573
2d class	10,083	10,795	712
3d class	2,063	2,142	79
Temporary limited, 2d class [1]	635	482	(153)
Radiotelephone:			
1st class	53,415	59,155	5,740
2d class	32,333	34,011	1,678
3d class	25,214	27,504	2,290
Restricted permits [2]	795,011	927,302	132,291
Aircraft authorizations [1]	61,426	45,011	(16,415)
Total	986,363	1,113,158	126,795

[1] This class of license discontinued.
[2] Restricted permits issued for lifetime of operator.

FIELD ENGINEERING PROJECTS AND FACILITIES

This has been a year of progress in improving and modernizing field engineering enforcement and monitoring facilities.

The first mobile TV monitoring unit, which was constructed at the FCC laboratory, commenced regular operation in September 1955. This unit contains various specialized precision measuring and analysis instruments for measuring the technical characteristics of TV broadcast transmissions to determine compliance with engineering standards. Major equipment or operational deficiences which resulted in degradation of the picture or sound transmissions were noted in about two-thirds of the TV stations checked with the new mobile unit. Remedial action by the stations resulted in a marked improvement in performance. A second mobile TV monitoring unit is now being completed at the laboratory and will be placed in service during the coming year.

Monitoring of the spectrum in the microwave regions above 1000 megacycles cannot be effectively accomplished at fixed monitoring stations because of the high rate of attenuation of microwave signals and because of the highly directional antennas used by stations operating on these frequencies. To provide microwave monitoring facilities to intercept and locate possible clandestine stations or sources of interference to communication, navigation and other services operating in the microwave regions, microwave mobile monitoring and frequency-measuring installations were made in two of the engineering test cars. These vehicles are equipped with receivers, special high-gain antennas and frequency-measuring instruments covering frequencies from 1000 to 11750 megacycles.

A new high-resolution type of spectrum analyzer was placed in service at three monitoring stations. This instrument, as modified

by the Commission's laboratory, permits a determination of the characteristics of and the bandwidth occupied by many classes of emissions which could not be accomplished with the previously available spectrum analyzers. The Commission now has the technical facilities for determination of spectrum occupancy, a necessary function for maximum utilization of the available spectrum and for assisting industry and Government in the solution of interference problems.

Continued progress was made in replacing the old long-range direction finders with new high-speed models having symmetrical all-metal structures. The new remotely controlled high-speed drive system, which was designed by the Commission at its Powder Springs primary monitoring station, provides a means of obtaining more rapid bearing fixes than was possible with earlier remote control devices. The new direction finders are now in operation at the Anchorage, Ambrose, and Fort Lauderdale monitoring stations, and construction of seven additional units is under way.

The need for improved receiving facilities in the VHF ranges, and particularly in the frequency bands assigned for mobile radiotelephone operations, was met during the year by purchase of new, more selective receivers for use by the field engineers in solving interference problems and for other investigative activities requiring the use of a selective VHF receiver.

Progress was made in improving the precision frequency-measuring facilities at the monitoring stations by installation of more accurate frequency standards at three stations and by utilization of electronic counter-measuring techniques. Electronic counters have proven to be particularly useful in providing more accurate and rapid frequency measurements of frequency-modulated signals and certain other emissions where the carrier frequency varies with modulation.

An average of 20 continuous signal field-intensity recorders were in operation at certain monitoring stations to obtain radio propagation data required by the Commission in its allocations and rule-making activities. Most of the recorders were operated in the VHF and UHF ranges. Mobile field-intensity surveys were also made to provide coverage data and information concerning the interference potentialities of various classes of stations and electronic devices.

ANTENNA OBSTRUCTION MARKING

In administering part 17 of the rules concerning the construction, marking, and lighting of antenna towers and their supporting structures, the criteria set forth in subpart B are applied to all proposals for new or modified antenna structures. Proposals that exceed these criteria are referred for special aeronautical study to appropriate Regional Airspace Subcommittees (ASP) of the Air Coordinating

Committee (ACC) created by Executive order to examine and make recommendation on aviation matters affecting Federal departments. The antenna proposals that conform to the criteria are approved by the Commission which prescribes obstruction markings pursuant to subpart C of part 17.

The number of applications requiring antenna processing reached a record total during fiscal 1956 of 13,294, an increase of 3,438 over fiscal 1955. Of this number, antenna proposals for safety and special radio services inceased from 8,065 to over 11,000. The number of antenna proposals processed by the Commission for all radio services during fiscal 1956 totaled 13,089, an increase above fiscal 1955 of over 325 applications per month, of which approximately 300 were for safety and special services. The number of antenna proposals requiring special aeronautical study by the FCC was more than double the number during fiscal 1955. Referrals of broadcast and common carrier proposals increased approximately in proportion to the increase in applications processed for each service, while referrals of safety and special radio services proposals increased from 211 to 530. It is significant that a high percentage of the latter antenna proposals were under 170 feet in height.

Section 17.14 of the rules, which provides that certain antenna structures are exempt from special aeronautical study, was amended by the Commission to exclude from that exemption antenna additions of 20 feet or less to existing antenna structures.

Pursuant to recommendations of Joint Industry-Government Tall Structure Committee (JIGTSC) which were approved by the ACC on October 18, 1955, the Commission proposed rule making to amend part 17 to require applicants proposing transmitting towers in excess of 500 feet in height to specify antenna sites within areas suitable for grouping towers (designated "antenna farm areas"), on existing structures, or to demonstrate why their antennas cannot be so located. Changes in criteria contained in part 17 to achieve these objectives are under study.

During the year, WFAA–TV and KRLD–TV, each with an overall antenna height of 1,521 feet above ground, began operations from their combined "candelabra type" tower at Dallas, Tex. The Commission held a hearing on the Deep South Broadcasting Co., Selma, Ala., antenna proposal for 1,993 feet. Decision was still pending.

During the year, the ACC approved a program of operational and field evaluation of special lighting and marking techniques for tall towers developed by its Subcommittee on Aerodromes, Air Routes, and Ground Aids. Pursuant to recommendations of the ACC, the Commission has prescribed experimental marking for several new tall towers selected for their height, terrain background and prevailing

visibility conditions. Evaluations made by observations taken in controlled tests in the areas of the experimental towers will determine the nature and degree of increments in detectability and conspicuity of the towers resulting from the new marking and lighting systems.

