FEDERAL COMMUNICATIONS COMMISSION

23rd Annual Report

For Fiscal Year 1957

With introductory summary and notations of later important developments

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COMMISSIONERS

Members of the Federal Communications Commission

(As of June 30, 1957)

GEORGE C. MCCONNAUGHEY, *Chairman* [1]
(Term expires June 30, 1957)

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

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)

T. A. M. CRAVEN
(Term expires June 30, 1963)

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

[1] Succeeded as Chairman by John C. Doerfer on July 1, 1957, and as Commissioner by Frederick W. Ford on August 29, 1957.

LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C.

To the Congress of the United States:

Herewith is transmitted the 23rd annual report of the Federal Communications Commission. It contains information and data required to be reported to the Congress by section 4 (k) of the Communications Act of 1934, as amended.

Though this compilation covers, primarily, the fiscal year ending June 30, 1957, notations of subsequent important developments are included to make the information more current.

Biographies of employees joining the Commission during the year, as well as a list of those leaving during that period, are being reported in a nonprinted supplement.

Respectfully,

JOHN C. DOERFER, *Chairman.*

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Introductory Summary

GENERAL

The United States not only continued to set the world pace in electrical communication but advanced its lead.

The soaring use of radio in this country is reflected in the fact that today some 1.2 million transmitters furnish about 65 different services to the public, business, and individuals. Each of the nearly 390,000 radio authorizations covers the use of one or more fixed or mobile transmitters.

Manning these transmitters accounts for over 1.4 million operator authorizations of various grades.

The Commission received the greatest number of applications for spectrum space in any of its 23 years.

It now has more than 1.8 million radio authorizations on its books.

COMMON CARRIERS

Domestic Telephone

The $20 billion telephone industry (Bell and independents) grossed $6.5 billion in revenue.

More than 60 million telephones handled nearly 224 million calls a day.

Nearly 14 million subscribers can now dial outside calls.

Over half of the Bell System's intercity facilities are radio.

More than 600 two-way mobile communication systems engage in common carrier operation.

About 100 one-way signaling systems are used for "paging" purposes.

Domestic Telegraph

Western Union's $333 million industry grossed nearly $238.4 million revenue, the highest in its history.

It handled 151.6 million land line messages through 23,000 public offices.

So far it has spent over $69 million on its modernization program.

Its Eastern microwave system is being extended from Pittsburgh to Chicago via Columbus and Cincinnati.

About 29,500 "deskfax" (desk facsimile machines) were in use.

Teleprinter tielines serve 23,000 customers.

International Telephone and Telegraph

Practically every place on the globe is within quick contact with the United States through 10 telegraph carriers (4 cable and 6 radio), and 1 radiotelephone carrier.

Both international message telegraph traffic and overseas telephone calls reached new annual high—598.5 million words and 1.5 million calls, respectively.

Overseas telegraph gross income increased to nearly $73.5 million and overseas telephone service to $15.8 million.

The first transatlantic telephone cable and cables from the United States to Alaska and Hawaii are now in operation.

The first international use of tropospheric "scatter" technique to carry TV programs was authorized between Florida and Cuba.

Western Union was still seeking to divest itself of its international telegraph operations as required by law.

SAFETY AND SPECIAL RADIO SERVICES

These services contribute to navigation and safety of ships and aircraft, expedite and safeguard land transportation, aid police and fire protection, speed emergency calls, and make industrial and commercial operations more efficient.

Policing and administering to these services is a particularly big job in view of the constant demand for exclusive or augmented frequencies and the fact that their nearly 376,000 authorizations cover the use of about 1,165,000 fixed and mobile transmitters. For example:

Over 65,000 transmitters are employed for marine use.

Aviation interests use 62,600 transmitters.

Nearly 307,000 transmitters are represented by 37,500 authorizations to railroads, buses, taxicabs, trucks, and other land vehicles.

The 35,700 petroleum, power, and other industrial stations utilize 325,200 transmitters.

Public safety services, such as police, fire, highway maintenance, forest conservation, etc., have about 23,300 stations with 243,600 transmitters.

Amateurs operate 156,000 transmitters.

Miscellaneous services account for about 4,700 additional transmitters.

About 1,300 United States vessels use radiotelegraph and nearly 100 cargo ships carry radiotelephone. In addition, some 3,350 ships are equipped with radar.

Although over 52,000 small boats use radiotelephone on a voluntary basis, a new law requires those transporting more than 6 passengers

for hire on the sea or tidewaters to be so equipped. About 5,000 small pleasure, fishing, and other craft are affected.

The Commission proposes to combine the present Low Power and Special Industrial Service into a new service to be known as the Business Radio Service, also to establish a Manufacturers Radio Service.

BROADCAST

TV

Of 774 authorized TV stations (651 commercial, 49 educational, and 74 translator), 540 were on the air (475 commercial, 24 educational, and 41 translator). Of these operating stations 408 were VHF (389 commercial and 19 educational) and 132 were UHF (86 commercial, 5 educational, and 41 translators).

A total of 302 communities had 1 or more operating commercial TV stations, and of these 80 had 2, 27 had 3, and 11 had 4 or more.

Over 90 percent of the population was within range of at least 1 TV station, and over 75 percent could receive 2 or more TV stations.

About 80 percent of all homes had TV. Some 44.5 million TV receivers were in use. Of these, 160,000 were color sets. Stations equipped to handle color numbered 257.

A special industry group was studying the potentialities of UHF service in connection with Commission consideration of ultimately shifting all or a major portion of TV operation to UHF.

Meanwhile, in an effort to make UHF operation more competitive with VHF, the Commission raised the maximum power for UHF stations, amended the TV mileage separation requirements, made certain areas all-UHF and increased VHF competition in others, and is considering "booster" operation for UHF only.

To attract TV service to smaller localities, it has authorized "satellite" VHF and UHF operation, use of "translators" on UHF channels to locally rebroadcast programs from the outside, reduced the minimum power for regular VHF and UHF stations, and is considering low power VHF or UHF "repeater" operation.

Applications to conduct subscription TV on a trial basis will be considered after March 1, 1958.

Channels reserved for educational TV now number 257. Educational TV stations broadcast an average of over 25 hours a week, some as much as 50 hours weekly.

Because it believes that educational TV channels should not lie fallow indefinitely, the Commission made 2 such channels available for immediate commercial use in places where there was no foreseeable prospect of their educational use. In another case it refused to make a change in view of local educational activity looking to establishing a station.

AM

AM broadcast netted over 200 stations, increasing to 3,238 those authorized, of which 3,079 were on the air. More than 1,200 of these operating stations are daytime only.

The Commission gave further consideration to whether the AM rules governing the use of "clear channels" should be changed, and whether "daytime skywave" radiations of new stations should be restricted to protect wide-area service by dominant clear channel stations at night.

The United States and Mexico signed an agreement on AM channel use, which should facilitate Senate consideration of a still unratified 1950 pact covering practically all North American countries.

The highest price yet paid for a single AM station was recorded when WNEW, New York City, was sold for more than $5.1 million.

FM

Commercial FM broadcast authorizations showed their first numerical increase in 9 years, adding 15 for a total of 561, of which 530 were operating.

Applications for new FM stations doubled during the year and, for the first time in many years, some were in competition.

Revived interest in commercial FM is attributed in large part to functional music operations which provide additional income. Seventy-four FM stations held these special authorizations.

The number of educational FM stations continued to gain both in authorizations and those on the air, reaching 148 and 135, respectively.

Miscellaneous

Industry estimates nearly 150 million aural receivers in use, to the inclusion of FM (on which there are no separate figures).

The Commission received a special staff study of TV network operations.

A District Court of Appeals reversed a Commission ruling that broadcast of a certain bingo-type of game constituted a lottery under Federal law.

The FCC is cooperating with the Federal Trade Commission in advising broadcast stations of radio and TV advertising questioned by the FTC.

The Commission recommended to Congress that the act be changed to permit licensing of AM, FM, and TV broadcast stations for 5 years instead of 3 years as now.

TALL TOWERS

The growing height of antenna towers requires joint study and processing by Government agencies concerned of those which might

be a hazard to air navigation. The Commission proposes that towers over 500 feet tall be grouped on "antenna farms" (such as in New York City, Miami, and Los Angeles) away from the air lanes, and also seeks legislation to require that abandoned radio towers continue to be painted and lighted.

In the TV broadcast field, 52 towers over 1,000 feet high above ground were in operation, 17 others had been authorized and 20 applications were pending. The world's highest man-made structure—1,610 feet above ground—is being used by KSWS–TV, Roswell, N. Mex. However, others of 1,993 feet and 1,799 feet are proposed.

FIELD ENGINEERING AND MONITORING

Field engineering functions are conducted through 24 district offices, 5 suboffices, 2 marine offices, and 18 monitoring stations plus a mobile TV monitoring unit.

The Twin Falls, Idaho, secondary monitoring station was moved to Douglas, Ariz., to improve coverage of the Southwest, and the Millis, Mass., primary monitoring station is to be relocated at Canandaigua, N. Y.

The FCC monitoring network took nearly 116,400 bearings not counting those by individual monitoring stations in their local work. Nearly 2,500 of these were in behalf of lost or disabled ships and aircraft.

In addition to policing the airwaves for interference, monitoring stations handled over 1,300 major cases. These involved 100 illegal operations. In the Fall of 1957 it obtained positioning data on two Russian earth satellites.

About 9,300 inspections were made of radio stations (1,100 broadcast, 2,200 ship, and 6,000 other), resulting in nearly 4,000 violation notices (600 broadcast, 1,600 ship, and 1,800 other).

Examinations for commercial and amateur operations, conducted regularly at 30 engineering field offices and 56 other points, resulted in field issuance of over 262,000 commercial radio operator authorizations. Over 52,000 "ham" examinations were given.

RESEARCH AND LABORATORY

Continuous research is necessary to keep up with radio's developments and to encourage new uses of radio. Consequently, the Commission's technical studies concern, among other things, radio propagation, operating standards, and interference protection.

To prevent interference before it starts, "type acceptance" and "type approval" are given to certain equipment before manufacture. "Type acceptance" is on the basis of acceptable engineering certifi-

cation, while "type approval" results from tests of working models at the Commission's laboratory at Laurel, Md.

Under the Communications Act the Commission is also required to provide for experimental operation of new radio devices and techniques. This is done in the Experimental Radio Service. Such authorizations are of limited duration and about 800 were active at the close of fiscal 1957.

SPECTRUM CONSERVATION

Increasing demands for spectrum space and technical developments in radio operation require the Commission to reexamine its frequency allocations to radio services in the light of present and future needs. This extensive study, the first of its kind in 12 years, is encompassed in two separate proceedings. One concerns use of the spectrum between 25 and 890 megacycles; the other involves that portion above 890 megacycles.

New spectrum-saving techniques such as "offset carrier," "single sideband," and "split channel" operation must be considered; also tropospheric and ionospheric "scatter" and the expanding use of "microwave."

NATIONAL DEFENSE

The Communications Act gives the President special powers to control wire and radio communication, also electronic devices, in a national emergency.

Under this authority, the Commission is delegated supervision of the CONELRAD program which (as its coined name implies) concerns the CONtrol of ELectromagnetic RADiation. It is intended to thwart possible enemy bombers and guided missiles from using radio transmissions as navigational aids yet permit alerting and other radio operations essential in event of an air attack.

The Commission also participates in other military and civil defense programs, besides providing for communication facilities to be used in time of regional or local disaster.

COMMISSION

The term of George C. McConnaughey, both as a Commissioner and Chairman, expired June 30, 1957. On July 1 the President designated Commissioner John C. Doerfer to be Chairman.

T. A. M. Craven and Frederick W. Ford became Commissioners on July 2, 1956 and August 29, 1957, respectively.

The Commission operated on a fiscal 1957 appropriation of $7,828,000, which was about $500,000 more than in 1956.

Of its 1,197 employees (81 more than the year previous), one-third were performing field engineering duties.

PROBLEMS

A combination of developments and circumstances pose particular problems on the Commission.

First and foremost is the fact that the fields which it regulates are in a state of flux due to constant change and expansion. This is reflected in the complicated and time-consuming task of reviewing spectrum allocations and revising rules and regulations to accommodate new communication methods and more services. The rapid march of radio is accompanied by mounting administrative perplexities involving competition, distribution, interference, enforcement and processing considerations.

Then there is the additional factor that, while the Commission regulates the elements responsible for the high tempo of modern communication, it is in turn regulated to an unusual degree. This regulation from above comes from the Congress and, in a sense, from the courts. The former is in the form of legislative supervision; the latter is through judicial review.

The Commission has done everything possible to expedite its adjudicatory procedures but is handicapped by amendments to its governing act which afford parties exceptional opportunities and extensive processes to balk and delay the finalizing of its decisions. Also, there is a provision in the law which, in effect, makes the FCC the only Federal agency whose heads are prohibited from consulting staff experts on legal, engineering and other problems involved in certain proceedings which they must resolve.

Court decisions require the Commission to hear, and expeditiously determine, practically all protests to grants made without hearing. This not only further bogs down the Commission's processes but holds up new services to the public. The Communications Act, unlike other regulatory statutes, allows protestants to virtually write their own issues in such hearings, to the inclusion of matters which the Commission has no authority to consider in making a decision, and so adds to its hearing burden. A current practice of protestants is to inject economic issues, especially in broadcast cases, though the Commission is without power to protect stations from legitimate competition or guarantee them a profit.

As far as its own economic interest is concerned, the Commission is trying to handle an administrative load which has more than doubled in volume and complexities since World War II but which has brought little change in appropriations or size of staff to keep up with it. Though its 1957 appropriation was about $1 million more than in 1947, the Commission had to operate with 200 less people than it had 10 years before.

Not only has the Commission's workload been multiplied by the phenomenal growth of radio, but Congress has given it additional administrative and regulatory responsibilities which demand more of its time and manpower. Also, at the risk of backlogs in its routine, the Commission must give priority to mounting Congressional committee inquiries and requests for information, some of which cover the same basic data but want it in a form that requires separate exhaustive research and presentation.

Competition and interference conditions now require one-third of all applications for new AM and TV stations to go to hearing. Highly competitive cases take at least a year to go through the normal application and hearing procedure, not considering further delays due to crowded dockets and extra time needed to handle the flood of pleadings. Many of these filings are so repetitious and redundant as to still further delay final determination.

Because of its spectacular impact on home and business, TV commands the lion's share of both Congressional and public interest. But other radio services—particularly nonbroadcast—also affect the public and industry. They teem with their own particular problems. Some of these are as important and as complicated as those which beset TV. They are recounted in the separate chapters dealing with the respective services.

Regulation

AUTHORITY

The Communications Act of 1934 created the Federal Communications Commission and made it responsible for regulating radio, wire and cable communication between the states and between this country and foreign points. In doing so, it centralized in the Commission regulatory functions formerly invested in various Federal agencies, supplemented by additional powers.

Commission jurisdiction extends over the continental United States and its territories and possessions, but not to the Canal Zone, or to communication facilities operated by the Federal Government.

COMMUNICATIONS ACT OF 1934

This statute consists of six major sections or "titles":

Title I defines the purposes of the act, the terms and duties of the Commissioners, and confers general powers.

Title II contains provisions applicable to common carriers that are subject to Commission regulation.

Title III relates to radio and is divided into three parts. Part I deals with radio licensing and regulation in general. Part II pertains to use of radio equipment and radio operators on board ship. Part III concerns radio installations on vessels carrying passengers for hire.

Title IV spells out procedural and administrative provisions.

Title V prescribes penalties and forfeitures for violators.

Title VI prohibits unauthorized interception and publication of communications by wire or radio and gives the President certain powers to deal with communication matters in event of war or other national emergency.

Extensive revisions of the Communications Act—particularly in 1952—made important changes in the Commission's organization and its procedures.

In addition to provisions of that act, Commission practices conform to the Administrative Procedure Act and other applicable laws.

GENERAL REGULATION

Under its creative act, as amended, the regulatory powers of the Commission fall into three major categories:

1. *Those affecting common carrier services (telephone and telegraph by means of radio, wire and submarine cable);*
2. *Those dealing with nonbroadcast radio services (public safety, marine, aviation, industrial, land transportation, amateurs, etc.); and*
3. *Those concerning broadcast (AM, FM, and TV) program services.*

The major activities of the Commission embrace:

a. *Allocating bands of frequencies to the different radio services;*
b. *Assigning specific frequencies and call signals to individual radio stations;*
c. *Licensing and regulating radio stations and radio operators;*
d. *Regulating common carriers engaged in interstate and international communication;*
e. *Promoting protection of life and property through the use of radio on the land, on the water and in the air;*
f. *Encouraging more effective and widespread use of radio; and*
g. *Helping coordinate wire and radio communication with the national defense program.*

Because the act makes a distinction between common carrier and broadcast operations, the Commission's jurisdiction in the broadcast field is more limited.

The act restricts licensing by the Commission to citizens of the United States. Licenses are denied to corporations in which any officer or director is an alien, or of which more than one-fifth of the capital stock is owned or controlled by foreign interests.

COMMON CARRIER REGULATION

The Communications Act recognizes two types of common carriers—those fully subject to the act and those only partially subject. The latter do not operate facilities crossing state or national boundaries nor engage in interstate or foreign communication except through physical connection with other nonaffiliated carriers. They are exempt from certain provisions of the act which apply to fully subject carriers.

Among regulatory provisions of the act is the requirement that every subject common carrier furnish service at reasonable charges upon reasonable request. No carrier may construct or acquire interstate or foreign facilities without Commission approval. Likewise, it cannot discontinue or curtail interstate or foreign service without Commission approval. All charges, practices, classifications, and regulations in connection with interstate and foreign communication service must be just and reasonable. To implement this requirement, the common carriers concerned file tariff schedules which are subject to review and regulation by the Commission.

The Commission regulates rates for interstate telephone and telegraph services, as well as rates for service between the United States and foreign points and ships at sea. At the same time, it reviews the adequacy and quality of these services.

To aid its regulation of rates and services, the Commission prescribes the forms of records and accounts kept by the carriers. Under this authority, it has established uniform systems of accounts for them to follow. Commission regulation in this repect includes, for example, the establishment and maintenance of original cost accounting, continuing property records, pension cost records, and depreciation records.

Carriers file monthly and annual reports with the Commission, giving specified financial and operating information, also copies of contracts with other carriers relating to traffic subject to the act.

The Commission regulates the interlocking of officers and directors of carriers, it being unlawful for any person to hold office in more than one carrier unless specifically authorized by the Commission. The latter also passes upon applications of domestic telephone and telegraph carriers for authority to merge or consolidate.

The Commission licenses the operation of common carrier radio stations under provisions of the act which require the licensing of all radio transmitters. This is necessary because radio energy knows no state or national boundaries and must be controlled among the users to prevent interference and waste of frequencies.

After obtaining the approval of the Secretary of State, the Commission can issue, withhold, or revoke licenses to land or operate submarine cables in the United States.

The Commission is charged with domestic administration of wire and radio communication provisions of treaties and international agreements to which the United States is a party.

All common carrier applications are processed by the Common Carrier Bureau.

BROADCAST REGULATION

Since the Communications Act gives the Commission less control of broadcasting than of common carrier operation, its regulation of broadcasting is largely technical in nature and is in two phases.

The first phase deals with the allocation of spectrum space to the different types of broadcast services in accordance with Commission policies and rules to carry out the intent of international agreements, the Communications Act, and other domestic laws affecting broadcasting.

The second phase is concerned with individual stations, and embraces consideration of applications to build and operate; the assignment of specific frequencies, power, time of operation and call letters; the periodic inspection of equipment and the engineering aspects of operation; passing upon transfers and assignments of facilities; also the many varied changes in existing authorizations; modifying and renewing construction permits and licenses; reviewing the general service of each particular station to determine whether it has been operating in the public interest; licensing radio operators, and otherwise discharging domestic regulatory responsibilities.

Broadcast stations are licensed to serve the public interest, convenience and necessity. Because radio channels are limited and are part of the public domain, it is important that they be entrusted to licensees who have a high sense of public responsibilty.

The Communications Act sets up certain basic requirements which must be met by broadcast applicants. In general, applicants must be legally, technically, and financially qualified, and show that their proposed operation will be in the public interest.

Under the Communications Act, it is the responsibility of each broadcast station licensee to arrange his program structure so that his operations will be in the public interest. The Commission does not prescribe any percentages of time which should be devoted to particular subjects, such as news, education, religion, music, public issues, etc. That is something which can vary with the locality. However, the Commission does periodically review the overall performance of a station—engineeringly and otherwise—when it applies for renewal of its license, to determine whether it has lived up to its obligations and the promises it made in obtaining permission to use the public's airwaves.

This review of broadcast station performance does not, however, give the Commission authority to censor programs. The Communications Act states: "Nothing in this Act shall be understood or construed to give the Commission the power of censorship over the radio communications or signals transmitted by any radio station, and no regulation or condition shall be promulgated or fixed by the Commission

which shall interfere with the right of free speech by means of radio communication." The Commission has held that freedom of speech on the air must be broad enough to provide full and equal opportunity for the presentation of both sides of public issues. Under such conditions, licenses of broadcast stations have the right to editorialize.

The Communications Act expressly provides: "If any licensee shall permit any person who is a legally qualified candidate for any public office to use a broadcasting station, he shall afford equal opportunities to all other such candidates for that office in the use of such broadcasting station: Provided, That such licensee shall have no power of censorship over the material broadcast under the provisions of this section. No obligation is hereby imposed upon any licensee to allow the use of its station by any such candidate. The charges made for the use of any broadcasting station for any of the purposes set forth in this section shall not exceed the charges made for comparable use of such station for other purposes."

The United States Criminal Code prohibits broadcast of information concerning "any lottery, gift enterprise, or similar scheme," also utterance of obscene, indecent, or profane language, and fraud by wire, radio, or television.

The Communications Act declares that broadcasting is not a common carrier operation; consequently a broadcast station is not required to sell or to give time to all who seek to go on the air. Because programing is primarily the responsibility of broadcast station licensees, the Commission does not ordinarily monitor or pass upon individual programs, or require the filing of radio scripts. However, broadcast stations are required to keep a program log and a technical log, and a record of all requests for political broadcast time. The Commission does not maintain surveillance of the day-by-day internal management of broadcast stations.

The Commission does not license networks as such; only individual stations. However, stations are subject to the chain broadcasting regulations adopted by the Commission in 1941 to further competition in broadcasting. Network operation is largely dependent upon common carrier facilities—telephone lines (including coaxial cable) and microwave relay. There is some pickup and rebroadcast of aural and visual radio programs.

The Commission does not license radio sets for reception only, nor does it regulate their production or sale. However, it does impose limitations on their radiations which may interfere with radio or TV service.

BROADCAST LICENSE PROCEDURE

The broadcast license procedure is detailed in part 1 of the Commission's rules, "Practice and Procedure," while station operation is

covered by part 3, "Radio Broadcast Services." The latter includes technical standards for AM, FM, and TV stations; FM frequency allocations by classes of stations, and TV channel assignments by States and communities.

Once a prospective licensee has decided upon the type of station he desires and where it could be located, the next step is to apply for a construction permit. This is done on FCC form 301, "Application for Authority to Construct a New Broadcast Station or Make Changes in an Existing Broadcast Station," which covers AM, FM, or TV broadcast. This form requires information about the citizenship and character of the applicant, as well as his financial, technical, and other qualifications, plus details about the transmitting apparatus to be used, antenna and studio locations, and the service proposed. A specific frequency or channel must be requested.

Applications are, in general, processed in the order in which accepted. They are reviewed in their engineering, legal and financial aspects by the Broadcast Bureau, which makes recommendations to the Commission.

If, upon examination of an application, the Commission determines that there are no engineering or other conflicts, that the applicant is qualified, and that all other requirements are met, the application is granted without hearing and a construction permit is issued.

Any grant made by the Commission without hearing is subject to protest within 30 days, during which the protesting party may request a hearing. Within 30 days thereafter the Commission determines whether the objection merits a hearing.

The law requires that, in general, decision on noncontested applications be made within 3 months from the date of the original filing, and within 6 months from the conclusion of a hearing in those cases which go through a hearing.

A maximum of 60 days from date of the construction permit is provided in which construction shall begin, and a maximum of 6 months thereafter as the time for completion (or 8 months in all). Application to modify a broadcast construction authorization, or to make changes in an existing station, or to modify a license, is made on the same form (301) used in seeking initial construction authorization. If the permittee is unable to build his station within the time specified, he must apply for extension of time on form 701 ("Application for Additional Time to Construct a Radio Station"), giving the reasons. Upon completion of construction the permittee conducts equipment tests.

The final step is to apply for the actual license on form 302 ("Application for New Broadcast Station License"). Applications must show compliance with the terms, conditions and obligations set forth in the original application and the construction permit. After ap-

plying for a license and receiving authority from the Commission, the holder of a construction permit then conducts program tests. A station license is issued if no new cause or circumstance has come to the attention of the Commission that would make operation of the station contrary to public interest.

AM, FM, and TV broadcast stations are licensed for the statutory limit of 3 years. Applications for renewal of license are made on form 303 ("Application for Renewal of Broadcast Station License")

If the holder of a construction permit or license desires to assign the same to someone else, he makes application on form 314 ("Application for Consent to Assignment of Radio Broadcast Station Construction Permit or Licensee"). Should the permittee or the licensee wish to transfer corporate control, he applies on form 315 ("Application for Consent to Transfer Control of Corporation Holding Radio Broadcast Station Construction Permit or License"). Transfer of corporate control or an assignment of license may be sought on form 316 ("Application for Assignment or Transfer—Short Form") when the transfer or assignment involves no substantial changes in interest.

NONBROADCAST RADIO REGULATION

The Communications Act requires the Commission to study new uses for radio. It also stresses the utilization of radio to protect life and property.

In order to realize these objectives, the Commission has authorized many uses for radio other than the traditional and better known broadcast and common carrier services. Collectively, these new radio services, together with some older nonbroadcast services, make up a group known as the Safety and Special Radio Services. These services, in effect, embrace practically all radio operations which are neither broadcast nor open for hire to the general public.

The Safety and Special Radio Services cover use of radio by ships afloat and planes in the air, by police and fire departments, by highway and forestry agencies, by railroad and street car systems, by power and petroleum companies, by taxicabs, passenger buses, highway trucks and amateur stations; and by a host of other interests including geologists, doctors, newspaper reporters, lumberjacks, motion picture directors, manufacturers, construction contractors, experimenters and other professional and private individuals.

These services are governed in general by the Communications Act, international agreements, and by the Commission's rules and regulations dealing with the particular class of service authorized to use radio.

Owing to the limited number of frequencies available for nonbroadcast services, the Commission has been unable to provide exclusive channels for all specialized services. It, therefore, has had to

establish particular services along the lines of certain types of public and private activities which the Commission considers to be more directly related to the public interest, convenience, and necessity. The demand for stations by some services exceeds the frequencies allocated, so it is necessary to share available frequencies among certain classes of users.

NONBROADCAST LICENSE PROCEDURE

The first step in seeking to operate a radio station in the Safety and Special Radio Services is to file an application with the Commission for authority to render a particular service which is provided for in the rules. Each service has its own rules. These applications are processed by the Safety and Special Radio Services Bureau.

In 1955 the Commission waived its previous requirement that an application for a "construction permit" precede an application for a license to cover operation in the Safety and Special Radio Services, with several specific exceptions. In most cases, a single license authorization is now issued instead of the previous two separate authorizations.

This authority, when granted, authorizes the station to operate for a stated period. In most Safety and Special Radio Services the normal license period is 5 years.

Each application must be specific and complete. It should contain, among other things, information about the station location, proposed equipment, power, antenna height and operating frequency.

Further application procedure must be followed in order to obtain a renewal of license. There are also forms for requesting additional time to construct a station, to modify a permit or license, and for permission to assign or transfer control of a permit or station license.

HEARING PROCEDURE

Where it appears that an application violates the Commission's rules and regulations; or that serious interference would be caused; or if other serious questions of a technical, legal, or financial character are involved, a hearing is usually required. The Commission must accord a hearing to competing applicants.

If unable to grant an application, the Commission is required to notify the applicant and other known parties in interest as to the reason. The applicant is usually given 30 days in which to reply. After that, if the Commission is still unable to make a grant, a hearing is ordered.

In designating an application for hearing, the Commission gives notice of the issues for the information of the applicant and others concerned. Findings are made upon the basic qualifications (legal,

financial and technical) of the applicant in the hearing order. The hearing notice generally allows the applicant 60 days or more in which to prepare. Even after being designated for hearing, an applicant may find it possible to amend his application to resolve engineering or other problems.

Hearings are customarily conducted by an examiner. The hearing examiner has authority to administer oaths, examine witnesses and rule upon the admission of evidence. Prehearing conferences are held both prior to and after an exchange of exhibits by the parties. The latter takes place at least 20 days in advance of the hearing date. The second prehearing conference is held at least 10 days before the hearing commences.

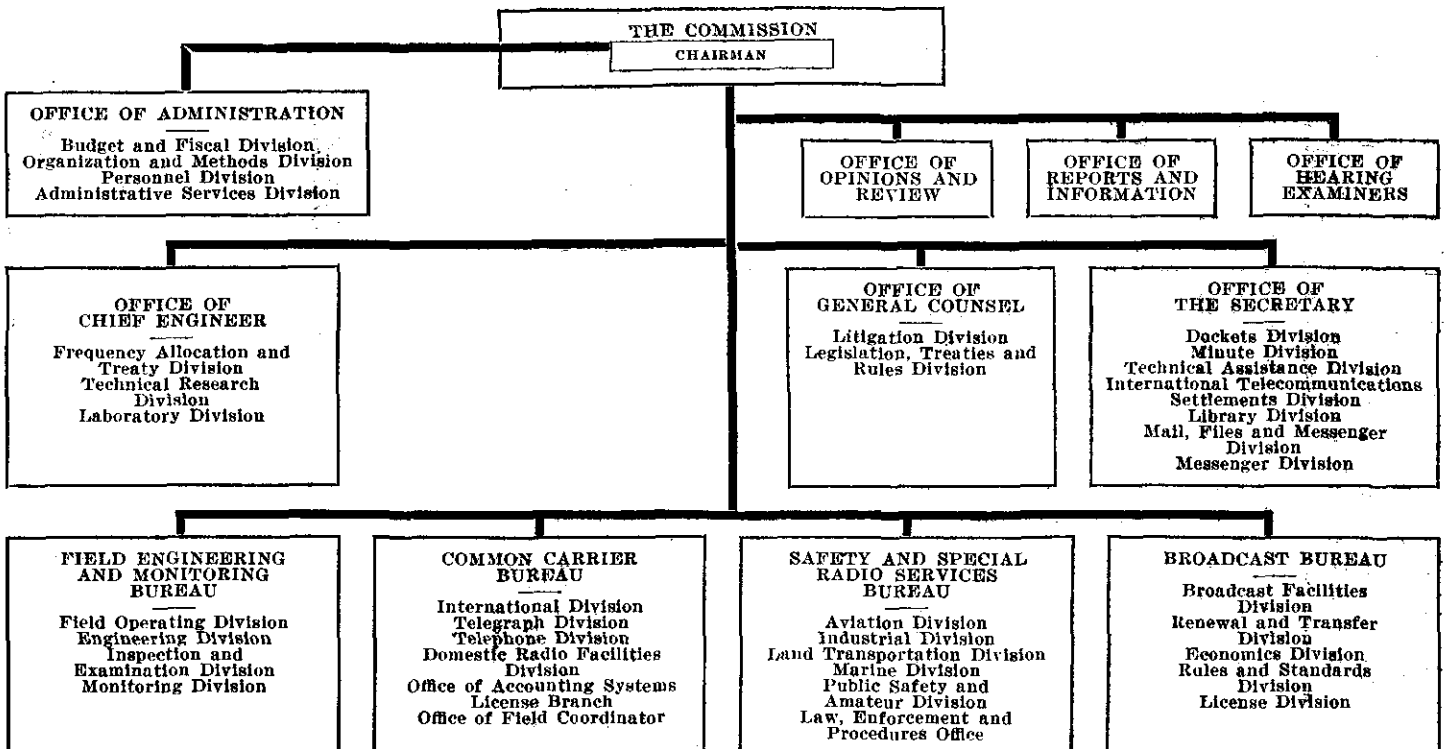
Within 20 days after the close of a record by the hearing examiner, each party and the chief of the bureau concerned has the privilege of filing proposed findings of fact and conclusions to support their contentions. After review of the evidence and statements, the hearing examiner issues an initial decision.

If he wishes to contest the initial decision, the applicant or any other interested party has 20 days from the date on which the initial decision was announced to file exceptions and to request oral argument before the Commission. In all cases heard by an examiner, the Commission will hear oral argument on request of any party. After oral argument, the Commission may adopt or reverse the hearing examiner's initial decision. Within 30 days thereafter, any party involved may petition for rehearing.

If no exceptions are filed and the Commission does not initiate a review of the hearing examiner's initial decision, the latter becomes effective 40 days after its issuance, unless otherwise ordered by the Commission. Court appeals can be taken within 30 days following announcement of the Commission decision.

FEDERAL COMMUNICATIONS COMMISSION

Organization Chart as of June 30, 1957



Commission

COMMISSIONERS

The Federal Communications Commission consists of seven Commissioners. They are appointed by the President with the advice and consent of the Senate.

The President designates one of their number to serve as Chairman, without Senate confirmation, during the Chief Executive's pleasure. As its chief executive officer, the Chairman is responsible for the general administration of the Commission's internal affairs.

The normal term of a Commissioner is 7 years, except in filling an unexpired term. The terms are staggered so that only one terminates in a year. Not more than four members of the Commission may be members of the same political party. Effective July 1, 1956, the annual salary of a Commissioner was increased from $15,000 to $20,000, with $500 additional for the Chairman.

All policy determinations are made by the Commission as a whole. The Commissioners function as a body, directly supervising all Commission activities, with delegations of responsibilities to individual Commissioners or committees of Commissioners, and to staff units.

Committees of Commissioners include those on the radio and TV network broadcasting study, private TV intercity microwave relay systems study, and the Telephone and Telegraph Committees. Certain Commissioners are members of outside groups such as the Telecommunications Coordinating Committee, Telecommunications Advisory Board, Telecommunications Planning Committee, Air Coordinating Committee, and the Radio Technical Commission for Marine Services Executive Board. The Commission also has a Defense Commissioner.

The following changes occurred in the Commission membership since the last annual report:

On July 2, 1956, Commissioner T. A. M. Craven succeeded Commissioner Edward M. Webster, whose term expired June 30 of that year. Commissioner Craven is the first Commissioner to serve two separate terms.

The term of Chairman George C. McConnaughey expired June 30, 1957, and on the following day President Eisenhower designated Commissioner John C. Doerfer as Chairman.

On July 2, 1957, Frederick W. Ford was nominated by the President to be a Commissioner. He was confirmed by the Senate on August 5 and took office on August 29.

A list of Commissioners as of June 30, 1957, appears on the back of the title page of this report. Past and present Commissioners, and their periods of service, are listed in the appendix.

STAFF ORGANIZATION

The Commission staff is organized into integrated bureaus and offices on the basis of its major workload operations and other functions.

There are four operating bureaus—Common Carrier, Safety and Special Radio Services, Broadcast, and Field Engineering and Monitoring; and seven offices—Secretary, Administrative, Chief Engineer, General Counsel, Hearing Examiners, Opinions and Review, and Reports and Information.

Certain bureaus and offices have delegated authority 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.

On May 15, 1957, four branches were established in the Office of the General Counsel—two for each of the existing divisions of that office, namely, a Legislation and Rules Branch and an International Treaties and Allocations Branch under the Legislation, Treaties and Rules Division, and an Appellate Branch and a Research and Compliance Branch under the Litigation Division.

An organization chart of the Commission as of June 30, 1957, appears as a separate page of this chapter.

PERSONNEL

Commission personnel at the close of the fiscal year totaled 1,197, or 81 more than the same time in 1956. Field engineering accounted for about one-third of this number. Distribution was as follows:

	Washington	Field	Total
Commissioners' offices	46	0	46
Office of Opinions and Review	24	0	24
Office of Hearing Examiners	25	0	25
Office of Reports and Information	3	0	3
Office of Administration	85	0	85
Office of Secretary	64	0	64
Office of General Counsel	29	0	29
Office of Chief Engineer	63	42	105
Common Carrier Bureau	92	29	121
Safety and Special Radio Services Bureau	132	0	132
Broadcast Bureau	167	0	167
Field Engineering and Monitoring Bureau	59	318	377
Special Network Study Group	14	5	19
Total	803	394	1,197

As required by a Communications Act amendment of 1952, biographies of employees added during the year, as well as the names of those leaving during that period, are being furnished Congress separately.

APPROPRIATIONS AND EXPENDITURES

The Commission received an appropriation of $7,828,000 for fiscal 1957. About 90 percent of this was for personal services. Obligations were as follows:

Personal services	$6,919,449
Travel	112,824
Transportation of things	24,397
Communications services	186,378
Rents and utilities	57,186
Printing and reproduction	40,488
Other contractual services	157,596
Supplies and materials	156,546
Equipment	146,565
Land and structures	18,253
Awards and indemnities	1,125
Taxes and assessments	4,438
Total obligations	7,825,245
Savings, unobligated balance	2,755
Total	7,828,000

The source of these funds and the authority for expenditures thereunder was Public Law 623, 84th Congress.

DOCKET STATISTICS

Docket statistics for fiscal 1957 follow:

	Pending June 30, 1956	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1957
AM broadcast	165	145	87	78	145
TV broadcast	99	39	14	65	59
FM broadcast	1	0	0	0	1
Other broadcast	9	2	1	0	10
Total broadcast	274	186	102	143	215
Safety and special	20	28	23	5	20
Common carrier	45	30	17	24	34
Joint and general	50	22	14	7	51
Total nonbroadcast	115	80	54	36	105
Petitions, rules, etc.	43	69	69	3	40
Grand total	432	335	225	182	360

During the year, 107 initial decisions were issued covering 154 applications. Fifty-seven of these covered 78 broadcast cases; 24

covered 47 TV cases; 3 covered 3 safety and special cases; 17 covered 20 common carrier cases; and 5 covered 5 joint and general cases.

At the close of the year the number of hearing examiners had increased to 12, or 2 more than for the previous year, but the same number as in 1955.

RULES OF PRACTICE AND PROCEDURE

The Commission instituted rulemaking on October 10, 1956 (Docket 11846), looking toward a complete revision of its rules concerning practice and procedure (part 1) in order that they may be recodified in accordance with current concepts as determined by public interest, administrative expediency, recent legislation and court decisions. Among the proposals is a new section containing specific rules to govern rulemaking procedures.

In November 1956 the Commission participated in a conference of the Federal Communications Bar Association on the proposed changes. As a result of this session, and consideration of informal comments by FCBA members, it felt that further study should be given to the desirability of making further changes in the proposed text. Consequently, the time for filing comments in the proceeding was on December 17, 1956, postponed indefinitely.

