FEDERAL COMMUNICATIONS COMMISSION

21st Annual Report

For Fiscal Year 1955

With introductory summary and notations of later important developments

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COMMISSIONERS

Members of the Federal Communications Commission
(As of June 30, 1955)

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

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

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

FRIEDA B. HENNOCK [2]
(Term expired June 30, 1955)

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

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

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

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[1] Succeeded George E. Sterling, resigned, as a Commissioner, and Rosel H. Hyde, as Chairman, October 4, 1954.

[2] Succeeded by Richard A. Mack, July 7, 1955. Term of latter expires June 30, 1962.

LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C.

To the Congress of the United States:

The twenty-first annual report of the Federal Communications Commission is herewith submitted pursuant to section 4 (k) of the Communications Act of 1934, as amended.

In compliance with the 1952 amendments, it endeavors to point up the Commission's problems in dealing with the development of new radio services, expansion of or difficulties experienced by existing services, and regulation of telegraph and telephone carriers which now make extensive supplemental use of microwave and coaxial cable facilities.

For convenience and timeliness, this report includes notations of subsequent developments since the close of the fiscal year ending June 30, 1955, up to the time of going to press.

Required biographical data concerning persons taken into the Commission's employ during the fiscal year, together with the names of those who have left it, are being transmitted as a nonprinted supplement to this report.

Respectfully,

GEORGE C. MCCONNAUGHEY, *Chairman.*

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Introductory Summary

NEW PEAKS

The accelerated pace maintained by radio communication is reflected in the fact that the Federal Communications Commission now has more than 1,400,000 authorizations in this field, which is an increase of 200,000 since last year. They represent about 60 different kinds of land, sea, and air radio services, as well as the operators who man the 800,000 transmitters involved.

To serve the public, business, industry, and individuals are authorizations in these general groups:

Marine.—More than 50,000 stations and 51,000 transmitters,
Aviation.—Nearly 44,000 stations and 42,000 transmitters,
Industrial.—Nearly 25,000 stations and over 180,000 transmitters,
Land transportation.—More than 20,000 stations and nearly 161,000 transmitters,
Public safety.—Over 18,000 stations and 201,000 transmitters,
Amateur.—Nearly 140,000 stations and over 127,000 transmitters,
Broadcast.—Nearly 6,300 stations and their auxiliaries,
Common carrier.—Nearly 2,000 stations, and
Miscellaneous.—Over 3,000 stations.

To operate the transmitters of these stations, more than 1,100,000 radio operator licenses and permits of different grades are outstanding—over 986,000 commercial and 136,000 amateur.

People talk more over the telephone than ever before. Nearly 200 million calls are handled daily by 54 million telephones. Six million miles of telephone circuit is in microwave. Telephone facilities also relay radio and TV programs. Mobile radiotelephone systems exceed 600. There is radiotelephone connection with a hundred overseas and foreign points, over which more than a million messages go in a year. The first long-distance submarine telephone cables are being laid between North America and Europe, and to connect the United States with Alaska. Another one will link Hawaii. In substance, the telephone industry has tripled in size since 1940. Its gross investment is $16 billion and its annual revenues exceed $5 billion.

The only domestic telegraph carrier (Western Union) reported a new high of $209 million in landline revenue. Speed in handling telegrams has improved through mechanization and direct connections. Business customers are using 20,000 "deskfax" and 23,000 teleprinter tielines. International telegraph carriers serving this country carried more than 520 million words and their revenues climbed to $63 million. Western Union announced plans to sell its cable system in compliance with the terms of its merger with Postal Telegraph.

Whether by radio or wire or cable, communication systems are depending upon automatic devices to an increasing degree. This is particularly evinced in the "automation" of the telephone and telegraph industries, and in the "push-button" operation of transmitters and other radio apparatus. In fact, as far as the radio industry is concerned, "radiomation" might be a more expressive word.

HIGHLIGHTS

National Defense

The Commission continued to collaborate on various defense projects which cannot be reported because of the security classifications given them by their originating Federal agencies.

