SIXTEENTH ANNUAL REPORT

FEDERAL COMMUNICATIONS COMMISSION

FISCAL YEAR ENDED JUNE 30, 1950

(With notation of subsequent important developments)

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LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C., December 29, 1950.

To the Congress of the United States:

The sixteenth annual report of the Federal Communications Commission is submitted herewith in compliance with section 4 (k) of the Communications Act of 1934, as amended.

By custom, this report deals primarily with Commission activities for the fiscal year ended June 30, 1950. However, telecommunications is such a fast-moving subject that it has been found appropriate to include in the introductory summary brief reference to subsequent events up to the time of going to press.

The attention of the Congress is invited, in particular, to the little-publicized yet highly important developments in the nonbroadcast field. Here new and augmented services have a material public impact in utilizing radio for the protection of life and property, as adjuncts to commerce and industry, and in furthering common carrier telephone and telegraph service.

Respectfully,

WAYNE COY, *Chairman.*

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INTRODUCTORY SUMMARY

1. HIGHLIGHTS OF THE FISCAL YEAR
2. SUBSEQUENT EVENTS

1. HIGHLIGHTS OF THE FISCAL YEAR

GENERAL

Demands for radio that taxed the available spectrum space, coupled with a substantial increase in radio uses and facilities which posed major interference and other regulatory problems, highlighted the sixteenth year of operation of the Federal Communications Commission.

While broadcasting continued to attract the popular interest, developments in other fields of radio had equal, if not greater, public impact. Because they affected common carrier and safety and other radio services, the year's events were of vital concern to people who pay for the convenience of messages sped by improved telephone and telegraph facilities; people who travel on the ground, on the water and in the air with assurance of having the most modern radio safeguards; firms and persons who use radio for business or personal purposes; and individuals who operate transmitters for a livelihood or a hobby.

Despite the revamping of existing services and creation of new outlets, there are still not enough radio frequencies for all who want to use them. This has thrown a heavy burden on the Commission to seek refinements and economies in apportioning the limited radio spectrum in the best interests of the public. This now involves working arrangements with other nations as well as with users in our own country. Coordinating groups representative of services and industries concerned have been highly cooperative in the domestic endeavor.

The expanded use of radio in general, and increased television operation in particular, has deluged the Commission with interference complaints. Some of these cases may be resolved in a manner of minutes or hours, but many require days, even weeks, for their solution. Mounting use of low-power and other electrical devices which emit radiations that play hob with radio communication is another subject which is receiving mutual attention by the Commission, in-

dustry and others involved with a view of establishing rules to minimize this type of interference.

Some of the Commission's normal routine was delayed or foregone temporarily because of budgetary limitations and the press of more important problems requiring priority consideration. Examples of the latter were the time-consuming television proceedings, international communication matters, legislative and litigation proceedings, and special engineering and technical investigations.

The numerical extent of the Commission's supervisory and regulatory field is exemplified in the fact that, as of June 30, 1950, its records showed more than 775,000 licenses and other authorizations outstanding. This represents a net increase of about 75,000 during the year. Not included in the above total are associated portable and mobile radio transmitters, which alone exceeded 220,000.

In the radio field there were nearly 35 times as many nonbroadcast authorizations as broadcast authorizations. In round figures, these groups numbered 155,000 and 4,500 authorizations respectively. Radio operator authorizations rose to 615,000, an increase of 52,000 during the year.

In the same period the Commission received more than 220,000 applications of all kinds. Of this number, nearly 150,000 concerned radio operators, and there were about 63,000 nonbroadcast applications as compared with 6,200 dealing with broadcast. Common carrier applications numbered 3,600. In addition, common carriers filed some 23,500 tariffs and reports requiring Commission attention.

There were 595 cases on the Commission docket at the close of the year, or 60 less than for the previous year. About 90 percent of these hearing cases concerned broadcast.

COMMISSION

There was no change in membership of the Commission during the year. Commissioner George E. Sterling was reappointed and confirmed for a 7-year term.

Major steps were taken in reorganizing the operating staff on functional instead of professional lines. On March 3, 1950 a unified Common Carrier Bureau was established, effective April 3 thereafter, and on June 29, 1950, the Commission provided for a Safety and Special Radio Services Bureau, to become effective July 31, 1950.

At the close of the year the Commission's personnel numbered 1,285, which was a reduction of 55 during the year.

The Commission's appropriations for the year amounted to $6,729,345.

During the year the Commission made five legislative proposals, namely: (1) to enable it to purchase land and construct buildings for monitoring and research; (2) to authorize it to issue cease and desist

orders; (3) to provide that no broadcast station censor, alter or control broadcasts by legally qualified candidates for public office, and to relieve the stations from being liable for such broadcast material; (4) to provide for reimbursement to the Commission by the States for compensation, transportation, and subsistence expenses of Commission employees when made available as consultants or witnesses in common carrier regulatory matters pending before State commissions; and (5) to add a radio fraud statute to the United States Criminal Code.

In the Federal courts were 32 cases which involved the Commission. Of these, 9 were decided in favor of the Commission, 2 others were reversed or remanded to the Commission, 6 were dismissed by agreement, and 15 remained in litigation.

NATIONAL DEFENSE

Throughout the year the Commission cooperated with military and other Government agencies, also with civil organizations and elements of industry, in matters pertaining to the national defense. On March 23, 1950, the Commission proposed a new Disaster Communications Service which would enable Government and nongovernment radio stations to engage in emergency communication in event of armed attack as well as during times of floods, hurricanes, earthquakes, and other disasters. The Commission continued regional disaster coordination with the Coast Guard, Navy, Army, Air Force, Red Cross, radio amateurs, and State and municipal police organizations. Its established services include the Special Emergency Radio Service, for handling matters directly relating to public safety and the protection of life and property; the Civil Air Patrol, a civilian auxiliary of the Air Force, and the Amateur Radio Service, which maintains regional networks for emergency purposes.

COMMON CARRIERS

The telephone industry reached new peaks, reporting a total of over 40,000,000 telephones in service, an over-all investment of around $10,000,000,000 and more than $1,000,000,000 in new facilities added. The number of telephone calls increased to more than 45,000,000,000 and revenues reached about $3,000,000,000.

Improvement in facilities and installations of new types of plant continued at a rapid pace. The conversion of manual telephones to dial was accelerated. Facilities to provide dialing of long distance calls by operators are in general use; a transcontinental microwave radio relay system for telephone service is well under construction; and mobile radio-telephone service is expanding as rapidly as the available radio frequencies permit.

On December 21, 1949, the Commission adopted a report and order requiring the Bell system telephone companies and The Western

Union Telegraph Co., among other things, to permit interconnection of their intercity television program (video) transmission channels with private noncommon carrier intercity television relay channels authorized by the Commission pending availability of adequate common carrier service. This action was designed to encourage and expedite the development of network TV broadcasting. Hearings were also held on the question of whether Bell system companies and Western Union should be required to establish physical connections and through routes for TV program transmission service.

Domestic telegraph service, which experienced a gradual decline in revenues and volume of business for several years, reached a leveling-off point and registered some gains. Western Union completed and installed a Nation-wide uniform rate structure during the year. Modernization of facilities has continued and plans for an extensive microwave radio relay system for telegraph service are materializing. Improvement of facilities and operating efficiency, coupled with an increase in the volume of business, are producing profits, thereby bettering the earnings situation of Western Union that had been unfavorable for several years.

International telegraph business continued the downward trend of the past several years but indications of a reversal were evident at the close of fiscal 1950. A new international message service providing for direct connections between customers was inaugurated, on May 15, 1950, between New York City and The Netherlands. International radiotelegraph service was being furnished directly to 74 countries and through them indirectly to nearly every other country. International telegraph (radio and cable) traffic during the calendar year 1949 amounted to more than 400,000,000 words, of which amount nearly 260,000,000 was out-bound.

International radiotelephone service was furnished directly to 56 countries and through them to about 30 more countries. The volume of overseas telephone calls ran about 8 percent over the previous year with 675,000 calls in the calendar year 1949. A rate reduction, amounting to $280,000 a year, on telephone service between this country and Cuba was agreed to during the year to become effective July 1, 1950.

SAFETY AND SPECIAL RADIO SERVICES

Increasing interest and activity was reflected in the safety and special radio services which embrace radio aids for the protection of life and property as well as utilization of radio for business and other purposes.

Authorizations in this category (exclusive of amateurs, citizens, and special aircraft which, for the convenience of this report, are treated under "Radio Operators"), exceeded 66,000, not counting about

three times that many associated portable and mobile transmitters. The safety and special radio authorizations are almost 15 times the number of all broadcast authorizations.

The largest single classification was the marine services, in which ship and coastal stations totaled nearly 25,000. Aeronautical stations—both aircraft and ground—approximated 24,000. The public safety radio services, comprising police, fire, forestry-conservation, highway maintenance, and special emergency, numbered more than 7,600. Stations in the industrial radio services, such as power, petroleum, forest products, relay press, motion picture, etc., exceeded 6,000. Land transportation radio services held nearly 3,500 authorizations in the railroad, urban transit, intercity bus, taxicab, highway truck, and automobile emergency classifications. There were nearly 500 experimental authorizations.

However, the foregoing figures do not reflect the actual number of transmitters involved, since one authorization can cover hundreds of portable and mobile units. For example, in addition to ships and aircraft, there were nearly 60,000 portable or mobile units in the public safety services (including over 47,000 police units); nearly 52,000 in the land transportation services (including nearly 48,000 taxicabs), almost 34,000 in the industrial services (including over 23,000 in the power field), and more than 4,500 in the experimental service.

The public safety, land transportation, and industrial radio services operated their first full year under extensive rule changes which went into effect on July 1, 1949.

The mounting interest in the safety and special services is attested by the fact that more than 62,000 applications were received during the year in the groups previously mentioned, exceeding those of the previous year by over 10,000.

BROADCAST

The broadcast year witnessed mounting interest in television, a further slackening of FM authorizations and applications, but a continued growth of AM facilities, particularly in the smaller communities. Authorized AM, FM, and TV commercial broadcast stations totaled 3,144 at the close of the fiscal year, which was only 17 more than the year previous. However, the number of licensed stations rose to 2,658, an increase of 305. On June 30, 1950, there were 351 TV, 277 AM and 17 FM applications on file for new stations. The number of broadcast receivers was approaching 81,000,000.

The aggregate revenues of the aural and television broadcast industries reached $450,000,000 in 1949 or 8 percent above 1948. TV revenues were $34,300,000, or almost four times the 1948 amount. Despite this tremendous increase in TV revenues, however, aural broadcast industry revenues rose to about $415,000,000 or about 2 per-

cent above 1948. Aggregate aural and TV income (before Federal income tax) dropped to $27,300,000 in 1949, or 41 percent below the preceding year largely as a result of the $25,300,000 loss sustained by the television industry.

Hearings on color TV proposals consumed 62 days between September 1949 and May 1950, during which nearly 10,000 pages of testimony was taken and nearly 300 exhibits were introduced. This was the first phase in the Commission's TV proceeding, announced July 11, 1949, looking towards new standards to curb interference, providing additional channels, and consideration of color. Decision on the color issue was pending at the close of the year.

Despite the attendant "freeze" on new TV station construction, there were 109 previously authorized TV stations at the year's end, of which number 47 were licensed. Altogether, 106 TV stations were on the air serving 64 cities and metropolitan areas, as compared with 71 stations serving 42 cities the year previous. An estimated 7,000,000 TV receivers were in the hands of the public. More than 200 experimental TV stations were functioning, including nearly 160 auxiliary TV broadcast stations.

For the first time the number of licensed AM stations passed the 2,000 mark. They totaled 2,118, or 155 more than in 1949. AM authorizations mounted to 2,303, an increase of 103 during the year. Most of this AM expansion took place in nonmetropolitan districts, particularly in communities which previously had no local AM outlets. Decision in the clear channel proceeding was held in abeyance because of negotiations for a new North American regional broadcasting agreement.

Despite deletions which reduced FM broadcast authorizations from 865 to 732, the year closed with 493 licensed FM stations, a gain of 116. The number of FM stations on the air decreased by 46, leaving 691 in operation. However, FM programs remained available over most of the eastern half of the United States, over most of the west coast area, and in a number of cities and adjacent rural areas in the West. FM audiences were using approximately 5,500,000 receivers. A few FM stations provided facsimile service during the year.

Due, in part, to the economies of low-power operation, noncommercial educational FM broadcast stations grew from 58 to 82. During the year the Commission set aside a channel in this service for the United Nations headquarters in New York.

International broadcast stations, which operate under the auspices of the Department of State, increased from 37 to 40.

Miscellaneous auxiliary broadcast services (remote pickup, studio transmitter, and developmental) accounted for 1,038 additional authorizations, or 416 more than the year previous.

RADIO OPERATORS

The largest single group which the Commission administers comprises more than 615,000 radio operators, and over 88,000 radio stations licensed to amateurs and individual citizens. There are over 408,000 commercial operators, 120,000 private flyers holding special aircraft radiotelephone authorizations, nearly 87,000 amateur operators, and 88,000 amateur stations, and over 300 authorizations to individuals for personal radiocommunication, etc. Together these services accounted for nearly 148,000 applications during the year.

Changes made in rules affecting commercial radio operators included establishment of a third-class operator permit for nontechnical duties, definition of the qualifications of persons who adjust or test ship radar installations, and liberalization of the requirements for physically handicapped persons to obtain operator licenses.

The Commission amended its amateur rules to clarify eligibility for two-letter calls, and to provide a year of grace for renewal of licenses expiring after January 1, 1951.

Established on a regular basis as of June 1, 1949, the citizens service has been handicapped by lack of type-approved manufactured sets and inability of home constructors to meet the technical standards required for low power transmitter-receivers to operate in this personalized service.

FIELD ENGINEERING AND MONITORING

The Commission's field engineering work was conducted through 9 regional offices supervising 23 district offices, 6 suboffices, and 3 ship offices, augmented by 11 primary and 8 secondary monitoring stations.

Monitoring operations resulted in the serving of nearly 10,000 violation notices, handling over 100 requests for assistance involving lost or disabled aircraft, and helping trace sources of interference.

During the year the field staff handled more than 8,600 investigative complaints and closed down 149 illegal radio operations. Inspection of nearly 2,000 broadcast stations revealed more than 1,100 technical discrepancies. Over 10,000 ship station inspections showed more than 8,900 discrepancies. Nearly 13,000 other nonbroadcast radio-station inspections resulted in about 3,700 deficiencies being cited.

The engineering field staff also gave examinations to radio operators, and as a result, granted more than 100,000 operator authorizations of all classes.

In addition, it engaged in 128 technical engineering projects for the Commission and other Government agencies.

TECHNICAL RESEARCH AND LABORATORY

The Commission's research and technical studies were conducted by the Technical Research Division with the assistance of the Laboratory Division and the Field Engineering and Monitoring Division.

During the year emphasis was placed upon VHF (very high frequency) and UHF (ultra high frequency) propagation studies, with attention also given to restricted and incidental radiation devices, receiver radiation, single and side band suppressed carrier studies, and radiolocation, but with continuance of medium frequency projects, such as sunspot cycles and atmospheric noise.

The laboratory at Laurel, Md., investigated various methods of transmission and reception, tested transmitters and receivers, and monitoring equipment, and investigated interference produced by noncommunication use of radio-frequency energy. Its testing of equipment prior to marketing is an interference preventative because cooperating manufacturers take any remedial measures which may be necessary in order to obtain type approval prior to production and distribution of units in large number.

INTERNATIONAL

Besides its continuing regulatory work having to do with frequency allocations, the Commission was active in preparing to bring into force domestically the international table of frequency allocations below 27,500 kilocycles. The Atlantic City table of frequency allocations above 27,500 kilocycles is now in force and is reflected in part 2 of the Commission's rules.

During the year, the Commission assisted in the United States preparation and participation in 19 international meetings and conferences having to do with all types of electrical communication media. At the close of the year, it was preparing for 24 additional international sessions. It also made extensive changes in its frequency records and system of notifying the International Telecommunications Union at Geneva.

The Commission handled nearly 400 cases of international interference, and prepared approximately 3,000 reports of treaty infractions for transmittal to nearly 150 foreign countries.

2. SUBSEQUENT EVENTS

INTERNATIONAL

On August 25 the Commission released the list of proposed frequency assignments below 27,500 kilocycles, with special reference to those in the 2,000–3,500 kilocycle band to be recommended for international registration in connection with the Extraordinary Administrative Radio Conference of the International Telecommunication Union

(ITU). This conference, which had been scheduled for The Hague in September, was postponed because of world conditions.

The final protocol of the Paris International Telegraph Conference and United States adherence to the International Telegraph Regulations, with reservations, was ratified by the United States Senate on August 9, and proclaimed by the President on November 20.

The second session of the North American Regional Broadcasting Conference, in Washington on November 15, concluded an agreement relating to operating policies and procedures for AM broadcasting in that region.

NATIONAL DEFENSE

Proposed rules were issued by the Commission on August 3 for a new Disaster Communications Service which would provide emergency radio communication in time of floods, earthquakes, hurricanes, etc., as well as armed attack.

On the same date, rules were proposed to enable non-Government radio stations to use Government frequencies for intercommunication where such cooperation is required, such as the conduct of joint operations. They were finalized October 30.

Reactivation of the State Guard Radio Service was proposed September 8 and effected October 30. This service is for guard units which function in States where the National Guard has been called into Federal service. Texas received the first grant in this reactivated service (November 8).

COMMON CARRIERS

The American Telephone & Telegraph Co., on September 1, placed into service a microwave relay system between New York and Chicago to augment existing coaxial cable routes. The first microwave circuit between Los Angeles and San Francisco was opened by the Pacific Telephone & Telegraph Co. on September 15. By October the Bell System intercity coaxial cable-microwave network had extended from Boston to Jacksonville, thence to Atlanta and Birmingham; from Philadelphia westward to Omaha and Kansas City, with links to Minneapolis and St. Paul; St. Louis and Memphis; Columbus, Dayton, Cincinnati, Indianapolis, and Louisville; Cleveland to Rochester; and New York to Syracuse.

Because applications for mobile radiotelephone carrier operations in New York, Chicago, Houston, Dallas, and Los Angeles exceeded available frequencies, the Commission in the late summer and fall scheduled competitive hearings in those areas.

As of August 18, the Commission amended its rules governing preservation of records by common carriers to separate the provisions applying to telephone and telegraph companies.

On October 18 the Commission instituted an investigation into the lawfulness of the American Telephone & Telegraph Co. and certain Bell System companies tariffs governing the allocation of intercity video relay facilities (docket 9816).

The Commission on November 14 (in docket 9433) found that practices in acceptance and delivery, to and from hinterland points, of overseas and foreign telegraph messages were just and reasonable, but ordered carriers to file certain covering tariffs before December 20.

SAFETY AND SPECIAL RADIO SERVICES

On September 15 the Commission announced rule-making looking to extensive revisions of its rules governing the Maritime Radio Services—Part 7, Coastal and Marine Relay Services, and Part 8, Ship Service. They are designed to bring these rules in step with marine radio developments and to reflect new international treaties and agreements affecting these services.

As of August 21, the frequency 6210 kilocycles was made available as an international calling and working frequency for private and carrier aircraft. Establishment of Aeronautical Advisory Stations in the Aeronautical Radio Services was effected November 22. On October 13 it was proposed to transfer rules and regulations governing aeronautical services in Alaska from Part 14 to Part 9. The effective date for implementing the aeronautical VHF (very high frequency) program was postponed from July 1 until further notice.

Revision of the experimental rules, as proposed August 3, would replace the present classes 1, 2, and 3 authorizations with two new classifications—research and developmental.

On industry complaint, the Commission on August 2 withdrew its type approval of a diathermy machine produced by a New York manufacturer. The case went to hearing.

BROADCAST

As a result of the extensive hearing mentioned elsewhere in this report, the Commission on September 1 issued its first report on the color issue in the general television proceedings (dockets 8736 et al.). It found that the field sequential color system of the Columbia Broadcasting System more fully met the Commission's criteria for a TV color system. However, in view of the compatability problem and the possibility of improvements in TV color systems generally, the Commission proposed postponing a color decision and adopting monochrome "bracket standards" which would enable black-and-white TV sets incorporating those standards to receive CBS color transmissions in monochrome. This proposal was conditioned to receiver manufacturers agreeing to equip future TV sets with a manual or automatic switch for that purpose.

But the response from set makers was insufficient and, in accordance with its September 1 announcement, the Commission on October 11 issued a second report in which it adopted the field sequential color system for commercial broadcasting, effective November 20. In so doing, it held the door open for consideration of competitive systems or developments on the basis of testing and practical demonstration. At the same time, the Commission announced that at a later date it would hold a hearing on bracket standards for the present monochrome TV system.

The Radio Corp. of America and two subsidiaries litigated the Commission's color TV decision and, on November 16, the United States District Court at Chicago issued a temporary order restraining such commercial color broadcasts pending a decision by that court. Meanwhile, on October 16, Commission hearing on other phases of the TV proceedings was resumed at Washington.

On October 5 the Commission proposed temporary rule-making (docket 9807) which would maintain competition between TV network organizations during the current "freeze" period, when the number of interconnected stations in many cities is less than the number of networks available to supply programs to those cities, by limiting the number of hours a TV station could use the programs of any single network.

In November, WOR-TV, New York, was authorized to test the "Skiatron Subscriber-Vision" system. Zenith Radio Corp. postponed its "Phonevision" tests in Chicago to December 1.

The Commission announced, on July 21, that a review of the record of its hearing on the sale of national spot advertising by networks (docket 9080) was insufficient to support a finding that this practice violates the chain broadcasting regulations but was still considering whether it was in the public interest.

On October 6 the Commission dismissed its proceedings in the matter of adopting rules relating to forfeiture of broadcast construction permits if a contract for transfer or assignment is entered into prior to completion of station construction (docket 9553).

The STL (Studio-Transmitter-Link) broadcast rules were amended September 8 to permit AM as well as FM use of such facilities.

On September 27 the Commission proposed rules to permit remote control operation, under certain conditions, of low-power noncommercial educational FM broadcast stations.

As of July 21, the Commission resumed processing of AM broadcast applications in a single processing line instead of the two classifications (simple and complicated) which had been in effect since August 16, 1946.

OPERATORS

Two new classes of commercial radio operator permits—radiotelephone third class and radiotelegraph third class—became effective September 1, when the restricted radiotelegraph operator permit was discontinued. The renewal section of the amateur rules was waived for 1 year, from November 13, for applicants in the military service. At the same time, the amateur rules were clarified to permit photostating of amateur operator licenses.

COMMISSION

In the late summer the Commission completed microfilming its official minutes, and those of its predecessor Federal Radio Commission. By this means, 99 volumes (78,000 pages) were reduced to 46 small reels. The latter were offered to the National Archives for safekeeping.

As of October 31, the number of radio authorizations outstanding on the Commission's books, for the first time, exceeded the 800,000 mark. This represented a gain of nearly 30,000 since the close of the 1950 fiscal year. Comparative figures for groups and services follow:

Service	June 30, 1950	Oct. 31, 1950	Increase or (decrease)
Common Carrier Services:			
Domestic Land Mobile	551	551	
Fixed Public Telephone	26	26	
Fixed Public Telegraph	58	41	(17)
Experimental	290	315	25
Total	925	933	8
Safety and Special Services:			
Aeronautical	23,794	27,870	4,076
Marine	24,921	27,184	2,263
Public Safety	7,607	8,139	532
Industrial	6,090	7,336	1,246
Land Transportation	3,495	3,901	406
Amateur	87,967	89,739	1,772
Citizens	335	380	45
Experimental	466	480	14
Total	154,675	165,029	10,354
Broadcast:			
Standard (AM)	2,303	2,336	33
Frequency Modulation (FM)	732	711	(21)
Noncommercial Educational (FM)	82	87	5
Television (TV)	109	109	
Television (experimental)	206	227	21
International	40	40	
Remote Pickup	1,003	956	(47)
Studio Transmitter (ST)	29	29	
Developmental	6	6	
Total	4,510	4,501	(9)
Radio operators:			
Commercial	408,221	419,595	11,374
Aircraft Radiotelephone	120,550	126,692	6,142
Amateur	86,662	88,338	1,676
Total	615,433	634,625	19,192
Grand total	775,543	805,088	29,545

CHAPTER I—GENERAL

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1. AUTHORITY

The Federal Communications Commission was created by and operates pursuant to the Communications Act of 1934, as amended. Its authority under this statute extends to Alaska, Hawaii, Puerto Rico, the Virgin Islands, and other possessions, but not to the Canal Zone. As an independent Federal agency established by Congress, the Commission reports directly to Congress.

2. FUNCTIONS

The Commission is, in general, charged with regulating interstate and international communication by telephone and telegraph, and broadcast and other forms of radio services.

Its duties embrace supervision of rates and services of subject common carriers; allocation of radio frequencies; licensing of nongovernment radio stations and radio operators; promoting safety through the use of radio on land, water, and in the air; encouraging more effective and widespread utilization of radio; participating in the formulation and domestic administration of wire and radio provisions of treaties and other international agreements to which the United States is a party; and helping coordinate the many forms of electrical communication with the national security effort.

The Commission's regulatory functions include the establishment and enforcement of rules and regulations, and engineering standards,

and making and carrying out policies to meet expansion and developments in this field. In so doing, it must conform to the Administrative Procedure Act which prescribes uniform rule-making practices for Federal agencies to follow.

Licensing by the Commission is limited by the Communications Act to citizens of the United States.

No fee or charge of any kind is exacted by the Commission in connection with its licensing and regulatory functions.

3. COMMISSIONERS

The Commission is administered by seven Commissioners who are appointed by the President and confirmed by the Senate. The President designates one of these Commissioners to serve as Chairman. The normal term of a Commissioner is 7 years. Terms are staggered. Not more than four Commissioners may be members of the same political party.

Throughout the fiscal year the Commissioners continued to function as a unit, directly supervising all activities of the Commission, with delegations of responsibility to boards and committees of Commissioners, individual Commissioners, and the Commission staff. Policy determinations were made by the Commission as a whole.

On June 2, 1949, the Chairman was given additional administrative responsibility by the Commission. On policy matters, such as preparation of budget requests, he was given the responsibility of developing proposals for Commission action. On nonpolicy matters he was given authority for final action with the Commission to be merely informed as to the actions he takes. At the same time, the Office of Administration was made directly responsible to the Chairman in order to aid the Chairman in carrying out his increased responsibilities.

The mounting workload and growing complexity of problems requiring policy consideration caused provision to be made early in fiscal 1950 for a legal assistant to each Commissioner.

On March 27, 1950, the Commission changed the name of its special legal and technical group to the Office of Formal Hearing Assistants. This unit, created June 2, 1949, comprises special legal and technical assistants assigned to work on hearing matters for the Commissioners as a body.

There was no change in the membership of the Commission during the year. On May 26, 1950, Commissioner George E. Sterling (who took office on January 2, 1948, under a recess appointment) was renominated by the President and, on June 20, 1950, was confirmed by the Senate for a 7-year term from June 30, 1950.

4. STAFF ORGANIZATION

During the year, the Commission began reorganizing its operating staff on functional instead of professional lines.

By orders of March 3, 1950, effective April 3 thereafter, the Offices of General Counsel, Chief Accountant and Chief Engineer were set up as major staff units with these duties:

Office of General Counsel.—Advise and represent the Commission in matters of litigation; advise and represent the Commission, and coordinate and make recommendations to the Commission on proposed legislation and international agreements with which the Commission is concerned; interpret the statutes, international agreements, and regulations affecting the Commission and advise the Commission (including the Common Carrier Bureau) as to the authority and power the Commission possesses under such statutes, agreements, and regulations; formulate and make recommendations on procedural rules of general applicability and review all rules for consistency with other rules, uniformity, and legal sufficiency; conduct research in legal matters as directed by the Commission; participate in and render advice to the Commission in proceedings and matters involving rulemaking which concern jointly the common-carrier services and any services other than common carrier; maintain liaison with other agencies of Government on common-carrier matters; provide representation for the Commission on Commission-wide and interdepartmental committees; deal with members of the public and of the industries concerned; perform such other duties as may be assigned or referred by the Commission; exercise such authority as may be assigned or referred by the Commission pursuant to section 5 (e) of the Communications Act. The Office of General Counsel functions with a Broadcast Division and a Litigation and Administration Division.

Office of Chief Accountant.—Recommend the accounting principles which shall be observed; conduct research in and advise the Commission on economic matters to be considered in policy determinations; advise the Commission and its bureaus regarding accounting, economic, and statistical matters; maintain liaison with other agencies of Government on common-carrier matters; provide representation for the Commission on Commission-wide and interdepartmental committees, and on the National Association of Railroad and Utilities Commissioners' Committees on depreciation and on accounts and statistics; deal with members of the public and of the industries concerned; perform such other duties as may be assigned or referred by the Commission; exercise such authority as may be assigned or referred by the Commission pursuant to section 5 (e) of the Communications

Act. The Office of Chief Accountant comprised three divisions—Accounting Systems, Broadcast, and Economics.

Office of Chief Engineer.—Advise the Commission and the Common Carrier Bureau on matters of applied technical research; advise and represent the Commission in the deliberations on the allocation of radio frequencies; collaborate with the Common Carrier Bureau in the formulation of standards of engineering practice and the rules and regulations related thereto, and advise the Commission on such matters; participate in and render advice to the Commission in proceedings and matters involving rule-making which concern jointly the common-carrier services and any services other than common carrier; maintain liaison with other agencies of government on common-carrier matters; provide representation for the Commission on Commission-wide and interdepartmental committees; deal with members of the public and of the industries concerned; perform such other duties as may be assigned or referred by the Commission; exercise such authority as may be assigned or referred by the Commission pursuant to section 5 (e) of the Communications Act. Divisions of the Office of Chief Engineer embrace Aural Broadcast, Television Broadcast, Field Engineering and Monitoring, Technical Research, Laboratory, and Frequency, Allocation and Treaty.

Also effective April 3, 1950, the Commission created a *Common Carrier Bureau* with four divisions—Telegraph, Telephone, International, and Statistics. This new bureau, which unifies related legal, engineering, and accounting activities, is charged with "carrying out the common-carrier regulatory program of the Commission under applicable statutes, international agreements, and rules and regulations, including the regulation of common-carrier rates, services, and accounting, and the licensing of common carrier wire and radio services."

Its duties include the initiation of rules and regulations, except as otherwise specifically provided in the functions of the Offices of the Chief Accountant, Chief Engineer, General Counsel, and the Office of Formal Hearing Assistants; collaboration with representatives of State regulatory commissions and with the National Association of Railroad and Utilities Commissioners in the conduct of cooperative studies of regulatory matters of common concern; participation on behalf of the Federal Communications Commission in international conferences involving common-carrier matters; and, further, assist, advise, and make recommendations to the Commission and represent the Commission in matters pertaining to common-carrier regulation. The Common Carrier Bureau comprises Telephone, Telegraph, Common Carrier Statistics, and International Divisions.

On June 29, 1950, the Commission established a Safety and Special Radio Services Bureau, to become effective July 31 thereafter. This new bureau will consist of five divisions—Aviation, Marine, Industry and Commerce, State-local Government and Amateur, and Authorization Analysis—supplemented by an Enforcement Unit in the Office of the Chief. It will unify the regulation of practically all the nonbroadcast and certain nonexclusive common carrier radio services. In general, it will "assist, advise and make recommendations to the Commission with respect to the development of a safety and special services regulatory program and shall be responsible for the performance of any work, function or activities to carry out that program in accordance with applicable statutes, international agreements, and rules and regulations, except insofar as functions are specifically delegated to other bureaus or staff offices of the Commission."

Its prescribed functions are to "issue authorizations for radio stations (in the safety and special services); initiate rule-making proceedings (in the safety and special services); participate in international conferences with respect to safety and special services; study frequency requirements in the safety and special services and make recommendations with respect to the allocation of frequencies and the drafting of frequency assignment plans for safety and special services; collaborate with Federal and State governmental agencies and industry groups interested in the problems of safety and special services; study technical requirements for equipment in accordance with standards established by the Office of the Chief Engineer; plan and execute a safety and special services enforcement program, including educational campaigns conducted in collaboration with Field Engineering and Monitoring Division; and perform all other functions or activities essential to regulation of safety and special services."

A survey of the Commission's broadcast administration is to be started in the fall; this will be followed by a study of the staff offices later in the fiscal year, and by a study of the field engineering and monitoring activities near the end of the 1951 fiscal year.

This functional staff reorganization, initiated by the Commission as the result of a long-range study of its administrative needs, conforms in general to certain recommendations made in the staff report of the Hoover Commission on Organization of the Executive Branch of the Government, and to like provisions contained in proposed legislation.

The Offices of the General Counsel, Chief Accountant, and Chief Engineer continued to exercise jurisdiction with respect to broadcast and field engineering and monitoring matters. In May 1950 the handling of AM, FM, noncommercial educational and facsimile engineer-

ing matters was consolidated in a new Aural Broadcast Division; auxiliary broadcast engineering was transferred to the Television Broadcast Division, and international broadcast engineering was placed in the Office of the Chief Engineer.

In October 1949 the Technical Information Division in the Office of the Chief Engineer became the Technical Research Division, with three branches—Technical Standards, Low Frequency Radio, and High Frequency Radio.

Other major staff units were:

Bureau of the Secretary.—License, Service, and Records Divisions.

Office of Administration.—Personnel, Organization and Methods, and Budget and Fiscal Divisions.

Office of Information.

Office of Formal Hearing Assistants.—(previously mentioned).

Hearing Division which, since May 28, 1947, has functioned under the direct supervision of the Commission and in accordance with the provisions of the Administrative Procedure Act. This division comprises hearing examiners who preside at hearings and prepare recommended decisions. As of June 2, 1949, the Commission provided for initial decisions to be issued by hearing examiners or Commissioners presiding at hearings, and for motions heretofore handled by motions Commissioners, with certain exceptions, to be acted upon by hearing examiners. Thus, an initial decision takes the place of and serves the same purpose as a proposed decision of the Commission. Death of the chief hearing examiner during the year reduced the number of hearing examiners to nine.

5. PERSONNEL

On June 30, 1950, a total of 1,285 persons were employed by the Commission, or 55 less than in 1949. Personnel distribution was:

Office or bureau	Washington	Field	Total
Office of chief engineer	260	401	661
Office of general counsel	82	3	85
Office of chief accountant	45	0	45
Common carrier bureau	113	38	151
Office of secretary	236	0	236
Commissioners and administrative offices	107	0	107
Total	843	442	1,285

6. APPROPRIATIONS

A breakdown of the Commission's appropriations and expenditures for the fiscal year 1950 follows:

Appropriations		Expenditures	
Regular appropriations (salaries and expenses—including printing and reproduction)	$6,600,000	Personal services	$6,124,115
Deficiency—Public Law 529	129,345	Travel	84,428
		Transportation of things	19,692
		Communication services	148,533
		Rents and utilities	63,949
Total funds available	6,729,345	Printing and reproduction	37,489
		Other contractual services	60,102
		Supplies and materials	114,876
		Equipment	74,419
		Refunds, awards and indemnities	188
		Total obligations	6,727,791
		Transfer to public health	1,540
		Savings, unobligated balance	14
		Total	6,729,345

These appropriations and expenditures were made under authority of Public Law 266, Eighty-first Congress, approved August 24, 1949, and the Deficiency Appropriation Act of 1950, Public Law 529, approved May 26, 1950.

In dollars, this was approximately $12,000 more than the appropriation for the previous year. However, when pay increases and travel allowance increases, resulting from Public Laws 92, 359, and 429 of the Eighty-first Congress, are taken into consideration, the 1950 appropriation is in effect a net decrease of approximately $145,000.

7. LITIGATION

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

During the fiscal year, there were 32 cases involving the Commission in the Federal courts. Of this total, 18 were instituted during the fiscal year—11 in the Court of Appeals for the District of Columbia Circuit; 6 in district courts, and 1 in the United States Supreme Court. The other 14 cases were pending at the start of the fiscal year.

The Supreme Court upheld the Commission in the one case brought before it. In the Court of Appeals for the District of Columbia Circuit, the Commission was upheld in 6 cases and reversed in 1 case, the court remanded 1 case to the Commission for further proceedings, and 6 cases were dismissed by agreement of the parties. In the district courts, two cases were decided, both in favor of the Commission.

As of June 30, 1950, 10 cases were pending in the Court of Appeals for the District of Columbia Circuit and 5 pending in United States district courts.

The status of litigation for the fiscal year is tabulated as follows:

Court	Total	Decisions affirming Commission	Decisions reversing or remanding case	Dismissed by agreement of parties	Cases pending June 30, 1950
Supreme court	[1] 1	1			
Court of Appeals for District of Columbia Circuit	24	6	2	6	10
District courts	7	2			5
Totals	32	9	2	6	15

[1] In *Regents of the University System of Georgia* v. *Carroll*, 338 U. S. 586, 70 S. Ct. 370, 94 L. Ed. 320 (1950), not included in the above tabulation, the Commission, though not a party, filed a brief *amicus curiae*, urging reversal of the judgment of the Court of Appeals of Georgia, 78 Georgia, App. 292, 50 S. E. (2d) 808. The Supreme Court, however, affirmed the judgment.

The following cases, decided during the fiscal year, were of particular interest:

1. In *A. J. Felman* v. *United States* 339 U. S. 973, 70 S. Ct. 1030, 94 L. Ed. 918 (1950), A. J. Felman, former owner of radio station WJOL, who had a contract with the present licensee of the station, under which certain broadcast time was reserved to him for so long as the station should be operated, challenged the authority of the Commission to adopt sections 3.109, 3.241, and 3.641 of the Commission's rules. These rules prohibit the assignor of a station license to retain any right of reversion or any right to use the facilities of the station for any period whatsoever. They also provide that where the contract, the terms of which were fully disclosed to the Commission at the time of execution, was entered into prior to the adoption of the rules, the Commission will not require the licensee to abrogate the contract, provided certain modifications are made to insure full licensee responsibility. Felman contended the rules deprived him of property without due process of law but the three-judge court, convened in the United States District Court, Northern Division Eastern District Illinois to hear the case, sustained their validity. On the Government's motion the Supreme Court, in a *per curiam* order, affirmed the judgment of the lower court without opinion.

2. In *Mansfield Journal Co.* v. *Federal Communications Commission*, 86 U. S. App. D. C. — 180 F. (2d) 28 (1950), the Commission denied the applications of Mansfield for station licenses where it was shown that Mansfield's actions as the sole owner of a newspaper in Mansfield, Ohio, were taken for the purpose of suppressing competition and of securing a monopoly of mass advertising and news dissemination and that such practices were likely to continue by its acquisition of a radio station in Mansfield. The applicant used its position as sole newspaper in the community to coerce its advertisers to

enter into exclusive advertising contracts with the newspaper and to refrain from utilizing radio station WMAN for advertising purposes. Accordingly, the applications of Mansfield for radio station licenses were rejected on the ground that a grant to it would not be in the public interest. On appeal, the court affirmed the Commission, holding that it was fully within the Commission's jurisdiction to hear evidence on the monopolistic practices of the appellant, regardless of whether or not such practices were specifically forbidden by the antitrust laws, and to deny the licenses upon its finding that such practices had taken place and were likely to carry over into the operation of the radio station. The court also ruled that the mandate of the first amendment did not preclude the Commission from considering the competitive practices of the newspaper applicant.

3. In *Edwin W. Pauley, et al d/b as Television California* v. *Federal Communications Commission*, 86 U. S. App. D. C. —, 181 F. (2d) 292 (1950), petitioner was an applicant for a construction permit for a television station in San Francisco, Calif. Since the number of available channels was smaller than the number of applicants, the Commission ordered a consolidated hearing. Petitioner objected to an order of the Commission severing from the consolidated proceeding an application which had been filed several years previously but upon which no action had been taken pending the outcome of related proceedings, concerning the qualifications of such other applicant. Petitioner sought review under section 402 (b) of the act which provides for an appeal to the Court of Appeals for the District of Columbia Circuit from an order resulting in the grant or denial of an application. The court determined that it had no jurisdiction to entertain the appeal, reasoning that the order neither granted nor denied any of the applications so that at most there was " * * * no more than a lessened statistical probability that petitioner will ultimately succeed in getting a station."

4. In *Roy L. Albertson* v. *Federal Communications Commission*, — U. S. App. D. C. 182, F [2d] 397 (1950), the court held that where the Commission entertains a motion for rehearing, filed to request the Commission to reconsider a denial of a previous motion for rehearing, consideration of the second motion on the merits suspends the running of the period for taking an appeal from the order denying the first application for rehearing. In that case, the Commission dismissed Albertson's application for rehearing, which alleged that the grant of a station license to Dunkirk Broadcasting Corp., Dunkirk, N. Y., would cause interference to it, for failure to comply with the requirements of the Commission's rules with respect to petitions for rehearing. The court did not question the validity of the rules but held that Dunkirk having admitted the interference in its re-

sponsive pleading, Albertson was entitled to a hearing despite noncompliance with the rule.

5. In *Radio Cincinnati, Inc.* v. *Federal Communications Commission*, 85 U. S. App. D. C. 292, 177 F. (2d) 92 (1949), the Court of Appeals for the District of Columbia Circuit affirmed a decision of the Commission granting the application of WJIM, Inc., for a station license in Lansing, Mich., and denying the mutually exclusive application of Radio Cincinnati, Inc., holding that the Commission had been eminently fair and diligently conscientious in complying with section 307 (b) of the act which provides that "* * * In considering applications for licenses * * * the Commission shall make such distribution of licenses * * * among the several States and communities as to provide a fair, efficient, and equitable distribution of radio service to each of the same."

8. LEGISLATION

During the fiscal year 1950 the Commission submitted five proposals to the Bureau of the Budget as part of the Commission's legislative programs. These proposals included: (1) An amendment to section 4 (g) of the Communications Act, which would authorize the Commission to purchase land and construct buildings to be used for monitoring and research purposes; (2) the addition of a new section to the act which would authorize the Commission to issue cease and desist orders; (3) an amendment to section 315 of the act, which would provide no radio station licensee has the power to censor, alter or control broadcasts by legally qualified candidates for public office and that licensees cannot be held criminally or civilly liable for material broadcast by any such candidate; (4) an amendment to section 410 (b) of the act to provide for reimbursement to the Commission by the States for the compensation, transportation, and subsistence expenses of Commission employees when they are made available to State commissions to act as consultants or witnesses in common carrier regulatory matters pending before such commissions; and (5) a proposal to add a radio fraud statute to the United State Criminal Code. All of these proposals were approved for submission to Congress.

The Commission's proposals with respect to authorizing purchasing of land for monitoring station and research activities, the issuance of cease and desist orders and enacting a radio fraud statute were included in S. 1973, introduced by Senator McFarland, which passed the Senate on August 9, 1949. These same three proposals were included in S. 1626, introduced by Senator Johnson (Colorado), and the proposals concerning cease and desist orders and political broadcasts were embodied in H. R. 6949, introduced by Mr. Sadowski. No action had been taken on either of these latter two bills. H. R. 4251, which also authorizes the Commission to purchase land to be

used for monitoring stations, was passed by the House of Representatives on May 16, 1949. The Commission's proposal to amend section 410 (b) has not been introduced in Congress, but a similar amendment to section 410, advanced by the National Association of Railroad and Utility Commissioners, was embodied in H. R. 7385. The Commission prepared and submitted detailed comments on each of these bills.

There were also numerous bills considered by the Congress which directly or indirectly concerned the Commission, and on which it was called to submit its views. The most important of these were: S. 1973 and H. R. 6949, both of which, in addition to embodying some of the Commission's legislative proposals, would extensively amend the Communications Act as well as make substantial changes in Commission organization and procedure; H. R. 5487, introduced by Mr. Hobbs, which would revise the procedure for handling appeals to the courts from Commission decisions and orders, and which was passed by the House of Representatives June 5, 1950; H. R. 7310 introduced by Mr. Sheppard, which would place restrictions on the ownership and use of radio broadcasting stations engaged in network operations; and S. 3358 and H. R. 7233, which would prohibit or restrict the transmission of certain gambling information in interstate commerce by means of communications facilities.

Members of the Commission's staff aided in the drafting of S. 3358 and the Chairman of the Commission gave extensive testimony on the bill at a hearing held before a subcommittee of the Senate Committee on Interstate and Foreign Commerce, and the committee favorably reported the bill to the Senate on May 26, 1950. The Chairman also testified on the use of interstate communications facilities in the dissemination of gambling information before the Special Senate Committee to Investigate Organized Crime in Interstate Commerce. In addition to its legislative drafting activities and the testimony presented before congressional committees, the Commission prepared comments for the Congress and the Bureau of the Budget on more than 40 proposed bills, other than those specifically mentioned above, which contained provisions concerning the Commission's functions.

9. NATIONAL DEFENSE

Use of wire and radio communication to aid the national defense, along with promotion of safety of life and property in general, is among the stated purposes of the Commission under section 1 of the Communications Act. In event of war, or public peril or disaster, or other national emergency, special powers in connection with such communication are conferred upon the President by section 606 of that act.

Under this authority, the President in 1940 created the Defense Communications Board, which later became the Board of War Communications. Headed by the then chairman of the Commission, this board coordinated electrical communication facilities in the war effort. Having served its emergency mission, the board was dissolved in 1947.

Also during World War II, the Commission cooperated with the Army Air Forces in maintaining a constant vigil on the coasts, at times closing down radio transmissions which might have furnished bearing to enemy aircraft; and, with the Office of Civilian Defense, worked to guard vital communication facilities against sabotage.