OTHER GENERAL RULEMAKING

On April 24, 1957, the Commission terminated rulemaking proceedings to require filing of initial and annual patent information by its licensees. It felt that such information could be obtained as required in individual cases.

The Commission took no further action on proposed fees for licensing and other administrative services. Such rulemaking was initiated in 1954 pursuant to higher directive but action was postponed on resolution by the Senate Interstate and Foreign Commerce Committee.

Decision is still pending on a Commission 1954 proposal to deny licenses to any amateur or commercial radio operator who is a member of an organization which advocates the overthrow of the Government by violence. In 1955 it looked toward eliminating a related proposal for submission of fingerprints and operator applications.

LITIGATION

During fiscal 1957 the Commission was a party to 107 Federal court cases as compared to 93 the previous year. Of 64 new cases in 1957, 6 were instituted in the Supreme Court, 56 in the courts of appeals, and 2 in the district courts.

A tabulation of these cases and the results of such litigation follow:

	Supreme Court	Court of appeals (402b)	Court of appeals (402a)	Court of appeals (neither 402a nor 402b)	District courts	Total
Total	6	68	29	2	2	107
Cases affirming Commission		8	4			12
Cases reversing Commission		11	2			13
Cases dismissed on jurisdictional grounds		3	9			12
Cases dismissed by agreement of the parties or as being moot or without decision on merits		16	9			25
Cases in which mandamus to Commission was denied				2		2
Actions denying certiorari petitions by parties other than Commission	6					6
Cases pending June 30, 1957		30	5		2	37

LEGISLATION

Seven bills directly affecting the Commission became law within the past year. Six of these were enacted by the 84th Congress at the beginning of this fiscal year and were mentioned in the 22d annual report since they became law before that report went to press. Those six bills were:

Public Law 688, approved July 11, 1956, amended 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, increased the salary of the FCC Chairman from $15,000 to $20,500 and of the other Commissioners from $15,000 to $20,000.

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 provided for procedural flexibility in the former hearing requirements in the cases of interlocking directorates and consolidation of common carriers, and clarified the powers of Commission representatives on joint boards.

Public Law 947, as originally introduced and passed by the House, required the installation of an automatic radiotelegraph call selector on certain cargo vessels. As enacted August 3, 1956, it required 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. This was done.

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

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

Legislative proposals offered by the Federal Communications Commission did not reach the hearing stage before any of the Congressional committees. They included:

An amendment of the act to give the Commission authority to impose a small monetary forfeiture for violations of rules and regulations in described circumstances.

A proposal to authorize the Commission to grant licenses for a period not to exceed 5 years for broadcast stations, instead of 3 years.

A proposal to require the painting and/or illumination of abandoned radio towers when air safety will be increased in the judgment of the Commission.

An additional Commission proposal relating to receiving towers which may become a hazard to air navigation was submitted to the Bureau of the Budget which is coordinating it with other Government agencies concerned.

The Commission is drafting legislative proposals with respect to the separation of functions between the Commission and its engineering and legal staff in adjudicatory proceedings; also requests for other clarifying amendments in the act.

A number of bills affecting the Commission were submitted to Congress by others. The Commission has studied these proposals and has responded in 52 instances to requests from Congress for comments.

A significant portion of the Commission's efforts during the year were devoted to attending Congressional hearings and furnishing information to Congressional committees investigating the FCC and its functions. The Senate Interstate and Foreign Commerce Committee has held major hearings on subjects including television allocations, subscription television and networks and networks practices. A subcommittee of the House Judiciary Committee (Subcommittee No. 5—Antitrust) had hearings, the record of which embraces over 3,000 printed pages. Reports from these committees have been received by the Commission and are now receiving its consideration.

The Senate Committee on Interstate and Foreign Commerce on March 15, 1957, concluded comprehensive hearings in its television inquiry which began January 26, 1956. Five volumes and a record of 3,464 pages resulted from the committee's investigation. Parts I and II of its report covered UHF–VHF allocations problems, part III related to subscription television, part IV dealt with network practices, and part V covered allocations with supplementary information on network practices.

AUTHORIZATIONS

The fiscal year closed with over 1.8 million radio authorizations on the Commission's books, or 200,000 more than for 1956. The largest

group—over 1.4 million—represented various classes of radio operators. Safety and special radio service authorizations approximated 376,000; those of broadcast exceeded 8,000; common carrier radio accounted for about 2,800, and there were nearly 800 experimental radio authorizations. These radio grants collectively represent the use of about 1.2 million fixed and mobile transmitters.

APPLICATIONS AND OTHER FILINGS

The number of applications of all kinds received by the Commission during fiscal 1957 exceeded 500,000, which was some 50,000 more than the year previous. Of these, 300,000 concerned commercial radio operators; 186,000 were in the safety and special radio services; 9,700 in broadcast; 6,200 in common carrier, and 2,400 experimental.

The Commission also had to consider a multitude of petitions and other filings in hearing and rulemaking proceedings, as well as thousands of tariffs and reports by common carriers, and reports by radio stations of various types.

CORRESPONDENCE

More than 1,343,000 pieces of mail were received or dispatched by the Commission's Washington office during the year. Of this number, over 928,000 were incoming and over 415,000 outgoing. These figures do not include mail handled by the Field Engineering and Monitoring Bureau. The Commission paid the Post Office Department nearly $30,000 for the use of penalty mail.

RELEASES AND PUBLICATIONS

Commission actions are reported in public notices released at the Commission's Washington headquarters. No public mailing lists are maintained for this issue. Copies of orders, decisions, opinions, etc., are served on the parties involved and copies are available on individual request of others interested as long as the supply lasts.

All hearing orders as well as proposed and final rulemaking are published in the Federal Register. Beginning January 1, 1957, the Government Printing Office started to print and sell the texts of the Commission's major decisions in weekly pamphlet form. On February 7 thereafter the Commission initiated the reporting of instructions looking toward certain actions in important docket cases, but reserved the right to reach a different result upon the subsequent adoption and issuance of the formal decisions.

The Commission's printed publications (reports, rules, regulations, etc.) are not distributed by the Commission but are sold by the Government Printing Office. A list is contained in the appendix to this report.

Mimeographing in connection with the Commission's regulatory and administrative procedures required the use of nearly 52,500 stencils, 9,600,000 sheets of paper, and over 13,723,000 impressions.

FOREIGN TECHNICAL ASSISTANCE

The Commission cooperates with the Department of State, the United Nations and the International Cooperation Administration in providing technical assistance in connection with our Nation's foreign aid policy. It plans programs of study and observation of the domestic telecommunications industry for technicians of friendly governments interested in improving their radio, telephone, and telegraph systems.

So far, about 45 countries have been represented in itineraries arranged by the Commission. As of July 1, 19 projects were in operation for participants of 8 nations. During the year, 33 projects were completed, 27 others were begun, and 16 requests were on hand for programing in fiscal 1958. These figures do not include casual visits by foreign experts.

National Defense

ACT PROVISIONS

Section 1 of the Communications Act states that one of the objectives in creating the Federal Communications Commission was "for the purpose of the national defense."

Section 606 of that act gives the President special powers to control wire and radio communication in time of national emergency. The authority is generally delegated by the Chief Executive to the Commission or to other Government agencies or officials.

In 1951 these Presidential powers were extended to deal with electronic devices which, though not used for communication purposes, are capable of sending out emissions which might be used to guide enemy planes and missiles in event of an air attack. Under Presidential delegation of that same year, the Commission promulgated and is enforcing control regulations with respect to the services and apparatus involved.

CONELRAD PROGRAM

CONELRAD (a contraction of the words "CONtrol of ELectromagnetic RADiation") was developed in 1950 at the request of the Department of Defense to meet the dual purposes of minimizing the navigational aid an attacking force of bombers or guided missiles might obtain from our radio stations, while at the same time permitting limited radio operation.

CONELRAD plans have been completed for all radio services except the international and domestic public communication and the maritime services. Implementing rules have been finalized for the Aviation, Broadcast, Land Transportation, Industrial, Public Safety, Amateur, Citizens and Experimental Services, also for broadcast stations in Hawaii and Alaska.

With the advent of the hydrogen bomb, and its attendant problem of widespread radioactive "fall out," civil defense officials have indicated a need for a wider area communication to the public than can be obtained under normal broadcast CONELRAD operation. Broadcast CONELRAD, as now constituted, will provide satisfactory coverage from 5 to 30 miles with a national average of about 15 miles, while civil defense would like reliable communications to a much greater

distance, preferably to every corner and hamlet of the country. Such extreme coverage is not possible under normal broadcast conditions.

The Commission has proposed a means whereby broadcast coverage can be expanded materially and still deny navigation aid to an attacking enemy. This method is termed "selective segment" operation. Under such operation, a single station in a cluster would be used to give civil defense information to the area covered by that station. Each station in the cluster could be used in rotation for the dissemination of information to its area, thus materially increasing the coverage of the cluster but still retaining the sequential, common frequency operation necessary for the CONELRAD navigation deception feature.

A further extension of CONELRAD coverage is called CONELRAD Phase II. It is planned to go into effect when the Air Division Commander determines that some relaxation of maximum radiation controls is permissible. Under Phase II operation one specified CONELRAD station in each target area (chosen for maximum coverage, maximum security, and minimum interference, etc.) would return to the air on its normally assigned frequency with maximum available power and a nondirectional antenna for the broadcasting of civil defense information directly from the civil defense control point. All other broadcast stations would leave the air and maintain radio silence, while radio stations in services other than broadcast would continue operating under CONELRAD requirements. CONELRAD Phase II operation would substantially increase broadcast coverage over normal operations.

The FCC's special CONELRAD staff, in addition to developing CONELRAD plans and rules, acts in an advisory capacity regarding CONELRAD to the Department of Defense, Office of Defense Mobilization and military and civilian government agencies.

COMMISSION PARTICIPATION

In general, the Commission contributes to the national defense effort by helping link its licensees to the military and civil defense programs, performing monitoring and other specialized engineering work for defense agencies, and participating in national and local civil defense activities.

Most of the defense projects undertaken by the Commission at the request of other Government agencies cannot be reported here because of the security classification given them by their originating authority, which is further protected by section 4 (j) of the Communications Act. It may be said, in brief, that such activities represent the cooperative effort of Government and industry to meet possible emergencies, to harness electrical communication to the defense effort,

to provide alternative circuits under different situations, and to safeguard the nation's vital communication facilities.

Department of Defense agencies engaged in research and development programs continued to require Commission monitoring assistance, particularly in tracking high altitude radio-equipped balloons and free-floating radio-equipped weather buoys. This service, to the required accuracy, is not available elsewhere, and the Commission is in a position to provide it, to a limited degree, at a considerable saving compared to the cost of establishing duplicate facilities. Contracts for such service amounted to $234,206 in fiscal 1957.

The Commission is represented on various Government boards and committees which are engaged in studying communication uses and needs under normal or wartime developments. It has its own Defense Steering Committee with Commission and staff representation and has established a line of succession for its officials to act under extreme emergency.

Meanwhile, some existing Commission licensees contribute to the national welfare in different ways. Public telephone and telegraph circuits handle a large amount of Government correspondence. Various radio services protect the movement of life and property by land, water and air. Others furnish relief in time of disaster or other emergency; still others aid civilian defense, state guard, civil air patrol and other activities which protect the public.

At the same time, the Commission's monitoring network ferrets out illicit radio operations, traces sources of serious interference to radio communication, and furnishes bearings to lost or disabled planes and ships.

EXECUTIVE ORDER OF 1957

By Executive order of April 17, 1957, the President delegated to the Director of the Office of Defense Mobilization certain of the wartime powers conferred on the former by the Communications Act.

This delegation involves authority, in time of war, to provide for a system of priorities for the use of the nation's telephone and telegraph systems, for the resumption of intercity private line service following interruption, and for the effective use of communications for the purpose of national defense.

The Director of ODM can redelegate this authority, but only to officers of the executive branch appointed by the President and confirmed by the Senate. However, authority to take over or use stations or other facilities, or to remove apparatus or equipment from them, can be exercised only by the Director or with his express approval in each case. He is not authorized to censor communications.

Spectrum Conservation

GENERAL

The rapid growth of radio, the increasing demands by both present and potential users for more spectrum space, and the technical developments in electronics require the Commission to review its frequency allocations to services in the light of present and future needs.

With more than 1.2 million transmitters in operation and radio services expanding and multiplying, the scarcity of frequencies in many portions of the radio spectrum presents a serious problem. Means of making more assignments in the same frequency space is essential to finding room for new users, helping reduce interference and, at the same time, obtaining more efficient use of one of the country's most important natural resources—the radio spectrum.

The magnitude and importance of radio communication has grown to the point where it has a profound impact upon the social, economic, and political activities of the Nation as a whole. Since the end of World War II, the use of radio communication for industry, commerce, and the general public has expanded so rapidly that it is now an important segment in the national economy.

Radio is vital to furthering public safety and protecting life and property. Radio is making material contributions to the efficiency and modernization of operations in many avenues of commerce and industry. Equally significant is the fact that broadcast stations, particularly in the comparatively new medium of television, are integral parts of our democracy in that they constitute a powerful media of communication directed to the informational, educational, entertainment, and commercial activities of our communities.

Moreover, the postwar expansion in scientific research and application of new techniques in electronics has brought with it the promise of unprecedented technical progress for the future. Ways to get more economical use of radio frequencies are receiving the cooperative attention of industry and the FCC. Spectrum-saving techniques of all kinds require high priority in planning circles both in the Government and industry. The most fertile and productive ground for research and development lies in the area of new methods for com-

pressing more and more intelligence into narrower bandwidths, thus opening the way for more and better services of all types in the public interest.

NEW TECHNIQUES

Three particular spectrum conservation techniques may offer considerable aid in relieving heavily congested frequency bands. They are known, respectively, as "offset carrier," "single sideband," and "split channel" operation.

"Offset Carrier"

In TV broadcasting, for example, a station may be required to operate with its carrier frequency "offset" 10 kilocycles above or below the normal carrier frequency. The channel assigned to such a station is, in consequence, designated "plus" or "minus," as the case may be. Through careful planning, the application of this "offset carrier" technique results in less mutual interference between stations and thereby makes more assignments possible.

"Single Sideband"

"Single sideband" has been used for many years on international radiotelephone circuits and, to some extent, for ship-to-shore communication. However, the percentage of stations using this type of transmission is very small and most stations continue to transmit two sidebands, one slightly above and one slightly below the "carrier" signal. Since each of the two sidebands contains all of the information transmitted, technically, there is a duplication of effort and more frequency space is used than is actually required. By eliminating either of the sidebands, a narrower channel may be employed and assignments can be made closer together, making room for more stations.

A further improvement in single sideband technique can be realized by making use of what is called "suppressed carrier" so that the power of a station is concentrated in whichever sideband is being used and the station automatically shuts itself down "between words" when power is not needed. This is equivalent to a type of cleanup campaign to help rid the air of "clutter" caused by the radiation of large amounts of wasted power. For example, such power is responsible for undesirable byproducts such as the familiar "whistling" type of interference observed when two stations are on almost the same frequency.

"Split Channels"

The use of "split channels" offers another means of obtaining greater use of the frequency space available. Because of the need for additional channels in the land mobile service, efforts have been made to develop equipment which requires less spectrum space and can,

therefore, be operated in narrower channels. For example, ten years ago assignments could not be made closer than 60 kilocycles apart in one typical land mobile band because of the width of the channel which the signal required. Through a combination of technical improvements in equipment design, manufacturers were able to produce equipment which could operate in channels half as wide. As a result, many more assignments can be accommodated in a particular band of frequencies by making use of the split channels. This development is somewhat equivalent to putting radio stations on a reducing diet so that more can occupy a given amount of space.

RADIO'S NEW WORKHORSE—MICROWAVE

The microwave portion of the radio frequency spectrum is rapidly becoming one of radio's most useful communication mediums. In addition to furnishing links in the national telephone and telegraph system, microwave is employed by broadcasters and others to relay television programs, by public agencies to protect life and property, and for a widening variety of industrial and other business purposes. The interests which seek to use microwave have become so extensive that the Commission must reexamine operating policies in the light of rapid development of apparatus and techniques.

What Microwave Is

Normally, microwave signals are beamed from one point to another in line of sight. As the name ("micro," meaning "small") implies, microwaves are very short waves (12 inches or less in length) which are found in the upper part of the radio spectrum. These radio waves have many of the characteristics of light waves which make them particularly useful for point-to-point communication.

Microwave signals can be directed to any selected spot within view of the transmitter and, by means of successive repeater stations, relayed over added distances. Microwave communication can be in the form of voice and telegraph correspondence, also teletype, facsimile, and TV relay services. Further, microwave facilities permit "push-button" observation of industrial and other business operations, and remote control of devices throughout a system. By methods known as "multiplexing," many messages or functions may be handled simultaneously over a single microwave channel.

Microwave Characteristics

Because of their high position on the radio spectrum, microwaves are not affected in the same way by weather and man-made interference as are radio services operating on lower frequencies. In turn, their straight-line directivity permits the same channel to be used by parallel systems transmitting different kinds of information. Micro-

wave systems are usually more economical to install and maintain, as compared to wire lines, where a substantial number of communication channels are required, or a single broad communication channel, such as television, is involved. Also, since the transmitter energy may be concentrated and pointed, microwave requires comparatively little transmitter power.

How Microwave Works

Microwave communication requires successive relay stations in order to span great distances. A highly directional antenna focuses the waves in a beam—akin to a searchlight—on a distant repeater station within view of the initiating transmitter. The repeater station amplifies and retransmits these signals to the next repeater station, and so on until they reach the final terminal.

Since the range of a single microwave transmitter is generally limited to line of sight, spacing between microwave repeater stations is usually of the order of 20 to 50 miles, depending upon the nature of the terrain and the height of the towers. Accordingly, most of these stations are located on high ground to permit furthest separation, thereby reducing the total number of relay stations necessary in a microwave system.

Microwave and TV Broadcasting

The major part of the nationwide TV program network operates over microwave systems provided by telephone companies. In other cases, where such facilities are not available from the telephone companies, individual TV stations have installed their own private microwave relay systems.

Also serving TV are the microwave links which carry programs from the local city studios of the broadcaster to the distant transmitter site of the TV broadcast station. Portable and mobile microwave transmitters make it possible to pick up news, sports and other events outside of the regular studios and deliver them to the transmitter for broadcast.

Microwave adjuncts for TV broadcasting, other than intercity circuits operated by common carriers, operate in bands at 2000, 7000, and 13,000 megacycles.

Common Carrier Microwave Operation

Common carrier use of microwaves has become commonplace. Microwave links constitute about half of the Bell System's national coaxial-cable-microwave network. In addition to relaying TV programs, the Bell System can carry up to 600 two-way telephone conversations at the same time on a pair of microwave channels.

The Commission has also authorized some nontelephone company microwave systems, usually in isolated places, to pick up and relay

TV programs to particular TV broadcast stations or community TV antenna systems on a common carrier basis.

Since 1948, The Western Union Telegraph Co. has had a microwave system connecting New York, Philadelphia, Washington, and Pittsburgh, which it now plans to extend to Columbus, Cincinnati, Indianapolis, and Chicago.

Common carrier microwave operation generally is provided in the region of 890–7200 megacycles.

Private Microwave Systems

It is in the noncommon carrier and nonbroadcast services that the most varied utilization of microwave facilities is found. That is because practically all forms of communication which can be converted into electric impulses can be sent by microwave. Consequently, certain industries and business establishments harness microwave for many purposes. With it, they can direct various activities at remote points. These field installations can, in turn, automatically report pertinent information back to the control office.

Thus, the central station in a microwave system can start, stop, slow, or speed unattended equipment; open and close valves; record pressure, temperature, engine speed, rate of processing and other data; telemeter voltage, current and power; locate line faults, and perform other supervisory functions.

Many public utilities—also power systems and oil and gas pipelines—depend upon microwave to control installations along the way. Pipelines constitute about two-thirds of the present route mileage of all private microwave systems, and power utilities about one-fourth. One petroleum chain extends from Texas to New York, a distance of 1,700 miles.

In addition to using other forms of electrical communication, railroads employ microwave for signaling and other traffic controls. Radar operation on land and water also involves some incidental microwave utilization. Some private microwave systems provide more than 100 channels for voice communication.

Present private microwave operation is mostly in the 2000–6000 megacycle range.

Public Agency Microwave Operation

Federal, state, county, and municipal governments find microwave systems a valuable adjunct in handling police, fire, highway maintenance, special emergency, conservation, civil defense, and general administrative matters. The Bonneville Power Administration is one example of such Federal use. Microwave controls traffic and otherwise helps in the operation of state highways. The Pennsylvania, New Jersey, and Ohio turnpikes are examples.

International Microwave

Possibilities of microwave for international communication, to the inclusion of TV program relay, are indicated by experiments with "over-the-horizon" or "tropospheric scatter" technique. This type of transmission does not follow the curvature of the earth, but goes in a straight line beyond the horizon into the atmosphere where some of it is "scattered" by the tropospheric layer back to earth far from its origin. In 1956, the Commission made its first regular grant of such a service—for telephone—from Florida to Cuba.

Microwave Development

The possibilities of microwave operation received some study after World War I. A test microwave telephone transmission was sent across the English Channel in 1930. Other experimentation followed, but it remained for developments born of World War II to intensify the interest in microwave potentialities. That conflict popularized general reference to the short waves around and above 1000 megacycles as "microwaves."

Two factors contributing to the practicability of microwave operation have been the postwar extension of the usable radio spectrum beyond 30 megacycles and development of equipment and techniques to operate there. The growing utilization of "upstairs" spectrum space is reflected in some exploratory radio operation in the vicinity of 30,000 megacycles, where the waves are less than one-half an inch in length. However, equipment feasible for commercial use of those frequencies is not yet available.

As early as 1944, in connection with the general revision of frequency allocations, the Commission considered and, subsequently, provided spectrum space to further microwave experimentation and development. The first regular microwave system in this country—for telephone service between Boston and New York—was placed in operation in 1947.

Microwave Problems

In the present stage of development, all of the private microwave systems, except those of TV broadcasters, are licensed on an experimental or developmental basis. Now that apparatus and methods have improved, and practical operation has been demonstrated, the Commission is considering the possibility of placing many of the non-common carrier microwave services on a regular basis.

However, various considerations are involved—such as the present and future needs for microwave communication; the availability of channels to meet these needs and, if insufficient, who shall have prior rights in congested areas; and how to deal with interference which may be created by many microwave systems operating in, or converg-

ing upon, a single large metropolitan area. Also, the question as to whether, and under what conditions, private microwave systems shall be permitted to duplicate or parallel those of common carriers needs to be settled in an equitable manner, and in a way which will best serve the public interest.

NATIONAL FREQUENCY ALLOCATION

During the past year the Commission instituted two broad frequency allocation proceedings. They do not involve specific proposals either by the Commission or by industry and, instead, are general fact-finding inquiries into the frequency and operational requirements of all services—old, new, or prospective. One of these is a review of the spectrum between 25 and 890 megacycles (Docket 11997); the other concerns that portion above 890 megacycles (Docket 11866). Evidence and testimony on the latter are being presented but the hearing stage has not been reached for the region below 890 megacycles.

The Commission's decision to undertake this comprehensive reexamination of the major part of the radio spectrum was based upon the fact that a dozen years have elapsed since the last such full-scale inquiry. Many of the service allocations at that time had to be made on "educated guesses" as to requirements. Since then many new uses of radio have developed. Some services have grown faster than anticipated and others more slowly. Some parts of the spectrum have become heavily loaded while other segments are little used. In addition, new methods of operation, such as those previously mentioned, must be considered.

Consideration of "split channels" in the land mobile and maritime mobile services operating generally between 25 and 470 megacycles continues to be the subject of various proceedings before the Commission. The so-called split channel proceedings were instituted as an effective method of expanding the several vehicular radio services, to accommodate more users and to improve spectrum utilization. The Commission issued several proposals involving these services. Some proposals have been finalized while others still are pending. They involve considerable readjustment of the vehicular services and several frequency allocation changes. One of the Commission's continuing problems is explaining to an individual licensee how a decision which affects him somewhat adversely is actually in the public interest because it makes room for new users of radio.

Several petitions requested that the use of frequencies allocated to the mobile service also be permitted for incidental fixed (point-to-point) operations. The proposals involved such things as burglar and fire alarm systems, and fault indicators for power line systems. Inasmuch as the land mobile service has, in many instances, grown to such

an extent that frequency congestion in some areas is now serious, the Commission has been reluctant to permit even secondary use of their frequencies by fixed services because the latter can, with some increase in cost, utilize frequencies higher in the spectrum. Still under consideration is determination of whether the general policy of requiring fixed service to utilize frequencies higher than 890 megacycles should be continued.

During the year, special studies relating to the maritime mobile service (primarily domestic) were instituted. Due to the frequency congestion existing in the 2000–3000 kilocycle band, this service is receiving increasing interference. Furthermore, under present conditions, it has been impossible to expand the service to any great extent in this band by assignment of additional frequencies. Government-industry committees are studying application of "single sideband" techniques and expansion of VHF maritime mobile usage. Widespread adoption of "single sideband" and the use of VHF (very high frequencies), wherever possible, will do much to decrease interference and congestion in this band.

The solution of these problems appears to be largely a matter of economics. VHF equipment is still quite expensive due to light demand. Consequently, marine operators hesitate to go to VHF because of the cost involved and the fact that VHF is so lightly utilized. On the other hand, manufacturers are unable to go into assembly line production and thus reduce the price of equipment until there is more demand.

On September 20, 1957, the Commission announced a series of frequency allocation actions to aid vehicular radio communication in the portion of the radio spectrum between 25 and 50 megacycles. These actions, together with certain allocation changes to meet essential Government radio requirements in this portion of the spectrum, was coordinated with the Office of Defense Mobilization. It includes allocation of 1200 kilocycles of spectrum space between 150.8 and 152.0 megacycles for the exclusive use of the non-Government land mobile service to protect it from the interference that Government stations outside of the country caused to operation on 25–50 megacycles in the past.

A new frequency plan for Alaskan fixed and maritime mobile services in the band between 1605 and 8000 kilocycles came into full effect for the first time during the year. It resulted from a joint FCC-industry study of the problems of congestion and interference which have plagued these services in recent years due to the substantial and rapid growth of industry in Alaska. It is hoped that more and more of these Alaskan services will utilize VHF so that the congestion on medium and high frequencies will be reduced. Under present condi-

tions, not much can be done to increase the number of frequency assignments in the MF and HF bands since that spectrum space is at a premium for all services in this territory.

INTERNATIONAL FREQUENCY ALLOCATIONS

There has been no change in the international table of frequency allocations since 1947, the year of the last international conference to consider such matters. However, a new conference has been scheduled by the International Telecommunication Union to begin at Geneva, Switzerland, in the summer of 1959. It is expected to meet for several months, reviewing and revising various parts of the international radio regulations, including allocations. Since practically all countries are expected to participate, it promises to be the biggest and most important world get-together of its kind.

In preparation of this session, the Department of State has established a number of joint Government-industry preparatory committees. Since November 1956, the Commission has participated extensively in the work of these groups and expects to devote many man-hours to further preparation.

The objective is to prepare a firm and acceptable set of United States proposals to revise the present treaty. Because 97 governments have become ITU members or associate members, it is clear that many nations have a vital interest in the outcome of this conference.

The Commission devotes work from time to time on other international conferences requiring lesser effort. Of 12 such meetings held during the year, in addition to preliminary work, it furnished one delegation chairman and 14 other representatives for delegations. It also helped prepare for 3 other such gatherings. And it will have to plan for 32 more international conferences scheduled to be held between 1957 and 1965.

The United States participated in the 1957 VHF marine conference at The Hague which adopted the Baltic-North Sea VHF maritime mobile agreement. (See "Marine Radio Services".) This pact incorporates, in large measure, many of the operational and frequency features developed for the maritime mobile services in our own country. Since the Hague plan will undoubtedly be considered at the 1959 conference, the Commission has invited industry comment on a possible United States position relative to international VHF standardization for this service.

The opening of the St. Lawrence Waterway will, for the first time, make it possible for large ocean-going vessels to enter the Great Lakes which already has a maritime VHF operational system. However, the existing area system coordinated with Canada may require minor modifications in order to comply with the phases of the Hague plan.

The Commission continued to move the few remaining out-of-band

stations into bands prescribed by the Atlantic City radio regulations. Except for 2 frequencies used by the Mississippi River marine system practically all non-Government stations are in conformity.

The problem of providing "silent" spectrum space for making of astronomical radio observations received consideration during the year. While the problems would appear to center on a matter of protecting our own scientific radio astronomy observations, actually international questions are involved. For example, one of the chief frequencies concerned is known as the "hydrogen line frequency" of approximately 1420 megacycles. It is in a band allocated on an international basis for the radionavigation service. It might be possible to give a certain degree of protection to radio astronomical observations in this country without the necessity of obtaining international agreement. However, other countries are facing the same situation and the subject will undoubtedly be considered at the forthcoming international conference.

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 frequencies. The Commission found it desirable to reaffirm its longstanding policy that frequencies suitable for international communication should not be used for domestic purposes.

Under current international agreements, 7 different systems are employed to obtain recognition and protection of assignments. The one 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 the Master International Frequency Register and published in the Radio Frequency Record with associated date. 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, and, if it appears 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 several hundred unsatisfactory findings. Although this appears to be a good average, since there were more than 65,000 notifications, many of the "unsatisfactory" assignments involved are basic to our global communications network whereas the majority of notifications were for types of domestic uses of radio about which questions seldom arise internationally.

Substantial effort is being expended to get the ITU's findings modified whenever the Commission feels it justified after further study. The problem is that, due among other things to the increasing use of radio on a global 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 has been considered by a joint Government-industry group as part of the preparatory work for the next world Administrative Radio Conference.

INTERNATIONAL FREQUENCY USAGE DATA

During the year, data on 166,393 monitoring observations were furnished to the ITU. Quality of the monitoring data so reported has been consistently high because the Commission has always applied strict criteria in their processing. The ITU has from time to time adopted suggestions and standards utilized by the Commission and at present is planning to institute a monthly publication as an improvement over the quarterly issuance of summary data.

International monitoring data has proved to be a valuable tool in the worldwide effort to make all radio assignments conform with the Atlantic City Agreement. The data accumulated domestically is also useful to the Commission for a variety of purposes.

INTERNATIONAL FREQUENCY COORDINATION

Universal action to bring all radio assignments into the proper bands has continued to show progress in most countries. This has helped the corresponding effort in the United States. The "final-adjustment period," set by the Extraordinary Administrative Radio Conference Agreement of 1951, began June 1, 1957.

Cooperation with Canadian telecommunication officials continued to prove beneficial. Informal coordination at the technical level, as in previous years, resolved many individual assignment problems. A special border coordination procedure adopted in 1950 for the exchange of data and comments on assignments in certain parts of the VHF and UHF spectrum furnishes a large amount of useful engineering information to both countries with a minimum of effort.

During the year, exchange of comments and data for non-Government assignments in the band 162–174 megacycles was added to this arrangement.

FCC FREQUENCY LIST

Good administration requires the Commission to maintain a detailed record of the frequencies of all stations it authorizes. With the exception of aircraft, amateur, citizens, civil air patrol, disaster and ship stations, this information is contained in a semi-annual compilation which is distributed to interested Government agencies and may be inspected at the Commission's headquarters and engineering field offices.

Tabulated by frequencies, it lists station locations, call signs, identification of licensees, and technical particulars of each frequency assigned. During the year about 41,000 entries were added. The several volumes now run to more than 3,500 pages, an increase of about 1,000 over the previous year.

FCC-GOVERNMENT FREQUENCY COORDINATION

Coordination between the Commission and other Federal agencies in the use of frequencies is essential. The Commission uses some parts of the spectrum and the Government uses other parts, but much of the spectrum is shared jointly. It is on the shared parts that the Commission and the Executive Branch of the Government must consult before making an assignment.

The President assigns frequencies to Government stations pursuant to a provision in the Communications Act. The Interdepartment Radio Advisory Committee (IRAC), under the Office of Defense Mobilization, handles these day-by-day assignments. During the year the Commission made some 3,500 informal engineering studies in this connection and processed 7,500 formal proposals for IRAC consideration. Of this number about 1,100 were for applicants in the experimental services who, having no frequencies of their own, have to seek temporary operation on most any frequency in the spectrum which can accommodate them.

Common Carrier Services

DOMESTIC TELEPHONE

General

The calendar year 1956 witnessed a continued rapid growth in the telephone industry. The Bell System added a near record of 3.2 million telephones as compared with 2.8 million in the previous year, and net plant added was about $1.7 billion, bringing its total gross plant investment to about $17 billion. Independent telephone companies also expanded their facilities. This brought the nationwide industry total investment to about $20 billion.

The year closed with over 60 million telephones in service throughout the nation, handling a daily average of 216 million local and 8 million toll calls, an increase of about 5 and 12 percent, respectively, over the previous year. Private line services increased 20 percent.

During the year, the Bell System converted 369 central offices to dial operation so that 89 percent of its telephones were dial operated. About 11 million Bell subscribers can now dial nearby cities and towns directly, and about 2.7 million others can dial more than 20 million telephones at more distant locations.

Bell System's annual gross operating revenues reached $5.8 billion for 1956, while the industry total was over $6.5 billion. Consolidated net income applicable to American Telephone and Telegraph capital stock amounted to $755,933,854, an increase of 13.8 percent over 1955. Earnings per share increased from $13.10 in 1955 to $13.16 in 1956, while the number of outstanding shares increased by about 7 million. The following table illustrates the expansion of the Bell System for the past seven calendar years (figures as of December 31):

Year	Telephones	Plant book cost	Revenues	Employees
1950	35, 343, 440	$10, 101, 521, 562	$3, 261, 528, 032	523, 251
1951	37, 413, 614	10, 949, 685, 522	3, 639, 462, 365	551, 415
1952	39, 413, 889	11, 971, 435, 727	4, 039, 664, 218	579, 500
1953	41, 353, 483	13, 059, 232, 000	4, 416, 729, 614	587, 839
1954	43, 321, 849	14, 131, 277, 000	4, 784, 500, 000	578, 436
1955	46, 218, 000	15, 340, 459, 000	5, 297, 043, 000	615, 895
1956	49, 438, 000	17, 074, 206, 000	5, 825, 298, 000	638, 103

The conversion to radio by the Bell System was highlighted in testimony in the Commission's allocation hearing relating to frequencies above 890 megacycles (Docket 11866). It was pointed out

that microwave systems now furnish 10.5 million miles of the long distance telephone circuit mileage of the Bell System (22 percent of the total), and 60,000 miles of its intercity television circuit mileage (78 percent of the total). In terms of "megacycle miles," which is the product of bandwidth and circuit length, slightly over half of Bell's intercity facilities are now radio.

Services and Facilities

Construction of facilities.—The largest portion of the $1.7 billion in net plant added by the Bell System in calendar 1956 was for additional exchange telephone buildings, switching, cables and other local plant distribution facilities. However, the rapid increase in interstate toll calls, the need for increased operator and customer toll dialing facilities, and the growing demand for interstate private line services necessitated substantially larger expenditures for interstate services than in previous years.

During fiscal 1957, the Commission authorized the Bell System to construct or acquire additional interstate facilities at an estimated cost of about $259 million. Of this amount, $89 million was for the construction of new radio relay routes and to add channels on existing routes, totaling about 53,000 channel miles. By contrast, $27 million and $42.7 million were authorized in fiscal 1955 and 1956, respectively, representing 22,200 and 28,329 channel miles.

A substantial portion of the new construction will provide express radio systems to bypass large population centers and other potential bombing areas. These express routes will be strategically interconnected with other Bell radio and cable routes to eventually permit routing telephone calls and important private line circuits between any two points in the nation without passing through intervening cities or target areas. In addition, routes are being constructed around certain major population centers, both for bypassing and to permit ready access into the centers from several directions to insure the continuity of essential communication in event one of the entry routes is interrupted.

A substantial number of the microwave circuits authorized during the year was for the SAGE and other national defense projects. To provide necessary communication circuits in connection with the launching and tracking of the earth satellite, projected as part of the International Geophysical Year, the Southern Bell Telephone & Telegraph Co. was authorized to construct a microwave radio relay system between Spruce Creek and Jupiter, Fla., estimated to cost $977,987. Independent telephone companies also made strides in the use of microwave radio facilities. During the fiscal year, 19 independent microwave systems involving estimated expenditures of $3.4 million were approved by the Commission. A total of 1,433

common carrier point-to-point microwave stations held authorizations at the year's end.

In addition to microwave construction, Bell System received approval of 177 projects involving $122 million for the construction or acquisition of cable, wire, and carrier systems during fiscal 1957, including the annual blanket construction program estimated to cost $38 million and 4 authorizations for acquisition or lease of plant or facilities of other companies. One of the latter involved acquisition by the Mountain States Telephone & Telegraph Co. of the communications property located in Yellowstone National Park. These totals also include the conversion of 1,184 coaxial tube miles to type L–3 operation, to triple the capacity, and the initial equipment of 284 coaxial tube miles for type L–3 operation.

Fiscal 1957 also saw activity in the consolidation of independent telephone companies. In two of the largest transactions of this type, subsidiaries of the General Telephone Corp. were authorized to merge 3 companies having aggregate gross book investments of $50 million with other subsidiaries.

By the end of fiscal 1957, about 77,000 channel miles of Bell coaxial cables and microwave facilities were being used to interconnect 458 television stations in 315 cities. Color program service was available to 338 TV stations in 209 cities. In addition, systems to provide off-air pickup and relay of TV programs to broadcast stations and community antenna systems were being provided by various common carriers—17 by Bell companies, 1 by an independent telephone company, and 26 by specialized common carriers. One Bell company started providing closed-circuit TV facilities for an educational project in a large city, interconnecting 11 buildings and eventually expected to link 48 buildings. Another Bell company was constructing about 38 miles of coaxial cable facilities to bring closed circuit telecasts into homes of a large southwestern community.

The following tabulation shows the estimated amounts and costs of cable, wire and carrier supplementations (principally Bell System) authorized by the Commission in the past six fiscal years:

Fiscal year	Number of projects	Cost	Sheath miles of cable	Tube miles of coaxial	Conductor miles of open wire
1952	323	$107, 533, 688	1, 386	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	135
1956	178	84, 573, 125	2, 606	1, 562	765
1957	177	122, 244, 624	2, 226	1, 152	586

Discontinuance of service.—The Commission granted 15 applications to discontinue telephone service during fiscal 1957, each of which involved the continuance of service by another telephone com-

pany. One of these authorizations eliminated uneconomical duplication of service which has been in effect in six western communities for some 40 years, and provided them with extended area service.

Speed of service.—The Bell System reported that the average time required for completing toll calls was 1.4 minutes in 1956, and that about 97 percent of the calls were completed while the calling party held the line.