Statistics of antenna construction proposals processed during the fiscal year follow:

Services	Pending July 1955	Received in ASB	Cleared by ASB	Pending June 30, 1956
Broadcast:				
AM	45	851	856	40
FM	1	94	94	1
TV	20	673	668	25
International	0	0	0	0
Experimental	0	12	12	0
Total	66	1,630	1,630	66
Safety and special radio services	866	11,089	10,919	1,036
Common carrier	14	575	540	49
Grand total	946	13,294	13,089	1,151

The number of proposals referred to the Regional Airspace Subcommittees for special aeronautical study follow:

Services	Pending at airspace July 1, 1955	Sent to airspace during year	Received from airspace during year	Pending at airspace June 30, 1956
Broadcast:				
AM	28	194	186	36
FM	0	8	7	1
TV	14	115	112	17
International	0	0	0	0
Experimental	0	0	0	0
Total	42	317	305	54
Safety and special radio services	28	530	464	104
Common carrier	4	47	43	8
Grand total	74	894	802	166

More than 40 TV broadcast station towers 1,000 feet or higher are now in use.

Research and Laboratory

TECHNICAL RESEARCH

General

Basic engineering problems which occupy the Commission include the application of radio propagation theory and data to allocation and assignment planning, and development of uniform technical standards for transmitting systems as well as nontransmitting electrical and electronic equipment capable of interfering with radio communication. Also, under its obligation to study new uses for radio, the Commission encourages experimentation and, itself, must keep abreast of technical developments and improvements in both radio and wire transmission.

Government-Industry Cooperation

Dealing as it does with technical matters affecting the entire radio field, the Commission necessarily devoted much time to conferences with representatives of industry and engineering and scientific associations, besides being represented on many Federal and industry-Government working groups. Through such contacts, the Commission is kept informed of technical developments. Many problems can frequently be resolved through such cooperation.

Typical of these groups are the Interdepartmental Council on Radio Propagation of the Central Radio Propagation Laboratory (CPRL), the Radio Propagation Advisory Committee (RPAC), Committee C63 of the American Standards Association (ASA), the various committees of the International Scientific Radio Union (URSI) and the International Radio Consultative Committee (CCIR), the Institute of Radio Engineers (IRE), the Radio Technical Commission for Marine Services (RTCM), the Radio Technical Commission for Aeronautics (RTCA), the American Institute of Electrical Engineers (AIEE), the Radio-Electronics-Television Manufacturers Association (RETMA), and the National Association of Radio and Television Broadcasters (NARTB).

VHF and UHF Propagation Research

During the year an appreciable amount of new information on VHF and UHF propagation was developed from field strength recordings.

This is largely due to the increased transmitter powers and the higher antenna efficiencies of TV stations which result in the radiation of stronger fields making it possible to obtain more extensive and more accurate measurements of field strength. As a result, new VHF field strength curves have been prepared. These curves, after coordination with the other United States members of the CCIR Study Group will be presented by the United States delegation at the CCIR plenary meeting in Warsaw.

The Commission also carried out an extensive study of the discrimination to be expected from cross polarization of TV signals; that is, the discrimination of a vertical antenna to TV signals that are normally horizontally polarized. The results were used by the Commission in several service studies.

A special study was made of VHF propagation as applied to marine communications in the Great Lakes region. Many reports and memoranda were prepared applying VHF and UHF propagation information to allocation and other problems of the various radio and TV services.

The Commission surpervised a project under contract with the Army Signal Corps and prepared quarterly reports on the results obtained. This information is also useful to the work of the Commission. Arrangements have been completed and preliminary work started on a new contract in which the Commission is furnishing engineering assistance in a Signal Corps project involving a study of spectrum utilization.

AM Broadcast Propagation Research

The overriding importance of TV propagation studies required a cutback in standard broadcast propagation research. However, a study was made of the effective coverage of AM broadcast stations, the results of which were useful to the CONELRAD program and the Commission's broadcast work.

Sunspot Cycle Recording

The sunspot cycle recording program has now been in operation for nearly two 11-year sunspot cycles. This is believed to be the only set of measurements in the world covering as much as a complete sunspot cycle. Originally, recordings in this project were made over several dozen paths. During fiscal 1956 recordings of field strength of AM broadcast stations were made at three FCC monitoring stations using 6 different paths. The pressure of more urgent work in connection with VHF and UHF propagation research prevented immediate analysis of these records. It is expected to continue recording the same 6 paths through the sunspot maximum during 1957.

Technical Standards

Work continued on improving the technical standards throughout the Commission's rules. Particular emphasis was given to reduction of extraneous emissions, improved bandwidth specifications and reduced spectrum occupancy by means of single sideband techniques or by reduction of FM frequency deviation. Proposed rule making was initiated to require use of single sideband for radiotelephony below 25 megacycles and to specify technical standards for such operation. The utilization of single sideband would reduce by a factor of one-half the spectrum space occupied by present double sideband emissions, in addition to other advantages which would accrue, including improved communication efficiency and lower cost. Consideration was given to comments filed in the narrow band rulemaking proceeding for the land mobile services (Docket 11253) looking toward final rules and technical standards for split-channel operations in these services.

The specification of spurious emissions in the vicinity of the assigned frequency is being examined, pursuant to rule-making proceeding in Docket 11654, for all of the radio services. This rule making resulted from fundamental limitations on the degree of spurious emission suppression which can be achieved in the vicinity of the assigned frequency, which became apparent in connection with measurements of spurious emissions for type acceptance purposes.

The new class of translator TV broadcast stations, which was provided for during the year, required suitable technical standards which, while meeting the objective of economy for this class of station, will assure satisfactory TV operation and will adequately protect other services from interference.

Proposed technical standards for the aviation services were issued (Docket 11619), including type acceptance requirements. Final rules are being drafted.

Particular attention is being given to formulation of technical standards for services operating above 300 megacycles, including private microwave stations and land mobile stations, which are presently authorized on a developmental basis pending promulgation of technical standards.

The necessity for minimizing interference between stations in order to obtain maximum spectrum utilization leads to consideration of various technical expedients for this purpose. Studies are being made of polarization discrimination in the TV broadcast service to determine quantitatively the improvement which might be obtained. Improved frequency stabilization of transmitters may lead to reduction of interference by adjacent stations and cochannel stations. In the latter case, the advantages of "frequency offset" techniques are being

studied with regard to possible refinements useful in TV broadcasting and the use of such techniques in the land mobile service.

Type Acceptance of Transmitters

The Commission's activity with regard to type acceptance of transmitters increased during the year. Type acceptance requirements which became effective June 30, 1955, for AM, FM, and TV broadcast transmitters were followed by issuance during the year of parts A and B of the Radio Equipment List, for TV and aural broadcast equipment, respectively. Part A consists of 3 entries (1 yet unpublished), and part B, including the 3 supplements issued during the year, comprises 259 entries. The issue of part C (for radio services other than broadcast) on July 1, 1955, was supplemented September 29, 1955. A complete reprint of part C was issued January 12, 1956, and this with the entries added by the 2 subsequent supplements consists of 1,401 entries compared with 1,322 last year.