Further, during that conflict, the Commission established a Foreign Broadcast Intelligence Service which monitored and analyzed broadcast programs from overseas for military and other Government agencies. Its own Radio Intelligence Division policed domestic frequencies. The latter located nearly 400 unlicensed transmitters, most of which, fortunately, did not involve espionage. Employing the same direction-finding equipment, it was able to furnish bearings to several thousand planes and vessels in distress. The FBIS was absorbed by the armed services in 1945 and the RID was merged with the Commission's Field Engineering and Monitoring Division the following year.

Despite the necessary freeze on new construction during World War II, operating broadcast stations—including some in the then new FM and TV services—continued to function. However, amateurs were required to cease operation for the duration, and some common carrier and other nonbroadcast radio facilities were diverted to temporary military and other government use.

The Commission is, of course, unable to publicly detail its current activities relating to the national defense. This is largely due to their classified nature, plus section 4 (j) of the Communications Act which, in effect, enjoins the Commission from publicizing information affecting the national security. However, in general, it can be reported that the Commission is cooperating closely with military and other Government agencies engaged in such work and with organizations and other elements of industry.

In particular, liaison is maintained with the communications divisions of the National Security Board and the Department of State. Further Government military and civil cooperation is effected through the Interdepartment Radio Advisory Committee and the Telecommunications Coordinating Committee.

Of special national defense significance during the year was the Commission's initiation, on March 23, 1950, of a proposed new Disaster Communications Service which would enable both Government and nongovernment stations to furnish emergency communication in event

of armed attack as well as during times of floods, earthquakes, hurricanes, and other disasters.

The Commission has long maintained regional disaster emergency coordination with the Coast Guard, Navy, Army, Air Force, Red Cross, amateurs, and State and municipal police organizations. Its established services include the Special Emergency Radio Service, for handling matters directly relating to public safety and the protection of life and property; the Civil Air Patrol, a civilian auxiliary of the Air Force whose stations are licensed by the Commission, and the Amateur Radio Service, which has long provided regional networks for emergency purposes and now has a military amateur radio system affiliated with the Army and Air Force.

The country's radio and wire installations which have been greatly augmented and improved since the last war, constitute an important and speedy media for Government and mass communication in time of national emergency. Indeed, no other nation is so well equipped with civilian radio facilities—facilities which can be used to help insure our national security in war as well as contribute to our efficiency, economy, convenience, and enjoyment in peace.

10. HEARINGS

The Commission, under the provisions of the Communications Act, cannot deny an application for new facilities or modify an existing authorization without affording an opportunity for a hearing. The great bulk of Commission hearings concern broadcast and are required in order to determine which of several mutually exclusive applications should be granted, and whether the facilities applied for would interfere with the operation of stations already authorized. Standard (AM) broadcast cases continue to predominate the Commission's hearing workload.

Applications may be disposed of in three ways: First, by a decision after hearing; second, by removal from the hearing docket and grant without hearing when the application has been amended to eliminate the conflict which necessitates a hearing; and, third, by dismissal of the application at the request of the applicant.

Docket statistics for the 1950 fiscal year follow:

	Pending June 30, 1949	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1950
Broadcast	599	351	239	166	545
Safety and special	19	20	10	13	16
Common carrier	28	25	18	7	27
Other	9	2	3	1	7
Total	655	398	270	187	595

11. LICENSES AND OTHER AUTHORIZATIONS

The Communications Act limits licensing by the Commission to citizens of the United States. Further, it denies the license privilege 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.

At the close of the year the Commission had more than 775,000 radio licenses and other authorizations outstanding, not counting over 220,000 associated portable and mobile units. The first mentioned figure is approximately 75,000 more than in 1949. Nonbroadcast radio services held over 155,000 authorizations as compared with 4,500 for the broadcast services. Amateur, commercial, and other operator authorizations together exceeded 615,000.

12. APPLICATIONS AND OTHER FILINGS

The Commission received more than 220,000 applications of all kinds during the year, which was about 4,000 less than in 1949. Nearly 150,000 of this total concerned amateur and commercial operators, some 63,000 were in the nonbroadcast services, over 6,200 were broadcast, and over 3,600 were from common carriers. These figures do not include legal filings, periodic reports, or common carrier tariff schedules. Common carriers and holding companies filed some 1,900 annual and monthly reports. Tariff schedules numbered 21,600.

13. CORRESPONDENCE, RELEASES AND PUBLICATIONS

Nearly 1,200,000 pieces of correspondence in the form of letters, telegrams, etc., were received or handled through the Commission's Mail and Files Branch during the fiscal year. Of this number, about 860,000 involved receipt and distribution of incoming messages, while outgoing messages exceeded 332,000.

Mimeographed public notices, orders, decisions, and opinions issued during the same period required about 521,200 stencils, 7,550,000 sheets of paper, and 11,367,000 impressions.

The Commission's printed publications are processed by the Government Printing Office and sold by the Superintendent of Documents. A list of those currently available from that source appears in the appendix.

CHAPTER II—COMMON CARRIERS

1. COMMON CARRIER REGULATION
2. DOMESTIC TELEPHONE
3. DOMESTIC TELEGRAPH
4. INTERNATIONAL TELEGRAPH AND TELEPHONE
5. STATISTICS

1. COMMON CARRIER REGULATION

The Commission regulates interstate and foreign communication by telephone and telegraph, whether by wire; ocean cable, or radio. Such communication which is purely intrastate in character is not, in general, subject to Commission jurisdiction.

Provisions of the Communications Act affecting common carriers reflect congressional policy that the public interest in adequate public communications service and reasonable rates is to be protected and promoted by Federal regulation.

Among the regulatory provisions of the act is the requirement that every subject common carrier furnish service upon reasonable request and at reasonable charges. No carrier may construct or acquire additional facilities, or curtail or discontinue service, without Commission approval. All charges, practices, classifications, and regulations in connection with interstate and foreign communication service must be just and reasonable and nondiscriminatory. To implement this requirement, the common carriers concerned file tariff schedules with the Commission, and those schedules are subject to review and regulation by the Commission.

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

To aid its regulation of rates and services, the Commission is empowered to prescribe 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 respect includes the establishment and maintenance of original cost accounting, continuing property records, pension cost records, and depreciation records.

The Commission regulates the interlocking of officers and directors of common carriers, it being unlawful for any person to hold office in more than one carrier unless specifically authorized by the Commission. The Commission 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.

The Commission receives applications to land or operate submarine cables connecting the United States with other countries, and advises the President with respect to the granting of such licenses, after receiving the approval of the Secretary of State.

2. DOMESTIC TELEPHONE

GENERAL

The development of the telephone industry in the United States reached new peaks. During the year ended December 31, 1949, the industry installed more than 1,850,000 telephones so that at the close of that calendar year a total of 40,600,000 telephones were in service of which 33,400,000, or 82 percent, were accounted for by the Bell system. The cost of additions to telephone plant by the industry amounted to well over $1,000,000,000, with the Bell system reporting total gross telephone plant investment of more than $9,430,000,000 as of December 31, 1949, as compared to $8,610,000,000 as of December 31, 1948.

Telephone conversations also reached a record high in the calendar year 1949 with the Bell system handling 43,000,000,000 local and 2,000,000,000 toll calls. Other services furnished by telephone companies, including teletypewriter exchange service (TWX) and private line services, likewise increased. Bell system revenues reached almost $2,900,000,000, an increase of $270,000,000 over the preceding year. The growth of the Bell system is evident from the following tabulation which shows selected data of the system on a consolidated basis for the prewar year of 1940 and the calendar years 1945 through 1949, inclusive:

Year	Number of telephones	Plant investment	Revenues	Employees
1940	17,483,981	$4,701,177,364	$1,174,322,517	275,317
1945	22,445,519	5,702,056,557	1,930,889,452	387,300
1946	25,709,458	6,294,419,079	2,093,664,941	496,438
1947	28,506,795	7,348,802,865	2,224,582,932	524,120
1948	31,364,493	8,618,842,204	2,624,827,067	546,723
1949	33,388,258	9,432,749,584	2,893,273,356	515,854

During the past year the telephone carriers continued the improvement of their facilities. The proportion of dial telephones in the Bell system increased to 73 percent by December 31, 1949, as compared with 68 percent a year earlier. Facilities for dialing of long-distance toll calls by operators are in service so that more than 800 cities and towns can be reached by this means and 30 percent of long-distance toll calls are handled in this manner. The speed of service in handling toll calls has improved. Television program transmission networks had been extended to most of the larger cities in the general area from Boston southward to Norfolk, as far west as St. Louis, and northward to Milwaukee, Detroit, and Buffalo. Demands for telephone service remained at a high level. Despite an increase of over 2,000,000 telephones in the past calendar year, the Bell system still had unfilled orders for over 750,000 more.

Earnings on interstate telephone operations showed a steady rise both in amount and in return on investment. On the other hand, many telephone companies are currently seeking permission of State regulatory authorities to increase further their rates for local exchange and intrastate toll service. As indicated more fully elsewhere in this chapter, the Commission has been called upon by various State commissions and municipalities to provide assistance in matters of mutual interest that are involved in State rate proceedings and, in addition, has been cooperating with the States through the National Association of Railroad and Utilities Commissioners (NARUC) in the study of telephone regulatory problems of common concern.

DOMESTIC TELEPHONE SERVICES

Construction of facilities.—The telephone companies expended over a billion dollars for new construction in the expansion, replacement, and modernization of exchange and toll plant. The bulk of this construction consisted of central office equipment, buildings, exchange lines, and station apparatus. Most of the additions to toll lines were provided through carrier systems, with a relatively small part through additions of physical lines.

During fiscal 1950 the telephone industry requested Commission authority to construct $19,330,168 in interstate wire and cable facilities. Besides six applications carried over from the preceding year, 161 applications were received during the year requesting authority to construct, acquire, extend, and lease wire facilities. The Commission approved 153 of these, including 141 for construction. The American Telephone & Telegraph Co., and certain associated companies, filed a blanket application and a supplemental application covering most of the construction to be undertaken by the Long Lines Depart-

ment during the calendar year 1950. This construction amounted to $12,093,000, of which $6,253,000 was authorized during fiscal 1950. The following table sets forth the amount of wire and cable construction authorized by the Commission during the past 7 years:

Fiscal year	Projects	Cost	Sheath miles of cable	Tube miles of coaxial units	Conductor miles of open wire
1944	121	$9, 582, 239	574. 8		7, 968
1945	210	70, 091, 140	2, 378. 3	7, 902	2, 963
1946	239	78, 896, 450	3, 193. 8	16, 580	12, 261
1947	289	126, 325. 771	5, 587. 7	23, 490	15, 976
1948	348	127, 162, 499	2, 637. 5	46, 080	16, 373
1949	313	38, 638, 919	1, 370. 5	1, 323	7, 278
1950	141	13, 230, 678	399. 3		3, 491

No authorizations for construction of coaxial cable were requested or granted during the year; however, some of the construction authorized in previous years had not been completed. The Bell system had 8,330 route miles of coaxial cables installed, the principal routes consisting of a transcontinental link from New York to Florida and on to the west coast; a route from New York, through Philadelphia, Pittsburgh, Cleveland, Chicago, St. Louis, and Memphis to join with the transcontinental line at Jackson, Miss.; and a number of shorter routes supplementing these as well as other long-distance facilities.

During the 1950 fiscal year, the Bell system added about 1¼ million toll message circuit miles to its facilities, an increase of 6½ percent over circuit mileage in service at the beginning of the year. About 90 percent of the channels added during fiscal 1950 were provided by carrier systems. Only a few of the emergency type EB carrier systems were authorized by the Commission during the year.

Microwave relay systems.—The establishment of microwave radio relay stations for providing intercity television program transmission, telephone and telegraph services has assumed an important role in modern communication. Although the use of microwave for transmission over extensive intercity radio relay systems is still, relatively, in its infancy, telephone carriers' experience has proven the reliability of this medium.

During the latter part of the fiscal year the Commission granted construction permits to the American Telephone & Telegraph Co. for a microwave system consisting of 55 stations to be located between Omaha, Nebr., and San Francisco. This is the final link in its New York-San Francisco microwave relay route which is expected to be completed by January 1, 1952. The New York-Chicago link of the transcontinental system has been completed and scheduled to be available for television service on September 1, 1950. Construction of the links between Chicago and Omaha was well under way at the end of

fiscal 1950 and it is expected that television service between these points will be available by the end of September 1950. Construction of the link between Des Moines and Omaha was progressing with the expectation that TV service will be available on that circuit by April 1951. In addition to providing television service, the Omaha-Denver link will be used at the outset to furnish toll telephone service.

The magnitude of the project may be illustrated by the fact that the total initial cost of the transcontinental system is estimated by the A. T. & T. to be $37,590,000, and will include more than 100 microwave relay stations. The over-all facilities are capable of providing channels for both intercity television and telephone service.

At the eastern end of the transcontinental circuit, A. T. & T.'s New York to Boston microwave system was used for television relay operation throughout the year. At the western terminus, The Pacific Telephone & Telegraph Co. completed construction of its Los Angeles to San Francisco microwave system and intercity TV service over this latter system was planned for the fall of 1950. A number of additional intercity microwave relay systems of Bell system companies were in use or were under construction to supplement existing facilities or to join additional cities to the television network system. All of these facilities are being installed initially for TV service, but are expected to provide an important part of the future toll telephone network.

Channels for TV program transmission.—The fourteenth and fifteenth annual reports referred to the investigation and hearing instituted by the Commission on April 28, 1948 (docket 8963) into the lawfulness of rates, regulations, practices, and services of A. T. & T. and Western Union in furnishing intercity channels and facilities for the transmission of the video portion of TV programs. On December 23, 1949, the Commission issued its final report on the issue involving the reasonableness of the restrictions contained in the Bell tariffs regarding interconnection of its facilities with the facilities of others. It required the Bell system companies and Western Union to connect their intercity video transmission channels with private microwave relay facilities authorized by this Commission, pursuant to its policy of permitting private intercity video transmission by TV broadcasters pending availability of adequate common carrier facilities. Hearings on the remaining issues were to be held in the future.

Concurrently with the issuance of its report in docket 8963, the Commission instituted an investigation on its own motion to determine whether or not it is necessary or desirable in the public interest to require interconnection of the intercity video transmission facilities of the Bell system companies with existing and proposed intercity video transmission facilities of Western Union (docket 9539). Hearings were completed on June 30, 1950.

Speed of service.—The speed of service on telephone toll calls is a measure of the time interval from the appearance on the recording signal at the originating toll board to the start of conversation or, in the case of person-to-person calls, to a report of delay in reaching the desired party, including calls encountering such a report of delay as a "busy" or a "don't answer" at the called station. The average speed of service required to complete a toll call on the Bell system was 1.6 minutes during June 1950, compared to 1.7 minutes in June 1949 and 2.1 minutes in June 1948. The increase in the number of toll channels, additional toll board facilities, expansion and conversion to dial of the exchange plant, more efficient personnel, and dialing of toll calls by operators have had a marked effect upon the improvement in the speed of service.

Discontinuance, reduction, or impairment of service.—The Commission received four applications for authority to discontinue telephone service, of which two were granted during the year and two were pending on June 30, 1950. The two applications granted were filed by the Bell system; one to discontinue local exchange service in Kelsey, Calif., and establish toll stations and toll service stations in lieu thereof, and the other to discontinue exchange service at Clifton, Tex., where another carrier planned to provide the same service.

The joint application filed during fiscal year 1949 by Western Union to discontinue its public message toll, private line, and program telephone service; by the A. T. & T. and certain Bell system companies to acquire the telephone business and certain telephone property of Western Union located in 30 States; and by the Pacific Telephone & Telegraph Co. and the Bell Telephone Co. of Nevada to discontinue all message telegraph service rendered by them in California, Oregon, Washington, Idaho, and Nevada (docket 9235) was the subject of extensive formal proceedings during fiscal 1950.

The application represented a consummation of negotiations between the parties over a period of several years. Western Union acquired the telephone business from Postal Telegraph & Cable Co. at the time of merger of that company with Western Union in 1943. As of July 1, 1949, Western Union was furnishing message toll telephone service to 2,559 subscribers in 157 cities. The Pacific Co. and Bell of Nevada now provide message telegram service throughout their territories. On July 28, 1950, the initial decision of the hearing examiner recommending approval of the application was issued.

Domestic Public Land Mobile Radio Service.—The Domestic Public Land Mobile Radio Service provides communication service for hire. primarily between fixed points and mobile units on land. Secondarily, the service is afforded to vessels and remote fixed points, and, under some circumstances, a nontelephonic signaling service is offered. This

service is of two general classes: that furnished by land line telephone common carriers and which connects with the land line telephone system; and that furnished by others than the land line telephone companies which does not provide direct connection with the land line telephone system.

This service was established on a regular basis as of July 1, 1949, following several years of developmental experimentation. During its first year of regular operation, the service showed a steady expansion and growth with authorizations granted to cover service to nearly 24,000 mobile units. Authorizations for mobile radiotelephone systems in 158 cities had been granted to the miscellaneous or nontelephone company carriers. Telephone company carriers also received authorizations for such systems in 158 cities. However, the number of communities actually receiving mobile radiotelephone service was considerably larger because the service range of the licensed facilities often extends to additional communities beyond the physical location of the base station.

The need for additional frequencies for this service has become increasingly evident because of the widespread public acceptance of, and demand for, the service. In the larger cities, the telephone company carriers have a substantial backlog of orders for service which they are unable to provide on the available frequencies. Also, in such areas, the number of miscellaneous common-carrier applicants for facilities in this service usually exceeds the number of frequencies available for assignment.

To meet the problem of expanding frequency space for the service, two separate steps were taken during the latter part of fiscal 1950. First, in docket 8736 et al., in connection with the television proceedings, the Commission conducted hearings to determine whether an allocation of 30 megacycles of frequency space between 470 and 500 megacycles could be provided for the development of a broad band multichannel system of public mobile operation from which there might be derived as many as 150 additional two-way communications channels. No decision had been reached in this matter. The second step was the proposal, on May 12, 1950, in docket 9648, to establish a policy of effecting adjacent channel assignments (60 kilocycle separation) to the miscellaneous carriers in lieu of the present practice of making assignments on an alternate channel basis (120 kilocycle separation). No final determination had been made on that proposal.

Much interest has been manifested by the carriers in providing radio communication service to mobile stations on board vessels, on a secondary basis, through the facilities licensed for operation in the Domestic Public Land Mobile Radio Service. Thus, many of the car-

riers serving areas contiguous to navigable waters have requested authority to provide service to vessels. A number of such special authorizations have been granted where it has been shown that there is a need for this service and that it would not degrade primary service to land vehicles in the area. The grant of authority to provide service to vessels is made subject to the condition that it must be discontinued within 60 days after the establishment of a VHF [very high frequency] public maritime mobile service in the area.

A large number of nontelephone company carriers filed applications for authority to establish one-way signally or "radio-paging" operations. The receivers for this type of service vary in size from a small unit which can fit into the subscriber's pocket to a large packaged unit to be installed in vehicles. Thus, a subscriber to this service may be contacted while on the golf course, while fishing, or at other locations within communication range.

At the end of the fiscal year, the Commission proposed rule-making in docket 9732 to provide a new simplified and short annual report form to be used by the nontelephone company common carriers in this service in lieu of their use of the more comprehensive FCC annual report Form M.

Rural Subscriber and Short Haul Toll Radiotelephone Services.—There was an increase in activity in the Rural Subscriber and Short Haul Toll Radiotelephone Services. These services are designed to provide short distance radiotelephone service in areas where rugged terrain, etc., make it impracticable to construct wire lines. The communication range of such operations is generally line-of-sight or about 20 to 25 miles.

The Rural Subscriber Radiotelephone Service was intended to provide a point-to-point radiotelephone service to miners, farmers, ranchers, etc., located in remote areas where wire line facilities are not available. A substantial number of requests for such authorizations have been granted. In several instances, authorizations have been issued to provide radiotelephone service to off-shore islands.

The Short Haul Toll Radiotelephone Service is used by the telephone companies to bridge gaps in toll telephone wire lines where direct wire interconnection is not economically feasible because of the intervening terrain.

Service in Hawaiian Islands.—The Mutual Telephone Co. furnishes interisland radiotelegraph and radiotelephone service in the Territory of Hawaii. Much of its service is provided by means of point-to-point telegraph and telephone radio stations operating on frequencies in the 152–162 and 30–50 megacycle ranges. Features of these systems include simultaneous telephone and telegraph operations on a single frequency and interisland dialing.

Coastal and Alaskan service.—Coastal harbor, coastal telephone, and Alaskan radiocommunications, though largely authorized on a common carrier basis, are discussed in the separate chapter on "Safety and Special Radio Services" because of their close relationship to radio aids for the safety of life and property.

Cable landing licenses.—During the fiscal year, upon the recommendation of the Commission, the President granted two cable landing licenses. The first license covered a private telephone line across the Rio Grande River near Presidio, Tex., to connect with the Bell system. The second license authorized the Cuban American Telephone & Telegraph Co. to amend its present presidential license covering four submarine cables between Key West, Fla., and Havana, Cuba, to include the landing and operation of two additional submarine cables between these cities.

Foreign attachment cases.—Hearings on the complaint of *Hush-A-Phone Corp. et al.* v. *American Telephone and Telegraph Co., et al.* (docket 9189), which attacked as unlawful the so-called foreign attachment provisions in the defendants' tariffs insofar as such tariffs are construed by the telephone companies to prohibit the subscribers' use of the Hush-A-Phone device in interstate and foreign telephone service, were concluded January 26, 1950. The matter was awaiting issuance of an initial decision by a hearing examiner.

The complaint of *Jordaphone Corporation of America* and *Mohawk Business Machines, Inc.* v. *American Telephone & Telegraph Co., et al.* (docket 9383) requested the Commission to declare the defendants' foreign attachment tariff provisions unlawful insofar as they are construed to prevent subscribers' use of Telemagnet, an automatic telephone answering device. Other manufacturers of telephone answering devices participated in the proceeding. Hearings were held April 25 through 28, 1950, and were adjourned until October to permit laboratory and field testing of telephone answering devices. In addition, on June 8, 1950, the Commission instituted an investigation on its own motion into the use of telephone answering devices in connection with interstate and foreign telephone service under broadened issues (docket 9701). Both proceedings were designated for joint hearing.

On March 23, 1949, the Commission dismissed the complaint of *Walter S. Berkman et al.* v. *American Telephone & Telegraph Co., et al.* (docket 9100), which requested the Commission to require the defendants to furnish a call waiting indicator device to signal when another call is coming in on the line at the same time. However, the matter was being given further study in connection with a petition filed by the complainant for reconsideration.

RATES AND TARIFFS

Rate schedules.—At the close of the year, 232 telephone carriers had tariffs and concurrences on file with the Commission, an increase of 49 over the previous year. This increase is accounted for principally by new carriers in the Domestic Public Land Mobile Radio Service. During the year, a total of 15,685 tariff publications establishing or changing rates, regulations, practices, and classifications of service were filed.

Special permissions.—Thirty-five applications for special permission to make changes in the tariffs or to file new tariffs to become effective on less than statutory notice or involving waiver of certain rule requirements were received. Of these 31 were granted and four were denied.

Unlawful use of telephone facilities.—In connection with the general problems of the use of electrical communication facilities for unlawful purposes, the Commission actively cooperated with law-enforcement agencies during the year. The Commission was represented at the Attorney General's Conference on Organized Crime, and its representatives were active on the conference's committee on legislation. Members of the Commission's staff participated in the drafting of legislation aimed at prohibiting the use of communication facilities for gambling and other unlawful purposes.

Reference was made in last year's annual report to tariff regulations filed by the Bell system companies to the effect that service is furnished subject to the condition that it will not be used for an unlawful purpose, and that service will be discontinued if any law enforcement agency acting within its jurisdiction advises that such service is being or will be so used in violation of law. On November 10, 1949, a complaint was filed by Harry Katz and Bertha B. Katz against the Chesapeake & Potomac Telephone Co. and the American Telephone & Telegraph Co. alleging that such tariff provisions constitute a denial of free speech, a denial of complainants' rights without due process of law, and are unjust and unreasonable and contrary to the public interest. The matter was awaiting the issuance of an initial decision by a hearing exminer.

Studies of Long Lines operations.—In the fifteenth annual report, reference was made to the series of studies which the Commission initiated with respect to all phases of the operations of the Long Lines Department of American Telephone & Telegraph Co., with the view to developing a comprehensive report to provide a more adequate basis for determination of matters involving the earnings or revenue requirements of Long Lines. During the fiscal year, progress was made towards the completion of several important portions of the study, with particular attention being given to such matters as depreciation,

working capital requirements, Western Electric prices, license service charges, pension and benefit payments, and summaries of investment and operations.

Toll rate study.—As also noted in the previous annual report, a cooperative committee consisting of staff members of this Commission and State commissions was appointed early in 1949 to study the toll rate problem presented by the fact that rates for the intrastate message toll service are, in many instances, higher than the rates for interstate message toll service for comparable distances. The study contemplates collection and analysis of available data and information relating to the development of intrastate and interstate message toll telephone rates, and to the technical and economic ramifications of the toll rate problem. The working committee held a number of sessions extending over several weeks and a comprehensive report was in the process of preparation.

Separation of property, revenues, and expenses.—Although the joint cooperative committee composed of Commission staff members and the State regulatory commissions is still functioning to review principles and methods employed in the separation of telephone property, revenues, and expenses, there were no activities of this committee during fiscal 1950. The Bell system continues to use the separations manual prepared by the committee in 1947, for effecting separations of telephone plant investment, expenses, and revenues among exchange, interstate toll, and interstate toll telephone services in connection with its State rate cases and also in connection with the division of its interstate message toll telephone revenues among its participating operating units. A recent development was that starting early in 1950 the companies' practices were changed to make separations directly on a station-to-station basis, according to the principles and methods prescribed in the separations manual, as against the former practice of first effecting a complete board-to-board separation, which is then supplemented by a station-to-station increment based on certain selected factors. The Commission continued to study the application of the separations methods by the Bell system to the division of its interstate message toll telephone revenues, which is of particular importance in determining the level of earnings from interstate service. The matter of separations continues to be of increasing importance in rate considerations and is, of course, given added impetus by its inclusion as a factor in the cooperative study relating to rates covering intrastate and interstate toll services.

Western Electric cost and price review.—As noted in the fourteenth and fifteenth annual reports, a cooperative committee of Commission staff members and State commissions was appointed in January 1948 to review the matter of prices, costs, and profits of Western Electric

Co., Inc. This was prompted by the fact that Western Electric is the manufacturing and supply unit of the Bell system, and the prices it charges the Bell operating companies for equipment, supplies, and services exert a considerable influence on rates and charges for telephone exchange, and State and interstate toll service. Sales to Bell companies by Western Electric amounted to about a billion dollars for each of the years 1947 and 1948 and declined to about $760,000,000 in the calendar year 1949. Following its initial comprehensive report in 1948, the committee has issued supplemental periodic reports bringing the data up to date.

Since the inception of these studies, Western Electric has made several adjustments in its prices, the net effect of which has been to reduce prices on articles it manufactures by approximately 13 percent, a cumulative reduction of about $130,000,000 by the end of 1950. Besides the indicated effect of Western Electric's prices, the committee's studies have been of value to various States in connection with Bell applications for increases in intrastate telephone rates.

State telephone rate cases.—At the request of State regulatory commissions, as well as some municipalities, assistance was rendered to the extent possible and consistent with the available staff personnel and budget, on common problems in connection with State telephone rate cases. Such assistance included advice, consultation, and furnishing information concerning such matters as depreciation rates and charges, pension accrual rates and costs, procedures for allocation of telephone plant, and revenues and expenses between various services and jurisdictions. Some of these studies were conducted cooperatively with State commissions and testimony was presented by Commission staff members.

OTHER REGULATORY MATTERS

Depreciation.—On the basis of studies completed during the year, the Commission, pursuant to the requirements of section 220 (b) of the Communications Act, prescribed annual depreciation rates for the following telephone elements of the Bell system: the Long Lines Department of A. T. & T.; New Jersey Bell; and the three Chesapeake & Potomac companies serving in the District of Columbia, Maryland, and Virginia. The prescribed rates resulted in annual depreciation expense charges amounting to $61,410,000 and represented a total reduction of $7,233,000, or 10.5 percent from the annual charges based on the rates in effect prior to the Commission action. To date the Commission has prescribed depreciation rates for eight Bell companies including the Long Lines Department, out of a total of 22 Bell companies. Studies necessary for prescribing depreciation rates have been completed for one additional Bell company, and are in progress with respect to three more Bell companies.

Provision for plant depreciation by domestic telephone carriers reporting to the Commission through charges to operating expenses continued an upward trend during the year in spite of substantial reductions effected in annual depreciation rates of several of the Bell system companies. These expense charges during the 12 months ending April 30, 1950, in the case of 22 Bell companies, including the Long Lines Department of A. T. & T., aggregated over $328,660,000, an increase of $34,553,000, or 11.7 percent over the charges for the previous 12 months. During the same period, 32 other large telephone carriers (independent systems) made depreciation provisions amounting to $16,100,000, an increase of $1,452,000, or 9.9 percent over the provisions for the previous 12 months. This increase was almost entirely due to the large increase in telephone plant, including expansion of existing manual switchboard facilities scheduled for replacement by dial equipment in the near future, which require high depreciation rates for that reason.

Annual depreciation expense of the Bell system companies during the year amounted to 17 percent of their operating expenses before Federal income taxes, as compared with less than 16 percent for the previous year.

Allocation of depreciation reserves of multistate companies.—Cooperative studies by Commission and the Southeastern Association of Railroad and Utilities Commissioners, to serve as a basis for allocating the Southern Bell Telephone & Telegraph Co.'s depreciation reserve among the nine States served by it, were undertaken at the request of that association (see fifteenth annual report). Because of substantial changes in plant composition resulting from a large construction program carried on by the company during the year, the studies were continued with the view to reflecting such changes in the reserve allocation on an equitable basis.

NARUC Committee on Depreciation.—The Commission participated in the meetings and activities of this committee, whose function is to coordinate and consider the accounting, engineering, and economic aspects of depreciation as related to the various utilities subject to jurisdictions of Federal and State regulatory bodies. The committee was preparing a report on remaining life depreciation accounting, and a digest of recent State and Federal commission cases and court cases involving important phases of depreciation.

NARUC Committee on Accounts and Statistics.—The Commission also participated in the meetings and activities of this committee, whose function is to formulate proposed changes in uniform systems of accounts, annual report forms, preservation of records regulations, and related accounting regulations, as well as amendments to, and interpretations of, such regulations, in order that substantially uniform

accounting requirements may be submitted for adoption by the several State and Federal regulatory agencies. A subcommittee, whose chairman is a staff member of the Federal Communications Commission, has the task of proposing revisions of the regulations with respect to the establishment and maintenance of continuing property records by large telephone companies.

Financing and refinancing.—Collaboration has continued with the Securities and Exchange Commission in the review of prospectuses required to be filed with that commission in connection with issuance of securities by telephone companies.

Pensions and relief.—Although there was a decrease in the number of employees, raises in wages, and further liberalization of minimum pension benefits resulted in continued increases in relief and pension costs to telephone carriers. For the Bell system, including manufacturing and research activities, the number of employees declined to 593,900 as of December 31, 1949 as compared with 656,500 at the beginning of the year, and pension and other benefit costs amounted to $137,000,000, excluding social security taxes which amounted to approximately $27,000,000. Due to the substantial amount of and the continued increase in pension costs, problems of pension accounting, and the determination of the reasonableness of methods pursued and resulting amounts, are of importance. These problems received detailed attention during the year and studies were continuing.

Preservation of records.—On September 28, 1949, the Commission proposed a complete revision of its rules for the preservation of records by telephone [also telegraph] carriers. The changes are designed to improve records-management procedures and to provide reasonable retention periods for records currently maintained by the several carriers. They were developed by members of the staff in cooperation with representatives of the Bureau of Standards, Bureau of the Budget, National Archives, State and Federal regulatory commissions, and the several carriers. Recognition is given to such modern record-preservation methods as microfilming, tabulating cards, humidified storage, etc. Final action by the Commission was pending at the end of the year.

Restatement of plant accounts on basis of original cost.—Joint studies with State commissions were completed with respect to the reclassification of accounts on the basis of original cost by two of the larger independent telephone companies, and similar studies were initiated for another independent telephone company. Restatement of the present investment at original cost by telephone companies was well advanced, except for a few important instances that apply to earlier years, and an attempt is being made to complete these as rapidly as circumstances permit. Action was also taken to approve the state-

ment of a number of plant acquisitions at original cost in the case of several other carriers.

Annual report Form M (applicable to class A and class B telephone companies).—A number of more urgent revisions were made in this form for use for the calendar year 1949 by the simplification and clarification of the reporting requirement of a number of schedules, and by eliminating some schedules. A further revision of the form was being studied.

Annual report Form H (holding companies).—This report form is applicable to persons immediately controlling communication common carriers. It was revised for the calendar year 1949 by eliminating a number of schedules which were found to require information not presently needed by the Commission.

3. DOMESTIC TELEGRAPH

GENERAL

During the latter months of the fiscal year, The Western Union Telegraph Co. reported increases in revenues and volume of business, reversing the downward trend that has been experienced over the past several years. Up to that time the rate increases granted in 1946, approximating 25 percent and which might have been expected to produce revenue benefits, had been offset by declining traffic volumes. Western Union reported net income of $2,687,000 for the first 6 months of 1950 from system operations. For the calendar year 1949, it reported a net loss of $4,390,000 from operations, with extraordinary and nonrecurring income items reducing the net loss to $2,500,000. This is made up of a net loss of $3,468,249 applicable to the land line system and a profit of $968,000 applicable to the overseas cable system. The company's improved operating experience is due principally to a reduction in revenue deductions made possible by its modernization and economy programs.

In October 1949, Walter P. Marshall, president of Western Union, forwarded to Senator McFarland, chairman of the Communications Subcommittee, Committee on Interstate and Foreign Commerce, United States Senate, a recommendation for future communication policy. The program advanced to improve Western Union's position was (1) elimination of the 25 percent excise tax, (2) subject to the determination of a fair rate base, the acquisition by Western Union of the telegraph business of the telephone companies, (3) the setting up of an integrated system of domestic communications for the Government, (4) consolidation and merger of international telegraph carriers, and (5), to the extent private capital might not be available to insure accomplishment of these objectives, long-term Government financing to be provided.

SERVICES AND FACILITIES

Western Union modernization program.—Western Union's modernization program insofar as it relates to reperforator switching at relay offices, was nearing completion. The last of 15 such offices was being installed at Portland, Oreg. The improved mechanized system results in reduced handlings and permits faster over-all service between points of origin and destination. In terms of cost, Western Union had expended, as of December 31, 1949, $40,000,000, or 56 percent of the $72,000,000 estimated total cost of plant and equipment to be added under the program. The construction of the large terminal reperforator offices planned at New York, Chicago, and Washington had not yet been started. According to company estimates, the remaining $32,000,000, or 44 percent of the expected costs for completion of the modernization program, will be expended in the next 8 years as follows: Reperforator equipment, $12,000,000; carrier equipment, $9,000,000, and the microwave relay system, $11,000,000.

Deskfax and facsimile.—Western Union continued the development and use of the facsimile process for terminal handlings of telegrams. "Deskfax" instruments to the number of 1,861 were in use by customers in nine cities. These machines provide two-way transmission of messages in picture form between customers' premises and the central telegraph offices. In addition, 191 larger types of facsimile machines known as "Telefax" were in customer offices and a number of others were being used in branch and agency offices.

Construction of wire facilities.—The year brought 25 requests covering wire telegraph construction and extensions. Two such applications were carried over from the preceding year, making a total of 27. One was withdrawn and 25 granted. Those granted covered the leasing by Western Union of 198,800 telegraph channel miles of line at an annual rental of $364,954 and the construction of 30,856 telegraph channel miles of line and associated equipment at a cost of $2,133,797.

Speed of service.—The quality of domestic telegraph service rendered by Western Union showed some improvement over the preceding year. The origin to destination speed of service (the interval from the time a message is filed to the time it is delivered, or first attempt) for fiscal years 1949 and 1950 and the average time required to relay a message through a large message center is shown in the following table:

Origin to destination	Average speed in minutes	
	1949	1950
Delivered by:		
Telephone	41	41
Messenger	47	46
Private tie-line	39	37
Office relay drag	11.5	9.9

Microwave relay system.—The microwave radio triangle connecting New York, Washington, and Pittsburgh, and the link between New York and Philadelphia, were being operated on a full-time basis carrying telegraph traffic formerly transmitted over wire line facilities. Western Union plans to expand its microwave facilities and has acquired tower sites extending as far west as Kansas City and southward to Atlanta, a total of 3,527 route miles. In hearings in docket 9539, in the matter of the establishment of physical connections and through routes and charges applicable with respect to intercity video transmission service (see telephone section), Western Union introduced plans to provide TV transmission service over some of these routes. The furnishing of this service is dependent, in part, on the outcome of this proceeding.

Discontinuance or reduction of telegraph service.—During the year, 1,093 applications for reduction of office hours or closure of public offices were filed. In addition, 214 such applications were pending at the beginning of the year. With few exceptions, these applications were filed by Western Union. Of the total, 1,060 applications were granted, 16 were withdrawn, and 231 were pending at the close of fiscal 1950. Generally, where hours were reduced or offices closed, alternate service was made available. With respect to applications where the matter of employee protection was raised, the Commission, pending formulation of a general policy on the matter, reserved jurisdiction to consider the question of whether conditions should be imposed for the protection of employees who may be adversely affected.

The Commission on January 18, 1950, issued its final report and order in docket 8088 in which it granted the application of Western Union for authority to close permanently a branch office in Dallas, Tex. In so doing, the Commission reserved jurisdiction to consider whether conditions should be imposed for the protection of employees who may have been adversely affected by discontinuance of the office.

The joint application filed during fiscal 1949 by Western Union to discontinue its public message toll, private line, and program telephone service; by the American Telephone & Telegraph Co. and certain Bell system companies, for authority to acquire the telephone business and certain telephone property of Western Union located in 30 States; and by the Pacific Telephone & Telegraph Co. and the Bell Telephone Co. of Nevada, for authority to discontinue all message telegraph service rendered by them in California, Oregon, Washington, Idaho, and Nevada, was the subject of extensive formal proceedings during fiscal 1950. (See telephone section.)

RATES AND TARIFFS

Rate schedules.—At the close of the fiscal year, 70 domestic telegraph carriers had tariffs or concurrences on file with the Commission.

During the year, Western Union, the principal domestic telegraph carrier, filed 865 tariff publications establishing or changing rates, regulations, practices, and classifications of service, including concurrences.

Special permissions.—During the year, 15 applications for special permission to make changes in tariffs or file new tariffs to become effective on less than statutory notice, or involving waiver of certain requirements of the Commission's rules, were granted.

Western Union domestic rates.—Western Union revised its interstate telegraph message rate structure, effective February 1, 1950. The revised rate structure is the result of a long and intensive study made by Western Union at the suggestion of the Commission, and represents a major step toward the rationalization of interstate telegraph rates (see fourteenth and fifteenth annual reports). The new rate pattern establishes uniformity in rates for the transmission of messages over equivalent distances between points within the United States, and so eliminates the geographical inequalities in Western Union's former charges, wherein substantially different rates applied between different pairs of points the same distance apart.

Minimum message charges and additional word rates for all classes of domestic message telegraph service were revised. The establishment of a minimum message charge for any nondeferred telegraph message, including press telegrams, of 35 cents, and a minimum message charge for a deferred message or a night letter of 30 cents corrects the apparent inequalities in the former minimum message charges which, in the case of press telegrams, were as low as 12 cents. Although the new rate structure, wherein the rate steps are based on airline distances, produces increased charges in some cases and reduced charges in others, special traffic repricing studies by Western Union indicate that no material change in revenues will result.

Baseball-sports service by message and direct wire.—As reported in the fifteenth annual report, Western Union on March 1, 1949, filed new tariff schedules, effective April 18, 1949, revising charges and regulations applicable to the furnishing of baseball-sports service by message and direct wire. Following a complaint of a radio broadcaster concerning these revisions, insofar as they imposed an additional charge for service to subscribers who engage in network broadcasting, the Commission, on its own motion, entered into an investigation of the matter (docket 9286). After public hearings, the Commission on May 15, 1950, concluded that the additional charge imposed by Western Union for each station in a subscriber's network using baseball-sports service was an unlawful discrimination and charge within the meaning of the Communications Act. In compliance with the Commission's order, Western Union on May 29, 1950,

filed revised tariff provisions, effective June 1, 1950, which eliminate all restrictions and additional charges for each station in a radio network other than the subscribing station.

OTHER REGULATORY MATTERS

Depreciation.—Since prescription of depreciation rates applicable to the various classes of Western Union's land lines plant in February 1948 and April 1949, pursuant to the provisions of section 220 (b) of the Communications Act, a review was made of the application of the company's rates in its accounts. Particular attention was directed toward the manner in which the rates, which had been prescribed for plant classifications that were in existence before the current system of accounts became effective, were applied to the balance in the accounts as classified under the presently effective system of accounts.

Relief and pensions.—Western Union provides for pensions and relief on a "pay as you go" basis. Matters given consideration by the Commission during the fiscal year were, chiefly, minor changes in, or variations of, Western Union's pension plans respecting employees transferred incident to the sale of telegraph lines to the railroads.

Reclassification of plant accounts.—Western Union completed the restatement of its accounts on the basis of original cost, in accordance with the requirements of the currently effective uniform system of accounts, as to all plant and equipment not previously reclassified (principally that used in rendering international telegraph service) and the reclassification adjustments were recorded in its books of account. Examinations and investigations by the Commission's staff were undertaken, and are expected to continue into fiscal 1951, to verify the entries and to determine the reasonableness and propriety of the reclassification methods, computations, and amounts.

Continuing property records.—The completion of Western Union's restatement of its accounts on the basis of original cost and the complete establishment of continuing property records permitted the initiation of comprehensive studies for verification of the form and contents of these records and the evaluation of the effectiveness of continuing property record procedures as to both land lines and cable plant.

Uniform system of accounts.—The operating revenue accounts included in the system of accounts which became effective January 1, 1943 (part 35 of the Commission's rules), were designed to reflect the several sources of revenues of wire-telegraph and ocean-cable carriers as then existing. During fiscal 1950 these accounts were revised in order to provide changes occasioned by progress in the art of telegraph communication and to provide uniformity in the operating revenue accounts of all types of international telegraph carriers.

Retirement units.—At the time of promulgation of part 35 (Uniform System of Accounts for Wire-telegraph and Ocean-cable Carriers) the matter of prescribing a list of retirement units under section 35.1–6–1 was deferred pending a review by the carriers of the prescribed accounting and an inventory of the property as reclassified under the newly prescribed plant accounts. An amendment was adopted in 1946 which incorporated a list of retirement units for outside plant and work equipment as a part of section 35.1–6–1. Another amendment was made during fiscal 1950 which incorporated in section 35.1–6–1 a list of retirement units for inside plant. This completed the list for wire-telegraph and ocean-cable carriers.

Report forms.—Annual report Form O for wire-telegraph and ocean-cable carriers, classes A and B, was revised for filing information for the calendar year 1949. The revisions simplified and clarified the reporting requirements of a number of the schedules and deleted a substantial number of other schedules. The amendments were designed to reflect the improvements which had been developed by an interdepartmental staff committee which started functioning in 1948 for the purpose of improving the statistical program of the Commission.

Form 905A, "Monthly Report of Revenues, Expenses and Other Items," applicable to certain wire-telegraph carriers, was rescinded during the year for a new form, No. 905. A number of revisions were incorporated in the latter to bring it into conformity with other monthly report forms of the Commission.

Preservation of records.—At the end of the fiscal year final action by the Commission was pending with regard to promulgation of new preservation of record rules [see page 40].

4. INTERNATIONAL TELEGRAPH AND TELEPHONE

GENERAL

For the fourth consecutive year the volume of international telegraph traffic handled by the United States cable and radiotelegraph carriers showed a decrease. During the calendar year 1949 such carriers handled a total of 513,175,244 paid words, a decrease of 8.7 percent from the 1948 volume. Traffic out-bound from the United States decreased 8 percent for 1949 as compared with 1948, while traffic in-bound to the United States decreased 9.4 percent from the volume handled in 1948. However, during the latter part of June 1950 this downward trend was reversed.

Despite this decrease in the volume of traffic handled, the total revenues realized by the United States international telegraph carriers (after pay-out to foreign correspondents) in 1949 was $33,500,000, an increase of 0.4 percent over 1948. This was due to the increases in

out-bound rates authorized by the Commission on April 22, 1948 and January 26, 1949, in the proceedings in the international rate case (docket 8230) which resulted in an increase of approximately 9 percent over 1948 revenues from such out-bound traffic. However, revenues from in-bound traffic to the United States showed a decrease of 6.9 percent from the previous year.

International radiotelephone calls, and the revenues derived therefrom by United States telephone carriers, showed an increase for 1949 as compared to 1948. Chargeable calls reached 647,052 in 1949, an increase of 8 percent over the previous year, while revenues (including land line charges) were $7,058,321, an increase of 4.7 percent over the previous year.