Acquisitions and consolidations.—In addition to the acquisitions of property noted previously, the Commission received 30 applications under section 221 (a) of the Communications Act by telephone companies to acquire other telephone property. Hearings were held on 14 applications, and all were granted. Rule changes during the latter part of calendar 1956 provide that hearings are no longer mandatory on such applications unless requested by a telephone company, an association of telephone companies, a State utility commission or local regulatory authority. Consequently, 27 applications were granted without hearing.

Interlocking directorates.—The Commission granted 15 applications for individuals to act as interlocking directors. The rules were revised, to implement changes in section 212 of the act, to provide that duly designated persons may act as officer or director of more than one carrier in a commonly owned group without securing individual authorization.

Microwave facilities for closed circuit TV.—The Commission authorized 18 new microwave radio relay systems for common carriers to provide off-air pickup and relay of TV programs to community antenna systems, involving gross construction cost of more than $1 million. Specialized common carriers received 14 of these authorizations and Bell System companies the remaining 4. Certain carriers were also authorized to provide additional channels for existing systems.

A hearing was held on applications by a specialized common carrier and competing applications by A. T. & T. to determine, essentially, which should be permitted to construct a new off-air radio relay system to serve the communities of Sterling, Colo., and Sidney and Kimball, Nebr. (Dockets 11883–4). An initial decision favored the specialized carrier.

On April 24, 1957, the Commission granted, after hearing in which A. T. & T. was an intervenor, construction permits to a specialized common carrier for a system of microwave radio relay stations to carry programs broadcast by Denver TV stations to Rapid City, S. Dak., for use there by a community antenna system (Docket 11393).

Local TV transmission.—During fiscal 1957, the former experimental TV pickup and studio-transmitter link licenses were modified and relicensed pursuant to the new Domestic Public Radio Services rules (part 21) under the designation Local Television Transmission Service. Frequency assignments are provided under these rules for TV pickup, nonbroadcast pickup, and studio-transmitter link uses. At the close of the year, the 101 stations licensed in this service employed 850 transmitters to handle TV program material. Of these units, 591 are for TV broadcast pickup and 259 for nonbroadcast pickup for closed-circuit TV.

Impact of microwave on telephone service.—The impact of common carrier microwave radio facilities on nationwide telephone service is evinced in the fact that more than half of Bell's intercity facilities are now radio circuits, as well as by the greatly expanded radio usage by independent companies and the funds earmarked by the Bell System for future radio construction. Present telephone company trend is toward greater radio usage for intercity facilities, with wire lines being used for local distribution.

In view of the present dearth of frequencies, it is encouraging that the usable radio frequency spectrum is ever being extended upward to provide more space for expanding radio services. The 4000 megacycle range is presently widely used by Bell and Western Union and there is increased usage of the 6000 megacycle frequencies, primarily by independent common carriers. The Bell System proposes to introduce two new microwave systems. The first of these—designated TH—employs an improved traveling wave tube developed by the Bell Telephone Laboratories. It looks to making 6000 megacycle operation more efficient than the best system in present use (1,860 telephone circuits per radio channel compared to 600). It will use, in conjunction with the present Bell microwave circuits, a new horn-reflector type of antenna system to provide, according to Bell, the lowest cost per telephone circuit mile yet achieved. Due principally to microwave, the Bell System's cost per telephone circuit mile decreased in the period 1952–56 from approximately $70 to $51 for interstate facilities. Equipment for the TH system is expected to be in quantity production by 1959.

The second new system—designated TJ—has been developed for 11,000 megacycle operation. It is being field tested and production is expected to start during the coming fiscal year. It is anticipated that this system will be used for many short haul circuits to conserve the 4000 and 6000 megacycle frequencies which are more satisfactory for longer transmission paths. The TJ system can also be operated with the new horn-reflector type of antenna.

On September 4, 1956, part 21 of the rules governing Domestic Public Radio Services (other than Maritime Mobile) became effective. These rules provide for regular operation of certain domestic common carrier radio services, previously authorized under parts 5 (Experimental Radio Services) and 6 (Public Radiocommunication Services), under one title providing technical standards and operating rules for all Domestic Common Carrier Radio Services other than Aeronautical, Maritime, and certain Alaskan and Special Emergency services. Covered under this new title are the Developmental, Domestic Public Land Mobile, Rural, Point-to-Point Microwave, and Local Television Transmission services.

This step required that more than 1,500 authorizations previously issued as experimental (including, among others, Microwave Relay, Rural Radiotelephone, and TV Pickup and Studio-Transmitter-Link stations) be renewed under the new title. These licenses are now issued for terms of from 3 to 5 years, in lieu of the 1-year license period in the experimental services. This is expected to save time for the applicant as well as the Commission.

Domestic public land mobile radio service.—Thirty-six new miscellaneous common carrier land mobile radio systems for two-way communication service were granted during the year, also 8 new radio systems for one-way signaling radiopaging service.

Due to the lack of frequencies to accommodate all applicants for one-way signaling systems, it was necessary to hold comparative hearings for the Seattle and Dallas areas (Dockets 11833, 10767, and 10769). Final decisions granted construction permits to the applicant in each area who appeared best qualified to serve the public interest.

A final decision, issued May 29, 1957, authorized The Bell Telephone Co. of Pennsylvania to construct two stations, one at Allentown, and the other at Bethlehem, to provide, on a developmental basis, a one-way selective signaling service to portable pocket-type receivers (Docket 11500). This was the first such developmental authorization issued in this service and represents an advancement in radio, since the subscriber need not take the small receiver from his pocket to ascertain if there are any messages for him. The new receiver automatically responds (provided it is turned on) with a signal tone notifying the subscriber that he is to take some predetermined action. The one-way signaling receiver now in general use requires the subscriber to periodically monitor all voice communications heard on it to ascertain if there are any meassages for him.

Licenses for miscellaneous common carrier stations providing two-way communication and one-way signaling service expired on April 1, 1957. In filing for renewal, all licensees were required, by part

21 of the rules, to make a showing that at least 50 percent of the mobile units operated on any one channel were used by persons who were not under the control of the applicant or that efforts had been made to meet this criterion. Nine licensees were unable to make a satisfactory showing and surrendered their authorizations and 2 additional licenses were not renewed because of failure to properly report their operations. At the close of the fiscal year, there were 296 two-way communications systems licensed, and outstanding permits for 22 new systems. In addition 77 one-way signaling stations held licenses, and 15 new stations had construction permits.

The Commission designated two license renewal applications for hearing because their annual reports indicated they were not rendering service to the general public. One of these (Docket 11707) commenced public service and its license was renewed. The other application (Docket 11706) was dismissed upon the applicant's request.

A comparative hearing (Dockets 11816 and 11817) was scheduled for two applicants for two-way mobile service at Sarasota, Fla. A decision on December 27, 1956 granted a construction permit to one of the applicants after the other failed to prosecute. Construction permits issued without hearing to applicants at Louisville, Ky. (Docket 11878); Ridgewood, N. J. (Docket 11932); and Clearwater, Fla. (Docket 11971) were protested by existing stations in those areas. After hearing, an initial decision was issued on May 31, 1957, in the Ridgewood case. A final decision was issued in the Clearwater case on June 6, 1957, after the protest was withdrawn. A petition to dismiss the Louisville case was pending.

Thirty-nine authorizations were made to general communications common carriers (telephone companies) for two-way land mobile radio systems. As of June 30, 1957, there were 317 licensed systems and 25 new systems held construction permits.

The growth of the Domestic Public Land Mobile Radio Service in populous areas was impeded during the year by the shortage of available frequencies. To alleviate this situation, the Commission on April 3, 1957 proposed to make available 2 additional frequencies for one-way signaling stations, 7 additional channels for miscellaneous common carriers providing two-way communications service, and 33 additional channels for two-way land mobile systems of general communications common carriers, through the technique of splitting existing channels into narrower bands (Docket 11995).

Prior to the adoption of part 21 of the rules, Control and Repeater stations used in connection with base stations in the Domestic Public Land Mobile Radio Service were authorized on an experimental basis. During the year, 86 such authorizations were regularized and

made a part of the licenses for the base stations with which they were associated, thus permitting the issuance of one authorization where previously two or more were required.

Developmental domestic public aeronautical service.—In order to develop engineering and operational data relative to providing public radiotelephone service aboard private and commercial aircraft, which is a prerequisite to the Commission's establishment of a domestic public aeronautical radio service on a regular basis, the Commission, on April 17, 1957, authorized the Illinois and Michigan Bell telephone companies to construct, on a developmental basis only, radio facilities to operate in the 450–460 megacycle band in the vicinity of Chicago and Detroit. No frequencies have yet been specifically allocated for such a service on a regular basis.

Rural radiotelephone service.—The Rural Radio Service is intended to provide domestic public communication to points where it is not practical to construct wire lines. With the implementation of part 21 of the rules, experimental authorizations for Rural Subscriber stations and Short-Haul radiotelephone services were regularized under the classifications of Central Office, Inter-Office, and Rural Subscriber stations. In consequence, 140 such authorizations were converted from experimental to the Rural Radio Service. These conversions, together with facilities added during the year, brought the number of Rural Radio Service authorizations to 222. Of these, 23 are Central Office stations, 63 are Inter-Office stations and 136 are Rural Subscriber stations. The regularizing of stations in this service has resulted in a change in the term of such authorizations from 1 to 3 years.

Public radiotelephone service to vessels.—The Commission designated for hearing the application of Wisconsin Telephone Co. (Docket 11268) for a new VHF Public Class III–B coast station at Milwaukee, and the applications of Ohio Bell Telephone Co. (Dockets 11269 and 11270) for new VHF Public Class III–B coast stations at Cleveland and Toledo. Lorain County Radio Corp. and Michigan Bell Telephone Co. were made parties in these proceedings. At the same time, the Commission granted applications of Michigan Bell for new VHF Class III–B coast stations at Hancock, Port Huron, Escanaba, East Tawas, and Marquette, all Michigan, and the application of Wisconsin Telephone for a new VHF Public Class III–B coast station at Green Bay. Upon protests by Lorain County Radio Corp. and Central Radio Telegraph Co., the Commission postponed the effective date of these grants and ordered hearing (Dockets 11375–11380, inclusive) in consolidation with applications previously set for hearing. The extensive hearing extended through September,

October, and November 1956. Initial decision was pending at the close of fiscal 1957.

On July 6, 1956, the Commission acted (Docket 11374) to delete the frequencies 6240 and 6455 kilocycles and to make the frequency 4372.4 kilocycles available for ship and coast stations using radiotelephone on the Mississippi River connecting inland waterways (except the Great Lakes). Upon protests by interested parties, the Commission stayed this action and scheduled a hearing to be held during the next fiscal year, to obtain additional information with respect to the interference which may be caused to other services by the continued use of 6 megacycle frequencies for ship-shore public telephony on the Mississippi River system, and justification for permitting such use in derogation of the international radio regulations.

Approximately 100 Domestic Public Land Mobile Radio Service systems are currently authorized to render service to vessels in areas where VHF Public Coast service is generally not available.

Private line service rates.—The 1956 annual report noted the general investigation which the Commission instituted on March 7, 1956. with respect to the lawfulness of the effective tariff rates and regulations of A. T. & T. and Western Union for private line services and channels (Dockets 11645 and 11646). At the close of the current fiscal year the companies were completing special studies, pursuant to Commission request, to ascertain costs associated with their respective private line services. It is anticipated that with the submission of these results, further proceedings can be scheduled.

Foreign attachment case.—On November 8, 1956, the U. S. Court of Appeals for the District of Columbia, in *Hush-A-Phone Corp.* v. *U. S.*, 238 F. 2d 266, set aside the decision and order of the Commission which upheld the reasonableness of the so-called foreign attachment provision of Bell company tariffs to bar the use by their customers of the Hush-A-Phone device. Accordingly, the Bell companies were ordered by the Commission to file revised tariff regulations which would permit customer use of the Hush-A-Phone and other devices which do not impair the operation of the telephone system. The resultant tariff revisions became effective May 16, 1957.

Bell System lease-maintenance service.—On March 27, 1957, the Commission suspended new tariff schedules filed by A. T. & T. providing rates and regulations for the leasing and maintenance of equipment used by private mobile communication systems (Docket 11972). It ordered an investigation and hearing to determine whether the contemplated service constitutes a common carrier communication service subject to the Commission's jurisdiction and, if so, whether provi-

sions of the tariff are just and reasonable. The present and proposed lease-maintenance operations of the other Bell System companies were also included in the investigation to determine the jurisdictional status. Hearings were scheduled to begin in the fall of 1957.

Off-the-air pickup TV transmission channels.—On March 13, 1957, the Commission ordered an investigation into the lawfulness of revised tariff schedule filed by A. T. & T. providing new rates and regulations for off-the-air pickup TV transmission channels (Docket 11956). Prior to commencement of the hearing, A. T. & T. amended the tariff in an effort to remove questionable features. At the close of the fiscal year, further action was awaiting disposition of an A. T. & T. petition to dismiss the investigation in view of the tariff amendments.

TV transmission charges.—On April 11, 1956, Community Television Systems of Wyoming, Inc., filed a complaint alleging that the charges of Mountain States Telephone & Telegraph Co. for certain TV transmission facilities furnished the complainant were unjust, unreasonable, and discriminatory (Docket 11680). On January 23, 1957, it was dismissed at the request of the complainant.

Tariff filings.—At close of the fiscal year, tariffs or concurrences were on file for 447 telephone carriers. During the year 18,172 tariff publications were received, consisting of new or revised pages, supplements, concurrences, revocations, or adoption notices.

Other Regulatory Matters

Depreciation.—The Commission's program of prescribing depreciation rates for telephone companies, as required by section 220 (b) of the act, has thus far been concentrated on operating companies of the Bell System (23 companies in all, including the Long Lines Department of A. T. & T.). The first stage—i. e., the prescriptions of rates for these companies for the first time—was completed in fiscal 1954 as a result of extensive studies conducted, in many cases, jointly with State regulatory commissions. Even before this initial task was completed, it became evident that, in view of rapidly changing conditions, depreciation rates prescribed for Bell companies could not remain fixed for extended periods of time. Therefore, reexaminations of the service lives of plant and other factors underlying previously prescribed depreciation rates had to be undertaken. To date, as a result of such reexaminations, depreciation rates prescribed for most Bell companies have been revised at least once. Due to limited personnel and funds available, it has not as yet been possible to undertake a similar program with respect to independent telephone companies which come under the Commission's jurisdiction.

On the basis of studies completed, and through joint reviews of relevant facts with State commissions and the companies concerned, the Commission revised during fiscal 1957 previously prescribed rates for 8 Bell companies, including 3 multistate companies serving 16 States. The new rates reflect both upward and downward revisions in the individual class rates. However, the studies indicate a definite trend toward higher depreciation rates in the case of certain classes of plant, mainly because of the factor of obsolescence, and the overall effect of the revised rates was a net increase averaging about 5 percent in annual depreciation charges in the case of these 8 companies.

In addition, in connection with new rules for station equipment accounting adopted by the Commission (Docket 11769), information was developed for the establishment of depreciation rates for the various classes of plant affected, including station connections, a new depreciable class of plant established under these rules. The matter of prescribing depreciation rates for the several classes of station equipment of each Bell company is now under consideration. Comments and views have been solicited from each State commission. In the interim, the Bell companies have been authorized to use temporary depreciation rates for station equipment, subject to such retroactive adjustments as may be necessary when the rates are finally prescribed.

Because of the continued rapid expansion of the telephone industry and accompanying technological changes, the Commission's task in connection with the prescriptions of depreciation rates and other depreciation matters is becoming increasingly more complex and extensive in scope. As indicated in the last annual report, significant changes in telephone techniques are anticipated. One example is the advent of an electronic central office system, expected to be in commercial production by 1960 or 1961. This new development is expected to have a considerable impact upon the useful lives of most, if not all, types of central office equipment currently in service, which represents an investment of over $5.3 billion in the case of the 23 Bell companies alone. This change has created for the Commission a major problem, whereby its effect upon equipment, involving an investment of such a magnitude, must be evaluated from time to time so that depreciation charges are reasonable for both the ratepayers and the companies.

Separation procedures.—The Commission, in cooperation with the National Association of Railroad and Utilities Commissioners, has been engaged in a general revision of the Telephone Separations Manual which sets forth the procedures used by telephone companies to separate and apportion their investment and expenses between interstate and intrastate operations. The purpose of the revision is to incorporate basic changes which have been made in the procedures

since the manual was first issued in 1947 and to adapt the procedures to current operating conditions and regulatory requirements. Work on the revision was nearing completion at the close of the fiscal year.

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.—Bell companies continued their pension systems without change, except that additional companies have 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, and some companies have reduced the minimum service requirement for eligibility of sickness benefits.

The cost of pensions and other benefits (including Federal taxes for social security benefits) of the Bell companies, including those engaged in manufacturing and research, amounted to $312 million in 1956 compared to $287 million in 1955. At December 31, 1956, the pension funds of these companies aggregated about $2,382 million, a net increase of $214 million during 1956. Retired employees receiving service pensions at the end of 1956 totaled 41,745.

Earnings of the Bell companies' pension funds continued at about 3 percent, as in 1954 and 1955. The interest rate assumed for actuarial purposes was changed from 2¾ percent to 3 percent. This has the effect of reducing current pension accruals.

Group life insurance coverage has been extended to certain employees of the Bell companies as well as to employees of the General Telephone System companies.

Uniform systems of accounts.—The Commission amended (Docket 11769) its system of accounts for large telephone companies with respect to the accounting prescribed for station apparatus (principally telephone instruments) and station connections (the wiring connecting station apparatus to the general wire telephone transmission system). Under the revised accounting, station apparatus will be charged to the telephone plant accounts when purchased and will remain there without interruption until finally junked or otherwise disposed of. This will eliminate the present relatively frequent accounting entries for retirement and transfers to and from material and supplies account. Another change makes station connections depreciable whereas they were previously charged to expense upon removal or abandonment. (See also "Depreciation.")

While the mandatory effective date of the revisions is January 1, 1958, the Commission included an option permitting any company to place the revised accounting into effect as of January 1, 1957. All Bell companies and most of the independent companies have taken advantage of this option in order to reduce record-keeping expenses.

A petition by General Telephone Corp., filed on behalf of its operating telephone company subsidiaries, requested an amendment of the system of accounts for large telephone companies to provide that amounts recorded as income tax expense should be unaffected by a taxpayer's decision to use one of the types of liberalized depreciation permitted by section 167 of the Internal Revenue Code of 1954 for tax purposes but not for accounting purposes. Proposed rule making (Docket 11913) requested comments as to appropriate amendments to all systems of accounts prescribed by the Commission. Numerous replies were received from State regulatory agencies, communication carriers, public accounting firms and a labor union, but no final action had been taken by the close of the year.

Original cost accounting.—The accounting for several current acquisitions of plant was considered and approved, including the disposition of amounts in excess of original cost. 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 vendee is still under consideration.

Continuing property records.—Studies were made of various phases of the continuing property record plans and procedures of 6 Bell companies and 3 non-Bell companies. Particular attention continued to be given to the continuing property records maintained for central office equipment.

Field studies and reviews.—Limited studies were made of certain of the accounts and records of 9 Bell companies and 3 non-Bell companies. These studies were directed, among other matters, to the establishment and maintenance of continuing property records, accounting for additions to and retirements of telephone plant and equipment, accounting for improvements to leased buildings, accounting for station apparatus and station connections, and plans for quantity control of items in supply stock. This led to a number of accounting exceptions which resulted in adjustments in the accounts and modifications in the accounting procedures of the companies.

As a result of this work, new procedures have been adopted by the Bell companies providing for cross-indexing to the estimate and cost ledgers of records associated with plant installations requiring the approval of the Commission under section 214 of the act.

NARUC Committees on Accounts and Statistics and Depreciation.—The Commission cooperated with these committees in a number of joint projects of mutual concern to State and Federal regulatory commissions. One such project was the revised rules for station equipment accounts. (See "Depreciation.")

DOMESTIC TELEGRAPH

General

The nation's domestic message telegraph service is carried on almost exclusively by The Western Union Telegraph Co. by means of a nationwide system of wire lines, radio facilities and terminal equipment and through approximately 23,000 offices open to the telegraph using public. Western Union's land lines gross telegraph plant, representing an investment of some $333 million, has been modernized extensively over the past 10 years and includes microwave radio beam equipment and electronic and push-button reperforator switching facilities for speedy transmission of messages as well as teleprinter, ticker and facsimile equipment for terminal handling of record communications. A separate division of Western Union handles a substantial amount of international ocean-cable traffic in competition with other international ocean-cable and radiotelegraph carriers.

Western Union's private line telegraph services are now second only to its message services as a source of revenue, while both of these services together account for 83 percent of all its land lines business. Next in importance are its revenues from money order service, the land line revenue on cable and radio messages, and revenue from press and Government message service.

Western Union's private line telegraph service revenues increased 19.7 percent in calendar 1956 over 1955 as compared with a 19.4 percent increase in similar revenues of the Bell System. The Bell System's telegraph services revenues, including teletypewriter exchange service, increased 14 percent in the same period. Bell's share of total land line telegraph revenues increased slightly to 32.9 percent in 1956.

Gross land line operating revenues of $238,362,000 reported by Western Union for 1956 are the highest in its history and exceeded 1955 revenues by nearly $10 million. Message volume declined some 1.5 percent, from 153,910,000 messages in 1955 to 151,600,000 in 1956. Land line expenses for 1956 increased some 6.5 percent over 1955 due principally to a new labor contract effective June 1, 1956, and to increased rents for operating offices and other facilities. As discussed under "Domestic Telegraph Rates," these cost increases were offset by increases in rates in interstate message, money order and miscellaneous service classifications. Systemwide net income, which includes the operations of Western Union's ocean-cable system, was the highest since 1929 and amounted, in 1956, to $14,208,000, after

providing $8 million for Federal income tax. In 1955 net income of the system was $11,686,000 with $10,476,000 going for Federal income tax.

Western Union's gross land line operating revenues amounted to $123,966,000 for the last half of fiscal 1957, as compared with first half revenues of $122,038,000. Private line telegraph revenues comprised 12.9 percent of total land line revenues, and traffic volume was represented by 73,170,000 messages handled in the latter half of the fiscal year, as contrasted with a private line revenue proportion of 13.4 percent and 74,688,000 messages in the first half. Net income system-wide, including operation of both the land lines and the cable systems, amounted to $6,671,000 for the last half of the fiscal year, after provision of $4,641,000 for Federal income tax. Earnings during this period reflect the full impact of rate revisions that went into effect shortly after the start of the fiscal year, and are affected by the general wage increase.

No major financing or refunding was undertaken by Western Union during the fiscal year. However, in view of a rather substantial budget goal of $40 million established for the calendar year 1957, representing capital requirements for future growth in the private wire, data processing, facsimile, microwave and other fields, the company, in April 1957, set up a finance committee to consider matters of capital financing and fiscal policy. In June 1957, Western Union increased the dividend rate on its capital stock from the 25-cent quarterly rate previously maintained to 30 cents per share, quarterly.

Western Union, during fiscal 1957, continued its program of diversification of investment, acquiring substantial interests in companies whose activities are devoted to manufacturing, research, development, engineering and design associated with Western Union's own expanding development and research activities. Toward the close of the year Western Union obtained an option to acquire an interest in a company that has developed a miniaturized page teleprinter, smaller and lighter than a portable typewriter.

As the fiscal year ended there was pending before the Commission a rate proceeding involving Western Union's petition for increased divisions of charges for its domestic land line handling of international cable and radio messages.

Services and Facilities

Modernization expenditures.—During 1956 Western Union expended $6,266,770 on its modernization program which was designed to provide cheaper and more efficient methods of furnishing telegraph service. The total expenditures for this program through 1956 amounted to $69,271,809. The expenditures on the program through 1955, in 1956 and projected are as follows:

	Prior to 1956	During 1956	Subsequent to 1956 (estimated)	Total
Reperforator switching	$35,026,701	$1,113,619	$7,900,000	$44,040,320
Radio beam	2,851,521	215,454	10,400,000	13,466,975
Carrier equipment	19,589,326	4,495,733	8,700,000	32,785,059
Miscellaneous [1]	5,537,491	441,964	600,000	6,579,455
Total	63,005,039	6,266,770	27,600,000	96,871,809

[1] Largely wire removals.

Western Union estimates that the modernization program has resulted in savings of $35 million a year.

Reperforator switching.—The reperforator switching system was substantially unchanged during 1956. This high-speed automatic and semi-automatic system, substituting electronic for manual transmission of telegrams, has doubled message capacity and increased efficiency and speed in handling messages. Improvements were scheduled during 1957 to provide selective switching for the heavier tributaries at the less modern reperforator centers at Philadelphia, Cincinnati, Atlanta, and Dallas. So-called "small office reperforation" now being operated at Passaic, N. J., is scheduled for Miami, New Haven, and Memphis, in the fall of 1957. Installation of equipment in the New York message center will provide reperforator handling for the Brooklyn branch offices and tieline message files. These types of operation will reduce the number of manual relays and thereby speed up service.

Carrier equipment.—During the year, the company added 286,000 telegraph channel miles bringing the total miles in operation to 4,126,000 as of June 30, 1957, of which 71 percent were voice frequency facilities leased from the Bell System at an annual rental of approximately $4 million. Telegraph channels are derived principally from the use of Western Union carrier equipment on voice frequency channels. Western Union obtains up to 20 telegraph channels from one voice frequency channel by this means.

Radio beam.—The extension of the Western Union microwave system westward from Pittsburgh through Columbus and Cincinnati to Chicago was begun in 1956 and it now appears that these new facilities which will comprise 48 voice bands will be in service early in 1958. The New York-Philadelphia section of the present Western Union radio relay system is to be expanded to its full capacity of 32 voice bands and it is expected to be ready for service on this enlarged basis by the latter part of 1957. Properties were optioned in 1956 for the extension of microwave facilities to Kansas City via St. Louis and Chicago eastward to Detroit and Cleveland. The aerial photographic survey along these two further extended routes will be made in the

summer of 1957 to determine tower requirements. Under present schedules, service would be inaugurated via these projected sections about mid-year of 1959.

Construction of radio facilities.—During fiscal year 1957, Western Union was authorized to construct 23 new point-to-point microwave stations for extending its microwave system westward to Chicago. This extension, which is expected to cost $1,714,000, will provide about 2,240 additional channel miles with a total of 1,820 telegraph channels or 96 facsimile circuits, or various combinations thereof in each direction. Its use will enable Western Union to release a portion of the telegraph circuits it presently leases from the Bell System.

Private wire systems.—Facilities leased to subscribers for private wire telegraph service increased from 2,202,000 miles in 1956 to 2,375,000 miles in 1957, an increase of 8 percent. The telegraph company's growth in private wire service and facsimile fields, revenues from which have increased fivefold since 1947, is continuing at a rate of nearly 20 percent annually. A new, fully automatic custom-built system has been developed to meet the maximum speed requirements of brokerage firms and two such systems have already been installed. Work is progressing on a commercial fully automatic switching system which is expected to be in operation in 1958. The use of private wire telegraph systems to transmit data for processing by business machines and computers is fast becoming a heavy contributor to Western Union's private wire business.

Facsimile and teleprinter tielines.—The telegraph company installed 4,565 deskfax units for patron tielines during the year, bringing the total to approximately 29,500. It is estimated that deskfax installations during the ensuing year will approximate 3,600. The investment for deskfax equipment on patron premises and associated equipment in Western Union offices as of December 31, 1956, amounted to $12.8 million. Indications are that additional installations in 1957 will add $1.5 million to the overall investment in deskfax tieline service. The number of teleprinter patron tieline customers as of June 30, 1957, was 23,000. The 1957 program calls for the replacement of 255 tape printers on customers' premises with page printers. The continuing expansion in these direct connections improves service and materially reduces the need for messengers.

The program of providing heavy volume teleprinter tieline customers with direct connections into the reperforator system which began 3 years ago is continuing gradually. It is expected that such customers will number about 350 in 2 or 3 years.

Construction of wire facilities.—The Commission granted nine Western Union requests for the supplementation of existing facilities

and extensions. They involved the leasing of 319,000 telegraph channel miles at an annual rental of $378,000 and the construction of 568,300 telegraph channel miles and associated equipment at a cost of about $2,393,000. Approximately 90 percent of these facilities are to meet the needs for private wire telegraph services, while the remainder are for extension of lines and improvement in message telegraph service. The development of additional and more diversified facilities by means of the radio relay system will enable the telegraph company to release a portion of the channels currently leased from the Bell System and will provide room for the rapidly expanding teleprinter and facsimile private wire service.

Curtailment of service.—During the year, 931 applications for reduction in hours of service or closure of public telegraph offices were filed, as compared with 710 the previous year. All of these were by Western Union with the exception of one filed by the West Coast Telephone Co. In addition, 87 such applications were pending at the beginning of the year. Of the total, 929 applications were granted, 1 was granted in part, 1 was denied, 1 was dismissed, 8 were withdrawn, and 78 were pending. Generally, where hours were reduced or offices closed, substitute service was made available. Western Union estimates that savings of more than $8 million a year are now being effected due to office closures and hour reductions, 1947 through 1956.

Speed of service.—Pursuant to the Commission's rules, 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 to the Commission. The reports show the average office relay drag (time required for a message to pass through a large message center) and 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). The following table compares the average speed of service in minutes reported for the past 7 fiscal years:

Fiscal year	Message center	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
1957	7.6	39.5	34.3	43.5

The summary shows that generally the improved service attained during fiscal 1955 was held during fiscal 1956 and 1957. This improvement was due in part to the company's expediting efforts in its

reperforator switching centers and its so-called quality control program initiated in 1954 on a systemwide trial basis. Under this plan the filing time of a message becomes the controlling factor in transit, in contrast to the control of service performed in individual offices. Quality control is primarily intended to achieve the goal of handling 100 percent of full-rate messages within 60 minutes from filing time to the time of delivery (or first attempt at delivery) by telephone or tieline, or from filing time to time routed out at the destination office for messages requiring physical delivery.

During the year, inspections of the speed-of-service performance were made by the Common Carrier Bureau offices in New York and San Francisco at 107 telegraph offices located in or near those cities. Similar inspections of 12 other Western Union offices were made by the Commission's field engineers. Studies were also made of telegraph service conditions in 21 large cities following the closure of branch offices in those cities. The studies indicate that service conditions improved substantially as a result of the Commission's on-the-spot check following closure of branch offices. It is planned to make more field studies to determine the adequacy of services and facilities and to determine what measures should be taken to provide improved service where deficiencies exist.

Rates and Tariffs

Domestic telegraph rates.—As reported in 1956, Western Union filed revised tariff schedules on June 29, 1956, which provided for new and increased rates for interstate message, money order, and certain miscellaneous services designed to increase annual revenue by $9,657,000. The increased rates were primarily to offset higher wages resulting from labor contracts. The new schedules became effective on August 26, 1956, and on subsequent dates in 1956 and provided, among other things, for a liberalized discount plan for tieline customers and discontinued collection of additional delivery charges for messages destined to published points beyond the telegraph company's lines, except where another telegraph carrier is involved. Deletion of the additional delivery charges was adopted pursuant to the Commission's suggestions of long standing and is considered to be a major improvement in the domestic telegraph rate structure.

On November 5, 1956, Western Union requested increased and revised divisions of charges for its domestic land line handling of international telegraph message traffic. The proposed divisions of charges were designed by the company to recoup a total of $2,350,000 which had been allocated to this segment of Western Union's services in its prior general rate increases in 1951, 1952, 1954, and 1956. On March 13, 1956, the Commission instituted an investigation (Docket 11953), among other things, into the lawfulness of the charges for domestic

telegraph service and international traffic; of the classifications, practices, and regulations affecting such charges; and of the divisions of charges applicable to the land line handling of international traffic by Western Union within the continental United States. An issue in this proceeding is whether Western Union requires additional revenue in the amount sought in order to satisfy its reasonable requirements for revenue from all its domestic telegraph operations in the continental United States. Hearings were in progress at the close of the year.

Western Union, at the request of the Alaska Communication System, filed revised tariff schedules, effective July 1, 1957, generally increasing charges for the Seattle-Alaska haul of domestic telegraph messages between the United States and Alaska. The increased charges are those of the Alaska Communication System for message telegraph service which it provides over its own facilities between Seattle, Wash., and its stations in Alaska.

Leased facilities services.—As reported last year, 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, which was consolidated with investigations (Dockets 11518 and 11645) of all private line services of the Bell System (except broadcast transmission). This matter is still under consideration. (For details see "Domestic Telephone.")

Tariff schedules.—During the year, telegraph carriers filed 914 pages of tariff material affecting charges and regulations applicable to domestic telegraph service.

Other Regulatory Matters

Original cost of plant and continuing property records.—The Commission determined previously that Western Union's investment in plant and equipment was restated appropriately on basis of original cost, as defined in the Communications Act, and that a system of continuing property records in detailed support of plant ledger balances was established. During fiscal 1957 the Commission gave accounting and rule-making consideration in the light of original cost and continuing property record requirements to the problems created by installations of private wire facilities and equipment leased by Western Union's customers. A study was made of records maintained and accounting performed with respect to substantial improvements to and replacements of leased premises for the purpose of obtaining compliance with original cost and continuing property record rules. A petition for rule making with respect to treatment of completed but unclassified construction work as plant in service had not been acted upon at the close of the fiscal year.

Pensions.—Further review was made of actuarial reports on Western Union's plan for partial funding of employees' pensions, which was established in 1955. It was determined that increased pension charges to operating expense for the calendar year 1956 were due primarily to wage increases. For the ensuing year Western Union contemplates a payment of $3,939,000 to 4,759 pensioners of its land lines system, of which some $1,920,000 is payable from the pension trust fund. Some 32,000 land lines employees are covered by the pension plan.

Miscellaneous accounting matters.—Continuing inquiry was directed to the telegraph carrier's accounting practices and procedures and submission of required reports for the purpose of assuring compliance with prescribed accounting rules and to develop information essential in carrying on the Commission's rate regulatory activities. A reappraisal was made of the field accounting investigative program consistent with these purposes. Particular attention was given to the carrier's use of clearing accounts and the development of overhead loadings to construction and expense. Studies are being made of statistical data indicative of cost of capital for the domestic telegraph carrier.

INTERNATIONAL TELEGRAPH AND TELEPHONE

General

Rapid and efficient international communication through 11 telegraph and telephone carriers was available to the United States public during fiscal 1957.

Telegraph service was provided by 4 ocean-cable and 6 radiotelegraph carriers. While telegraph messages still constituted the bulk of international telecommunications, such customer-to-customer services as international teletypewriter exchange service (TEX or TELEX), as well as a cable service called IMCO, and leased channel services continued to expand at a substantial rate. Radiotelegraph service to ships at sea was furnished by 4 of the radiotelegraph carriers and by 5 mobile marine carriers. At the end of the year the A. T. & T. offered overseas telephone service to 118 points, service having been initiated during the year with Jordan, Saudi Arabia, and Vietnam. Radiotelephone contact was also offered to certain ships at sea equipped for this service.

The volume of international message telegraph traffic rose for the third consecutive year, reaching a new postwar high of 598,515,096 words. This was an increase of 49,940,919 words or 9.1 percent over the previous year, the highest annual gain in the postwar period. Similarly, the number of overseas telephone calls also reached a new high of 1,507,995, or 314,210 (26.3 percent) more than in 1955. A

large part of this increase was due to use of the new transatlantic cable placed in service in September 1956. The revenues from overseas telephone service (including associated land line charges) rose to $15,802,079, which was 21.5 percent higher than the previous year.

The 10 cable and radio carriers furnishing overseas telegraph service reported gross operating revenues of $73,472,449 for calendar 1956, an increase of about 8 percent or $5,422,906 over 1955. Message telegraph revenues increased to $59,762,803 in calendar 1956 or about 6.8 percent over 1955. The balance of the increase in gross revenues was attributable to special services, such as international teleprinter exchange, leased channel, and other nonmessage services. Revenues from such services increased by $1,625,631 or 13.5 percent from the previous year. International teleprinter exchange service continued its rapid growth as the number of calls climbed to 141,541, while the associated revenues rose to $1,883,347, an increase of 53.6 percent.

Gross operating revenues from marine message service to ships and aircraft in calendar 1956 was $1,719,825, which was an increase of $165,556 or 10.7 percent over 1955.

The increase in gross revenues of the international telegraph carriers more than offset an increase of expenses of 4.3 percent and resulted in net revenues, before Federal income taxes, of $12,610,734, which was another postwar high. As of December 31, 1956, international telegraph carriers had a gross investment in communications plant and equipment of $139,818,030; an increase of $4,639,694, or about 3.4 percent over 1955; and a net investment, after depreciation allowances, of $62,188,373.

International Services

Telegraph.—Direct telegraph service by means of submarine cables is provided by United States companies to European and Latin American points. There is now a telephone cable between the mainland and Hawaii which also provides non-message telegraph services.

At the close of fiscal 1957, United States companies were operating direct radiotelegraph circuits from the continental United States to 82 foreign countries and to Hawaii and Puerto Rico. Through interconnection with telegraph systems in other countries, message telegraph service is available from the United States to practically every country in the world.

Services provided include, in addition to the regular message service, radiophoto, program transmission, scheduled transmission service; the various customer-to-customer types of service, such as international teletypewriter services, called TEX or TELEX, as well as a cable service called IMCO; and leased circuits. International teletypewriter services were extended to Argentina, Brazil, Czechoslovakia, Japan, Monaco, Poland, and Southwest Africa. Such serv-

ice is now available between the United States and 33 foreign or overseas points. Cable companies continued to improve their facilities by the addition of undersea repeaters which make possible higher speeds of transmission.

Radiotelegraph companies continue to advance in the use of techniques which make possible the transmission of a larger amount of information in a given space in the radio spectrum. One such recent development is the use of "single sideband" for transmission of telegraph signals.

Under international agreement, each country is required to provide for the settlement of accounts for vessels under its registry of tolls for radiotelegraph traffic exchanged with coastal stations of other administrations. This function for United States ships is carried out by the Commission which, in fiscal 1957, accounted for the following messages and made the following disbursements:

Messages on hand beginning of period	30,297
Messages received during period	156,462
	186,759
Messages processed during period	163,091
Messages on hand June 30, 1957	23,668
Cash on hand beginning of period	$68,577.61
Cash received from American companies during period	244,768.04
Total	313,345.65
Cash disbursed to foreign governments during period	240,419.13
Cash on deposit for disbursement as of June 30, 1957	72,926.52

Telephone.—International telephone service is provided by direct radio circuits from the continental United States to 59 foreign countries and to Hawaii and Puerto Rico.

The new transatlantic telephone cable, opened September 25, 1956, provides service to London and interconnection with European wireline systems to many other points. The need for standby service, plus the fact that telephone traffic has increased since the opening of the cable, makes it necessary to maintain the radio circuits to London at very nearly their former operating capacity.

Construction of a "scatter" system to supplement the cable circuits between Florida and Cuba, authorized in fiscal 1956, was proceeding. Authority was given to include the transmission of TV program material. In addition, a second applicant received a construction permit for a "scatter" transmission system to handle TV program material to Cuba.