Additional type acceptance rules were adopted for ship radiotelephone transmitters, to bring those below 30 megacycles into the type acceptance program, which previously has applied only to those above 30 megacycles. Rules for type acceptance in the Domestic Public Radio Services were adopted, becoming effective in September 1956.

Requirements for field intensity measurements of spurious emissions in connection with type acceptance were postponed until December 1956 to allow additional time for development of adequate measurement methods.

Of the 14 type acceptance applications pending at the beginning of the year and 106 subsequently received, 65 were granted and 14 dismissed. Three were removed from pending status because of the applicants' failure to pursue them and 9 were removed because they were superseded by applications later granted. There are now pending 29 applications for type acceptance. Technical details concerning 180 equipments were filed during the year for application reference purposes.

Experimental Radio Services

The Experimental Radio Services, covered by part 5 of the rules, are designed to "provide for the experimental uses of frequencies" as required by the Communications Act.

These rules cover the use of radio in connection with basic research in radio such as investigations of propagation, exploration of the various ionized layers in the ionosphere, studies of tropospheric effects, research in new circuitry, and modulation techniques. The rules also enable experimentation in connection with the development of new radio services as well as the development of new techniques and procedures in existing services. Many of these investigations, both re-

search and developmental, are on behalf of Federal agencies, chiefly the Department of Defense.

Experimental stations operated by manufacturers and developmental laboratories are engaged primarily in development of new radio and electronic techniques. Narrow band, split-channel communication is receiving increased attention. New aids to navigation are being developed, including high definition radar sets as well as lightweight radar equipments for small craft. Experiments in the development and application of industrial TV are being pushed rapidly. Broad band, multiple-channel microwave experimentation as well as ionospheric scatter tests are receiving increasing attention from both civilian and military interests.

Hundreds of experimental stations are operated by persons engaged in the development or testing of radio equipment under contractual agreements with Government agencies. Most of these contracts are with the Department of Defense and are classified. However, the techniques developed by these investigations, as well as any technical knowledge that is acquired, eventually show up as improvements in civilian radio facilities.

The most difficult problem involved in the administration of the experimental radio services lies in the finding of frequencies which can be used for experimentation. Previous to the implementation of the Atlantic City agreement, specific frequencies were reserved for experimental operations. Now that practically all usable frequency bands in the spectrum have been allocated to the regular radio services it is necessary to borrow frequencies from these regular services in order to permit experimentation. The difficulties involved in finding usable frequencies for this purpose are compelling the Commission to restudy its allocation policy and the frequency assignment procedures relative to experimental operations.

Revision of the experimental rules and of the application forms used in this service are long past due. However, because of the urgency of pending applications and the present limited staff, little or no long-range planning can be carried on.

Statistics covering the experimental radio services for the fiscal years 1952–1956 follow:

Fiscal year ending—	Special temporary authorizations granted	Stations licensed	Applications received
June 30, 1952	140	369	915
June 30, 1953	163	444	1,055
June 30, 1954	300	586	975
June 30, 1955	528	625	1,447
June 30, 1956	643	716	1,507

A less well known function under the experimental service is the provision for making field surveys in order to determine what type of a radio installation is required to meet the communication needs of a prospective customer. This function also provides for the use of radio for technical demonstrations of equipment. A frequency for a survey or a demonstration is assigned for a limited period of time and for use at a specific location.

The demand for special temporary authorizations to conduct field surveys and to demonstrate equipment has increased 360 percent in 4 years. Since both the applications and the resulting authorizations are handled in the form of telegrams, there is constant pressure to expedite these cases. Because most cases involve the clearance of frequencies to prevent interference, simplified procedures are impractical.

Practically all applications for experimental authorizations are accompanied with, and followed up by, insistent demands for expeditious handling. While the rapid processing of applications is highly desirable, the increasing workload and the current limits on personnel make quicker action impossible. During the past year the backlog of work has increased and the average application processing delay is from 8 to 10 weeks.

LABORATORY

General

The Commission's laboratory near Laurel, Md., makes engineering studies of systems and equipment, both as to the service that may be rendered and the interference that may result. Besides studies of communications equipment, the laboratory investigates the interference caused by other electronic and electrical equipment.

Calibrations and adjustments are made to various engineering measurement instruments and equipments used by the Commission's field engineering and monitoring installations. In addition, special monitoring equipment is developed at the laboratory.

Type Approval Testing

In the type approval procedure the manufacturer of certain types of equipment submits a sample unit to the laboratory for tests, and if satisfactory the unit is approved. When an applicant files for license he then only needs to indicate that he proposes to use a type approved transmitter and need not furnish complete technical details, and the Commission does not have to examine this technical data in individual cases.

Some equipments not normally licensed, such as diathermy machines, industrial heating equipment, ultrasonic apparatus, epilators, radio-frequency-excited welders and certain electric signs, are also

tested and type approved at the laboratory. One of these types, the ultrasonic medical unit, generally operates in the AM broadcast band. Over 50 of these machines were submitted for test during fiscal 1956 and about 25 were approved, mostly after modifications. Some of these modifications reduced the interference potentialities materially.

Television Propagation

During the year the laboratory conducted a pilot-scale project to determine whether home TV receiver installations are sufficiently insensitive to vertically polarized transmissions to permit further spectrum economy through the addition of some vertically polarized TV station assignments. While the results are not extensive enough for final conclusions, indications are that only a modest discrimination against the cross-polarized transmission is available.

In furtherance of the same aim, the laboratory is currently engaged in studies to determine whether TV stations may be spaced at smaller distances apart through the use of precise control of the operating frequencies.

Cooperation With Other Groups

The laboratory has participated in the work of a number of engineering groups working toward the wider and better use of radio and the reduction of interference.

It participated extensively during the past year in the IRE committee activities which led to the standardization of methods for measurement of TV receiver oscillator radiations now extensively employed by manufacturers.

The laboratory also assisted the Coast Guard in the evaluation of several transmitting antennas for use in the latter's land-mobile operations. Tests of a line noise filter device were made at the request of the Post Office Department.

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Frequency Allocation

ROUTING INVISIBLE TRAFFIC

Some knowledge of radio frequencies and their allocation is a necessary background for understanding the details of various types of radio operation and regulation which are set forth in other chapters.

Allocation of radio frequencies is a very complex subject. In brief, it involves designating portions of the radio spectrum for the use of particular radio services and assigning specific frequencies within those segments for the operation of individual radio stations.