INTERNATIONAL SERVICE

Telegraph circuits.—A total of 74 foreign countries and United States territorial possessions were served by direct radiotelegraph circuits from the United States, and 7 additional foreign countries were served via the Tangier, North Africa, relay stations of United States radiotelegraph carriers. In addition, a number of countries in the Far East, not reached by direct circuits, were served via relay stations operated by United States carriers at Manila, Philippine Islands. Most other points in the world were served through connections with the facilities of foreign carriers. In the past year, United States radiotelegraph carriers transmitted program material originating with the United Nations and the Department of State to approximately 30 foreign countries.

A new two-way, customer-to-customer overseas radio teleprinter exchange service (TEX) was inaugurated May 15, 1950, between teleprinter stations in New York City and The Netherlands. In rendering this service, the radiotelegraph carrier (RCA Communications, Inc.), does not undertake to transmit messages in the usual "telegram" form, but furnishes its facilities to customers for the direct exchange of telegraph dispatches. This permits the transmission of communications in each direction alternately, rather than simultaneously in both directions, at a speed of approximately 60 words of 5 characters per minute.

Telephone circuits.—Radiotelephone message toll service was in effect with 87 foreign countries and United States territorial possessions. Fifty-six of these countries were served directly, and the others were served through connecting carriers. Private line service was available to 8 foreign countries, and program transmission service was furnished by Bell system companies to 56 foreign countries.

Frequencies.—The continued demand for additional frequency assignments in the range suitable for international communications

by both Government and nongovernment users makes it increasingly difficult to clear frequencies for assignment to licensees in the fixed public service. The demand for frequencies is greatest from the radiotelephone carriers because of the increased use of such international communication.

Equipment and operating techniques.—A total of 21 new transmitters was added during the year to stations in the international fixed public service. The radiotelephone service led in plant expansion with the addition of 15 new transmitters, 8 which were of the single sideband type.

Experimental authorization was granted for the transmission of four voice channels by the use of the single sideband technique. The band width required for the four channels represents a saving in spectrum space per channel over the three channel systems presently in use. Authority was also granted on a temporary basis for the use of narrow band frequency modulation for program transmission. It is believed that a more reliable service can be rendered in this manner without increase in band width requirements over those required for the amplitude modulation presently used for this service. Another development during the year was the transmission of two telegraph channels on a single carrier frequency by means of a composite emission consisting of a simultaneous tone and frequency shift keying.

Applications.—A total of 390 applications for additional frequencies, additional transmitters, and additional points of communications, as well as renewal of current licenses and special temporary authorizations, were filed by licensees in the international fixed public service. Approximately the same number were acted on by the Commission during that period. Of these applications, 265 were filed by licensees in the radiotelegraph service and the balance by licensees in the radiotelephone service.

Docket cases.—In the fifteenth annual report, reference was made to two proceedings involving possible violations of the Communications Act. One of these, docket 9093, involved an investigation to determine whether the common ownership and consolidated operation of cable and radio facilities by the American Cable & Radio Corp. system, including All America Cables & Radio, Inc., The Commercial Cable Co., and Mackay Radio & Telegraph Co., constituted a violation of section 314 of the Communications Act. On May 11, 1950, the Commission adopted a report in which it concluded that such common ownership, control, and operation of cable and radio facilities in the A. C. & R. system does not result in a violation of section 314, and thereupon ordered the proceeding terminated and dismissed.

The other proceeding, docket 9188, was instituted to determine the facts and circumstances surrounding the installation and operation of two transmitters by Mackay Radio & Telegraph Co. prior to the

receipt of authorization from the Commission, and to determine, further, whether such transmitters should be licensed. In a final report and order in this proceeding adopted December 7, 1949, the Commission found "not only has there been an inexcusable omission of an obvious duty on the part of important and responsible company officials in ordering transmitters to be placed in operation without first making certain that they had been licensed but also that there is ample evidence that these officials wilfully and knowingly suffered things to be done which are prohibited by provisions of the Communications Act, specifically section 301 thereof." It concluded, however, that because Mackay was engaged in common carrier service to the public and had a need for the transmitters involved, the construction permits should be granted. The matter of the above-described violations was referred to the Attorney General of the United States with a recommendation for prosecution. On May 12, 1950, a complaint was filed against Mackay. The company entered a plea of *nolo contendere* and was fined $1,000.

On June 2, 1950, the Commission granted the Press Wireless, Inc., motion to dismiss without prejudice its applications for authority to handle administrative press messages and commercial messages in the deferred classification (dockets 7987 and 8057).

The Commission had pending before it the applications of Mackay to communicate with Portugal, Surinam, and The Netherlands (docket 8777). These applications involve the question of whether and to what extent the Commission will authorize a second direct radiotelegraph circuit to countries already served directly by one carrier. An initial decision looking toward the grant of Mackay's Portugal and Netherland applications and its denial of its Surinam application was issued July 29, 1949. Oral argument was held on December 16, 1949, and the matter was awaiting final decision.

The International Bank for Reconstruction and Development and the International Monetary Fund, in a complaint filed against United States telegraph carriers (docket 9362), presented for determination by the Commission the question of whether the bank and the fund should be accorded the same rates for out-bound official international telegraph communications as those accorded to the United States Government for similar communications. Hearings on this matter were scheduled to begin October 1950.

By order dated April 21, 1950, the Commission designated for hearing in docket 9638 the applications of Globe Wireless, Ltd., for construction permits to move certain of its transmitters to stations of Press Wireless, Inc. The basic issues in this proceeding are: Whether the public interest would be served by permitting one carrier to operate, at its own site and with its own employees, the transmitting equipment of a competing carrier in return for the payment of a fee;

and the nature of the provisions, if any, which should be made for the protection of those employees of the applicant who might be adversely affected by a grant of the applications.

INTERNATIONAL CONFERENCES

International Administrative Telephone and Telegraph Conference, Paris, 1949.—As was noted in the fifteenth annual report, the Commission with Chairman Coy acting as chairman of the United States delegation, was represented at this conference which convened at Paris in May 1949. The United States participated in its telegraph aspects to the end that regulations to which it could become a party might be developed. However, while it followed the work of the telephone committee carefully, the United States delegation advanced no proposals regarding telephone regulations and advised the telephone committee at the outset that the United States did not intend to sign the International Telephone Regulations. The conference revised these regulations in various respects. Among the more important changes were: Unification of rates for ordinary telegrams composed of plain language, cipher language, and code language or any mixture thereof at 75 percent of the pre-existing plain language rate; elimination of the deferred classification and the fixing of letter telegram rates at 50 percent of the new ordinary rate; the revision of regulations with respect to the counting of words in a telegram, and the establishment of a minimum charge of 5 words for ordinary telegrams, 22 words for letter telegrams, and 10 words for press telegrams.

At the close of the conference, the United States delegation signed the revised regulations with various formal reservations and unilateral declarations, it being understood that such signing did not constitute formal approval by the United States. Subsequently, on January 16, 1950, a public conference was held at the offices of the Commission to determine whether any of the reservations which had been made should be withdrawn and whether any additional reservations should be made. Representatives of interested Government agencies, certain press users, and the various international carriers attended the conference and made numerous suggestions with respect to the revised regulations. After considering the matter, the Commission informed the Department of State that it was of the opinion that the United States should become a party to these regulations with certain qualifying reservations and declarations. The Commission's recommendations were adopted by the Department of State and the regulations were subsequently forwarded by the President to the Senate for ratification.

London revision of the Bermuda Telecommunications Agreement.—The Commission was represented at the conference to revise the Bermuda Telecommunications Agreement of 1945, which convened in Lon-

don on August 8, 1949. The Bermuda agreement contained, among other things, multilateral agreements for the establishment of rate ceilings for telegraph traffic between the United States and various British Commonwealth countries. At London, this agreement was revised to make it more flexible. Thus, the rate ceilings were increased and, in addition, each party to the agreement was authorized to raise its rates above the specified ceilings upon 90 days' notice to the other parties. Furthermore, the matter of retaining existing circuits or establishing new circuits between any two parties to the agreement was left to the discretion of the governments involved, thereby making possible additional radiotelegraph circuits between the United States and the various commonwealth countries through bilateral agreement. The London agreement has been formally accepted by all parties thereto and is now in effect.

Other conferences.—The Commission is participating in the preparatory work for the meetings of the International Telegraph Consultative Committee (CCIT) and the International Radio Consultative Committee (CCIR), which are to be held during the spring of 1951 in The Netherlands and in Czechoslovakia, respectively. These committees study technical telegraph and radio problems and submit appropriate recommendations to the various participating nations which are members of the ITU. These nations then study the recommendations and may use them as a basis for proposals to be submitted for consideration at the next international Administrative Telegraph and Radio Conference at Buenos Aires in 1952.

The Commission was also engaged in preparatory work for the Extraordinary Administrative Radio Conference, scheduled for The Hague beginning in September 1950. This conference will be concerned with implementing the table of frequency allocations adopted at Atlantic City in 1947. In this connection, the Commission continued to cooperate with other Government agencies and representatives of the commercial carriers in studies looking toward proposals for implementation of that table.

INTERNATIONAL MERGER

During the year the Commission devoted considerable time and attention to studying the matter of the merger of United States international telegraph companies and facilities. It developed and is maintaining on a current basis detailed records with respect to the more important phases of the facilities, operations, traffic loads, and revenues, and financial problems of the various international telegraph carriers. The Commission cooperated with and supplied detailed information to the subcommittee of the Senate Committee on Interstate and Foreign Commerce which is studying various aspects of the problem of international merger. The Commission likewise supplied

relevant data on the matter of international merger to the President's Communications Policy Board which, among other things, is considering this problem.

RATES AND TARIFFS

Rate schedules.—At the close of the year international telegraph carriers had 111 tariffs and concurrences on file with the Commission. During the year they filed 4,610 tariff publications establishing or changing rates, regulations, practices, and classifications of services, including concurrences.

Special permissions.—International telegraph carriers filed 90 applications for special permission to make changes in tariffs or file new tariffs. Of these, 86 were granted and 4 were retired to the files.

Telephone rates between United States and Cuba.—As a result of action initiated by the Commission, the Cuban American Telephone & Telegraph Co. reduced its rates for telephone service between the United States and Cuba, effective July 1, 1950, by about 17 percent, resulting in an estimated annual savings to telephone users of $280,000. Telephone service between the United States and Cuba is furnished jointly by the Bell system which performs the portion of the service within the United States, the Cuban American Telephone & Telegraph Co. which owns the ocean cables between Key West, Fla., and Havana, Cuba, and the Cuban Telephone Co. which performs the portion of the service within Cuba. At the same time the rate structure for the service, formerly made up of the separate charges of each of these three companies for its own portion of the service, was improved by establishing joint through rates for message toll telephone service between the two countries at a lower level than the former separate rates; reducing the rate for the Key West-Havana portion of the various private line services; and establishing joint through rates for a new short period private line telephone service.

International rate case.—As was stated in the fifteenth annual report, the Commission in its third interim decision in docket 8230 (international rate case) issued January 26, 1949, noted that there was scheduled to convene in Paris, in May 1949, an International Administrative Telephone and Telegraph Conference at which revision of the international rate structure would be considered. The Commission then indicated that, after the close of this conference, it would review, in the light of current traffic experience, the revenue effect of any rate structure revision agreed to at Paris, and their impact upon the general rate matters at issue in docket 8230. The Commission explained in its 1949 report that the ceiling rates fixed by the Bermuda telecommunications agreement prevented it from authorizing rates in excess of 30 cents for full rate words and 6½ cents per ordinary press word for traffic to the British Commonwealth countries and indicated that it would institute procedures to remove these rate limitations.

As already mentioned, the London revision of the Bermuda agreement lifted the rate ceiling to 40 cents per full rate word and 10 cents per press word and further made it possible for any country to exceed the newly established ceiling on 90 days' notice.

Further proceedings were held in docket 8230 in December 1949 to determine what changes, if any, should be made in charges for telegraph communications service between the United States and foreign and overseas points in the light of the decisions reached at the Paris and London conferences and in the light of the most recent experience of the carriers with respect to traffic and earnings. On January 27, 1950, the Commission issued a fourth interim report wherein, because of special circumstances, it authorized increased rates for message telegraph service from the continental United States to most of the Central American countries. It was estimated that the increases in out-bound rates would produce about $99,000 additional annual gross revenue to the carriers and that increases in in-bound rates would produce an additional $89,000. The Commission stated, however, that it would defer a final decision with respect to general rate adjustments and other matters at issue in this proceeding until after there had been a period of actual experience under the new rate structure agred to at the Paris conference, which rate structure would become effective July 1, 1950.

Elimination of special reduced Government rates.—Also in its fourth interim report in docket 8230, the Commission authorized the international carriers to eliminate special Government rates, provided such special rates were eliminated for messages of all governments and all international organizations, and over all routes, direct and indirect, and in both directions, between the particular two countries or points involved in each case. Pursuant to this authority the carriers eliminated, in fiscal 1950, such special reduced Government rates between the United States and its possessions, also between United States territory and Japan. The carriers also filed revised tariff schadules eliminating special Government rates between the United States and its possessions and 30 overseas and foreign points, effective July 1, 1950.

Multiple address press rates.—As noted in the fifteenth annual report, the Commission had held hearings in December 1948 and January 1949 with respect to charges, regulations, practices, and services of the three international telegraph carriers engaged in rendering multiple address press service. These hearings were an outgrowth of the investigation in docket 8230 into international telegraph rates generally. On Mar. 21, 1950, the Commission adopted a report and order which stated that, in view of the limitations of the evidence adduced by each carrier as to its costs of rendering this service, the Commission reached no conclusions with respect to the over-all justness and reason-

ableness of the rates of the carriers for the service. The Commission did conclude, however, that Mackay's existing rate structure for this service contained within itself an unjust and unreasonable discrimination for or in connection with like communication service by reason of the extent of the differential maintained between the rate for a primary transmitter and the rate for each auxiliary transmitter. Mackay was, therefore, ordered to revise its rate structure so as to eliminate such discrimination. Pursuant to this order, Mackay on May 1, 1950, filed revised tariff schedules for its multiple address press service wherein the differential for charges for primary and auxiliary transmitters was considerably narrowed. The Commission permitted these tariff schedules to become effective June 1, 1950.

Acceptance and delivery practices.—Under revised tariff schedules filed by All America Cables & Radio, Inc., the Commercial Cable Co. and Mackay Radio & Telegraph Co., Inc., which became effective December 3, 1949, overseas telegraph users located outside gateway cities, and marine service users located outside coast station cities, may forward outbound messages to the carriers by telephone, teletypewriter exchange service (TWX), or otherwise. The tariffs also provide that in-bound messages addressed to points beyond the carriers' office and coast station cities will, upon specific request of the addressee, be delivered by telephone, TWX, or otherwise. Charges for such facilities used in filing or delivery will be borne and paid for by the user selecting or specifying this means of forwarding. In acting upon a complaint filed by Western Union on behalf of its land line system, the Commission instituted an investigation into the acceptance and delivery regulations and practices of all international and marine carriers (docket 9433). Hearing was held and the matter was pending initial decision by the hearing examiner.

Distribution of international traffic.—In connection with its authorization for the merger of domestic telegraph carriers in 1943, the Commission approved a formula which specified, in general, the manner in which Western Union, the merged domestic carrier, should distribute unrouted international traffic filed at its offices among the various international telegraph carriers, including the Western Union cable system. Various problems have arisen in connection with the interpretation and administration of the formula. In the past year the Commission considered proposals by the various interested telegraph carriers for modification of several provisions of the formula. There was also pending before the Commission a formal complaint alleging that Western Union was erroneously interpreting various provisions of the formula and was engaging in traffic distribution practices which violate the provisions thereof (docket 9369).

In addition, interpretation of certain provisions of the formula is involved in the proceedings in docket 9292. This matter, which arose

out of formal complaints, involves the legality, under the formula and the Communications Act, of agreements for the exchange of certain international telegraph traffic between Western Union on the one hand and Globe Wireless Ltd., and Tropical Radio Telegraph Co. on the other hand. Extensive public hearings were held during the year and additional hearings were scheduled for September 1950.

OTHER REGULATORY MATTERS

Depreciation.—Studies to determine the reasonableness of annual depreciation rates and charges, and the recorded depreciation reserves, and to determine the propriety of the depreciation practices of the international telegraph carriers were continued. Progress was made on a comprehensive study, initiated in 1949, relative to one large carrier, and similar studies were contemplated with respect to the other international carriers. During the year one cable carrier was authorized to reduce its depreciation reserve by $2,500,000 to reverse an accounting entry of a prior year. Near the close of the year, another cable carrier submitted a proposal to revise and reduce its depreciation-expense rates.

Continuous property records.—Verification of the form and contents of continuous property records and evaluation of the effectiveness of continuous-property-records procedures of radiotelegraph and ocean-cable carriers were continued.

Pensions and relief.—The Commission pursued its general studies of the carriers' pension arrangements. Several changes in pension plans introduced during the year were analyzed to determine their effect upon the operating expenses of the companies.

Reclassification of plant.—Except for minor adjustments which are still under investigation, the plants of the international radiotelegraph and cable carriers have been reclassified in accordance with the respective uniform systems of accounts.

Part 34 (Uniform System of Accounts for Radiotelegraph Carriers).—The operating revenue accounts prescribed in this system, which became effective January 1, 1940, were designed to reflect the several sources of revenue of radiotelegraph carriers then existing. Progress in the art of radiotelegraph communication, the withdrawal of the radiotelegraph carriers from the field of domestic telegraph communication, changes in the types of services rendered, and other developments within the past decade have occasioned the need for substantial revision of these rules. Consequently, in order to provide for these changes and secure uniformity in the operating revenue accounts of all types of international telegraph carriers, the operating revenue accounts were revised during the year.

Annual report Form R (applicable to class A and class B radiotelegraph carriers).—This form was amended for use for the calendar

year 1949. The amendments were designed to reflect improvements and simplification of annual reports which had been developed by an interdepartmental staff committee, organized in 1948, for the purpose of improving the statistical program of the Commission.

Monthly report forms.—Section 43.31 of the Commission's rules and regulations provides for the filing of monthly financial reports by all common carriers whose average annual operating revenue exceed $250,000. These reports were previously filed on F. C. C. Form No. 903 by radiotelegraph carriers, and on F. C. C. Form No. 905B by ocean-cable carriers. A review of the two aforementioned forms indicated the feasibility and desirability of combining them. Accordingly, Form No. 905B was rescinded and Form No. 903 was made applicable to both classes of carriers. The latter form also was revised in order, among other things, to give effect to the new operating revenue accounts provided for by revisions of part 34 (Uniform System of Accounts for Radiotelegraph Carriers) and part 35 (Uniform System of Accounts for Wire-telegraph and Ocean-cable Carriers).

Preservation of records.—At the end of the fiscal year final action by the Commission was pending with regard to promulgation of new preservation of record rules [see page 40].

5. STATISTICS

TELEPHONE CARRIERS

Annual reports for the calendar year 1949 were filed by 24 controlling companies and 132 common carriers, of which latter figure 105 were telephone carriers. The following table shows financial and operating data relating to these telephone carriers for the calendar year 1949 in comparison with 1948:

Item	1948	1949	Percent of increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$9, 108, 408, 570	$9, 986, 086, 460	9. 64
Depreciation and amortization reserves	$2, 665, 101, 862	$2, 796, 221, 835	4. 92
Net investment in plant and equipment	$6, 443, 306, 708	$7, 189, 864, 625	11. 59
Local service revenues	$1, 598, 952, 274	$1, 801, 126, 866	12. 64
Toll service revenues	$1, 061, 661, 716	$1, 126. 496, 490	6. 11
Total operating revenues [1]	$2, 820, 088, 577	$3, 096, 309. 980	9. 79
Operating expenses [1]	$2, 235, 184, 804	$2, 407, 442, 713	7. 71
Taxes	$310, 718, 568	$366, 731, 809	18. 03
Net operating income after all taxes	$274, 186, 145	$322, 135, 485	17. 49
Net income	$228. 596, 769	$252, 325. 062	10. 38
Dividends declared	$218, 806, 027	$234, 294, 968	7. 08
Company telephones:			
Business	11, 146, 019	12, 101, 347	8. 57
Residence	22, 609, 910	23, 851, 862	5. 49
Average number of calls originating per month:			
Local [2]	4, 835, 601, 447	5, 087, 024, 778	5. 20
Toll [2]	181, 995, 982	179, 346, 751	(1. 46)
Number of employees at end of October	585, 702	559, 979	(4. 39)
Male	198, 841	195, 524	(1. 67)
Female	386, 861	364, 455	(5. 79)
Total payroll for the year	$1, 667, 054, 353	$1, 754. 640, 079	5. 25

[1] Intercompany general service and license fees and rents, amounting to approximately $48,500,000 for 1949, and $45,000.000 for 1948 have not been eliminated.
[2] Partly estimated by reporting carriers.

LAND-LINE TELEGRAPH

Financial and operating reports for the calendar year 1949 were filed by 27 wire-telegraph, ocean-cable and radiotelegraph carriers. Statistical data covering land-line operations of Western Union for that calendar year as compared with 1948 are included in the table shown below. Data applicable to its cable operations are shown in a subsequent table concerning ocean-cable carriers:

The Western Union Telegraph Co.[1]

Item	1948	1949	Percent of increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$310, 295, 071	$306, 316, 463	(1. 28)
Depreciation and amortization reserves	$136, 267, 016	$133, 978, 693	(1. 68)
Net investment in plant and equipment	$174, 028, 055	$172, 337, 770	(. 97)
Transmission revenues	$165, 595, 812	$151, 739, 815	(8. 37)
Total operating revenues	$183, 429, 431	$171, 393, 408	(6. 56)
Operating expenses, depreciation, and other operating revenue deductions	$185, 362, 154	$173, 504, 919	(6. 40)
Net operating revenues	($1, 932, 723)	($2, 111, 511)	
Net income	$1, 264, 578	($3, 468, 249)	(374. 26)
Dividends declared	$1, 228, 428		(100. 00)
Revenue messages handled	[2] 197, 915, 842	[2] 182, 069, 952	(8. 01)
Number of employees at end of October	48, 967	41, 660	(14. 92)
Total payroll for the year	$140, 900, 964	$125, 871, 207	(10. 67)

[1] Represents data for land line operations. Figures covering cable are included in another table.
[2] Includes domestic haul of cable and radio messages (8,896,985 in 1948 and 7,997,626 in 1949).

RADIOTELEGAPH AND OCEAN-CABLE CARRIERS

The financial and operating data contained in the accompanying tables were compiled from the annual reports received from radiotelegraph and cable carriers engaged in international service for the calendar year 1949 in comparison with 1948:

Radiotelegraph carriers

Item	1948	1949	Percent of increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$37, 369, 829	$38, 042, 579	1. 80
Depreciation and amortization reserves	$17, 472, 888	$18, 207, 637	4. 21
Net investment in plant and equipment	$19, 896, 941	$19, 834, 942	(. 31)
Message and other transmission revenues	$21, 186, 729	$22, 174, 840	4. 66
Total operating revenues	$22, 423, 542	$23, 440, 539	4. 54
Operating expenses, depreciation, and other operating revenue deductions	$23, 009, 343	$22, 696, 908	(1. 36)
Net operating revenues	($585, 801)	$743, 631	
Income taxes	$624, 709	$500, 989	(19. 80)
Net income	($453, 748)	$430, 506	
Dividends declared	$2, 000	$5, 000	150. 00
Revenue messages handled:[1]			
Domestic service classification [2]	59, 998	52, 784	(12. 02)
Foreign service classification [2]	10, 148, 439	9, 588, 339	(5. 52)
Marine	905, 332	920, 044	1. 71
Number of employees at end of October	5, 782	5, 483	(5. 17)
Total payroll for the year	$18, 452, 422	$18, 231, 825	(1. 20)

[1] Excludes domestic haul of foreign, insular, and marine messages to avoid duplications.
[2] International messages (primarily Canadian and Mexican) transmitted in accordance with carriers' rules governing domestic traffic are included under domestic service classification. Insular messages are included under foreign service classification.

Ocean cable carriers (including cable operations of the Western Union Telegraph Co.)

Item	1948	1949	Percent of increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$98, 256, 204	$96, 289, 405	(2.00)
Depreciation and amortization reserves	$64, 614, 333	$64, 688, 689	.12
Net investment in plant and equipment	$33, 641, 871	$31, 600, 716	(6.07)
Transmission revenues:			
Domestic service classification	$608, 664	$254, 266	(58.23)
Foreign service classification	$20, 896, 317	$20, 389, 931	(2.42)
Total operating revenues	$23, 856, 903	$23, 154, 138	(2.95)
Operating expenses, depreciation, and other operating revenue deductions	$23, 024, 993	$22, 169, 301	(3.72)
Net operating revenues	$831, 910	$984, 837	18.38
Income taxes	$211, 219	$117, 888	(44.19)
Net income	($324, 288)	$187, 916	----------
Dividends declared	$706, 936	$353, 468	(50.00)
Revenue messages handled:			
Domestic service classification	535, 089	217, 691	(59.32)
Foreign service classification	10, 487, 041	10, 172, 458	(3.00)
Number of employees at end of October	5, 973	5, 667	(5.12)
Total payroll for the year	$13, 265, 006	$13, 036, 719	(1.72)

INTERNATIONAL TELEGRAPH TRAFFIC

Reports filed by cable and radiotelegraph carriers concerning international traffic with the United States show that more than 513,000,000 paid words were handled during the calendar year 1949. Outbound traffic during the year amounted to nearly 260,000,000 words, and inbound over 253,000,000 words. An analysis of this United States traffic with the principal countries of the world is shown in the following table:

International telegraph (radio and cable) traffic, 1949

Country	Number of words		Country	Number of words	
	Outbound from the United States	Inbound to the United States		Outbound from the United States	Inbound to the United States
Europe, Africa, and the Near East:			Europe, Africa, and the Near East—Continued		
Arabia	895, 145	709, 890	Liberia	419, 871	467, 823
Austria	1, 633, 812	1, 997, 518	Netherlands	6, 718, 002	6, 657, 716
Belgian Congo	356, 639	296, 626	Norway	2, 885, 136	2, 127, 120
Belgium	5, 500, 796	4, 951, 618	Persian Gulf	469, 384	563, 634
Czechoslovakia	1, 087, 205	1, 411, 711	Poland	647, 391	564, 051
Denmark	1, 967, 212	1, 434, 405	Portugal	1, 303, 540	952, 951
Egypt	1, 987, 523	1, 694, 797	Spain	3, 068, 842	2, 179, 894
Finland	546, 288	589, 702	Sweden	3, 334, 117	2, 964, 293
France	19, 883, 086	13, 202, 650	Switzerland	7, 342, 368	5, 813, 865
French Morocco	390, 747	287, 975	Syria	373, 143	246, 532
Germany	6, 641, 504	9, 477, 893	Tangier	652, 128	754, 037
Greece	2, 612, 210	2, 931, 071	Turkey	1, 249, 318	905, 546
Hungary	380, 067	393, 506	Union of South Africa	3, 226, 465	3, 367, 461
Iceland	307, 753	286, 607	U. S. S. R.	6, 944, 280	3, 377, 296
Iran	1, 268, 496	1, 266, 982	United Kingdom	47, 357, 472	45, 272, 549
Ireland	924, 830	1, 084, 652	Yugoslavia	1, 153, 348	894, 058
Israel	3, 564, 425	3, 864, 949	All other countries	3, 535, 488	3, 975, 283
Italy	9, 692, 377	8, 122, 921			
Lebanon	812, 556	844, 114	Total	151, 132, 964	135, 933, 746

International telegraph (radio and cable) traffic, 1949—Continued

Country	Number of words	
	Outbound from the United States	Inbound to the United States
West Indies, Central, North and South America:		
Argentina	6,997,879	7,935,910
Bahamas	494,040	615,257
Bermuda	845,587	908,512
Bolivia	874,262	661,512
Brazil	9,267,949	10,024,687
British West Indies [1]	657,267	151,832
Canada	6,530,890	8,537,342
Canal Zone	643,271	672,224
Chile	2,211,550	2,469,589
Colombia	4,288,591	4,258,316
Costa Rica	857,896	716,886
Cuba	7,304,278	9,255,455
Dominican Republic	1,178,001	1,239,073
Ecuador	1,296,519	893,823
Guatemala	1,223,388	1,258,429
Haiti	761,421	744,796
Honduras	604,904	558,199
Jamaica	508,001	462,469
Mexico	1,748,274	1,708,858
Netherlands West Indies	1,164,848	1,188,876
Nicaragua	585,658	574,610
Panama	1,302,810	1,022,907
Peru	1,924,347	1,836,305
Puerto Rico	3,284,438	3,008,415
Salvador	708,145	527,799
Trinidad	434,628	434,589
Uruguay	1,771,114	1,431,484
Venezuela	6,951,517	7,828,618
All other countries	1,123,509	1,021,242
Total	67,544,982	71,948,014
Asia and Oceania:		
Australia	3,100,981	2,945,584
Ceylon	517,800	419,565
China (excluding Hongkong)	3,108,703	3,899,577
Guam	388,754	484,639
Hawaii	4,665,809	4,612,677
Hongkong	3,905,348	2,963,711
India	5,189,732	4,785,912
Indonesia	1,653,131	1,841,720
Japan	4,775,746	6,381,259
Korea	281,512	681,784
Malay States	1,003,937	1,138,328
New Zealand	838,294	889,589
Okinawa	193,923	449,672
Pakistan	1,081,413	985,977
Philippines	7,119,555	8,381,885
Siam	1,164,270	1,159,682
All other countries	1,050,439	876,821
Total	40,039,347	42,898,382
Unknown destination or origin	1,072,229	2,605,580
Grand total	259,789,522	253,385,722

[1] *Points not listed separately.*

BUSINESS AND RESIDENCE TELEPHONES BY STATES

Of the more than 40,000,000 telephones in the continental United States, over 28,000,000 are in homes and more than 12,000,000 are in business establishments. The following compilation by States was made on the basis of American Telephone & Telegraph Co. estimates as of January 1, 1950:

State	Business	Residence	Total
Alabama	114,100	282,600	396,700
Arizona	56,900	92,000	148,900
Arkansas	76,400	165,500	241,900
California	1,233,500	2,355,600	3,589,100
Colorado	129,600	284,300	413,900
Connecticut	207,600	536,100	743,700
Delaware	32,700	76,800	109,500
District of Columbia	211,600	255,000	466,600
Florida	252,100	349,600	601,700
Georgia	169,100	372,500	541,600
Idaho	37,700	94,300	132,000
Illinois	945,800	1,990,100	2,935,900
Indiana	270,600	818,200	1,088,800
Iowa	161,400	635,400	796,800
Kansas	131,000	438,900	569,900
Kentucky	119,900	322,700	442,600
Louisiana	143,200	332,000	475,200
Maine	56,700	170,000	226,700
Maryland	182,500	438,400	620,900
Massachusetts	448,300	1,081,200	1,529,500
Michigan	606,200	1,427,700	1,933,900

State	Business	Residence	Total
Minnesota	213,400	660,600	874,000
Mississippi	64,800	145,800	210,600
Missouri	318,800	790,300	1,109,100
Montana	41,400	93,600	135,000
Nebraska	92,100	292,200	384,300
Nevada	19,800	27,200	47,000
New Hampshire	36,800	112,100	148,900
New Jersey	453,100	1,089,700	1,542,800
New Mexico	44,900	61,100	106,000
New York	1,929,400	3,238,800	5,168,200
North Carolina	155,300	351,800	507,100
North Dakota	30,300	89,100	119,400
Ohio	629,400	1,847,300	2,476,700
Oklahoma	159,900	385,400	545,300
Oregon	126,500	286,400	412,900
Pennsylvania	814,800	2,154,900	2,969,700
Rhode Island	68,300	165,400	233,700
South Carolina	70,800	158,000	228,800
South Dakota	34,400	114,000	148,400
Tennessee	166,300	439,600	605,900
Texas	558,700	1,152,300	1,711,000
Utah	54,000	133,700	187,700
Vermont	23,900	71,500	95,400
Virginia	202,900	446,600	649,500
Washington	213,500	508,300	721,800
West Virginia	93,300	250,200	343,500
Wisconsin	253,700	693,300	947,000
Wyoming	23,600	48,900	72,500
United States total	12,381,000	28,327,000	40,708,000

COMMON CARRIER RADIO AUTHORIZATIONS

Base radio stations authorized to the common carrier services fluctuate around 1,000 in number. At the close of the last fiscal year there were 925 such authorizations as compared with 1,052 of the year previous. The following figures do not include associated mobile units:

Class of station	June 30, 1949	June 30, 1950	Increase or decrease
Fixed public telephone	26	26	
Fixed public telegraph	57	58	1
Domestic land mobile	795	551	(−244)
Experimental	174	290	116
Total	1,052	925	(−127

COMMON CARRIER APPLICATIONS

The Commission received more than 3,600 applications from common carriers during the year, which was nearly 500 more than for the previous fiscal period. Comparative figures follow:

Class of station	Pending June 30, 1949	Received	Disposed	Pending June 30, 1950
Fixed public telephone	57	118	159	6
Fixed public telegraph	59	199	203	41
Domestic land mobile	46	1,342	1,012	289
Experimental	62	445	483	8
Wire service extensions	12	205	193	3
Wire service reductions	158	1,342	1,301	62
Total	394	3,651	3,351	409

CHAPTER III—SAFETY AND SPECIAL RADIO SERVICES

1. GENERAL
2. MARINE RADIO SERVICES
3. AERONAUTICAL RADIO SERVICES
4. PUBLIC SAFETY RADIO SERVICES
5. LAND TRANSPORTATION RADIO SERVICES
6. INDUSTRIAL RADIO SERVICES
7. EXPERIMENTAL RADIO SERVICES
8. INDUSTRIAL, SCIENTIFIC AND MEDICAL SERVICE
9. RESTRICTED RADIATION DEVICES
10. STATISTICS

1. GENERAL

For administrative purposes, the many radio services which are neither broadcast nor common carrier are grouped in what is known as the Safety and Special Radio Services. They comprise a broad field of radio utilization by commerce, industry, and individuals.

These services fall into five categories:

Safety services.—Aeronautical, Marine, Police, Fire, Forestry-conservation, Highway Maintenance, and Special Emergency.

Land transportation services.—Railroad, Urban Transit, Intercity Bus, Highway Truck, Taxicab, and Automobile Emergency.

Industrial services.—Power, Petroleum, Forest Products, Motion Picture, Relay Press, Special Industrial, and Low-power Industrial.

Developmental services.—Industrial, Scientific and Medical; Experimental, and Low-power Radio Devices.

Operator services.—Commercial radio operators, Amateur, and Citizens.

Included in the aviation, marine, special emergency, and experimental services are certain radio stations whose operations cut across both the common carrier and safety and special services. For convenience, radio operators are treated in a separate chapter.

Until comparatively recent years, the employment of radio for purposes other than broadcast and common carrier communication was by circumstances restricted to operations contributing to the public safety. It was later extended on a relatively small scale to activities involving the conservation of natural resources, protection of public property,

and a few industrial enterprises of a particularly hazardous character, such as bridge construction, oil exploration, and the maintenance of power transmission lines. The knowledge acquired and the equipment developed during and since the war years made it possible to further expand the public use of radio. Commission rules which became effective July 1, 1949, established new services on a regular basis and realigned and modified the regulations respecting existing services.

However, with the growth of radio stations and increasing demand for new services, it became necessary to eliminate many of the convenience or luxury operations from the new rules, particularly in populous areas where common carrier facilities are available. The operations of some existing services had to be curtailed or restricted. This does not mean that there is no room for expansion in the nonbroadcast field but rather that the potential uses for radio have become so great that eligibility must remain on a highly competitive basis. Public safety radio necessarily continues to have the highest priority, but as the factor of safety decreases in importance the other principles governing a comparative determination in the public interest become very complex.

2. MARINE RADIO SERVICES

GENERAL

As the title implies, the Marine Radio Services involve the use of radio for the safety, navigation and communication needs of ships. Of the many safety radio services in existence today, the application of radio for the safety of ships is by far the oldest. Through the use of radio, many dramatic rescues have been made at sea, and an unknown but large number of diseasters have undoubtedly been averted through the use of safety radio systems developed on broad international bases.

Radio, as an aid to navigation, has also proved its worth over the years. It assists in navigating safely, avoidance of grounding, foundering, and collision. The normal radio installation aboard ship also provides means for exchanging operational and public correspondence with coast stations, other ships, and, in some cases, with aircraft.

Under the Communications Act, the Commission is required to license all compulsory and voluntary radio stations on board ships of the United States (including certain United States Government ships) whether radiotelegraph, radiotelephone, radar, or other systems involving the transmission of radio energy.

With respect to the installation of shipboard radio equipment, ships are classified as compulsorily-equipped and voluntarily-equipped. This classification is necessitated by the fact that specific national and international obligations require the mandatory installation of

radio for safety purposes on board certain vessels. Title III, part II of the Communications Act (for the oceans) and the Ship Act of 1910 (for the Great Lakes) embody the national law on this subject; while the International Convention for the Safety of Life at Sea (London, 1929), still in force, and that of London, 1948, which is not yet in force, contain the international law with respect to the high seas. The Commission has the responsibility for the domestic administration and enforcement of these laws and treaties.

Because ships travel internationally, because the radio waves they use travel internationally, and because they serve as common international media for radiocommunication, the Commission is obligated to participate actively in any international conferences or meetings related to the regulation, control, or improvement of the equipment, facilities, methods of operation, and the radio operators for marine radio communication.

SAFETY ON THE GREAT LAKES

Of outstanding significance during the year was a series of meetings in Washington, attended by representatives of Government and industry, which discussed a proposed safety radio treaty between the United States and Canada applicable to certain vessels operating on the Great Lakes. One purpose of the proposed treaty is to enlarge the safety base from seven ships now required to be equipped with radio apparatus to several hundred.

The statutory requirement for the installation of radio equipment and the carrying of qualified radio operators for safety purposes on certain United States ships has been in effect since about 1910. An act of Congress approved May 20, 1937, is the most recent domestic law covering the subject. It prescribes the requirements for radio installations for safety purposes on ships of the United States on the ocean and is in general accord with treaty and practice.

Previous radio statutes had included certain ships on the Great Lakes. At hearings before Congressional committees which considered the 1937 legislation, Great Lakes' interests claimed that though past policy treated the Lakes on a par with the high seas the factors to be considered on the Lakes were so different from those on the ocean that separate consideration was warranted. They also contended that radiotelephony should be recognized as the medium for marine safety communications on the Great Lakes instead of radiotelegraphy as previously required. Consequently, the act of 1937 which, as a practical matter requires the use of radiotelegraphy only, was not made applicable to the Great Lakes.

In their reports the Congressional committees observed that no drastic change in the policy affecting radio on ships on the Great

Lakes should be undertaken without consultation with Canada; that the Federal Communications Commission make a study of marine radio requirements in that area; and that it was hoped and expected that the Department of State would reach an agreement with Canada. The legislation, as finally passed, requested and directed the Commission to make a special study of the radio requirements necessary or desirable for ships navigating the Great Lakes and the inland waters of the United States.

An exhaustive study and an investigation made by the Commission was reported to Congress on December 16, 1940. In 1941 the Department of State called a meeting of representatives of interested Government agencies to consider the question of an agreement with Canada. Because of the war, the two Governments agreed to delay consultation looking toward a treaty. By a recent (1949) exchange of letters with Canada, the United States agreed to give early consideration to the holding of meetings between the two governments on the subject.

In order to develop a representative United States position and proposal, informal meetings of representatives of Government and industry agencies, under the chairmanship of FCC Commissioner Webster for the Department of State, began a series of meetings on February 7, 1950, in Washington. As of June 30, 1950, work on the language and format of the proposed treaty was being completed. The matter will probably be discussed formally with representatives of the Canadian Government early in the next fiscal year.

SAFETY OF LIFE AT SEA

Administration of title III, part II of the Communications Act, requiring the compulsory fitting of radio apparatus on board ocean-going vessels, involved, as of June 30, 1950, approximately 1,300 ships of United States registry. When navigated in the open sea these ships must carry qualified radio operators and maintain safety watches.

In administering the Communications Act, the Commission is empowered to and does occasionally impose fines and forfeitures, as well as apply corrective measures of a less stringent nature for violation of its provisions. During the year 40 violations of the compulsory radio provisions of the Communications Act were dealt with by the Commission. Of these 35 were satisfactorily cleared after a warning to the offender concerned; in two cases forfeitures were imposed and the remaining three were pending. Investigation is being made of two cases involving ship radio stations being operated in a service for which they are not licensed.

There were five instances in which foreign vessels were not in compliance with the provisions of the International Convention for the

Safety of Life at Sea, 1929, and, although due notice was given, these vessels sailed without informing the Commission that corrective action had been taken. In addition, notices for noncompliance were served on foreign vessels belonging to countries which are not party to this Convention and which are, in consequence, subject to domestic law, in this case the Communications Act.

The Commission's records reveal that the international radio distress signal was used 167 times during the year. Studies of distress communications, made pursuant to section 4 (o) of the act, are used to strengthen the rules of the Commission to ensure the maximum use of radio for the safety of life and property at sea.

The Commission is authorized by the Communications Act and the 1929 Safety of Life at Sea Convention to exempt ships in certain categories from radiotelegraph installation requirements, if it finds that the route or the conditions of the voyage or other circumstances are such as to render a radio installation unnecessary or unreasonable. Under this authority, the Commission renewed for 1 year blanket exemptions for passenger vessels of 15 or less gross tons when navigated not more than 20 nautical miles from the nearest land or more than 200 nautical miles between two consecutive ports, and also for passenger vessels of less than 100 gross tons when navigated within certain designated coastal areas.

Individual applications for exemption received during the year numbered 79. Exemptions were granted to several cargo vessels used as tenders and moored most of the time to oil well drilling platforms located in relatively shallow water within 15 miles of the coast of Louisiana in the Gulf of Mexico. These vessels are, however, equipped with two-way radiotelephone installations capable of communicating with nearby coast stations, with ships similarly equipped, and with United States Coast Guard stations.

RADIO AIDS TO NAVIGATION

Shore-based harbor radar (radionavigation land) stations are authorized on an experimental basis in the cities of Long Beach and San Francisco, Calif., and Baltimore, Md., for the purpose of assisting ships entering or leaving the harbor. However, since the Coast Guard has the responsibility of providing and supervising public aids to marine navigation, licensees who operate "private" aids must also obtain permission from the Coast Guard. Very high frequency maritime communications systems are being used experimentally by the radar stations, in some cases to communicate with the pilots aboard the ships to furnish navigational information.

An authorization was granted to Marine Exchange, Inc., of San Francisco, Calif., for an experimental harbor radar (radio location

land) station for the sole purpose of observing ship movements in San Francisco harbor.

Nine experimental radar authorizations (radionavigation land stations) are held by various members of the petroleum industry engaged in off-shore oil drilling activities in the Gulf of Mexico. These stations are used in the navigation of ships of the licensee in his particular operations.

At the close of the fiscal year there were 1,125 United States merchant ships authorized to use radar on a regular basis, representing a 30 percent increase in the number of radar-equipped ships over the preceding year.

Several experimental authorizations cover shore-based radar stations for training of merchant marine deck officers in shipboard radar operation on both the great Lakes and the seaboard. The need for this type of station is partly the result of its being a relatively new device for merchant ship navigation and the fact that its use is not yet sufficiently widespread to provide normal means of training navigators.

On May 11, 1950, the Commission reached a final decision, after public hearing, with respect to the question of whether licensed operators are required for ship radar stations. New rules, effective January 2, 1951, in effect waive the legal license requirement for the normal operation of ship radar stations, such as that performed by a ship's navigating officer, but require that adjustments or tests coincident with the installation, servicing and maintenance of the radar equipment while it is radiating energy be performed by or under the supervision and responsibility of properly licensed persons. The minimum grade of license specified for this purpose is a commercial second class license, either radiotelephone or radiotelegraph, with a "radar" indorsement.

An additional period of time was needed in the case of certain wartime ship radar installations, the licenses for which terminated July 1, 1950, to either modify such equipment for type approval purposes or replace the equipment. To provide for this and avoid any interruption of service, the Commission modified its rules to permit appropriate extension of the licenses on an individual basis.

RADIO TECHNICAL COMMISSION FOR MARINE SERVICES

The Radio Technical Commission for Marine Services, of which Commissioner Webster is vice chairman, was organized early in 1947 as a cooperative association of United States Government-industry telecommunications agencies. Its principal objective is the resolution of technical problems in the marine radio field by mutual agreement. Its findings are in the nature of coordinated recommendations to all United States organizations concerned. The Commission has found

its recommendations very useful, and its work a savings to the Commission since it would otherwise have to be done by the Commission itself.

The RTCM achieves its technical results through temporary special committees organized to develop solutions to particular problems. Commission marine specialists are invariably members of these committees, sometimes chairmen. Fourteen such special committees have thus far been set up and three of them are still at work.

From the inception of the RTCM and until January 1, 1950, the United States Coast Guard furnished an executive secretary for this organization. Upon withdrawal by the Coast Guard of this assistance, a Commission engineer was appointed to perform this work until such time as the RTCM is able to make some permanent provision. It is expected that this will take place during the next fiscal year, and that both Government and industry members will contribute toward the financial upkeep of the organization.

INTERNATIONAL FREQUENCY COORDINATION

The marine radio services cannot function efficiently without international coordination. Universality and systematization of marine communication on a world-wide basis have been developed over the years through periodic international conference decisions.

The latest and most far-reaching of these conferences was held under the auspices of the International Telecommunications Union at Atlantic City in 1947. Although some of these revised radio regulations came into force on January 1, 1949, the remainder, mainly involving the assignment of frequencies between 10 and 27,500 kilocycles, are to come into force on a date or dates to be determined by an extraordinary administrative radio conference to be convened at The Hague, Netherlands, on September 1, 1950.