Twin submarine telephone cables of the same type as the transatlantic telephone cable, laid between Port Angeles, Wash., and

Ketchikan, Alaska, during the year were opened for service on December 11, 1956.

Twin transpacific cables to Hawaii were opened October 8, 1957.

Applications.—Applications by licensees in the International Fixed Public Radio Services during fiscal 1957 totaled 269, of which 266 were acted upon. Three applications for submarine cable landing licenses were received and acted upon.

Docket Cases

Circuits to The Netherlands and Portugal.—The 1956 annual report noted that RCA Communications, Inc., had appealed from the Commission's reaffirmation (Docket 8777) of its grant of applications filed by Mackay Radio and Telegraph Company to establish radiotelegraph circuits to these points which would compete with circuits operated by RCAC. On October 11, 1956, the court of appeals affirmed the Commission's decision. Certiorari was denied by the Supreme Court on February 25, 1957.

Radiotelephone service to Hawaii.—On September 14, 1956, A. T. & T. applied for renewal of its Dixon, Calif., International Fixed Public radiotelephone station license. Subsequently, on October 30, 1956, RCAC applied for a new point-to-point radiotelephone station in the International Fixed Public Service at Bolinas, Calif., to communicate with Koko Head, Hawaii; service to commence upon the establishment of telephone cable service between the United States and Hawaii. Among other things, RCAC requested the use of 12 frequencies licensed to A. T. & T.; and further requested the substitution of RCAC for A. T. & T. as the operator of the overseas radiotelephone facilities near San Francisco which communicate with the RCAC radiotelephone station in Hawaii. The Commission granted A. T. & T.'s application for renewal of its Dixon station except insofar as it requested renewal of authority to communicate with Hawaii, and to use the 12 frequencies requested by RCAC. The matter was set for hearing (Dockets 11954-5), and the Hawaiian Telephone Company was permitted to intervene. Hearings began June 3, 1957.

Circuits to Turkey.—The 1953 annual report stated that the consolidated hearings on the applications (Docket 10360) of Mackay Radio & Telegraph Co. and RCAC for authority to communicate with Ankara, Turkey, and the application (Docket 10489) of Mackay to communicate with Istanbul, Turkey, were postponed at the request of the parties pending a decision in Docket 8777 (described previously). The applicants are presently evaluating the effect of that decision upon the matter, and will notify the Commission as to their current positions.

Puerto Rico application.—On August 29, 1956, after denying one petition to reopen the record in Docket 10056 and after holding oral argument, the Commission granted a second petition to reopen the record to reflect current data. These hearings ended in January 1957. On May 29, 1957, a supplemental initial decision was issued looking toward a grant of the applications of Mackay Radio & Telegraph Co., Inc., and All America Cables & Radio, Inc., for modification of fixed public radiotelegraph station licenses in Brentwood, N. Y. to permit operation of a radiotelegraph circuit between the United States and Puerto Rico on a regular instead of an emergency basis. On June 17, 1957, RCAC was granted extension of time to July 18 within which to file exceptions.

Delays in handling international press traffic.—In November 1956, Press Wireless, Inc., filed a complaint (Docket 11871) against Western Union alleging excessive delays in the transfer by the latter to Press Wireless of international press traffic specifically routed by the sender via Press Wireless. On March 19, 1957, the Commission designated the matter for hearing, to begin July 9, 1957, and gave Press Wireless leave to file a supplemental complaint for damages, subject to rules provisions with respect to the running of the statutory limitation on the commencement of damages actions.

Review of international radiotelegraph circuits and frequencies.—In November 1946, the Commission ordered a general review (Docket 7974) of the distribution of radiotelegraph circuits and frequencies. Scheduled hearings were postponed indefinitely pending resolution of similar and associated issues in other proceedings before the Commission, and an international conference on the worldwide distribution of radio frequencies. On May 29, 1957, the Commission terminated the proceeding because many of the issues had been resolved and those remaining had become obsolete.

Western Union divestment.—Oral argument on exceptions to the initial decision in the Commission's investigation into the requirement of section 222 of the act and related orders that Western Union divest its international telegraph operations (Docket 10151) was held May 13, 1957, after several postponements and after denial of a Western Union petition to reopen the record to admit evidence of sale negotiations since the close of the record. The matter is waiting final decision.

Negotiations for the divestment of the cables are being currently conducted with American Securities Co., there being a memorandum of understanding between the two companies. Any final agreement will be subject to Commission approval.

Far East traffic.—Hearings began September 11, 1956, on the complaint (Dockets 11364 and 11663) of RCAC alleging that Western

Union was illegally handling traffic to various Far Eastern points over its cable system via London, and alleging that such traffic should be distributed only to the international telegraph carriers entitled to share in traffic designated as destined to "Area C" under the terms of the international formula. The hearings are continuing.

Western Union international formula practices.—In 1955 RCAC had requested (Docket 11298) that the Commission rule upon the lawfulness, under section 222 of the act and the international formula, of certain Western Union practices in soliciting and routing outbound international messages. RCAC also requested reparations. On March 27, 1957, the Commission ordered consolidated hearings to include a petition filed by American Cable & Radio Corp. (Docket 9369) making similar allegations. After a prehearing conference in April 1957, the hearings were postponed indefinitely by agreement of the parties to afford them opportunity to agree on stipulations as to the facts.

Canadian traffic transiting United States.—In 1954 RCAC had requested a ruling that Western Union was in violation of both the international formula and the Canadian formula by failing to transfer to RCAC certain traffic destined for transpacific points which Western Union had received from Canadian National Telegraphs in Canada (Docket 10984). RCAC had also requested an award of damages (Docket 11873). In March 1957, the matter was designated for hearing. American Cable & Radio Corp. operating companies filed a notice of intention to participate. The parties have reached an agreement in this matter and have filed a motion to dismiss the complaint.

Participation under international formula.—In January 1957, Mobile Marine Radio, Mobile, Ala., petitioned under section 222 of the act for participation in the distribution of outbound marine radio traffic by Western Union under appendix 2 of the international formula. The Commission is exploring the possibility of an informal resolution of the matter.

Mackay offer of free automatic equipment for TELEX users.—In December 1956, the Commission instituted an investigation and hearing into the lawfulness of tariff revisions by Mackay Radio and Telegraph Company to furnish automatic teleprinter equipment without charge to users of its TELEX service in the gateway cities and Honolulu (Docket 11900). Prior to the revisions, which were suspended for 3 months by the Commission and subsequently postponed by Mackay, a charge was made for such equipment, although manual equipment was furnished without charge. RCAC, which protested the revisions, was made a party to the proceeding and Globe Wireless, Ltd., filed a notice of participation. On April 22, 1957, an initial decision held the revisions unlawful under sections 201, 202, and 203

of the act. On motion of Mackay, the time for filing exceptions to the initial decision was extended to June 29, 1957.

Nonchargeable tieline designations.—As reported last year, a hearing on the investigation into the lawfulness of the American Cable & Radio Corp. proposed tariff revision to allow a sender to insert a nonchargeable tieline number designation on telegrams addressed to persons connected by tieline to its operating companies (Docket 11761) was postponed indefinitely following cancellation of the proposal by the company. On October 10, 1956, the investigation was dismissed and the proceeding terminated.

Western Union—Globe and Tropical contracts.—As noted in the 1956 report, following affirmation by the court of appeals of the Commission's decision holding illegal certain contracts between Western Union and Globe Wireless Ltd., and Tropical Radio Telegraph Co. for the exchange of international traffic filed with Western Union (Docket 9292), the Commission withheld approval of an agreement for the settlement of damages due Mackay Radio & Telegraph Co., The Commercial Cable Co., All America Cables & Radio, Inc., and RCA Communications, Inc. The parties, however, were afforded an opportunity to present an alternative proposal prior to designating the damages question for further hearing. Such alternative plan, presented March 18, 1957, and approved May 1 thereafter, provided for the transfer of traffic to complainants in lieu of monetary damages. On May 14, 1957, the matter was terminated as to all complainants except Commercial Pacific Cable Co., which was not a party to the damages agreement as it is no longer in business.

Tariff Schedules, Contracts and Miscellaneous Reports

Carriers engaged during fiscal 1957 in furnishing international and marine telegraph services filed 790 tariff schedules, 30 applications for permission to file tariff schedules effective on less than 30 days notice, 159 division-of-tolls statements, 124 reports of negotiations with foreign administrations and carriers, 250 contracts and 975 amendments to contracts. As a result of reorganization by Radio Corporation of America, all the operations of Radiomarine Corporation of America, insofar as they related to common carrier services and the licensing of coastal and ship stations, were assumed by RCA Communications, Inc., in August 1956. The contracts between Radiomarine Corporation of America and shipowners or operators relating to the operation and maintenance of ship radio stations were transferred to RCAC.

Rate Level and Structure

During fiscal 1957 the level of rates for telegraph traffic outbound from the United States remained unchanged. Except for a few

minor upward changes, inbound telegraph rates also remained about the same. No requests were received from international telegraph carriers for revision of the existing rate level. However, a complaint and petition filed by Western Union on November 5, 1956, sought an increase in the charges payable to it for the domestic handling of international telegraph messages. The complaint resulted in a proceeding (Docket 11953) described under Domestic Telegraph. It is not only concerned with the need for and justification of higher divisions to Western Union, but it also involves an investigation into the lawfulness of the present level of charges for handling international message telegrams.

Other Regulatory Matters

Relief and pensions.—One large carrier instituted a group-life insurance program for its ocean-cable employees. Studies were continued to determine, for ratemaking purposes, the effect upon allowable operating expenses of the overall costs of the international telegraph carriers' pension arrangements.

Reclassification of plant.—The classification of the investment in the plant and equipment of the international telegraph carriers on the basis of original cost has been consummated in substantial compliance with the rules and regulations of the Commission.

Depreciation.—Continued progress was made in studies designed to develop information necessary for the Commission to prescribe annual rates of depreciation for the remaining carriers, as required by section 220 (b) of the act. No depreciation rates were prescribed in fiscal 1957, but some are expected for other international telegraph carriers in fiscal 1958. The Commission also continued its consideration, for ratemaking purposes, of the reasonableness of the carriers' annual depreciation rates and charges, their booked depreciation reserves, and the propriety of their depreciation accounting practices and procedures.

Continuing property records.—The Commission continued its general evaluation of the regulatory effectiveness of its rules requiring that each carrier install and maintain a satisfactory property record of its plant and equipment on the basis of original cost. One remaining carrier whose property record had not been completed in fiscal 1956 was merged with another international carrier which previously had installed a satisfactory record. In view of the cooperative efforts of the carriers, and with the advice and assistance of the Commission, substantial compliance by all carriers is expected in fiscal 1958.

Accounting compliance.—Studies and limited field reviews to determine the reasonableness and propriety of the international tele-

graph carriers' accounting practices and procedures were continued by the Commission. These studies are designed to assure substantial compliance with the rules as an essential tool toward implementing effective rate regulation.

STATISTICS

General

Annual reports were filed by 431 common carriers and 5 controlling companies for the calendar year 1956. 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 78 telephone carriers and 340 miscellaneous (nontelephone company) land mobile radiotelephone carriers. Of the 78 telephone carriers, 43 offered mobile radiotelephone service, including 16 carriers not otherwise subject to the reporting requirements of the Commission. The reports of the 340 miscellaneous carriers show that their operating revenues for 1956 totaled $2.2 million. More than half of these carriers reported operating losses for 1956.

Selected financial and operating data concerning telephone carriers for 1956 as compared to 1955 are shown in the following table:

Telephone carriers [1]

Item	1955	1956	Percent of increase or (decrease)
Number of carriers	56	56	
Book cost of plant (as of Dec. 31)	$16,234,470,453	$18,081,317,347	11.38
Depreciation and amortization reserves	$4,100,772,299	$4,332,266,533	5.65
Net book cost of plant	$12,133,698,154	$13,749,050,814	13.31
Local service revenues	$3,254,786,256	$3,554,189,627	9.20
Toll service revenues	$2,049,672,066	$2,276,537,652	11.07
Total operating revenues	$5,564,755,029	$6,122,272,522	10.02
Operating expenses and operating taxes	$4,138,998,516	$4,547,931,559	9.88
Provision for Federal income taxes	$661,258,575	$733,974,937	11.00
Net operating income after all taxes	$764,497,338	$840,366,026	9.92
Net income	$694,527,436	$782,753,906	12.70
Dividends declared	$497,963,286	$563,287,333	13.12
Company telephones:			
Business	14,720,802	15,568,852	5.76
Residence	34,524,486	37,103,938	7.47
Number of calls originating during the year:			
Local [2]	77,273,004,697	81,437,603,661	([3])
Toll [2]	2,713,478,755	2,901,364,425	([3])
Number of employees at end of October	649,190	683,020	5.21
Male	241,722	263,396	8.97
Female	407,468	419,624	2.98
Total compensation for the year	$2,694,237,387	$2,954,335,788	9.65

[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 1956, due to enlargement of numerous local calling areas.

Telephones by States

There were approximately 60,200,000 telephones in use in the United States at the beginning of the calendar year 1957 (excluding approximately 200,000 private line telephones). Of this number 49,440,000 were owned by American Telephone & Telegraph Co. and its principal telephone subsidiaries (Bell System), 1,560,000 by Bell associated companies in Connecticut and the Cincinnati, Ohio, area, and 9,200,000 by independent telephone companies.

A tabulation follows:

State	Total number of telephones	Distribution of telephones by—			
		Ownership		Type of service	
		Bell System	All other	Business	Residence
Alabama	632,300	557,300	75,000	169,300	463,000
Arizona	291,800	282,100	9,700	105,900	185,900
Arkansas	335,700	259,300	76,400	101,600	234,100
California	6,011,500	4,914,700	1,096,800	1,877,200	4,134,300
Colorado	614,900	596,300	18,600	196,700	418,200
Connecticut	1,088,000	22,600	1,065,400	302,400	785,600
Delaware	180,100	180,100		53,500	126,600
District of Columbia	569,400	567,400	2,000	271,100	298,300
Florida	1,314,500	892,500	422,000	465,000	849,500
Georgia	893,000	777,800	115,200	269,100	623,900
Idaho	186,600	147,900	38,700	51,300	135,300
Illinois	3,920,600	3,311,700	608,900	1,187,600	2,733,000
Indiana	1,562,900	962,000	600,900	395,600	1,167,300
Iowa	990,100	626,200	363,900	209,500	780,600
Kansas	762,400	602,600	159,800	185,200	577,200
Kentucky	649,200	439,200	210,000	168,900	480,300
Louisiana	814,400	776,000	38,400	224,900	589,500
Maine	271,000	244,300	26,700	73,000	198,000
Maryland	1,039,000	1,016,800	22,200	280,100	758,900
Massachusetts	2,010,500	2,006,900	3,600	575,600	1,434,900
Michigan	2,818,800	2,556,300	262,500	733,600	2,085,200
Minnesota	1,157,200	903,400	253,800	289,000	868,200
Mississippi	329,900	317,400	12,500	93,600	236,300
Missouri	1,468,600	1,229,700	238,900	401,100	1,067,500
Montana	209,700	181,300	28,400	59,100	150,600
Nebraska	492,800	254,100	238,700	119,900	372,900
Nevada	84,300	42,000	42,300	35,000	49,300
New Hampshire	185,700	176,500	9,200	48,600	137,100
New Jersey	2,417,600	2,372,800	44,800	647,400	1,770,200
New Mexico	208,400	173,100	35,300	81,300	127,100
New York	7,577,900	7,029,300	548,600	2,460,500	5,117,400
North Carolina	882,100	484,900	397,200	253,900	628,200
North Dakota	157,800	104,000	53,800	39,800	118,000
Ohio	3,508,700	2,316,900	1,191,800	891,100	2,617,600
Oklahoma	742,100	648,200	93,900	220,500	521,600
Oregon	610,300	489,500	120,800	172,900	437,400
Pennsylvania	4,306,700	3,627,700	679,000	1,090,000	3,216,700
Rhode Island	301,500	292,400	9,100	83,900	217,600
South Carolina	411,600	313,900	97,700	120,100	291,500
South Dakota	186,400	142,100	44,300	45,600	140,800
Tennessee	912,000	799,100	112,900	241,400	670,600
Texas	2,754,000	2,310,500	443,500	858,500	1,895,500
Utah	286,100	270,300	15,800	81,100	205,000
Vermont	112,800	98,800	14,000	30,100	82,700
Virginia	1,051,100	849,600	201,500	307,600	743,500
Washington	1,013,500	808,200	205,300	290,400	723,100
West Virginia	456,900	406,500	50,400	115,500	341,400
Wisconsin	1,300,200	957,400	342,800	348,900	951,300
Wyoming	107,800	98,300	9,500	34,300	73,500
United States	60,190,400	49,437,900	10,752,500	17,358,200	42,832,200

Land Line Telegraph

The following table sets forth financial and operating data relating to the domestic land line operations of the Western Union Telegraph

Company for the calendar year 1956 as compared to 1955. 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	1955	1956	Percent of increase or (decrease)
Book cost of plant (as of Dec. 31)	$310, 967, 883	$332, 726, 471	7.00
Depreciation and amortization reserves	$135, 826, 081	$141, 489, 718	4.17
Net book cost of plant	$175, 141. 802	$191, 236, 753	9.19
Message revenues	$188, 854, 951	$192, 473, 810	1.92
Total operating revenues	$228, 816, 199	$238, 361, 660	4 17
Operating expenses, depreciation and other operating revenue deductions	$206, 024, 140	$219, 231, 379	6. 41
Net operating revenues	$22, 792, 059	$19, 130, 281	(16. 07)
Provision for Federal income taxes	[2] $9, 613, 288	[2] $6, 665, 000	(30. 67)
Net income	$10, 330, 982	$12, 059, 604	16. 73
Net income (land line and cable systems)	$11, 686, 415	$14, 207, 510	21. 57
Dividends (land line and cable systems)	$5, 695, 383	$6, 226, 395	9. 32
Number of revenue messages handled [3]	153, 910, 153	151, 599, 945	(1. 50)
Number of employees at end of October	37, 785	37, 754	(0. 08)
Total compensation for the year	$143, 289, 324	$153, 624, 446	7. 21

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

[2] Reflects estimated reductions in Federal income tax liability of $274,000 and $1,248,000 in 1955 and 1956, respectively, arising from the utilization, for income tax purposes but not for accounting purposes, of a liberalized depreciation method recognized by section 167 of the Internal Revenue Code of 1954. Also reflects estimated reductions in Federal income tax liability of $477,000 in both 1955 and 1956 arising from the use of 5-year amortization authorized under sec. 168 of the Internal Revenue Code of 1954.

[3] Includes domestic transmission of transoceanic and marine messages (about 8,996,000 in 1955, and about 9,604,000 in 1956).

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 1956 to those for the previous year.

Radiotelegraph carriers

Item	1955	1956	Percent of increase or (decrease)
Number of carriers	7	7	----------
Book cost of plant (as of Dec. 31)	$41, 952, 129	$45, 450, 062	8. 34
Depreciation and amortization reserves	$18, 459, 646	$19, 603, 028	6. 19
Net book cost of plant	$23, 492, 483	$25, 847, 034	10. 02
Message revenues:			
Domestic [1]	$2, 053, 155	$2, 285, 729	11. 33
Transoceanic	$23, 780, 911	$26, 525, 460	11. 54
Marine	$1, 554, 269	$1, 719, 825	10. 65
Total operating revenues	$34, 590, 802	$39, 102, 062	13. 04
Operating expenses, depreciation and other operating revenue deductions	$29, 207, 577	$31, 039, 618	6. 27
Net operating revenues	$5, 383, 225	$8, 062, 444	49. 77
Provision for Federal income taxes	$3, 473, 747	$4, 307, 600	24. 00
Net income	$3, 533, 997	$4, 057, 682	14 82
Dividends declared	$650, 000	$600, 000	(7. 69)
Number of revenue messages handled:			
Domestic [2]	50, 971	50, 111	(1. 69)
Transoceanic	11, 853, 461	12, 951, 547	9 26
Marine	1, 010, 338	1, 105, 356	9. 40
Number of employees at end of October	5, 148	5, 241	1. 81
Total compensation for the year	$23, 451, 160	$24, 819, 044	5. 83

[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	1955	1956	Percent of increase or (decrease)
Number of carriers	3	3	
Book cost of plant (as of Dec. 31)	$93, 226, 207	$94, 367, 968	1. 22
Depreciation and amortization reserves	$57, 971, 725	$58, 026, 629	. 09
Net book cost of plant	$35, 254, 482	$36, 341, 339	3. 08
Message revenues:			
Domestic [1]	$196, 432	$201, 871	2. 77
Transoceanic	$22, 908, 230	$23, 330, 466	1. 84
Total operating revenues	$33, 458, 741	$34, 370, 387	2. 72
Operating expenses, depreciation and other operating revenue deductions	$29, 158, 127	$29, 822, 097	2. 28
Net operating revenues	$4, 300, 614	$4, 548, 290	5. 76
Provision for Federal income taxes	$2, 854, 712	$1, 475, 000	(48. 33)
Net income	$1, 486, 516	$2, 128, 260	43. 17
Dividends declared [2]	$883, 670	$883, 670	
Number of revenue messages handled:			
Domestic [3]	105, 081	104, 154	(. 88)
Transoceanic	10, 489, 882	10, 824, 602	3. 19
Number of employees at end of October	5, 919	6, 065	2. 47
Total compensation for the year	$15, 924, 564	$16, 469, 250	3. 42

[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

During calendar 1956 a total of 598,515,096 words were handled into and out of the United States by international cable and radiotelegraph carriers. In the outbound direction 305,791,956 words were transmitted, while 292,723,140 words were inbound. The 6 radiotelegraph carriers handled 332,114,010 words, or about 55.5 percent of the total, while the 4 cable carriers handled 266,401,086 words, or 44.5 percent. The word volume of international telegraph traffic exchanged between the United States and each of the principal countries of the world during calendar 1956 is set forth in the table on the following page.

United States—International telegraph (radio and cable) traffic in words, 1956 (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	172, 640	137, 168
Arabia	1, 150, 846	1, 033, 412
Austria	1, 860, 769	1, 624, 569
Azores	101, 591	62, 904
Belgian Congo	350, 948	261, 295
Belgium	5, 327, 178	4, 334, 599
British East Africa	398, 635	366, 064
British West Africa	337, 999	341, 496
Canary Islands	111, 809	40, 230
Cyprus	78, 776	166, 730
Czechoslovakia	678, 047	1, 168, 968
Denmark	1, 960, 558	1, 255, 684
Egypt	2, 597, 996	3, 204, 271
Ethiopia	231, 190	161, 553
Finland	635, 038	626, 820
France	15, 993, 332	15, 024, 383
French West Africa	155, 013	160, 943
Germany	16, 339, 006	13, 441, 802
Greece	1, 974, 055	1, 439, 918
Hungary	618, 427	812, 914
Iceland	258, 596	280, 628
Iran	1, 123, 656	1, 090, 999
Iraq	790, 093	942, 653
Ireland	862, 437	913, 482
Israel	2, 925, 503	2, 707, 249
Italy	12, 923, 360	9, 434, 762
Lebanon	1, 099, 456	1, 179, 683
Liberia	685, 848	741, 197
Libya	183, 819	101, 873
Luxembourg	124, 465	98, 059
Madagascar	120, 875	112, 905
Morocco-French	509, 919	503, 127
Morocco-Tangier	424, 630	502, 687
Netherlands	7, 948, 344	6, 460, 379
Norway	3, 133, 295	2, 067, 447
Persian Gulf	478, 474	534, 774
Poland	1, 103, 071	1, 500, 006
Portugal	1, 213, 091	948, 939
Rhodesia	166, 837	167, 307
Roumania	376, 080	332, 221
Spain	3, 653, 944	2, 372, 793
Sweden	3, 904, 923	3, 515, 612
Switzerland	8, 469, 978	5, 421, 208
Syria	266, 560	209, 897
Transjordania	250, 062	438, 770
Trieste, Free Territory of	122, 047	98, 079
Turkey	1, 331, 299	1, 409, 871
Union of South Africa	2, 649, 708	2, 764, 721
U. S. S. R.	6, 112, 705	4, 612, 197
United Kingdom	50, 570, 204	52, 985, 546
Vatican City	138, 866	102, 822
Yugoslavia	1, 081, 199	1, 060, 039
All other places	746, 853	1, 548, 810
Total	166, 824, 050	152, 826, 465
West Indies, Central, North, and South America		
Argentina	6, 579, 780	7, 847, 284
Bahamas	1, 229, 597	1, 216, 489
Barbados	287, 698	210, 678
Bermuda	969, 159	845, 812
Bolivia	894, 427	816, 964
Brazil	9, 742, 455	9, 396, 365
British Guiana	237, 303	225, 160
British Honduras	167, 995	161, 606
Canada [1]	10, 613, 144	12, 869, 582
Canal Zone	724, 684	699, 730
Chile	2, 893, 976	2, 357, 076
Colombia	5, 512, 151	5, 068, 209
Costa Rica	1, 014, 426	779, 261
Cuba	7, 265, 353	10, 168, 954
Dominican Republic	1, 887, 232	1, 583, 437
Ecuador	1, 669, 481	937, 017
Guatemala	1, 743, 893	1, 675, 110
Haiti	1, 048, 082	847, 763
Honduras Republic	828, 838	786, 279
Jamaica	1, 264, 584	931, 577
Mexico [2]	2, 048, 352	1, 320, 144
Netherlands West Indies	1, 183, 697	1, 130, 826
Nicaragua	954, 410	661, 816
Other British West Indies [3]	272, 593	195, 586
Panama	1, 590, 293	1, 136, 523
Paraguay	287, 275	249, 221
Peru	2, 587, 503	2, 288, 137
Puerto Rico	5, 108, 454	4, 647, 947
Salvador	1, 106, 693	939, 499
Surinam	165, 716	133, 678
Trinidad	969, 814	746, 240
Uruguay	2, 143, 376	2, 081, 047
Venezuela	10, 119, 640	12, 370, 563
Virgin Islands	327, 587	294, 819
All other places	243, 477	151, 896
Total	85, 683, 138	87, 772, 295
Asia and Oceania		
Afghanistan	382, 092	83, 742
Australia	4, 216, 944	3, 528, 557
Burma	686, 882	179, 636
Ceylon	545, 863	398, 094
China (Excluding Hong Kong)	215, 039	88, 607
Formosa	1, 487, 819	1, 321, 977
Guam	420, 829	570, 945
Hawaii	5, 365, 833	4, 417, 925
Hong Kong	2, 113, 975	1, 879, 438
India	4, 990, 164	4, 407, 027
Indochina	690, 896	1, 159, 285
Indonesia	2, 001, 345	3, 760, 154
Japan	17, 700, 763	15, 931, 726
Korea	1, 377, 063	2, 030, 689
Malaya, Federation of	1, 838, 071	1, 362, 479
New Caledonia	227, 844	26, 986
New Zealand	1, 183, 933	1, 026, 775
Okinawa	545, 070	760, 672
Pakistan	1, 292, 413	1, 584, 179
Philippines	4, 656, 629	5, 457, 635
Thailand (Siam)	1, 022, 947	1, 042, 726
All other places	261, 860	391, 434
Total	53, 224, 274	51, 410, 688
Unknown destination or origin	60, 494	713, 692
Grand total	305, 791, 956	292, 723, 140

[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 U. S. 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 U. S. carriers via the United States.

[3] Points not listed separately.

Common Carrier Applications

Nearly 6,300 applications were filed with the Commission by common carriers during the fiscal year (exclusive of Alaskan and marine mobile). The following table shows the number of applications according to class of service:

Class	Pending June 30, 1956	Received	Disposed of	Pending June 30, 1957
Radio facilities				
Domestic:				
Pt/pt microwave radio stations	167	1,699	1,694	172
Local television transmission stations	1	26	26	1
Rural radio stations	6	174	144	36
Domestic public land mobile radio stations	65	826	822	69
Developmental stations	2	28	25	5
Registration of Canadian radio station licensees		26	26	
International:				
Fixed public telegraph	6	222	219	9
Fixed public telephone	2	46	46	2
International control		1	1	
Subtotal	249	3,048	3,003	294
Wire facilities				
Telephone extensions	10	192	195	7
Telegraph extensions	1	31	32	
Telephone reductions	3	12	14	1
Telegraph reductions	85	936	950	71
Subtotal	99	1,171	1,191	79
Miscellaneous				
Interlocking directorates	5	27	31	1
Submarine cable landing licenses		3	3	
Petitions or motions (nondocket)		5	5	
Renewals		2,008	1,988	20
Subtotal	5	2,043	2,027	21
Total	353	6,262	6,221	394

Safety and Special Radio Services

GENERAL

The Safety and Special Radio Services comprise most of the nonbroadcast services and are the largest in number of radio stations authorized by the Commission. Their authorizations collectively now exceed 375,000 representing the use of nearly 1,200,000 transmitters. These services are divided into four general classes:

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.

These services benefit the public directly by increased efficiency of police and fire protection, safety in navigation by ships and aircraft, speeding emergency calls for doctors, ambulances, tow trucks, etc. Indirect public benefits are received through the ever increasing employment in industry and commerce of modern radio equipment to provide better service at lower cost.

The limited number of frequencies allocated these services requires sharing their use between licensees and between services, which poses complex problems in licensing and regulation. Although the Commission is continually evolving ways to better utilize frequencies, a high level of compliance with regulations is required to obtain their full benefit.

The application workload, as it increases each year, presents the additional problem of maintaining a reasonable processing time geared to these fast-moving services. At present, the average time from the filing of an application to the receipt of an authorization is slightly more than 4 weeks. At the growing rate of applications—over 186,000 last year—it is doubtful whether this processing schedule can be maintained.

PRIVATE MICROWAVE SYSTEMS

On November 9, 1956, the Commission released its preliminary notice in the matter of allocating frequencies in the bands above 890 megacycles (Docket 11866). This proceeding, which began May 20, 1957, may result in several rulemaking proceedings, not only affecting frequency allocations but also regulations governing the many services involved.

The hearing was held to obtain evidence on all phases of the operation of existing and proposed point-to-point communication systems. Included were present and future demands for frequencies for point-to-point service, both common carrier and private; possible areas of harmful interference between systems; standards of eligibility; sharing privileges by two or more persons of the same system; sharing of frequency bands by private systems, common carrier systems, and industrial, scientific, and medical operations; consideration of the availability of common carrier facilities as a condition of eligibility; obligation on the part of the Commission under the Communications Act to protect the users of the common carrier services; engineering standards for equipment; and possible restrictions on the use of certain frequency bands.

Pending the outcome of this proceeding, certain private point-to-point radio communication systems are receiving developmental grants for 1 year, subject to renewal.

MARINE RADIO SERVICES

Safety at Sea

Communications Act requirements.—Part II of title III of the Communications Act, in effect, carries out the radio provisions of the International Convention for the Safety of Life at Sea, London, 1948. Briefly stated, it requires that all United States ships navigated in the open sea, except cargo ships of less than 500 gross tons and other vessels specifically exempted, be provided with efficient radio installations operated by a qualified operator. These provisions apply also to ships of countries not signatory to the convention when they use United States ports. Cargo ships of 1,600 gross tons and upwards, also passenger ships, are required to be radiotelegraph equipped. Cargo ships of between 500 and 1,600 gross tons may carry radiotelephone instead. Approximately 60 passenger ships and 1,228 cargo ships of United States registry use radiotelegraph, while 93 United States cargo ships elect to carry radiotelephone.

A new part III of title III of the same act requires that each United States vessel transporting more than 6 passengers for hire on the open sea or on tidewaters be equipped with radiotelephone unless specifically exempted by the Commission or unless equipped with

radio in accordance with the preceding paragraph. Part III became effective March 1, 1957, and affects an estimated 5,000 vessels.

Great Lakes agreement.—The agreement between the United States and Canada for the promotion of safety on the Great Lakes by means of radio, which became effective November 13, 1954, applies with certain exceptions to ships of all countries which are of 500 gross tons or over and to passenger carrying vessels over 65 feet in length while navigated on the Great Lakes. Each such ship is required to have a radiotelephone installation of not less than 50 watts output power, with a certified operator or operators. Approximately 400 United States ships are subject to this pact.

Safety at sea legislation.—Public Law 947, enacted in August 1956, resulted from a series of bills, including H. R. 4090. The latter, introduced in February 1955, sought to require installation of an automatic radio call selector on United States cargo ships carrying less than 2 qualified radio operators. It passed the House, but the Senate deleted the bill's provisions in their entirety and, instead, directed the Federal Communications Commission, the United States Coast Guard, and the Maritime Administration to make a joint study of the need for automatic radiotelegraph call selectors on ships, as well as other safety devises, and to report to Congress by March 1, 1957. The House agreed to the Senate substitution and the President approved the bill in August 1956. The three agencies formed the Public Law 947 Inter-Agency Committee which, after making the directed study, recommended that no legislation be enacted to require installation of automatic radiotelegraph call selectors.

As a part of the study, tests were made of a typical modern shipboard auto alarm receiver and an automatic receiving call selector designated by the manufacturer as an "automatic radiotelegraph call selector." Tests also were made of a selective calling radio communication system, which included a tape printer. The availability of a teleprinter system for the maritime mobile service is considered significant in the matter of possible future "automation" of marine radiotelegraph communication circuits since it provides a simple method for recording messages without the presence of an operator.

Exemptions from compulsory radio requirements.—In May 1957, the Commission exempted all United States passenger vessels of less than 100 gross tons subject to part II of title III of the act, but not subject to the radio provisions of the safety convention, from the radiotelegraph provisions of part II, provided that the vessels complied with the new part III and were not navigated more than 50 nautical miles from the nearest land.

Formal applications for exemption from part III numbered 276. Of these, 82 were considered and 2 granted. In addition, a request

for blanket exemption for vessels of a certain class was denied. Grant of temporary exemptions totaled 146.

Of 28 formal applications for exemption from part II, 2 were granted. These included 5 cargo ships ranging in size from 1,040 to 4,005 tons and one passenger vessel of 1,776 tons. Four passenger ferries of from 887 to 1,417 tons, not subject to title III but subject to the safety convention, were exempted from the latter's requirements provided they met the radiotelephone provisions of part II. Five informal requests for emergency exemption from part II were received and granted to enable the affected vessels to proceed to port where defective radio equipment could be repaired.

Distress studies.—Due to a continued lack of personnel, studies of distress communications pursuant to section 4 (o) of the act have been virtually at a standstill. However, a special study of radio communication in the *Andrea Doria-Stockholm* disaster of July 1956 was completed and a report made to the House Committee on Merchant Marine and Fisheries, as requested.

Radio aids to navigation.—At the end of the fiscal year 3,353 United States vessels held authorizations to operate ship radar stations. Five shore radar stations were authorized on a developmental basis primarily to assist in the piloting of ships entering and leaving a harbor, and two developmental shore radar stations were granted to help navigate vessels engaged in construction projects and oil well drilling in the Gulf of Mexico.

Equipment and Technical Advancement

Type-acceptance program.—In anticipation of the requirement that shipboard radiotelephone transmitters operating on frequencies below 30 megacycles and licensed after June 1, 1958, be type accepted, various manufacturers voluntarily obtained acceptance of 14 types of such equipment.

On request by the American Merchant Marine Institute, Inc., the Commission amended its rules so that recently adopted standards concerning limitation of spurious emisson would not apply to shipboard radiotelegraph transmitters licensed prior to June 1, 1958, when held by the same licensee or on board the same vessel after that date.

Radio Technical Commission for Marine Services (RTCM).—The Radio Technical Commission for Marine Services completed 4 additional technical studies pertaining to the advancement of marine electronics. The RTCM, with a membership of 7 Government and 130 non-Government agencies, considers marine telecommunication problems and related matters for the purpose of providing guidance to, and coordinating the efforts of, organizations concerned. The Commission provides an electronics engineer as Executive Secretary

and office space for the secretariat. A former FCC Commissioner is Chairman of the RTCM and the Assistant Chief of the Telecommunications Division of the Department of State is the vice chairman.

Technical studies completed during the past fiscal year were:

Special Committee No. 25 reported on the "Minimum Performance Standards for Maritime Mobile Radiotelephone Equipment Operating in the 2–3 Megacycle Band." It was submitted to the Radio-Electronics-Television Manufacturers Association for approval as manufacturers' standards for the guidance and protection of the purchasers of this type of equipment.

Special Committee No. 34 issued a nontechnical paper to encourage, through educational measures, the proper use of 2-megacycle radiotelephone equipment and improve circuit utilization.

Special Committee No. 33 reported a study of the problems and procedures involved, both domestic and international, in possibly changing the operation of the mobile maritime service of telephony from the "double sideband" to the "single sideband" type of system with the primary objective of providing additional communication channels for this service.

Special Committees are continuing studies of the following subjects:

Special Committee No. 35, on the requirements for maritime long distance aids to navigation.

Special Committee No. 36, on the problem of interference to the VHF maritime service which is caused in some areas by "intermodulation" between stations of this service and TV broadcast stations.

Special Committee No. 37, on the present and future radio frequency spectrum requirements for the various marine services.

Special Committee No. 38, on recommendations for the electronic equipment for the new commercial nuclear ship to be constructed by the Maritime Administration.

An RTCM committee, at the request of the Department of State, prepared a report used as the basis for instructions to the United States delegation to the international meeting on VHF radiotelephone at The Hague in January 1957. Another RTCM committee is considering the recommendations contained in House Report 2969, "Safety of Life at Sea Study."

Single-sideband radiotelephone system.—Interest continues to be shown by operators and manufacturers in a wider use of the single sideband system for radiotelephony in the maritime mobile service. At least one manufacturer is developing a high frequency shipboard transmitter capable of both radiotelegraph and single sideband radiotelephone emission.

2182-kilocycle calling and distress frequency.—Licenses for public coast stations using frequencies for telephony within the band 1600 to 3500 kilocycles were subject to renewal during the year. They were reviewed for compliance with a new requirement which provides, in effect, that the transmitting and receiving maritime safety coverage on the radiotelephone calling and distress frequency of 2182 kilocycles must not be less than on associated working frequencies. New equip-

ment for use on this frequency was added in some cases to achieve the necessary additional coverage. The majority of applications, however, showed that duplication of transmitting and receiving facilities was not necessary at all locations to provide the necessary maritime safety coverage.

Improvement in techniques and equipment.—In connection with determining the level of interference that has developed from intermodulation of television picture and sound carrier frequencies and VHF maritime transmitter carrier frequencies, the Commission authorized the use of frequencies for shipboard tests which would provide for a separation of 4.6 megacycles between ship and coast station frequencies instead of the 4.5 megacycle separation previously deemed satisfactory.

The Commission also authorized tests on ship radiotelegraph high frequencies to determine whether ship-to-shore transmission of data by means of 5-unit tape is practicable.