Its unclassified activities included extension of the CONELRAD (control of electromagnetic radiation) program to additional services in the national endeavor to prevent radio transmissions from being used as possible guides by an attacking enemy. About 1,300 AM broadcast stations are cooperating.

At the request of the Office of Defense Mobilization, the Commission set up a priority system for telephone and telegraph communication in event of a national emergency.

Oral argument was heard on a proposal to deny amateur or commercial radio operator licenses to any member of a communist group. The Commission set up a line of succession for its officials to act for it during war or other emergency. Other defense activities are related in sections of this report dealing with individual services.

Frequency Allocation

Domestic implementation of the Geneva Agreement was completed as far as Commission licensees in the aeronautical, mobile, amateur, fixed, and maritime mobile services are concerned. In the high frequency broadcast service, all stations licensed by the Commission are now within the internationally agreed broadcast bands.

In bringing into force the Atlantic City table of frequency allocations within the United States, the rules governing radio operation in Alaska were revised.

The Commission's table of frequency allocations was amended to permit testing a new technique called "troposphere scatter" which

permits over-the-horizon communication on frequencies normally considered limited to line-of-sight transmission. An experimental authorization permits such telephone transmission from Florida to Cuba.

The Commission was represented at or otherwise participated in 10 international meetings during the year, and was preparing for 28 projected meetings.

Common Carriers

Telephone.—With over 54 million telephones in operation at the end of fiscal 1955, the telephone industry is expanding at the rate of 2 million telephones a year. Now three times the size it was at the end of 1940, that industry has a gross investment of $16 billion and produces annual revenues of over $5 billion. The Bell System does about five-sixths of the business.

The entire industry handled 186 million local calls and 6.8 million long distance calls a day compared to 179 and 6.6 million respectively the year before.

The Commission made 126 wire line and 381 microwave radio grants for construction of long distance telephone circuits during fiscal 1955. The Bell System now operates 6.2 million miles of toll circuits over microwave paths. It also furnishes 67,000 miles of broad-band channels, mostly radio, to provide network service to 363 TV stations in 200 cities. Over 600 mobile radiotelephone systems are in service.

The Bell System made two changes in its rates for TV program relay which were designed to benefit using stations. On October 1, 1954, a package rate was established for video and audio channels for TV transmission on a monthly contract basis with a minimum daily service period of eight hours. Previously these channels were offered only in separate tariffs, with the charges for video channels being on an eight-hour daily basis and the audio channels on a 16-hour daily basis. A simpler TV transmission service also was made available at a lower rate for broadcasters who do not desire the higher quality service furnished under the regular tariff. The new service consists of off-the-air pick up of programs of one broadcast station and transmitting them to another station for rebroadcasting. By eliminating network interconnections and monitoring, the new service is provided at a lower rate.

Telegraph.—Western Union, the single domestic telegraph carrier, reported an alltime high of $209 million in landline revenue for calendar 1954. It handled fewer domestic telegrams—152 million compared to 162 million the previous year—but this was more than offset by revenues from the growth of private line telegraph service and by increases in rates.

Effective July 15 and August 1, 1954, Western Union increased rates for domestic message services which it estimated would add

revenues of $10 million a year for combined interstate and intrastate traffic. Later in 1954 rates to Canada were increased by $316,000 a year and rates for domestic press messages by $150,000 a year. It was after study of the company's revenue requirements and operations that the Commission permitted these increases to go into effect.

The speed of handling telegrams improved due largely to the extensive mechanization of the telegraph system and direct connections with customers. The carrier now has 20,000 "deskfax" and 23,000 teleprinter tielines in business use.

International.—International telegraph and telephone carriers regulated by the Commission furnish service between this country and nearly every point on the globe. Telegraph carrriers reported substantial improvement in revenues and earnings. The volume of message traffic amounted to 521 million paid words in calendar 1954, an increase of 2.1 percent over the previous year. Total revenues climbed to $63 million, or 6.8 percent more than 1953. Earnings before deducting Federal income taxes advanced to $9 million, a 40.7-percent increase.