In some respects, frequency allocation can be likened to building land highways. However, the planning and development of invisible communication lanes is much more complicated than road building. There is still a wide choice of land highway routes but radio paths are limited in number and many are congested. And, unlike land traffic, radio transmissions can not be routed by underpasses and overpasses. Neither can they obey traffic signals to allow other traffic to pass, or to stop at any given point. For radio waves spread out in all directions, crossing State lines and international boundaries.

As land traffic increases, highways are widened and alternate routes provided when necessary. Likewise, radio highways can handle only a certain amount of traffic before additional lanes are needed and more exacting operating controls invoked.

RADIO PATHS DIFFER

However, not all radio paths are the same width. Some types of transmissions require wider lanes than others. For example, an FM broadcast needs a channel 20 times wider than that used by an AM station, while a TV station's combination of picture and sound requires about 200 times the spectrum space occupied by an AM program. In the nonbroadcast field, too, channel widths differ according to the nature and requirements of the particular services.

Furthermore, not all radio frequencies behave alike. Also, those in the various portions of the spectrum have different characteristics. For example, 1000 kilocycles is suitable for AM broadcasting but not for FM or TV broadcasting. Similarly, 415 kilocycles is good for ship navigation by direction finding but not for ship navigation by

radar. Consequently, each radio band has particular qualities which must be taken into account in determining the type of service which can best operate on it. Use of frequency bands, especially in the upper reaches of the radio spectrum, is further determined by the development and availability of apparatus to operate there.

Also, there are certain limitations in any radio system which govern its use. It goes without saying that mobile and portable transmitters require frequencies of limited range. On the other hand, transmissions which cross the seas need frequencies with long-range characteristics.

RADIO BANDS, CHANNELS, AND FREQUENCIES

It is customary to speak of the spectrum space occupied by each radio service as a "band", meaning a group of frequencies allocated for the use of a particular service. These bands are in turn broken down into "channels", which are the traffic lanes assigned for the transmissions of individual stations in that service.

Within these channels each station operates on a designated "frequency". This means that it transmits its electrical impulses at so many "cycles" (vibrations also called "waves") a second. These emissions are measured in "kilocycles" and "megacycles". A kilocycle denotes a thousand of these waves a second, while a megacycle is a short way of indicating 1000 kilocycles. Radio waves of certain frequencies travel great distances, others have shorter range.

The lowest frequency useful for radio communication is 10000 cycles (10 kilocycles) per second. This, then, is the bottom of the useful radio spectrum. The latter embraces that part of the electromagnetic spectrum which can be used for communication purposes. It is arranged progressively according to the respective wave lengths graduating upwards from "long waves" to "short waves".

For convenience, the radio spectrum below 30 kilocycles is known as the VLF (very-low frequency) range; from 30 to 300 kilocycles, LF (low frequency); from 300 kilocycles to 3 megacycles, MF (medium frequency); 3 to 30 megacycles, HF (high frequency); 30 to 300 megacycles, VHF (very high frequency); 300 to 3000 megacycles, UHF (ultra high frequency); 3000 to 30000 megacycles, SHF (super high frequency); and 30000 to 300000 megacycles, EHF (extremely high frequency).

RADIO SPECTRUM

Before World War II, the usable portion of the radio spectrum was limited to between 10 kilocycles and 300 megacycles. Electronic developments spurred by that conflict made it possible to extend the commercially useful spectrum to 30000 megacycles.

For layman purposes, the radio spectrum may be compared to a long vertical ruler with inches or fractions of inches marking off, but in irregular fashion, the relative bands used by the different radio services.

That portion between 10 and 540 kilocycles is employed largely by radiotelegraph stations and radio beacons for ships and aircraft.

The section between 540 and 1600 kilocycles is the familiar AM broadcast band.

Between 1600 kilocycles and 25 megacycles are bands for long-distance radiotelegraph and radiotelephone communication, for ships at sea and planes in the air, and for international broadcasting.

FM and TV broadcast, as well as various safety and special services, are individually provided for in the segment between 25 and 900 megacycles.

Above that, extending to 30000 megacycles, are bands for radio navigation, common carrier, mobile, and a host of other specialized radio services.

Spectrum space beyond the latter figure is employed mainly for experimental and developmental work in connection with prospective new or improved services and equipment.

It is difficult to spell out an exact spectrum chart because various services—such as Government, amateur, etc.—have scattered allocations, and many bands must be shared by different services. In effect, the spectrum chart may be likened to a gigantic club sandwich, with the different layers and overlapping fillers representing an assortment of services.

It is interesting to note that the space occupied by AM broadcasting is only one thirty-thousandth of the entire known radio spectrum. In addition to bands for broadcasting, there are bands for aviation, marine, police, fire, industrial, land transportation, amateur, citizens, common carrier, experimental and other uses. Also, there are portions of the radio spectrum in which noncommunications equipment—such as medical, industrial and other electronic devices—can release their excess energy without causing interference to radio channels used for communication purposes.

ALLOCATION CONSIDERATIONS

It would be wasteful and chaotic to operate a broadcast station on one frequency and, say, a police station and a ship station on adjacent frequencies. There must be respective and appropriate bands of frequencies for the some 65 different radio services with which the Federal Communications Commission now has to deal, and within these bands assignments must be made for the operation of more than 1.2 million fixed and mobile transmitters.

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Hence a fundamental task of the Commission is to allocate the radio spectrum to the various radio services and to write the rules and regulations which govern their operation. In the early days of radio, a few kilocycles one way or another was of little importance. Later, with increasing use of the spectrum, the problem of interference between stations grew proportionately, and it became necessary to define more precise channel boundaries, engineering standards and other requirements.

Since maximum utilization of the radio spectrum depends upon proper allocation of working bands and upon proper use of the frequencies assigned therein, an essential function of the Commission is to study the behavior of radio waves, to laboratory test apparatus and performance, and to monitor the technical quality of emissions.

RADIO HOUSING SHORTAGE

The primary obstacle to expanded radio use is the scarcity or nonavailability of channels for certain fast-growing services, particularly in the nonbroadcast field. Technical developments have made it possible to move further "upstairs" in spectrum occupancy but, at the same time, the number of industrial and business firms desiring to employ radio has expanded even more rapidly. The result is that there is a dearth of frequencies for certain new or expanding services.

In consequence, some frequency rationing is required in order to provide the maximum benefit to the greatest number of people. Basically, preference in the use of radio is given those services on which the safety of life and property depends, followed by those which serve the public in other ways.

Some increased use of nonbroadcast radio channels in short supply is obtained by increasing the amount of frequency sharing in an area. There is prospect of further relief through so-called "split channel", "single side-band", "tropospheric scatter", and other technical refinements. Splitting channels and using a single side band would permit more stations to operate in closer proximity. Tropospheric scatter concerns over-the-horizon communication, to the inclusion of television, on frequencies formerly considered limited to line-of-sight transmission.