Marine Radio Communications Systems

Coast stations.—As of June 30, 1957, the number of public coast and limited coast stations, other than those in Alaska, providing communication service to ships is shown in the following table:

Frequency band and range	Public	Limited
Telephony in 2-3 megacycle band (medium range)	48	11
VHF telephony (short range)	38	203
HF telephony (long range)	4	2
Telegraph, LF, MF, HF (medium to long range)	28	1

Marine fixed stations.—The number of marine fixed stations is 82. They are used primarily for safety purposes and, on a secondary basis, for communication concerning off-shore oil-well drilling operations.

Great Lakes weather transmissions.—The service rendered by Great Lakes public coast radiotelephone stations in transmitting weather data to ships during the navigation season, and to vessels operating on Lakes Superior and Michigan during the winter, was authorized on a continuing basis without any change in the weather reporting schedules already in effect, or the frequencies already authorized for this purpose.

Implementation of Geneva frequency plan.—The Atlantic City (1947) frequency allocations and the Geneva (1951) agreement covering frequencies below 27 megacycles for the maritime mobile service have virtually been implemented. With few exceptions, all ship and coast stations are now operating in accordance with the new frequency assignments.

Operation in 152–162 megacycle band.—On January 21, 1957, a Baltic-North Sea Maritime VHF Telephone Conference convened at The Hague to devise, among other things, a channeling and channel-usage plan that could be standardized in Baltic-North Sea areas in the maritime mobile service. The resulting agreement, although regional in nature, will, as a result of the forthcoming 1959 international radio conference, have an impact upon maritime mobile service throughout the world. If United States ships are to obtain VHF communication service in European ports and, conversely, European ships are to receive VHF communication in United States ports, it is to the advantage of interested administrations to standardize the same basic technical factors to the maximum extent possible.

For its part, the Commission proposed to amend its rules to halve the spacing between assignable public correspondence ship station frequencies at 157.3–157.4 megacycles and the corresponding assignable public correspondence coast station frequencies at 161.90–162.00 megacycles, thus making the additional frequencies 157.35 and 161.95 megacycles available for assignment to ship and coast stations, respectively. Simultaneously, it proposed to rearrange the pairing of coast and ship station frequencies for public correspondence in this portion of the spectrum.

Special communication for laying cable to Hawaii.—The Commission authorized the American Telephone & Telegraph Co. and RCA Communications, Inc., to establish class II–B limited coast stations near San Francisco, Calif., and Kahuka, Hawaii, respectively, to communicate with the cable ships *Monarch* and *Ocean Layer* from July through September 1957 to safeguard lives and coordinate testing during the laying of the submarine telephone cable between Point Arena, Calif., and Hanauma Bay, Hawaii.

Developmental control and relay microwave system.—Interest continued in the use of microwave systems. Lafferty Transportation Co., Coeur d'Alene, Idaho, received grants for marine control and marine relay stations operating on microwave frequencies in the 900 megacycle band for remotely controlling a VHF limited coast station at Mica Mountain, Idaho. The Bronx Towing Lines, Inc., applied for a microwave link between New York City and New Canaan, Conn., to control a VHF limited coast station at New Canaan used to communicate with its tugboats in Long Island Sound.

Great Lakes VHF public coast applications.—Consolidated hearing on the applications of Wisconsin Telephone Co. and the Ohio and Michigan Bell Telephone companies for new VHF public class III–B coast stations on the Great Lakes was concluded in December

1956. The hearing examiner's initial decision on August 7, 1957, recommended denial.

Ship-shore radiotelephone public correspondence.—The hours of operation of the frequency pair 2482 kilocycles (coast)—2430 kilocycles (ship) at Seattle, Wash., were extended somewhat by finalization of the Commission's proposal in Docket 11617. In another action, the Commission made the daytime frequency pair 2490 kilocycles (coast)—2031.5 kilocycles (ship) available at Miami, Fla., on a 24-hour basis.

On May 29, 1956, the Commission invited comments 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 Atlantic and Pacific coasts for telephone communication with oceangoing vessels. The submitted comments were under consideration at the close of the year.

That part of the Commission's order of July 6, 1956, which deleted the frequencies 6240 and 6455 kilocycles for use on the Mississippi River System for ship-shore public correspondence, effective February 1, 1957, was stayed by Commission action of January 17, 1957, pending determination of petitions for a reconsideration.

The Commission denied a request of Mobile Marine Radio of Mobile, Ala., to make the Mississippi River frequencies available for assignment to one or more coast stations in the vicinity of Mobile to serve ships on the Gulf Intracoastal Waterway and the Alabama River System and connecting inland waters.

Provisions for public ship-to-shore radiotelephony to serve the safety and operational communication needs primarily of pleasure boats on interior waters was made by the adoption of rules to permit the use of the general intership frequency 2638 kilocycles conditioned to noninterference to its intership use in other areas and, further, on showing that the use of VHF is impractical.

An application by Cumberland River Sand & Gravel Co. to establish a new limited class II–B coast station at Nashville, Tenn., was designated for hearing. It was subsequently dismissed without prejudice at the applicant's request. The latter is considering a different type of station.

Improvement of facilities and frequencies.—Improvements in marine facilities and frequencies were accomplished as follows:

A new public class III–B coast station was established by Southern Bell Telephone & Telegraph Co. at Memphis, Tenn., to improve service to vessels equipped to operate on VHF frequencies along the Mississippi River.

To eliminate harmful interference to Great Lakes stations, the frequency pair 2514 kilocycles (coast)—2118 kilocycles (ship) for use

at Miami, Fla., was limited to "day only" operation from April 1 to December 15, annually (unlimited hours of use the rest of the year).

Rule making was proposed which would make the frequency pair 2466 kilocycles (coast)—2009 kilocycles (ship) available on a 24-hour basis at Tampa, Fla., and simultaneously, would make effective certain limitations on the previously unlimited use of the frequency pair 2550 kilocycles (coast)—2158 kilocycles (ship) in the same area to further protect Great Lakes communication.

Public Fixed and Maritime Stations in Alaska

Radio communication in Alaska.—Alaskan communities, except the larger cities served by Alaska Communication System (ACS) trunk lines, depend largely on radiotelephone and radiotelegraph service. Frequencies are allocated for this purpose.

The new frequency assignment plan for Alaskan coast, fixed, and ship stations became fully effective on May 1, 1957.

Study of duplicate public facilities in Alaska.—The problem of duplication of public facilities in the fixed service in Alaska is being studied by a committee of Commissioners. Industrial interests claim a need for private systems in cities and towns where public facilities, either non-Government or Government, are already established. Under present rules, other public stations are precluded from operating at such locations. The study, which had not been completed at the end of the fiscal year, is to determine whether the public interest would be served by modifying this policy or making some other provision for nonpublic operations in Alaska.

There were, exclusive of Government stations, 986 public fixed stations and public coast stations in Alaska.

AVIATION SERVICES

General

Radio is relied upon to perform a variety of communication and navigational functions in connection with the safe, expeditious, and economical operation of aircraft. Aviation radio facilities (except those directly owned and operated by the Federal Government) are regulated and licensed by the Commission. These facilities are grouped into broad classes of ground and airborne stations, based on the function performed, and include air carrier aircraft, private aircraft, aeronautical en route, aeronautical fixed, operational fixed, aeronautical advisory, aeronautical utility mobile, airdrome control, flight test, flying school, radionavigation, aeronautical public service aircraft, and Civil Air Patrol.

Aviation radio authorizations were approaching 50,000, with over 62,000 transmitters.

Aviation Organizations and Conferences

To keep abreast of the rapid technological advances in the field of aviation and to cope with the many new problems created by the expanding needs of civil aviation, the Commission participates actively in the work of various coordinating groups on technical and policy matters. The more significant include the Air Coordinating Committee (ACC), and International Civil Aviation Organization (ICAO), and the Radio Technical Commission for Aeronautics (RTCA).

Air Coordinating Committee.—The ACC is responsible to the President for coordinating Federal aviation policy. It examines aviation problems and developments affecting more than one participating agency, develops and recommends actions to be taken by responsible agencies, and, to the extent permitted by law, coordinates their aviation activities.

Many of the problems considered by the ACC relate to aeronautical telecommunications and are, therefore, of concern to the Commission. Besides being a full member, the Commission is represented on the following subordinate components: Executive Council; Technical Division, Airspace Panel; Aeronautical Communications and Electronic Aids Subcommittee; Search and Rescue Subcommittee; Airmen Qualifications Subcommittee; Aerodrome, Air Route, and Ground Aids Subcommittee, and the Air Traffic Control and Navigation Panel.

Some of the current ACC problems which concern the Commission are: recommendations pertaining to the construction of antenna towers which may be a hazard to air navigation; "common system" operational requirements for short-distance Rho/Theta Navigation Systems (VORTAC); formulation of policies for the guidance of United States representatives to the ICAO; and preparation of positions for the use of United States delegations to international conferences on such matters as allotment of VHF frequencies for air-ground use, single sideband system characteristics for air-ground communication, standardization of long distance navigation systems, use of ionospheric scatter techniques for communication on international air routes, geographical separation criteria for VHF facilities, principles and procedures for international radiotelephone network operation, and system planning for use of selective calling devices.

To implement ACC recommendations regarding the joint use of airspace by the aviation and broadcast industries, the Commission in fiscal 1957 proposed legislation which, if adopted, would require the continued lighting and marking of abandoned antenna structures. Separate proposals look to regulating the construction of radio receiving towers and to require the grouping of tall transmitting towers, to

the extent possible, within areas (antenna farms) designated for that purposes. (See also "Antenna Obstruction Markings.")

International Civil Aviation Organization.—The Commission took an active part in the preparation of United States positions for 10 separate international conferences held under the sponsorship of ICAO; for example, the Sixth Session of the ICAO Communications Division, the South American-South Atlantic (SAM–SAT) Regional Air Navigation Conference, the Third European-Mediterranean (EUM/MED) Regional Air Navigation Conference, and the Special EUM/MET/COM Meeting.

Radio Technical Commission for Aeronautics.—The RTCA is a nonprofit cooperative association comprised of both Government and industry aeronautical telecommunications groups. It studies aeronautical telecommunications problems and related matters with a view toward resolving them by mutual agreement among the member agencies. Its findings are in the nature of recommendations to all United States organizations concerned.

The general membership of RTCA, known as the assembly, is composed of over 100 groups. Membership is voluntary and is open to organizations actively identified with any phase of aviation radio. The Commission is represented on the RTCA executive committee and many of its subcommittees. During the year, the Commission participated in special technical subcommittee studies of the following subjects: operational-special service communications; implementation of the VHF utilization plan and review of transition period communications requirements; helicopter air navigation, communication and traffic control; channeling requirements of short-distance navigation aid system; and aviation's present and future use of the radio frequency spectrum.

Rule Amendments

Because of the continuing growth and expansion of the aviation industry and the resulting changes in operational requirements, the Commission's rules governing the aviation services (part 9) are frequently amended. During fiscal 1957, there were numerous changes made to keep them current with developments.

Among rule making projects completed were: revision of Alaskan aeronautical and aeronautical fixed frequency assignments; reduction of channel spacing in the VHF flight test and air traffic control bands to provide additional frequencies; expansion of the scope of aeronautical advisory communication and the provision of an additional frequency (123.0 megacycles) for advisory communication at landing areas served by airdrome control stations; making additional UHF and microwave bands regularly available to licensees of airborne navigational aids; designation of the frequency 133.20 megacycles for use

by civil aircraft in contacting Air Force radar facilities to obtain weather information; extensive revision of the technical standards, and provision for type acceptance of radio equipment manufactured for use in the aviation services. In addition, various license application forms were revised with a view to simplifying procedures.

Air Carrier Aircraft Stations

Air Carrier Aircraft stations are operated aboard commercial aircraft engaged in transporting passengers or cargo for hire. There were approximately 3,000 such authorizations.

Private Aircraft Stations

These stations are used on pleasure and business type aircraft. Their number approximates 30,000.

Aeronautical Public Service Stations

Public Service stations provide communication between aircraft in flight and the public telephone system, through the facilities of public coast stations. They total about 350.

Aeronautical Enroute and Aeronautical Fixed Stations

These ground stations assist in the safe, expeditious, and economical operation of aircraft. Aeronautical enroute stations are used to communicate with aircraft while enroute, whereas aeronautical fixed stations provide point-to-point communication. In the continental United States, aeronautical fixed radio stations are used primarily as "back-up" circuits for land line facilities; however, in international operations and in areas where land line facilities are not adequate, they provide primary service. Enroute stations furnish two-way radio telephone communication with aircraft at terminals and over their entire routes. There are some 1,500 licenses in this group.

Operational Fixed Stations

Operational fixed stations, numbering about 30, are used for point-to-point communication links, such as control and relay circuits to remote transmitter and receiver sites.

Aeronautical Advisory Stations

These ground radio stations are used primarily to provide advisory communication service to aircraft, regarding the condition of runways, type of fuel available, wind conditions, weather data or other essential information. They may be used, on a secondary basis, for special service communication relating to the efficient portal-to-portal transit of occupants of the aircraft. In addition, some advisory stations communicate with private aircraft engaged in organized civil defense activities. Over 700 of these stations have been authorized.

Aeronautical Utility Mobile Stations

Utility mobile stations are installed aboard crash, maintenance, fire, and other vehicles operated on airdromes. They provide routine communication between vehicles and control towers in normal airport operation as well as emergency communication. There are approximately 200 such stations.

Airdrome Control Stations

These stations are used primarily for communication between airdrome control tower operators and aircraft in directing the safe and efficient flow of air traffic into and out of airports. They also direct surface traffic through communication with aeronautical mobile utility stations installed in maintenance and emergency vehicles at airports. They number about 40.

Flight Test Stations

Flight test stations are employed on the ground and in the air for communication in connection with the testing of aircraft or major components of aircraft. In addition to radiotelephony, telemetered data is transmitted from aircraft under test to ground stations where it may be monitored and recorded. Over 200 licenses are outstanding.

Flying School Stations

These stations are operated by flying schools and soaring societies for the instruction of students and safeguarding life and property in that connection. Approximately 40 such stations are licensed.

Radionavigation Stations

Radionavigation stations radiate signals of various types which are used by aircraft to determine position and course with reference to the ground station received, and also to land by means of instruments. Over 300 radionavigation stations are used in connection with radio beacons and ranges, localizers, glide path facilities, and ground control approach systems.

Civil Air Patrol Stations

These stations provide point-to-point air-ground and base-mobile communication in connection with search, rescue, training, or other activities for which the Civil Air Patrol is responsible. Their number exceeds 12,000.

PUBLIC SAFETY RADIO SERVICES

General

The Public Safety Radio Services embrace radio's use for police, fire, forestry-conservation, highway maintenance, special emergency, and state guard purposes. Collectively, these authorizations exceed 23,000 representing the use of over 243,000 transmitters.

In keeping with past practice, the Commission has sent representatives to the national meetings of associations such as the Police Communication Officers, Inc.; Forestry-Conservation Communications Association; International Municipal Signal Association and other user groups to discuss ways and means to increase the utility of radio in connection with their particular services.

Rule Changes

Rule changes include two amendments which apply to all these services. One amendment provides that stations licensed for voice emissions are also permitted to use tone signals to actuate emergency warning devices. The other amendment places applicants on notice that frequencies below 25 megacycles may not be available in all areas. When an applicant seeks such a frequency and it is not available for assignment at the location desired, an endeavor will be made to find a substitute frequency.

The police rules were amended to provide 2 frequencies for intersystem operation, thereby allowing establishment of a simple means for communication between various departments. The police rules were also amended to limit the power of stations authorized to use 39.06 megacycles to 3 watts. This was for the purpose of making available a frequency for hand carried and other low-powered mobile radio equipment which would be free from interference by higher powered stations.

In rulemaking status were proposals to implement Commission decision reducing the separation between assignable frequencies in the 152–162 megacycle band. These proposals affect all public safety radio services. Their primary effects would be:

Establishment of local government and interstate highway radio services within the public safety services.

Deletion of a number of frequencies presently available for assignment to some public safety services, and addition of others not now available for assignment.

Make frequencies available to public safety services in the 450–460 megacycle band assignable on a regular basis.

Restrict the communications which are permissible by stations licensed in the police, fire, forestry-conservation, and the highway maintenance radio services to those essential to official activities.

The special emergency rules were amended to make schools of medicine, including schools of veterinary medicine, which have a regular rural practice eligible for licensing.

Police Radio Service

Licenses in the Police Radio Service are issued only to States, territories, possessions, and other governmental subdivisions including towns, cities, and counties.

Police radio authorizations total over 11,500, covering nearly 147,000 transmitters.

Police use radiotelephone for base station to mobile station communication. Zone and interzone radiotelegraph networks provide regional and nationwide communication coverage.

Radio keeps police units in almost instantaneous contact, thereby speeding the dispatch of assistance. This greatly enhances the ability of law enforcement agencies to act quickly and, at the same time, permits flexible disposition of force for the protection of property and prevention of crime.

Fire Radio Service

Eligibility requirements for the Fire Radio Service are the same as for the police service except that persons and organizations such as volunteer fire departments may obtain a license upon a showing that they have specific fire protection responsibility. Applications from persons or organizations, other than governmental subdivisions, must be supported by the official bodies having legal jurisdiction over the area to be served.

The usual fire radio system consists of a combination of base, mobile, and pack or "handie-talkie" radio sets. One of the many uses of radio in this service occurs where lightweight portable sets are carried by firemen into burning buildings so that communication can be maintained with outside mobile stations. The use of radio on the fire scene makes it possible to integrate the different elements of a firefighter group.

The number of fire radio stations increased to more than 3,800, with over 46,000 transmitters.

Forestry-Conservation Radio Service

The Forestry-Conservation Radio Service is used chiefly in forest areas to facilitate the work of fire prevention, detection, and suppression. The fire towers scattered throughout the forests are equipped with radio to enable forest rangers to communicate with headquarters. Many States use radio-equipped aircraft to carry men and materials to the scene of a fire. The men and equipment, including a lightweight radio set, are dropped in the vicinity and radio facilities are then used to maintain contact between the groups engaged in fighting the blaze.

In lieu of a forest ranger on duty in the fire tower, developmental use of closed-circuit TV is being studied. When perfected, it appears possible that one man may perform the detection duties now performed by many.

Operation of forestry-conservation stations is almost exclusively in the hands of State conservation departments, except in some States

where cities use such stations to integrate their fire departments with the State forestry firefighting department under a mutual-aid plan.

There were nearly 3,000 stations licensed in this service by the end of the year. They operated nearly 28,000 transmitters.

Highway Maintenance Radio Service

Authorizations for stations in the Highway Maintenance Radio Service are issued only to governmental entities such as in the police and fire radio services.

The use of radio to coordinate the many phases of highway maintenance work not only greatly enhances the safety of the motoring public but also, through more efficient use of men and heavy, expensive road building equipment, reduces costs considerably.

This service has over 2,100 authorizations with 15,000 transmitters.

Special Emergency Radio Service

This particular service provides communication facilities dedicated to safety of life and property for diverse groups of persons such as physicians, veterinarians, and schools of medicine which have a regular practice in rural areas; ambulance operators; rescue organizations; beach patrols providing a lifesaving service; school-bus operators; persons in isolated areas where public communication facilities are not available; communication common carriers desiring to provide standby facilities or make emergency repair; and disaster relief organizations.

Heretofore, various chapters of the American Red Cross were the only disaster relief organizations seeking special emergency radio station licenses. Now there is interest in the use of these stations by governmental subdivisions to provide civil defense communication facilities.

The Special Emergency Radio Service has grown to more than 2,700 stations with 4,300 transmitters.

State Guard Radio Service

This service was established to meet the radio communication requirements of State semimilitary organizations established to assume the duties normally performed by the National Guard when the latter is on active duty. There are 22 stations with over 400 transmitters.

DISASTER COMMUNICATIONS SERVICE

This service was established to provide additional radio communication facilities for use during emergencies such as in time of war, storm, and flood. Additional facilities are necessary because, when disaster strikes, regular communication facilities are disrupted or are unable to cope with the increased requirements.

Stations licensed in this service may transmit any communication necessary to civil defense or relief work during a disaster. At other times communications are limited to those necessary in drills and tests to assure efficient functioning of equipment and personnel.

To be eligible for licensing in this service, an applicant must show that the proposed station is a part of an organized local or regional disaster communications plan. United States Government stations may be authorized in this service.

The nearly 350 disaster stations use about the same number of transmitters.

INDUSTRIAL RADIO SERVICES

General

The Industrial Radio Services are made up of 8 individual services; namely, power, petroleum, forest products, motion picture, relay press, special industrial, low power industrial, and industrial radiolocation. Their total authorizations increased to nearly 36,000 and the number of transmitters to over 325,000.

As a result of the extensive growth and increasing complexity of these services, the Commission has made the administration of the industrial services the responsibility of a new Industrial Division. By separating the industrial services from the land transportation services, the Commission can more effectively keep pace with the ever-increasing demand for industrial radio facilities.

Major Problems and Accomplishments

Over the years, a critical shortage of assignable frequency channels has resulted in heavy congestion in most of the industrial services, and has prevented the Commission from adequately providing for the radio needs of large numbers of industrial and commercial enterprises. With the adoption in September of 1956 of a basic policy with respect to reductions in separations between presently assignable frequencies in the 152–174 megacycle portion of the spectrum, and with the simultaneous adoption of technical standards which will facilitate implementation of such reductions not only in this but in certain other frequency bands, it is believed that a partial solution of this and related problems can be effected in the near future. Furthermore, it is felt that important progress is being made in the matter of frequency-sharing among services whose respective licensees (by the nature of their industrial activities) tend to concentrate in distinct geographic areas.

To give practical effect to these determinations and conclusions, the Commission during the year instituted a number of interrelated rulemaking proceedings proposing substantial changes affecting the industrial services. In large part, the industrial proposals are concerned with the specific distribution to be made of the frequency

channels derived by "channel splitting" in the 152–174 megacycle band; they are also designed, however, to promote greater and more equitable utilization of available frequencies. A major proposal in the latter connection contemplates that industrial frequencies in the 450–460 megacycle band be made available on a regular, rather than the present developmental, basis and that 8.45 megacycles of spectrum space in the 460–470 megacycle band be transferred from the citizens service to the industrial services.

A substantial increase in the number of frequencies available in the industrial services appearing to be both technically feasible and in the public interest, the Commission has proposed to apportion and reapportion such frequencies in a manner promising the greatest and, at the same time, most equitable utilization of available spectrum space.

Thus, believing that eligibilities of industrial and commercial enterprises can be expanded beyond those presently obtaining, the Commission proposes to combine the existing Low Power and Special Industrial Radio Services into a new service to be known as the Business Radio Service. Eligibilities in this new service would contemplate "any lawful business activity," "educational or philanthropic institutions," and "clergymen or ecclesiastical institutions," and additional frequencies would be provided for the combined service from those proposed to be obtained from the citizens service.

In addition, the Commission has proposed the establishment of a Manufacturers Radio Service, this contemplated new service to share with the petroleum and forest products services in the use of certain frequencies presently and proposed to be available to these services. In areas where interservice frequency sharing is not possible, the manufacturers would have access to some 20 exclusive frequencies in the block being reallocated from the citizens service.

Another feature of the Commission's overall proposal relates to the matter of providing within the Power Radio Service for the use of two-way radio by communications common carriers having a need for such facilities in connection with construction and maintenance activities. In a new approach to this problem, the Commission has announced an intention to give such carriers exclusive access in the power service to 10 frequencies in the 450–460 megacycle band and, for purposes of better description, to redesignate the service as the Utilities Radio Service.

In general, the Commission proposes that the power, petroleum and forest products services, respectively, retain their present frequencies and obtain those created by the separation-reductions in their presently available frequency space below 175 megacycles. There is one important exception. Because of the comparatively heavy frequency-utilization by the forest products service in Oregon and

Washington, and by the petroleum service in Texas, Oklahoma, Louisiana, and Arkansas, the Commission proposes that the power service be deprived, in these 6 States, of secondary channels which have been obtained by the reduction in separations with respect to its present 152–162 megacycle frequency space, and that these channels be utilized by the forest products and petroleum services in the respective States. Additionally, the Commission proposes that the petroleum and forest products services share in the utilization of 12 frequencies in the 450–460 megacycle band and that the power service have the exclusive use of 10 channels in this band. Finally, with respect to these particular services, the Commission proposes that the petroleum and forest products services receive qualified access to those channels which have derived from reducing the separations of the taxicab service's present 152–158 megacycle frequencies, the newly acquired frequencies to be available to industrial users only outside standard metropolitan areas of 50,000 or more population.

In connection with the above apportionment and reapportionment of frequencies, the Commission proposes to discontinue access by the motion picture and relay press services to frequencies in the 450–460 megacycle band and to provide no new industrial frequencies as a result of channel splitting above 152 megacycles. Otherwise, the frequency complement for these services will remain unchanged.

Other Developments

Effective September 3, 1957, is a rule amendment which permits electric companies in the power service to engage in one-way signaling on mobile service frequencies to indicate electric line outages. Under its provisions an unattended fixed station can be automatically activated by an electric power line failure and thereby intermittently transmit a distinctive radio signal (indicating the location of the outage) to an attended base station.

Industrial rulemaking proceedings which were started and completed within the year include one placing the assignment of frequencies below 25 megacycles on a case-by-case basis in most of the industrial services, one easing standard metropolitan area restrictions on heavy construction and manufacturing concerns, and one making the frequency 154.57 megacycles secondarily available in the forest products service for radio systems utilizing tone signals.

The latter proceeding presents an interesting example of how the Commission was able to effect an interservice frequency-sharing arrangement by reason of the geographic concentration of the forest products industries in the Pacific Northwest. A petitioner had demonstrated a need of the logging industry for a radio signaling device to replace certain hand and mechanical signals to control a dangerous phase of log-hauling activity. Safety considerations dictated that the

frequency assigned for this purpose be relatively free of interference which could cause false signals endangering life and property. By reason of heavy loading, the existing forest products frequencies and the "catch-all" frequency of 27.255 megacycles were not suitable for the safety use involved. It was determined, however, that the frequency 154.57 megacycles, which had heretofore been exclusively available for low power industrial use, would be ideally suited for the proposed type of operation and, because the frequency was being used primarily in areas removed from the logging country, the Commission was able to permit the use. To preclude any possible deterioration of the low power service, the Commission placed power and antenna limitations on the forest products use of the frequency, and made all such use conditioned that no harmful interference be caused to any low power station on this frequency.

LAND TRANSPORTATION RADIO SERVICES

General

The Commission's rules (part 16) provide for licensing and regulating radio facilities in the Land Transportation Radio Services which consist of the motor carrier, railroad, taxicab and automobile emergency services. Each has its own eligibility requirements and frequency assignments, and some services are, in addition, assigned frequencies on a shared basis with others. The total number of authorizations in all the land transportation services is about 37,500, involving the use of over 306,000 transmitters.

During fiscal 1957, various rule parts were amended to permit more effective use of these radio facilities, and other rulemaking proceedings were initiated in anticipation of their more extensive use.

One general amendment provides for extension of license terms, upon renewal, from 4 to 5 years.

Another amendment (included in an order affecting all radio services using the 152–162 megacycle band) established the basic "split channel" policy. In implementing this policy in the land transportation services, rulemaking proposals were issued to provide specific 152–162 megacycle frequencies derived from such channel splitting for the motor carrier, railroad, taxicab and automobile emergency services, plus 2 frequencies set aside for developmental operations with the newer narrow band techniques in the land transportation services.

At the same time the Commission proposes to regularize all operation in the 450–460 megacycle band and to subdivide between the railroad and the motor carrier services the frequency space in that band now shared by them. In addition, certain frequencies in the 27 megacycle band were proposed for the motor carrier, railroad, taxicab and automobile emergency services on a shared basis with each other and with other services for use by base mobile and operational fixed sta-

tions. It is expected that when these proposals are finalized the problem of sufficient radio frequencies to cope with present demands for more stations in the land transportation services will be greatly relieved in areas of present congestion, namely, in and near large metropolitan areas.

An amendment to part 16 was proposed to clarify the permissible scope of communications during civil defense exercises and actual emergencies, and to prescribe applicable procedures.

To eliminate delay and extra work in processing applications in those cases where it appears that the applicant has not cooperated with licensees in a particular service in his selection of a frequency, the Commission proposed to require the applicant to indicate the basis for his particular frequency selection. The proposed amendment points out that licensees are expected to resolve their own interference problems, and sets forth certain restrictions the Commission may impose where licensees are unable to reach a satisfactory agreement.

Remaining problems to be considered in connection with the land transportation services include possible amendment of the rules to provide for microwave systems in accordance with the outcome of the hearings on allocation of frequencies above 890 megacycles; amendment licensing speed meters on a regular basis; automatic identification of base stations during and without interruption to regular operation; study of the possibility of obtaining frequencies below 25 megacycles for mobile service use in Alaska; revision of the transmitter identification card to provide a more satisfactory method of identification; and the question of placement of base stations outside the actual area of operation of their associated mobile units.

Motor Carrier Radio Service

This service is available to firms primarily engaged in providing a common or contract motor carrier service for passenger transportation between urban areas, passenger transportation within a single urban area, property transportation between urban areas, and property transportation within a single urban area for its local distribution or collection for intercity, interstate, or international shipment. The number of motor carrier authorizations at the end of fiscal 1957 approached 2,000.

During the year, the motor carrier rules were amended, in response to a petition by the American Trucking Association, to remove the restriction that limited interurban property carriers, operating on the 43-45 megacycle frequencies, to communicate with their vehicles only when the latter were engaged in the transportation of property between urban areas. This amendment, in effect, permits communication with those vehicles of an interurban property carrier that is engaged solely in the local pickup and delivery of property which has been shipped, or is destined for shipment, between urban areas.

A general proposal implementing the Commission's "split channel" policy allots certain primary, secondary and tertiary frequencies in the 159 megacycle band exclusively to common or contract carriers of property operating solely within single urban areas. It also broadens the category of common and contract carriers of property by removing the restriction that local property picked up or delivered must be in intercity, interstate or international shipment.

Another proposal regularizes and splits the 450–460 megacycle channels the motor carrier service now shares with the railroad service and gives half of the doubled number of channels exclusively to each service. The motor carrier service is alloted 4 additional 27 megacycle frequencies but all are limited to 30 watts final plate input power, 8 kilocycle bandwidth of emission, and are to be shared with several other radio services.

Railroad Radio Service

Railroad common carriers (including railroad-owned express companies) furnishing the public a passenger or freight service are eligible for authorizations in this service. At the end of the year railroads held over 2,000 authorizations covering over 51,000 transmitters.

During the year, the railroad service rules were amended, upon petition of the Atchison, Topeka and Sante Fe Railway Co. and the Association of American Railroads, to provide for the utilization on a secondary basis of frequencies in the band 159.51 to 161.79 megacycles for transmitting tone signals for signaling and control purposes where a satisfactory showing of need has been made.

Another amendment, resulting from a petition of the Railway Express Agency, Inc., and the Association of American Railroads, makes eligible railroad express companies wholly owned by railroad common carriers and permits them to use railroad frequencies in connection with the operation of land motor vehicles engaged in the pickup, delivery, or transfer of property in railroad shipment. This same amendment redefined eligibility to preclude a possible interpretation that it includes persons other than railroad common carriers.

Proposals to amend various rules to implement the 152–162 megacycle "split channel" policy include several changes to the frequency band 159.48 to 161.85 megacycle presently available to the railroad service. In addition to dividing this band, the proposal allocates certain portions to the maritime mobile, remote pickup broadcast, and motor carrier services. The part of the band remaining to the Railroad Radio Service is from 160.2075 to 161.5725 megacycles. This reduces the total band space from 2.37 to 1.365 megacycles but increases the number of usable channels from 39 primary only, to 45 primary and secondary.

Another proposed amendment, resulting from a petition by the Association of American Railroads, would permit licensees in the railroad service to install mobile units in the vehicles of other persons furnishing to the licensee, under contract, a service or facility necessary in connection with railroad operation or maintenance. The mobile units would remain under license to the railroad concerned, be dispatched by its base station, and be kept under the railroad's control by the agreement requirements presently set forth in the land transportation rules.

Taxicab Radio Service

This service is available to persons regularly engaged in furnishing to the public for hire a nonscheduled passenger land transportation service not operated over regular routes or between established terminals. The more than 4,800 authorizations cover over 105,000 transmitters.

Proposals to amend the taxicab service rules are included in proceedings to implement the 152–162 megacycle "split channel" policy. Three additional frequency pairs are proposed between present assignments in the 152 megacycle band but only for assignment to base or mobile stations operated wholly within metropolitan areas of 50,000 or more population.

Automobile Emergency Radio Service

Associations of owners of private automobiles which provide private emergency road service and public garages operating emergency road service vehicles are eligible for radio station authorizations in this service. There were 765 such authorizations for nearly 6,500 transmitters.

During the latter part of the year, rules were amended to reflect the long-standing practice of assigning only one of the two 35 megacycle frequencies available to public garages operating emergency road service vehicles to a single licensee in a given area. This rule provides for more efficient utilization of frequencies available in any one area of operation.

"Split channel" proposals include 2 secondary and 1 tertiary frequencies from the VHF taxicab and VHF maritime mobile bands for use by operators of public garages to supplement the 2 existing 35 megacycle frequencies which are subject to long range interference. Only one of these frequencies is assignable to any single licensee in a given area.

CITIZENS RADIO SERVICE

This radio service, available to persons not eligible for licenses in any other radio service, is a fixed and mobile service intended for use for private or personal radio communication, radio signaling,

control of objects or devices by radio, and other legal purposes not specifically prohibited by the rules. Any citizen of the United States 18 years of age or over is eligible.

The citizens service has expanded far more than expected, due primarily to its widespread use by industrial concerns and business enterprises unable to establish eligibility in other radio services for their particular activites. There are nearly 28,000 citizens authorizations, involving 107,000 transmitters.

During the year, the rules were amended to permit the use of class C citizens stations to actuate devices which are used solely as a means of attracting attention. One-way paging systems exemplify the type of operation covered. No charges may be made to persons receiving these signals, as such systems are for private use only. The citizens service rules prohibit the use of radio facilities to carry communications for hire.

In implementing the "split channel" policy, proposal was made to completely revise the citizens service rules (part 19). It would delete the availability to this service of frequencies in the bands 460 to 464.725 and 465.275 to 470 megacycles, but would provide for the use of certain frequencies from the 26.96 to 27.23 megacycle band, presently assigned for the use of amateurs, for class A and class C citizens stations. The frequency 465 megacycles would be retained for use by class B stations and 50 kilocycle channels between 464.725 and 465.275 megacycles would be made available to class A stations. Additionally, it is proposed that the "type-approval" requirement for station equipment be changed to "type acceptance" but only in the case of class A stations, with the exact frequency to be used specified on the station authorization. Specific class C frequencies would also be shown on licenses. Included in the proposals are changes in permissible power and narrower frequency tolerances with some relaxation in types of emission. The restriction of citizens service eligibility to only those unable to establish eligibility in one of the other radio services has been dropped in the proposed new rules.

Another amendment proposes to clarify the permissible scope of communications during civil defense exercises and actual emergencies and to prescribe procedures.

AMATEUR RADIO SERVICE

The Amateur Radio Service is a radio service carried on by stations used by persons interested in radio technique solely as a hobby. Those who engage in amateur radio activities do so only because they desire to and, as contrasted to persons who carry on other radio services, without economic compulsion, goals or compensation. As such, this service is of an essentially different nature than any other type of radio service.

The year-by-year increase in the number of amateur stations and operators indicates that amateur radio activities are rapidly taking their place as one of the country's most popular hobbies. As of the end of the year, more than 156,000 amateur operator licenses and an estimated 160,000 amateur station licenses were outstanding.

Although amateur operations are carried on as a hobby, the result is the creation of a large reservoir of personnel skilled in the art of radio communication. This has proved of value both to the nation in time of war and the industry in time of peace.

Also, there are numerous instances where amateurs have voluntarily provided vital communication service during disasters which disrupt or destroy normal communication facilities.

One of the most important developments in the amateur service is the ever increasing willingness of amateurs to unstintingly devote themselves and their equipment to civil defense training. While "ham" communication assistance during floods, fires, tornadoes and other natural disasters has been an amateur tradition for many years, the Radio Amateur Civil Emergency Service (RACES) communication networks furnish an even greater reserve of volunteer communication facilities available for such emergencies. When normal amateur activity is shut down during a time of enemy attack or other national emergency, the amateurs may continue to serve the public through their participation in the RACES networks. Since wire and other radio facilities can be expected to be severely burdened during an enemy attack, amateur communication will fill a vital and most important civil-defense need. At the year's end, more than 5,500 amateur stations and an estimated 20,000 amateur operators were participating in this civil emergency program.

Despite the large number of individuals involved, serious violations of the Commission's rules by amateurs are few. During the year, only 16 violations were sufficiently serious to warrant suspension of license. The Commission believes that this commendable conduct by amateur licensees may be primarily attributed to the fact that amateurs take pride in policing their own service.

The amateur rules were amended in several respects during the year, but no fundamental changes were involved. The Commission also denied several petitions seeking amendments as not being in the public interest. At the end of the year petitions were pending which seek amendment of 7 sections of the rules, and 1 proposed change was in rulemaking status. This proposal would delete the frequencies 26.96 through 27.23 megacycles from those availabe for use by amateurs and add them to frequencies allocated to the citizens service.

ENFORCEMENT

Achieving compliance with the Communications Act and the Commission's rules and regulations by the steadily increasing number of radio stations in the Safety and Special Radio Services continues to be a mounting problem. Although the number of wilful or serious violations and the corresponding number of cases resulting in revocations, suspensions or penal prosecutions are not numerically great, there are a very large number of lesser offenses which require enforcement action.

As in the past, the chief method presently available to handle the myriad of minor violations and complaints is the process of trying to educate licensees by means of special bulletins and public notices, and individual warning letters when necessary, as to their obligations under the law and the necessity to be considerate of other users of radio; and dependence upon the press, industry and organizations of those interested to help spread the word. The chief difficulty is to reach the chief offenders—countless individuals who have no trade or other organizational membership and carry on part-time radio activities without care or understanding of the consequences of improper operation.

There continues to be a distinct need for authority to be placed in the Commission to impose small forfeitures for violations which are serious enough to demand more than a mere warning or educational letter yet are not sufficiently serious to justify license revocation.

On March 1, 1957, a new law became effective (see Marine Radio Services) requiring that United States vessels transporting more than 6 passengers for hire when navigated in the open sea or tidewater be equipped with radiotelephone. A considerable number of small boats will be affected, and the law makes provision for the imposition of forfeitures for violators. This statute has not been in force long enough to enable any considered estimate to be made of the extent of the enforcement problems which will result, but it can be expected to open up a new area of violations.

During the year there were issued 17 orders to modify licenses so as to delete frequencies which were used improperly, 9 forfeiture notices against compulsorily equipped vessels, 6 orders suspending amateur operator permits, 1 of which resulted in a hearing; 6 orders to show cause why a station license should not be revoked, 1 of which resulted in an adversary hearing requiring the expenditure of a considerable amount of manpower, and 1 case which was submitted to the Department of Justice with recommendation for prosecution.