Growing out of the Atlantic City decisions were the international Provisional Frequency Board; three regional radio conferences (region 1—Europe and Africa; region 2—Western Hemisphere; and region 3—Asia); and a number of service conferences, all of which were held, wholly or in part, during fiscal 1950 to develop, among other things, internationally coordinated lists of frequency assignments to radio stations. In preparation for region 2 planning it was necessary to prepare lists of frequencies which the United States proposes to assign to coastal and ship stations which operate in the regional bands. These lists are being coordinated with neighboring countries.

The lists as currently proposed provide reassignments of frequencies in the present coast and ship radiotelegraph band 365 to 515 kilocycles, in order that such stations may operate in the smaller spectrum space 415 to 515 kilocycles allocated by the Atlantic City conference.

However, provision has been made for coastal telegraph and ship telegraph frequencies of the order of 2,000 kilocycles to compensate for the loss of spectrum space in the lower band.

With respect to radiotelephone communication between ship and coastal harbor stations, the proposed list provides for additional channels at major ports where the present channels are overloaded. These additional channels, insofar as possible, are in accordance with recommendations of the Radio Technical Commission for Marine Services. Implementation of the frequency list with respect to coastal harbor and ship telephone stations would involve the shifting of the presently assigned frequencies in only a few areas.

The work of the Provisional Frequency Board and the three regional radio conferences in the marine field was directed toward the more orderly assignment of frequencies to coast and ship stations of the maritime mobile service in accordance with the allocation table groupings of coast and ship stations in separate frequency bands to meet the technical and engineering principles governing the service, along with certain aspects of operating practices.

The results expected to be achieved at the forthcoming Hague conference must necessarily be translated into detailed rules and regulations by the various Government administrative agencies concerned. As far as the Commission is concerned, it means that its rules and regulations governing maritime services must be extensively revised and that the frequencies now assigned to some 470 coast stations and 22,600 ship stations would be subject to change in order to achieve the main purpose of the new table, that is, a more orderly and equable utilization of the radio spectrum throughout the world.

INTERNATIONAL TECHNICAL STANDARDS

Another international activity in which Commission marine personnel participated is preparatory work for the sixth meeting of the International Radio Consultative Committee (CCIR) to be held in Europe in 1951. This committee is an organ of the International Telecommunications Union and its principal concern is the study of world technical radio problems and standardization of solutions and the submission of recommendations to the 78 member countries. For example, one of its studies concerns automatic monitoring devices for maintaining watch on the new international distress frequency of 2,182 kilocycles for maritime mobile radiotelephone stations and a suitable signal which may be used universally to actuate the automatic devices.

Further progress was made in the development of an automatic alarm system and an associated alarm signal for use on that frequency. During the past year the Commission conducted additional field and lab-

oratory tests employing auto alarm devices proposed by the United States and those furnished by the British administration for comparative demonstration. United States models have been sent to England, France, and Sweden to permit tests by these interested countries. Similarly, France expects to furnish the United States with models of its auto alarm devices.

VOLUNTARILY EQUIPPED RADIOTELEPHONE SHIPS

Records of the Commission show that there are approximately 21,000 vessels licensed to use radiotelephone equipment in the 2,000–3,000 kilocycle band. The heavy congestion in this band has emphasized the need for more strict enforcement of regulations in order that the safety factor not be jeopardized.

The Commission by amending its rules, effective August 1, 1949, allocated the frequency 2,003 kilocycles for ship stations on the Great Lakes as an intership working frequency in place of the frequency 2,738 kilocycles which they shared with stations in other areas. The former furnished some relief from delays previously experienced since it is not used in other areas and does not have the objectionable interarea interference so noticeable at night on 2,738 kilocycles. The Commission set January 1, 1950, as the final date for relinquishing 2,738 kilocycles on the Great Lakes. It also authorized use of safety and calling frequency 2,182 kilocycles as a common working frequency for ship-to-ship communication during this change-over period.

The Commission collaborated in a plan of the Department of the Army for the systematized use of the intership frequency 2,738 kilocycles by radiotelephone stations at lock 19, Keokuk, Iowa, and at each of 46 dams on the Ohio River to facilitate the movement of tows through locks and to promote safety. When a ship approaches the locks, radio contact is established with the Army stations for the purpose of obtaining instructions preparatory to passage through the locks. If the ship cannot proceed through the locks immediately, it is instructed by radio to wait until further radio orders are received.

COMMERCIAL COAST STATIONS

The use of high frequencies for long-distance communication between coastal telegraph and coastal telephone stations and ocean-going vessels continues to be important. The fact that ships on the high seas can communicate by radio with United States coast stations has increased the use of high frequencies.

Several applications were pending for authority to discontinue or reduce service at coastal telegraph stations. On the seaboard, this trend to curtailment is due in part to ship stations being equipped with high frequency radiotelegraph installations in addition to medium

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frequency installations required by law and treaty, thus allowing communication with more distant stations. On the Great Lakes, the curtailment is because most of the ships which formerly carried radiotelegraph apparatus have changed to radiotelephone. Only 16 licensed ship radiotelegraph stations remain. Eleven of these ships also have radiotelephone installations.

A new public coastal harbor (telephone) station was authorized at Lake Dallas, Tex., an inland lake, for daytime operation only. A considerable number of applications were pending for additional frequencies for existing stations of this class, and for permission to construct new stations in the 2–3 megacycle band. These applications have not been acted upon because there is an acute shortage of maritime frequencies and further assignments involve the implementation of the final acts of the Fourth Inter-American Radio Conference and the evolution of a new frequency assignment plan for the maritime service in the continental United States and contiguous areas.

Numerous applications for VHF [very high frequency] coast stations and associated ships were received. These stations are expected to provide communication for a large number of small vessels in harbors and nearby areas and thus relieve, to some extent, the overcrowding of 2–3 megacycle marine frequencies in certain areas.

Since deciding to establish the VHF Specialized Operational Radiotelephone Maritime Mobile Service in April 1948, the Commission has authorized on an experimental basis 63 land stations and 716 associated ship units. Such short-range communication is expected to play an important part in piloting and docking ships by providing direct radiotelephone service between the pilot or master of the ship, the dockmaster, and tugs. Rules and regulations to establish the VHF maritime mobile service on a regular basis were under preparation at the end of the fiscal year.

Interest has been shown in, and a need expressed for, an integrated maritime communication system using VHF which would provide communication in a basically maritime operation between land vehicles, ships, and coast stations. The Commission is studying the problems posed in this connection in consonance with the provision of the Communications Act relating to encouragement of new and more effective use of radio in the public interest.

There were 42 licensed public coastal telegraph stations in the United States, including island possessions, at the end of the year. The number of coastal harbor stations, exclusive of Alaska, was 50. Five domestic coastal telephone stations employed high frequencies for long distance public service with ocean-going vessels. In addition, three mobile press stations operated for ship-shore radiotelegraph press traffic exclusively.

ALASKA FIXED PUBLIC AND PUBLIC COASTAL SERVICES

Because of the many isolated communities in Alaska and the various industries there, such as fishing, mining, logging, etc., requiring speedy communication, the Commission has established a special category of fixed public and public coastal radio services to serve those needs. These services provide communication between communities, between communities and the Alaska Communication System, and between the coast and ships in Alaskan waters. In emergencies, any station in Alaska, regardless of the class in which licensed, and subject to certain limitations, may transmit messages relating to safety of life and property. The ACS, under the Department of National Defense, operates the main intra-Alaska communication routes and makes its service available as a connecting carrier to nongovernment stations. The Commission maintains liaison with the ACS for the coordination of communications facilities in Alaska in order to best serve the public.

INTERFERENCE PROBLEMS

Numerous reports of interference involving the maritime mobile service were received during the year. Most of them came from Alaska where commercial ship, point-to-point and coast station operations were reported to be causing serious interference to reception of aircraft stations on 3,105 kilocycles by Civil Aeronautics Administration stations. The interference was so severe in two localities that the use of the interfering commercial frequency was discontinued. Investigation, with the cooperation of the CAA, disclosed that in some cases the interference was caused by improper adjustment or use of the commercial stations' equipment and indicated a possible need for stricter technical standards. Licensing of new coast and point-to-point operations in Alaska for use of the interfering frequency in the vicinity of CAA receiving locations was discontinued.

EQUIPMENT DEVELOPMENTS, PROBLEMS, AND APPROVALS

There was considerable activity in the commercial marine radar equipment field during the year. The Commission granted type approval, after commercial laboratory and shipboard tests witnessed by Commission engineers, to a total of 18 basic types of ship radar equipment. Included were six types of modified wartime radar equipment and two types of Canadian radar equipment. Some of the new radar equipment includes such features as "bifocal" presentation, which permits simultaneous observation of both "close-in" objects and a more distant over-all picture; compact, relatively light weight, less expensive small vessel radar sets with performance features comparable to the large types; multiple indicators for special applications, such as

ferryboat installations, and the use of larger cathode ray tubes in the indicators.

A new, compact, medium frequency radiotelegraph transmitter of 500 watts capacity for use primarily aboard ships was approved after laboratory tests. One type of radiotelegraph receiver was approved with respect to the Commission's rules imposing a limitation on the radiation of energy from shipboard receiving equipment. A number of new medium frequency radiotelephone transmitters, which in general are not subject to prior laboratory tests, were accepted for licensing in the ship service.

A nickel-cadium type of storage battery has been introduced for use on board ships which have to carry an emergency power supply. Although this kind of battery is not new, its use in American ships is a recent development. It may offer certain advantages over the lead-acid type commonly used in the United States Merchant Marine. However, its introduction has brought about new administrative problems in connection with determination of the state of charge and capacity of battery installations, and certain other considerations.

Commission engineers participated in studies by the Radio Technical Commission for Marine Services. They covered such subjects as the intermodulation problem in the VHF region, the solution to which bears directly upon equipment design and frequency utilization and, accordingly, has a direct bearing upon regulatory procedures; the relative merit of FM and AM in the VHF spectrum for marine radiotelephone equipment, looking to eventual international standardization; effective standardization of ship radiotelephone selective ringing systems which would offer economic advantages and better frequency utilization; and the problem of improving marine radiotelephone communication in the 2,000–3,500 kilocycle band in portions of which extreme congestion has been experienced.

3. AERONAUTICAL RADIO SERVICES

GENERAL

The year witnessed a continued increase in civil aviation activities under the Commission's jurisdiction. Radio communications have become vital for the operation of aircraft under all weather conditions both from the standpoint of safety of life and property as well as for the efficient, expeditious, and economical operation of aircraft in general. Navigational aids, traffic control operations, approach and instrument landing systems, special devices such as radio altimeters and distance measuring equipment and public correspondence systems all involve the use of radio in the aviation services.

There were nearly 24,000 air and ground aviation station authorizations outstanding at the close of the fiscal year. Though this is almost

3,500 less than in 1949, the decrease is due at least in part to the fact that a number of private aircraft owners have not been prompt in filing application for renewal. An enforcement program presently being conducted by the Field Engineering and Monitoring Division resulted in a large increase in the number of applications for private aircraft during the month of June, and an increase is expected to continue during the next 6 months. This delay in filing application for renewal was not apparent previous to 1950 since the rapid expansion in new aircraft stations more than offset these cases.

The fiscal year 1950 was the first major renewal year since the 2 year license term was inaugurated for private aircraft, hence the Commission deleted from its active files a large number of stations whose licenses had expired. Over 4,000 such stations were deleted during June 1950.

AVIATION ORGANIZATIONS AND CONFERENCES

The Commission has increased its participation in the various interagency coordinating and policy groups, both on a domestic and international scale, in order to solve the many new problems which are occurring as a result of increasing telecommunications developments. The most important of these groups are the International Administrative Aeronautical Radio Conference, the Air Coordinating Committee, the Radio Technical Commission for Aeronautics and the International Civil Aviation Organization.

The International Administrative Aeronautical Radio Conference convened in Geneva in July 1949 for its second session in order to complete a world assignment plan for the allotment of frequencies for the aeronautical mobile route services in accordance with the Atlantic City table of frequency allocation. The recommendations and plan, when adopted, will be used as a basis not only for the international allocation of frequencies but also for a high frequency plan for the continental United States.

A major and continuing function of the Commission is participation in the work of the Air Coordinating Committee. The ACC recommends proposed United States policy on aviation to the President, and acts as a vehicle for coordinating aviation matters between the various departments of the Government and industry. The Commission is active in the ACC through its membership on the Technical Division and the following subcommittees of that division: Aeronautical Communications and Electronic Aids; Airspace—Rules of the Air and Air Traffic Control; Search and Rescue; and Airmen Qualifications.

In addition, the Commission is represented on the Air Traffic Control and Navigational Panel which was established by the Air Coordinating Committee for the guidance and implementation of the "National All-

weather Air Navigation and Traffic Control Program." This panel also established an operational policy working group to formulate the operational programs and procedures for use during the period which the interim system of air navigation and traffic control is in effect.

The Radio Technical Commission for Aeronautics is a cooperative association of the United States Government-industry aeronautical telecommunication agencies. It conducts studies of aeronautical telecommunications problems and related matters for the purpose of providing guidance to, and coordinating the efforts of, the organizations concerned. One of the major and continuing activities of the Commission involves participation in the executive committee and special technical committees of the RTCA. During the past year, the RTCA has studied and is making recommendations on such problems as: (1) television interference to radio marker beacon receivers, (2) test standards and procedures for VHF radio equipment, (3) operational requirements and evaluation of long distance aids to navigation, (4) protection ratios for carrier current broadcast systems operating in the band 200–400 kilocycles, (5) reevaluation of the operational requirements for air-ground communications and equipment to fill these requirements for control of air traffic, and (6) development of a high altitude grid plan for omnidirectional radio range and distance-measuring equipment frequency pairing.

The International Civil Aviation Organization was established to develop the standards and recommended practices for international civil aviation through the process of regional and divisional agreements among the nations of the world. Representation at these meetings insures that the established policies of the Commission will be reflected in the deliberations of the meetings and further insures that the Commission will be kept informed on current trends and developments in international civil aviation telecommunications requirements which, because of the nature of aviation operations, affect and, in many instances, become a part of United States domestic requirements.

During fiscal 1950 the Commission assisted in the preparation for and participated in the following ICAO meetings: European-Mediterranean fixed telecommunication meeting, African-Indian Ocean fixed and Middle East fixed telecommunication meetings, African-Indian Ocean and Middle East frequency planning meeting, and European-Mediterranean frequency planning meeting, all held in Paris; the south east Asia frequency planning meeting at New Delhi, India, and the Caribbean RAN and frequency planning meeting held in Havana. The Commission furnished one chairman of a United States delegation, two vice chairmen and one United States spokesman to these meetings.

AIRCRAFT RADIO

The utility of radio in connection with aircraft operation is shown not only by the fact that it is legally required for the operation of an airline, but also by the great growth in the number of voluntary installations in private aircraft. There were over 20,000 authorized aircraft radio stations at the close of the fiscal year, of which number nearly 18,000 were private aircraft.

Rapid expansion in the aviation industry has called for correspondingly, far-reaching changes in the scope and nature of the services rendered by radio to aircraft operators. To meet the congestion of communication channels which resulted from expansion of civil aviation activities, the aviation communication systems have been undergoing a process of reengineering. Very high frequencies have been placed in service, new communication and traffic control procedures are being adopted, and every effort is being made to bring aviation communications to a peak in engineering efficiency.

AERONAUTICAL LAND AND AERONAUTICAL FIXED RADIO STATIONS

The aeronautical land and aeronautical fixed stations provide nongovernment communication service necessary for the safe, expeditious, and economical operation of aircraft. Aeronautical land stations communicate between the ground and aircraft, whereas aeronautical fixed stations furnish point-to-point communication to enable the airline to carry on its business more efficiently. In the United States the fixed service stations are used primarily as "backup" circuits for land line facilities; however, in international operations, and operations in areas where land line facilities are not adequate, radio provides the primary service. Domestic air carriers are required to maintain two-way ground-to-air radiotelephone communication at terminal and at such other points as may be deemed necessary by the Government to insure satisfactory communication over the entire aircraft route.

The growing importance of air travel in Alaska has necessitated major changes in aeronautical communications. An Alaska communications plan is being formulated, and will require considerable coordination between Government agencies and industry because of the diversified nature of Alaskan operations before it can be fully implemented.

In previous years the aeronautical land and aeronautical fixed stations included Civil Air Patrol radio stations. The Commission has recently amended its rules and is authorizing these facilities as Civil Air Patrol land and Civil Air Patrol mobile stations. Accordingly, the number of aeronautical land and fixed facilities decreased to slightly more than 1,400 at the year's close.

CIVIL AIR PATROL STATIONS

These stations provide the necessary communication for Civil Air Patrol activities and emergencies pertaining to the protection of life and property. Air shows, missing aircraft search missions, training missions, and communication systems at encampments, bases, and meetings are examples of official activities. To aid in the furtherance of Civil Air Patrol activities the United States Air Force has made certain frequencies available for assignment to the CAP.

There are nearly 2,000 ground stations licensed in this service as compared to some 1,600 last year. The increase in the number of authorized stations is not as slight as it would appear from the foregoing figures due to the fact that one application for construction permit or license may be submitted to the Commission for a Civil Air Patrol land station together with the associated number of Civil Air Patrol mobile stations required. In order to consolidate the files and lessen the workload in keeping records, the application is considered as one station. Due to this consolidation the license records for 1950 indicate that the number of units authorized for CAP in 1950 exceeds 7,000.

AIRDROME CONTROL STATIONS

This type of station provides communication between an airdrome control tower and arriving and departing aircraft for the purpose of regulating the separation of aircraft to avoid collisions and maintaining an efficient flow of traffic into and out of an airport. An airdrome control station also communicates with aeronautical mobile utility stations aboard essential vehicles of an airport. Airdrome control stations, for the most part, are operated by the Civil Aeronautics Administration; however, the number of such stations licensed by the Commission is continuing to increase.

AERONAUTICAL MOBILE UTILITY STATIONS

This class of station is installed aboard crash, maintenance, fire, and other vehicles which operate on an airdrome in order that the airdrome control operators may direct the movements of the vehicles as necessary. This service is used by many municipalities and individuals concerned with the care and upkeep of airports.

AERONAUTICAL NAVIGATION RADIO STATIONS

These stations involve the transmission of special radio signals to enable an aircraft to determine its position with reference to the navigational facility. Included are radio beacons, radio direction finders, radio ranges, localizers, glide paths, markers, and ground control approach stations.

This service, for the most part, is operated by the Civil Aeronautics Administration. The stations licensed by the Commission are installed at locations not served by the Government stations. The number of stations is expected to increase as the combined civil and military system of air navigation and air traffic control becomes further implemented.

FLYING SCHOOL RADIO STATIONS

Flying school stations aboard aircraft and on the ground are used for communication pertaining to instructions to flight students or pilots while actually operating an aircraft.

FLIGHT TEST RADIO STATIONS

A flight test radio station is a station aboard an aircraft or on the ground used for the transmission of communications in connection with the test of aircraft and major components of such aircraft.

AERONAUTICAL PUBLIC SERVICE RADIO STATIONS

The public service type of aircraft station has been provided for private communications between individuals aboard aircraft in flight and persons on the ground, and affords communication similar to those available by use of the public telephone. The aeronautical public service station connects to the Nation-wide land line telephone system through the facilities of the coastal harbor radiotelephone or coastal telephone stations. This service has increased each year largely due to the fact that operators of the "executive" type aircraft consider telephone communication to be essential in their business.

4. PUBLIC SAFETY RADIO SERVICES

The Public Safety Radio Services consisting of the Police, Fire, Forestry-conservation, Highway Maintenance, and Special Emergency Services have been operating for a full year under the major revision to part 10 of the Commission's rules effective July 1, 1949.

The extensive shift in frequency assignments necessary to bring existing operations into compliance with the revised frequency allocations has progressed satisfactorily. Out of the thousands of stations affected, approximately 100 licensees failed to meet the July 1, 1950 deadline. The Commission authorized an additional period of 3 months to enable the delinquent licensees to change to the new frequencies.

During the year a major improvement in the capabilities of the standard types of equipment employed in these services made it possible to assign adjacent channels to licensees in the same area. This, in effect, doubled the number of channel assignments that could be

made. The types of equipment in use at the time the adjacent channel equipment was developed will continue to be used for a few years before it will need to be replaced; consequently a short period of time must elapse before full advantage may be taken of the capabilities of the improved equipment.

Except for a few minor changes, the rules contained in part 10 have proved adequate. Some of these changes are undergoing proposed rule making while others are being studied.

The establishment and expansion of a network of police radio stations by the Territory of Alaska has required an extended survey of the frequency allocation and assignment plans of both the Federal departments and other nongovernmental agencies so that adequate channels may be made available. One frequency in the 2 megacycle band and 1 frequency in the 7 megacycle band have provided for police highway patrol.

It is proposed to authorize operation of stations with a maximum input power of 10 kilowatts in the Police Radio Service on frequencies now allocated primarily by State police licensees. With this increase in power many States hope to operate with fewer base stations and still obtain equal or better service. It is thought that considerable savings in operating expense may be gained.

During the past year all public safety services continued to expand. Indeed, radio systems in these services are being augmented at a rate that is taxing the manufacturers' ability to supply the equipment demanded, particularly certain components such as crystals.

POLICE RADIO SERVICE

Police radio station authorizations are issued to States, Territories, possessions, and other governmental subdivisions including counties, cities, and towns. Governmental institutions charged with the responsibility for providing police protection are also eligible. Networks covering entire States have been established on the radiotelephone channels, and these networks are linked into still larger networks embracing groups of States by means of the radiotelegraph channels which have been made available for long distance fixed operations.

FIRE RADIO SERVICE

Eligibility for licensees in the Fire Radio Service is restricted to governmental agencies and organizations such as the volunteer fire departments which are responsible for providing local fire protection. Expansion in this service is occurring principally in the heavily populated urban areas where the need for separate communication facilities is necesary because the police radio system is unable to provide fire protection service. In the rural areas the volunteer fire

departments are establishing radio systems very slowly due to the limited funds available for radio equipment. Unless funds can be provided, it appears that these areas where there is a great need for radio communication due to the lack or inadequacy of public telephone facilities must continue to operate without the assistance of radio.

FORESTRY-CONSERVATION RADIO SERVICE

Stations in the Forestry-conservation Radio Service are authorized to transmit communications directly relating to public safety and the protection of life and property including those essential to the prevention, detection, and suppression of forest fires, and official forestry-conservation activities. Eligibility for this class of station is restricted to States, Territories, possessions, and other governmental subdivisions including counties, cities, and towns and similar governmental entities, and persons or organizations charged with specific forestry-conservation activities.

The forestry portion of this service has been established for many years and most of the eligibles have established radio communication systems. Consequently, the number of forestry systems did not increase much during the past year. However, most of these systems have been greatly expanded to provide a more complete coverage. During the year several States added conservation communication systems which are independent of their forestry operation.

HIGHWAY MAINTENANCE RADIO SERVICE

The Highway Maintenance Radio Service completed its first full year of operations. Eligibility for this service is likewise restricted to States, territories, possessions, and other governmental subdivisions, including counties, cities, towns, and similar governmental entities. The scope of service provides primarily for the transmission of messages directly relating to public safety and the protection of life and property; and secondarily provides for intercommunication with other stations in the Public Safety Services. It is anticipated that this particular service will continue a steady growth, particularly among the State and county eligibles.

SPECIAL EMERGENCY RADIO SERVICE

Communications in the Special Emergency Radio Service are restricted to matters directly relating to public safety and the protection of life and property. The eligibility provisions include physicians normally operating in remote areas where other communication facilities are not available, ambulance services, beach patrols responsible for life-saving activities, school bus operators having regular routes into rural areas where other communication facilities are not available; in

addition to the previously recognized eligible groups, namely: persons having establishment in remote locations lacking other communication facilities, and organizations established for relief purposes in emergencies and communication common carriers.

During the year, many members of the medical profession obtained licenses to intercommunicate between their homes and offices and their automobiles. And ambulance services, too, have been issued licenses to equip their ambulances with radio.

5. LAND TRANSPORTATION RADIO SERVICES

The Land Transportation Radio Services provide radio facilities for commercial activities closely connected with the Nation's transportation industries. This group includes the Railroad, Urban Transit, Taxicab, Intercity Bus, Highway Truck, and Automobile Emergency Radio Services.

The year marked a continuation of rapid expansion in radio facilities authorized for these transportation services. This growth can be attributed to several major factors, one of which is the adoption of part 16 of the Commission's rules, effective July 1, 1949, which made it possible for numerous transportation carriers to invest in communication equipment with assurance that the facilities to be installed would be protected by firm frequency allocations. By virtue of this Commission action, the trucking, taxicab and intercity bus transportation carriers and the operators of vehicles providing emergency road service were authorized, for the first time, to operate in an established radio service. Prior to this date, authorizations for these operations were permitted only on an experimental basis, consequently industry was reluctant to invest in radio facilities wherein no assurance existed that their use could be continued. Considerable credit is also due manufacturers for their part in expediting the development of radio equipment capable of operating on adjacent channel frequency assignments without undue interference. Without this improved equipment the present and future expansion of these services would be seriously handicapped.

The rules reflect, to a large extent, the experience gained during the years since the war, particularly in the general mobile experimental program. The rules are designed to permit the maximum utilization of frequencies allocated with a minimum of interference. They cover technical specifications for the equipment to be used, transmitter operation practices and licensing procedures. Frequency allocation and the requirements relative to determining eligibility are set forth for each of the various service categories.

The scope of eligibility was broadened during the past year. Heretofore, the service rules required that an association be composed of

members who were themselves, as individuals, eligible for authorizations in the respective service in which the association was rendering a communication service. Under the revised rules, the eligibility requirement of the association's members has been changed so as to permit establishment of radio systems financed on a cost-sharing basis and thus enable companies to make use of an economical arrangement of common communication facilities.

Notwithstanding equipment improvements made during the year, the one major problem still hindering the full development of these services is frequency spectrum congestion. The ever expanding use of radio has created service problems requiring constant study on the part of the Commission and industry. Education in the use of this new communication expedient is essential to obtain maximum benefits for all concerned. Industry has been encouraged to organize local, regional, or national frequency advisory committees for the purpose of formulating frequency assignment plans which reflect a coordinated effort on the part of the users to obtain maximum frequency utilization with a minimum of interference. Committee participation in these frequency assignment matters is of great value to the Commission in the discharging of its regulatory obligations to the public of making effective use of the available radio frequency spectrum.

RAILROAD RADIO SERVICE

The Railroad Radio Service is available to all railroads providing a passenger or freight transportation service on a common carrier basis. Communications are limited to those relating directly to the protection of life or property and messages essential to the maintenance, supervision, and efficient operation of the railroad systems.

Radio has provided these carriers with an economical and dependable means of communication between cab and caboose, between trains within range of each other, between moving trains and wayside stations, and between adjacent wayside stations. It has made possible the efficient and safe operation of yards and terminals under conditions of heavy weather and fog. The performance of the extensive railroad radio communication systems in use throughout the country under diverse climatic conditions and terrain has successfully demonstrated that radio has become an integral and effective factor in safe, efficient, and dependable railroad transportation. It has been of material aid in preventing accidents and in practically all cases its use has saved considerable time in effecting repairs.

In its administrative functions regulating this service, the Commission has given considerable study to operational and other related problems unique to the railroad industry. The service showed a healthy development during the year and it is anticipated that ex-

pansion will continue. Numerous new applications of radio are continually arising which give promise of even further advantages from the users standpoint. Such new usages, in numerous cases, require extensive study to determine the over-all effect, not only in the railroad service, but in other services sharing the radio frequency spectrum, to insure that extending the service will be beneficial to all concerned.

The expansion of the service has been sound and its radio communication systems are being installed on a carefully engineered basis. This has worked to the advantage of the user as well as the Commission and its regulatory responsibilities. A gratifying interest is being shown in the automatic repeater type of installation used in yard and terminal operations where direct communication is essential between yard and train dispatchers moving about in the yard and the switchmen and engineers engaged in classification movement of cars. Microwave installations have also proved valuable along railroad right-of-ways during periods when wire lines are subject to disruption by ice, sleet, or wind storms, and also to supplement wire line systems for control circuits, telemetering, and voice channels. Developmental work in this portion of the radio spectrum is being encouraged and it is expected that microwave operation will expand as experience is gained on its use and advantages. Microwave systems presently in operation have given firm evidence of the economic and operational advantages over wire line facilities.

As of June 30, 1950, in addition to base stations, over 2,400 radio-equipped mobile units were authorized in this service. Approximately 30 percent of the class I railroads are using radio facilities in their operation.

URBAN TRANSIT RADIO SERVICE

This service makes radio communications facilities available for street railway systems and city and urban bus lines. Its use has been of value in providing prompt aid to streetcars and transit buses in periods of emergency occasioned by power failures, collisions, or breakdown of equipment. In addition, the use of radio communication facilities provides efficient dispatching of passenger-carrying vehicles during rush hours and other critical traffic periods. To date most authorizations in this service have been granted for transit operations in the larger cities. It is expected that the service will continue its steady growth and that more use will be made of its potentialities in smaller cities.

TAXICAB RADIO SERVICE

This particular service is used in connection with the dispatching and other operation of taxicabs. It should not be confused with radiotelephone service available to passengers in public vehicles, which is

separately treated in the chapter on common carriers. In the 5 years the taxicab radio service has been authorized, 4 of which were on an experimental basis, it has expanded at a remarkable rate and at the close of the year approximately 50,000 taxicabs were linked to base stations for operational purposes.

In accordance with rules which went into effect on July 1, 1949, a total of eight frequencies in the 152–162 megacycle band were opened to this service. In addition, 10 frequencies in the 450–460 megacycle band were allocated for developmental operation looking towards the eventual establishment of these frequencies for regular taxicab service assignment. Although equipment is presently being developed for those higher frequencies, their use will be curtailed until such time as economical and efficient apparatus is available. Tests conducted on 450–460 megacles indicate that for localized taxicab radio-communication needs use of these frequencies will materially reduce the interference currently caused by the simultaneous operation of several taxicab systems on the same frequency in congested or thickly populated areas. Every effort is being made to encourage the manufacture of equipment for operation in these bands and it is felt the continued healthy expansion of this service rests on the ultimate use of these higher frequency assignments.

In the taxicab radio service, more than any other, the coordinated assignment of frequencies is of primary importance if all users are to obtain maximum benefits from their investments. During the year the Commission actively encouraged cooperation and coordination of frequency assignments among the various taxicab operators, In many communities committees of operators have been formed for the purpose of selecting particular frequencies to be used by each individual system. This coordination has resulted in improvement of the service, and it is anticipated that the coming year will see the taxicab interests expanding their cooperative effort to include more segments of the industry. This is of prime importance to a service which is expanding at such a rapid rate that a critical shortage of frequency assignments will occur, and has already occurred in numerous areas, unless prompt steps are taken to obtain the maximum possible use from the available frequencies. Careful coordination in the selection and assignment of frequencies is imperative if maximum frequency utilization is to be obtained and, further, to prevent degrading the service.

The year also saw the widespread installation of equipment which will operate satisfactorily on adjacent frequency channel assignments. This development is of major importance to this industry where adjacent channel operation is a necessity. Taxicab radio users are urged to consider carefully the planning of their systems to assure

the equipment to be used has been designed to permit adjacent channel operation between stations in the same geographical area.

INTERCITY BUS RADIO SERVICE

This service provides for the operation of radio-communication facilities by carriers regularly engaged in passenger transportation over public highways between cities. The use of radio for this purpose assists bus operators in providing efficient, safe, and dependable bus service. Communications are often necessary to expedite warnings to drivers of dangerous road conditions likely to be encountered. Mechanical trouble can often be speedily rectified by the bus driver calling the dispatcher to facilitate the dispatch of repair trucks or an additional bus as needed. Schedules can be more readily adjusted to fit the traffic demands. Radio is also valuable in emergencies requiring medical assistance.

The Intercity Bus Radio Service has, since its inception, experienced a slow but steady growth. Radio installations in this service, to be effective, must provide an extensive area of coverage. Such systems require detailed coordinated planning and normally involve a number of highway transmitter installations. This is costly and operators are proceeding cautiously before making extensive commitments. It is expected, however, that the experience gained from the satisfactory operation of the systems already installed will influence other operators to participate on a progressively larger scale than heretofore. As the larger bus companies install radio systems along highways, smaller operators may find it desirable to integrate their communication needs into the radio system of the larger companies by the cooperative use of the base station facilities. The rules governing this service provide for such cooperative operation.

HIGHWAY TRUCK RADIO SERVICE

This service provides radio-communication facilities to persons engaged in trucking operations on an intercity basis, or on a route basis outside of metropolitan areas. Stations in this service are authorized to transmit messages relating directly to the safety of life or property and communications essential to the maintenance, supervision, and efficient operation of trucks.

The year witnessed a marked increase in the number of systems installed, including authorizations for a number of extensive networks covering several States. It is anticipated that the operation of such extensive radio systems will induce others to follow as experience reveals the needs and advantages of an integrated radio-communications system as an aid to increasing the efficiency of trucking. In addition to normal interstate and intercity type of truck operations,

interest was manifested by many business concerns engaged in the distribution of various commodities such as butane gas, fuel oil, milk, etc.

A nation-wide plan of frequency allocations was recently prepared by the traffic section of the American Trucking Associations, Inc., which will assist the Commission in frequency assignment problems associated with this expanding radio service. The plan has been carefully engineered to take into account wave propagation characteristics as well as the rate territories and the major traffic patterns. It parallels closely the previous plan established by the Commission, dividing the country into six major areas for frequency assignments. The areas are formed so that boundary lines cross areas of minimum traffic density; also, taking into consideration distribution centers and points served to permit maximum use of radio with single frequency equipment in the respective areas. It is anticipated that such an assignment of frequencies in accordance with the traffic needs of the industry will greatly aid trucking operations obtain reliable, interference-free radio communication.

AUTOMOBILE EMERGENCY RADIO SERVICE

This service was established to provide persons or organizations rendering emergency automobile road service to the general public with radio facilities to expedite the dispatching of service cars and trucks. Considerable interest has been shown in this service by both automobile associations and operators of public garages. It has proved especially effective in getting emergency road-service trucks to stalled vehicles, which materially contributes towards public safety by the prompt removal of traffic hazards.

A continued steady growth is anticipated for this service. During those periods of adverse weather conditions in which the need for such service is greatest, the single channel presently in use has not proven adequate in heavily congested metropolitan areas to handle the large volume of message traffic. It is hoped that future availability of equipment in the 450-megacycle band will materially lessen congestion and permit this important service to provide reliable service in all areas.

6. INDUSTRIAL RADIO SERVICES

The year saw the services in the industrial radio group grow in the manner that had been expected. These services, which include power, petroleum, forest products, motion picture, relay press, special industrial, and low-power industrial radio, were by rules effective July 1, 1949, either created or carried over from services already established.

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A major problem developing during the year was that of administering the expanding industrial services without a corresponding increase in Commission personnel. The principal difficulty has been in processing the increasing number of applications; at one time the backlog of pending applications reached 2,500, resulting in processing delays of up to 6 months. Adding to this problem is the increasing complexity of the applications handled, along with a temporary emergency due to reclassification of licenses formerly issued for services deleted by the 1949 rule making.

In an effort to minimize processing delays, the whole licensing procedure is to be simplified. To reduce the number of applications filed, it is proposed to allow the licensee to make minor changes to his facilities without prior authorization.

It is hoped that the simplification and time saving resulting from the foregoing, and from other administrative changes, such as departmental reorganizations within the Commission, will afford the Commission staff opportunity for further study and action in the year to come relative to other needed rule revisions.

One important rule amendment, effective July 31, 1950, was the provision for use by fixed stations of frequencies in the band 456–458 megacycles formerly designated only for mobile use. Although subject to certain limitations, including the condition of noninterference to mobile stations, this relaxation of the rules will permit licensees of mobile systems requiring fixed point-to-point radio circuits adjuncts to establish the necessary fixed circuits in areas where proximity of television channel allocations precludes use of frequencies in the band 72–76 megacycles. Equipment for the 456–458 megacycle frequencies is less costly and complicated than for the next available band of fixed service frequencies, which begins at 952 megacycles.

Regional industry advisory committees now functioning in the power, petroleum, and forest products industries have rendered substantial aid to the Commission in the matter of frequency assignment by supplying applicants with information as to which frequencies may be expected to remain largely free from interference in the applicants' proposed areas of operation. The committees likewise provide liaison with their industries, informing the Commission of their particular needs at the local level and, in turn, keeping their own members informed as to regulatory changes, rule interpretations, and licensing procedures. Such cooperative educational and informational functions relieve the Commission of answering many inquiries, as well as reducing the occurrence of illegal operation and involuntary violation of operating rules and administrative requirements.

POWER RADIO SERVICE

This service makes available the use of frequencies by those public utilities which supply electricity, gas, water, and steam to the public. Although such use of radio was authorized under the superseded Utility Radio Service, the newer service rules are more liberal, notably in the total number of frequencies provided and specific provisions being made for operation of fixed point-to-point auxiliary circuits.

The basic power radio system usually comprises one or more base stations together with a number of mobile units installed in service vehicles, all operating on a single mobile service frequency. Very large systems, or those operating in congested metropolitan areas, may be assigned two or more mobile service frequencies upon furnishing proof of sufficient need. Many licensees maintain battery-operated pack radio sets of the type commonly known as "handi-talkies", either for emergency use or for specialized operations such as the "sagging in" of transmission line spans.

Fixed circuits are used in lieu of telephone wire lines in areas where wire lines are unavailable or, if constructed, would be unreliable or difficult to maintain. Fixed station frequencies most generally used are those in the band 72–76 megacycles, except in localities where proximity of television stations operating on TV channels 4 or 5 (directly below and above the hand 72–76 megacycles, respectively) precludes power ultility use of those frequencies by reason of interference to TV reception.

Several licensees have installed microwave point-to-point circuits operating at frequencies above 952 megacycles, but only one extensive microwave system has resulted in the power radio service. It is expected that considerable use will be made of 456–458 megacycle frequencies for point-to-point operation, under the rule revision mentioned in the preceding section.

PETROLEUM RADIO SERVICE

Persons eligible for operation in the Petroleum Radio Service are those engaged in searching for, producing, collecting, refining, or transporting by means of pipelines, petroleum or its products, including natural gas.

This service includes drilling companies, but does not include contractors engaged in pipeline or oil field construction, nor is provision made for the inclusion of persons supplying specialized services such as well-cementing, acidizing, or mud-conditioning. Some of these activities are conducted in the Special Industrial Radio Service discussed elsewhere in this chapter.

An important phase of petroleum radio communication is in connection with geophysical exploration for development of our oil reserves. Here radio may be used either for voice communication to coordinate the efforts of exploring parties, for the transmission of timing impulses as an aid to the operation of sounding equipment, or for a combination of both, using the same frequencies. Prospecting for oil and the drilling of wells on the continental shelf in the Gulf of Mexico continues, with some companies licensed in both the Petroleum Radio Service and the Ship Radio Service, the latter primarily for long distance over-water communication.

The major oil companies retailing finished petroleum products, as well as a number of smaller independent producers of crude petroleum, continued to expand their conventional mobile radio systems. Also popular in the Petroleum Radio Service are movable base stations, suitable for temporary installation at a drilling site to direct the movement of men and materials as the drilling progresses.

Perhaps the most spectacular development of the year was the increase in the number of point-to-point radio circuits along petroleum pipelines. In all but one instance, these systems are to operate at microwave frequencies. Provision is made for several voice communication channels, with other channels devoted to telemetering and signaling application. In order to introduce and extract, at transmitter and receiver locations, the various types of intelligence carried simultaneously over the system, highly complicated and expensive equipment similar to that found in telephone exchanges is required at each way station. When it is considered that the average distance between retransmission points on microwave systems is necessarily of the order of 35 miles, it becomes apparent that microwave communication along a long pipeline involves expenditure of a considerable sum of money. For one such installation, cost of the microwave equipment to span a distance of approximately 1,800 miles is approximately a million dollars. This cost excludes the conventional mobile radio system operating along the route of the same line from base stations tied in to each way station.

The point-to-point circuits are used to coordinate the movement of crude petroleum, petroleum products, or natural gas through the line. The most important item is exchange of line pressure information between the various pumping stations along the route. The regular mobile radio system is necessary for maintenance work along the line, and for the dispatching of repair crews in event of leaks or blowouts with accompanying danger of fire or explosion.

FOREST PRODUCTS RADIO SERVICE

The Forest Products Radio Service was established in 1949 for the purpose of extending the use of radio to privately owned timber and logging companies to promote safety of their personnel, conservation of wooded areas, and increased efficiency of logging and tree-farming operations. No provision is made for use of radio outside of actual woods operations.

To date, the majority of systems have been for conventional single frequency operation of base and associated mobile station, with a few point-to-point circuits to connect base station control positions with their transmitter sites located upon more favorable terrain. A few large operators have been permitted the use of separate frequencies in different divisions of their operating areas, where such divisions are widely separated and do not require intercommunication, or where use of different frequencies may be required to prevent interference to other licensees.

The majority of grants in the Forest Products Service continue to be made in the Pacific Northwest. However, a number of inquiries indicate that timber operators in the Southern and Northeastern States are planning more extensive use of radio communication in their pulpwood operations.

RELAY PRESS RADIO SERVICE

The present Relay Press Radio Service is derived from a former radio service which made no provision for dispatching of mobile units from newspaper offices. Consequently, the newer service is of considerably more benefit to persons engaged in operation of a newspaper or press association in an urban area.

Inasmuch as only four frequencies are available to this service in the range of mobile frequencies considered to be useful at the present state of the radio art, some difficulty is anticipated in areas where the four frequencies have been assigned. In New York City, for example, the next new licensee must be assigned one of the frequencies already in use, except in the event that equipment suitable for mobile service and operation in the band 450–460 megacycles becomes available in the immediate future. The possibility of two reporters from rival papers attempting to file stories simultaneously over the same radio channel indicates that some sort of industry priority or sharing plan must be adopted. As has been successfully demonstrated in other industries, cooperation and self regulation at the licensee level can avoid many situations which would result in degradation of service.

MOTION PICTURE RADIO SERVICE

This is another service carried over from rules in effect prior to the rule revisions of July 1, 1949. Eligibility is confined to persons producing motion pictures for public showing. In the new Motion Picture Radio Service, additional frequencies are available, affording the applicant a wider choice of the usable frequency spectrum.

As predicted in the last report, there has been no material increase in this service. Since the use of equipment in this service is largely limited to operation while on location in remote areas, and because of the intermittent character of such operation, the use of frequencies shared with other services has been found satisfactory.

SPECIAL INDUSTRIAL RADIO SERVICE

Eligibility for the Special Industrial Radio Service is restricted to persons engaged in production or construction activities and no provision is made for operations of a service or distribution nature. Under the present rules, the applicant is further required to show that his activities would be confined to remote or sparsely settled regions, the yard area of a single manufacturing plant or a construction project of a public character.

Even with the restrictions outlined, the rapid growth of this service and the heterogenous character of its licensees attests to the value placed upon the use of radio by businesses, both large and small, heretofore ineligible for radio operation. Typical operations include directing the movement of locomotive and rail cars within steel mill yards; agriculture, including the operation of large ranches, produce farms, and nurseries; operation of canneries, and vegetable or fruit processing plants; and strip mining of coal and copper.

Another important group of special industrial licensees are contractors engaged in public construction, such as highway building, bridge and tunnel construction, and dredging or other harbor improvements. Particularly important at the present time is the construction of petroleum and natural gas pipelines by independent contractors. As indicated earlier in this report, these contractors are not included under either the Power or Petroleum Radio Services rules. Likewise ineligible under the Petroleum Radio Service, geophysical exploration companies engaged in prospecting for minerals other than oil have obtained authorization in the Special Industrial Radio Service.

The problems of determining the eligibility of applicants for the Special Industrial Radio Service have been the most troublesome arising in any of the industrial radio services. One chief difficulty lies in establishing at what point an applicant's productive operations leave off and his distribution or service activities begin. An unsuspected

ambiguity which became apparent only after the service had been placed in operation was what is meant in the present rules by the term "remote or sparsely settled region." Still another, though less insoluble problem, presented itself from time to time in determination of what constituted a "construction project of a public character".

Accordingly, a proposal to amend the rules pertaining to the Special Industrial Radio Service is now under consideration, designed to eliminate a majority of the defects presently apparent in eligibility requirements, as well as to more clearly indicate to applicants what types of radio systems may be established. It is believed that a number of applicants presently ineligible may be admitted if the proposed rule revisions are adopted.

LOW-POWER INDUSTRIAL RADIO SERVICE

All business organizations are eligible for licenses to operate in this service whenever they have a need for short-distance mobile communication as an aid to the more efficient and safe conduct of their operations. Eligibility has purposely been made broad because by limiting every one to the use of low-power, short-range equipment it is possible for a large number of persons to operate their own radio systems with little interference to one another.

This service was first established in July 1949, when it was expected that its growth would be rapid. The experience of the past year has shown that its expansion is not as rapid as anticipated, but it is still substantial and, according to reports, has proved to be useful to the licensees. The principal users of the service are contractors and maintenance and service companies.