International radiotelephony also reached a new high, with 1.1 million calls between the United States and outside points in calendar 1954. Work was started on twin submarine cables across the North Atlantic and between this country and Alaska. There will be similar linkage with Hawaii. These will be the first long-distance submarine cables for telephone service.

On June 22, 1955, the Commission reaffirmed a grant of applications by Mackay Radio and Telegraph Company to establish radiotelegraph circuits to The Netherlands and Portugal in competition with existing circuits operated by RCA Communications, Inc. This proceeding had been remanded to the Commission by the Supreme Court for further consideration.

The Commission, on December 20, 1954, issued an initial decision proposing to direct Western Union to divest itself of its international cable system promptly. Subsequently, the company announced that it was negotiating to sell these facilities.

Safety and Special Radio Services

The Safety and Special Radio Services is the largest and fastest-growing group of radio users. Its total authorizations, for the first time, topped the 300,000 mark. The nearly 50 different classes of radio stations employ almost 770,000 fixed and mobile transmitters.

They provide communication between ships and ship-to-shore; aircraft-to-ground; by police, fire and highway departments; disaster organizations; public utilities; petroleum production and distribution; many types of industry; in railroad, bus, truck, and taxicab operations; and by amateurs and other individuals.

The most extensive growth of radio has been in the fields of industry and commerce. Its use ranges from small portable equipment for directing warehouse crews or steam-shovel operators to complex radio facilities to control big pipeline operations.

Action was taken to establish a permanent licensing policy for private microwave systems.

Broadcast Services

Broadcast authorizations collectively, for the first time, passed the 6,000 mark. Of these, more than 4,000 were for program outlets and the remainder comprised pickups and other adjuncts.

Of general broadcast interest during the year was action by the United States Court of Appeals for the District of Columbia in holding that the Commission's multiple ownership rules were invalid to the extent that they impose maximum limits on interests in broadcast stations, which the Commission has appealed to the Supreme Court; appropriation of $80,000 by Congress to enable the Commission to initiate a study of radio and TV network broadcasting in fiscal 1956; adjournment of Congress without taking action on legislation proposed by the Commission for relief from a 1952 amendment to the Communications Act which has been interpreted by the courts to stay new station grants pending hearing on protest by any "party-in-interest"; and further steps to simplify and speed up the hearing procedure on competitive applications.

TV.—Of 582 authorized commercial TV stations, 458 were on the air. Over 90 percent of the people of the country were within service range of at least one TV station, and about 75 percent were served by 2 or more stations.

The Commission is taking various steps to assist UHF stations to operate on a comparable basis with VHF stations and to help TV in general. These include authorization of "satellite" stations, low power operation, liberalization of the multiple ownership rules to permit joint operation of seven TV stations by the same interest if at least two of the stations are UHF, and amending its chain broadcasting rules to remove a restraint on station competition for the same TV network programs; also, proposals to authorize UHF "booster" operation to fill holes in service areas, to permit an increase in maximum power of UHF stations from 1 to 5 megawatts, to allow broadcasters to establish their own intercity relay systems, and to require transmitters to be located within 5 miles of the station's "home" city. It is not considering petitions for local deintermixture of UHF and VHF channels pending a general rule-making proceeding to consider possible solutions, on a nationwide basis, to the difficulties now hindering expansion of TV service.

Of 34 educational TV stations, 11 were operating. The first and only such station to surrender its permit was KTHE, which had been operated by the University of Southern California. The number of TV channels reserved for education increased to 258. Thus far the Commission has denied requests to transfer educational channels to commercial use. For the first time, it instituted rule making to change an educational reservation from VHF to UHF (Des Moines, Iowa).

AM.—There was a net gain of 143 AM stations for the year, bringing their total to 2,840, of which 2,732 were on the air.

The North American Regional Broadcasting Agreement, submitted to the Senate in 1951, was still unratified and there were indications that this delay was causing some countries to depart from the interim policy of not making new assignments or changing existing assignments contrary to its provisions. Seperate negotiations continued with Mexico, which is not a party to NARBA.