STATISTICS

Stations in Safety and Special Radio Services

Stations in the safety and special radio services (exclusive of experimental, which is included in another chapter) exceeded 375,000 at the close of the fiscal year. This is an increase of about 37,000 over those authorized during the previous year. Each separate license, construction permit, or combination construction permit and license are counted as one station. For example, 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 1957 compared to 1956:

Class of station	June 30, 1956	June 30, 1957	Increase or (decrease)
Amateur and disaster services:			
Amateur	150, 549	160, 000	9, 451
Disaster	327	347	20
RACES	3, 461	5, 561	2, 100
Total	154, 337	165, 908	11, 571
Aviation services:			
Aeronautical and fixed group	2, 445	2, 497	52
Aircraft group	33, 689	33, 753	64
Aviation auxiliary	188	230	42
Aviation radionavigation land	316	342	26
Civil air patrol	12, 107	12, 877	770
Total	48, 745	49, 699	954
Industrial services:			
Forest products	1, 316	1, 513	197
Industrial radiolocation	168	184	16
Low Power industrial	1, 269	1, 861	592
Motion picture	50	60	10
Petroleum	6, 754	6, 899	145
Power	9, 874	10, 617	743
Relay Press	95	121	26
Special industrial	11, 071	14, 456	3, 385
Total	30, 597	35, 711	5, 114
Land transportation services:			
Automobile emergency	571	765	194
Citizens	18, 602	27, 931	9, 329
Highway truck	842	606	(236)
Interurban passenger	68	62	(6)
Interurban property	680	1, 034	354
Railroad	1, 731	2, 007	276
Taxicab	4, 830	4, 842	12
Urban passenger	111	109	(2)
Urban property	157	167	10
Total	27, 592	37, 523	9, 931
Marine services:			
Alaskan group	919	909	(10)
Coastal group	301	316	15
Marine auxiliary group	91	104	13
Marine radiolocation land	19	21	2
Ship group	55, 585	62, 494	6, 909
Total	56, 915	63, 844	6, 929
Public safety services:			
Fire	3, 062	3, 820	758
Forestry conservation	2, 704	2, 959	255
Highway maintenance	1, 699	2, 131	432
Police	10, 819	11, 501	682
Public safety (combined)	70	110	40
Special emergency	2, 344	2, 727	383
State guard	20	22	2
Total	20, 718	23, 270	2, 552
Grand total	338, 904	375, 955	37, 051

Transmitters in Safety and Special Radio Services

More than 1,164,000 transmitters were authorized to operate in the safety and special radio services as of January 1, 1957. Of these, 234,000 land and fixed stations represent an increase of about 124,000 or a total increase of 150,000 transmitters during the calendar year.

Class of station	Land or fixed transmitters	Mobile station transmitters	Total transmitters
Amateur and disaster services:			
Amateur [1]	156,203		156,203
Disaster [1]	330		330
RACES [1]	4,398		4,398
Total	160,931		160,931
Aviation services:			
Aeronautical and fixed group	3,556		3,556
Aircraft group		43,668	43,668
Aviation auxiliary	34	1,079	1,113
Aviation radionavigation land	291		291
Civil air patrol	5,115	8,869	13,984
Total	8,996	53,616	62,612
Industrial services:			
Agriculture			
Forest products	1,244	12,716	13,960
Industrial radiolocation	32	402	434
Low power industrial	4	19,077	19,081
Motion picture	41	538	579
Petroleum	7,676	35,679	43,355
Power	7,678	97,695	105,373
Relay press	78	1,364	1,442
Special industrial	11,320	129,676	140,996
Total	28,073	297,147	325,220
Land transportation services:			
Automobile emergency	650	5,820	6,470
Citizens		107,000	107,000
Highway truck	32	303	335
Interurban passenger	50	1,073	1,123
Interurban property	1,458	26,739	28,197
Railroad	1,929	49,302	51,231
Taxicab	5,034	100,417	105,451
Urban passenger	104	2,610	2,714
Urban property	114	4,058	4,172
Total	9,371	297,322	306,693
Marine services:			
Alaskan group	2,257		2,257
Coastal group	442		442
Marine auxiliary group	251		251
Marine radionavigation land	20		20
Ship group	124	62,000	62,124
Total	3,094	62,000	65,094
Public safety services: [2]			
Fire	2,921	43,377	46,298
Forestry conservation	5,809	21,944	27,753
Highway maintenance	1,292	13,605	14,896
Police	9,170	137,575	146,745
Public safety (combined)	3,173		3,173
Special emergency	1,006	3,283	4,289
State guard	195	238	433
Total	23,565	220,022	243,587
Grand total	234,030	930,107	1,164,137

[1] Represents the number of licensed stations as of January 1, 1957. No factual transmitter count is available in these services.

[2] Due to an error in tabulating, the 1956 report shows approximately 160,000 more mobile transmitters in the Public Safety Services than were licensed.

Applications in Safety and Special Radio Services

More than 186,000 applications for stations in the safety and special radio services were received during the 1957 fiscal year. This is an increase of approximately 15,500 more than were received in 1956. The number of applications received in each service is shown below:

Class of station	Received 1956	Received 1957	Increase or (decrease)
Amateur and disaster services:			
Amateur	89,093	93,116	4,023
Disaster	22	53	31
RACES	1,638	2,900	1,262
Total	90,753	96,069	5,316
Aviation services:			
Aeronautical and fixed group	1,642	2,076	434
Aircraft group	19,358	20,112	754
Aviation auxiliary group	149	182	33
Aviation radionavigation land	160	175	15
Civil air patrol	2,200	4,020	1,820
Total	23,509	26,565	3,056
Industrial services:			
Forest products	757	896	139
Industrial radiolocation	177	106	(71)
Low power industrial	663	988	325
Motion picture	37	30	(7)
Petroleum	4,403	3,561	(842)
Power	4,340	4,099	(241)
Relay press	49	53	4
Special industrial	7,449	8,458	1,009
Total	17,875	18,191	316
Land transportation services:			
Automobile emergency	373	564	191
Citizens	2,178	3,167	989
Highway truck	90	106	16
Interurban passenger	29	30	1
Interurban property	817	872	55
Railroad	859	1,075	216
Taxicab	2,592	3,218	626
Urban passenger	67	82	15
Urban property	223	225	2
Total	7,228	9,339	2,111
Marine services:			
Alaskan group	376	767	391
Coastal group	210	444	234
Marine auxiliary group	32	49	17
Marine radiolocation land	15	10	(5)
Ship group	18,948	23,330	4,382
Total	19,581	24,600	5,019
Public safety services:			
Fire	1,916	1,589	(327)
Forestry conservation	1,199	1,174	(25)
Highway maintenance	1,081	1,387	306
Police	6,038	5,562	(476)
Public safety (combined)	120	153	33
Special emergency	1,194	1,393	199
State guard	2	3	1
Total	11,550	11,261	(289)
Grand total	170,496	186,025	15,529

Broadcast Services

TELEVISION (TV) BROADCAST SERVICE

TV Expansion

Five years have elapsed since the Commission adopted the present television allocation plan and engineering standards laying a foundation for the development of a nationwide competitive TV system in which (*a*) at least all areas would have at least 1 service, (*b*) the largest possible number of communities would have at least one local TV station, and (*c*) multiple services would be available in as many communities and areas as possible to provide a choice of programs to the public and to further competition among TV stations, networks and other elements of that broadcast industry.

The tremendous growth of TV service and the substantial progress made toward achieving these basic objectives is reflected in the following facts:

In contrast to the TV situation in mid-1952, when only 108 commercial VHF stations were in operation, on June 30, 1957, 475 commercial TV stations (389 VHF and 86 UHF), 24 educational stations (19 VHF and 5 UHF), and 41 UHF translator stations were actually on the air. In addition, construction permits were outstanding for 230 TV stations (51 commercial VHF, 121 commercial UHF, 10 educational VHF, 15 educational UHF, and 33 translator stations).

In 1952, only 63 communities had one or more local commercial stations, and of these only 23 had two or more, and the number of TV receivers in use totaled about 15 million. At the end of fiscal 1957, 302 communities had 1 or more commercial TV stations in operation, and of these 80 had 2, 27 had 3, and 11 had 4 or more.

Over 90 percent of the population is now estimated to be within the service range of at least 1 TV station and over 75 percent within range of 2 or more stations. Approximately 44.5 million TV sets are in use, representing about 80 percent of all homes in this country.

TV Problems

Despite this record growth, not all the Commission's objectives for a nationwide competitive TV service are being realized. Local outlets have not been established in many of the smaller communities and growth of multiple, competing services in the larger markets has been retarded. Serious difficulties, relating principally to the use of the UHF channels, impeded the fuller utilization of available channel assignments. There is general agreement that these problems stem from the limitation to 12 channels in the VHF band, and the difficulties experienced in utilizing the 70 UHF channels because of the overwhelmingly large number of VHF-only receivers being manufactured and used, the disparity in performance between UHF and VHF transmitting and receiving equipment up to the present time, and the preference of program and revenue sources for VHF over UHF outlets.

While the extent to which channel assignments are taken up is dependent upon many factors beyond the control of the Commission—such as those which are basically economic and arise out of the inability, under the present economics of TV broadcasting, to obtain sufficient support to cover the high cost of TV construction and operation, and those which are technical and relate to the improvement of transmitting and receiving equipment—the Commission has devoted a major part of its time during the past 3 years to determining whether some alleviation of TV problems may be found in revisions of the present TV allocation plan and engineering standards.

During 1954 and 1955 the Commission considered numerous widely divergent proposals for their solution. Some of them affected only single communities or local areas; others were nationwide in scope, calling for such conflicting approaches as conversion to an all-UHF system or an all-VHF system. Many favored the continued use of both bands, under a variety of proposals, such as the use of additional VHF channels, the use of the present 12 VHF channels under reduced spacings, or both. Others called for the elimination, or transfer elsewhere, of VHF commercial channels and the substitution of UHF channels locally, as well as revision of the technical standards, particularly respecting minimum spacings, maximum antenna heights and powers, the directionalizing of antennas, and the use of cross-polarization.

In view of the nationwide scope of TV problems, the widespread disagreement as to how they should be solved and the need for their consideration initially on a broad, overall basis, the Commission on November 10, 1955 instituted rulemaking (Docket 11532) to review the entire TV allocation system and to provide an orderly basis for evaluating the proposals and determining what revisions in the allo-

cation system and standards would promote the fuller use of TV channels and expansion of the competitive TV service.

Long-range program.—After considering over 500 comments and proposals filling over 12 volumes, the Commission on June 26, 1956, concluded that the proposal to shift all TV broadcasting, or in a substantial portion of the country, to UHF offered the most hope for a long-range solution. It was of the view that if suitable means could be found to move all TV to UHF, and if UHF could be sufficiently developed to permit the elimination of VHF channels without an overall loss of service, substantial advantages could be expected. All stations would be able to compete on a more nearly comparable technical basis, the coverage of competing stations would likewise be more comparable than at present, and competitive opportunities among stations and program and revenue sources would improve. Also, the crucial problem of receiver incompatibility would be eliminated, and the use of the UHF band exclusively would add to the number of stations which could be built eventually.

However, the Commission cautioned that before any final determination could be made to use the UHF band exclusively, or in a major portion of the United States, further study of the feasibility of the proposal, both as to UHF's capacity to provide a complete service and as to means of minimizing cost and dislocation both to the public and to industry during the transition period, is necessary. Interested parties were, therefore, invited to submit comments and data. The Commission also called upon various segments of the TV broadcasting and manufacturing industry (the National Association of Radio and Television Broadcasters, Radio-Electronics-Television Manufacturers Association, Joint Council on Educational Television, the Committee for Competitive Television and the Association of Maximum Service Telecasters, Inc.) to assist in obtaining factual information upon which the full technical potentialities of UHF could be determined.

Television Allocations Study Organization.—In response to this request, by January of 1957 these organizations had formed a special industry group, known as the Television Allocations Study Organization (TASO), whose objectives are the development of information and engineering principles based upon present and potential UHF and VHF service which would help the Commission determine the soundest approach to TV channel allocations. TASO has been set up under five basic panels: transmitting equipment, receiving equipment, field tests, propagation data, and analysis and theory, with various subdivisions. Over 132 individuals from 67 different organizations, representing a wide cross section of all TV interests, serve on

these panels. The Commission provides supervision and control of TASO activities. It is hoped that much useful information will be forthcoming from this combined effort in the next fiscal year.

Interim program.—The Commission also concluded that, since it would be a number of years before this long-range solution to TV problems could be resolved or an extensive transition to UHF started, interim action should be taken to make such improvements in the existing allocation system as would be likely to result in expansion of service and improved opportunities for effective competition among a greater number of stations.

As one immediate step, the Commission decided to institute rule making to examine proposals for the reallocation of TV channels on a case-by-case basis in some 13 localities, and to also consider requests for channel changes in other areas. In some of the 13 cases, it proposed to enhance the opportunities for more effective competition and improvement in the TV situation by adding VHF channels. In others, it proposed to delete VHF channels in order to make the community dependent in whole or in part on UHF. In some cases, the Commission believed it would be possible to improve the situation by deleting a VHF channel from one area to make it all UHF and shifting it to another community in a VHF area to provide an additional outlet.

Much Commission time was devoted to considering the record of these proceedings. Before the end of the fiscal year the Commission reached conclusions in all 13 cases and in some others. Since some of the conclusions affected existing stations, they were afforded an opportunity for hearing, as required by the Communications Act, if they did not consent to the proposed modifications affecting them, and in those cases the Commission delayed final action until further necessary procedures are completed.

Deintermixture.—If finally effectuated, the principal deintermixture actions taken by the Commission will result in areas with UHF-only in the vicinity of Springfield and Peoria, Ill.; Fresno, Calif.; Elmira, N. Y.; and the Evansville and Hatfield, Ind., and Owensboro, Ky., areas. Also, these deintermixture actions look to VHF areas with greater opportunities for competitive services in such cities as Louisville, Ky.; St. Louis, Mo.; Rock Island and Moline, Ill., and Davenport, Iowa; New Orleans, La.; Duluth, Minn.; and Miami, Fla., and will make possible certain improvements in service and increased VHF competition in such areas as Terre Haute, Ind.; Santa Barbara, Calif.; and Beaumont-Port Arthur, Tex.

One of the principal deintermixture cases involved Albany-Schenectady-Troy and Vail Mills, N. Y., area. It was originally con-

cluded that this area should be made all-UHF but, upon reexamination, further rule making was commenced June 20, 1957, to consider making it a 3 VHF market.

Mileage separations.—The Commission also decided in its 1956 decision in the general TV allocation proceeding that certain amendments of the TV rules would be beneficial. Accordingly, on July 19, 1956, the TV mileage separation requirements were amended to permit channel assignments on the basis of showings that spacing measured from transmitter sites meet the minimum spacing requirements, even though such requirements could not be met from the city to which the channel was, or was proposed to be, assigned. This relaxation provides needed flexibility in making channel assignments which will permit additional service and more effective competition among stations in some communities.

UHF power increase.—Another amendment, effective on August 1, 1956, raised the maximum power limits for UHF stations from 1,000 to 5,000 kilowatts. This action was taken to make UHF coverage more comparable to VHF. Several UHF stations are now authorized to operate with 1,000 kilowatts or more.

Low power operation.—The minimum power requirement for TV stations, both UHF and VHF, was reduced from 1,000 watts to 100 watts and the TV minimum antenna height requirements were deleted entirely. This was done in June 1955 to help lessen the cost of station operation and as a further incentive to construct stations in smaller communities where the establishment of local outlet might otherwise not be economically feasible.

TV Table of Assignments

Unlike the procedure for assigning frequencies for AM broadcast stations, where an applicant after making a study to determine the availability of a frequency requests its use, a TV applicant is required to apply for a channel which has been previously assigned to a community in a table of assignments contained in section 3.606 of the rules. This table was adopted by the Sixth Report and Order in 1952. It may be amended by rule making, and since its adoption over 250 changes, some simple and some complex, have been made.

In adopting this preengineered allocation table, the Commission believed that it was the only feasible means of processing the then huge backlog of TV broadcast station applications resulting from the lifting of the "freeze" on new station construction. In addition, the Commission felt that the allocation of TV channels by a planned assignment provided for a more efficient use of the available channels, would better protect the interests of small communities and rural

areas, would provide an effective means of reserving channels for educational use, and would eliminate certain disadvantages in processing applications.

On April 26, 1957, rule making was instituted (Docket 12005) on a proposal to change largely to the application method of assigning TV channels, maintaining a table only for noncommercial educational assignments and all assignments within 250 miles of the Canadian and Mexican borders which have been allocated under international agreements. On October 9, 1957, the Commission vacated this proceeding.

Satellite Operation

One of the first steps taken by the Commission to create greater opportunity for smaller communities to obtain local TV service was its August 1954 authorization of so-called satellite stations. These stations operate on locally assigned VHF or UHF channels and must meet the same requirements as regular TV stations except that they can carry little or no local programs and may limit their broadcasts to duplicating the programs of a parent station. The cost of local programming facilities has been one of the deterrents to the establishment of new TV stations, especially in smaller communities.

At the end of the fiscal year, some 19 satellites (14 VHF and 5 UHF) were on the air.

Translator Stations

On May 23, 1956, the Commission provided for a new type of TV broadcast station called a translator as a means of extending TV service to remote areas.

Translators employ relatively inexpensive, low-powered equipment to pick up the programs of any TV station operating on a VHF or UHF channel within range and convert (or translate) them for rebroadcasting on one of the upper 14 UHF television channels (Channels 70–83). The average cost of a translator, including transmitter, receiving and transmitting antennas, power lines, housing, land, etc., runs between $5,000 and $6,000. Since translators have no local studios, originate no local programs, and technical requirements have been reduced to the barest minimum, their operating costs are low.

As of July 1, 1957, 41 translator stations were on the air, 33 additional authorizations were outstanding, and applications on file totaled 49.

A proposal issued April 29,1957, to preclude translator operation in any place where a regular TV station is operating or commences operating (Docket 12006) was rejected the following August 1.

Booster Operation

The signals of TV stations may also be received and retransmitted to unserved areas by means of amplifying transmitters, or "boosters"

as they are often called. Booster operations differ from translators in that the programs received from VHF and UHF stations within range are not rebroadcast on another channel, but are simply amplified and retransmitted on the same channel used by the station or stations whose programs are picked up.

Interference and other technical problems are created by boosters radiating signals on these frequencies, and present rules make no provision for booster licensing. Since March 1955, however, the Commission has been exploring in a rulemaking proceeding (Docket 11331) the conditions under which TV booster operations might be permitted without endangering other services. The possibility of authorizing their limited use to fill in "shadow" or unserved spots within the normal service areas of UHF stations was the particular proposal under study.

On June 27, 1957, the Commission decided that, on the basis of available technical data, it did not appear feasible to permit booster operations in the VHF bands and that such operations should be authorized only to enable UHF stations to improve their Grade A service. Comments were invited on proposed rules covering this type of UHF booster operation.

Low Power TV "Repeater" Stations

On behalf of the Governors of a number of Western States, the Commission on July 29,1957, proposed to consider still another type of low power station as a further aid in bringing TV service to remote and sparsely settled areas, especially those in rugged terrain. They would be known as "repeater" stations since they would pick up the programs of outside stations and "repeat" or retransmit them locally on VHF or UHF channels.

Subscription TV

For the first time since its subscription TV rulemaking proceeding (Docket 11279) was inaugurated in 1955, the Commission found it possible to give concentrated attention to the important questions of law, fact and policy raised by pending proposals that TV frequencies be authorized for the broadcast of programs in "scrambled" form, the proper reception of which would require the payment of a charge by by the viewer.

After months of study of the voluminous comments (now more than 75 volumes) and analysis and discussion of the issues involved, the Commission reached two preliminary conclusions: first, that it possesses the statutory authority to authorize subscription TV, if it finds it in the public interest to do so, and second, that trial demonstrations of this new kind of service might provide useful information, not now on the record, concerning questions which would help it make that public interest determination.

Trial operations raise difficult questions concerning the scope, nature, conditions and duration of a demonstration which would be neither so limited or inflexible as to preclude obtaining meaningful experience nor, on the other hand, so extensive that it would be difficult, owing to the size of the investments in the systems being tried, to limit or terminate toll-TV operations if trial should disclose that it would be contrary to the public interest to authorize the service on a nationwide basis.

To assist it in resolving these problems, the Commission on May 23, 1957, invited comment on a series of questions relating to the appropriate scope and conditions of trial authorizations. These were received in July 1957 and, on October 17 thereafter, the Commission looked toward considering applications from TV stations to conduct trial subscription operations on a limited basis, subject to the furnishing of pertinent information and controlled conditions; applications not to be acted upon prior to March 1958.

This proceeding does not involve pay-TV activities for theaters and homes which employ common carrier or private cable facilities to carry programs especially prepared or selected for paying audiences. These and other localized "closed-circuit" TV operations, not being transmitted over the air, do not require Commission licensing. However, any extension of such a nonbroadcast service beyond State borders might require Commission consideration under its authority to regulate interstate electrical communication services.

Community Antenna TV Systems

A community antenna TV system picks up the programs of one or more distant TV stations at an advantageous location, such as a high hill or mountain, and transmits them by means of amplifying equipment and wire or coaxial cable to the TV sets of subscribers paying for the service. These systems mostly serve customers in communities and areas without regular TV stations or where direct service from outside stations may be unsatisfactory. Over 500 such systems serving over 500,000 homes are estimated to be in operation. The greatest number are to be found in Pennsylvania, West Virginia, Oregon, Washington and other parts of the Pacific Northwest.

At the present time the Commission exercises jurisdiction over community antenna systems only to the extent of prescribing limitations on their radiation which may interfere with authorized radio services. Under study are several petitions requesting the Commission to extend its regulatory control over community antenna operations which raise the question of whether such operations are a common carrier or other kind of service which comes within FCC jurisdiction.

Noncommercial Educational TV

When the present TV assignment table was adopted, 242 channels were reserved for noncommercial educational TV stations, in recognition of the fact that educational institutions would require a longer time than commercial interests to prepare for television. As of June 30, 1957, the number of TV channels reserved for educational use totaled 257, of which 86 were VHF and 171 were UHF. As of that date, 24 educational stations (19 VHF and 5 UHF) were operating. In addition, 25 construction permits (10 VHF and 15 UHF) were outstanding, and 8 applications were pending.

Educational TV stations broadcast an average of more than 25 hours a week, some as much as 50 hours weekly. Their programs generally are of two kinds: those designed for in-school use and others, less formal in nature, for general education.

While the rules put no time limit upon the duration of educational reservations, the Commission has recognized that unused channels should not be reserved for an excessively long period and should be surveyed from time to time. In accordance with this policy, several rulemaking proceedings have been initiated to consider proposals to make idle educational reservations available for immediate commercial use.

During the year, in separate rulemaking proceedings, the Commission made VHF educational assignments in two communities available commercially upon determining that there were no prospects there for educational operation in the foreseeable future. In one case, Channel 48 was substituted for Channel 3 as the educational reservation at College Station, Tex., and Channel 3 was assigned for commercial use to Bryan-College Station, Tex. In the other case, Channel 5 was unreserved at Weston, W. Va. Later, in September 1957, the Commission made educational Channel 9 at Eugene, Oreg., available for commercial use. This left 256 channels (85 VHF and 171 UHF) still reserved for educational use, or 14 more than first allocated in 1952.

In another proceeding, affecting Channel 11 at Des Moines, Iowa, the Commission refused to make it commercial upon determining that educational interests were actively working towards its use and the need for a fourth VHF commercial station there did not justify a change. A proposal to shift the unused educational reservation at Tampa-St. Petersburg to Fort Pierce, Fla., for commercial use was also rejected since it was found that the progress made by Tampa educational interests justified its retention for education. At the year's end, rulemaking proceedings were in progress concerning the advisability of continuing the unused educational reservations at Eugene, Oreg., and Denton, Tex.

Station Studio and City Identification

On March 13, 1957, the Commission denied petitions to amend the rules to permit TV stations, under certain conditions, to maintain main studios in more than one principal community and to incorporate those communities in station identification, but will make case-by-case determination of whether the present rules should be waived in special circumstances (Docket 11660).

Color TV

While TV colorcasts continued to increase slowly during the year, no significant developments occurred which would indicate when the present trend will be sharply accelerated and when color TV will be firmly established on a mass market basis. Some in industry believe that a mass market for color TV continues to lie in the future; others claim that it can be expected to become a reality by 1958.

At the close of fiscal 1957, 257 TV stations were equipped to handle network colorcasts, and these stations are estimated to reach 96 percent of all TV homes in the country. About 50 TV stations were equipped to broadcast their own live color programs.

It is estimated that approximately 160,000 color receivers are in use and that about 125,000 of these were purchased in 1956. Some industry spokesmen expect the number of color sets to rise to over 300,000 by 1958. Twenty-one-inch color receivers were on the market, and smaller screen color sets were available in the $500 price range.

TV Application Filing

The TV rules were amended on October 25, 1956, to permit the filing of applications specifying channels in accord with ordered changes in the table of assignments even though tendered before the date such channel changes become effective. Since a 30-day "waiting period" is required before broadcast applications can be acted upon, and changes in the assignment table normally become effective 30 days after public notice in the Federal Register, this amendment reduces the period which must elapse before final action can be taken upon an application for a TV channel from at least 60 days to at least 30 days.

TV Test Signal

TV broadcasters and the Commission have long recognized the need of using a test signal to check transmissions to obtain optimum performance and technical conformance, particularly for color TV. Such signals can be transmitted during the vertical blanking period without interfering with the picture. From time to time, several broadcasters have obtained authority to use various test signals. The Commission is of the view that such tests, to be of the greatest value

to all concerned, should be standardized and be required rather than optional. Therefore, on April 5, 1957, it proposed covering rules.

FREQUENCY MODULATION (FM) BROADCAST SERVICE

Revived Interest in Commercial FM

For the first time in 9 years, the number of authorized commercial FM broadcast stations showed an annual increase rather than a decrease. From a peak of 1,020 authorizations in 1948 the commercial FM total had fallen to 546 in 1956. But figures for 1957 show 561, a net gain of 15.

Also, applications for new commercial FM stations doubled from 28 in 1956 to 58 in 1957. Twenty-four of the latter were pending at the year end as compared with 10 in 1956. Also, for the first time in many years there were competing applications, and 4 of these cases have been designated for hearing—2 in the New York area and 2 in the Los Angeles area. The number of operating commercial FM stations remained the same as for the previous year—530.

The revived interest in commercial FM is attributed, in large part, to opportunities for additional income through functional music operations.

Educational FM Continues Gain

Noncommercial educational FM stations show small but steady numerical gain. The year closed with 148 such stations authorized, or 12 more than the year previous. However, only 2 applications for new educational FM stations were pending as compared with 4 at the same time in 1956. Educational FM stations on the air have always shown a slow but consistent increase. Fiscal 1957 closed with 135 operating, a gain of 9 for the year. Educational FM stations represent nearly 21 percent of the total number of all authorized FM stations.

Functional Music

In an effort to stimulate the growth of the FM broadcast service by enabling commercial FM stations to increase their income, the Commission has, since July 1, 1955, permitted such FM licensees to obtain Subsidiary Communications Authorizations (SCA) to provide a limited nonbroadcast type of program service, commonly called "functional music," as an adjunct to their regular FM operations. This subsidiary service is geared for reception by commercial and other subscribers, and the programs are limited to music, news, time, weather reports, and similar subjects. Background music to commercial establishments, "storecasting" to store customers and "transitcasting" to passengers in public vehicles are examples.

In authorizing functional music service, the Commission contemplated that as soon as feasible all such operations should be on a "multiplex" rather than a "simplex" basis. In multiplexing, transmission is on a subchannel simultaneously with regular FM programs on the main channel, and the special programs cannot be heard on ordinary FM receivers. Simplexing, being on the same carrier used for FM broadcasting, can be heard on FM receivers and, consequently, may be carried on only when the regular programs are not being broadcast. The Commission felt that all-multiplex operation was ultimately necessary to insure that this nonbroadcast service would remain subsidiary to the primary FM operation and would not cause any appreciable degradation of the superior quality of FM broadcast.

In the light of the unavailability of multiplex equipment in 1955, the Commission authorized use of simplexing until July 1, 1956, in the belief that this provided a reasonable time for converting to multiplex. However, some stations were able to multiplex from the start. In June 1956 multiplexing equipment was still scarce so the Commission postponed the conversion date to July 1, 1957. Upon review of the situation in June 1957, the Commission again extended this time, to January 1, 1958, but gave notice that no new authorization for simplex operations would be made after July 1, 1957.

As of May 1957, 47 FM stations held authorizations for multiplex operations and of these 35 were either actually operating or were preparing to do so, while 27 others had grants to operate on a simplex basis.

STANDARD (AM) BROADCAST SERVICE

AM Stations Still Climb

AM broadcast station authorizations showed a net gain of over 200 for the year, increasing to 3,238. Of this number, more than 1,200 were for daytime only operation. AM stations with on-air authorizations numbered 3,079.

Industry estimates that nearly 150 million receivers are getting aural broadcasts, to the inclusion of FM (on which there are no separate figures).

AM Frequency Allocations

Four major rule-making matters concerning allocation of AM frequencies received Commission attention during the year: the "clear channel" proceeding (Docket 6741), the "daytime skywave" proceeding (Docket 8333), a petition by the Daytime Broadcasters Association, Inc., to extend the hours of operation of daytime stations, and a petition by Community Broadcasters Association, Inc., to increase the maximum power of class IV stations to 1 kilowatt (Docket 12064).

Clear channels.—Substantial changes in the radio broadcast industry since reexamination of clear channel allocations was commenced in 1945 have necessitated reevaluation of the massive record compiled in the evidentiary hearings held during 1946 and 1947. The Commission is making a continued effort to resolve the intricate problems posed in determining whether AM service, which is below acceptable standards in some of the less densely populated parts of the country, could be improved by changing the rules governing use of the clear channels.

Daytime skywave.—In the associated but separately docketed daytime skywave proceeding, the Commission has conducted evidentiary hearings, heard oral arguments and received comments on the allocation problems created by the existence of skywave radiations which cause increasing interference to cochannel AM stations during the 2 hours preceding sunset when nighttime operating requirements, based on the nighttime strength of skywave radiations, generally go into effect. Corresponding daytime skywave interference, decreasing gradually to a generally insignificant degree at the second hour after sunrise, is present during the first 2 hours after sunrise. At the year's end the Commission had commenced a restudy of tentative conclusions reached in 1954 in an effort to determine whether the daytime skywave radiations of newly assigned stations should be restricted to protect dominant class I (large-area coverage) stations on the clear channels and, if so, to what extent.

While consideration has been given to restricting the daytime skywave radiations of, at least, the newly assigned daytime stations on clear channels, the Commission has been petitioned to consider extending the hours of daytime station operation from 5 a. m., or sunrise, whichever is earlier, to 7 p. m., or sunset, whichever is later. In hearings conducted in April 1957 by a special subcommittee of the Senate Committee on Small Business, the Commission reported on the problems raised by the added interference this proposal would cause during nighttime hours, and explained why it would not be feasible to examine the merits of this proposal separately from a consideration of the related, more basic issues of the daytime skywave and clear channel proceedings.

Proposed power increase.—On June 20, 1957, the Commission initiated rule making to examine a proposal to increase the maximum power of class IV (local) AM stations to 1 kilowatt daytime, on a case-to-case basis, taking into account the need for protecting cochannel and adjacent channel stations. Owing to domestic and international interference problems, the Commission proposed to leave the present 250 watt maximum unchanged for class IV operations during the nighttime.

Regional Broadcasting Agreements

On January 29, 1957, after negotiations extending over several years, representatives of the United States and Mexico signed a bilateral agreement governing their coordinated use of the channels in the AM broadcasting band (535–1605 kilocycles). As a result, there are now pending before the Senate, for ratification, AM broadcasting agreements with all North American countries except Haiti. The agreement with Mexico removes what had been considered an obstacle to further Senate consideration of the North American Regional Broadcasting Agreement (NARBA).

The United States is also party to NARBA, which it signed on November 15, 1950. A subcommittee of the Senate Foreign Relations Committee held hearings on this agreement in 1953. On July 11, 1957, this subcommittee held a hearing to consider the question of ratification of both the NARBA and the United States-Mexican agreement.

"Unique" Program Service

On January 4, 1957, the Commission proposed abolishing a rule which curbed interference beyond the normally protected service areas of AM stations claiming "unique program" service. This was done, effective November 7 of that year. The Commission held the rule vague, indefinite and serving no useful purpose.

Auxiliary Transmitters

On October 3, 1956, the rules were amended to provide AM stations with an alternative method for testing auxiliary transmitters. The former rule limited such testing to the licensed frequency of the station. This required stations using their auxiliary transmitters for CONELRAD purposes to switch back to their regular frequency each time they were tested. The new rule permits tests to be made while auxiliary transmitters are adjusted to a CONELRAD frequency, with certain conditions to prevent interference. The time limit placed on use of an auxiliary transmitter when a main transmitter is inoperative was deleted.

AUXILIARY BROADCAST SERVICES

All classes of broadcast stations (AM, FM, and TV) are eligible for authorizations to use relatively low-powered transmitters for speeding programs of outside origin to studios or other broadcast points. Their number aggregates 3,300.

Remote pickup and TV pickup stations are employed by aural and TV stations, respectively, for live "on-the-spot" coverage of local events. They constitute a versatile tool for increasing the range and scope of programming. Their increasing importance to the TV

broadcaster is illustrated by a weekly network program which takes the viewer to various parts of the country to see activities peculiar to those regions. This would not be possible without pickup adjuncts.

STL (Studio-Transmitter Link) stations are also of two classes, one for aural and the other for TV operation. They are used to transmit programs from conveniently located studios to remote transmitters. Because a TV station's coverage depends to a large extent upon the height of its antenna, the latter is often located on a mountain. Some TV STL stations can transmit programs for a distance of 50 miles in one "hop."

Intercity relay stations fall into FM and TV groups but currently there is only such TV operation. They provide a means whereby these stations may, on an interim basis, provide their own intercity relay system when it can be shown that common carrier facilities are not available. Private TV intercity relay systems, while furnishing less reliable service than that of a common carrier, can be installed and operated at considerably less cost. The question of whether the Commission shall relax its present requirement for a showing that common carriers are not available before authorizing a private relay system is still under study.

Cueing transmitters.—The Commission is considering proposal to license, on a regular basis, low-powered radio transmitters used by broadcast stations in cueing production personnel and program participants who wear small battery-operated receivers. The customary cueing method has been by telephonic apparatus using earphones on long extension cords. Since cueing transmitters and remote pickup base stations serve a comparable function, it is proposed that they be licensed under the provisions applicable to the latter in part 4 of the rules.

EXPERIMENTAL BROADCAST SERVICES

Part 4 of the rules also provides for the licensing of experimental broadcast stations to explore new techniques and develop broadcast equipment. Information so obtained often proves valuable to the Commission when considering modification of its rules to keep pace with the rapidly changing broadcast scene. Experimental operations also help manufacturers evolve and test equipment for manufacture.

Experimental TV stations were active during the year in the field of subscription TV; low-powered TV broadcast equipment, including translators and boosters; and with tests of the TV aural carrier multiplexed on the visual carrier. The latter was originally conducted to test an emergency system which could be used by a TV sta-

tion should the aural transmitter fail. Some resulting data indicates the possibility of reducing the power requirements of TV aural transmitters without adversely affecting their service.

Developmental broadcast stations saw the start of experiments with the use of a "compatible" system of single sideband transmission for AM broadcast. All domestic AM broadcast stations now utilize dual sideband transmissions. Single sideband systems are employed in some other radio services for the primary purpose of conserving spectrum space, but special receivers are required for reception of the signals, and considerable sound distortion may be present. The developer of the "compatible" system claims that transmissions can be received on conventional AM receivers with little distortion. If the current test is successful, the possibility of utilizing this system to reduce interference between AM stations will be explored.

NETWORK STUDY

The Commission initiated a network study in fiscal year 1956 to determine whether the operation of networks and their relationships with their affiliates and other components of the industry tend to foster or impede the growth and maintenance of a nationwide, competitive broadcasting system. The Commission delegated the study to a Committee of four Commissioners headed by the Chairman of the Commission. The Committee defined the scope of the study in Network Committee Order No. 1 and organized a special staff to conduct it.

As reported in the previous annual report, during fiscal year 1956 the staff planned the study, held meetings with representatives of the various components of the broadcasting industry, sent questionnaires to most components of the industry, observed operations of various components, and studied pertinent information in the Commission files and in records of various Congressional investigations relative to broadcasting.

Congress appropriated $221,000 for the study.

During 1957, the staff sent additional questionnaires to components of the industry, conducted a "spot-check" of network files relative to the problems under study, observed additional industry operations, surveyed selected markets, appraised the data and information obtained through the questionnaires and other sources, and drafted a substantial portion of the report of its findings and recommendations.

Non-network program producers and syndicators were among the companies to which questionnaires were sent during 1957. Some of these producers and syndicators objected to submitting program costs and revenues on a per-program basis. The relevancy and materiality

of this data was sustained by the Commission but was contested in and sustained in court. This occasioned some delay in completing of the study.

A 1,400-page staff report was submitted to the Commission's Network Study Committee on October 3, 1957. It deals with television primarily, laying a base for reappraisal by the Commission of related chain broadcasting rules, for comment on legislative proposals to regulate networks, and for recommending any needed changes in the Communications Act.

The Commission has established an Office of Network Study in the Broadcast Bureau to assist it in dealing with problems concerning radio and television networks.

MULTIPLE OWNERSHIP RULES

The multiple ownership rules are intended to insure adequate diversification of program service and sources and to preserve and augment the opportunities for free, effective competition in the broadcast industry. Two basic types of restrictions are imposed on the ownership of broadcast stations, whether AM, FM or TV. The first restriction prohibits the common ownership or control of broadcast stations whose service areas overlap substantially. The second restricts the number of stations in any one broadcast service which may be commonly owned or controlled. Under this restriction, the rules prohibit any one interest from owning more than 7 AM stations, 7 FM stations, or more than 7 TV stations, of which no more than 5 may be VHF.

Prior to September 1954, the number of TV broadcast stations any one interest could own was limited to 5. The increase from 5 to 7—provided 2 of the 7 are UHF—was authorized to encourage more multiple station licensees to enter UHF. No other changes have been made in these rules since 1954, but their reappraisal is encompassed in the scope of the network study.

POLITICAL BROADCASTS

The Commission's release of September 8, 1954 entitled "Use of Broadcast Facilities by Candidates for Public Office" continues to be of assistance to station licensees in interpreting and applying section 315 of the Communications Act. During the past year, the Commission issued two related rulings which warrant mention.

During the 1956 Presidential campaign, President Eisenhower used 15 minutes of radio and TV time to address the Nation with respect to the grave situation in the Middle East. A question was raised as to whether "equal opportunities" had to be afforded the other

Presidential candidates. A majority of the Commission "reached a conclusion that we do not believe that when Congress enacted section 315 it intended to grant equal time to all Presidential candidates when the President uses the air lanes in reporting to the Nation on an international crisis."