The utilization of radio by industry has, in particular, exceeded the most optimistic expectations of 10 years ago. Cooperative effort, including a higher degree of efficiency in the use of frequencies, is required to open the door to new groups as well as to take care of the mushrooming of existing services.

In addition to spectrum space allocated to, but little used by, some services, there are many frequencies which bear heavy traffic in some areas but go begging elsewhere. Means must be found to put these

fallow radio lanes to work. But it must be done without discommoding services unduly, and without causing interference complications.

Any extensive rerouting of traffic over the invisible radio paths requires complex planning and execution. A mass of facts and figures relating to the use of the radio spectrum must be studied, plotted and applied. In some respects the work resembles a giant checkerboard. For example, changing the frequency of one station may mean moving it to another band, and one in the latter band being moved to still another, and so on until a chain reaction of shifts is completed in order to accommodate the first move without inviting interference headaches. In the reverse order, the shift of a frequency can cause a reshuffling of many other channels.

INTERNATIONAL ASPECTS

As the radio spectrum becomes more crowded the interference problem grows in seriousness. It can come not only from domestic radio stations (not to mention the increasing number of electronic gadgets), but also from foreign radio stations. That is why mutual radio operating arrangements between nations are necessary.

Bands allocated for radiotelephone and radiotelegraph must be used by such stations of all nations, and the ship and aeronautical bands must likewise be shared, and so must the broadcast bands. A French plane over New York must be able to talk to the local airfield on the same frequency that an American plane over Paris communicates with the airfield there. By the same token, merchant ships the world over must be able to communicate on frequencies common to marine use.

The international aspect of radio has developed to such an extent that almost no major frequency allocation can be made without considering worldwide usage. In consequence, the primary allocation of frequency bands is now determined by international treaty and other agreement, and assignment of individual channels within those bands is made by the member nations accordingly.

ALLOCATIONS AND THE FCC

Constant study by the Commission of the radio spectrum is required so that domestic allocations and use of frequencies keep pace with advancements in electronics and shifting public demand. Continual changes and readjustments are the price of progress.

Since it is not possible to re-examine in detail each year all uses of radio in all parts of the spectrum, current FCC scrutiny is of the VHF and lower UHF parts (roughly 25–1000 megacycles), where TV and land mobile, among other fast growing services, are located.

Meanwhile, the worldwide effort to complete the tens of thousands of changes in frequency assignments necessary to carry out agreements of the Extraordinary Administrative Radio Conference (Geneva, 1951) and implement the allocation table contained in the International Radio Regulations (Atlantic City, 1947) continues. Insofar as FCC licensees are concerned, this program was substantially completed during the past year.

NATIONAL FREQUENCY ALLOCATION

Emphasis has been placed upon enlarging the scope of the vehicular radio service which uses frequencies in the VHF and UHF portions of the spectrum (30–3000 megacycles). In order to answer the always elusive questions of "who has more than he needs" and "who needs more than he has", the Commission has instituted several rule-making proceedings and has studied thousands of frequency assignments made to the various vehicular radio services.

One important step with respect to the vehicular frequency problem was the initiation in 1955 of the proceeding known as the "split channel" proposal. This was taken after technical studies indicated that improvements in equipment would permit the assignment to mobile systems of frequencies spaced much less than that now specified. It has been found, for example, that in the 152–162 megacycle band where frequency spacings are normally 60 kilocycles, based upon 1947 equipment capabilities, it is now technically feasible to halve the spacing, thus doubling the number of assignable frequencies in this extremely useful range. On September 20, 1956, the Commission announced a decision which provides for split channel use in the 152–162 megacycle band but postponed decision as to what vehicular services will benefit.

A study of national frequency allocations in conjunction with the Office of Defense Mobilization found that it was not feasible to allocate additional VHF TV channels due to defense requirements of Government services for VHF space. However, the study proved helpful in narrowing the direction in which efforts can be concentrated in resolving TV broadcast problems.

The Commission completed 5 proceedings involving frequency reallocation for many radio services. They concerned several portions of the radio spectrum and included such diverse subjects as the use of 512 kilocycles by United States ships in world regions 1 and 3; the band 72–100 megacycles in Alaska by non-Government fixed stations and various Government services; portions of the 152–162 megacycle band by remote pickup and fixed stations in Puerto Rico; the upper reaches of the UHF TV band by "translator" stations; and the band 9800–13325 megacycles by various fixed and mobile services to

provide radiolocation service suitable for use by speed meters and traffic control devices.

Of particular interest are studies of the use of single sideband being conducted by the Commission with the cooperation of industry. This system permits more efficient utilization of the radio spectrum and thus an expansion of systems or a reduction in interference by the process of filtering out some of the signals transmitted by an ordinary radiotelephone transmitter. It should be pointed out that this system is not new. It has been utilized to an extent in the international fixed service and, in a few instances, for ship-to-shore communication. However, its possible application to a multitude of mobile services gives substantial promise of reducing spectrum congestion, particularly between 1605 kilocycles and 25 megacycles.

FCC-GOVERNMENT FREQUENCY COORDINATION

Under provisions of section 305 of the Communications Act, the President assigns frequencies to United States Government radio stations. The Interdepartment Radio Advisory Committee, which functions within the Office of Defense Mobilization, handles these day-to-day assignments. Only careful advance coordination can eliminate a chaotic interference situation. During the past year, the Commission conducted some 3,000 engineering studies in this connection. Approximately one-third of these were for the benefit of applicants in the experimental radio services which have no frequencies exclusively their own but have access to almost the entire spectrum on a case-by-case basis. By interagency agreement, the Commission uses some parts of the spectrum and Federal agencies other parts, but much of the spectrum is shared jointly. It is on the shared parts of the spectrum that the Commission and the Executive Branch of the Government consult with each other before making an assignment.

INTERNATIONAL FREQUENCY ALLOCATIONS

While the task of changing several tens of thousands of frequency assignments, pursuant to the new International Table of Frequency Allocations, was virtually completed at the beginning of the fiscal year, there still remained many adjustments to be made. In putting the finishing touches to this work, which was probably the most gigantic "frequency shuffle" ever attempted, the Commission issued approximately 40 rule-making notices and orders.

While many problems remain to be solved, generally, all services except high frequency broadcasting have either changed to internationally planned frequencies or to frequencies which are judged to

be compatible with world agreement. In the case of high frequency broadcasting, the adoption of an international plan of assignments still remains to be accomplished. Meanwhile, American broadcasters keep inside the frequency bands allocated internationally for broadcasting. In a few instances, complete adjustment of operating frequencies in the maritime mobile service has not yet been made, but it is expected that the few remaining necessary changes will be made within the next year.