7. EXPERIMENTAL RADIO SERVICES

Part 5 of the rules and regulations governing experimental services became effective October 1, 1939, and has been modified from time to time as the demands of these services have required. The rules were designed to promote all types of experimentation in and relating to the radio art. This was done in compliance with the Communications Act requirement that the Commission "study new uses for radio, provide for the experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest."

Under the present rules, experimental stations are divided into three categories, namely: Class 1, class 2, and class 3. Class 1 stations are for the use of persons engaged in fundamental or general research, experimentation and development of the radio art; or for the development, testing and calibration of radio equipment. Class 2 stations are authorized for the development of a new radio service or the expansion of an established service. Class 3 station authorizations are available

to individuals interested in conducting an experimental program on his own behalf for a limited time.

In addition to the above categories, two subclasses of experimental stations were established by part 2 of the rules. These subclasses of class 1 stations are contract developmental and export developmental stations. The former classification includes experimental stations licensed for developing equipment or techniques to be used by stations operated by the United States Government. The latter classification is for a similar purpose where the equipment is to be used by stations under the jurisdiction of a foreign government.

Class 1 stations are, in the main, presently operated by equipment manufacturers and research and development organizations. They engage in experimentations directed toward the improvement of existing radio equipment as well as the development of new equipment, new techniques in the electronic art, and fundamental studies involving radio propagation. Several manufacturers are developing equipment suitable for adjacent channel operation which would effect a more efficient use of the radio spectrum. Other development work includes microwave equipment, radiolocation equipment and systems, and radio aids to navigation. Considerable experimental work is also being done in ionospheric investigations and propagation studies of the various frequency bands, particularly in the spectrum range where the presently available information is meager.

Prior to February 1, 1949, specific frequencies above 25 megacycles were available for assignment to class 1 stations. These frequencies are no longer available specifically for that purpose. In lieu thereof, part 2 of the rules provides for the use of frequencies throughout the spectrum, subject to the condition that interference is not caused to the service or stations to which these frequencies are regularly assigned. The Commission is, therefore, unable to make frequency assignments to experimental stations for general use throughout the United States. The use of assigned frequencies is limited to a designated geographical area. The specific frequencies below 25 megacycles allocated for class 1 stations and listed in part 5 of the rules are still available for assignment as in the past.

Applications for class 2 experimental stations usually involve proposals for the establishment of new services which are not provided for in the rules or are directed toward the development of some phase of an established service. Since the establishment of the Land Transportation and Industrial Radio Services on a regular basis, the number of class 2 stations has decreased.

Because of the limited scope of experimentation permitted by class 3 stations, the Commission receives few requests for such authorizations. Most types of experimentation permitted under a class 3 authorization

may also be conducted under a class 1 authorization or by persons qualifying under the rules governing the amateur radio service.

Part 5 is being completely revised and it is expected that the necessary rule-making procedure will be completed in the near future.

8. INDUSTRIAL, SCIENTIFIC AND MEDICAL SERVICE

The prevalence of electrical interference tending to prevent the satisfactory reception of transmitted signals is one of the most serious limiting factors in the use of radio transmitting and receiving equipment. This interference may be in the form of atmospheric background noise, or it may appear as a result of spurious and harmonic emissions from various types of electrical and radio frequency operated equipment.

The Commission has long recognized the fact that certain equipment using radio frequency energy, but not designed for communication purposes, contributes a substantial portion of the interference to authorized radio services. Interference caused by this type of equipment has often resulted in the complete obliteration of the service of communication systems. Such interruptions to radio reception are not confined to the broadcast services but also seriously hamper those services concerned with the safety of life and property.

To minimize the actual or potential interference from particular kinds of radiating equipment, the Commission adopted, effective June 30, 1947, part 18 of its rules which relates to the Industrial, Scientific and Medical Service. It is designed to govern the operation of medical diathermy, industrial heating, and miscellaneous apparatus.

Medical diathermy equipment includes any apparatus (other than low power intermittent surgical diathermy equipment) which generates radio frequency energy for therapeutic purposes. Industrial heating equipment embraces apparatus using radio frequency energy for the purpose of heating operations in manufacturing or production processes. Miscellaneous equipment covers apparatus, other than diathermy or industrial heating equipment, in which the action of the energy emitted is directly upon the workload and does not involve the use of associated radio receiving apparatus.

Part 18 specifies the frequency bands which have been allocated for use by such equipment. Subsequent to the adoption of this part, five additional frequency bands above 40 megacycles have been made available for the operation of this equipment but have not as yet been included in part 18. The rules also specify the extent to which harmonic and spurious radiations must be suppressed.

Proceeding under these rules, the Commission has dealt with interference problems first on a request-for-cooperation basis, and later, in those cases where cooperation was not satisfactorily accomplished,

by the use of enforcement provisions available to the Commission. In the administration of part 18, the Commission has been guided by a desire to provide interference-free communication and yet permit the necessary use of medical diathermy, industrial heating, and miscellaneous equipment. Advice and suggestions regarding the possibility of modifying older types of equipment to effect compliance with the rules have been given by the Commission. The Commission's efforts to effect amicable solutions of interference problems created by the use of equipment included in part 18 have, in general, been well received.

The mounting use of the television broadcast facilities and the growing congestion of the frequency spectrum by other services have resulted in an increase in the number of interference cases reported. Thus far the procedure set up for processing complaints of interference to radio reception has been satisfactory; however, the rapid growth and expansion of the broadcasting, communication and safety services may lead to difficult situations which can be resolved only by the use of stronger measures available under the Communications Act.

In addition to its regulatory duties, the Commission has held conferences with representatives of industries engaged in the manufacture, sale or construction of equipment regulated by part 18. These conferences have been beneficial to both the Commission and industry and have resulted in a better understanding of the problems concerning interference confronting the Commission. Type approval certificates have been issued covering 58 machines and equipment tested in accordance with and found to comply with the rules.

In order to clarify sections 18.17, 18.24, and 18.32 of the rules, footnotes were appended to these sections which relieves operators of diathermy and other type-approved or certified devices from being required to eliminate interference to authorized radio services resulting from direct intermediate frequency pickup in inadequately shielded receivers of the fundamental frequency of such devices where the radiation is otherwise in accord with the rules.

The Commission has successively postponed the effective date of the rules concerning welding devices employing radio frequency energy until January 31, 1951. An industry committee is cooperating with the Commission to eliminate interference caused by the operation of such welders. Conferences have been held with representatives of the welding industry to study this problem and to arrive at suitable technical standards whereby the welding industry can be brought under the rules and, at the same time, minimize interference caused to radio communication services.

9. RESTRICTED RADIATION DEVICES

As a result of studies made in 1938, the Commission adopted rules relating to certain low-power devices. These rules, presently codified as part 15, Rules Governing Restricted Radiation Devices, were the outgrowth of the Commission's recognition of the necessity for establishing a minimum field strength figure, below which it would not require the use of radio frequency emissions to be licensed. The present part 15 does not place a limitation upon the permissible power, but specifies the maximum distance at which such equipment can be used, the distance being an inverse function of the frequency employed, and specifies a maximum permissible radiation at that distance.

Considerable use has been made of equipment ostensibly designed to operate within the provisions of part 15, particularly within the frequency band allocated for use by the standard broadcast service. Typical of these uses are so-called "college campus" broadcast stations which employ carrier current techniques for the dissemination of programs essentially broadcast in nature; industrial signalling and communication systems using carrier current; space radiating devices such as phono-oscillators, garage door openers, remote-control devices for model airplanes or other objects, etc.

Since the operation of radio transmitting devices under part 15 does not involve licensing procedure for either equipment or operators, this mode of operation has been adopted by many persons. As a result, the Commission has received considerable correspondence regarding restricted radiation devices purportedly operating in compliance with part 15. It has been found, however, that much of the equipment intended to operate under these rules has proved incapable of compliance with the maximum permissible field strength. Campus broadcasting, and other carrier current systems, have grown to such proportions that an examination of the problems created is being made.

A notice of proposed rule making has been published and comments invited regarding suggested amendments to part 15. The Commission and industry are cooperating in an effort to secure all available information and data regarding the various types of restricted radiation devices and systems now in use. Due to the many ramifications of the problem involved, it is apparent that further intensive study by all interested groups will be required to effect an equitable solution.

10. STATISTICS

SAFETY AND SPECIAL RADIO AUTHORIZATIONS

Authorizations in the safety and special radio services (exclusive of amateurs, citizens, and special aircraft radiotelephone, which are treated in a separate chapter) exceeded 66,000 at the close of the fiscal year. This represents a net increase of more than 5,000 during the

year. The figures for 1950 reflect various service changes occurring during the year, which are explained under the following table:

Class of station	June 30, 1949	June 30, 1950	Increase or decrease
Aeronautical:			
Carrier aircraft	1,600	1,572	(−28)
Private aircraft	21,517	17,856	[1](−3,661)
Public service aircraft	606	690	84
Aeronautical and fixed	1,485	1,409	(−76)
Civil air patrol	1,608	1,886	278
Airdrome control	53	53	0
Navigational	88	134	46
Flight test	89	83	(−6)
Flying school	19	16	(−3)
Mobile utility	162	95	(−67)
Total	27,227	23,794	(−3,433)
Marine:			
Ship	18,140	22,601	4,461
Ship radar	863	1,125	262
Coastal and marine relay	136	130	(−6)
Alaskan coastal	302	340	38
Alaskan fixed public	480	524	44
Other	83	201	18
Total	20,004	24,921	4,917
Public safety:			
Police	4,759	5,618	859
Fire	124	276	152
Forestry-conservation	565	1,307	742
Highway maintenance	165	238	73
Special emergency	87	168	81
Total	5,700	7,607	1,907
Industrial:			
Power	2,712	3,601	889
Petroleum	802	1,380	578
Forest products	144	246	102
Speciali ndustrial	571	724	153
Low-power industrial	3	93	90
Relay press	19	26	7
Motion picture	15	20	5
Total	4,266	6,090	1,824
Land transportation:			
Railroad	334	450	116
Urban transit	80	100	20
Intercity bus	20	30	10
Taxicab	3,144	2,750	[2](−394)
Highway truck	8	107	99
Automobile emergency	2	58	56
Total	3,588	3,495	(−93)
Experimental:			
Class 1	455	416	(−39)
Class 2	46	50	4
Total	501	466	(−35)
Grand total	61,286	66,373	5,087

[1] Approximately 7,000 new private aircraft radio licenses were issued during the year. The numerical drop in the number of these stations is due to several factors. There is a large turn-over in private aircraft and many owners are delinquent in notifying the Commission when their planes are sold or removed from service. In addition, large numbers of private aircraft owners have been delinquent in filing applications for renewal of licenses. This delay was not apparent previous to 1950 since the rapid expansion of new aircraft stations more than offset these cases. The fiscal year 1950 was the first major renewal year since the 2-year license term was inaugurated for private aircraft. The Commission surveyed its active files and deleted more than 4,000 such stations whose licenses had expired. An enforcement program instituted by the Commission resulted in a large increase in the number of applications for private aircraft during June; such an increase is expected to continue during the ensuing 6 months.

[2] The apparent decrease in the taxicab service was the result of a change in licensing procedure. For administrative convenience, there was inaugurated a system license plan which combined the base station transmitter and the associated mobile units into a single station authorization. If the Commission had continued to license these stations as it did formerly, the station count would have been approximately 5,400 instead of the 2,750 shown as of June 30. In fact, more than 500 new taxicab systems were authorized during the fiscal year 1950.

FIXED, PORTABLE AND MOBILE TRANSMITTERS

Operation of more than 300,000 transmitters was covered in non-broadcast radio authorizations, according to a Commission compilation, completed in February 1950, on the basis of records as of June 15, 1949.

Of this total, nearly 100,000 were land or fixed stations, and over 220,000 were portable or mobile units. The greater portion of these—over 290,000—were in the safety and special services, which had some 94,000 land or fixed stations and 196,000 portable or mobile units. Nearly 26,000 transmitters were authorized for the common carrier services—about 2,200 land or fixed stations and over 23,600 portable or mobile units.

The breakdown follows:

Classification	Land or fixed stations	Portable or mobile units	Total transmitters
Safety and special services:			
Aircraft [1]		23,723	23,723
Aviation ground	1,987	4,314	6,301
Total aeronautical services	1,987	28,037	30,024
Police	3,425	47,327	50,752
Fire	174	3,118	3,292
Forestry	493	7,774	8,267
Highway maintenance	139	682	821
Special emergency	70	221	291
Total public safety services	4,301	59,122	63,423
Ship [1]		18,140	18,140
Coastal and marine relay	425		425
Radar [1]		863	863
Other marine	18	167	185
Total marine services	443	19,170	19,613
Railroad	213	2,388	2,601
Transit utility	42	1,108	1,150
Busses and trucks	7	304	311
Taxicabs	2,497	47,974	50,471
Total land transportation services	2,759	51,774	54,533
Power radio service	1,925	23,248	25,173
Petroleum	370	5,474	5,844
Forest products	80	874	954
Relay press	6	60	66
Motion picture	2	103	105
Low-power industrial		37	37
Special industrial	157	1,787	1,944
Provisional and experimental	225	2,025	2,250
Total industrial services	2,765	33,608	36,373
Experimental, class 1	179	2,078	2,257
Experimental, class 2 (miscellaneous)	195	2,484	2,679
Total experimental services	374	4,562	4,936
Citizens		[2] 300	[2] 300
Amateur [1]	81,675		81,675
Total civilian radio service	81,675	300	81,975
Total safety and special services	94,304	196,573	290,877

[1] As of June 30, 1949.
[2] Estimated.

Classification	Land or fixed *stations*	Portable or *mobile units*	Total transmitters
Common carrier:			
International fixed public service:			
Fixed telegraph	[3] 697		[3] 697
Fixed telephone	[3] 776		[3] 776
International fixed public (press) service:			
Fixed telegraph	[4] 155		[4] 155
Agriculture service:			
Fixed telegraph	9		9
Domestic public land mobile service:			
Base	369		369
Auxiliary test	154		154
Control	9		9
Mobile		23, 602	23, 602
Domestic fixed public service:			
Microwave relay	39		39
Rural subscriber	6		6
Short haul toll telephone	18		18
Total common carrier	2, 232	23, 602	25, 834

[3] These tables contain both station counts (Alaskan stations) and frequency assignment counts (other *than Alaskan stations).* [4] This is a count of frequency assignments.

SAFETY AND SPECIAL RADIO APPLICATIONS

There was a net increase of more than 10,000 applications affecting the safety and special radio services during the year, bringing the sum total of those received during the fiscal year to more than 62,000. The number of applications by services was as follows:

Class of station	Received 1949	Received 1950	Increase or *decrease*
Aeronautical:			
Aircraft	13, 524	14, 201	677
Ground	4, 300	2, 413	(−1, 887)
Total	17, 824	16, 614	(−1, 210)
Marine:			
Ship	15, 249	16, 905	1, 656
Ship radar	966	680	(−286)
Coastal and marine relay	297	126	(−171)
Alaskan fixed public	599	351	(−248)
Alaskan coastal	487	264	(−223)
Other	145	340	195
Total	17, 743	18, 666	923
Public safety:			
Police	4, 609	8, 119	3, 510
Fire	254	488	234
Forestry conservation	611	2, 201	1, 590
Highway maintenance	243	327	84
Special emergency	110	298	188
Total	5, 827	11, 433	5, 606
Industrial:			
Power	3, 167	5, 228	2, 061
Petroleum	1, 166	2, 452	1, 286
Forest products	269	364	95
Special industrial	1, 129	1, 418	289
Low-power industrial	50	169	119
Relay press	40	48	8
Motion picture	30	41	11
Total	5, 851	9, 720	3, 869
Land transportation:			
Railroad	401	579	178
Urban transit	60	104	44
Taxicab	3, 667	4, 323	656
Intercity bus	[1] 209	*13*	109
Highway truck		189	
Automobile emergency		116	
Total	4, 337	5, 324	987
Experimental:			
Class 1	849	799	(−50)
Class 2	105	100	(−5)
Total	954	899	(−55)
Grand total	52, 536	62, 656	10, 120

[1] Not broken down in fifteenth annual report.

CHAPTER IV—RADIO BROADCAST SERVICES

1. BROADCAST REGULATION
2. TELEVISION (TV) BROADCAST SERVICE
3. STANDARD (AM) BROADCAST SERVICE
4. FREQUENCY MODULATION (FM) BROADCAST SERVICE
5. NONCOMMERCIAL EDUCATIONAL FM BROADCAST SERVICE
6. FACSIMILE BROADCAST SERVICE
7. INTERNATIONAL BROADCAST SERVICE
8. REMOTE PICKUP BROADCAST SERVICE
9. ST (STUDIO-TRANSMITTER) BROADCAST SERVICE
10. DEVELOPMENTAL BROADCAST SERVICE
11. STATISTICS

1. BROADCAST REGULATION

SCOPE OF AUTHORITY

The Communications Act deems broadcasting not to be a common carrier operation; hence the Commission has no jurisdiction over charges made by broadcast stations for air time, nor does it maintain surveillance of their day-by-day programming and internal management, salaries paid artists and personnel, etc.

Consequently, the Commission's regulation of broadcasting is limited to two general phases. The first deals with the allocation of portions of the spectrum to the different types of broadcast services in accordance with the Commission's rules and regulations to carry out the intent of international agreements, the Communications Act and other domestic law affecting broadcasting.

The second phase concerns individual stations, and embraces consideration of applications to build and operate; the assignment of specific frequencies, power, operating time, and call letters; the periodic inspection of equipment and the engineering aspects of operation; passing upon transfers and assignments of facilities, also changes in existing authorizations; modifying and renewing construction permits and licenses; licensing radio operators, and otherwise discharging regulatory responsibilities.

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

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, in addition to meeting technical requirements, to arrange his program structure so that his operation is in the public interest. Pursuant to duties imposed by the act, the Commission periodically reviews the over-all performance of stations, usually when they apply for renewal of license, to see if they have lived up to their obligations, and the promises they made in applying for facilities.

This review of broadcast station performance does not, however, give the Commission censorship authority, for 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 radio must be broad enough to provide full and equal opportunity for the presentation of both sides of public issues.

The Communications Act contains an express provision with respect to political broadcasts: "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 radio facilities * * * *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 to any such candidate."

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. Under the first-named provision, the Commission on August 19, 1949 adopted rules affecting lotteries and "give-away" programs, to become effective October 1 thereafter. However, because of litigation, the Commission on September 29, 1949, postponed the effective date of these rules until final court determination.

The Commission prohibits the same interest or group from owning or operating more than 1 AM, FM, or TV broadcast station in the same area, or more than 6 FM stations or 5 TV stations throughout the country as a whole. Decision was pending, following oral argument, on proposed rule amendments which would limit ownership or control to not more than 7 AM stations in the country as a whole, and over-

lapping interest to not more than 14 AM, 12 FM and 10 TV stations throughout the Nation.

On January 12, 1950, the Commission proposed rules which would curb trafficking in broadcast frequencies by causing construction permits for AM, FM, and TV stations to be automatically forfeited if the holder enters into a contract to transfer to another party before the station has been constructed and operated. Oral argument began June 19.

NETWORKS

The Commission does not license networks as such; only individual stations. However, stations owned or affiliated with networks are subject to chain broadcasting regulations promulgated by the Commission in 1940 and now incorporated in part 3 of its rules.

There are four major networks—American Broadcasting Co., Columbia Broadcasting System, Mutual Broadcasting System, and National Broadcasting Co.—and various regional and other AM, FM, and TV groups.

At the close of the year, 1,189 AM stations were affiliated with the major networks, which operated 18 AM stations. A breakdown follows:

Network	Network owned AM stations	Affiliated AM stations
ABC	[1] 5	286
CBS	[2] 7	184
MBS	[3] 0	543
NBC	6	176

[1] Includes one 100-percent owned subsidiary.
[2] Includes one 100-percent owned subsidiary, but does not include a 45-percent minority interest in 1 other station.
[3] Although MBS does not itself operate any broadcast station, its stock is held by 7 corporations of which 6 are station licensees in this country.

RECEIVING SETS

The Commission does not license radio receiving sets which are exclusively that, nor does it regulate their manufacture or sale. Based upon industry estimates, the total number of broadcast receivers was currently approaching 81 million.

Production of home broadcast receivers declined 31 percent between the calendar years 1948 and 1949 but was expected to show an increase of 70 percent in calendar year 1950. Production of TV receivers almost tripled in calendar year 1949.

Production of all types of home receivers was increasing in 1950. The output during the first 6 months of that year was reported to be 6,263,857 sets. Of this total, 2,413,145, or 38.5 percent, were TV sets, and 539,852, or 8.6 percent, were FM sets (including dual FM-AM

sets). Production of AM only receivers accounted for 52.9 percent of the total. However approximately 10 percent of the TV sets produced in the first half of 1950 contained AM or FM bands, or both.

TYPES OF BROADCAST STATIONS

At the close of fiscal 1950 there were more than 4,500 outstanding authorizations in 10 categories of broadcast services. The majority of these—over 3,100—comprised stations in the three principal commercial broadcast services, namely: AM (amplitude modulation); FM (frequency modulation), and TV (television), also known as video. The remainder were made up of noncommercial educational, facsimile, international, developmental stations, and remote pickup and studio transmitter links.

GROWTH OF BROADCASTING

The growth of AM, FM, and TV broadcast services since 1943 is shown in the following table of authorized and licensed stations at the close of each fiscal year:

	AM		FM		TV		Total	
	Authorized	Licensed	Authorized	Licensed	Authorized	Licensed	Authorized	Licensed
1943	912	911	48	37	6	6	966	954
1944	924	912	52	45	9	6	985	963
1945	955	931	53	46	25	6	1,033	983
1946	1,215	961	456	48	30	6	1,701	1,015
1947	1,795	1,298	918	48	66	6	2,779	1,352
1948	2,034	1,693	1,020	142	109	7	3,163	1,842
1949	2,179	1,963	865	377	117	13	3,161	2,353
1950	2,303	2,118	732	493	109	47	3,144	2,658

2. TELEVISION (TV) BROADCAST SERVICE

INCREASE IN TV APPLICATIONS AND SERVICE

Throughout the year there was greater availability of television receivers, transmitters, and relay facilities. The public acceptance of and interest in visual broadcasting continued at a high level. Due, however, to the continuance of the so-called "freeze" policy, explained hereafter, there was only a small increase in the number of commercial TV broadcast stations on the air.

At the end of the year, 47 television stations were licensed and 62 construction permits were outstanding. In addition to those licensed, 59 stations were operating on a commercial basis under special temporary authorizations.

In spite of the "freeze," the year's close saw 106 stations bringing TV programs to 64 cities and metropolitan areas as compared with 42 cities served by 71 stations the previous year. It was estimated

that there were 87,000,000 potential television viewers in 43 States. This represented about 57 percent of the population of the entire United States. The demand for TV outlets also continued high with 351 applications for new stations pending at the end of the year, many of which were in comparative hearing status due to the fact that their requests exceeded the available facilities.

Television receiver production also continued to mount with a continued trend toward larger picture screens. It was estimated that over 7,000,000 receivers were in the hands of the public in areas capable of TV reception. The 16-inch direct view tube replaced the 10-inch tube in public favor. The rectangular shaped tube made its debut.

EXPERIMENTAL TV SERVICE

At the end of the year there were 183 experimental TV stations licensed and a score of outstanding construction permits. Included in these figures were 158 relay stations operating in the microwave region and used by TV broadcasters as pick-up, studio-to-transmitter link, and interim intercity relay stations. Proposed rules for putting these television auxiliary services on a permanent basis were pending at the end of the year.

Television research and experimentation continued with special interest in color televising and operation in the 475–890 megacycle UHF (ultra high frequency) band. About 25 authorizations were outstanding in this band. Studies made included propagation, circuitry in transmitters and receivers, and the rebroadcasting of VHF (very high frequency) signals in the UHF region. One such station commenced experimentation for the purpose of testing the feasibility of satellite operation in small cities using the signals of "mother" stations in nearby large cities or metropolitan areas. Several licensees used pulse-type transmitters to explore the coverage possibilities of the UHF band.

OTHER TV DEVELOPMENTS

The principal development in the television art was the giant strides made in color TV. The Commission authorized color transmissions on an experimental basis for the three systems of the principal proponents of color. These broadcasts were made over regular commercial TV stations and were witnessed by thousands of persons on receivers especially built or converted for the reception of the respective color systems.

On February 8, 1950, the Commission granted the Zenith Radio Corp. special temporary authority for a 90-day period to utilize the facilities of its Chicago experimental station to conduct "Phonevision" tests under certain conditions attached. It was proposed to transmit

programs to 300 telephone subscribers in that area interested in this pay-as-you-see television broadcasting method.

TV network facilities, both coaxial cable and radio relay, were expanded, bringing the total number of metropolitan areas in the chain to 28. About 14 more cities and metropolitan areas are on the 1950 schedule for network linkage. (See also coaxial cable and microwave relay in the chapter on common carriers.) In addition to these common carrier facilities for simultaneous viewing of network programs, many broadcasters were using programs picked off the air and relayed to their stations by means of private intercity relays operated by themselves.

Two motion picture companies continued their experiments in the relaying of events to theater audiences. In view of the many petitions filed by motion picture interests, the Commission on January 11, 1950, issued a notice of hearing to determine whether provision should be made for a theater television service. The date of this hearing was to be set later.

ULTRA HIGH FREQUENCY TV

The Commission's rules now in effect are based on the use of 12 VHF television channels with assignments distributed about the country in a precut plan involving approximately 150-mile separation between stations operating on the same channel, the stations having a maximum 50 kilowatts effective radiated power and an average antenna height of 500 feet. This plan was drafted in 1945 on technical data then available and did not take into account interference from propagation due to tropospheric bending of radio waves. Early in 1948 it became evident from new data and the operational performance of stations on the air that the 150-mile cochannel separation of stations was inadequate if a service radius of about 40 miles was to be expected. As a result, the Commission (on September 30, 1948) stopped granting applications for new TV facilities pending a study of the problems involved. This was the so-called "freeze" order.

After the study was completed it was apparent that the cochannel separation would necessarily have to be increased to approximately 220 miles to retain a reasonable service area for TV stations. This fact greatly reduced the number of potential assignments on the 12 available channels. At the same time, the number of applications from people desiring to get into the TV broadcasting field was rapidly increasing. The Commission had no alternative other than to propose additional channels in the only available spectrum space, which was in the 475–890 megacycle region. This UHF region had previously been set aside for experimentation in color and high definition monochrome television.

COLOR TELEVISION

As early as May of 1945, the Commission foresaw the necessity for the development of a Nation-wide competitive TV service, including color operation in the UHF band. In September of 1946 the Columbia Broadcasting System, Inc., filed a petition for authorization of its color system in the UHF band using channels 16 megacycles wide. In the course of the hearing held on that petition, the Radio Corp. of America demonstrated its color system operating within a 14.5 megacycle band. In its report of March 18, 1947, the Commission denied the CBS petition on the ground that it was not ready for commercial use and concluded: "It is hoped that all persons with a true interest in the future of color television will continue their experimentation in this field in the hope that a satisfactory system can be developed and demonstrated at the earliest possible date."

TELEVISION HEARING

On July 11, 1949, the Commission announced a rule-making proceeding looking towards new standards to avoid interference, the opening up of 42 additional channels in the UHF, to hear evidence on "stratovision" (broadcasting from planes) and "polycasting" (community service by various low-powered stations), and the introduction of information and proposals for a color system. It was proposed to base the new allocation table and standards on the latest available technical information in order to provide a satisfactory television service giving the maximum coverage. To insure that any standards adopted for black-and-white television would not adversely affect future color television, it was further proposed to consider only color systems which could operate in a 6-megacycle channel (the same as for black and white).

At the end of the year, this important hearing was not yet concluded except for the color phase which began September 26, 1949, and was completed May 26, 1950, except for final filings up to July 10. Nearly 10,000 pages of color testimony were taken from experts in the television industry. The Commission witnessed the proposed color systems of the Columbia Broadcasting System, Inc., the Radio Corp. of America, and Color Television, Inc. All three systems were in various stages of development and could operate in the prescribed 6 megacycles. A decision on the color phase of the proceeding was to be rendered before the other issues in the hearing would be taken up.

3. STANDARD (AM) BROADCAST SERVICE

EXPANSION AND OTHER DEVELOPMENTS

The fiscal year witnessed continued interest in standard (AM) broadcast and demand for new outlets. At its close, the number of

outstanding authorizations had climbed to 2,303, which was an increase of 124 over the previous year. For the first time the number of licensed AM stations passed the 2,000 mark. They totaled 2,118, or 155 more than in 1949.

Most of this expansion took place outside of the metropolitan districts, particularly in communities which did not have local AM stations previously. Since the close of the last war, approximately three-quarters of all new AM authorizations have been made in the smaller communities, and more than half in communities which had no local outlets at the end of the war.

There was an increase over the previous year in both number of applications for new stations and in number of applications for major changes in facilities. The Commission was still able to process applications at a somewhat higher rate than they were filed and thereby make a fairly substantial reduction in the backlog.

The Commission staff reorganization contemplates the establishment of a broadcast bureau wherein legal, engineering, and accounting personnel will all be responsible to one bureau chief. Preparatory changes have already been effected. The old standard broadcast and FM broadcast engineering divisions have been incorporated into one division, now known as the Aural Broadcast Division.

A number of significant rule changes have been made which are primarily designed to simplify procedures and include changes which eliminate the requirement for formal applications for stations originating programs to be transmitted to foreign broadcast stations for rebroadcast in those cases where the same program is broadcast by a United States station.

Other changes in rules and standards included the adoption of a simplified form for certain pro forma transfers of control or assignments of license; inclusion of a map of ground conductivity in Canada to aid in estimating interference between United States and Canadian stations; and streamlining the administrative procedures involved in the transition time between completing construction of facilities and granting of a license.

A solution to a long standing difficult problem was proposed (docket 9671) in the form of a new set of rules specifying the conditions under which antennas of a certain height would be considered as not constituting a hazard to air navigation. The proposal, the result of lengthy discussion with the Civil Aeronautics Administration and military agencies, was released on May 23, 1950 for public comment and had not yet been adopted.

CLEAR CHANNELS

Action in the clear channel hearing (docket 6741), for which the record was closed in October 1947, and with which is consolidated the daytime skywave hearing (docket 8333), was held in abeyance during the year. It involves questions which are intimately tied in with those encountered in the negotiations for a new North American Regional Broadcasting Agreement since the latter is concerned to a large extent with exclusive rights on and the sharing of the so-called clear channels.

The need for clear channels arises indirectly from the fact that 47 of the 106 broadcast channels are used for service to cities and towns by numerous stations of medium or low power. Their unavoidable mutual interference, particularly at night when signals are propagated over long distances by means of skywaves, restricts their service to a relatively few miles from the transmitter. Hence the remaining 59 channels are used for wide area coverage by one, two, or perhaps three high-powered stations whose signals are relatively free from interference, so that persons not residing in or near cities where a broadcast station is located may have some radio service. Dividing up the available clear channel assignments between the several countries thus is a major issue in the regional conference and the decisions reached there will have an important effect on the decision in the clear channel hearing.

NORTH AMERICAN REGIONAL BROADCASTING CONFERENCE

Because radio signals ignore political boundaries, the question of interference from stations of one country with the stations in another country rapidly became acute as the number of broadcast stations increased. Piecemeal efforts at abatement by bilateral arrangements with neighboring countries gave way in 1937 to the signing of the first North American Regional Broadcasting Agreement (NARBA) which included Mexico, Cuba, Haiti, the Dominican Republic, and all countries to the north. It became effective in 1941 and by its own terms expired in 5 years, in 1946. An interim agreement was effected in 1946 which extended the terms of the first NARBA for 3 years until March 28, 1949, making certain new priorities for the benefit of Cuba. It also established a timetable for the negotiations of a new agreement.

This timetable was extended by mutual agreement of the countries, although Cuba could not agree to her adherence to the terms of the interim agreement beyond the 3-year period. Thus, when the third NARBA conference opened in Montreal on September 13, 1949, Cuba

already had made a number of assignments which were inconsistent with the terms of the old agreement. Mexico, at the last minute, notified the other countries that she would be unable to attend the conference and Haiti was also not represented, but the other signatories decided to proceed nevertheless, making provision that Mexico and Haiti could adhere to it at a later date. The United States delegation was headed by FCC Commissioner Rosel H. Hyde with the Honorable Fletcher Warren, United States Ambassador to Paraguay, as special consultant. There were 18 other Government members and 27 industry members accredited by the Department of State.

The conference drafted the administrative sections of the new treaty which concerned the methods of establishing priorities, the method of reporting and handling interference cases, the duration of the agreement and the method of its renewal. However, no agreement was reached on the basic problem of the degree of protection from interference to be afforded to stations of the various categories, particularly with respect to the sharing by Cuba, Dominican Republic, and Jamaica of the clear channels on which the United States had heretofore enjoyed exclusive or nearly exclusive use. Under the advice of the Department of State, the United States delegation agreed to suspension of the deliberations on December 8 in order that Cuba and the United States could undertake bilateral conversations in Havana beginning in February 1950.

The initial phases of the Havana discussion indicated that an agreement on station assignments in Cuba might be reached which would avoid the obstacles which proved insurmountable in Montreal. A document embodying the essentials of an arrangement was submitted by the United States delegation to the Cuban delegation, which indicated its acceptability in principal. The United States delegation was entrusted with the preparation of a document that would specify the scope and effect of the proposed arrangement and fill in the detailed specifications regarding mutual protection from interference. When this document was received by the Cuban delegation, the latter advised the United States delegates that it did not accord with their understanding of the first document. The Cuban delegates in turn prepared a draft of the proposed arrangement as they understood it. It embodied certain reservations concerning its effectiveness not contemplated by the United States delegates during the preceding conversations, as well as a number of differences in the details. Since part of the problem involved the question of the effect of the proposed Cuban assignments on Mexican priorities, which was unanswerable in the absence of Mexican representation, and since the total discrepancy be-

tween the United States and Cuban proposals was quite large, it seemed advisable to the United States delegation to postpone further efforts at agreement until the full conference reconvened. Accordingly, the delegation returned to Washington after more than 7 weeks in Havana.

The second session of the third NARBA conference is scheduled, by mutual agreement between all countries of the region, to open on September 6, 1950, in Washington. As of June 30, 1950, all countries have signified their intention to attend. Meanwhile, between sessions of the conference, the chairman of the United States delegation is keeping in close touch with the interested segments of the broadcasting industry through a Government-industry NARBA preparatory committee.

4. FREQUENCY MODULATION (FM) BROADCAST SERVICE

Although the number of FM broadcast stations on the air decreased by 46 during the year, leaving a total of 691 in operation as of June 30, 1950, the number of licensed FM stations increased from 377 to 493. Also, FM broadcasting service continued available over most of the eastern half of the United States, over most of the west coast area, and in a number of cities and adjacent rural areas in the West. It was estimated that more than 100,000,000 people live within range of one or more FM stations. The stations which are in operation provide high-quality reception which is static-free and fade-free in character.

The rate of filing new FM applications remained low. During the year, only 16 applications for new FM stations were filed. However, many FM modification applications were filed to make changes in previous authorizations to increase power or decrease power, to change location or frequency, or to make other changes. Many of these represented a revision of earlier plans because of economic factors, while others sought improved facilities made available by the decrease in stations authorized.

Also, the total number of FM stations authorized decreased from 856 to 732. This reduction was largely due to economic problems and uncertainties occasioned by the rapid growth of television and the limited number of satisfactory FM receivers which have been purchased and placed in use.

FM receiver production and sales continued to be slow. At the end of the fiscal year, approximately 5,500,000 FM receivers were in use. Small inexpensive receivers providing FM reception only were a moderately popular item. Some television receivers tune the FM band;

however, the percentage is small. Since the FM and TV services operate in the same general frequency range, it is possible to provide FM broadcast reception in TV receivers at very little increase in cost.

Under the Commission's rules, FM stations operated in conjunction with AM stations may employ duplicate or separate programming of the two stations or a combination of the two. In most cases fully duplicated programming is chosen.

Due to the noise-free characteristics of FM reception, many FM stations rebroadcast the programs of others and thereby form regional networks without the use of wire facilities. In one instance 11 stations are combined in a network extending for more than 500 miles. The programs are relayed entirely by means of radio.

5. NONCOMMERCIAL EDUCATIONAL FM BROADCAST SERVICE

Interest in this field has continued to increase and 82 stations were authorized at the end of the fiscal year as compared with 58 in 1949.

Much of the activity centers around the low-power (10 watt) stations which cover a radius of from 2 to 5 miles and which can be built for $2,000 to $3,000 if studio facilities are available. (If studio facilities are required the minimum cost is usually increased by another $1,000 or more.) These can later be built into higher powered stations.

To facilitate the operation of these 10-watt stations, the Commission in June 1950, announced a new grade of radio operator's license—the radiotelephone third-class operator permit—to become effective September 1, 1950. An operator must have basic radiotelephone operating practice, but is not required to be an expert in radio theory.

At the request of the Department of State, the Commission set aside a noncommercial educational FM channel for the United Nations headquarters in New York City.

A considerable number of educational institutions are also licensed in the AM broadcast service, but in the standard band no distinction is made insofar as Commission rules are concerned between licenses issued educational institutions and those issued to the more numerous commercial operators. It is only in the FM band that a portion of the band has been set aside for use by educational institutions and special rules established to promote the particular noncommercial type of operation that is advantageous to these institutions. However, educators have requested an allocation of TV frequencies for their particular use.

6. FACSIMILE BROADCAST SERVICE

Commission rules provide that FM broadcast stations may conduct facsimile broadcasting, and a few FM stations carried on facsimile

service during the year. In some instances FM stations operated facsimile on a temporary basis for experimental and exhibition purposes.

Facsimile transmission of printed matter and pictures is received by recorders attached to FM broadcast receivers. This may be accomplished on either a simplex or multiplex basis. When using simplex facsimile the regular aural FM program is not transmitted, but with multiplex operation both are transmitted simultaneously. It is, of course, preferable that multiplex operation be employed so that there will be no interruption of the aural programs. In December 1949, the Commission conducted a hearing to determine whether additional multiplex standards should be adopted and multiplex operation permitted without limitation on hours during the broadcast day. Decision was pending at the close of the year.

7. INTERNATIONAL BROADCAST SERVICE

The number of stations in this country engaged in international broadcasting increased from 37 to 40 during the fiscal year. Though licensed by the Commission, these stations operate under the auspices of the Department of State. Shortwave transmitters located near New York, Boston, Cleveland, and San Francisco daily beam "The Voice of America" programs in a score of languages to various parts of the world.

8. REMOTE PICKUP BROADCAST SERVICE

Remote pickup broadcast stations, employing portable or mobile transmitters of low power and generally self-powered, are used to provide temporary aural program circuits from points away from regularly maintained studios to a broadcast station. They are employed in the origination of on-the-spot broadcasts of sporting events, parades, fairs, and other special events. Since these transmitters are often mounted in automobiles and light trucks, they can also provide emergency communication during the disruption of normal circuits as the result of floods, storms, or other disasters.

During the past year the rules governing this service were revised pursuant to frequency-service allocation proceedings consummated July 1, 1949, and expanded to meet certain requirements of the growing TV and FM broadcast services.

Amendment of the rules made it possible to place on a formal licensed basis a number of stations that had been operating under special temporary authority. This, together with the demands of an expanding broadcast service, has resulted in a large increase in the number of stations in the remote pickup service during the past year, and this growth is expected to continue.

9. ST (STUDIO-TRANSMITTER) BROADCAST SERVICE

ST broadcast stations are used to provide a program circuit between the main studio and the transmitter of FM broadcast stations. The use of radio for this purpose permits locating FM broadcast transmitters at highly favorable locations that may be inaccessible to ordinary wire lines. Operated in the 940 to 952 megacycle portion of the UHF spectrum and required to employ directional antennas, they not only serve a real need of the broadcast industry with maximum spectrum economy but also act as a proving ground for equipment that may be used by other domestic fixed services in this portion of the spectrum.

During the year the Commission proposed rules that would extend the availability of this service on frequencies in a portion of the ISM (industrial, scientific, and medical) band, 890–940 megacycles, to AM broadcast stations which may be faced by problems similar to those frequently encountered by FM broadcast stations and would also permit FM broadcast stations to employ studio-transmitter links at studios other than the main studio if frequencies are available. This proposal was awaiting final action.

10. DEVELOPMENTAL BROADCAST SERVICE

Developmental broadcast stations are licensed experimentally to carry on development and research, primarily in radiotelephony, for the advancement of the broadcasting services. They are used extensively by manufacturers in the development and testing of transmitters and antennas designed for use in the broadcast or auxiliary broadcast services. Among projects conducted during the year was the development of low-powered FM transmitters for use by noncommercial educational FM broadcast stations and experimentation with remote pickup equipment designed for use in the newly allocated 450-megacycle band. Such stations are also used in propagation studies and the data thus accumulated adds to the fund of knowledge required by the Commission in the orderly administration of its functions.

11. STATISTICS

BROADCAST AUTHORIZATIONS

As of June 30, 1950, there were 4,510 broadcast authorizations outstanding, an increase of 425 over the previous year. A breakdown by broadcast services follows:

Class of broadcast station	June 30, 1949	June 30, 1950	Increase or decrease
Standard (AM)	2,179	2,303	124
Frequency modulation (FM)	865	732	(−133)
Television (TV)	117	109	(−8)
Television (experimental)	205	206	1
Noncommercial educational (FM)	58	82	24
Facsimile	2	[1] 0	[1](−2)
International	37	40	3
Remote pickup	580	1,003	423
Studio transmitter (ST)	28	29	1
Developmental	14	6	(−8)
Total	4,085	4,510	425

[1] Commercial facsimile broadcasting is now authorized over FM broadcast facilities.

Broadcast authorizations by States and cities

Texas leads all States in the total number of broadcast station authorizations, according to a tabulation of Federal Communications Commission records of June 7, 1950. As of that date, Texas had 222 AM, FM, and TV authorizations collectively; California came second with 219.

Texas and California likewise topped the AM list, with 183 and 143 such authorizations, respectively; and Pennsylvania was third with 111. Puerto Rico's 25 AM authorizations was more than any of 15 States.

Pennsylvania had the most FM authorizations—67, commercial and educational—followed by 65 for California, 62 for New York and 51 each for Illinois and Ohio. Commercial FM authorizations showed 63 for Pennsylvania, 58 for California, and 56 for New York State. In the noncommercial educational FM field, California had 7 such authorizations, and Indiana, New York, Ohio, and Wisconsin 6 each.

The television list was led by New York, Ohio, and California, in that order, with 13, 12 and 11 TV stations respectively.

Cities with 10 or more broadcast stations, including noncommercial educational, totaled 36. In number of AM, FM, and TV stations collectively, New York led with 35, with Chicago's 34 a close second.

New York had the most commercial FM outlets—14; Chicago second with 13. Eight cities had more FM (commercial and educational) than AM grants (New York, San Francisco, Washington, Baltimore, Pittsburgh, Detroit, Columbus, and Madison), and two cities had as many FM as AM grants (Boston and Dallas).

Chicago led with 16 AM stations, followed by New York with 14, Los Angeles 13, and 10 each for Philadelphia, Minneapolis-St. Paul, Portland, and New Orleans.

Los Angeles headed the TV list with 7 stations; New York 6 and 4 each for Chicago and Washington, D. C.

A breakdown of broadcast authorizations by States and cities follows:

Broadcast authorizations by States

	AM	FM		TV	Total
		Commercial	Educational		
Alabama	71	14	1	2	88
Arizona	25	0	2	1	28
Arkansas	34	7	0	0	41
California	143	58	7	[1] 11	219
Colorado	35	3	0	0	38
Connecticut	27	11	0	1	39
Delaware	5	3	0	1	9
District of Columbia	7	8	0	4	19
Florida	75	21	1	3	100
Georgia	76	22	1	3	102
Idaho	22	3	0	0	25
Illinois	74	46	5	5	130
Indiana	45	20	6	2	73
Iowa	52	20	2	2	76
Kansas	39	6	1	0	46
Kentucky	43	12	3	2	60
Louisiana	42	16	2	1	61
Maine	16	2	0	0	18
Maryland	22	18	0	3	43
Massachusetts	51	28	2	2	83
Michigan	63	25	4	6	98
Minnesota	49	10	2	2	63
Mississippi	43	5	1	0	49
Missouri	51	15	2	2	70
Montana	25	0	0	0	25
Nebraska	22	3	0	2	27
Nevada	10	1	0	0	11
New Hampshire	12	4	0	0	16
New Jersey	20	13	2	1	36
New Mexico	25	0	1	1	27
New York	95	56	6	13	170
North Carolina	93	42	2	2	139
North Dakota	14	0	0	0	14
Ohio	69	45	6	12	132
Oklahoma	46	10	3	2	61
Oregon	43	8	2	0	53
Pennsylvania	111	63	4	7	185
Rhode Island	11	5	1	1	18
South Carolina	42	11	0	0	53
South Dakota	14	1	0	0	15
Tennessee	57	13	1	2	73
Texas	183	29	4	6	222
Utah	18	3	1	2	24
Vermont	9	0	0	0	9
Virginia	57	20	0	2	79
Washington	53	7	1	1	62
West Virginia	38	15	0	1	54
Wisconsin	55	18	6	1	80
Wyoming	13	0	0	0	13
Alaska	10	0	0	0	10
Hawaii	12	0	0	0	12
Puerto Rico	25	0	0	0	25
Virgin Islands	3	0	0	0	3
Grand totals	2,295	740	82	109	3,226

[1] Includes 1 experimental authorization operating on commercial basis.