In another case, station WWJ–TV, Detroit, televised the ceremonies in which a number of judges were sworn into office by the Governor of Michigan. One of the judges, a temporary appointee, was among 21 candidates seeking the nomination for a regular appointment for that office. A competing candidate requested that WWJ–TV afford him like opportunity to "use" its facilities. The Commission concluded that there was no evidence that the temporary appointee "in any manner or form directly or indirectly initiated or requested either filming of the ceremony or its presentation by the station, or that the broadcast was more than a routine news broadcast by Station WWJ–TV in the exercise of its judgment as to newsworthy events." Accordingly, the Commission held that the station was not required to afford time to the competing candidate.

LOTTERIES

The broadcasting of a lottery is prohibited by the rules of the Commission and by section 1304 of the U. S. Criminal Code (18 U. S. C. 1304) which proscribe the broadcasting of "information concerning any lottery, gift enterprise, or similar scheme, offering prizes dependent in whole or in part upon lot or chance." In *F. C. C.* v. *American Broadcasting Company*, 347 U. S. 284 (1954), the Supreme Court construed the Commission's earlier lottery rules and held that since they were based on the criminal statute cited, they must be as strictly construed. Accordingly, it reversed a Commission ruling concerning "give-away" programs, and held that the mere listening or watching of a program was not sufficient to support the third requirement—consideration—necessary to constitute a lottery, the other elements of chance and prize admittedly being present.

On March 14, 1957, the Court of Appeals for the District of Columbia Circuit, in *The Caples Company* v. *F. C. C.*, 243 F. (2d) 232 (1957), held that the case before it was controlled by the Supreme Court's decision in the American Broadcasting case and similarly reversed a Commission ruling that a TV bingo-type of game called "Play Marko," in which participating viewers used cards obtained free of charge but only from "stores handling the sponsor's products," was a lottery in violation of the Commission's rules. Although the court conceded that necessity of going out to a store to pick up "Marko" game cards came closer to being consideration, it nevertheless determined that to so rule would stretch the rules which, being

based on the criminal statute, should be construed narrowly. "The undesirability of this type of program is not enough to blame those responsible for it as criminals," the court concluded.

ADVERTISING

The Commission has consistently held that the selection and presentation of program material to the inclusion of advertising is the responsibility of the individual broadcast station licensee, subject to statutory obligation to operate in the public interest. Station licensees, therefore, are under an obligation to exercise reasonable care and prudence with respect to advertising copy to assure that no material is broadcast which will deceive or mislead the public. Where findings are made by an authoritative body in the field of advertising claims, such as the Federal Trade Commission, that particular advertising matter is deceptive, its continued broadcasting by station licensees raises a serious question as to whether they are operating in the public interest.

In order to permit the FCC to apprise broadcast stations of advertising found to be false and misleading, a cooperative arrangement was arrived at early in 1957 whereby the FTC advises the FCC of questionable advertising broadcast over radio and TV stations, together with the call letters and locations of the stations responsible. The FCC communicates such information to these stations so that they may be fully informed and be in a position to consider taking action consistent with their operation in the public interest.

BROADCAST STATION SALES AND OWNERSHIP

Transfer of control of broadcast stations was involved in 1,315 applications received in fiscal 1957. This was 239 more than the year previous and this trend is expected to continue.

The highest price yet paid for a single AM station was recorded in early 1957 in the sale of WNEW, New York City, for $5,160,800. (The record for individual TV station sale was made in 1955 when WDTV, Pittsburgh, sold for $9,750,000.)

In addition to broadcasters, interests buying stations included magazine publishers, newspapers, investment companies and manufacturers. One magazine publisher purchased a group of midwestern radio and TV stations and other properties for $15,750,000.

Operation of broadcast stations now represent a variety of business, professional and other interests which, alphabetically, extend from A (advertising companies) to U (undertakers). They include firms or individuals identified with such businesses as aviation, banks, coal, construction, dairying, distribution, film production, foundations,

garages, hotels, insurance, lumber, manufacturing (auto parts, band instruments, combs, electric products, fishing tackle, flour, furniture, glass, jewelry, paper, paint, phonograph records, steel, textiles, tire and rubber, woolens, etc.); oil, optical, publications, ranching, real estate, sports, stores and other retailing, suppliers and theaters. Other organizations are typified by cooperatives, educational, fraternal, labor, and religious interests. Professions are represented by doctors, druggists, engineers, geologists, lawyers and public officials (national, State and local).

Auditing, as received, of over 2,500 ownership reports disclosed instances of unreported and unauthorized transfers of control of broadcast stations. Most of these involved licensees who claimed to be unaware of the requirement that application must be made and Commission approval be received before broadcast stations change hands.

REVISION OF RENEWAL APPLICATION FORM

In February of 1957, the Committee on Radio and Television Broadcasting of the Advisory Council on Federal Reports, one of the advisory committees of the Bureau of the Budget, submitted to the Commission certain proposed changes to section IV (Statement of Program Service) of FCC Form 303, "Application for Renewal of Broadcast Station License." The proposed changes are quite broad with respect to reporting on AM operations, and to a lesser degree in regard to TV programming. They express an industry view that a change in the Commission's forms relating to programming matters is necessitated by the fact that at the present stage of broadcasting development, the Commission should require "more specific and detailed information concerning the newer art—television—than is required for long established radio . . . particularly in view of the present day comparatively simple pattern of radio broadcasting." The committee's proposals are being studied by the Commission.

REMOTE CONTROL OPERATION

On September 19, 1957, the Commission amended its rules to enable AM and FM broadcast stations to extend remote control operations under certain conditions (Docket 11677). Previously, remote operation was permitted only for nondirectional AM and FM stations operating with power not in excess of 10 kilowatts.

IDENTIFICATION OF RECORDED PROGRAMS

New rules, adopted October 3, 1956, relax the AM, FM, and TV rules governing identification requirements for recorded programs and material. An identifying announcement is now required only where the element of time is of special significance in recordings, and it may

be made either at the beginning or end of the program in which the recording or transcription is used. There are two exceptions: no identification is required for recorded programs of 1 minute or less, and a single daily announcement only is required for network programs transcribed and rebroadcast at a later time because of daylight saving or time zone differences.

STATISTICS

Current Broadcast Authorizations

The fiscal year closed with broadcast authorizations collectively exceeding 8,000. Their 8,034 represented a gain of 992 for the year.

One international broadcast station was deleted; all other program outlets grew in number. The biggest growth was 218 for AM, making its total 3,238. Commercial TV showed a net gain of 42, giving it 651, and educational TV's gain of 8 brought its total to 49. Commercial FM's net gain was 15, bringing its total to 561, and educational FM's gain of 12 brought its figure to 148. Seventy-four UHF TV translator stations were authorized pursuant to the new rules providing such operation. The remaining 3,311 authorizations were for other broadcast adjuncts, of which remote pickup facilities accounted for 2,461.

Authorizations for the different classes of broadcast services were:

Class	June 30, 1956	June 30, 1957	Increase or (decrease)
Commercial AM	3,020	3,238	218
Commercial TV	609	651	42
Educational TV	41	49	8
TV Translator	0	74	74
Auxiliary TV	682	778	96
Experimental TV	17	18	1
Commercial FM	546	561	15
Educational FM	136	148	12
International	3	2	(1)
Remote pickup	1,936	2,461	525
Studio-transmitter link	50	53	3
Developmental	2	1	(1)
Total	7,042	8,034	992

Status of Broadcast Authorizations

Of 4,647 authorized AM, TV, and FM broadcast stations at the close of the year, 4,289 had authorizations to go on the air and 358 others held construction permits. A breakdown follows:

Class	Operating authorizations	Construction permits
Commercial AM	3,079	159
Commercial TV	519	132
Educational TV	26	23
Commercial FM	530	31
Educational FM	135	13
Total	4,289	358

In addition, 41 TV translator stations (out of 74 granted) were operating, and 74 FM stations held Subsidiary Communications Authorizations to engage in functional (background) music operations.

Broadcast Authorizations by States

According to a May 1, 1957 tabulation, every State had AM and TV station authorizations, but seven States (Idaho, Montana, Nebraska, North Dakota, South Dakota, Vermont and Wyoming) had no FM stations. Texas had more AM, FM, and TV authorizations collectively than any other State, and led in number of AM and TV facilities.

Leading States in the matter of broadcast authorizations as a whole, were Texas (311), California (279), Pennsylvania (229), and New York (214).

Topping the AM list were Texas (232), California (173), Florida (142), Pennsylvania (139), North Carolina (133), New York (121), and Georgia (117).

The commercial TV list was led by Texas (48), Pennsylvania (38), California (37), and New York (31). The educational TV list was headed by New York (7), with Alabama, Connecticut, and Ohio next (3 each). The most TV translator stations were in Colorado and Oregon (9 each) and California (8).

In the commercial FM category, California and New York tied for first place (47 each) with Pennsylvania next (42). California had the most educational FM authorizations (13), followed by Indiana (11) and Ohio (10).

As for the territories, Puerto Rico had the most broadcast grants (37) including the only territorial educational TV authorization. Hawaii had the most commercial TV stations (7), also the only 2 educational FM stations in our outlying possessions.

The May 1, 1957 breakdown of broadcast authorizations by States, territories, etc., follows:

	AM	FM		TV			
		Commercial	Educational	Commercial	Educational	Translator	Total
Alabama	100	14	1	12	3	0	130
Arizona	42	4	1	10	0	5	62
Arkansas	59	5	1	8	0	0	73
California	173	47	13	37	1	8	279
Colorado	54	5	2	9	1	9	80
Connecticut	27	7	2	9	3	0	48
Delaware	9	3	0	1	0	0	13
District of Columbia	7	8	0	5	0	0	20
Florida	142	18	4	23	2	0	189
Georgia	117	16	1	11	2	0	147
Idaho	33	0	0	7	0	2	42
Illinois	94	31	7	24	2	0	158
Indiana	61	19	11	17	0	0	108
Iowa	64	8	4	12	1	0	89
Kansas	45	1	5	9	1	0	61
Kentucky	73	14	3	11	0	0	101
Louisiana	77	10	2	15	2	0	106
Maine	23	2	1	7	0	0	33
Maryland	34	8	2	6	0	0	50
Massachusetts	57	16	9	11	1	0	94
Michigan	92	20	5	19	2	0	138
Minnesota	61	7	1	8	1	0	78
Mississippi	69	2	1	8	0	0	80
Missouri	75	9	2	17	1	0	104
Montana	32	0	0	9	0	2	43
Nebraska	32	0	0	8	1	0	41
Nevada	17	1	0	5	0	4	27
New Hampshire	14	4	0	3	0	0	21
New Jersey	25	10	2	5	1	0	43
New Mexico	36	3	1	7	0	2	49
New York	121	47	8	31	7	0	214
North Carolina	133	33	4	17	1	0	188
North Dakota	17	0	0	9	0	0	26
Ohio	86	35	10	29	3	0	163
Oklahoma	54	1	5	12	2	1	75
Oregon	66	7	3	10	1	9	96
Pennsylvania	139	42	8	38	2	0	229
Rhode Island	13	5	0	3	0	0	21
South Carolina	66	15	1	10	0	0	92
South Dakota	18	0	0	7	0	0	25
Tennessee	99	10	2	13	1	0	125
Texas	232	21	7	48	2	1	311
Utah	26	4	2	3	1	0	36
Vermont	13	0	0	1	0	0	14
Virginia	87	16	5	15	0	0	123
Washington	79	5	4	13	1	3	105
West Virginia	47	11	0	11	0	0	69
Wisconsin	73	12	9	16	2	0	112
Wyoming	21	0	0	4	0	2	27
Alaska	14	0	0	5	0	0	19
Guam	1	0	0	1	0	0	2
Hawaii	15	1	2	7	0	0	25
Puerto Rico	29	2	0	5	1	0	37
Virgin Islands	3	1	0	0	0	0	4

Broadcast Authorizations by Cities

The same May 1, 1957, count showed that New York City had more broadcast authorizations than any other city (38). Chicago and Los Angeles tied for second place (34 each).

New York City and Chicago led in AM authorizations (15 each), followed by Los Angeles (13).

Los Angeles had the most commercial TV authorizations (8); New York City and Chicago came second (7 each).

In the commercial FM field the standing was New York (13), Los Angeles (12), and Chicago (10). Philadelphia led in the number of educational FM stations (4); second place was shared by Boston and Dallas (3 each).

Following is the May 1, 1957, tabulation of the number of broadcast authorizations in particular cities. Most of these cities can also get outside broadcast service and, in turn, their own stations can be heard in neighboring communities.

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
New York	15	13	2	7	1	38
Chicago	15	10	1	7	1	34
Los Angeles	13	12	1	8	0	34
Philadelphia	10	7	4	5	1	27
Boston	8	5	3	5	1	22
San Francisco	10	4	1	6	1	22
Minneapolis-St. Paul	10	4	1	4	1	20
New Orleans	11	3	0	5	1	20
Washington	7	8	0	5	0	20
Atlanta	9	4	1	4	1	19
Cleveland	7	6	1	5	0	19
Denver	11	2	0	4	1	18
Detroit	5	7	1	4	1	18
Miami	8	3	1	5	1	18
Pittsburgh	7	4	1	5	1	18
Dallas	8	4	3	2	0	17
Portland (Oreg.)	10	4	0	3	0	17
San Antonio	9	4	0	4	0	17
Baltimore	8	2	1	5	0	16
Birmingham	8	2	0	4	1	16
Houston	8	2	1	4	1	16
Jacksonville	8	3	0	4	1	16
Salt Lake City	8	4	0	3	1	16
Seattle	9	3	1	2	1	16
Buffalo	6	4	0	4	1	15
Phoenix	9	1	1	4	0	15
St. Louis	8	1	1	4	1	15
Cincinnati	6	3	0	4	1	14
Fresno	7	3	0	4	0	14
Honolulu	7	1	2	4	0	14
Memphis	9	1	0	3	1	14
Richmond	8	3	1	2	0	14
Sacramento	5	5	0	4	0	14
Columbus (Ohio)	5	2	2	3	1	13
Louisville	7	0	2	4	0	13
Milwaukee	7	0	0	5	1	13
Providence	6	4	0	3	0	13
Rochester	6	2	0	4	1	13
Shreveport	8	3	0	2	0	13
Albuquerque	7	1	1	3	0	12
Baton Rouge	6	2	1	3	0	12
Des Moines	6	1	1	3	1	12
Knoxville	6	1	2	3	0	12
Oklahoma City	7	0	1	3	1	12
Tampa	6	3	1	2	0	12
Tucson	8	1	0	3	0	12
Tulsa	6	0	1	4	1	12

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 9 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
1957	232	14	431	3,044	35	3,079	159	3,238
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
1957	41	26	24	519	11	530	31	561
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
1957	17	5	2	135	0	135	13	148
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
1957	55	13	129	344	175	519	132	651
TV TRANSLATOR								
1957	74	0	48	17	24	41	33	74
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
1957	8	0	8	14	12	26	23	49

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.

The term "on the air" covers stations actually operating or holding authorizations to operate. "CPs" refer to construction permits.

Broadcast Applications

During the year more than 9,700 broadcast applications were received, which was about a thousand more than the previous year. Applications for new TV stations increased from 91 to 132, AM from 384 to 424, and FM from 57 to 77. Of these, 31 TV and 107 AM applications were designated for hearing.

A breakdown of applications by classes follows:

Class	On hand June 30, 1956	Received	Granted	Dismissed, denied or returned	Designated for hearing	On hand June 30, 1957
AM						
New stations	274	424	203	101	107	322
Major changes	154	240	162	32	27	185
Transfers	84	681	636	59	5	70
Renewals	300	1,086	1,080	58	2	252
Licenses	72	492	457	25	0	82
Other	80	948	907	57	1	64
AM total	964	3,871	3,445	332	142	975
TV						
New stations	54	132	47	28	31	87
Major changes	37	179	155	13	6	47
Transfers	18	132	120	11	2	19
Renewals	18	81	77	0	0	22
Licenses	183	186	291	5	0	73
Other	120	689	635	31	0	143
TV total	430	1,399	1,325	88	39	391
FM						
New stations	15	77	57	9	0	26
Major changes	6	89	81	6	0	8
Transfers	12	74	78	1	0	7
Renewals	45	251	222	12	0	63
Licenses	7	90	76	6	0	15
Other	14	146	127	5	0	28
FM total	99	727	641	39	0	147
Miscellaneous						
New stations	104	1,070	863	140	2	171
Major changes	11	349	320	13	0	27
Transfers	49	424	425	19	1	29
Renewals	148	819	841	13	0	113
Licenses	596	938	1,007	53	0	474
Other	2	107	94	4	0	11
Miscellaneous total	910	3,707	3,550	242	3	825
Grand total	2,403	9,704	8,961	701	184	2,338

Age of Pending Broadcast Applications

Of the 2,338 broadcast applications pending at the close of the fiscal year, 1,190 were less than 3 months old; 697 had been pending

from 3 months to 1 year; 179 from 1 to 2 years, and 335 for more than 2 years. Their classifications are shown in the following table:

Service	Total	Under 3 months	3 to 12 months	12 to 24 months	Over 24 months
AM					
New stations	322	90	150	22	60
Changes	185	66	60	19	40
Renewals	252	214	28	6	4
Other	216	158	40	9	9
AM total	975	528	278	56	113
FM					
New stations	26	14	10	0	2
Changes	8	5	3	0	0
Renewals	63	58	4	1	0
Other	50	35	12	1	2
FM total	147	112	29	2	4
TV					
New stations	87	40	31	7	9
Changes	47	28	15	2	2
Renewals	22	18	3	0	1
Other	235	70	119	16	30
TV total	391	156	168	25	42
Miscellaneous					
New stations	171	111	43	4	13
Changes	27	26	0	0	1
Renewals	113	99	8	1	5
Other	514	158	107	92	157
Miscellaneous total	825	394	222	96	176
Grand total	2,338	1,190	697	179	335

Action on applications in the older groups depends largely upon the outcome of competitive hearings, legislation and litigation, and resolvement of rule making and other proceedings affecting several stations or groups of stations. In many individual cases, delay is caused by frequent amendments to applications and other filings, which require restudy of a case, and delay on the part of the applicant in conforming with financial, engineering, and other requirements.

Broadcast Industry Financial Data

In the calendar year 1956, 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 $1,377.5 million.

Total radio revenues rose 6.0 percent to $480.6 million while TV revenues reached $986.9 million, or 20 percent above 1955.

Total radio and TV profits of $238.8 million in 1956 were 22 percent above 1955. Television broadcast profits of $189.6 million were 26 percent higher and radio profits of $49.2 million were 7 percent higher.

The following tables show the comparative calendar 1955–56 financial data for the radio and television broadcast industries:

All Networks and Stations, 1955–56

Item	1955 (millions)	1956 (millions)	Percent increase in 1956
Total broadcast revenues	$1,198.1	$1,377.5	15.0
Radio [1]	453.4	480.6	6.0
Television	744.7	896.9	20.4
Total broadcast expenses	1,001.9	1,138.7	13.7
Radio	407.4	431.4	5.9
Television	594.5	707.3	19.0
Broadcast income (before Federal income tax)	196.2	238.8	21.7
Radio	46.0	49.2	7.0
Television	150.2	189.6	26.2

[1] Radio includes AM and FM broadcasting.

Note. 1956 radio data cover the operations of 4 nationwide networks and 3 regional networks, 2,916 AM and AM–FM and 53 independent FM stations. Excluded are 55 stations whose reports were filed too late for tabulation. 1955 data are for the same networks and 2,704 AM and AM–FM and 38 independent FM stations. Excluded are 90 stations whose reports were filed too late for tabulation. 1956 TV data cover the operations of 3 networks and 474 stations. 1955 TV data cover the operations of 4 networks (3 networks after Sept. 15, 1955, when DuMont ceased network operations) and 437 stations.

Nationwide Networks Only, 1955–56

[Including owned and operated stations]

Item	1955 (millions)	1956 (millions)	Percent increase or (decrease) in 1956
Total broadcast revenues	$448.5	$508.1	13.3
Radio	74.5	65.8	(11.7)
Television	374.0	442.3	18.3
Total broadcast expenses	375.4	423.1	12.7
Radio	69.4	66.2	(4.6)
Television	306.0	356.9	16.6
Broadcast income (before Federal income tax)	73.1	85.0	16.3
Radio	5.1	(0.4)	
Television	68.0	85.4	25.6

Note 1: Radio data include the operations of 15 network-owned AM stations in 1955 and 1956.
Note 2: Television data include the operations of 16 network-owned stations in 1955 and 15 in 1956.

AM Radio [1] Broadcast Revenues, Expenses and Income, 1955–56

[In thousands]

Item	4 nationwide networks and their stations [2]		3 regional networks and their stations [2]		All other stations [2]		Industry total	
	1955	1956	1955	1956	1955	1956	1955	1956
Total broadcast revenues	$74,511	$65,804	$3,814	$4,373	$374,013	$408,984	$452,338	$479,161
Total broadcast expenses	69,449	66,233	2,968	3,579	333,565	359,794	405,982	429,606
Broadcast income (before Federal income tax)	5,062	(429)	846	794	40,448	49,190	46,356	49,555

[1] Excludes independently operated FM stations, 38 in 1955 and 53 in 1956. Also excludes 90 AM stations reporting too late to tabulate in 1955 and 55 in 1956.
Includes the operations of 18 network-owned stations in 1955 and 19 network-owned stations in 1956.
[2] Includes 2,685 stations in 1955 and 2,897 stations in 1956.

TV Broadcast Revenues, Expenses and Income, 1956

Item	3 networks and their 15 owned and operated TV stations	459 other TV stations (millions)	Total 3 networks and 474 TV stations
Revenues from the sale of time:			
Network time sales:			
Nationwide networks	$269.1	$98.6	$367.7
Miscellaneous networks and stations			
Total network time sales	269.1	98.6	367.7
Non-network time sales to:			
National and regional advertisers	55.7	225.5	281.2
Local advertisers	22.9	151.3	174.2
Total non-network time sales	78.6	376.8	455.4
Total time sales	347.7	475.4	823.1
Deduct—Commissions to agencies, representatives, etc	[1] 70.9	63.1	134.0
Net time sales	278.8	412.3	689.1
Revenues from incidental broadcast activities:			
Talent	135.1	11.3	146.4
Sundry broadcast revenues	30.4	31.0	61.4
Total incidental broadcast activities	165.5	42.3	207.8
Total broadcast revenues	442.3	454.6	896.9
Total broadcast expenses of networks and stations	356.9	350.4	707.3
Broadcast income before Federal income tax	$85.4	$104.2	$189.6

[1] Of this amount $55.7 million is applicable to the total sale of network time.

Due to higher priority work, the Commission was unable to compile FM broadcast financial data in time to appear in this report, or to tabulate investment in tangible AM broadcast property.

Interference Control

GENERAL

Until the close of World War II, interference was largely between radio stations since the noncommunication use of radio was small and its problems could be handled on an individual basis. However, as early as 1940, the Commission recognized that electronic devices, such as used in medical diathermy and for industrial heating, could be a source of serious interference to radio services. This, in turn, has led to the present broader concept of interference as any signal, noise or radiation that endangers radio communication.

The mushrooming of transmitters, the super-sensitivity of television reception and the mounting use of electronic devices are the chief contributors to the current interference epidemic which, because of its widespread contagion, is proving difficult to control on a national basis.

The result is that, in addition to regulating radio transmission, the Commission finds it necessary to curb excessive radiation from receiving equipment as well as from industrial, medical, household, and other appliances. This is essential to prevent disruption of radio communication services, especially those used to help safeguard life and property. In so doing, the Commission is receiving the cooperation of manufacturers, retailers, and users of noncommunication apparatus.

One effective prevention is Commission consideration, at the makers' request, of certain equipment before it is produced and sold. This is known as type approval or type acceptance prior to going on the assembly line. "Type approval" is given after tests of working models submitted to the Commission's laboratory for that purpose; "type acceptance" is based upon engineering certification by the manufacturer that it meets requirements. Users of nonapproved equipment emitting out-of-bounds energy are generally helpful in providing curbs by installing adequate shielding.

The cooperative effort is further reflected in the organization and functioning of special committees of interested persons throughout the United States and its territories to handle local and area interference problems. They are sponsored by the Commission. One of

these self-help groups is the 27 Cooperative Interference Committees organized throughout the communications industry for area service. The other is composed of 473 Television Interference Committees, representative of amateurs and various other users of radio, who operate locally in nearly every State, and in Alaska, the Hawaiian Islands, and Puerto Rico.

At the same time, the FCC is trying to educate unorganized users of radio transmitters to their individual responsibility to obey the law and operate in a manner that will contribute to the most practical and economic utilization of the public radio highways.

INDUSTRIAL, SCIENTIFIC AND MEDICAL EQUIPMENT

Abbreviated "ISM" for convenience, this category covers equipment using radio frequency energy for the purposes indicated which, though not licensed, must comply with the technical requirements of part 18 of the Commission's rules.

Industrial heaters are used in the plastics industry for drying, sealing, molding, and setting of plastics; in the metals industry for hardening, heating, brazing, and soldering, and in the furniture and plywood industries for setting of glue. During the year, the Commission completed a major revision of the rules dealing with industrial heating equipment to clarify the requirements to be fulfilled by the user and also to provide for prototype certificates of these heaters. Miscellaneous items apply radio frequency energy to materials to produce physical, biological, or chemical effects, such as heating, ionization of gases, mechanical vibration, and acceleration of charged particles. One example is epilators employed for removing surplus hair.

Medical equipment is largely diathermy or ultrasonic. Conversion from the old pre-June 1947 diathermy machines (illegal after June 3, 1953) to approved nonradiating types is well on the road to completion. This is indicated by the fact that only 5 major investigations of such apparatus were necessary during the year. Elimination of obsolete diathermy apparatus is largely due to the intensified program of 1955–56 which resulted in the voluntary removal of 1,040 old machines from service.

Arc welders stabilized by radio frequency are utilized to weld stainless steels, aluminum, and its alloys and nonferrous metals generally. Present design incorporates a spark gap generator which is cheap, reliable, and self adjusting. However, it has the fault of generating energy over a wide range of frequencies and is a potent source of interference. The Commission has instituted rulemaking to deal

with these welders but final action waits completion of industry evaluation of a redesigned circuit to reduce radiation.

Electronic ovens for home use is a late development. They use microwave radio energy to cook or bake food. Heat is developed directly inside the food, which enables it to be cooked faster than in the conventional oven where cooking depends on heat applied to the outside of the food. Also, frozen foods can be put in the electronic oven without prior thawing. Electronic ovens now on the market operate on 915 or 2450 megacycles, both of which are frequencies assigned for ISM use.

Electronic cookers were developed some years ago and have seen limited commercial use. This year, having adapted the idea to home ovens, several manufacturers started promoting sales to the general public. The electronic oven is the forerunner of numerous electronic devices being developed for home use with which the Commission must cope within the next few years in carrying out its obligation to control interference.

The basic philosophy of ISM regulation is to provide a small number of frequencies on which unlimited radiation is permitted and to require rigid control of radiation on all other frequencies. Accordingly, the rules provide 7 frequencies throughout the spectrum which may be used by such equipment with unlimited radiation. These frequencies have been established by international agreement to encourage grouping apparatus of this type on frequencies not intended, primarily, for radio communication. Radiations on other than ISM frequencies are required to be suppressed to specified limits which are based on a compromise between the probability of interference and practical considerations of the cost of controlling the radiation.

The problem concerns the users of both radio communication and ISM equipment. The Commission is charged with protecting authorized radio services from the destructive effect of excessive radiation. At the same time it recognizes the important role played by ISM equipment. Consequently, the rules strive to provide for the successful coexistence of both.

ISM equipment continues to particularly bother aural and TV broadcast services but its overall interference is no longer the problem it was in the years immediately following 1947 when the ISM rules were first adopted.

INCIDENTAL AND RESTRICTED RADIATION DEVICES

Incidental and restricted radiation devices are governed by part 15 of the rules and include innumerable devices, other than ISM equip-

ment, capable of causing radio and TV interference. The regulations are designed to be self executing and do not require Commission licensing or approval of equipment.

Incidental radiation devices are electric or electronic in nature and although not designed to generate radio frequency energy, do produce such energy in operation. Interference is caused when this is radiated, as in the case of electric appliances, switches, generators, and automotive ignition systems. Considering the almost infinite variety of these devices and present lack of knowledge as to what limitations to apply, the Commission is currently regulating them on the basis that any harmful interference they cause must be promptly eliminated.

Restricted radiation devices, on the other hand, deliberately generate small amounts of energy for different purposes. In this category are radio receivers, various types of carrier current systems such as those used by telephone and power companies, "wired wireless" (campus radio), and community antenna systems; also wireless microphone, radio-controlled garage door openers, and a variety of other radio-controlled products including toys. The problem here is how to control radiation that is harmful to regular radio operation while permitting these items to function.

The Commission found it necessary to make some adjustments to its receiver radiation control program initiated in 1955. These changes—which involved extensions of time, relaxation of some requirements for FM receivers and the temporary relaxation of the oscillator radiation limit for UHF TV receivers—were granted to help industry adjust itself to this relatively new field of regulation and to provide temporary relief in hardship cases. The Commission is confident that, after initial difficulties are overcome, this program will have mutually beneficial results. It is another example of the cooperation between the Commission and industry in the interest of all users of radio.

MONITORING FOR INTERFERENCE

The Commission's monitoring facilities seek out, identify, and locate sources of interference affecting radio communication of its licensees, Government agencies, and the general public. Its own routine surveillance of the radio spectrum locates many sources of potential interference before they become serious. However, in spite of this preventive monitoring, the Commission received and acted upon over

5,300 requests during the year for monitoring service relating to interference complaints. In comparison with 1956, they were:

	Fiscal 1956	Fiscal 1957
U. S. Air Force	337	323
U. S. Army	112	92
U. S. Navy	66	82
U. S. Coast Guard	61	91
Civil Aeronautics Administration	42	36
Other Government agencies	66	61
Law enforcement agencies	28	48
Commercial airlines	119	119
Commercial concerns	769	689
Foreign governments	20	15
Total major cases	1,620	1,556
Miscellaneous (minor cases)	4,144	3,804
Grand total	5,764	5,360

Following are illustrative of services rendered by the FCC monitoring network in resolving these complaints.

During flood relief operations in Kentucky, the FCC identified radioteletype signals interfering with State police radio communication as coming from Government radio stations in Alaska. This was due to unusual propagation conditions. The Federal agency concerned immediately shifted to another available frequency until the emergency was over.

A foreign nation sought assistance from both the United States and the Japanese monitoring services in tracing interference to reception of a United States fixed public international radio station. The FCC quickly pinned it on a Puerto Rican station operated by the same company on the same frequency. The interefence was cleared by the company rearranging the transmission schedules of the stations concerned.

An aeronautical station transmitter in Miami was inadvertently left on the air after communicating with San Juan. This caused interference to reception at Seattle of an aeronautical station in Honolulu. FCC bearings located the source within a few minutes after receiving the complaint and the situation was corrected quickly because the same licensee was involved at all locations.

INTERFERENCE INVESTIGATION

By far the largest number of interference complaints received by the Commission are so localized that long-range direction finding is not needed. These complaints are resolved wherever possible by encouraging radio station licensees or individuals to help themselves or to secure assistance from local self-help groups. If the inteference complaint is not resolved at the local level, a field investigation is made. There were 23,695 interference complaints during the year, an increase of 4,350 over 1956. Of these, 12,722 required investigation as compared to 11,431 last year.

Complaints involving interference to TV reception totaled 19,798, including 43 affecting color TV, in comparison with 15,042 last year, of which 5 related to color. Complaints of interference to AM and FM broadcasting amounted to 2,196. The remainder covered almost the whole communications field and included some cases of serious interference to vital industry and Government communication, including marine and aircraft radio navigation and facilities affecting the safety of life and property on the water and in the air.

The increased use of tropospheric and ionospheric "scatter-type" communication circuits resulted in a number of interference cases on the VHF bands at times when these signals were propagated over considerable distances to interfere with older services. These were resolved in the main by improvements in the indirectivity properties of the antennas concerned plus some realignment of frequencies. In one instance, lasting several days, unusual conditions caused European navigational signals on 24 megacycles to be received over the eastern part of the United States and interrupted reception on transatlantic radiotelephone circuits.

The number of interference complaints from industrial, scientific, and medical noncommunications equipment dropped to 170 as compared with 247 in 1956. This was due to increased compliance with FCC regulations.

One manufacturing plant, harassed by continuous complaints of interference caused by its industrial heating equipment, constructed a shielded room at a cost of $3,000 to insulate its heaters, and installed a field strength meter to continuously check their radiation.

Approximately 500 TV receivers in one section of an eastern city received severe interference which an FCC mobile unit traced to a flashing neon sign. The owner cooperated by turning the sign off until it could be serviced. In consequence, the FCC received a letter from the spokesman for a 60-unit apartment building expressing the appreciation of his "fellow cliff dwellers."

A radio communication channel used by five "Nike" installations ringing an east coast city was rendered useless by interference which was traced by FCC engineers to a "struck" transmitter at one of those installations.

In another instance, "leaky" insulators were replaced on a section of a power line after FCC engineers determined that this was the cause of severe interference to industry and military radio circuits as well as to broadcast reception.

Interference to Navy communication in the San Francisco Bay area was traced to a transmitter on a Navy vessel which had been inadverently left "on."

Over 200 families affected by TV interference in a Massachusetts city petitioned an FCC district office for relief. The trouble proved

to be faulty equipment on a power line pole. The power company cooperated by replacing defective lightning arrestors.

With the help of a local Television Interference Committee, an FCC engineer found the source of TV interference, covering a residential area of about one square mile, to be an oscillating TV receiver booster amplifier in a private home.

An FCC engineer located a radiating electric arc welder that was causing interference to radio amateurs. The radiation was eliminated when the company installed new power line filter condensers. Another arc welder which interfered with marine communication in Tampa was similarly located; and still another was found which interfered with radio communication of a bus line in the San Francisco area.

A tree branch which fell on an electric fence near Buffalo caused sparking which disrupted coast reception of ship radiotelephone stations, including the watch on distress frequencies. An FCC mobile unit located and remedied the condition.

Often seemingly unimportant devices can cause trouble. A defective doorbell transformer in a house in Minnesota caused such severe interference to frequencies between 2 and 9 megacycles that aircraft transmissions were unintelligible up to 50 miles or more from an airport.

FCC-GOVERNMENT INTERFERENCE CASES

Since cases of harmful interference arising between United States Government stations and Commission licensees have to be resolved on the basis of mutual and voluntary cooperation, this is done in the field, whenever possible, between the parties concerned or with the help of local Commission engineers. When local efforts fail, a case is referred to Washington. During the past year there were 314 such cases. Each one requires interagency discussion and fact-finding. It often develops that getting the engineering data is the most difficult part. When the facts are known, it is usually not difficult to determine the party at fault and the action he should take. It is interesting to note that more of these cases are due to human error than to equipment malfunction, although a considerable number are caused by abnormal propagation conditions.

The most serious group of FCC-Government interference cases during the year resulted from certain installations of the Department of Defense employing a new technique known as "Forward Propagation by Ionospheric Scatter" (FPIS). Such stations require use of a part of the spectrum already heavily occupied, principally by Commission licensees. The interference occurs, because of propagation behavior, principally during the winter months. Studies and negotiations looking toward a mutual solution were

under way at the close of the fiscal year. Meanwhile, the Department of Defense has taken steps which assure considerable temporary relief for Commission licensees.

Cases requiring interagency discussion and action totaled 314 for the year.

INTERNATIONAL INTERFERENCE AND INFRACTIONS

Many cases involving international interference are settled directly between the operators of the interfering stations. When this fails, either licensee may request his government to take up the matter. Some cases are handled through diplomatic channels. When the problem is purely technical, however, the telecommunications authorities of the country involved usually communicate directly with the Commission. Similarly, the Commission generally uses the same approach on behalf of its licensees. Approximately 300 international cases were dealt with by the Commission during the year, and most of them were settled satisfactorily.

As the Commission's monitoring stations "cruise" the spectrum, they report foreign stations operating with technical discrepancies which have an adverse effect upon United States stations. These reports of infractions are forwarded to the governments concerned in accordance with treaty provisions. Last year there were about 3,000 of these reports. Conversely, the Commission received a number of infraction reports from other countries.

Field Engineering and Monitoring

GENERAL

The Commission's field functions are of a technical nature and, among other things, involve radio station inspections, radio operator examinations, monitoring, and services to correct radio interference.

During the year, 2 marine offices were created—one at Tampa, Fla., and the other at San Pedro, Calif.—to replace the former suboffices there. An Equipment Construction and Installation Branch was installed at Powder Springs, Ga., in connection with the development, construction, and maintenance of specialized direction finders and certain other equipment for Commission use.

There are now 24 district engineering offices, 5 suboffices, 2 marine offices, 18 monitoring stations and 1 mobile TV monitoring unit.

MONITORING

Monitoring Facilities

The Commission's monitoring and direction-finding network comprises 10 primary and 8 secondary stations directed by a central monitoring control. (See list in appendix of this report.)

The Twin Falls, Idaho, secondary station was moved to Douglas, Ariz., in May 1957 to improve the coverage of the Southwestern States and to obtain a better site for long-range direction finding. Another advantage is that the new site is Government-owned.

The Commission has obtained surplus Government land near Chillicothe, Ohio, and also is in the process of securing such land near Canandaigua, N. Y., for the eventual relocation of the Chillicothe secondary and the Millis, Mass., primary monitoring stations, respectively. The Chillicothe station is now on leased property. The proposed move of the Millis station to Canandaigua is primarily to secure a better site for direction finding and for directional monitoring antennas.

Monitoring Surveys

The Commission's monitoring stations patrol the radio spectrum around the clock to report frequency occupancy and usage data for the International Frequency Registration Board (IFRB) of the International Telecommunication Union (ITU) at Geneva, Switzerland.

The United States is committed by international agreements to perform this service. The IFRB compiles and publishes summaries of this information supplied by participating countries. The summaries are used worldwide to assist all administrations, including the United States, in efficiently allocating radio frequencies and in resolving instances of international radio interference.

Because of the benefits they themselves derive from the international monitoring program, 6 of the largest domestic commercial communication companies operate monitoring facilities and participate in the work under the coordination of the United States Centralizing Office for International Monitoring which is located within the Commission. This year, 166,393 monitoring items were forwarded to the IFRB by that office. Of these, about 150,000 were obtained by FCC monitoring and the remainder by commercial monitoring.

Commission monitoring stations made 21 special surveys during the year to collect frequency usage and other engineering data required by the Commission in domestic frequency allocation, and for studying possible interference from new or modified frequency and radio station allocations. Included was the obtaining of factual engineering data required by the Commission in preparatory work for the 1959 International Radio Conference.