Over-the-horizon transmission.—Of particular import to international radio communication are the relatively new techniques of ionospheric and tropospheric scatter propagation. Both involve use of parts of the spectrum heretofore considered useful only for short-range communication. Although these developments took place several years ago, the past year saw the installation of operational circuits of very high efficiency.

Ionospheric scatter technique is useful for circuits in the lower part of the VHF spectrum over distances of from 600 to 1,200 or more miles with reliability approaching 100 percent. It will be possible, with appropriate choice of relay points, to span the several continents with international communication networks. At the present time, the high frequency portion of the spectrum, primarily between 4000 and 25000 kilocycles, is used for international radio communication and, due to the vagaries of radio propagation, such circuits are subject to interruption with the result that circuit efficiencies vary downward from approximately 90 percent and often are as low as 30 or 40 percent. However, the portion of the spectrum which is useful for ionospheric scatter transmission is already heavily used by important low power services for localized radio communication, and if the scatter technique is to be utilized to its fullest extent, international frequency allocation problems are sure to arise.

During the past year the Commission followed closely developments in this field to determine the possible future impact on the other services. For example, the band between 42 and 50 megacycles, which is heavily occupied by vehicular radio services—such as public safety, land transportation, and industrial—is in the portion of the spectrum considered to be especially suitable for ionospheric scatter circuits. Consequently, it would be necessary to shift these vehicular services to other parts of the spectrum.

International significance is witnessed in an existing Florida-to-Cuba circuit in the 800 megacycle band which is capable of handling dozens of telephone channels and which also shows promise of being able to carry international TV programs. Since this technique utilizes frequencies from several hundred to several thousand megacycles, the true impact upon existing services has not yet been ascertained.

However, the Commission, during the past year, initiated an allocations proceeding to investigate this mode of propagation, including what frequency ranges may be best suited. Since existing international frequency allocations were based upon the state of the art as it existed up to about 1947 and therefore do not take into consideration the requirements for this new system of transmission, some existing services in the UHF and higher parts of the spectrum may be seriously affected.

Radio astronomy.—Another international frequency problem that came to the forefront during the year was radio astronomy. Scientists have learned that radio energy in the form of noise originates from many stars, the sun, from at least one planet and from other sources in outer space. Systematic study of these distant sound has led to an increased knowledge of the make-up of outer space and the origin of energy and matter.

It should be emphasized that this radio energy, which is being observed at many locations on the earth's surface, is not in the form of communication signals; they are not transmitted by intelligent beings, and are purely radiations of a physical nature similar to those which take place in a thunderstorm. They are extremely weak and require the use of receivers having much more sensitivity than those utilized by radio services.

Consequently, man-made signals from the world's radio stations tend to interfere with these scientific observations. Much effort on the part of scientists, radio engineers and administrations has been expended in an effort to determine whether it is possible to protect from interference the radio astronomy observations being conducted throughout the world. This consideration has received impetus from the worldwide participation in the international geophysical year, 1957–58.

The extent to which radio astronomy observations may benefit mankind is believed by many to be of such magnitude as to warrant the reservation of particular frequencies for this purpose and may have a considerable impact upon other uses of the radio spectrum. The Commission, in collaboration with industry, Government, and foreign countries is continuing its study of the problems which are raised by this relatively new branch of the science of astronomy.

INTERNATIONAL MARINE STANDARDS

The Commission instituted a proceeding to determine the extent to which it may be possible to support VHF maritime allocations and technical standards on an international basis. Most international maritime agreements are limited to frequencies below 30 megacycles. The frequencies here involved are in the range 152–174 megacycles.

Worldwide interest has been shown in allocation of a specific group of frequencies for short-range ship-shore and ship-to-ship use, thereby reducing the congestion on long-range maritime frequencies lower in the spectrum. Since ships visit many countries, a maritime mobile allocation requires standardization throughout the world.

INTERNATIONAL PROTECTION OF FREQUENCY RIGHTS

The current year saw an increase in the number of problems associated with establishing and maintaining internationally United States' rights to reasonably interference-free use of radio frequencies. The Commission found it desirable to reaffirm its long-standing policy that frequencies suitable for international communication should not be used for domestic purposes. The United States is one of the world's heaviest users of the spectrum for international communications.

Under current international agreements to which the United States is a party, seven different systems are employed to obtain recognition and protection of assignments. The system used in a particular case depends upon the type of radio service involved. In general, the mechanism for obtaining protection is to inform the ITU of the technical particulars of a new or modified assignment, with a view to having them recorded in its Master International Frequency Register and published in its Radio Frequency Record (RFR). When published, a date is associated with the technical items, and this date is useful in deciding who is entitled to priority in case harmful interference between countries should develop. It is important to remember that each country is sovereign in its use of the entire spectrum and that international chaos can be avoided only by agreeing to "ground rules" in advance.

Before the notification of an assignment is accepted, it usually is given a technical examination by the ITU's radio experts and, if it appears to them that harmful interference will be caused to preexisting assignments of another country, the notice is returned to the country of origin with an "unsatisfactory finding" statement. Procedures are available to obtain reconsideration of such an action.

Serious problems arise when the ITU rejects an FCC notification. Since it frequently happens that the assignment in question could operate without causing harmful interference to other countries, it is national policy to submit the case with new facts for reconsideration. During the year there were 656 unsatisfactory findings. Although this appears to be a good batting average, since there were almost 60,000 notifications, many of the assignments involved are basic to our global communications network; others involve types of domestic uses of radio as to which questions seldom arise internationally.

Accordingly, substantial effort is being expended to get the Union's findings modified whenever it is felt to be justified after further study. The problem is that, due among other things to the increasing use of the radio spectrum on a worldwide basis, it is becoming more and more difficult to obtain such modifications. The end result is that many apparently operative United States assignments are without international recognition or protection. This matter will be considered during the coming year by a joint Government-industry group convened for this purpose as part of the preparatory work for the next world Administrative Radio Conference, scheduled to convene in 1959.

INTERNATIONAL FREQUENCY USAGE DATA

International Radio Regulations (Atlantic City, 1947) require that each country submit to the ITU monitoring information designed to show actual spectrum usage, particularly for that part of the spectrum used for international communication. The data serve as a cross-check in determining which internationally recognized assignments are in daily use, and hence are to be avoided in making new assignments. (See also "Monitoring Surveys" in chapter on Field Engineering and Monitoring.)