Broadcast authorizations by cities with 10 or more stations

	AM	FM		TV	Total
		Commercial	Educational		
New York	14	14	1	6	35
Chicago	16	13	1	4	34
Los Angeles	13	7	1	[1] 7	28
Philadelphia	10	8	1	3	22
San Francisco	8	8	1	3	20
Washington	7	8	0	4	19
Boston	8	6	2	2	18
Minneapolis-St. Paul	10	4	2	2	18
New Orleans	10	6	1	1	18
Baltimore	6	8	0	3	17
Pittsburgh	7	8	1	1	17
Atlanta	7	5	1	3	16
Cleveland	7	5	1	3	16
Detroit	5	6	1	3	15
Portland (Oreg.)	10	5	0	0	15
Dallas	6	5	1	2	14
Louisville	7	3	2	2	14
Seattle	9	4	0	1	14
Columbus	4	5	1	3	13
Houston	8	3	1	1	13
Madison (Wis.)	4	4	5	0	13
Providence	7	4	1	1	13
San Antonio	8	3	0	2	13
Cincinnati	5	4	0	3	12
Jacksonville	7	3	0	2	12
Miami	6	4	1	1	12
Birmingham	7	2	0	2	11
Buffalo	6	4	0	1	11
Oklahoma City	7	3	0	1	11
Richmond	6	4	0	1	11
Denver	7	3	0	0	10
Des Moines	6	4	0	0	10
Milwaukee	7	2	0	1	10
St. Louis	7	1	1	1	10
Syracuse	5	2	1	2	10
Tulsa	6	2	1	1	10

[1] *Includes 1 experimental authorization operating on commercial basis.*

BROADCAST DISTRIBUTION

GENERAL

The more than 3,100 authorized commercial AM, FM, and TV broadcast stations at the close of the fiscal year were distributed throughout nearly 1,300 communities in the United States and its possessions. All but 20 of these communities had at least one authorized AM station. The remaining 20 communities had FM authorizations only. A total of 384 communities had one or more authorized FM stations, and 66 cities had TV authorizations.

In addition, there were 35 AM stations and 82 FM stations engaged in or planning noncommercial operation. All but 16 of these 117 nonprofit authorizations were in communities which had commercial broadcast operation.

AM EXPANSION IN SMALL COMMUNITIES

During fiscal 1950, AM broadcast stations continued to expand in the small and medium sized nonmetropolitan communities. The table below shows the number and percent of communities of specified population size in the United States having one or more authorized commercial AM stations on October 8, 1945 when the Commission

resumed its peacetime licensing procedures, on December 31, 1948 and on June 30, 1950:

Population	Total number of communities (1940 Census) [1]	Number and percent of communities with 1 or more authorized commercial AM broadcast stations					
		On Oct. 8, 1945		On Dec. 31, 1948		On June 30, 1950	
		Number	Percent	Number	Percent	Number	Percent
2,500 to 5,000	1,134	27	2.4	[2] 218	19.2	[3] 282	24.9
5,000 to 10,000	678	86	12.7	311	45.9	356	52.5
10,000 to 25,000	413	204	49.5	330	79.9	350	84.7
25,000 to 50,000	122	109	89.3	123	100.0	124	100.0
Over 50,000	140	140	100.0	140	100.0	140	100.0
Total	2,487	566	22.8	1,122	45.1	1,252	50.3

[1] The number of communities in each of the population groupings under 50,000 is derived from the 1940 census data and excludes communities forming part of metropolitan districts. Each metropolitan district is counted as a single community and is defined as including a central city or cities with a population of 50,000 or more and all adjacent and contiguous areas having a population of 150 or more persons per square mile. Based on the 1940 census, there are 140 metropolitan districts in the United States.
[2] Includes 52 communities of less than 2,500 population.
[3] Includes 73 communities of less than 2,500 population.

A total of 23 communities in United States possessions had one or more authorized commercial AM stations as of June 30, 1950. Of these, 6 were in Alaska, 5 in Hawaii, 10 in Puerto Rico, and 2 in the Virgin Islands.

As of June 30, 1950, a total of 897 communities or 71.6 percent of all communities in the United States with one or more authorized commercial AM stations had only one AM station. In addition, 825 AM stations or 37.2 percent of the total of AM stations authorized were located in the 140 metropolitan districts.

The table below shows the number of United States communities of specified population size having specified numbers of AM stations on June 30, 1950:

Population	Total number of communities (1940 census)	Number of communities with 1 or more authorized commercial AM stations	Percent of total	Number of communities having—						
				1 station	2 stations	3 stations	4 stations	5 stations	6 stations	7 or more stations
2,500 to 5,000	1,134	[1] 282	24.9	276	6	------	------	------	------	------
5,000 to 10,000	678	356	52.5	332	22	2	------	------	------	------
10,000 to 25,000	413	350	84.7	240	98	10	1	1	------	------
25,000 to 50,000	122	124	100.0	47	41	27	7	2	------	------
Over 50,000	140	140	100.0	2	7	29	29	21	14	38
Total number of communities	2,487	1,252	50.3	897	174	68	37	24	14	[2] 38
Total number of stations	------	[3] 2,218	------	897	348	204	148	120	84	417

[1] Includes 73 communities of less than 2,500 population.
[2] Of the 38 communities with 7 or more stations, 9 had 7 stations; 7 had 8 stations; 3 had 9 stations; 9 had 10 stations; and 10 had 11 or more stations.
[3] Does not include 85 authorized AM stations as follows: 35 operating noncommercially and 50 located in United States possessions.

Twenty-three communities in United States possessions had 50 AM stations distributed as follows: 11 had 1 station; 6 had 2 stations; 3 had 3 stations; 1 had 5 stations; 1 had 6 stations; and 1 had 7 stations.

FM BROADCAST DISTRIBUTION

Of the 732 commercial FM broadcast stations authorized as of the close of the fiscal year, 598 or 81.7 percent were authorized to licensees of AM stations in the same community. The following table presents the number of United States communities of population classification having specified numbers of authorized FM stations on June 30, 1950:

Population	Total number of communities (1940 census)	Number of communities with 1 or more authorized commercial FM stations	Percent of total	Number of communities having—						
				1 station	2 stations	3 stations	4 stations	5 stations	6 stations	7 or more stations
2,500 to 5,000	1,134	[1] 21	1.9	20	1					
5,000 to 10,000	678	40	5.9	40						
10,000 to 25,000	413	122	29.5	115	7					
25,000 to 50,000	122	77	63.1	57	18	2				
Over 50,000	140	124	88.6	29	33	25	14	6	6	11
Total number of communities	2,487	384	15.4	261	59	27	14	6	6	[2] 11
Total number of stations		*732*		261	118	81	56	30	36	150

[1] Includes 13 communities of less than 2,500 population.
[2] Of the 11 communities with 7 or more stations, 1 had 7 stations, 2 had 8 stations, 1 had 9 stations, and 7 had 10 or more stations.

Thus, of the 1,272 radio communities in the United States with one or more authorized standard AM or FM broadcast stations, 384 or 30.2 percent had at least one FM station. In addition, of the 732 FM stations a total of 442 or 60.4 percent were located in the 140 metropolitan districts.

No FM stations were authorized in the territories of the United States as of June 30, 1950.

TV BROADCAST DISTRIBUTION

As of June 30, 1950 the 109 authorized TV broadcast stations were distributed in 66 different cities containing approximately half of the Nation's families. These cities were:

Birmingham, Ala.
Phoenix, Ariz.
Los Angeles, Calif.
San Diego, Calif.
San Francisco, Calif.
New Haven, Conn.
Wilmington, Del.
Washington, D. C.
Jacksonville, Fla.
Miami, Fla.
Atlanta, Ga.
Chicago, Ill.
Rock Island, Ill.
Bloomington, Ind.
Indianapolis, Ind.
Ames, Iowa
Davenport, Iowa
Louisville, Ky.
New Orleans, La.
Baltimore, Md.
Boston, Mass.
Detroit, Mich.
Grand Rapids, Mich.
Kalamazoo, Mich.
Lansing, Mich.
Minneapolis, Minn.
St. Paul, Minn.
Kansas City, Mo.
St. Louis, Mo.
Omaha, Nebr.
Newark, N. J.
Albuquerque, N. Mex.
Binghamton, N. Y.
Buffalo, N. Y.
New York, N. Y.
Rochester, N. Y.
Schenectady, N. Y.
Syracuse, N. Y.
Utica, N. Y.
Charlotte, N. C.
Greensboro, N. C.
Cincinnati, Ohio
Cleveland, Ohio
Columbus, Ohio
Dayton, Ohio

Toledo, Ohio	Pittsburgh, Pa.	San Antonio, Tex.
Oklahoma City, Okla.	Providence, R. I.	Salt Lake City, Utah
Tulsa, Okla.	Memphis, Tenn.	Norfolk, Va.
Erie, Pa.	Nashville, Tenn.	Richmond, Va.
Johnstown, Pa.	Dallas, Tex.	Seattle, Wash.
Lancaster, Pa.	Fort Worth, Tex.	Huntington, W. Va.
Philadelphia, Pa.	Houston, Tex.	Milwaukee, Wis.

BROADCAST INDUSTRY FINANCIAL DATA

GENERAL

The following tables show the comparative calendar year 1948–49 financial data for the AM, FM, and TV broadcast industries:

Item	1948	1949	Percent increase or (decrease)
Revenues:	[$ millions]	[$ millions]	
AM-FM	$408.1	$415.2	1.7
TV	8.7	34.3	294.3
Total	416.8	449.5	7.8
Expenses:			
AM-FM	347.1	362.6	4.5
TV	23.6	59.6	152.5
Total	370.7	422.2	13.9
Income: [1]			
AM-FM	61.0	52.6	13.8
TV	14.9	25.3	
Total	46.1	27.3	40.8

[1] Before Federal income tax.

Comparative 1948–49 data for AM and TV operations of Nation-wide networks

(including their owned and operated stations)

Item	1948	1949
Revenues:	[$ millions]	[$ millions]
AM	$104.0	$103.9
TV	4.8	18.9
Total	108.8	122.8
Expenses:		
AM	86.3	85.8
TV	11.2	30.6
Total	97.5	116.4
Income: [1]		
AM	17.7	18.1
TV	[2] 6.4	[2] 11.7
Total	11.3	6.4

[1] Before Federal income tax. [2] Deficit.

NOTE.—The 4 Nation-wide AM networks (ABC, CBS, MBS, and NBC) owned and operated a total of 17 stations in 1948 and 1949. The 4 TV networks (ABC, CBS, Dumont, and NBC) owned and operated a total of 10 stations in 1948 and 13 stations in 1949. Some networks indicated that expense allocations between AM and TV operations were not complete to the extent that certain indirect operating expenses of TV are included under AM operations.

STANDARD BROADCAST (AM) FINANCIAL DATA

The distribution of broadcast revenues and broadcast income (before Federal income taxes) as between networks and stations for the calendar years 1948 and 1949 is shown in the following table:

Distribution of (AM) broadcast revenues and income (before Federal income taxes)

Item	4 nation-wide networks and their 17 stations		3 regional networks and their 10 stations		All other stations [1]		Industry total	
	1948	1949	1948	1949	1948	1949	1948	1949
Revenues from network time sales	$88, 273, 588	$86, 401, 088	$2, 692, 619	$1, 959, 184	$50, 086, 146	$46, 538, 053	$141, 052, 353	$134, 898, 325
Revenues from sale of time to national and regional advertisers and sponsors	15, 118, 952	16, 763, 960	1, 260, 124	1, 269, 055	88, 380, 685	90, 281, 492	104, 759, 761	108, 314, 507
Revenues from sale of time to local advertisers and sponsors	4, 891, 375	4, 989, 432	1, 521, 791	1, 481, 059	164, 494, 999	175, 673, 810	170, 908, 165	182, 144, 301
Revenues from total time sales	108, 283, 915	108, 154, 480	5, 474, 534	4, 709, 298	302, 961, 830	312, 493, 355	416, 720, 279	425, 357, 133
Commissions paid to representatives, etc	23, 595, 353	22, 826, 553	943, 677	910, 163	25, 753, 251	26, 570, 967	50, 292, 281	50, 307, 683
Incidental broadcast revenues:								
Revenues from sale of talent, etc	9, 840, 499	10, 496, 580	292, 669	134, 540	12, 063, 101	11, 367, 149	22, 196, 269	21, 998, 269
Furnishing material or service	4, 446, 716	3, 642, 034	1, 701	946	5, 640, 612	5, 816, 908	10, 089, 029	9, 459, 888
Other incidental revenues	5, 065, 239	4, 459, 515	165, 559	219, 027	3, 051, 320	2, 598, 484	8, 282, 118	7, 277, 026
Total broadcast revenues	104, 041, 016	103, 926, 056	4, 990, 786	4, 153, 648	297, 963, 612	305, 704, 929	406, 995, 414	413, 784, 633
Total broadcast expenses	86, 252, 005	85, 858, 668	4, 694, 606	4, 747, 280	251, 957, 119	266, 915, 770	342, 903, 730	357, 521, 718
Total broadcast income or loss	17, 789, 011	18, 067, 388	296, 180	(593, 632)	46, 006, 493	38, 789, 159	64, 091, 684	56, 262, 915
Investment in tangible broadcast property:								
Original cost	25, 349, 620	23, 164, 616	4, 981, 876	4, 930, 738	[2] 171, 469, 479	[2] 200, 491, 681	201, 800, 975	230, 587, 035
Depreciation to date	13, 832, 180	14, 806, 195	1, 517, 232	1, 696, 588	51, 480, 114	64, 009, 960	66, 829, 526	80, 512, 743
Depreciated cost	11, 517, 440	10, 358, 421	3, 464, 644	3, 234, 150	119, 989, 365	136, 481, 721	134, 971, 449	150, 074, 292

[1] Includes 1,797 stations in 1948 and 1,993 stations in 1949.
[2] Data available from 1,795 stations in 1948 and 1,998 stations in 1949.

Distribution of total (AM) broadcast revenues, 1949

	Amount	Percent of total
4 Nation-wide networks and their 17 owned and operated stations	$102, 926, 056	25. 1
3 regional networks and their 10 owned and operated stations	4, 153, 648	1. 0
1,993 other stations	305, 704, 929	73. 9
Total broadcast revenues	413, 784, 633	100. 0

Distribution of (AM) broadcast income (before Federal income taxes)

	Amount	Percent of total
4 Nation-wide networks and their 17 owned and operated stations	$18, 067, 388	31. 8
3 regional networks and their 10 owned and operated stations	(593, 632)	
1,993 other stations	38, 789, 159	68. 2
Total broadcast income	56, 262, 915	100. 0

Comparative data for 1948–49 are presented below for identical AM stations which were in operation for both full years, i. e., stations which did not change their status during the period with respect to class, time, and whether or not affiliated with a network. The data

AM broadcast stations (excluding 11 key stations of Nation-wide networks	1948	1949	Percent increase or (decrease)
Averages per station:			
Clear channel 50-kilowatt unlimited:			
Number of stations, 53 [1]			
Total broadcast revenues	$1, 119, 612	$1, 083, 585	(3. 22)
Total broadcast expenses	823, 446	807, 396	(1. 95)
Broadcast income	296, 166	276, 189	(6. 75)
Clear channel 5–25-kilowatt unlimited:			
Number of stations, 34			
Total broadcast revenues	349, 768	334, 694	(4. 31)
Total broadcast expenses	302, 280	288, 256	(4. 64)
Broadcast income	47, 488	46, 438	(2. 21)
Clear channel 5–25-kilowatt part-time:			
Number of stations, 3			
Total broadcast revenues	152, 662	166, 309	8. 94
Total broadcast expenses	130. 172	148, 962	14. 43
Broadcast income	22. 490	17, 347	(22. 87)
Regional unlimited:			
Number of stations, 436			
Total broadcast revenues	263, 511	260, 442	(1. 17)
Total broadcast expenses	214, 708	218, 617	1. 82
Broadcast income	48, 803	41, 825	(14. 30)
Regional part-time:			
Number of stations, 284			
Total broadcast revenues	88, 214	96, 721	9. 64
Total broadcast expenses	85, 785	92, 912	8. 31
Broadcast income	2, 429	3, 809	56. 81
Local unlimited:			
Number of stations, 706			
Total broadcast revenues	91, 447	90, 973	(. 52)
Total broadcast expenses	80, 614	83, 494	3. 57
Broadcast income	10, 833	7, 479	(30. 96)
Local part-time:			
Number of stations, 105			
Total broadcast revenues	58, 074	64, 452	10. 98
Total broadcast expenses	54, 910	62, 504	13. 83
Broadcast income	3, 164	1, 948	(38. 43)
All stations:			
Number of stations, 1,621			
Total broadcast revenues	174, 147	173, 550	(. 34)
Total broadcast expenses	144, 951	148, 213	2. 25
Broadcast income	29, 196	25, 337	(13. 22)

[1] Includes 2 stations clear channel 50 kilowatts part-time.

are shown in terms of average per station of broadcast revenues, expenses, and income (before Federal incomes taxes) for each class of station and exclude the Nation-wide networks and their 11 key stations.

FM BROADCAST FINANCIAL DATA

TOTAL FM BROADCAST REVENUES

	1948		1949	
	Number of stations	Total FM revenues	Number of stations	Total FM revenues
FM stations operated by:				
AM Licensee:		*Millions*		*Millions*
Joint AM-FM operation	516	None	452	None
Separate FM operation	77	$0.6	167	$1.2
Non-AM licensee	89	1.1	114	1.6
Total FM stations	682	1.7	733	2.8

TOTAL FM BROADCAST EXPENSES

FM stations operated by:				
Non-AM licensees	89	$4.2	114	$5.1
Industry total	----------	(1)	----------	(1)

TOTAL FM BROADCAST INCOME (BEFORE FEDERAL INCOME TAX)

FM stations operated by:				
Non-AM licensees	89	$(3.1)	114	$(3.5)
Industry total	----------	(1)	----------	(1)

( ) Denotes loss.

[1] AM licensees operating FM stations reported FM station revenues, if any, separately from AM station revenues. In view of the difficulty of making allocations as between AM expense and FM expense, such licensees were not requested to report separately their FM station expenses. Thus, data with respect to FM expense and income (or loss) are available only for FM stations operated by non-AM licensees.

TV BROADCAST FINANCIAL DATA

The following table shows financial data for the television industry for the calendar year 1949.

Item	4 networks and their 13 owned and operated stations	85 other stations [1]	Industry total
Revenues from network time sales	$8,862,399	$1,933,113	$10,795,512
Revenue from sale of time to national and regional advertisers and sponsors	2,965,594	4,309,419	7,275,013
Revenues from sale of time to local advertisers and sponsors	2,295,468	7,164,140	9,459,608
Total revenues from time sales	14,123,461	13,406,672	27,530,133
Commissions paid to representatives, etc	2,273,333	1,805,394	4,078,727
Incidental broadcast revenues:			
Revenues from sale of talent, etc	4,490,492	1,521,237	6,011,729
Furnishing material or service	2,005,437	1,396,458	3,401,895
Other incidental revenues	547,983	916,943	1,464,926
Total broadcast revenues	18,894,040	15,435,916	34,329,956
Total broadcast expenses	30,635,895	28,956,011	59,591,906
Total broadcast loss	(11,741,855)	(13,520,095)	(25,261,950)
Investment in tangible broadcast property:			
Original cost	19,084,764	36,790,819	55,875,583
Depreciation to date	4,350,273	6,583,841	10,934,114
Depreciated cost	14,734,491	30,206,978	44,941,469

[1] 1 station was an experimental station operating commercially.

Total TV broadcast revenues almost quadrupled between 1948 and 1949. Revenues for the networks and their owned and operated stations and revenues for all other operating stations also increased by the same amount. The following table presents the 1948–49 comparative financial data for the TV broadcast industry:

Item	Networks and their owned and operated stations [1]			All other stations [2]			Industry total		
	1948	1949	Percent change	1948	1949	Percent change	1948	1949	Percent change
	Millions	*Millions*		*Millions*	*Millions*		*Millions*	*Millions*	
Total broadcast revenues	$4.8	$18.9	293.8	$3.9	$15.4	294.9	$8.7	$34.3	294.3
Total broadcast expenses	11.2	30.6	173.2	12.4	29.0	133.9	23.6	59.6	152.5
Total broadcast loss	6.4	11.7	--------	8.5	13.6	--------	14.9	25.3	--------
Investment in tangible broadcast property:									
Cost to respondent	12.1	19.1	57.9	15.8	36.8	132.9	27.9	55.9	100.4
Depreciation to date	2.3	4.3	87.0	2.1	6.6	214.3	4.4	10.9	147.7
Depreciated cost	9.8	14.8	51.0	13.7	30.2	120.4	23.5	45.0	91.5

[1] In 1948 the 4 networks (NBC, CBS, ABC, and DuMont) owned and operated a total of 10 stations; 1949 they owned and operated a total of 13 stations.
[2] Refers to 40 stations in 1948 and 85 stations in 1949.

Whereas in 1948 all networks and stations showed a loss from operations, in 1949 a total of three stations showed a profit from their operations.

Since the above trends reflect the operations of many stations which were in existence for only several months in 1948 or 1949, the data are not indicative of the experience of stations which were in operation for the full years 1948 and 1949. The following table presents comparative financial data in 1948–49 for 13 stations which were in operation for both full years:

Item	Aggregate		Average per station		Percent change
	1948	1949	1948	1949	
Total broadcast revenues	$2,794,374	$5,703,252	$214,952	$438,712	104.1
Total broadcast expenses	7,678,311	8,936,251	590,639	687,404	16.4
Total broadcast loss	4,883,937	3,232,999	375,687	248,692	--------

NOTE.—Data excludes the operations of network owned and operated stations.

The proportion of television broadcast revenues to total aural (AM or FM) and video (TV) broadcast revenues in cities served by TV rose from 4.4 percent in 1948 to 10.7 percent in 1949. The following table presents the proportion of TV broadcast revenues to total aural and TV revenues in specified metropolitan districts in 1949. In addition, comparison is made of percentages of TV revenues to total aural and TV revenues for 1948 and 1949 in the same districts.

Metropolitan district	Number of stations		1949—Broadcast revenues [2]		Percent TV of total 1948	Percent TV of total 1949
	AM and FM [1]	TV	Total aural and TV	TV only		
			($000)	($000)		
Baltimore	12	3	$4,405	$916	7.5	20.8
Philadelphia	16	3	8,022	1,596	9.5	19.9
Washington, D. C	17	4	5,364	1,057	7.7	19.7
Los Angeles	26	7	12,955	2,243	4.5	17.3
New York	37	7	30,291	5,111	8.2	16.9
Columbus, Ohio	5	3	1,656	210	0.0	12.7
Chicago	24	4	17,343	2,122	4.2	12.2
Detroit	12	3	8,526	940	3.4	11.0
Cleveland	9	3	5,020	491	1.7	9.8
Cincinnati	7	3	7,382	543	1.6	7.4
San Francisco	22	3	5,540	235	0.1	4.2
Total 11 TV metropolitan districts	187	43	106,504	15,464	[3] 5.6	14.5
47 other TV metropolitan districts [4]	309	55	95,489	6,179	[5] 2.0	6.5
Total 58 TV metropolitan districts [4]	496	98	201,993	21,643	[6] 4.4	10.7

[1] Jointly operated AM-FM stations counted as 1 station.
[2] Includes network owned and operated stations.
[3] Includes 10 TV metropolitan districts in 1948.
[4] Includes 2 nonmetropolitan communities: Albuquerque, N. Mex., and Bloomington, Ind.
[5] Includes 18 TV metropolitan districts in 1948.
[6] Includes 28 TV metropolitan districts in 1948.

BROADCAST APPLICATIONS

The Communications Act provides that the Commission "may grant licenses, renewals of licenses, and modifications of licenses only upon written application received by it." Consequently, a large part of the Commission's broadcast work involves the processing of applications by prospective and existing broadcasters.

Broadcast application statistics for the fiscal year follow:

AM broadcast applications

	Pending June 30, 1949	Received	Disposed	Pending June 30, 1950
New stations	382	242	347	277
Change in facilities	293	266	304	255
Renewals	201	743	706	238
License	92	381	400	73
Transfers	103	381	417	67
Miscellaneous	115	836	877	74
Total	1,186	2,849	3,051	984

FM broadcast applications

	Pending June 30, 1949	Received	Disposed	Pending June 30, 1950
New stations	65	16	64	17
Change in facilities	50	119	135	34
Renewals	21	154	150	25
License	89	139	188	40
Transfers	15	85	90	10
Miscellaneous	26	540	551	15
Total	266	1,053	1,178	141

TV broadcast applications

New stations	338	28	15	351
Change in facilities	14	26	23	17
Renewals	2	23	16	9
License	9	36	34	11
Transfers	10	15	22	3
Miscellaneous	13	179	186	6
Total	386	307	296	397

All other broadcast applications [1]

New stations	147	628	715	60
Change in facilities	13	141	146	8
Renewals	81	482	307	256
License	33	518	470	81
Transfers	40	85	94	31
Miscellaneous	4	168	155	17
Total	318	2,022	1,887	453

Total broadcast applications

New stations	932	914	1,141	705
Change in facilities	370	552	608	314
Renewals	305	1,402	1,179	528
License	223	1,074	1,092	205
Transfers	168	566	623	111
Miscellaneous	158	1,723	1,769	112
Total	2,156	6,231	6,412	1,975

[1] Includes noncommercial educational, facsimile, international, relay and studio link, experimental and developmental.

BROADCAST DELETIONS

There were 251 deletions of AM, FM, and TV broadcast authorizations during the year, which was 23 less than the year previous. Of this number, 173 were FM stations.

Deletions	AM	FM	TV	Monthly total
1950:				
June	10	14	0	24
May	4	16	0	20
April	1	13	0	14
March	10	15	1	26
February	6	9	0	15
January	1	22	1	24
1949:				
December	9	13	0	22
November	7	15	1	23
October	4	14	1	19
September	5	15	2	22
August	3	16	0	19
July	10	11	2	23
Total	70	173	8	251

ASSIGNMENTS AND TRANSFERS

	Pending July 1, 1949	Received	Disposed	Pending June 30, 1950
AM	103	381	417	67
FM	15	85	90	10
TV	10	15	22	3
Other	40	85	94	31
Total	168	566	623	111

CHAPTER V—RADIO OPERATORS

1. GENERAL
2. COMMERCIAL RADIO OPERATORS
3. SPECIAL AIRCRAFT RADIOTELEPHONE AUTHORIZATIONS
4. *AMATEUR RADIO SERVICE*
5. CITIZENS RADIO SERVICE
6. STATISTICS

1. GENERAL

The more than 700,000 operators and stations authorized in these categories constitute the largest group which the Commission administers and covers all persons who personally operate radio transmitters. Included are those who make such operation their vocation as well as those who make it their avocation. It includes the civilian flyer who uses an aircraft radiotelephone and the ordinary citizen who may find radio convenient in his daily activities. The group increased by nearly 60,000 during the fiscal year.

The administrative problems involved in the regulation of these services are great both because of the numbers involved and because these services concern private individuals and, therefore, must face personal problems which are unique and special in each case.

The law requires the Commission to approve the operators of radio transmitting apparatus as well as radio stations as such. (Operators of receiving equipment only do not require Commission authorization.) In accordance with the Communications Act, the Commission prescribes the kinds and classes of radio operators and the qualifications they must possess as a basis for licensing. Examination for the various operator licenses are given regularly at the Commission's field offices and at regular intervals at examination points located throughout the United States (see list appended to this chapter).

2. COMMERCIAL RADIO OPERATORS

Commission supervision of commercial radio operators covers all radio services, both broadcast and nonbroadcast, including common carriers. The term "commercial radio operator" applies to all persons authorized to operate transmitters as part of their livelihood or vocation. There are several grades of commercial operator licenses, each conferring a different degree of operating authority according

to the demonstrated qualifications of the holder. The commercial operator class, therefore, embraces more than 400,000 persons who are generally employed, either part-time or full-time, for the operation of radio transmitters in the many classes of radio stations. Commercial radio operators constitute the largest group of licensees which the Commission regulates.

The duties of a commercial radio operator include not only the handling of communications, the adjustment of transmitters, and the keeping of station logs (if required), but also the performance of any technical duties which may affect the station's authorized operation. Some classes of stations require a fully qualified operator to perform all of these functions; other classes of stations may have such an operator only on call and its routine operation carried on by an operator of lesser qualifications.

It is the responsibility of the Commission to prescribe the qualifications of radio transmitter operators, and to classify and license them according to the duties to be performed. Commercial radio operators are basically classified as radiotelephone and radiotelegraph. There are several grades within each classification, each conferring a different degree of operating authority according to their demonstrated qualifications (and in some cases experience). This grading varies from authorized operation of the most powerful and complicated transmitters to limited and nontechnical operation of simple "push-button" installations.

Revision of the commercial operator examinations to bring them up to date was completed during fiscal 1949, together with several related changes in the commercial operator rules and license structures, and other changes were in prospect. Perhaps the most significant of the changes made was the adoption in May 1950, after hearings and oral argument extending from March 1948, of a final order prescribing the qualifications of persons who are to be permitted to perform or supervise tests and adjustments of ship radar installations during the installation, servicing or maintenance of that equipment after January 1, 1951. The Commission determined that such persons shall be required to hold either radiotelephone or radiotelegraph first- or second-class operator licenses, as an evidence of their knowledge of basic technical and regulatory matters, and shall also be required to additionally qualify for the specialized duties involved by successfully completing a supplementary examination on the subject of ship radar techniques. This supplementary examination will constitute element 8 of the Commission's commercial radio operator examinations, and was expected to be issued shortly.

Another significant amendment to the operator rules was the provision, for the first time, of a standardized procedure for processing

applications for commercial radio operator licenses when submitted by persons having physical handicaps which might detract from their ability to perform all of the duties of a radio operator. Previously, such applications were processed only by the Washington office of the Commission, and on a case-by-case basis, which involved delay and, in some cases, personal hardship. Under the new rules, such applicants, unless afflicted with complete muteness or complete deafness or other inability to transmit and to receive spoken messages in English by radio, are permitted to be examined for any class of license which they may desire. Under the license for which they qualify they are limited in operating privileges only by an appropriate restrictive endorsement when the physical handicap is such as to clearly prevent the performance of all of the normal duties of a radio operator at a station used for protecting life and property at sea or in the air. This amendment became effective on May 1, 1950.

Still another significant change in the operator rules was accomplished just prior to the close of the fiscal year. It effected the rearrangement of the examination material contained in several of the elements composing the commercial radio operator examinations, the establishment of a new operator license entitled radiotelephone third class operator permit, and the revision of both the examination for and the scope of operating authority under the restricted radiotelegraph operator permit which is renamed the radiotelegraph third class operator permit. These provisions, effective September 1, 1950, accomplish one of the major revisions necessary at this time to reorganize the two separate series of radio operator licenses (radiotelephone and radiotelegraph) and to grade them in accordance with the duties to be performed by the respective license holders. The radiotelegraph third class operator permit and the radiotelephone third class operator permit have now been established as nontechnical licenses which will authorize the mechanical operation of certain classes of stations where the constant attendance of a fully qualified technical operator is not deemed necessary. The examinations by which these licenses are obtained are correspondingly limited to nontechnical matters such as correct radio operating practices and procedures, and pertinent rules and regulations governing such operation at stations where these licenses are valid.

In connection with these changes, two new license forms were designed, thus completing the simplification of such documents. These license documents, henceforth, will be of two sizes: one 8 by 10 inches, for the first and second class radiotelephone and radiotelegraph licenses; the other, 6 by 8 inches, for the third class licenses. These sizes were found particularly suitable for framing and posting at the stations where the operators are employed.

One of the individual problems most frequently presented by holders of commercial radio operator licenses concerns renewal of their operating privileges, since such licenses are normally issued only for a period of 5 years. When an applicant for a commercial radio operator license successfully completes the required examination and is issued his license, he may operate stations at which the license is valid, but only during the period of the license. If, at the end of that time, he desires to continue operating, he must again demonstrate his qualifications for that license. However, to demonstrate his qualifications, he may substitute proof of radio operating experience during the term of the license instead of being reexamined. Previously, the rules of the Commission required that, in order to take advantage of this provision, the operator had to submit his application for renewal during the last year of the license term and, further, had to show an aggregate of at least 3 years of service during the term of that license, or at least 2 years under the same conditions when the last year of such service was continuous and immediately prior to the date of application. As a result of reported hardship to operators whose employment was intermittent, the Commission amended these provisions to permit the acceptance of an aggregate of 2 years of service during the license term in lieu of the examination, and to further provide that applications for renewal may not only be submitted during the last year of the license term but may also be submitted during a 1-year period of grace after the license expires, during which period of grace, of course, the license is not valid.

Coincident with the above amendment, the Commission provided that, when the applicant for a renewal of the commercial radio operator license is unable to show sufficient service for a renewal without examination but is able to show an aggregate of at least 1 year of service during the last 3 years of the license terms, he may obtain the renewal upon successful completion of an abridged examination rather than take the entire examination for the class of license sought to be renewed. This action, which increased the service thus required for renewal by examination from 3 months to 1 year, is believed to achieve an equitable balance between the relative value of service under a license as compared with a full examination in demonstrating an operator's qualification to hold a license, and is intended to assure the Commission that the holders of commercial radio operator licenses are qualified for renewal of such licenses.

One of the basic requirement of the Commission, in the issuance of a commercial radio operator license, has long been that the applicant must demonstrate his ability to read and write the English language and to transmit and receive spoken messages in English by telephone or radio. This requirement has been uniformly applied, not only within the continental United States but also within its territories and

possessions. However, the development of local radio communication systems in some of the territories, especially in Puerto Rico where Spanish is the language in common use, appears to make advisable a revision of this requirement to allow the substitution of some language other than English, especially in connection with the issuance of some of the lower classes of licenses which grant only limited operating privileges. This matter was under study at the close of the fiscal year, although the existence of a large number of language minorities within the continental United States itself appears to raise certain problems. As an experiment in this regard, the Commission authorized the issuance of restricted radiotelephone operator permits to a number of residents of Puerto Rico who were proficient in Spanish but had no knowledge of the English language, on assurance that their operation would be limited to a strictly local communication system in Puerto Rico.

During fiscal 1949 there was established a special examination and a special endorsement to be placed on a radiotelegraph first or second class operator license to certify to the special qualifications of the holders to operate radiotelegraph stations on board aircraft. It became necessary to design a new element of the Commission's written commercial radio operator license examinations in order that the examination material might be available before the effective date of that requirement, February 15, 1950. This project was completed, in cooperation with the Civil Aeronautics Administration, in August 1949, at which time the examination, entitled element 7, aircraft radiotelegraph, was made available and a supplement (No. 5) to the "Study Guide and Reference Material for Commercial Radio Operator Examinations" was published. As a result of this action and of the Commission's coincident approval, without examination, of all operators who had served as chief or sole radiotelegraph operators on board Commission-licensed aircraft prior to February 15, 1950, the Commission's radio operator requirements and examinations in this regard were brought into conformity with the recommended standards of the International Civil Aviation Organization without hardship to the individual operators involved.

It is of interest that the number of licensed radio operators continues to increase although the Commission has waived, in a number of rapidly growing services, the requirement of a radio operator to perform the routine operation of small nonbroadcast radio stations, principally in land mobile units. The trend is moving toward the use of radiotelephone rather than radiotelegraph transmissions, with the result that the number of holders of radiotelegraph classes of licenses has apparently reached a maximum and may be decreasing slightly. The number of holders of the higher classes of radiotelephone licenses, on the other hand, continues to increase at the rate of approximately

6,500 per year with radiotelephone first- and second-class operator licenses approaching 58,000 at the end of the fiscal year. Holders of restricted radiotelephone operator permits also continue to grow at the rate of approximately 39,000 per year, with the total of these licenses outstanding at the end of the fiscal year approximating 350,000.

3. SPECIAL AIRCRAFT RADIOTELEPHONE AUTHORIZATIONS

In fiscal 1947 the Commission established a special class of operator authorization for the operation of radiotelephone stations on board private aircraft, in the international as well as the domestic service. This special aircraft radiotelephone authorization is issued not only by all Commission field offices but also as a special convenience to private flyers at airfields by approximately 1,500 aircraft pilot examiners of the Civil Aeronautics Administration who have been designated by the Commission for this purpose. In fiscal 1950 a total of 15,987 such authorizations were issued, which was a decrease of 10,149 from the previous year. However, the number of these authorizations outstanding on June 30, 1950, exceeded 120,000, representing an increase of nearly 16,000 over 1949.

4. AMATEUR RADIO SERVICE

The Amateur Radio Service continues to be one of the largest and most active services administered by the Federal Communications Commission. Amateurs now hold approximately 175,000 station and operator licenses collectively.

At the end of the fiscal year there were nearly 88,000 amateur station licenses and almost 87,000 amateur operator licenses outstanding, an increase from fiscal 1949 of approximately 6,300 and 6,000 respectively. The number of amateur stations remains slightly higher than the number of amateur operators as a result of some operators being licensees of more than one personal station or being licensee-trustees of stations licensed for the use of amateur radio operators in clubs or in military units.

There is no age limit in the Amateur Radio Service. Any United States citizen who passes the prescribed examination and is otherwise qualified may obtain amateur operator and station licenses. Applications were received during the year from persons in their early teens and in their seventies. Women as well as men find amateur radio an interesting avocation as is evidenced by the many feminine names appearing in the Commission's records of amateur licensees.

The amateurs, or "hams" as they prefer to be known, are internationally recognized and their ranks comprise persons in almost every walk of life. Some of them obtain a livelihood from employment in

the radio industry, others from entirely unrelated fields of endeavor. However, they are all joined by a common interest in radio; an interest which is without pecuniary considerations and involves only personal aims. Many of them bring to the amateur service outstanding ability in one or more of the various phases of the art of radio communication. Through the exercise of their respective skills in designing, developing, constructing, and experimenting with radio equipment, developing communication techniques, and by providing scientific observation services as well as the usual handling of third party messages during the past year, they have demonstrated that the privileges which they have been granted have been well justified.

Also, the amateur service has a high degree of national value. It constitutes a pool of self-trained radio technicians and operators upon which the country can draw in time of war and other national need. Further, special networking and other amateur activities have proved highly useful to the national defense program.

Every year brings numerous examples of the use of amateur radio during communications emergencies and fiscal 1950 was no exception. Amateurs volunteered their equipment and services during floods, hurricanes, fires, sickness, and distress aboard ships at sea. In one instance they assisted a "ham" in Australia to obtain 12 grams of aureomycin for his daughter, desperately ill with pneumonia. Within 6 days after the Australian "ham" called for help and a group of amateurs went into action on an international basis, the drug, not then available in Australia, had been delivered from the United States and administered to the patient with the result that she was considered out of danger.

Although the amateur licensees have an enviable record of self-policing, it was necessary, nevertheless, for the Commission to issue a number of citations in cases of frequency deviation or other minor infractions of its rules. It also ordered the suspension of the licenses of six amateurs involved in more serious irregularities and refused to grant a license to an applicant who had previously persisted in trying to operate in the amateur bands without a license despite several warnings.

During the year the Commission amended its amateur rules to clarify the matter of eligibility to apply for and obtain a two-letter call sign; and to provide a year of grace for the renewal of amateur licenses expiring on or after January 1, 1951. The interim authorization for use at amateur stations of narrow band frequency or phase modulation in the bands, 3,850 to 3,900 kilocycles, 14,200 to 14,250 kilocycles, 28.5 to 29 megacycles and 51 to 52.5 megacycles was extended to July 31, 1950.

The provisions for fostering further development in the Amateur Radio Service, as set forth in rule making proposed by the Commission

on April 20, 1949 (docket 9295), continued to be a controversial item. An informal conference was held on October 10 and 11, 1949, between members of the Commission's staff and interested parties. As a result of this get-together, a number of changes were made in the proposals and a new notice of rule making issued. However, certain sections of the amended proposed rules, designed to enhance the status of the amateur service, remained unacceptable to one of the national amateur organizations and the controversy culminated in an oral argument held before the Commission on June 2, 1950. The Commission is now studying the data presented at the oral argument and reviewing the entire docket prior to rendering its decision.

Interference to the reception of television broadcasts continued to be of concern to many amateur licensees in areas served by TV stations and a serious problem to many amateurs located outside the normal service areas of TV stations who are faced with the problem of trying to reduce or eliminate such interference where the owners of TV receivers are using them to receive weak signal programs not intended for their locality and beyond the normal range for which television receivers are designed. The challenge to reduce radiation of harmonics and other spurious emissions which results in interference to TV receivers has been successfully met by many amateurs. However, the Commission is aware of inequities in this situation and is studying the matter with a view to amending its rules to clarify individual responsibilities.

Amateur radio accompanied at least two expeditions to Arctic waters during the year. Amateurs expanded their use of "radio printer" equipment and increased activity was noted in the very high frequency and ultra high frequency amateur bands. Amateur radio's continued growth is reflected in a normal addition of 12,233 new operator and station licenses during the fiscal year and it is expected that, if adopted, the presently proposed rule changes contained in docket 9295 will provide impetus to this growth in the future.

5. CITIZENS RADIO SERVICE

Public demand for a radio service to meet the needs of the individual citizen was recognized by the Commission when it allocated the frequency band 460–470 megacycles to the Citizens Radio Service during its allocation hearing in 1945 and put this service on a regular basis as of June 1, 1949.

It is the purpose of the Citizens Radio Service to provide for private or personal radio communication, radio signaling, control of objects or devices by radio, and other purposes not specifically prohibited by the Commission's rules and regulations.

The Commission has endeavored to allow the widest possible latitude of activity in the Citizens Radio Service and it can be used, for ex-

ample, on farms and ranches for communications to and from men in the fields; to maintain contact with camps and to decrease the hazards of personal travel on board harbor and river craft and private aircraft; physicians may use this service to establish a calling service through which a central physicians' exchange in each city can reach doctors while they are enroute in their cars or otherwise not available by telephone. Also many business enterprises such as department stores, laundries, dairies, and fuel oil dealers might be able to use this service for communicating to and from their vehicles if distance and interference considerations are not too great.

Common carrier operation in the Citizens Radio Service is prohibited and no charge can be made for the transmission of messages or use of the licensed facilities. No protection from interference is afforded citizens radio stations, since citizens radio stations are in a "party line" system, and cooperation of all users is expected in order to avoid interference as much as possible. Stations employed for radio control of devices or objects cannot be used where such operation involves continuous radiation of energy.

For several years, operations in the Citizens Radio Service were conducted under experimental authorizations but on June 1, 1949, when this service was established on a regular basis, newly adopted rules governing its operation also became effective.

Since that date, considerable progress has been made in the development of equipment for this service. For the most part, manufacturers concentrated on the development of small units of the handi-talkie type, taking advantage of the ultra-high frequency band utilized by the Citizens Radio Service which makes feasible the design of small compact transmitter-receivers.

A sizable demand has developed for equipment for radio control of objects or devices such as model aircraft, boats, garage door openers, etc., and one manufacturer of radio-control equipment received a type-approval certificate from the Commission during the past year. In addition, other manufacturers have submitted radio transmitters to the Commission's laboratory which have been undergoing tests and will contribute to the available supply of equipment, if they meet type-approval requirements.

Many inquiries and a large number of applications were received during the year from potential users of the Citizens Radio Service who contemplated the use of home-built or war-surplus equipment converted to operate on the citizens frequency band.

The Commission has concluded that there is no simple method existing at this time for compliance with the technical standards of the

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Citizens Radio Service by home constructors and experimenters, and that highly specialized engineering in ultra-high frequency techniques is required in the design of equipment to be used in that service. Attempts to convert war-surplus equipment to operate on the citizens frequency band have been unsuccessful and no equipment of this type has been licensed in the regular Citizens Radio Service.

On the other hand, the use of type-approved equipment greatly simplifies the licensee's problem, since the applicant is not required to submit technical data respecting the type-approved transmitter inasmuch as the manufacturer of such equipment has previously met the technical standards under the provisions of the rules whereby manufacturers of radio equipment to be used or operated in this service may obtain type-approval of such equipment.

The licensing requirements under the new rules, which were in effect during the past year, have been reduced to a minimum and any citizen of the United States 18 years of age or over is eligible to apply for citizens station license.

Application for a citizens radio station construction permit and license is submitted on a simple card form obtainable from any engineering field office of the Commission or from the Commission's Washington office.

An operator's license is not required for citizens radiotelephone station operation and only a restricted radiotelegraph operator permit is needed at stations with manually operated radiotelegraph transmitters using any type of Morse code. However, any adjustments to equipment that may result in improper transmitter operation must be made by or under the immediate supervision and responsibility of an operator holding a radiotelegraph or radiotelephone first- or second-class operator license.

On June 21, 1950, the Commission issued a proposal to amend section 19.51 of its rules primarily to permit operation of transmitters used to control remote objects or devices by radio by unlicensed persons, and interested persons were allowed until July 12, 1950 to submit comments thereon. The Commission will consider such comments before taking final action on this matter.

Although the number of citizens radio stations licensed during the past year increased by more than 200 over 1949, the difficulties in obtaining type-approved equipment and failure of non-type-approved equipment in general to receive Commission acceptance prevent the licensing of many potential users of citizens radio.

During fiscal 1950, the Commission licensed 320 stations in the citizens radio service which increased the total number of stations to 335 since establishment of this service on a regular basis. Of the 616 applications submitted to Washington, it was necessary to return 436

applications involving use of non-type-approved equipment as unacceptable because the equipment proposed to be used by the applicant failed to meet technical requirements.