Direction Finding

Although the direction finder is only one of the many tools used by a coordinated monitoring network—others being precision frequency measuring equipment, spectrum analyzers for determining the spectrum space occupied by a signal, field intensity equipment to measure its strength, etc.—the importance of being able to determine the source of an unidentified signal makes the direction finding the second most important monitoring aid, topped only by the function of listening throughout the spectrum to detect unidentified transmissions.

The FCC 18-unit direction finder network provides a means of quickly locating unauthorized transmitters and sources of interference, and the general knowledge of its capabilities in this regard tends to discourage would-be violators. Also, these facilities aid in air and sea craft search and rescue operations and assist defense agencies in research and development projects.

The FCC monitoring network logged a total of 116,371 bearings during the year, although many more were taken by individual monitoring stations in the course of their local work.

Of the total reported bearings, 46,080 were taken to position high altitude balloons and surface weather buoys for the military agencies and 2,490 were taken in search and rescue operations. Last year the totals in these categories were 62,280 and 1,700, respectively.

Examples of emergency assistance.—A military plane en route from the Azores to Bermuda failed to sight its destination at the estimated time of arrival. The pilot radioed for assistance which was relayed to the Commission via the Coast Guard. The resulting fix showed that the plane had overshot its destination and was proceeding away from Bermuda. Acting upon data furnished by the FCC, the pilot was enabled to correct his course and land safely before his fuel supply became exhausted.

A Navy flying "boxcar" with 11 persons aboard departed from Miami, Fla., for Bermuda. Seven hours later, the pilot radioed that he was lost and requested bearings. After notification by the Coast Guard, the FCC direction finding net was able to furnish 6 fixes within a little more than an hour. They enabled search planes to locate the plane and guide it to a safe landing at Bermuda with less than 1 hour's fuel left. In a message of appreciation, the Coast Guard stated: ". . . all FCC fixes were extremely accurate. Successful completion of this case attributed to your prompt and accurate HF/DF fixes."

One monitoring station intercepted a distress call from an aircraft. Five minutes later the Coast Guard asked for direction finder assistance. A military plane somewhere west of Hawaii had a fire on board, part of its electrical equipment was inoperative and one engine was out. Two Coast Guard rescue planes were unable to find the distressed craft by use of radar. One FCC fix assisted in locating the area and this resulted in rescuing the passengers and crew who by that time were on a life raft.

A Navy plane enroute to California developed engine trouble and turned back to Hawaii barely able to maintain 500 feet altitude. This low altitude rendered long range radar search ineffective so FCC fixes were requested by the Coast Guard. These fixes assisted a rescue plane to make contact and escort the distressed plane to a safe landing.

Dense fog off the coast of southern California resulted in a Coast Guard request for FCC direction finding assistance in locating two small boats lost in coastal waters. The radio frequency and transmitter power used by the boats were such that only single bearings could be obtained in each instance. Although fixes could not be evaluated from single bearings, they did give the Coast Guard a line of direction which expedited locating the distressed craft.

In another such instance the FCC net obtained 2 bearings which determined a general search area so that the Coast Guard was able to find a yacht which was lost and short of fuel.

In response to another Coast Guard request, the FCC monitoring station on Oahu furnished a bearing on a fishing vessel lost in a storm

near Honolulu. The bearing assisted in "positioning" the vessel and guiding it safely to port.

Other Monitoring Cases

In addition to monitoring for radio interference, the Commission handled 1,327 major cases involving the detection and location of illegal transmitters, enforcement of radio laws and regulations, and special fact-finding studies to assist the Commission and other Government agencies. This was an increase of 26 from last year. Other cases of the same type but of only local interest, not involving more than one monitoring station or office, totaled 7,340 as compared to 6,548 last year. Additional monitoring statistics follow:

	Fiscal 1956	Fiscal 1957
Alerts, unknown or suspicious signals	10,104	9,280
Identification file slips	187,236	177,275
Monitoring citations served	13,674	14,255
Requests for monitoring coverage (noninterference cases):		
Field Engineering and Monitoring Bureau originations	137	136
Other FCC units	45	34
Other Government agencies	167	180
Amateurs	77	81
Commercial concerns	22	9
Foreign governments	26	31

In October and November of 1957 FCC monitors obtained positioning data on two Russian earth satellites for Government and other scientific study.

Monitoring Training Program

The specialized nature of the Commission's monitoring operations makes it difficult to recruit adequately pretrained monitoring and direction finding personnel. In accordance with a Presidential directive of January 11, 1955, the Commission has continued its on-the-job training program to develop recruits for replacements in its monitoring staff. Additionally, the Commission's experienced monitoring observers maintain and advance their knowledge and skills by participating in this training program.

The training program involves approximately 171 monitoring employees. Instruction generally consists of 1 hour a week of class work supplemented by approximately 2 hours of study assignments. The program has been coordinated with the Civil Service Commission.

INVESTIGATIONS

Investigation of Unlicensed Stations

During the year, mobile investigative units located 100 unlicensed stations as compared with 147 the previous year. Of the current total, 43 were unlicensed boosters, or 23 less than in 1956. Other types of unlicensed operation were:

An unauthorized station was located on a highway swing bridge on the Intercoastal Canal in Texas. It operated on a ship radiotelephone frequency purportedly for safety communications but transmitted superfluous signals.

By means of direction finder bearings taken by a mobile unit, an unlicensed station on coastal frequencies was found to be operated by a retired tug boat captain in a garage in the rear of his dwelling at a southern port.

Two unlicensed cases were in the nature of hoaxes. A woman stole into an unattended police patrol car and radioed: "Bergen Beach Tower . . . running out of fuel . . . crash landing . . . Plane 3417." In another instance 4 teenagers entered a parked automobile equipped with amateur radio and broadcast: "40 Russian bombers are approaching New York . . . get in your cellars."

Unlicensed war-surplus walkie-talkies were used by a New Jersey high school football team for instruction purposes. They discontinued this part of their practice.

Acting on information that an unlicensed Alaskan station was frequently checking into the amateur "Sourdough Net," on 3892 kilocycles, an investigative unit pinpointed the origin in an isolated area. After admitting being unlicensed, the operator made a closing announcement that he was signing off permanently.

An unlicensed radar installation was found at an oil company's deck in Seattle. It was operated by a marine equipment organization for sales purposes. Upon warning, operation ceased pending application for a proper authorization.

Officers of a foreign ship were found working an unlicensed VHF transmitter while the ship was in port at St. Thomas, V. I. Its use to direct the offshore unloading of passengers was discontinued.

INSPECTIONS

Broadcast Station Inspections

A continuing inspection of broadcast stations (AM, FM and TV) is necessary to determine compilance with standards and regulations and make certain that stations are operating in the proper technical manner. Observations and measurements are made to eliminate unnecessary interference with other broadcast stations and prevent harmonics and spurious emissions interfering with other types of radio communication, particularly those concerned with the safety of life and property. Inspections also establish whether qualified operators are employed as required and check on compliance with regulations governing the marking and lighting of tall towers which are a hazard to aircraft.

In fiscal 1957, inspections were made of 1,097 broadcast stations of which 192 were initial inspections of new stations conducted during equipment tests to establish technical eligibility for issuance of license. In the previous year 1,059 inspections were conducted. Notices of violation issued to broadcast stations in 1957 totaled 593 as compared with 615 in 1956.

Ship Radio Inspections

In addition to carrying out its responsibility under title III, part II of the Communications Act to inspect radiotelegraph installations aboard certain passenger and cargo vessels, the Commission now has the added task of seeing that the new part III, which requires radiotelephone installation on coastal vessels carrying more than 6 pasengers for hire, is complied with. (See Marine Radio Services.) Enforcement of the latter is a major problem since most of the 5,000 vessels affected are small fishing vessels or pleasure craft which are widely scattered along our coasts.

Small boats have long been authorized to use radiotelephone on a voluntary basis. A total of 52,360 hold licenses. An enforcement campaign against unauthorized radiotelephone operation on small craft is helping to bring about compliance. As a result of 2,611 small boat inspections last year, 442 were warned about unlicensed ship station operation and 294 letters were sent to unlicensed operators.

Complete ship inspection figures for fiscal 1956 and 1957 follow:

	United States ships		Foreign ships	
	1956	1957	1956	1957
Compulsory ship stations				
Number of stations	1,653	1,755	0	0
Number of inspections [1]	1,697	1,767	315	318
Number of deficiency notices served	1,127	1,090	109	94
Number of violations corrected during inspection [2]	2,481	2,955	375	368
Voluntary ship stations				
Number of stations	50,952	52,360		
Number of inspections	495	2,611		
Number of deficiency notices served	453	1,515		

[1] Not including "call backs" to verify correction of violations.
[2] For which deficiency notices were not served.

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In 1957, radiotelephony certificates were issued to 453 vessels as result of the Great Lakes Agreement as compared with 457 in 1956. Also, 65 radiotelephony certificates were issued under authority of parts II and III, title III, of the act as compared with 40 in 1956. A total of 1,172 radiotelegraphy certificates were issued to United States vessels in accordance with requirements of the Safety of Life at Sea Convention and 308 issued to foreign vessels. This compares with 1956 figures of 1,100 and 285, respectively.

At the request of the Coast Guard, 1,479 inspections were made of portable radio equipment aboard lifeboats in order that safety equipment certificates could be issued. In 1956 there were 1,390 such inspections.

Other Radio Station Inspections

In 1957 inspections of stations in services other than broadcast and ship were less than in 1956 due to manpower limitations. They were mainly on a sampling basis to determine areas where special enforcement emphasis was necessary. The 5,982 such inspections resulted in issuance of 1,760 violation notices. For the previous year there were 7,073 inspections and 1,444 notices.

INTERIM SHIP STATION LICENSES

To assist small boat owners obtain prompt authority to operate, the interim ship station license program was expanded. Field offices are now authorized to issue a "90-day" interim authority for operation on both medium and very high frequencies pending action by Washington on issuance of a full term license. During the year 8,084 interim ship radiotelephone licenses were issued as compared with 5,292 in 1956.

COMMERCIAL RADIO OPERATORS

The radio transmitting apparatus in any radio station for which a station license is required must, in general, be operated by a person holding an operator license. The grade of operator license required depends upon the class of station, the nature of the radio service, the complexity of the transmitting equipment and the extent to which the station may serve to promote safety of life and property. Under the law, radio operator licenses are issued only to United States citizens.

The duties of radio operators are many and varied. They include the handling of routine and emergency communications; the manipulation of controls of transmitting equipment; the keeping of radio station operating records, and the performance of complex technical duties that may critically affect the proper operation of the equipment and the service of the station. At some stations a single class of operator performs all types of duties; at others the duties are subdivided among operators of different classes who perform them according to the need of the particular station and the grade of operator license held.

The Commission is authorized to waive or modify the requirement of licensed operators under some conditions and circumstances and has done so in the cases of certain stations in which semiautomatic transmitting equipment is employed.

Operator Rule Changes

As a result of the enactment of Public Law 985, the Commission changed the license requirements for persons operating radiotelephone stations aboard certain ships carrying more than 6 passengers for hire. They are now required to hold a radiotelephone third class operator permit instead of the restricted radiotelephone operator permit previously held.

The Commission also deleted section 13.62 (a) of its rules which contained special provisions for the experimental radio services which has been superseded by detailed operator requirements for those services now incorporated in part 5 of the rules.

Operator Suspensions and Denials

Action was taken to suspend the licenses of 9 commercial radio operators. In 2 cases hearings were requested and the suspension orders were stayed meanwhile. Three suspension orders on which hearings had been held were affirmed. These cases have been appealed.

Four commercial radio operator applications were dismissed for failure to furnish information with respect to their alleged affiliation with subversive groups and another was dismissed for failure to furnish information relative to his alleged criminal record.

Operator Examinations

Examinations for both commercial and amateur operators are conducted regularly at 30 field engineering offices and at 56 other locations throughout the United States and its territories. The exact place and time are determined on the basis of a semiannual review. A radio operator examination schedule, published semiannually, is available at any of the Commission's field offices.

There has been an upsurge in the number of examinations for radiotelephone third class operators to operate ship stations as required by law.

In 1957 a total of 52,244 amateur examinations of all grades were conducted, or about 5,000 more than the year before.

Commercial Radio Operator Authorizations

The 300,681 commercial radio operator applications received in 1957 resulted in issuance of 262,134 authorizations of different classes. This is an increase of 43,366 over the number for 1956. Outstanding

commercial operator licenses of all classes at the end of the year reached a new high of 1,304,300 or 190,000 more than in 1956. Comparative figures by grades of licenses follow:

Class of license	Outstanding June 30, 1956	Outstanding June 30, 1957	Increase or (decrease)
Radiotelegraph:			
1st class	6,756	6,519	(237)
2d class	10,795	10,247	(548)
3d class	2,142	2,006	(136)
Temporary limited 2d class [1]	482	15	(467)
Radiotelephone:			
1st class	59,155	61,502	2,387
2d class	34,011	40,803	6,792
3d class	27,504	34,526	7,022
Restricted permits [2]	927,302	1,119,228	191,926
Aircraft authorization [1]	45,011	29,454	(15,557)
Total	1,113,158	1,304,300	191,142

[1] This class of license discontinued.
[2] This class of license issued for lifetime of operator.

FIELD ENGINEERING FACILITIES

Electronic Aids

Electronic instruments are the working tools of the Commission's field engineers in enforcing rules, monitoring the radio spectrum, locating sources of interference, tracking down unauthorized operation, and obtaining radio propagation and other data required by the Commission in its rule-making activities.

From the low frequencies used for long range navigation, up through the broadcast band, the shortwave bands of international communication, the FM, VHF, and UHF television bands and far up into the microwave spectrum where searchlight-like beams of radar and microwave links probe the ether, the Commission's equipment must be able to pick up and, when necessary, make accurate measurements and analysis of the technical characteristics of these emissions. The problem is further heightened by the complexity of types of signal now encountered. Except at sea, in a few other special services, and among amateurs, simple manual (hand key) radiotelegraphy is largely a thing of the past. High speed automatic (machine) sending, facsimile, TV, radio navigation signals, radar, telemetering and remote control by radio are the order of today, with new types of emissions designed to crowd a maximum of intelligence into the narrowest possible slice of the radio spectrum space. Hence, the constant need for improved field engineering facilities to keep pace with the rapid advances being made in all phases of radio communications and electronics.

Adequate monitoring and long range direction finding facilities is one essential. This includes the locating and acquisition of suitable sites for new monitoring stations, planning their layouts and making them ready for operation.

Progress continued during the year in replacing the old long range direction finders with the latest type high speed remotely controlled units of the Commission's own design. This new type direction finder was installed at 5 monitoring stations, bringing to 8 the number so equipped. Their performance has been very satisfactory, and construction of additional units is under way.

To provide the field engineers with certain highly specialized monitoring and measuring instruments that cannot be obtained from commercial sources, and for installation and initial testing of such instruments, including the remote controlled long range direction finders, an Equipment Construction and Installation Branch was established at Powder Springs, Ga., late in fiscal 1957.

Mobile TV Monitoring Units

A second mobile TV monitoring unit is being constructed jointly by the Field Engineering and Monitoring Bureau and the Laboratory and is expected to be in service by the middle of fiscal 1958. This unit, like the one now operating, will contain specialized precision measuring and analyzing instruments for determining the technical characteristics of TV broadcast transmissions so that deficiencies noted may be brought to attention of the stations for corrective action.

Utilization of Surplus Equipment

In practicing economy and still providing essential technical facilities, the Commission is constantly in search of electronic equipment which has become excess to the needs of the military or other Government agencies but which, nevertheless, is suitable to certain of its requirements. Availability of such equipment through the General Services Administration was of considerable help in improving field facilities during the year. Material obtained from surplus included electrical cable, radio parts, transmitters, test equipment, emergency power generating equipment, and teletype equipment. In some cases, repair or modification for specialized use has resulted in a marked saving and acquirement of needed equipment that might not otherwise have been available.

Miscellaneous

A start was made toward further modernization of the direction finder equipped mobile investigative units, including acquisition of several receivers having greater selectivity as required by the increasing congestion on frequencies in the mobile radio services.

Progress has been made by the Washington and Philadelphia field offices in developing transistorized frequency measuring and specialized receiving equipment for use where light weight and portability beyond that of commercially available equipment are required.

ENGINEERING PROJECTS, SURVEYS AND MEASUREMENTS

In addition to carrying out regular monitoring and rule enforcement duties, field engineers are also required to undertake special projects, including the development of technical data essential to Commission rule making and for use at international radio conferences.

With the constantly increasing significance of broadcasting to the public, it is essential that continuous sources of accurate data concerning propagation of radio and TV signals be available to the Commission for allocation planning and rule making. For this purpose an average of 12 continuous signal field intensity recorders, located at monitoring stations, were in operation day and night, recording data on the minute-to-minute, hour-to-hour, and season-to-season variations in strength of selected signals in the AM and FM aural bands and the VHF and UHF television bands.

A number of mobile field intensity surveys were made in various parts of the country to determine UHF television station coverage and propagation characteristics. Other mobile field intensity surveys included development of information on interference potentialities of industrial heating and electronic welding equipment and other noncommunications electronic devices. Bandwidth measurements of various types of emissions were made in connection with preparations for the 1959 International Radio Conference.

The mobile TV monitoring unit was used to observe the signals of 118 TV stations. It was displayed and its work explained at group meetings of the Institute of Radio Engineers at Chicago and Pittsburgh.

ANTENNA OBSTRUCTION MARKINGS

Pursuant to provisions of the Communications Act which stipulate that the Commission require painting and illumination of radio towers when in its judgment such towers do or may constitute a menace to air navigation, part 17 of the rules provide for the marking and lighting of antenna structures.

Proposals for new or modified antenna structures which meet criteria set forth in these rules are approved by the Commission. Those which do not are referred for special aeronautical study and recommendation to appropriate Regional Airspace Subcommittees (ASP) of the Air Coordinating Committee (ACC), which was created by Executive Order to coordinate and make recommendations on all matters concerning both civil and military aviation that affect more than one agency of the Government.

During fiscal 1957, the number of applications requiring antenna processing reached a record high of 14,483, an increase of approximately 100 applications per month over fiscal 1956. The number of

antenna proposals processed by Antenna Survey Branch (ASB) for all radio services exceeded the previous record high of 13,089 during fiscal 1956 and totaled 15,213, an increase of 2,124, of which 1,853 were for safety and special radio services.

Despite the increase in the number of antenna proposals requiring antenna processing, the Commission's backlog of pending applications was reduced during 1957 from over 1,150 to 421 with no increase in handling personnel. The number of antenna proposals referred to Regional Airspace Subcommittees for special study decreased from a record high of 894 in fiscal 1956 to 850 in 1957. Referrals of broadcast and common carrier proposals increased in proportion to the increase in applications processed for each service, while referrals of safety and special radio services proposals decreased from 530 to 459 notwithstanding the significant increase in number of applications processed for that service. A contribtuing factor is that a high percentage of the latter's proposed antenna are under 170 feet in height.

Tall TV Towers

At the close of the year, 52 tall TV towers (1,000 feet in height or higher) were in operation; construction permits for 17 towers over 1,000 feet in height were outstanding and applications for 20 additional towers over 1,000 feet were pending.

During the year, KSWS–TV, with an antenna towering 1,610 feet above ground that made it the tallest manmade structure in the world, began operation at Roswell, New Mexico. Final decision is pending in the hearing on the Deep South Broadcasting Co., Selma, Ala., antenna proposal for 1,993 feet above ground. The Commission designated for hearing the application of WHAS–TV, Louisville, Ky., which proposes a 1,799-foot tower above ground.

"Antenna Farms"

The Commission's proposed rule making (Docket 11665), to require applicants contemplating towers more than 500 feet tall to specify "antenna farm areas," or existing antenna structures, or to demonstrate why their antennas cannot be so located, was deferred pending conclusion of a study by the Joint Industry-Government Tall Structure Committee (JIGTSC) of changes in criteria for determining antenna height and location.

Abandoned Towers

Pursuant to recommendation of JIGTSC, the Commission proposed legislation to amend section 303 (q) of the Communications Act to require that abandoned radio towers continue to meet the same painting and lighting requirements applicable to towers in use.

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Antenna Application Processing

Statistics of antenna construction proposals processed during the fiscal year follow:

Services	Pending July 1, 1956	Received in ASB	Cleared by ASB	Pending June 30, 1957
Broadcast:				
AM	40	812	805	47
FM	1	113	109	5
TV	25	840	812	53
International	0	0	0	0
Experimental	0	18	18	0
Total broadcast	66	1,783	1,744	105
Safety and special radio services	1,036	12,038	12,772	302
Common carrier	49	662	697	14
Grand total	1,151	14,483	15,213	421

The number of proposals referred to the Regional Airspace Subcommittees for special aeronautical study follows:

Services	Pending at airspace July 1, 1956	Sent to airspace during year	Received from airspace during year	Pending at airspace June 30, 1957
Broadcast:				
AM	36	177	174	39
FM	1	4	5	0
TV	17	155	128	44
International	0	0	0	0
Experimental	0	0	0	0
Total broadcast	54	336	307	83
Safety and special radio services	104	459	515	48
Common carrier	8	55	60	3
Grand total	166	850	882	134

Research and Laboratory

TECHNICAL RESEARCH

General

The Commission has a number of basic engineering problems which require continuous study in order to keep up with developments in radio and to provide for new uses of the radio spectrum. These problems are in the field of propagation, study of technical standards for the various services, provision for interference protection from electric and electronic devices, and determining the interference potential of different services. Under the Communications Act, the Commission is also required to study new uses for radio and provide for the experimental operation of new devices.

VHF and UHF Propagation Research

During the year, field strength recordings were made at 8 monitoring stations using 13 different propagation paths from VHF and UHF television and FM broadcast stations. In view of the rules and engineering standards requiring changes as the industry expands, the information derived from these measurements and recordings will be useful in determining the physical separation needed to avoid destructive interference between stations, the amount of power required to provide efficient coverage, and the effects of antenna height, climate, season, etc., on signal ranges for TV and other services in the VHF and UHF frequency ranges.

From previously accumulated data, VHF field strength curves were prepared and presented at the International Radio Consultative Committee plenary session in Warsaw in August 1956. More emphasis is now being placed on the accumulation of UHF data. There continues an urgent need for information which can be obtained only from measurements, both on UHF and VHF.

Numerous reports were prepared for the information of outside engineers dealing with the application of newly proposed standards for calculating TV service and interference areas by methods developed from measurements made by the Commission and by the broadcasting industry.

Other problems dealing with VHF and UHF propagation investigated during the fiscal year include:

Techniques for predicting TV service in areas surrounded by various types of terrain.

Further study of measurements from different parts of the United States, correlating these with weather conditions, to clarify the need for retaining zones in which service areas are classed.

Cooperation with industry groups in planning field strength measuring programs and developing standard methods of measurement.

Properties of ionospheric and tropospheric scatter propagation, particularly with respect to inteference aspects.

Efficiency studies for allocating frequencies in TV and other radio services, incorporating new information on propagation and systems development.

Propagation factors involving frequency assignments for shipping in the Great Lakes area.

Miscellaneous Propagation Research

The sunspot cycle recording program was continued, and will be terminated after completing two 11-year sunspot cycles. Field strength recordings of AM broadcast stations were made at 3 monitoring stations using 6 different paths. Analysis of these records was deferred because of the more urgent problems encountered in VHF and UHF propagation studies.

An extensive study of radio communication facilities on the Mississippi and Ohio River systems was made during the year. This problem involved frequencies in use by coast stations and river boats operating from New Orleans to St. Louis, Chicago, and Pittsburgh, and by ships in the Atlantic Ocean and the Gulf of Mexico.

Much new information concerning spectrum utilization was accumulated in a project under contract with the Army Signal Corps. With the growing shortage of frequencies, technical standards for both civilian and military communication equipment are being tightened beyond the minimum requirements set forth in the Atlantic City radio regulations.

Government-Industry Cooperation

The rapid expansion of the electronics industry required an increasing amount of Commission representation at conferences and meetings of various technical and scientific organizations of Government and industry. Among these are the Telecommunications Planning Committee of the Office of Defense Mobilization (TPC; the Interdepartmental Council on Radio Propagation and Standards of the Central Radio Propagation Laboratory (ICORPS); the Inter-

national Radio Consultative Committee (CCIR); the International Scientific Radio Union (URSI); the FCC Radio Propagation Advisory Committee (RPAC); the Institute of Radio Engineers (IRE); the American Institute of Electrical Engineers (AIEE); the Radio-Electronics-Television Manufacturers Association (RETMA); the National Association of Radio and Television Broadcasters (NARTB); the Electrical Standards Board and the Electrical Coordinating Committee of the American Standards Association (ASA); the Radio Technical Commission for Marine Services (RTCM); the Radio Technical Commission for Aeronautics (RTCA); the Television Allocations Study Organization (TASO); the Association of Maximum Service Telecasters (AMST); the Air Coordinating Committee (ACC), and the Preparatory Committee for the International Radio Conference (PCIRC).

Technical Standards

Development of technical standards for the various radio services continued, with the basic objective of achieving maximum efficiency of radio spectrum utilization. Accordingly, transmitter performance characteristics affecting spectrum occupancy were of major concern. The technical standards incorporated in the rules for "split channel" operation in the land mobile services include specifications of reduced bandwidth, better frequency stability and specific audio filter characteristics designed to require optimum performance of equipment. These specifications apply uniformly to land mobile services operating under various parts of the rules, including common carrier, public safety, and private licensees. In the aviation radio services, revised technical standards and provisions for "type acceptance" of transmitters on the basis of these standards were adopted in part 9; these standards include specifications of emission bandwidth, frequency stability and spurious emission limitations. Studies were made toward improved standards for spurious emissions in the aural broadacst services, based on proposed rules.

The use of "single sideband" emission for radiotelephony, instead of the double sideband which is now in general use, offers the possibility of reducing the amount of spectrum occupied by such signals. Because of proposed rule making, this subject received intensive study by the Commission and joint Government-industry conferences for the purpose of developing technical standards which are useful and practicable. The varying needs and problems of the respective radio services regarding use of single sideband for radiotelephony were given particular attention. It is planned to continue these studies with the objective of arriving at final technical standards which can be made effective with provisions for an orderly conversion from existing practices. In the aeronautical and mari-

time mobile services, suitable international arrangements regarding "single sideband" will also be necessary prior to implementation. Present efforts concerning "single sideband" are limited to the spectrum below 25 megacycles; however, attention is also being given to possibilities of using this technique on higher frequencies.

Other technical studies were made with regard to possible development of standards for new kinds of systems, such as TV boosters, scatter communications and subscription TV.

Type Acceptance of Transmitters

The Commission's requirements for "type acceptance" of transmitters as a prerequisite to licensing were extended to include the aviation radio services (part 9) and the domestic public radio services (part 21), in addition to the broadcast, maritime mobile and noncommon carrier land mobile services. Type acceptance is based on evaluation by the Commission of certain measurements made upon transmitters prior to manufacture and use, to show that their performance meets the technical standards prescribed for the class of service involved.

During fiscal 1957, of 167 type acceptance applications received, 130 were granted. The 1956 figures were 106 and 65, respectively.

Requirements for field strength measurements of spurious emissions radiated from transmitter cabinets became effective June 1, 1957, after having been postponed several times since May 1955 due to problems concerning measurement methods. Industry groups cooperated in developing adequate methods of measurement.

Lists of "type accepted" and "type approved" radio equipment were published in the Radio Equipment List (parts A, B, and C) for aural broadcast, TV broadcast, and other than broadcast services, respectively. These lists can be inspected at any of the Commission's field offices, also in Washington. Copies may be loaned to interested parties for duplicating purposes. "Type approval" is mentioned in the "Laboratory Division" section of this chapter.

Experimental Radio Service

The Experimental Radio Service is one of the Commission's answers to Communications Act mandate that it provide for the experimental uses of frequencies and encourage the greater use of radio in the public interest.

Part 5 of the rules governing these services covers the use of radio in connection with such basic research as investigations of propagation, exploration of the various ionized layers in the ionosphere, and studies of tropospheric effects, new circuity and modulation techniques. The rules also provide for experimentation in connection with the development of new radio services as well as improvement of techniques and procedures in existing services. Many of these in-

vestigations, both research 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 evolving new radio and electronic techniques. Narrow band FM and the new single sideband suppressed carrier equipment have made possible a spectrum saving of approximately 50 percent for many radio services. High definition, lightweight radar sets are being developed for small craft and itinerant airplanes. Broad band, multiple-channel microwave equipments are being designed to utilize the new forward scatter propagation techniques in both civilian and military installations.

Among the many research and developmental operations licensed experimentally during the year are those associated with the project "Vanguard," the launching of an artificial satellite, and propagation studies in connection with the International Geophysical Year. Technological developments growing out of these undertakings will have a profound effect upon the world.

The current big problem in administering to the experimental services is finding frequencies for experimentation. Before implementing the Atlantic City frequency allocation table, specific frequencies were reserved for experimental operation. Since practically all usuable bands in the spectrum have been allocated to regular radio services, frequencies have to be borrowed from the latter to take care of experimentation. Such frequencies are hard to borrow so the Commission is restudying its frequency allocation and assignment procedures in the light of experimental needs.

Initial steps in revising the experimental rules were taken during the year.

Statistics covering the experimental services for the fiscal years 1952–57 follow:

Fiscal year ending—	Special temporary authorizations granted	Stations licensed	Applications received
June 30, 1952	140	369	915
June 30, 1953	168	444	1,055
June 30, 1954	300	586	975
June 30, 1955	528	625	1,447
June 30, 1956	643	716	1,507
June 30, 1957	634	801	1,824

Experimental authorizations are issued for making field surveys to determine what type of a radio installation is required to meet the needs of a prospective user, to make antenna site studies and to solve other problems in connection with the design of a radio communication system. Use of radio for technical demonstrations of equipment is also provided on a temporary basis.

Applications for special temporary authorizations to conduct field surveys and to demonstrate equipment have increased approximately 350 percent in 5 years. Most cases involve the clearance of frequencies to prevent interference and, therefore, require exacting study. However, the average processing delay was recently reduced to approximately 8 weeks.

LABORATORY

General

The Commission operates a Laboratory near Laurel, Md. The laboratory also makes tests and observations at other places as required in its studies of systems and equipment.

Type Approval of Equipment

"Type approval" of equipment is given after passing laboratory test. It covers apparatus required for the safety of life or property at sea, such as ship main and emergency telegraph transmitters, lifeboat transmitters, automatic alarms used for distress purposes, and ship radar; special monitoring equipment used in aural and TV broadcast stations; citizens radio equipment; and noncommunications equipment employing radio frequency and capable of causing interference to radio reception, such as diathermy, ultrasonic, epilators, and other miscellaneous equipment.

Of 68 submissions for type approval during the year, 43 were approved, a considerable portion being after modification to improve operation or reduce interference.

Of several microwave ovens for home use submitted, 1 was found in compliance and type-approved.

Technical Matters

The laboratory conducted extensive field-intensity surveys covering the transmissions of 13 UHF and 2 VHF television stations located in different parts of the country, including the East and West coasts, the Mid-West and Gulf areas. Terrain varied from extremely flat to mountainous. The measurements were made with a view to their use both for TV allocation problems and those arising in services such as land mobile. The UHF information obtained in these surveys is more extensive than that presently available to the Commission from all other sources.

Laboratory study was made of the possibility of using precision frequency offset to reduce TV interference, or to permit closer station spacing. It appears that precision offset may prove useful, at least for VHF operation.

Studies were made of the use of filters and other methods to reduce cochannel TV interference. The methods developed may be especially useful in areas located midway between TV stations. A patent application was filed on one.

The laboratory developed and installed test-line signal equipment for its own facilities and for use in calibrating field mobile TV units.

One TV translator was submitted for test, and approved.

Besides constructing a second field mobile TV unit, the laboratory provided FCC field engineers with receivers and spectrum analyzers covering the range up to 140 megacycles, and plans to extend the range higher in frequency. This equipment is becoming more and more essential as "split channel" operation and channel occupancy density increase.

The laboratory also tested a number of devices for the Post Office Department for detecting illegal matter in the mails.

Appendix

FIELD OFFICES

The Commission's field activities are largely of an engineering nature. Its Field Engineering and Monitoring Bureau maintains 24 district offices supplemented by 5 suboffices, 2 marine offices and 18 monitoring stations. Its Common Carrier Bureau has 3 field offices.

A list of all Commission field installations and their locations 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.; (marine office) 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) 301 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.; (marine office) 326 U. S. Post Office and Courthouse, San Pedro, Calif.
12	323–A Customhouse, San Francisco 26, Calif.
13	507 U. S. Customhouse, Portland 5, Oreg.
14	806 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.
21	502 Federal Bldg., Honolulu 13, Hawaii
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., N. W., Washington 25, D. C.

Primary monitoring stations
Allegan, Mich.
Grand Island, Nebr.
Kingsville, Tex.
Millis, Mass.
Santa Ana, Calif.
Laurel, Md.
Livermore, Calif.
Portland, Oreg.
Powder Springs, Ga.
Lanikai, Oahu, Hawaii

Secondary monitoring stations
Searsport, Maine
Spokane, Wash.
Douglas, Ariz.
Fort Lauderdale, Fla.
Ambrose, Tex.
Chillicothe, Ohio
Anchorage, Alaska
Fairbanks, Alaska

COMMON CARRIER BUREAU

New York, N. Y., 90 Church St.
St. Louis, Mo., 815 Olive St.
San Francisco, Calif., 180 New Montgomery St.

PUBLICATIONS

The Commission's printed publications are available from the Superintendent of Documents, Washington 25, D. C., at nominal cost. They are not distributed by the Commission.

Included are rules and regulations governing the different classes of radio and other services. Each part covers a particular service. On the back page is a form which, when filled out and forwarded to the Commission, entitles the purchaser to receive any subsequent changes to the part or parts purchased until a complete revision is printed.

A list of these printed publications follows:

Title	*Price*
Communications Act of 1934, with amendments and index, revised to May 1954	$0.70
Packet No. 2, revised pages from May 1954 to September 1955	.30
Packet No. 3, revised pages from September 1955 to February 1956	.15
Packet No. 4, revised pages from February 1956 to December 1956	.25
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
Vol. 22, pamphlets of selected decisions and reports, Jan. 1, 1957, to June 30, 1957	(*)
Vol. 23, pamphlets of selected decisions and reports, July 1, 1957, to ----------	(*)

*Annual subscription price of the weekly pamphlets is $6.75, with $2 additional for foreign mailing. A small supply of individual pamphlets will be available on a first-come-first-served basis. The price will vary according to the number of pages but the average price will be 15 cents. Subscriptions cannot be back-dated to include back issues and back issues will not be stocked for sale as such.

Title	Price
Code of FCC regulations as published in Federal Register, 1954 edition	7.75
Supplement to same, to Jan. 1 1957	2.75
Annual reports of the Commission:	
17th Annual Report—fiscal year 1951	.40
18th Annual Report—fiscal year 1952	.40
19th Annual Report—fiscal year 1953	.50
22d Annual Report—fiscal year 1956	.50
23d Annual Report—fiscal year 1957	(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
For the year 1955, common carrier only	.50
Public Service Responsibility of Broadcast Licensees (Blue Book), 1946	.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
Part 1, Practice and Procedure, December 1955 edition	.25
Part 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
Part 3, Radio Broadcast Services, January 1956 edition. Covers major broadcast services; includes engineering standards, also TV and FM frequency allocation tables	1.50
Figure M–3, Estimated AM Ground Conductivity of the United States (set of two maps)	3.50
Broadcast Engineering Charts, Graphs, and Figures from Part 3	1.00
Part 4, Experimental and Auxiliary Broadcast Services June 1955 edition	.15
Part 5, Experimental Radio Services, March 1953 edition	.10
Part 6, International Fixed Public Radiocommunication Services, December 1956 edition	.05
Part 7, Stations on Land in the Maritime Services, August 1955 edition	.25
Part 8, Stations on Shipboard in the Maritime Services, August 1955 edition	.35
Part 9, Aviation Services, December 1955 edition	.10

[1] In the process of printing; available at Superintendent of Documents at a later date.

Title	Price
Rules and regulations—Continued	
Part 10, Public Safety Radio Services, December 1953 edition	.15
Part 11, Industrial Radio Services, August 1956 edition	.20
Part 12, Amateur Radio Service, September 1956 edition	.15
Part 13, Commercial Radio Operators, December 1954 edition	.15
Part 14, Public Fixed Stations and Stations of the Maritime Services in Alaska, August 1956 edition	.10
Part 15, Incidental and Restricted Radiation Devices, February 1956 edition	.05
Part 16, Land Transportation Radio Services, September 1955 edition	.10
Part 17, Construction, Marking and Lighting of Antenna Structures, June 1953 edition	.05
Part 18, Industrial, Scientific and Medical Service, September 1953 edition	.10
Part 19, Citizens Radio Service, February 1955 edition	.05
Part 20, Disaster Communications Service, September 1955 edition	.05
Part 21, Domestic Public Radio Services, September 1956 edition	.20
Part 31, Uniform System of Accounts for Class A and Class B Telephone Companies, January 1957 edition	.25
Part 33, Uniform System of Accounts for Class C Telephone Companies, May 1948 edition	(2)
Part 34, Uniform System of Accounts for Radiotelegraph Carriers, October 1949 edition	.20
Part 35, Uniform System of Accounts for Wire Telegraph and Ocean-cable Carriers, October 1949 edition	.25
Part 41, Telegraph and Telephone Franks, December 1947 edition	.05
Part 43, Reports of the Communication Common Carriers and Certain Affiliates, September 1953 edition	.05
Part 45, Preservation of Records of Telephone Carriers, October 1950 edition	.10
Part 46, Preservation of Records of Wire Telegraph, Ocean-cable, and Radiotelegraph Carriers, October 1950 edition	.10
Part 51, Occupational Classification and Compensation of Employees of Class A and Class B Telephone Companies, October 1951 edition	.05
Part 52, Classification of Wire-telegraph Employees, July 1944 edition	(2)
Part 61, Tariffs, Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service, August 1946 edition	.10
Part 62, Applications to Hold Interlocking Directorates, April 1957 edition	(3)
Part 63, Extension of Lines and Discontinuance of Service by Carriers, December 1946 edition	(2)
Part 64, Miscellaneous Rules Relating to Common Carriers, July 1948 edition	.10
Part 66, Applications Relating to Consolidation, Acquisition or Control of Telephone Companies, January 1957 edition	(2)

[2] Out of print.
[3] Temporarily available, without charge, from the Commission.

The Commission has available various nonprinted information material concerning its fields of activity. Though none of these can

be supplied in quantity, a single copy may be obtained upon individual request to the Secretary, Federal Communications Commission, Washington 25, D. C.

It is unable to furnish lists of radio stations but, upon request, will supply a fact sheet about 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–June 30, 1957
Richard A. Mack	July 7, 1955–
T. A. M. Craven	July 2, 1956–
Frederick W. Ford	Aug. 29, 1957–

*Served as Chairman.
**Served as Interim Chairman.

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