INTERNATIONAL CONFERENCES AND MEETINGS

The Commission furnished six delegation chairmen and 20 representatives to 11 international conferences and meetings during the year. It now is preparing, or will later prepare, for 30 additional projected international meetings. All such participation is under Department of State sponsorship.

FCC FREQUENCY LIST

One of the basic requirements for any business enterprise is an accurate inventory of stock on hand. In the Commission's case, this takes the form of a detailed record of the frequencies each radio station licensed by it is authorized to use.

Comparison of this record of frequencies already assigned with a list of frequencies available for assignment is invaluable in finding "holes" in the spectrum for new stations. Such a list also has many other uses, including statistical reference, mobilization planning, revision of allocations, and as an aid in solving interference cases.

The FCC Frequency List is maintained with the aid of a machine record system. It is kept up to date and reprinted semiannually and distributed to interested Government agencies. Although there is insufficient public demand to justify its publication and sale by the Superintendent of Documents, it is available for inspection at all of

the Commission's engineering field offices, as well as at the Commission's headquarters.

The list includes all stations except aircraft, amateur, citizens, civil air patrol, disaster, and ship. The resulting document consists of several volumes with entries arranged in frequency order, and includes station locations, call signs, identification of licensees, and other technical particulars of each assignment. The document runs to more than 2,500 pages and involves approximately 157,000 machine record cards.

Appendix

FIELD OFFICES

As of June 30, 1956, the Commission discontinued the 6 regional offices of its Field Engineering and Monitoring Bureau. They were located at New York, Atlanta, Chicago, San Francisco, Seattle, and Lanikai, Hawaii. District engineering offices are maintained in the domestic cities mentioned, as well as in Hawaii. There are 24 such offices, 6 suboffices, 1 ship office, and 18 monitoring stations.

The Common Carrier Bureau also has three field offices.

A list of all the Commission's field offices follows:

FIELD ENGINEERING AND MONITORING BUREAU

District offices	*Address*
1	1600 Customhouse, Boston 9, Mass.
2	748 Federal Bldg., New York 14, N. Y.
3	1005 New U. S. Customhouse, Philadelphia 6, Pa.
4	400 McCawley Bldg., Baltimore 2, Md.
5	402 Federal Bldg., Norfolk 10, Va.
6	718 Atlanta National Bldg., Atlanta 3, Ga.; (suboffice) 214 Post Office Bldg., Savannah, Ga.
7	312 Federal Bldg., Miami 1, Fla.; (suboffice) 409-410 Post Office Bldg., Tampa 2, Fla.
8	608 Federal Bldg., New Orleans 12, La.; (suboffice) 419 U. S. Courthouse and Customhouse, Mobile 10, Ala.
9	324 U. S. Appraisers Bldg., Houston 11, Tex.; (suboffice) 329 Post Office Bldg., Beaumont, Tex.
10	500 U. S. Terminal Annex Bldg., Dallas 22, Tex.
11	1425 U. S. Post Office and Courthouse Bldg., Los Angeles 12, Calif.; (suboffice) 15–C U. S. Customhouse, San Diego 1, Calif.; (ship office) 326 U. S. Post Office and Courthouse, San Pedro, Calif.
12	323–A Customhouse, San Francisco 26, Calif.
13	507 U. S. Courthouse, Portland 5, Oreg.
14	802 Federal Office Bldg., Seattle 4, Wash.
15	521 New Customhouse, Denver 2, Colo.
16	208 Uptown Post Office and Federal Courts Bldg., St. Paul 2, Minn.
17	3100 Federal Office Bldg., Kansas City 6E, Mo.
18	826 U. S. Courthouse, Chicago 4, Ill.
19	1029 New Federal Bldg., Detroit 26, Mich.
20	328 Post Office Bldg., Buffalo 3, N. Y.

District offices	*Address*
21	502 Federal Bldg., Honolulu 1, T. H.
22	322–323 Federal Bldg., San Juan 13, P. R.
23	53 U. S. Post Office and Courthouse Bldg., Anchorage, Alaska; (suboffice) 6 Shattuck Bldg., Juneau, Alaska.
24	Briggs Bldg., 415 22d St. NW., Washington 25, D. C.

Primary monitoring stations	*Secondary monitoring stations*
Allegon, Mich.	Searsport, Maine
Grand Island, Nebr.	Spokane, Wash.
Kingsville, Tex.	*Twin Falls, Idaho.
Millis, Mass.	Fort Lauderdale, Fla.
Santa Ana, Calif.	Ambrose, Tex.
Laurel, Md.	Muskogee, Okla.
Livermore, Calif.	Anchorage, Alaska.
Portland, Oreg.	Fairbanks, Alaska.
Powder Springs, Ga.	
Lanikai, Oahu, T. H.	

COMMON CARRIER BUREAU

New York, N. Y., 90 Church St.
St. Louis, Mo., 815 Olive St.
San Francisco, Calif., 180 New Montgomery St.

PUBLICATIONS

Following is a list of the Commission's printed publications. They are not distributed by the Commission but may be purchased direct from the Superintendent of Documents, Washington 25, D. C., at the prices indicated.

On the back page of each part of the rules and regulations is a form which, when filled out and sent the Commission, entitles the purchaser to receive any subsequent changes until a complete revision is printed.

Title	*Price*
Communications Act of 1934, with amendments and index, revised to May 1954	$0.70
Amendments only from May 1954 to Feb. 1, 1956	.45
Federal Communications Commission reports (bound volumes of decisions and reports exclusive of annual reports):	
Vol. 5, Nov. 16, 1937, to June 30, 1938	1.50
Vol. 6, July 1, 1938, to Feb. 28, 1939	1.50
Vol. 11, July 1, 1945, to June 30, 1947	3.75
Vol. 12, July 1, 1947, to June 30, 1948	3.50
Vol. 13, July 1, 1948, to June 30, 1949	4.25
Vol. 14, July 1, 1949, to June 30, 1950	4.75
Annual reports of the Commission:	
13th Annual Report—fiscal year 1947	.25
14th Annual Report—fiscal year 1948	.30
17th Annual Report—*fiscal year 1951*	.40

*To be replaced by Douglas, Ariz., in 1957.