6. STATISTICS

AUTHORIZATIONS

Authorizations held by amateurs, commercial operators, and flyers operating radiotelephone in their aircraft passed the 700,000 mark at the close of the year, which was an increase of nearly 58,000 over the previous period. Comparative figures follow:

	June 30 1949	June 30 1950	Increase
Stations:			
Amateur	81,675	87,967	6,292
Citizens	122	335	213
Total	81,797	88,302	6,505
Operators:			
Amateur	80,721	86,662	5,941
Aircraft radiotelephone	104,569	120,550	15,981
Commercial	[1] 378,500	[1] 408,221	[1] 29,721
Total	563,790	615,433	51,643
Grand total	645,587	703,735	58,148

[1] Estimated.

APPLICATIONS

During the year, nearly 150,000 applications were received from these groups collectively. Compared with the previous year, these figures were:

	1949	1950	Increase or decrease
Amateur	33,604	31,034	(− 2,570)
Citizens	488	596	108
Aircraft radiotelephone	26,136	15,987	(−10,149)
Commercial operators	102,606	100,090	(− 2,516)
Total	162,834	147,707	(−15,127)

RADIO OPERATOR EXAMINATION POINTS

To handle the large number of applicants for radio operator authorizations, examinations are given daily in many engineering field offices (see "Field Engineering and Monitoring"). However, all applicants cannot visit Commission field offices for this purpose. Therefore, as a convenience to applicants, examinations are given periodically, by Commission field representatives, in larger cities scattered throughout the country.

Effective June 3, 1950, the list of places at which examinations for radio operator licenses may be taken was revised as follows:

Quarterly points

Birmingham, Ala.
Charleston, W. Va.
Cincinnati, Ohio.
Cleveland, Ohio.
Columbus, Ohio.
Corpus Christi, Tex.
Davenport, Iowa.
Des Moines, Iowa,
Fort Wayne, Ind.
Fresno, Calif.
Grand Rapids, Mich.
Indianapolis, Ind.
Jackson, Miss.
Knoxville, Tenn.
Little Rock, Ark.
Memphis, Tenn.
Milwaukee, Wis.
Nashville, Tenn.
Oklahoma City, Okla.
Omaha, Nebr.
Phoenix, Ariz.
Pittsburgh, Pa.
St. Louis, Mo.
Salt Lake City, Utah.
San Antonio, Tex.
Schenectady, N. Y.
Sioux Falls, S. Dak.
Syracuse, N. Y.
Tulsa, Okla.
Williamsport, Pa.
Winston Salem, N. C.

Semiannual points

Alburquerque, N. Mex.
Amarillo, Tex.
Bakersfield, Calif.
Bangor, Maine.
Boise, Idaho.
Butte, Mont.
El Paso, Tex.
Hartford, Conn.
Hilo, Hawaii, T. H.
Jacksonville, Fla.
Jamestown, N. Dak.
Manchester, N. H.
Lihue, Kauai, T. H.
Louisville, Ky.
Marquette, Mich.
Portland, Maine.
Roanoke, Va.
Spokane, Wash.
Tallahassee, Fla.
Tucson, Ariz.
Wichita, Kans.
Wilmington, N. C.
Wailuku, Maui, T. H.

Annual points

Billings, Mont.
Cumberland, Md.
Klamath Falls, Oreg.
Las Vegas, Nev.
Rapid City, S. Dak.
Reno, Nev.
Springfield, Mo.

CHAPTER VI—FIELD ENGINEERING AND MONITORING

1. GENERAL
2. FIELD OFFICES
3. MONITORING
4. INSPECTIONS
5. OPERATOR EXAMINATIONS
6. INVESTIGATIONS
7. TECHNICAL OPERATIONS
8. DISASTER EMERGENCY COORDINATION

1. GENERAL

The Field Engineering and Monitoring Division is the principal inspection, examining, enforcement, and engineering fact-finding unit of the Commission. Its field staff inspects all types of radio stations and serves discrepancy notices, gives radio operator examinations and issues operator licenses, monitors the radio spectrum to see that stations are operating on assigned frequencies with prescribed power, locates and closes down unauthorized transmitter operation, investigates complaints of interference to radio services, gathers technical data for use by the Commission, furnishes direction to lost aircraft and provides bearings on ships in distress.

2. FIELD OFFICES

There are 9 regional engineering offices which supervise 23 district offices, 6 suboffices and 3 ship offices, supplemented by 19 monitoring stations. These field offices and monitoring stations are listed in the appendix. The engineering work is directed and coordinated at the Washington office.

3. MONITORING

The Commission operates 11 primary and 8 secondary monitoring stations. Of these, 17 are located in the United States, 1 in Hawaii, 1 in Alaska.

This monitoring and direction-finding network is the only one of its kind in this country and renders service to the Government in general as well as to the Commission in particular. It functions on a 24-hour basis, being linked with Washington by teletypewriter and radio circuits. Monitoring operations, in addition to performing an important engineering measurement function, include "cruising" the spectrum

for violations of law and regulations and detecting illegal or unauthorized transmissions, and monitoring particular cases which involve work ranging from simple listening to recording and analyzing signals. Effective radio location necessitates that radio bearings be taken simultaneously by several direction-finder stations.

A strong or erratic signal may be observed by these "ears" of the Commission or reported to the field offices. The former can listen in on the transmission and plot its origin. Monitoring stations, in general, do not track down an unlicensed operation. That task is performed by field engineers using mobile and portable equipment.

Each radio district headquarters maintains special cars which can be used for this purpose. Some of them are equipped with all-wave receivers and antenna capable of being operated from the car's battery while the vehicle is in motion. Sometimes it is necessary to observe an illicit station over a period of time. In such cases the receiver can be removed from the car and connected with the power supply in an office, house, tourist cabin, or other base of operation.

Here determinations are made of the call letters employed by the operator as well as the station or stations called, the type of emission, the frequency used, the time and duration of the operation, the nature of the communication, and whether it is in voice, telegraph, or code.

With several portable receivers covering an area, it is then possible to "fix" the general location of the illegal station. Without being too technical, it can be said that this procedure involves the same triangulation method used in determining the position of ships at sea.

After that, a small detection apparatus carried in the hand, trouser pocket, or fastened to the vest can be used by an inspector in proceeding from house to house, floor to floor, and door to door, to observe at what point the strongest signals occur. When that point is reached, the offending apparatus itself must be close at hand. The actual arrest is made by cooperating local Federal officials.

Serious cases are referred to local United States district attorneys for prosecution. The Communications Act prescribes a maximum penalty of $10,000 fine or 2 years imprisonment, or both, for violators. The Communications Act requires all non-Government radio transmission to be licensed, and courts have held that such operation anywhere in the United States or its possessions is subject to Commission approval, both of the transmitter and its operator.

Monitoring activities can be grouped under two main headings, service and enforcement. The 1,883 major monitoring cases handled during the fiscal year was 145 more than in the previous year. This reflects the continued increase of interference complaints proportionate to the number of active operating stations. A definite increase in monitoring cases has been experienced annually since 1945 and it is

expected that this will continue as more and more services and stations are authorized.

MONITORING SERVICE

Service to both the military and industry was performed mainly in solving their interference problems by means of monitoring and direction finding. The greater part of the major interference complaints involve interference caused by unidentified signals which must be traced and identified. The mobile services are particularly vulnerable to interference, and since they deal with safety of life and property, the solution of such interference problems must be prompt and relief immediate. If a transmitter is not tuned correctly, its transmissions may interfere not only with its own communications but to the communications of other services as well.

Typical of the aid given to the aeronautical services was a case involving interference over the entire east coast and traced by long-range direction finder bearings and supplemental mobile unit action to an unauthorized station operating in Tennessee.

Another example involved interference to the American Airlines on the west coast caused by what was described as "Chinese language." Long-range bearings indicated the interference was coming from a point in the ocean off the coast and it was finally traced to one of the several vessels turned over to the Korean Government by the United States Navy.

In addition to resolving interference problems for Government and industry, the monitoring stations engaged in several surveys which resulted in the reclaiming of frequencies not being fully used, thereby enabling them to be reissued. One of the surveys was made for the Department of State which was trying to find "holes" in the crowded bands utilized by all countries for high-frequency broadcasting. A similar survey was made for the government of Eire.

Monitoring stations continued to be of service to both civilian and military aircraft. During the year, the division received 116 requests for assistance involving loss or disabled aircraft. While this represents a decrease since the last fiscal year (140), it still represents a sizeable amount of work and aid in furnishing positions derived from the evaluation of long range direction finding bearings.

This service is available alike to the individual pilot or to the large transocean passenger plane. An instance of aid given to a lost Canadian plane by one monitoring station brought a warm note of appreciation from the pilot. Another case involved furnishing "fixes" to a disabled plane over the Pacific which had been forced to turn back to the mainland after developing engine trouble. Among those on board was a West coast Congressman and the Secretary of the Navy. In still another instance, the FCC direction-finding stations

were called upon to establish a "fix" on a search plane which had spotted a flashing light from survivors on a raft who had been forced down in the Atlantic off Florida during a flight of a C-47 from Puerto Rico to New York. In this instance 37 of the 65 persons on board were saved.

MONITORING ENFORCEMENT

Commission monitoring stations also engaged in a systematic monitoring program for violations of the Communications Act, international treaties, and Commission rules and regulations. These activities in 1950 resulted in the issuance of 9,817 violation notices. This represents a decline in the number of notices issued as compared with 11,679 for the fiscal year 1949, and is due to a decrease in available personnel, the press of active interference complaints which did not leave enough time to cover the spectrum as much as desired, also, to the closure of two monitoring stations during the year, one at Juneau, Alaska, and the other at Point Maldonado, P. R. In addition to the issuance of notices, a continuing campaign of preventative monitoring resulted in clearing the spectrum of thousands of undesirable spurious signals before they became the subject of interference complaints. Also, many illegal radio operations were discovered (see "Investigations").

4. INSPECTIONS

BROADCAST STATION INSPECTIONS

The Commission's engineers inspect the equipment of all stations in the broadcast services—AM, FM, and TV—not less often than once during each station's regular license period. These inspections are made to see that each station lives up to the rules and regulations and complies with its license requirements in rendering an adequate technical broadcast service to the listening and viewing public. All technical operation is reviewed, such as maintenance of directional radiation patterns, authorized power, frequency, stability, modulation including quality of voice or music, and proper lighting of the antenna towers for the enhancement of safety to airborne passengers.

The following tabulation shows the number of broadcast stations of three major classes inspected in 1949 and 1950:

Number of broadcast inspections

Broadcast stations inspected	1949	1950
AM	1,663	1,476
FM	267	306
TV	36	104
Total	1,966	1,886

Discrepancies totaling 1,108 were discovered during broadcast inspections in fiscal 1950, while 1,303 were discovered during 1949. Percentagewise, 66 percent of the inspections resulted in discrepancy notices in 1949, while only 59 percent required this action in 1950, indicating a somewhat higher degree of compliance with the Commission's requirements.

SHIP STATION INSPECTIONS

The United States has continued in the forefront since the year 1910 in the enactment of safety legislation and in its enforcement of international laws for the safety of lives and property at sea. By regularly checking the operating condition of radio communication equipment of passenger-carrying and certain other vessels, both United States and foreign, the engineers of the Commission and its predecessor agencies have vigilantly assisted ship owners and operators to maintain the radio apparatus in a condition of instant readiness for emergency needs.

Number of ship inspections

	1949	1950
United States ships	7,991	6,982
Foreign ships	3,041	3,032
Total	11,032	10,014

The decrease noted is due to the shortage of personnel at maritime offices, such as New York City, which made it impossible to inspect as many vessels in 1950 as were inspected during the previous year.

Discrepancies discovered during inspections of ship radio equipment are totaled below:

Number of discrepancies discovered

	1949	1950
United States ships	8,244	6,960
Foreign ships	1,752	1,943
Total	9,996	8,903

A comparison of figures for 1949 and 1950 discloses no noticeable change in the ratio of discrepancies to inspections during 1950 and indicates the continued need of precise and frequent inspection of ship radio equipment to maintain its readiness for emergency use.

The following table shows the number of discrepancies which were corrected immediately by the licensee or his representative and which were, consequently, cleared during inspection:

Discrepancies cleared during inspection

	1949	1950
United States ships	3,000	2,783
Foreign ships	556	513
Total	3,556	3,296

INSPECTION OF OTHER RADIO STATIONS

Inspections of stations in services other than broadcast and ship totaled 12,755 in 1950 as compared with 10,534 in 1949. Technical deficiencies numbering 3,699 were discovered in 1950 as compared with 2,909 discrepancies revealed in 1949.

With the increased use of radio come added field responsibilities and obligations. Each Commission district office keeps a record of the new stations in its district as they are authorized and these stations are scheduled for inspection at the time of the next trip to that vicinity. However, due to the expansion in the number of such new stations due for inspection yearly and the decrease in the Commission's inspectional force, it has been necessary, in lieu of annual inspections as heretofore, to make an inspection of each station once during its regular license period, which results in a 3-year interval in most cases. Further, in order to avoid unnecessary citations, the Commission has adopted a policy whereby minor discrepancies which are discovered during inspections but which are cleared while the inspection is in progress are not formally cited and the incident is recorded as having been "cleared during inspection".

A further step recently taken by the Commission, and also dictated by a shortage of inspectional personnel, is that by which itinerant aircraft are inspected Nation-wide in a "drive" synchronized with the release of a public notice to the owners of private aircraft, advising them of this effort and the need for their obtainment of required operator and station licenses in cases where these documents have not previously been secured.

5. OPERATOR EXAMINATIONS

During fiscal 1950 the engineering field offices issued 101,226 commercial radio operator licenses of all classes, which was 4,227 in excess of the number handled in 1949.

Applications for radio operator authorizations of the various classes continue to be received in the Commission's field offices in large numbers. Many of these authorizations can only be issued as a result of the applicant having passed a thorough and exacting technical examination, while simpler and less comprehensive operating authorizations are issued without the necessity of the applicant passing a writ-

ten test. With the increasing number of broadcast stations, including those in the TV service, examinations for the radiotelephone classes continue at a high level. The demand for authorizations which permit the holder to engage in the operation of smaller radiotelephone stations, such as those used at base stations in the police, taxicab and highway services, continues to mount.

The Commission gives examinations regularly at its field engineering offices, and at Washington. Additionally, examinations are held regularly at various points throughout the United States, its territories and possessions, where the need for such examinations has been indicated by public request. These "field" examinations are held quarterly, semi-annually or annually as regional needs require.

During 1950, Jackson, Miss., and Phoenix, Ariz., were established as new quarterly examination points. Jamestown, N. Dak.; Manchester, N. H.; Tallahassee, Fla.; Louisville, Ky.; Marquette, Mich.; and Wailuku, Hawaii, were established as new semiannual points. Rapid City, S. Dak.; Springfield, Mo.; Las Vegas, Nev.; and Klamath Falls, Oreg., were established as new points for annual examinations. A complete list of radio operator examination points will be found in the chapter on "Radio Operators".

6. INVESTIGATIONS

Mounting investigative activity was noticeable in 1950 due to the increase in the number of new services inaugurated and to the expansion in services already in operation. The phenomenal public interest in TV reception resulted in a flood of interference complaints which are being investigated by Commission engineers as rapidly as time will permit. During 1950, a total of 8,613 investigative complaints were handled as compared with 7,618 in 1949.

As a result of investigative work relative to licensed stations, operator licenses of a number of amateur and commercial operators were suspended.

In addition to investigative work in connection with licensed stations, the Commission's field engineering personnel and facilities guard against illegal radio operation. One hundred and forty-nine unauthorized stations were discovered and closed down during the year.

One unlicensed operation was traced to an inmate of the Mississippi State prison. Other cases involved persons who tried to operate on particular frequencies, even those used by the military. An increase was noted in the activity of persons attempting to "beat the bookies" through illegal radio use at racetracks. Unlicensed installations operated by individuals attempting to broadcast to communities without benefit of license also continued to be uncovered. Such installations

caused interference to legitimate broadcasting and other radio services. Also discovered was a broadcaster who "jumped the gun" by employing facilities other than those applied for and beginning operations prior to receiving authorization. The speedy discovery of such operations is a lesson to those who fail to realize how diligently the radio spectrum is patrolled around the clock.

During the year, three heavy fines were levied for violation of the Commission's "low-power rules," indicating to those who would employ these provisions for illegal purposes that the regulations do have teeth.

The Commission did not seek prosecution and conviction of all operators of illegal stations detected and closed by investigative action. Prosecution is generally recommended in the case of "repeaters" and those who use radio in a flagrant unlawful manner. Six unlicensed station operators were prosecuted during the year, with resultant fines totaling $3,615, in addition to prison sentences amounting to 19 months. Of the cases previously referred to the Department of Justice, three were still in the process of resolution by that agency.

7. TECHNICAL OPERATIONS

With the continuing expansion of radio, there is a corresponding need for new and improved equipment for use in exercising technical surveillance over the operations of radio stations licensed by the Commission and to obtain propagation data and other information which may be required for consideration in allocating frequencies. To meet these needs, sundry items of equipment were purchased and modifications were made in existing equipment to provide improved operation.

During the year, 84 new engineering projects were assigned to the field offices and monitoring stations as a result of requests from the various offices in the Commission and from other Government agencies. In addition, 44 projects were carried over from the previous year. The total of 128 active engineering projects which involved engineering studies, measurements, and investigations was about 8 percent greater than for the previous year and required a total of 8,751 man-days for completion as compared with 8,685 man-days for 1949.

Following are some examples of engineering project assignments:

The directional patterns of 327 different AM broadcast stations were checked to determine whether their antenna systems were being operated in accordance with their licenses. Measurements were made at 15 AM stations to determine compliance with Commission rules concerning performance of station equipment and included measurements of the frequency response and of the degree of distortion introduced by the station's audio system and transmitting equipment.

The long-range broadcast signal intensity recording program was expanded to include recording above 500 megacycles, with recording installations at 11 monitoring stations and two district offices for AM, FM, and TV broadcast stations, and atmospheric noise involving a total of 37 field intensity recorders. Information obtained is used in connection with allocations studies and in determining range of coverage to be expected from the various classes of stations. Special mobile field intensity recordings were made at three offices using recently available test cars.

In cooperation with other Government agencies and with interested nongovernment organizations, field intensity measurements and surveys were made on the ground and in aircraft to obtain data concerning the characteristics of low frequency carrier current communication devices which will be used in considering promulgating rules for the control of such devices.

Installation of equipment was begun in 12 new investigative automobiles which will replace cars in use since 1942 or earlier. The new cars are designed to permit operation of the receiving equipment and the direction finder by one man from the driver's seat and will improve efficiency and convenience of operation.

Other field activities covered construction of special equipment for monitoring, engineering measurements, and other requirements which cannot be fulfilled by commercially available equipment. A number of tests were made to determine the suitability of various items of equipment for use at field offices and monitoring stations.

8. DISASTER EMERGENCY COORDINATION

The managers assigned to the nine geographical regions maintain continuous contact with officials of wire communications companies, licensees of the various classes of radio stations and amateur organizations to keep the Commission informed of plans to meet any communications emergency. To anticipate emergency communication needs, liaison is likewise maintained with officials of organizations such as the United States Coast Guard, United States Army engineers, military amateur nets, and others concerned with the protection of life and property. In the event of a disruption of communication facilities, reliable amateur contacts form a nucleus that can operate and be responsible for dealing with the Commission in requesting the declaration of a state of communications emergency in any affected area.

There is also close collaboration with the American Red Cross. In order to facilitate this coordination, a TWX communications printer has been installed by the Red Cross at the FCC net control in Washington for direct emergency contact.

Experience in emergencies has shown that immediate coordination of all communication facilities by a central coordinating agency is of the utmost importance to prevent confusion and aid relief operations. Regional managers rendered assistance in the case of emergencies which developed during the year, including the South Dakota and Minnesota blizzard, March 7–11, 1950; the flood resulting from the overflow of the Scagit River in the State of Washington, and the Florida hurricane which occurred on August 26–27, 1949.

CHAPTER VII—TECHNICAL AND LABORATORY ACTIVITIES

1. GENERAL
2. TECHNICAL RESEARCH DIVISION
3. LABORATORY DIVISION

1. GENERAL

One of the Commission's basic functions under the Communications Act is to regulate the use of the radio spectrum in order that this valuable natural resource may be employed as effectively as possible in the public interest. As a foundation upon which to make proper frequency allocation and assignment, it is necessary to have detailed factual knowledge of radio propagation and the capabilities and limitations of transmitting and receiving equipment.

"Radio propagation" is the term used in reference to radio signals and how they react to terrain, water, atmospheric and climatic conditions. Radio waves have a tendency to run wild, bouncing from earth to sky and back again, depending upon the frequency and its characteristics. In assigning appropriate frequencies to the different types of radio services, the Commission must first know about radio wave behavior at every hour of the day, every season of the year, and during sunspot periods and other atmospheric disturbances.

The rapid growth of the land mobile service, expansion of microwave links, adoption of a coordinated system of electronic aids to air navigation, advent of radio location, extension of marine radar, developments in television, and the increase of radio services generally, have contributed to bring about a critical problem in frequency allocation in the upper radio spectrum, i. e., that portion above 30,000 kilocycles. This requires extensive and exacting technical knowledge in order to allocate space and to adopt rules and standards covering its use.

Responsibility for carrying out the Commission's technical studies and research is assigned primarily to two units within the Office of Engineering. They are the Technical Research Division and the Laboratory Division.

Studies of wave propagation are undertaken by the Technical Research Division, field measurements are made by the Field Engineering

and Laboratory Divisions, and the resulting data analyzed by the Technical Research Division. This information is correlated with related work by other Government agencies, the industry, and various colleges and universities. The findings are presented to the Commission in the form of technical reports which are basic considerations in decisions to insure the most economic and efficient use of the radio spectrum.

2. TECHNICAL RESEARCH DIVISION

On October 24, 1949, the name of the Technical Information Division was changed to Technical Research Division. Commission reorganization in April 1950 placed this division under the Office of the Chief Engineer.

The Technical Research Division acts as an operational group and technical consultant to the Commission. For this purpose it organizes projects for the collection of data by the Field Engineering and Monitoring and the Laboratory Divisions and for obtaining data from other organizations. It also participates in the technical studies incident to international conferences and treaties, and represents the Commission in the coordination of radio research, standardization, and instrumentation with Government and industrial organizations.

During its fourteenth year, the technical research unit continued its long-term projects at a decelerated pace while it stepped up activity on VHF and UHF projects. The outstanding work of the year was that growing out of the television hearing and the ad hoc committee studies related thereto. The division continued to carry on special studies and to collect and analyze basic data concerning radio wave propagation as well as other communication problems, and to make the resulting scientific information available to the Commission for guidance in the promulgation of new rules and the determination of technical limitations and practical engineering standards.

A factual knowledge of equipment capabilities and limitations and of radio wave propagation characteristics is fundamental to frequency allocation. The whole structure of radio regulation depends on the soundness upon which this framework is built.

A judicious allocation of radio frequencies to the various radio services presupposes a knowledge of many highly technical and complicated things, including ionosphere and troposphere propagation, terrain, effects, useful intensities of signal as related to various sources of interference, geographical and frequency separations necessary to alleviate interference in accordance with various requirements, equipment capabilities and limitations, new developments and their possibilities, etc.

The Commission requires a detailed knowledge of the propagation characteristics of radio signals throughout the spectrum in order that the most economic and practical allocation of facilities may be achieved. The propagation characteristics of the band of frequencies allocated to a particular service must be consistent with the operating requirements. The allocation of stations within a service, i. e., the determination of cochannel and adjacent channel distance separations, service ranges, and power limitations must be founded on a knowledge of propagation. Such knowledge is best obtained from deductions arrived at through the study and analysis of long-term field intensity measurements involving the use of carefully calibrated recording equipment and requiring the attention of experienced engineers. It is the primary function of the Technical Research Division to obtain such data and furnish highly reliable solutions to the technical problems involved.

VHF AND UHF PROPAGATION STUDIES

Television and FM.—Continuation of the television "freeze" order through the year, made necessary by the injection of many TV considerations, entailed additioned study of VHF and UHF propagation, particularly as related to TV and FM broadcasting. The division was occupied in several lines of activity involving the current hearings. First, at least one member of the division was in attendance at all hearing sessions and engaged in the presentation of testimony and in assistance where technical advice was needed. Secondly, the nearly 10,000 pages of testimony and nearly 300 exhibits were analyzed, classified, indexed, and assimilated for technical information on color TV and a large number of reports concerning engineering matters were prepared for the Commission and its staff. Thirdly, several division members were associated with the work of the ad hoc committee formed in October 1948 for the purpose of investigating the properties of VHF propagation, with the chief of the division as chairman. This committee consists of engineers and scientists from the industry, from the Central Radio Propagation Laboratory of the National Bureau of Standards, and from among consulting engineers who are specialists in this field of activity in private practice.

Ad hoc committee.—On June 8, 1949, the Commission issued volume I of the report of the ad hoc committee and certain associated reference documents prepared by this committee. With this material as a foundation upon which properly directed programs of measurement and study could be formulated, the Technical Research Division investigated the existing facilities offered by the FM and TV broadcasting industries with respect to schedules of program transmissions,

frequency, power, location, and effective antenna height of the stations in operation, and selected locations available to the Commission for taking measurements under conditions where the maximum amount of useful information could be obtained with the limited amount of modern equipment in possession of the Commission. The division analyzed and interpreted the measurements and reported them to the ad hoc committee along with measurements from other sources.

During the year there were seven formal meetings of the ad hoc committee. Working subcommittees were appointed and members of the Technical Research Division actively participated throughout the year in the work of these subcommittees. The findings of working groups were reported to the main committee at its formal meetings from time to time. By the end of the year, the committee had produced another document designated as volume II of the ad hoc committee report along with 11 highly technical reference papers. New methods of evaluating VHF broadcasting service and interference area problems were developed with special attention directed to the complications which have arisen with respect to the deterioration of the quality of TV picture transmissions caused by several other stations operating on the same frequencies and on different frequencies. New methods of preventing these disturbances were also studied and evaluated.

Measurements.—There are a number of tropospheric and terrain propagation effects which must be resolved from actual measurements obtained by the continuous recording of field intensities at various locations. It has been observed that these effects are different and changeable in different sections of the United States. The magnitudes of these differences must be determined before reliable rules can be made for the allocation of TV channels and frequencies for the various radio services proposed in the VHF and UHF ranges. Several other factors relating to this problem also must be resolved in this manner.

The Field Engineering and Monitoring Division, at the request of and in close cooperation with, the Technical Research Division, placed in operation VHF field intensity recording equipment at the Commission's monitoring stations and offices at Millis, Mass.; Laurel, Md.; Powder Springs, Ga.; Houston, Tex.; Allegan, Mich.; Grand Island, Nebr.; Santa Ana, Calif., and Portland, Oreg. The measurements obtained are being analyzed by the division.

The need for additional measurements of this type on both VHF and UHF has been emphasized many times in the TV and FM hearings and at the meetings of the ad hoc committee. The division is constantly engaged in efforts to develop ways and means of obtaining these measurements. Several projects have been operated by the laboratories of the leaders of the industry from which valuable in-

formation has been obtained. Colleges, universities, and smaller units of the industry have indicated a willingness to cooperate in this matter, but they are not able to furnish special equipment of the type required. In order to obtain badly needed measurements, the Commission, during the year, furnished, on a temporary loan basis, two sets of equipment; one to the United Broadcasting Co. and the other to the University of Connecticut.

Bridgeport UHF-TV project.—In January 1950 the National Broadcasting Co. began experimental operation of the first station in the United States to transmit regular TV programs on UHF. For a number of reasons, a site was selected near Bridgeport, Conn., for this station and a channel was assigned on frequencies between 529 and 535 megacycles.

NBC and RCA have installed more than 50 TV receivers with special adapters in homes in and around Bridgeport in order to obtain information regarding the reliability of such equipment in this type of operation and to determine the usefulness of these ultra-high frequencies as applied to the TV service. Extensive measurements utilizing mobile equipment with captive balloons to support the receiving antennas have already been made in the Bridgeport area. NBC is now in the process of analyzing these measurements.

Members of the division have kept in close contact with these developments and have aided in the planning of projects in order to obtain the type of information which will be most useful to the Commission. As a result, continuous field intensity recorders tuned to this station are in operation at the Commission's monitoring stations at Scituate, R. I., and Millis, Mass., over distances of 88 and 116 miles, respectively, and at the University of Connecticut over a path of 62 miles. The equipment for the latter location was assembled and installed by the Commission's Laboratory Division, and is operated by staff members of the university's Electrical Engineering Department.

Land mobile propagation study.—This project involves frequencies in the band 152–162 megacycles and was inaugurated during fiscal 1950 to provide propagation information for use in connection with the administration of land mobile services.

A set of ground wave and tropospheric wave propagation curves of median and 10 percent field intensities versus distance have been calculated and used to determine the expected variations for different antenna heights with 250-watt power. Additional curves are being calculated showing variation of location probability for service versus distance concerning the clear channel case of one interfering station, and the case of six other interfering stations. These cases are computed for antenna heights of 50, 100, 200, and 500 feet at distances of

25, 50, 75, 100, 150, and 200 miles. With reasonable time allotment it is contemplated that the project will be completed in the near future.

Other VHF and UHF projects.—Although most of the time available for study of VHF and UHF propagation was devoted to activities outlined above, considerable work was completed and further work is planned on the following projects:

1. Research and investigation of new methods of modulation with respect to the relationship between these new methods and propagation conditions affecting frequency allocation problems. In particular, a comprehensive study was made of the use of frequency modulation as applied to TV video carrier transmissions.

2. Study of the sensitivity, selectivity, and noise characteristics of new TV receivers in relation to channel allocation theory, and investigation of new developments in measurement techniques.

3. Study of skywave propagation on frequencies between 25 and 50 megacycles.

4. Study of the time and space correlation of fading of signals transmitted over several different paths.

5. Study of the time continuity of service considering variable interfering signals superimposed upon a variable service signal.

6. Study of results of tests made on equipment developed by the Bureau of Standards for the purpose of automatically integrating and recording field intensity measurements. In a test run at the Laurel monitoring station it was found that considerable time could be saved with this equipment. However, no funds have been available for the purchase of new equipment.

7. When it is possible to obtain new measurements, the study of the terrain effects upon wave propagation will be continued.

MEDIUM FREQUENCY PROJECTS

Sunspot cycle recordings.—Solar activity has a profound effect upon radio wave propagation. During daytime hours, AM broadcast stations are heard over relatively short distances only. At night, skywave signals may be heard from distant States as well as from Mexico and Canada. The cycle of solar activity as indicated by sunspot numbers covers a period of about 11 years; however, the spots of succeeding cycles are of opposite magnetic polarity, so that a 22-year period is involved for definitive testing of these effects. The Commission's sunspot cycle project was inaugurated in 1938 and is still active. Continuous recordings of broadcast signals are being made at Baltimore, Grand Island, Portland, Powder Springs, and from time to time at other points.

These data are needed to supplement that taken in previous years. Additional recordings must be done to cover the full cycle at all loca-

tions and for all frequencies. Coordination of this information with similar data recorded in Canada was continued during the year and will be continued for some time to come.

An extensive analysis of the accumulated data was begun to determine the nature and magnitude of the medium frequency skywave propagation effects corresponding to variations in solar activity during the last sunspot cycle.

Atmospheric noise.—Continuous field intensity recordings of atmospheric noise between 200 and 1,600 kilocycles were continued. This information is analyzed and correlated with thunderstorm data and the results are used in the preparation of a series of noise maps to show characteristic variations with the time of day and a percentage of time for each frequency band and for various latitudes. These maps are used in estimating the signal level required to provide an acceptable radio service in the presence of atmospheric noise and, hence, the possible service ranges when interference from other stations is absent. Because of the pressure of other duties, analyses and map preparation could not be undertaken during fiscal 1950.

TECHNICAL STUDIES AND STANDARDS

General.—The rapid increase in the number and kinds of new radio services has produced a new array of technical problems. Each new service requires the preparation of specific rules including technical definitions, equipment requirements, and operational limitations. This often requires intensive studies involving formation of committees representing other Government agencies as well as industry. Whenever technical difficulties are encountered, the various divisions of the Commission turn to the Technical Research Division for assistance. Problems of this nature have increased to a marked extent. Additional technical standards have become necessary not only in the new radio services but also in the better established services where new techniques and new developments have made changes in the rules and regulations imperative. Due to the large number of receivers being sold, especially in the broadcast field, the number of complaints concerning interference have risen rapidly. This factor alone has forced the Commission to make special studies and set up joint Government-industry committees with a long range view toward the alleviation of the many troublesome interference problems.

Restricted radiation devices and low-power rules.—During the previous year the Commission's low-power rules became the subject of serious consideration, partly because of complaints of interference in the broadcast band from certain low-power systems and devices, and partly from the demand of the industry for clarification of the present rules. The Technical Research Division sponsored a committee to

study the problem and make recommendations to the Commission. This work was organized as a joint effort in which Government agencies and the electronics industry participated. Several Government-industry meetings were held. Extensive experimental programs were carried out in which the Air Force and the Civil Aeronautics Administration, as well as the Bell Laboratories, the Tennessee Valley Authority, and others participated. For the first time the radiation from carrier current lines was measured in the air. This was made possible through cooperative efforts. The Air Force furnished a suitable airplane; the Bell Laboratories furnished measuring equipment; the FCC, TVA and others furnished personnel, transmitters, sites, etc. The data obtained are now being analyzed and gives promise of throwing much light on a previously little explored subject.

Incidental radiation devices.—This subject is being treated as a corollary project with that of restricted radiation devices. Many devices, such as receivers, motors, generators, fluorescent lamps, ignition systems, etc., produce interfering radiations which are purely incidental to the purpose for which they are operated. The amount of interference resulting from such devices has increased so rapidly that it now behooves both industry and the Commission to make extensive investigations of the cause and effectuate remedial measures.

Receiver radiation.—Probably the most prolific offenders in the incidental radiation field are FM and TV receivers. Radiation from FM and TV receivers cause interference not only to FM and TV reception but to certain safety devices such as navigational aids in the aviation service. During the year the FCC held an engineering conference on this matter. A special central committee was set up to work on the problem with standing committees in the radio industry. These groups have since developed suitable methods of measurement and proposed interim standards of performance which give promise of relief from much of this interference. While progress has been made there still remains much work to be done. The Commission will continue to sponsor and encourage better circuit design and more effective suppression methods among the manufacturers of all kinds of radio receivers.

Coordination of technical rules.—With the large number of new radio services recognized by the Commission, the problem of coordinating the various technical phases of the rules for one service with those of other services has become a necessity. The responsibility for such coordination with a view to uniformity throughout all services has been charged to the Technical Research Division. This work will be expanded.

Single side band suppressed carrier studies.—With the ever-increasing demand for frequency space, engineers have turned to the single

side band suppressed carrier method of operation because it offers a saving in the bandwidth requirements. Many technical questions have arisen concerning the actual bandwith needed for various types of modulation, the methods of calculating and specifying power, etc. The study of these problems was accelerated early in the year but, due to the pressure of other work, was left for future attention.

Radiolocation.—The importance of crude oil in the present economy is evident. At present one of the most productive areas lies under water along the continental shelf in the Gulf of Mexico. In prospecting for oil from ships it becomes highly important to be able to locate a previously established point with exceptionally good accuracy. Radiolocation is a radio method which makes such accuracy possible. Since several different radiolocation systems have been developed, and because the Commission has been asked to grant authorizations involving the use of radio frequencies for such systems, it became necessary to make an engineering study of all the systems in use. Additional work will be carried on in order that the necessary technical knowledge will be available when hearings relative to the subject are scheduled.

GOVERNMENT-INDUSTRY COMMITTEES

The Commission is represented by its Technical Research Division on a number of important standing committees of Government and industry. Among these are executive groups of the Central Radio Propagation Laboratory, the URSI (International Radio Scientific Union) and CCIR (International Radio Consultative Committee), committees of the Institute of Radio Engineers and the Radio Manufacturers Association, and panels of the Committee on Electronics of the Research and Development Board. The chief of the division served as chairman of the Central committee which coordinated technical work related to restricted radiation devices. As indicated elsewhere, he continued to serve as chairman of the ad hoc committee on television.

TECHNICAL CONSULTING SERVICE

In addition to furnishing technical advice to the Commission, the division is called upon to answer technical questions of other Government agencies, industry, and private engineers. During the past year demands of this nature increased far beyond those of any previous period, and backlogs in routine work developed.

3. LABORATORY DIVISION

GENERAL FUNCTIONS

The Laboratory Division of the Commission is located near Laurel, Md. This division makes technical measurements and engineering investigations to assist the Commission in allocating frequency bands,

establishing and revising engineering standards and regulations for new as well as existing services, and establishing regulations covering noncommunications type of equipment employing radio-frequency energy which may interfere with the radio communications services.

Examples of the Laboratory Division activities are:

1. Investigation of various methods of transmission and reception to determine which method permits the most efficient utilization of the spectrum and to determine the interference factors which limit the various methods.

2. Tests of transmitters to determine whether interference signals are emitted on frequencies other than the assigned channel.

3. Tests of receivers to determine how close together the Commission might place stations without the listeners receiving several stations at the same time.

4. Tests of receivers to determine what interference they may produce in other nearby receivers either in the same service or in other services.

5. Tests for reliability of operation of equipment such as apparatus involving safety at sea. This type of equipment is required by the Commission's rules and regulations or by treaty.

6. Tests of the accuracy and reliability of monitoring equipment required to be used by stations.

7. Investigation of interference produced by noncommunication uses of radio-frequency energy.

The work of the laboratory generally is directed towards the testing of a type of equipment rather than the testing of individual units. Attempt is made to anticipate interference problems and to have remedial measures taken prior to the manufacture and distribution of a large number of units instead of waiting until the interference occurs in the field and requires numerous individual investigations. After a large number of units have been distributed the solution of the interference problem generally will be only of a "patchwork" nature, and in many cases may be practically impossible of solution without a serious waste of useful frequencies. In some instances type tests are required by the rules and regulations, and formal approval is given. In other cases the laboratory makes type tests not specifically required, in order that the Commission may be aware of the existing service and interference problems encountered in practical operation, so that either the allocation structure may be designed to fit the units available or the Commission may take other action leading to improved equipments which will permit more efficient use of the available radio frequencies. Type testing also is required of certain noncommunications equipment, such as diathermy machines which employ radio frequencies and may cause serious interference

unless the frequencies are properly maintained and the harmonic and spurious emissions sufficiently restricted.

Following is a summary of particular laboratory activities engaged in during the year.

BROADCASTING

Because of the current TV hearing a great amount of effort has been devoted to TV studies. These studies mainly concern TV interference problems since they lie in a no-man's land of which far too little is known. Interference is a most severe problem in the TV broadcast service. Why this is so can be seen from the following discussion.

An ordinary standard (AM) broadcast channel is only 10 kilocycles wide. At 1,000 kilocycles this channel width is 1 percent of the operating frequency. A TV channel is 6 megacycles wide. At 60 megacycles this represents a width of 10 percent of the operating frequency. This indicates that the interference problem in TV may be expected to be some 10 times greater. Although this percentage factor becomes smaller as we go to the upper VHF channels and to the UHF channels, other problems counteract any tendency for the interference problem to decrease. In fact, all indications are that the interference problems will increase.

Laboratory field tests were made on unsynchronized operation and with various values of offset carrier to obtain interference reduction for the several color TV systems proposed. Tests also were made covering the interference to the several proposed systems by other signals and by various propagation phenomena. With regard to the UHF part of the spectrum, tests were conducted on proposed receivers and converters to determine the problems involved. One of the studies indicated that the intermodulation problem may become a factor limiting the allocation in this portion of the spectrum.

Studies have been made of other technical problems involved in the several proposed color TV systems, including the problem of integrating one or more of the proposed systems into the present TV structure. Five exhibits, together with testimony, were presented in the hearing and further studies will be offered in the later phases of the hearing.

In addition, the laboratory made arrangements for the three comparative TV demonstrations, at which the operation of the three proposed systems could be viewed side-by-side under comparable conditions. One of the demonstrations was held at the laboratory. At the first of these demonstrations the Laboratory Division demonstrated an automatic device, developed by two Commission engineers, which when connected to a receiver permitted the reception, in black and white, of either signals transmitted on the present standards (or

on compatible standards), or signals transmitted at a different field and line frequency. A patent application has been filed.

Preliminary investigations are under way at the laboratory with regard to the proposal to use sampling techniques to obtain more efficient use of the spectrum. These tests involve not only the increase which may be expected in the useful information transmitted, but also the problems of interference which may be inherent in the employment of this new process.

A study was made of the problem of reducing the severity of interference to the aviation service caused by oscillator radiation from FM broadcast receivers, which interference is causing severe difficulty with navigational aids for aircraft in a number of areas.

Studies also were made concerning the effects of locations of TV broadcasting or FM broadcasting towers or antennas in the vicinity of directional antenna systems employed in the AM broadcast band.

One modulation monitor and one frequency monitor for AM broadcast station operation were tested and approved during the year.

SERVICES OTHER THAN BROADCASTING

Further studies and measurements are under way in the laboratory on the problem of intermodulation, which severely limits the efficient use in the same geographical area of a large number of stations on the higher VHF and UHF frequencies. Indications are that the adjacent channel selectivity of receivers employed in the various land mobile services has been materially increased in the last year. No such general improvement appears with regard to intermodulation interference effects. As a result, the intermodulation effects may become the limiting factor in allocation rather than the adjacent channel selectivity of the receivers.

Further tests were made on a number of units proposed to be used for distress use on radiotelephone-equipped ships. A number of units intended to operate on the standards proposed by the United States were designed and constructed at the laboratory and furnished the Marine Division for forwarding to foreign governments for testing.

Several models of a proposed keyer for sending the distress signal on radiotelegraph-equipped ships were submitted to the laboratory during the year but they were found not to comply with the Commission's requirements.

A number of laboratory tests were made on equipment submitted by applicants for licenses in the citizens radio band. These tests indicated that much of the converted war surplus equipment could not be expected to operate in accordance with the Commission's rules and regulations.

Numerous other devices in the citizens band, such as garage door

openers, walkie-talkies, etc., were tested during the year but no approvals were given except to a small unit for the control of model aircraft.

PROPAGATION

The laboratory operated a 400-megacycle transmitter at Dan's Rock, Md., for approximately 6 months during the year. Recordings were made at Laurel, together with other measurements at fixed and mobile locations. These measurements were to obtain information at frequencies near those proposed for the UHF TV band and for the operation of land mobile services. The laboratory also installed field intensity recording equipment at a distance of approximately 62 miles from the UHF TV station operating experimentally at Bridgeport, Conn.

CALIBRATION OF APPARATUS

In its enforcement and investigation activities, the Field Engineering and Monitoring Division uses a large amount of technical equipment. During the year 6 field intensity sets and 12 signal generators were calibrated at the laboratory for such use.

NONCOMMUNICATIONS EQUIPMENT

Industrial heating, medical diathermy, and other miscellaneous uses of radio-frequency energy for purposes other than communication have expanded to such an extent that the power used by this classification of equipments exceeds the total transmitter power required for radio communication. Since this noncommunications equipment employs frequencies of the same order as used by the communications industry, severe interference may be expected unless these units are designed and operated properly. Some of these units use power far in excess of the 50 kilowatt maximum permitted AM broadcast stations. Devices in this category are covered by part 18 of the rules and regulations of the Commission. Medical diathermy apparatus which falls within this general category is type approved by the laboratory to insure that the frequency is maintained within one of the specified bands and that the harmonic and spurious radiations are within the limits of the Commission's rules and regulations. During the year 36 submissions of diathermy machines were received for test.

The Laboratory Division has been represented on the following committees which are working toward the reduction of interference from industrial radio-frequency heating equipment: I. R. E. Industrial Electronics Committee, A. I. E. E. Subcommittee on Induction and Dielectric Heating, and A. I. E. E. Subcommittee on Radiation Measurements Above 300 Megacycles.

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CHAPTER VIII—FREQUENCY ALLOCATION AND INTERNATIONAL

1. GENERAL
2. FREQUENCY ALLOCATION
3. INTERDEPARTMENT RADIO ADVISORY COMMITTEE
4. FREQUENCY REGISTRATION AND NOTIFICATION
5. INTERNATIONAL

1. GENERAL

The radio spectrum is a comparatively small part of the electromagnetic spectrum in which waves of electrical energy can be used for communication purposes. These waves are transmitted on frequencies which are measured in "kilocycles" and "megacycles." A megacycle is a convenient way of denoting 1,000 kilocycles.

For convenience, the radio spectrum below 30 kilocycles is known as the VLF (very low frequency) range; from 30 to 300 kilocycles, LF (low frequency); from 300 to 3,000 kilocycles, MF (medium frequency); 3,000 to 30,000 kilocycles, HF (high frequency); 30,000 kilocycles to 300 megacycles, VHF (very high frequency); 300 to 3,000 megacycles, UHF (ultra high frequency); 3,000 to 30,000 megacycles, SHF (super high frequency), and 30,000 to 300,000 megacycles, EHF (extremely high frequency).

Before World War II, the usable portion of the radio spectrum was limited to between 10 kilocycles and 300 megacycles. However, developments spurred by that conflict made it possible thereafter to extend the potentially useful radio spectrum to 30,000 megacycles. However, for practical purposes, the present ceiling for commercial utilization is around 10,000 megacycles (10,000,000 kilocycles). The result is that today's demand for frequencies far exceeds the number available for current practical use.