Title	*Price*
Annual reports of the Commission—Continued	
18th Annual Report—fiscal year 1952	$.40
19th Annual Report—fiscal year 1953	.50
22d Annual Report—fiscal year 1956	(1)
(Reports for years unlisted are out of print and unavailable.)	
Statistics of the communications industry:	
For the year 1943	.35
For the year 1945	.50
For the year 1946	.55
For the year 1947	.75
For the year 1948, sections A and B	1.00
For the year 1949—sections A and B	1.00
For the year 1950—common carrier only	.50
For the year 1951—common carrier only	.40
For the year 1952—common carrier only	.50
For the year 1953—common carrier only	.50
For the year 1954—common carrier only	.50
Report on Public Service Responsibility of Broadcast Licensees (Blue Book), 1946	.40
An Economic Study of Standard Broadcasting, 1947	.40
Study Guide and Reference Material for Commercial Radio Operator Examinations, May 1955 edition	.75
Rules and regulations:	
Part 0, Organization, Delegations of Authority, etc., October 1954 edition	.15
Pt. 1, Practice and Procedure, December 1955 edition	.25
Pt. 2, Frequency Allocations and Radio Treaty Matters; General Rules and Regulations, July 1955 edition. Lists frequency allocations by services, and international treaties and other agreements relating to radio	.25
Pt. 3, Radio Broadcast Services, January 1956 edition. Covers major broadcast services; includes engineering standards, also TV and FM frequency allocation tables	1.50
FCC Broadcast Engineering Charts, Graphs, and Figures from part 3	1.00
Pt. 4, Experimental and Auxiliary Broadcast Services, June 1955 edition	.15
Pt. 5, Experimental Radio Services, March 1953 edition	.10
Pt. 6, International Fixed Public Radiocommunication Services, April 1949 edition	.10
Pt. 7, Stations on Land in the Maritime Services, August 1955 edition	.25
Pt. 8, Stations on Shipboard in the Maritime Services, August 1955 edition	.35
Pt. 9, Aviation Services, December 1955 edition	.10
Pt. 10, Public Safety Radio Services, December 1953 edition	.15
Pt. 11, Industrial Radio Services, August 1956 edition	.20
Pt. 12, Amateur Radio Service, November 1953 edition	.20
Pt. 13, Commercial Radio Operators, December 1954 edition	.10

[1] In the process of printing, available at Superintendent of Documents at a later date.

Title	*Price*
Rules and regulations—Continued	
Pt. 14, Public Fixed Stations and Stations of the Maritime Services in Alaska, August 1956 edition	$0.10
Pt. 15, Incidental and Restricted Radiation Devices, February 1956 edition	.05
Pt. 16, Land Transportation Radio Services, September 1955 edition	.10
Pt. 17, Construction, Marking and Lighting of Antenna Structures, June 1953 edition	.05
Pt. 18, Industrial, Scientific and Medical Service, September 1953 edition	.10
Pt. 19, Citizens Radio Service, February 1955 edition	.05
Pt. 20, Disaster Communications Service, September 1955 edition	.05
Pt. 21, Domestic Public Radio Services, September 1956 edition	.20
Pt. 31, Uniform System of Accounts for Class A and Class B Telephone Companies, May 1948 edition	.40
Pt. 34, Uniform System of Accounts for Radiotelegraph Carriers, October 1949 edition	.20
Pt. 35, Uniform System of Accounts for Wire-Telegraph and Ocean-Cable Carriers, October 1949 edition	.25
Pt. 41, Telegraph and Telephone Franks, December 1947 edition	.05
Pt. 43, Reports of the Communication Common Carriers and Certain Affiliates, September 1953 edition	.05
Pt. 45, Preservation of Records of Telephone Carriers, October 1950 edition	.10
Pt. 46, Preservation of Records of Wire-Telegraph, Ocean-Cable, and Radiotelegraph Carriers, October 1950 edition	.10
Pt. 51, Occupational Classification and Compensation of Employees of Class A and Class B Telephone Companies, October 1951 edition	.05
Pt. 52, Classification of Wire-Telegraph Employees, July 1944 edition	[2]
Pt. 61, Tariffs, Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service, August 1946 edition	.10
Pt. 62, Applications under Section 212 of the Act to Hold Interlocking Directorates, May 1944 edition	.05
Pt. 63, Extension of Lines and Discontinuance of Service by Carriers, December 1946 edition	[2]
Pt. 64, Miscellaneous Rules Relating to Common Carriers, July 1948 edition	.10

[2] Obtainable temporarily from the Commission without charge.

Various nonprinted information material about the FCC and its fields of activity are available, individually, upon request to the Secretary, Federal Communications Commission, Washington 25, D. C.

Because of their large number and constant state of flux, lists of radio stations cannot be supplied by the Commission. However, on request, it will furnish a fact sheet on commercial sources of such lists, also one on communications publications and services.

PAST AND PRESENT COMMISSIONERS

Following is a list of past and present members of the Federal Communications Commission, and their terms of service:

Commissioners	*Terms of service*
*Eugene O. Sykes	July 11, 1934–Apr. 5, 1939
Thad H. Brown	July 11, 1934–June 30, 1940
*Paul A. Walker	July 11, 1934–June 30, 1953
Norman S. Case	July 11, 1934–June 30, 1945
Irvin Stewart	July 11, 1934–June 30, 1937
George Henry Payne	July 11, 1934–June 30, 1943
Hampson Gary	July 11, 1934–Jan. 1, 1935
*Anning S. Prall	Jan. 17, 1935–July 23, 1937
T. A. M. Craven	Aug. 25, 1937–June 30, 1944
*Frank R. McNinch	Oct. 1, 1937–Aug. 31, 1939
Frederick I. Thompson	Apr. 13, 1939–June 30, 1941
*James Lawrence Fly	Sept. 1, 1939–Nov. 13, 1944
Ray C. Wakefield	Mar. 22, 1941–June 30, 1947
Clifford J. Durr	Nov. 1, 1941–June 30, 1948
**Ewell K. Jett	Feb. 15, 1944–Dec. 31, 1947
*Paul A. Porter	Dec. 21, 1944–Feb. 25, 1946
*Charles R. Denny	Mar. 30, 1945–Oct. 31, 1947
William H. Wills	July 23, 1945–Mar. 6, 1946
*Rosel H. Hyde	Apr. 17, 1946–
Edward M. Webster	Apr. 10, 1947–June 30, 1956
Robert F. Jones	Sept. 5, 1947–Sept. 19, 1952
*Wayne Coy	Dec. 29, 1947–Feb. 21, 1952
George E. Sterling	Jan. 2, 1948–Sept. 30, 1954
Frieda B. Hennock	July 6, 1948–June 30, 1955
Robert T. Bartley	Mar. 6, 1952–
Eugene H. Merrill	Oct. 6, 1952–Apr. 14, 1953
John C. Doerfer	Apr. 15, 1953–
Robert E. Lee	Oct. 6, 1953–
*George C. McConnaughey	Oct. 4, 1954–
Richard A. Mack	July 7, 1955–
T. A. M. Craven	July 2, 1956–

*Served as Chairman.
**Served as Interim Chairman.

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