It is customary to speak of the spectrum space occupied by each radio service as a "band," meaning a group of frequencies allocated for the use of a specified service. These bands are further broken down into "channels" which are, in effect, the traffic lanes assigned for the transmissions of individual stations. Within these channels each station operates on a designated frequency, which means that it transmits so many waves per second.

However, not all channels are the same width. Some types of transmission require wider paths than others. Thus, an FM broadcast

station needs a channel 20 times wider than that used by an AM station, while a TV station requires about 600 times the spectrum space occupied by an AM station. In the nonbroadcast field, too, channel widths differ according to the requirements of the particular service. Also, the nature of a service is an important factor in determining its position in the radio spectrum. Each band has certain characteristics which must be taken into account in deciding the kind of stations which can best use it. Utilization of frequency bands, especially in the upper reaches of the spectrum, is further determined by the development and availability of apparatus able to use those frequencies.

In the early days of radio regulation a few kilocycles one way or another way was of little importance. Later, with the filling of the spectrum, the problems of interference between stations grew proportionately, and it became necessary to define more precise channel boundaries, engineering standards, and other technical requirements.

A fundamental task of the Federal Communications Commission is to allocate the radio spectrum to the various radio services and to write the rules and regulations to govern the operation of stations in those services on the particular frequencies that are assigned to them.

It would be wasteful and chaotic to attempt to operate a broadcast station on one frequency and, say, a police radio station and a ship radio station on adjacent frequencies. There must be respective bands of frequencies for the two score radio services with which the Commission deals, and within these bands assignments of particular frequencies must be made to individual stations. Thus, frequency "allocation" refers to setting up bands of frequencies for the use of the various radio services, while frequency "assignment" pertains to assigning a specific frequency for use by a particular station.

Frequency allocation is a complex subject. It may, in brief, be likened to building communication highways in the spectrum. In ordinary road building there is a wide choice of land routes. However, most of the usable radio lanes are already crowded and, unlike land traffic, radio transmissions cannot be routed by underpasses and overpasses. Neither do they obey traffic signals to allow other traffic to pass, or go just to the point where they are to be heard. They spread out to thousands of other points as well, crossing political and geographical boundary lines in all directions.

As the spectrum becomes more congested, interference grows in seriousness. It can come not only from domestic stations, but also from foreign stations. That is why mutual working arrangements between nations to handle radio's expanded usage is necessary. Foreign merchant ships cannot, for example, employ for radar the bands which the United States uses for television. Consequently, radiotelephone and radiotelegraph bands must be shared by such stations of all na-

tions, and the ship and aeronautical bands must likewise be shared, and so must the broadcasting bands.

The international aspect of radio has developed to such an extent that almost no major frequency allocation can be made without considering world-wide usage. Hence, the primary allocation of frequencies is now determined by international treaty or other agreement. In this connection, the Federal Communications Commission is called upon by the Department of State to do a large share of the preparatory work for international radio conferences, and to furnish a large proportion of United States delegates and advisers to these conferences.

The direction in which a radio signal will travel and the frequency of the radio signal can be controlled. However, the distance a radio signal will travel cannot be controlled. It is this extended travel of radio signals which requires United States participation in international conferences to work out allocation, interference, equipment, and other radio problems, not to mention common carrier rate and regulatory matters.

By international agreement, the radio spectrum is allocated in such a way as to minimize interference between radio stations in different countries. Frequently, interference arises between stations in the United States and stations in other countries because of unusual propagation conditions, congestion in the radio spectrum, and imperfections of radio transmitters and receivers. In order that there be an uninterrupted flow of radiocommunication into and out of the United States, as well as within our own borders, interference cases reported by the Commission's monitoring stations, by the Commission's licensees, and by other governments must be resolved on an international basis.

The Commission examines and transmits to foreign administrations, through the Department of State, and to United States Government radio operating agencies, reports of treaty infractions so noted. Many of these infractions concern safety of life and property, particularly when they involve violations of the regulations regarding distress frequencies.

The international treaties to which this country is a party stipulate certain technical requirements which must be satisfied by equipment used within the various services. These requirements are intended to minimize interfence and to provide for further improvements in radio apparatus so that added uses can be made of the radio spectrum.

2. FREQUENCY ALLOCATION

The events of principal significance in the field of frequency allocations fall broadly into two categories. The first is the various continuing regulatory work of the Commission having to do with frequency allocations and the second is the project in which the United

States currently is engaged in preparing for bringing into force the International Table of Frequency Allocations below 27,500 kilocycles. The Atlantic City Table of Frequency Allocations above 27,500 kilocycles is now in force and part 2 of the Commission's rules contains the Commission's allocation table which is in accordance therewith.

FREQUENCY ALLOCATION BELOW 27,500 KILOCYCLES

The Atlantic City Radio Conference of 1947 adopted a complete set of radio regulations which is appended to the Convention of the International Telecommunication Union. These regulations became operative on January 1, 1949, but a provision stipulated that the table of frequency allocations below 27,500 kilocycles will not come into force until the effective date of the new international frequency list. Committee 6 of the Atlantic City conference was assigned the task of writing a frequency list for bands below 27,500 kilocycles but time did not permit its completion. Therefore, the conference established the Provisional Frequency Board to carry on this project. The board was charged with drafting lists of the world's frequency assignments in the bands generally between 14 kilocycles and 27,500 kilocycles. This work began in January 1948 and continued until February 1950.

Five principal radio services are recognized internationally in this portion of the spectrum, namely: Aeronautical mobile, broadcasting, maritime mobile, fixed, and amateur. The amateur service requires no frequency list but operates in a band allocation. The status of each of the other services, insofar as the PFB is concerned, is outlined in the following paragraphs:

Aeronautical mobile service.—An allotment plan of frequencies for areas was developed for the aeronautical mobile service (air to ground communication). These allotments do not specify specific assignments of individual frequencies to individual stations, but such assignment plans were considered at various International Civil Aviation Organization conferences during fiscal 1950 in preparation for the Extraordinary Administrative Radio Conference scheduled to convene at The Hague in September 1950.

High-frequency broadcasting service.—The Second International High Frequency Broadcasting Conference was held in Mexico City between October 22, 1948, and April 10, 1949. It resulted in an agreement, a final protocol and a basic plan for the distribution of channel hours for high-frequency broadcasting for one of the principal sunspot numbers and seasons. The United States was unable to approve this plan, however, and the Mexico City session provided that subsequent studies be made for other sunspot numbers and seasons.

These studies were undertaken first by a Technical Plan Committee comprising representatives from the United Kingdom, the USSR,

France, Australia, and about a dozen smaller countries with the United States participating as an observer, in Paris from June 22 to December 5, 1949, and by a second session of the High Freqency Broadcasting Conference in Italy in April 1950. This latter conference was in session at the close of the fiscal year.

Maritime mobile service.—The Provisional Frequency Board completed the drafting of a plan of assignments for the maritime mobile (telephone) and coastal telegraph stations of the world and has submitted these plans for consideration of the forthcoming Extraordinary Administrative Radio Conference.

Fixed service.—The Atlantic City Table of Frequency Allocations represents a reduction of spectrum space for the fixed service in order to provide more space for high-frequency broadcasting service, exclusive bands for the aeronautical mobile and maritime mobile services, and for other reasons. Outlining the responsibilities of the Provisional Frequency Board proved to be a most difficult task, principally because the various administrations requested far more frequency assignments than could be accommodated. As a result, the board did not complete the drafting of an assignment plan for the fixed service but reports of its various working groups concerning individual frequency bands are being made available to the Extraordinary Administrative Radio Conference.

It was agreed at Atlantic City that, when assignment plans for the several high-frequency services had been completed, a special conference of the ITU would be called for the purposes of approving the international frequency list for the bands below 27,500 kilocycles. Since a complete draft was not prepared in the time allotted, the Administrative Council of the ITU provided that an Extraordinary Administrative Radio Conference would be convened during September 1950, in lieu of the special conference envisaged at Atlantic City.

In addition to providing for drafting assignment plans for the four principal high-frequency services described above, the Atlantic City conference left to the three regions of the world the planning for implementation of the so-called regional frequency bands which lie generally below 4,000 kilocycles. The American hemisphere falls in region 2 for frequency allocation purposes. A conference of region 2 countries was held in Washington from April 25 to July 9, 1949. The proposal of the United States was, in effect, adopted by this conference, and provided that each country would prepare a list of its own assignments for coordination with such countries as may receive harmful interference from the assignments proposed. After coordination, these lists will be submitted to the ITU for inclusion in the first edition of the new international frequency list.

The following represents the status of the work done in the United States since the close of the region 2 conference:

The Commission prepared a list of non-Government stations and integrated it, on an engineering basis, with the corresponding United States Government lists, to form a United States frequency list for certain regional frequency bands. The frequency bands involved 150–415, 415–535, and 1,605–2,000 kilocycles.

In the band 535–1,605 kilocycles, no initial technical coordination is contemplated, since the region 2 conference provided for furnishing ITU the lists of assignments of the individual countries, taking into account bilateral and multilateral agreements, and since the assignment plans for the broadcasting service in this band for North America are currently scheduled to be considered at the North American Regional Broadcasting Conference to be held in Washington in September 1950. It is expected that whatever assignments for the United States result from this conference will be furnished the ITU for inclusion in the first edition of the new international frequency list.

The Commission has, since January 1948, provided the secretariat for the Washington Provisional Frequency Board Liaison Committee. This group (WPFBLC) assisted the Department of State in providing liaison between United States representative to the Provisional Frequency Board at Geneva and United States agencies interested in that work. During the fiscal year, until February 28, 1950, the PFB was engaged in compiling a list of world frequency assignments as a step toward implementing the Atlantic City Table of Frequency Allocations below 27,500 kilocycles.

NATIONAL FREQUENCY ALLOCATION

The domestic table of frequency allocations, which is in conformity with the Atlantic City Radio Regulations, was adopted as a portion of part 2 of the Commission's rules. Since the table came into force, some 20 amendments have been adopted. The list follows:

Frequency band	Amendment No.	Date	Description—Section number
		7- 1-49	Effective date, pt. 2 revised to 27 Apr. 1949.
	37344 (2-2)	7-14-49	Order amending sec. 2.405 "Operation during emergency" to prohibit transmission "on frequencies other than, or with power in excess of, that specified in the instrument of authorization" during such emergency.
1,750–1,800 kc	38735 (2-3)	8-11-49	Order amending sec. 2.104 (a) extending temporary allocation to the Radiolocation service to 2-17-50.
	40988 (2-4)	11- 9-49	Revised appendix to pt. 2 containing list of laws, treatics, agreements, and arrangements relating to radio to bring list up to date.
148.14 Mc	36059	6-15-49	P. N. proposing amendment of (pt. 9 and) secs. 2.1 and 2.104 (a) to add definitions of Civil Air Patrol land and mobile stations and to make the frequency 148.14 Mc. available to these stations (includes new US21 footnote.)
148.14 Mc	40998 (2-5)	11- 9-49	Order adopting amendments as proposed in P. N. 36059 (6-15-1949).
148.14 Mc	(2-10)	4-25-50	Correction of (2-5) for omission of US 17.

Frequency band	(Amendment No.) P. N.	Date	Description—Section number
35.2–36.0, 43.2–44.0 Mc	39781	9– 7–49	Proposed amendment sec. 2.104 (a) to subdivide the allocation of these bands to agree with actual licensing practice; and to restrict land stations using these bands (by proposed NG 12 footnote) to communication with mobile (except TV pick-up) stations, and; amendment section 2.1 revising definitions of industrial scientific and medical equipment and meteorological radar station, and; amendment sec. 2.103 revising clause permitting use of frequencies on temporary basis in exception to the table of frequency allocations and revising clause permitting use of frequencies by experimental stations.
3,500–3,700, 6,425–6,575, 11,700–12,200 Mc.	39781	9– 7–49	
35.2–36.0, 43.2–44.0, 3,500–3,700, 6,425–6,575, 11,700–12,200 Mc.	*43565* (2–6)	*1– 5–50*	*Order adopting amendments to pt. 2 as proposed in public notice 39781 (9–7–1949).*
420–460 Mc	44409	1–11–50	PN proposing amendment sec. 2.104 (a) footnote US 11 *to permit extension of use of band by aeronautical* radionavigation service to Feb. 15, 1953.
	45702 (2–7)	2– 8–50	Order extending date (to Feb. 15, 1953) after which the aeronautical radionavigation service will not be permitted use of the band *(footnote US 11).*
420–450 Mc	45704 (2–8)	2– 8–50	Order extending amateur peak power limitation (50 watts) in this band to Feb. 15, 1953, amending footnote US 18, sec. 2.104 (a).
1,750–1,800 kc	45772 (2–9)	2–15–50	Order amending sec. 2.104 (a) footnote (2) extending the temporary allocation of this band to the Radiolocation service to 8–17–1950.
162–174, 406–420 Mc	50889 (2–12)	6–22–50	Order amending sec. 2.104 (a) adding new footnote US 25 to these Government bands, containing list of frequencies available for non-Government use for transmission of hydrological and meteorological date.
140.58 Mc	50890 (2–12)	6–22–50	Order amending sec. 2.104 (a) deleting footnote US 7 effective 9–1–1950. This deletes interim emergency aeronautical mobile calling frequency 140.58 Mc which is in a Government band since regular emergency calling frequency 121.5 Mc will be fully implemented by 9–1–1950.
	48763 (2–11)	5–15–50	Order amending appendix to pt. 2 making certain additions and deletions to the List of Treaties, Arrange*ments and agreements to bring list up to date.*
940–952 Mc	42077	11–25–49	Proposed amendment to (pt. 4 and) sec. 2.104 (a) to delete footnote NG 13 as proposed Part 4 would list specific assignable frequencies.
162–174 Mc	51019	6–27–50	*Proposed amendment to sec. 2.104 (a) footnote US 19* to permit non-Federal conservation agencies to use 2 of the frequencies in this band previously available only to non-Federal forest fire fighting agencies.
10–535–Kc, 535–1605 kc, 1605 kc.	38578	7–29–49	Adopted order separating the (low power rules) docket into 4 parts; A—Incidental radiation devices; B—Carrier current communication systems and restricted radiation devices (10–535 kc., C—Restricted radiation devices above 1605 kc, D—Restricted radiation devices, 535–1605 kc. The ablve will affect the provisions of Section 2.103 of Part 2.
1750–1,800 kc	47525	3–23–50	Public notice setting date for informal conference on the proposed "disaster service" and setting forth basis for future rules. The above will affect Section 2.104 (a) of pt. 2 of the Rules.

3. INTERDEPARTMENT RADIO ADVISORY COMMITTEE

The Commission does not license United States Government radio stations or assign their frequencies. Such frequency assignments are made by the President upon recommendation of the Interdepartment Radio Advisory Committee (IRAC), composed of 11 Federal agencies. The Commission provides the secretariat of the IRAC.

During the fiscal year the IRAC approved 6,966 new and deleted 1,574 regular assignments, bringing the total of outstanding regular assignments to 64,265. In addition, it approved 863 changes in assignments, 2,363 temporary assignments, and 470 deletions of temporary assignments. In all, it processed a total of 12,439 applications.

4. FREQUENCY REGISTRATION AND NOTIFICATION

The past year required extensive changes in the Commission's frequency records. A large majority of the estimated 50,000 frequency card records (exclusive of government records) comprising the Commission's Master Frequency Record were changed to conform to the Atlantic City Radio Regulations, modified licenses were issued and the ITU notified accordingly.

Each new authorization issued by the Commission is incorporated into the Master Frequency Record by the preparation of a card record for each frequency, and each succeeding authorization is compared with the terms of the preceding one and the changes incorporated into the original card record. From these cards, intermixed with those produced from lists furnished by the several Government agencies, the frequency notifications to the ITU are prepared to safeguard the priority of frequency use by United States stations. In addition, cards and notifications are prepared to keep the station lists published by the ITU up-to-date as far as the United States is concerned.

The task of converting all of the present cards in the master frequency record to the format and column numbering system specified in the Atlantic City radio regulations, and bringing this record into agreement with the international frequency list, remains to be accomplished.

The following tabulation is a summary of the past year's activities, other than routine notifications. The dates shown are those of the radio service bulletins in which they were recorded:

Aug. 1, 1949 — Notification of bandwidths of emission was initiated.

Oct. 1, 1949 — Change of card records and notifications of FM broadcasting stations from "Special for FM" emission to "F3" was begun.

Nov. 1, 1949 — Resumption of notification of Commission licensed aeronautical stations for publication in the list of aeronautical and aircraft stations. (Notification of Government aeronautical stations and all aircraft stations has not yet been resumed.)

Dec. 15, 1949 — (*a*) Frequency notification for Commission authorized internationl broadcasting stations on special service authorization was made.

(*b*) Bandwidth of emission was notified for all international fixed telegraph stations.

Jan. 1, 1950 — Change of card records and notifications of FM broadcasting stations to 180F3 emission was begun.

Jan. 15, 1950 — Change of the "name of station" of all broadcasting station card records and notifications from transmitting sites to studio locations.

Feb. 1, 1950 — (*a*) Frequency notifications for all Commission authorized aeronautical fixed stations in the international service were sent to Geneva.

Feb. 1, 1950 (Con.) (*b*) Notifications for Commission authorized aeronautical radiolocation stations were prepared for the list of radiolocation stations.

1950 The task of collecting statistics of the numbers of Commission authorized and Government stations of the several classes, and the numbers of messages transmitted during the calendar year 1949 was initiated.

5. INTERNATIONAL

TREATY ACTIVITIES

Cooperation with Canada.—With the rapid occupancy of VHF non-Government fixed and mobile bands, a serious problem of interference arose in the case of United States and Canadian assignments made near the border of the two countries. In cooperation with the Department of State, discussions were held in Ottawa. As a result, the Commission and the Canadian Department of Transport, on May 3, 1950, announced the adoption of a coordination procedure for the exchange of engineering information and comments concerning proposed frequency assignments to civil fixed- and mobile-radio services in certain VHF and UHF frequency bands.

The purpose of this procedure is to enable Canada and the United States to ascertain, in advance of making assignments to stations not previously authorized to use such frequencies, whether a proposed assignment would be one which would be likely to cause or suffer harmful interference from a previous assignment by the other country. It is believed that this procedure will materially minimize interference between stations of the two countries.

International interference cases.—During the fiscal year, 315 new cases of international interference came to the Commission's attention. These, plus some 70 cases which existed at the beginning of the fiscal year, were handled by the Commission's frequency allocation and treaty division, in some cases with the assistance of the Department of State and other divisions of the Commission. Because of the long-term nature of the negotiations involved, some 100 cases remained unsolved at the end of the year. A new procedure was put into effect which greatly shortens the time formerly required by the Commission's staff to handle complaints of international interference involving United States Government stations.

Reports of treaty infractions.—The currently effective Atlantic City Radio Regulations provide that the different nations shall report infringements of the convention or radio regulations to the responsible administrations. An internationally standard report form is prescribed. A total of approximately 3,000 treaty infraction reports prepared by the Commission's Field Engineering and Monitoring Division were forwarded to the appropriate telecommunication agencies in 147 foreign countries. Prior to forwarding, these reports were

processed to insure that citations were based upon the appropriate treaty provision. A procedure was put into force during the year whereby the former total of about 400 reports per month received, processed and forwarded, was reduced to about 150 per month.

Special studies were conducted by the Frequency Allocation and Treaty Division concerning the future international consideration of the problem of VHF assignments and their growth in view of the propagation conditions which frequently cause international interference over great distances.

Studies were begun relating to the United States proposals to be prepared for the revision of the general technical provisions of the radio regulations (Atlantic City, 1947). Studies, preparation of proposals, and coordination between various divisions of the Commission were participated in with regard to the continuing actvities of the International Radio Consultative Committee (CCIR), including participation in many technical meetings of the Government-industry preparatory committees of the Department of State.

FOREIGN TECHNICAL ASSISTANCE PROGRAMS

During the fiscal year, a considerable number of foreign communications officials visited the Commission to study and observe United States communications regulatory methods, monitoring procedures, and American techniques in the communications art. Appropriate programs of study, technical training, observational tours, inspection of facilities, conferences and interviews with officials in both Government and private industry were arranged. In this connection, the Commission collaborated with Government and other agencies, such as the Economic Cooperation Administration, the Supreme Commander of the Allied Powers of the Pacific (SCAP), the United Nations, and with various private communications companies. The Commission is a member of the Interdepartmental Committee on Scientific and Cultural Cooperation, operating under the Department of State.

INTERNATIONAL CONFERENCES

The Commission assisted in the United States preparation for and participated in 19 international meetings and conferences. These conferences were either world-wide or regional and for the most part were convened either under the aegis of the International Telecommunication Union or the International Civil Aviation Organization, both of which are specialized agencies of the United Nations.

It should be borne in mind that these international sessions concern all types of electrical communication media operating between this country and foreign points. They affect international telephone and telegraph common carriers, as well as other overseas and between-

country radio services. Treaties and other agreements reached (see list in appendix) involve rates, regulations, and technical standards applicable to international or regional traffic. Particular references to the common carrier, safety and special services, and broadcast service phases will be found in those respective chapters.

The International Telecommunication Union first came into being as a European body called the International Telegraph Union following the signing of a treaty in Paris in 1865. In 1906 the International Wireless Telegraph Convention of Berlin entrusted the union with duties relating to radiotelegraphy, and at an international conference in Madrid in 1932 the International Telecommunication Union (ITU) was created. As a result of an agreement signed at Atlantic City in 1947, the ITU became one of the specialized agencies of the United Nations. Its headquarters are at Geneva, and its membership now includes 81 nations.

The International Civil Aviation Organization (ICAO), seated at Montreal, was established under the Convention on International Civil Aviation concluded at Chicago in 1944, and the organization came into being in 1947 following ratification of the convention by the twenty-sixth State. For the preceding period of nearly 2 years, an interim organization, the Provisional International Civil Aviation Organization (PICAO), similar in structure to ICAO, carried out many of the functions of and prepared the way for the permanent organization. ICAO was established to develop the principles and techniques of international air navigation and to foster the planning and development of international civil aviation so as to insure its safe and orderly growth by promoting uniformity in regulations, standards, and procedures throughout the world. Its present membership comprises 58 nations.

The need and general desirability of convening regional conferences, concluding regional agreements, and forming regional organizations is recognized by the Atlantic City Convention of 1947 for the purpose of settling telecommunication questions which are purely regional in character and therefore more susceptible of being treated on a regional rather than a world-wide basis, provided agreements so reached are not in conflict with the world convention. The American countries have observed this principle over a period of years, as is reflected by inter-American agreements reached at Havana in1937, Santiago in 1940, Rio de Janeiro in 1945, and Washington in 1949. Meetings, which may be termed subregional, have been held to solve problems peculiar to Central, South, or North America. Typical of these are the so-called NARBA, or North American Regional Broadcasting Agreement conferences, convened in Havana in 1937, Washington in 1941, and Montreal in 1949. In addition to these hemispheric and

geographic subdivisions, the radio regulations of Atlantic City divided the world into three regions for frequency allocation purposes. Allocation conferences have been held and agreements reached for each of these regions. The first conference of ITU region 2 was convened in Washington in April 1949. Likewise, initial meetings were held by the nations of regions 1 and 3, which in May following separately convened at Geneva for the purpose of drawing up frequency assignment plans.

In fiscal 1950, the Commission furnished 3 chairmen, 4 vice chairmen, 1 delegate, 1 chief observer, 1 chief technical adviser, and 35 advisers, as well as some staff assistance for the United States delegations to 12 ITU and regional telecommunications conferences:

1. Preparatory group for second session of International Administrative Aeronautical Radio Conference, ITU, Washington, March 15 to July 9, 1949.
2. Fourth Inter-American Radio Conference, Washington, April 25 to July 9, 1949.
3. ITU region 2 conference, Washington, April 25 to July 9, 1949.
4. International Telephone and Telegraph Conference, Paris, May 18 to August 5, 1949.
5. ITU region 1 conference, Geneva, May 18 to September 17, 1949.
6. ITU region 3 conference, Geneva, May 18 to November 4, 1949.
7. Technical Plan Committee of International High-Frequency Broadcasting Conference, Paris, June 22 to December 5, 1949.
8. Conference for Revision of 1945 Bermuda Telecommunications Agreement, London, August 1949.
9. Second session, International Administrative Aeronautical Radio Conference, Geneva, August 1 to October 14, 1949.
10. Third North American Regional Broadcasting Agreement Conference, Montreal, September to December 8, 1949.
11. Provisional Frequency Board, Geneva, January 1, 1948 to February 28, 1950.
12. Second International High Frequency Broadcasting Conference, Florence and Rapallo, Italy, April 1, 1950 (in session on June 30, 1950).

The Commission also furnished one chairman, four vice chairmen, one delegate, and two advisers for delegations to seven ICAO conferences:

1. European-Mediterranean Aeronautical Fixed Telecommunication Special Meeting, Paris, November 8 to December 8, 1949.
2. European-Mediterranean Aeronautical VHF Informal Meeting, Paris, November 8 to December 8, 1949.
3. Special Meeting on Aeronautical Fixed Services in African-Indian Ocean and Middle East Regions, Paris, March 21 to April 11, 1950.
4. African-Indian Ocean/Middle East Frequency Assignment Planning Meeting, Paris, March 21 to April 11, 1950.
5. South East Asia Frequency Assignment Planning Meeting, New Delhi, April 18 to May 10, 1950.
6. Second Caribbean Regional Air Navigation Meeting, Havana, April 11 to April 27, 1950.
7. Caribbean/South American/South Atlantic Frequency Assignment Planning Meeting, Havana, April 11 to April 27, 1950.

In addition to the above multilateral conferences, there were many bilateral meetings with Mexico, Cuba, and Canada, concerning such problems as broadcasting, aeronautical communications, and interference, as well as the coordination of frequency lists.

The Commission also assisted in the preparation of the United States position for the following meetings:

1. ICAO Fourth Assembly, Montreal, May 30, 1950.
2. European-Mediterranean Frequency Assignment Planning Meeting, Paris, June 6, 1950 (ICAO).

At the end of the fiscal year there were projected 24 conferences and meetings for which the Commission's staff was engaged in preparatory work:

1. Extraordinary Radio Conference (ITU), The Hague, September 1, 1950.
2. Second Session of Third North American Regional Broadcasting Agreement Conference, Washington, September 6, 1950.
3. ICAO Second Middle East Regional Air Navigation Meeting, Istanbul, October 17, 1950.
4. United States-Canada conference to draft treaty covering ship radio requirements for the Great Lakes, Ottawa, fall, 1950.
5. ICAO Third European-Mediterranean Regional Air Navigation Meeting, Paris, February 27, 1951.
6. ICAO Communications Division, Fourth Session, Montreal, April 3, 1951.
7. International Telephone Consultative Committee (ITU), Italy, spring, 1951.
8. International Radio Consultative Committee (ITU), Prague, spring, 1951.
9. International Telegraph Consultative Committee (ITU), Holland, spring, 1951.
10. Several Special Air Navigation Meetings of ICAO, site undertermined, 1951.
11. ICAO Search and Rescue Division, Third Session, Montreal, October 2, 1951.
12. ICAO Combined South American-South Atlantic Regional Air Navigation Meeting, Buenos Aires, November 15, 1951.
13. ICAO Combined North Pacific-South Pacific Regional Air Navigation Meeting, site undetermined, early 1952.
14. ICAO Third North Atlantic Regional Air Navigation Meeting, site undetermined, early 1952.
15. ICAO Second Southeast Asia Regional Air Navigation Meeting, site undetermined, late 1952.
16. Plenipotentiary Conference of ITU, Administrative Telegraph, Telephone and Radio Conferences (ITU), Buenos Aires, 1952.
17. Fifth Inter-American Radio Conference, Montevideo, 1952.
18. Special meeting of ICAO, site undetermined, late 1952.
19. ICAO African-Indian Ocean Second Regional Air Navigation Meeting, site undetermined, early 1953.
20. Special meeting of ICAO, site undetermined, early 1953.
21. ICAO Fourth European Mediterranean Regional Air Navigation Meeting, site undetermined, late 1953.
22. ICAO Third Caribbean Regional Air Navigation Meeting, site undetermined, late 1953.
23. ICAO Communications Division, Fifth Session, site undetermined, late 1953.
24. Two special meetings of ICAO, site undetermined, late 1953.

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APPENDIX

1. FIELD OFFICES
2. PUBLICATIONS
3. TREATIES AND OTHER INTERNATIONAL AGREEMENTS

1. FIELD OFFICES

The Commission maintains 65 field installations geographically distributed throughout the United States and its possessions. Sixty of these are engaged in engineering work, comprising 9 regional offices, 23 district offices, 6 suboffices, 3 ship offices, and 19 monitoring stations. There are also 4 Common Carrier Bureau field offices, and 1 Bureau of Law Field office. The complete list follows:

FIELD ENGINEERING AND MONITORING DIVISION

Regional offices	*Headquarters*
North Atlantic	506 Federal Building, New York 14, N. Y.
South Atlantic	411 Federal Annex, Atlanta 3, Georgia.
Gulf States	332 U. S. Appraisers Building, Houston 11, Tex.
South Pacific	323–A Customhouse, San Francisco 26, Cal.
North Pacific	801 Federal Office Building, Seattle 4, Wash.
Central States	876 U. S. Courthouse Building, Chicago 4, Ill.
Great Lakes	1029 New Federal Building, Detroit 26, Mich.
Hawaiian	P. O. Box 1142, Lanikai, Oahu, T. H.
Alaskan	52 Post Office and Courthouse, Anchorage, Alaska.

District offices	*Address*
1	1600 Customhouse, Boston 9, Mass.
2	748 Federal Building, New York 14, N. Y.
3	1005 U. S. Customhouse, Philadelphia 6, Pa.
4	508 Old Town Bank Building, Baltimore 2, Md.
5	402 New Post Office Building, Norfolk 10, Va. (ship office) 106 Post Office Building, Newport News, Va.
6	411 Federal Annex, Atlanta 3, Ga. (suboffice 214 Post Office Building, Savannah, Ga.
7	312 Federal Building, Miami 1, Fla. (suboffice) 409–410 Post Office Building, Tampa 2, Fla.
8	400 Audubon Building, New Orleans 16, La. (suboffice) 324 Courthouse and Customhouse, Mobile 10, Ala.
9	324 U. S. Appraisers Building, Houston 11, Tex. (suboffice) 329 Post Office Building, Beaumont, Tex. (ship office) 406 Post Office Building, Galveston, Tex.
10	500 U. S. Terminal Annex Building, Dallas 2, Tex.

11	539 U. S. Post Office and Courthouse Building, Los Angeles 12, Calif. (suboffice) 230 U. S. Customhouse and Courthouse, San Diego 1, Calif. (ship office) 326 U. S. Post Office and Courthouse, San Pedro, Calif.
12	323–A Customhouse, San Francisco 26, Calif.
13	307 Fitzpatrick Building, Portland 5, Oreg.
14	801 Federal Office Building, Seattle 4, Wash.
15	521 Customhouse, Denver 2, Colo.
16	208 Uptown Post Office and Federal Courts Building, St. Paul 2, Minn.
17	3200 Fidelity Building, Kansas City 6E, Mo.
18	246 U. S. Courthouse, Chicago 4, Ill.
19	1029 New Federal Building, Detroit 26, Mich.
20	328 Federal Building, Buffalo 3, N. Y.
21	609 Stangenwald Building, Honolulu 1, T. H.
22	322–323 Federal Building, San Juan 13, P. R.
23	7–8 Shattuck Building, Juneau, Alaska (suboffice), 53 U. S. Post Office and Courthouse Building, Anchorage, Alaska.

Primary monitoring stations	*Secondary monitoring stations*
Allegan, Mich.	Searsport, Maine
Grand Island, Nebr.	North Scituate, R. I.
Kingsville, Tex.	Spokane, Wash.
Millis, Mass.	Twin Falls, Idaho
Santa Ana, Calif.	Fort Lauderdale, Fla.
Laurel, Md.	Lexington, Ky.
Livermore, Calif.	Muskogee, Okla.
Portland, Oreg.	Bay St. Louis, Miss.
Powder Springs, Ga.	
Lanikai, Oahu, T. H.	
Anchorage, Alaska.	

COMMON CARRIER BUREAU FIELD OFFICES

Atlanta, Ga., 733 Hurt Building.
New York, N. Y., 624 Federal Office Building.
St. Louis, Mo., 334, 815 Olive Street.
San Francisco, Calif., 555 Battery Street.

BUREAU OF LAW FIELD OFFICE

Los Angeles, Calif., 1031 South Broadway.

2. PUBLICATIONS

In general, the Federal Communications Commission's printed publications are sold by the Superintendent of Documents, Government Printing Office, Washington 25, D. C., and are not distributed by the Commission.

Following is a list of such publications which are available from that source, at the prices noted, unless otherwise indicated:

Title	Price
Communications Act of 1934, with amendments and index, revised to Sept. 1, 1948	$0.20
Federal Communications Commission reports (bound volumes of decisions and orders exclusive of annual reports):	
Volume 3, July 1936, to Feb. 1937	2.00
Volume 4, Mar. 1937, to Nov. 15, 1937	1.50
Volume 5, Nov. 16, 1937, to June 30, 1938	1.50
Volume 6, July 1, 1938, to Feb. 28, 1939	1.50
Volume 7, Mar. 1, 1939, to Feb. 29, 1940	1.50
Volume 8, Mar. 1, 1940, to Aug. 1, 1941	1.50
Volume 10, Apr. 1, 1943, to June 30, 1945	2.00
Volume 11, July 1, 1945, to June 30, 1947	3.75
Volume 12, July 1, 1947, to June 30, 1948	(1)
Annual reports of the Commission:	
First Annual Report—Fiscal year 1935	.15
Twelfth Annual Report—Fiscal year 1946	.20
Thirteenth Annual Report—Fiscal year 1947	.25
Fourteenth Annual Report—Fiscal year 1948	.30
Fifteenth Annual Report—Fiscal year 1949	.35
Sixteenth Annual Report—Fiscal year 1950	(1)
Statistics of the Communications Industry:	
For the year 1939	.25
For the year 1940	.20
For the year 1942	.35
For the year 1943	.30
For the year 1944	.40
For the year 1945	.50
For the year 1946	.55
For the year 1947:	
Sections A and B	.75
Section B (broadcast only)	.25
For the year 1948:	
Sections A and B	1.00
Section B (broadcast only)	.35
For the year 1949:	
Sections A and B	(1)
Section B (broadcast only)	(1)

[1] In the process of printing—available at Government Printing Office at a later date.

Title	Price
Report on Public Service Responsibility of Broadcast Licensees, 1946	$0.25
An ABC of the FCC, 1949	.05
The Safety and Special Radio Services—a Public Primer, 1950	.15
Telephone and Telegraph—a Public Primer, 1949	.10
An Economic Study of Standard Broadcasting, 1947	.40
Study Guide and Reference Material for Commercial Radio Operator Examinations, revised to July 1, 1948	.25
Digest of Radio Regulations and Instructions for Restricted Radiotelephone Operators	.05
Standards of Good Engineering Practice:	
Concerning Standard Broadcast Stations, revised to Oct. 30, 1947	1.00
Section 26, Sunrise and Sunset Table	.10
Concerning FM Broadcast Stations, revised to Jan. 18, 1950	.10
Concerning Television Broadcast Stations, Revised to Dec. 19, 1945	.15
Rules and Regulations:	
Part 0, Organization, Delegation of Authority, etc	(2)
Part 1, Practice and Procedure, revised to Dec. 29, 1949	.20
Part 2, Frequency Allocations and Radio Treaty Matters; General Rules and Regulations, revised to Apr. 27, 1949	.20
Part 3, Radio Broadcast Services, revised to Jan. 6, 1949	.20
Part 4, Experimental and Auxiliary Broadcast Stations, effective Sept. 10, 1946	(2)
Part 5, Experimental Radio Services, revised to Jan. 16, 1948	.10
Part 6, Public Radiocommunication Services, revised to Apr. 27, 1949	.10
Part 7, Coastal and Marine Relay Services, revised to Sept. 30, 1945	(2)
Part 8, Ship Service, revised to May 31, 1943	.15
Part 9, Aeronautical Services, revised to July 1, 1947	.10
Part 10, Public Safety Radio Services, revised to Apr. 27, 1949	.10
Part 11, Industrial Radio Services, revised to Apr. 27, 1949	.10
Part 12, Amateur Radio Service, revised to Nov. 18, 1948	.15
Part 13, Commercial Radio Operators, revised to Mar. 30, 1949	.05
Part 14, Radio Stations in Alaska (other than Amateur and Broadcast) revised to Apr. 2, 1942	.05
Part 15, Restricted Radiation Devices (recodified July 21, 1948)	(2)
Part 16, Land Transportation Radio Services, revised to Apr. 27, 1949	.10
Part 18, Industrial, Scientific and Medical Service, revised to Jan. 25, 1950	.05
Part 19, Citizens Radio Service, effective June 1, 1949	.05
Part 31, Uniform System of Accounts for Class A and Class B Telephone Companies, revised to May 12, 1948	.35
Part 33, Uniform System of Accounts for Class C Telephone Companies, revised to May 12, 1948	.25
Part 34, Uniform System of Accounts for Radiotelegraph Carriers, revised to Oct. 14, 1949	.20
Part 35, Uniform System of Accounts for Wire-telegraph and Ocean-cable Carriers, revised to Oct. 14, 1949	.25
Part 41, Telegraph and Telephone Franks, revised to Dec. 4, 1947	.05
Part 43, Reports of Communication Common Carriers and Their Affiliates, revised to July 21, 1948	.10

[2] Obtainable temporarily from the Federal Communications Commission, Washington 25, D. C., without charge.

Title	Price
Part 45, Preservation of Records of Telephone Carriers, effective Oct. 1, 1950	([2])
Part 46, Preservation of Records of Wire-telegraph, Ocean-cable and Radiotelegraph Carriers, effective Oct. 1, 1950	([2])
Part 51, Classification of Telephone Employees, effective July 25, 1944	$0.05
Part 52, Classification of Wire-telegraph Employees, effective July 11, 1944	.05
Part 61, Tariffs, Rules Governing the Constuction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service, revised to Aug. 1, 1946	.10
Part 62, Applications under sec. 212 of the Act to Hold Interlocking Directorates, revised to May 23, 1944	.05
Part 63, Extension of Lines and Discontinuance of Service by Carriers, revised to Dec. 30, 1946	([2])
Part 64, Miscellaneous Rules Relating to Common Carriers, revised to July 16, 1948	.10

Purchasers of the Commission's Rules and Regulations are furnished a form by the Superintendent of Documents which, when filled out and forwarded to the Commission, entitles the purchaser to receive any future amendments to the part or parts purchased until a complete revision thereof is reprinted. In the event any exception is made in this procedure, rule purchasers will be advised by letter where the amendments may be obtained. All Standards of Good Engineering Practice and most of the rule parts are printed on 8 by 10½-inch pages and punched to fit standard three-ring binders.

The Commission is no longer able to supply lists of radio stations but, on request, will furnish a fact sheet about commercial sources of such lists, also one on commercial radio publications and services.

[2] Obtainable temporarily from the Federal Communications Commission, Washington 25, D. C., without charge.

3. TREATIES AND OTHER INTERNATIONAL AGREEMENTS

International treaties, agreements, and arrangements relating to radio and telecommunications which were in force and to which the United States was a party as of March 31, 1950 are listed below. Unless otherwise indicated, copies of these documents may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. (TS relates to Treaty Series, EAS to Executive Agreement Series, and TIAS to Treaties and Other International Act Series.)

Date	Series	Subject
1910		Ship Act of 1910 as amended in 1912. (Radiocommunication on the Great Lakes.)
1925	TS 724-A	Arrangement with Great Britain, Canada, and Newfoundland to prevent broadcast interference by ships.
1928-29	TS 767-A	Arrangement with Canada concerning private experimental radio communication.
1929	TS 777-A	Arrangement with Canada, Cuba, and Newfoundland relating to high-frequency assignments.
1929	TS 910	Safety of Life at Sea Convention (London).
1930	TS 921	Amendment to Regulation XIX of Annex 1 of Safety of Life at Sea Convention.
1934	EAS 62	Arrangement with Canada concerning amateur and private experimental communication.
1934	EAS 66	Arrangement with Peru concerning amateur communication.
1934	EAS 72	Same, with Chile.
1937	EAS 109	Agreement with Canada concerning issuance of radio licenses (largely suspended by TS 777-A, TS 962, EAS 227 and TIAS 1553).
1937	TS 962	North American Regional Broadcasting Agreement (Havana), (Supplemented by EAS 227 and TIAS 1553).
1937	TS 938	Inter-American Radio Communications Convention (First Inter-American Conference, Havana). (Amended by TIAS 1802.)
1938	TS 948	General Radio Regulations (Cairo Revision 1938); annexed to Telecommunications Convention (Madrid, 1932). (See TIAS 1901.)
1938	EAS 142	Agreement with Canada concerning radio communications between Alaska and British Columbia.
1938	TS 949	Regional Radio Convention (Guatemala—in behalf of the Canal Zone).
1938	EAS 136	Arrangement with Canada concerning broadcasting.
1939	EAS 143	Arrangement with Canada concerning civil aeronautical services.
1940	EAS 231	Inter-American Radio Communications Agreement (Second Inter-American Conference, Santiago, Chile).
1940	EAS 196	Agreement with Mexico concerning broadcasting.
1941	EAS 227	Supplementary North American Regional Broadcasting Agreement (Washington). (See TS 962 and TIAS 1553.)
1944	EAS 400	Wartime agreement with Canada re broadcasting stations in Northwestern Canada.
1945		Inter-American Telecommunications Convention (Third Inter-American Conference, Rio de Janeiro). (Not yet ratified by United States.) (Not available from Government Printing Office.)
1946	TIAS 1553	North American Regional Broadcasting Interim Agreement (Modus Vivendi), Washington. (Amended by TIAS 1802.)
1946	TIAS 1527	Agreement with U. S. S. R. concerning commercial radio teletype communication channels.
1947	TIAS 1726	Agreement with Canada concerning FM broadcasting in 88-108 Mc.
1947	TIAS 1670	Interim arrangement with Canada concerning mobile transmitters.
1947	TIAS 1901	Telecommunication Convention, Final Protocol, and Radio Regulations, Atlantic City, 1947. (Since the United States is not a party to the Additional Radio Regulations, they are not included in TIAS 1901 and are available only through the International Telecommunication Union, Geneva, Switzerland.)
1947	TIAS 1652	Agreement with Great Britain concerning standardization of distance measuring equipment.
1947	TIAS 1676	Agreement with the United Nations concerning its headquarters' use of radio.
1948	TIAS 1802	Arrangement with Canada on engineering standards applicable to allocation of standard broadcast stations.
1949		Agreement between United States and certain British Commonwealth governments (London). (To be published by Government Printing Office.)
1950		Arrangement with Ecuador concerning third-party amateur communication. (To be published by Government Printing Office.)
1950	TIAS 2052	Convention of World Meteorological Organization (Washington, 1947); effective Mar. 23, 1950.

In addition, the United States is bound by certain other treaties and agreements which are generally considered as superseded because certain of the contracting countries other than the United States did not become a party to subsequent treaties and agreements. The United States is, in such instances, bound to the original document with respect to its relations with those particular countries. These include the following:

Date	Series	Subject
1912	TS 581	International Radiotelegraph Convention (London).
1927	TS 767	International Radiotelegraph Convention and General Regulations (Washington).
1932	TS 867	International Telecommunications Convention; General Radio Regulations (Madrid).
1937	EAS 200	Inter-American Arrangement concerning Radio Communications and Annex (Havana, 1937), was replaced by Inter-American Agreement concerning Radio Communications (Santiago, 1940, EAS 231).

The following treaties, agreements, and arrangements have been signed by the United States and are included for informational purposes because of their importance or the imminence of their effective dates:

Date	Subject
1948	International Convention on Safety of Life at Sea (London), effective Jan. 1, 1951.
1949	Inter-American Radio Agreement between the United States, Canada and other American republics.[1] (Fourth Inter-American Conference), (Washington), effective Apr. 1, 1950. (Not yet available from Government Printing Office; available through ITU, Geneva.)
1949	Telegraph Regulations (Paris Revision, 1949) annexed to International Telecommunication Convention (Atlantic City, 1947) and Final Protocol to the Telegraph Regulations (Paris), effective July 1, 1950. Subject to United States ratification. (Not yet available from Government Printing Office; available through ITU, Geneva).

[1] In addition, certain resolutions and recommendations were adopted by a number of member countrie of the ITU in region 2 at Washington, July 9, 1949. (Not yet available from Government Printing Office but available through ITU, Geneva.)

There are, in addition to the foregoing, certain treaties, agreements, or arrangements primarily concerned with matters other than the use of radio but which affect the work of the Federal Communications Commission insofar as they involve communications. Among the most important of these are the following:

Date	Series	Subject
1944	TIAS 1591	International Civil Aviation Convention (Chicago).
1946		Special Radio Technical Meeting (COT), Montreal.[1]
1946, 1947, 1948, 1949, 1950		ICAO Regional Air Navigation Meetings, Communications Committee, Final Reports.[1]
1946		ICAO Communication Division, Second Session, Montreal.[1]
1949		ICAO Communication Division, Third Session, Montreal.[1]

[1] Not available from Government Printing Office; available from Secretary General of ICAO, Dominion Square Bldg., Montreal, Canada.

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