Dependent upon NARBA ratification is the outcome of the clear channel proceeding, from which rule making concerning daytime skywave interference had been severed. A tentative decision on the latter was made by the Commission in early 1955, subject to comments whether the restrictions should apply to existing stations.

The Commission amended its so-called "10 percent rule" relating to the degree of interference which proposed stations may receive in their normal service areas from existing stations.

FM.—Commercial FM stations continued to decrease. At the year end, 552 were authorized and 540 were on the air. However, educational FM stations continued to gain. Of 127 authorized, 124 were operating.

To enable commercial FM broadcasters to obtain additional revenue, the Commission permitted them, beginning July 1, 1955, to apply for special nonbroadcast authorizations to furnish "functional music" and other special programming to stores, factories, restaurants, street cars and buses and other places subscribing to this supplemental service.

Field Engineering and Monitoring

The Commission's field engineering work is conducted through 6 regional offices, 24 district offices, 1 ship office, 6 suboffices, and 18 monitoring stations. Besides rendering technical services, these field installations give radio operator examinations, license radio operators and certain classes of radio installations, inspect radio stations, locate and close unlicensed transmitters, investigate interference complaints, and furnish bearings on aircraft and ships in distress.

With the aid of mobile units, 105 unlicensed transmitters were uncovered as compared to 52 the previous year. They ranged from

illicit operation at racetracks to juvenile "pranks." The more serious cases were referred to other Federal jurisdiction for prosecution.

Budget limitations have reduced the number of radio station inspections. Even so, the year's total exceeded 7,200 including 661 broadcast, 2,200 ships, and 4,200 miscellaneous.

Much trouble was caused by small boat operators using a radiotelephone distress frequency for idle chit-chat, often with obscene and profane language. The Commission is considering ways to stop such widespread violation.

Investigation of interference complaints was centered on important cases, largely those jeopardizing safety and other radio communications. Of the nearly 18,000 complaints handled, more than 15,700 involved broadcast, and most of these concerned TV. Commission encouragement of local TV interference committees has resulted in 437 such groups functioning in 412 communities.

Commercial radio operator authorizations issued during the year totaled more than 188,500. This brought the number of such outstanding authorizations to over 986,000, which is 144,000 more than the year previous.

Antenna proposals processed to see if they conform to aviation safety requirements exceeded 9,100, of which number nearly 7,700 were nonbroadcast. AM and TV accounted for some 700 and 600 cases, respectively. At the year's end 28 TV towers 1,000 feet or more in height were in operation and 13 others were under construction, including a 1,521-foot tower at Dallas. Proposal for a 1,993-foot tower at Selma, Ala., was designated for hearing. Another applicant proposes one 2,003 feet high at Louisville, Ky.

Research and Laboratory

Research activities relate to technical standards for the various radio services, and miscellaneous radio-frequency devices, equipment specifications, and wave propagation, interference and other special studies. The Experimental Radio Services are in the research category.

Much time was spent in developing VHF-UHF tropospheric propagation curves as well as techniques for predicting service signal strengths under different terrain conditions. A study is in progress on the relative merits of line-of-sight microwave relays as compared with tropospheric scatter relays over greater distances.

Rules were finalized for type acceptance of certain radio equipment. This is apart from type approval of other equipment through tests at the Commission's laboratory at Laurel, Md.

The laboratory assists in various phases of the technical work, particularly where actual performance data is required. It studies

various methods of transmission and reception in their service and interference aspects, interference to radio reception from electrical equipment and new uses for radio. Also, it develops and calibrates equipment used by FCC field engineers.

Commission

On October 4, 1954, George C. McConnaughey became a member and also Chairman of the Commission, to fill out the unexpired term of George E. Sterling, resigned. On July 7, 1955, Richard A. Mack succeeded Frieda B. Hennock as a member.

The Commission operated during the fiscal year on appropriations of $6,911,769 and with a personnel of 1,094, of which one-third were engaged in field engineering work.

PROBLEMS

The current report emphasizes the plight of the Commission in trying to regulate radio's tidal-wave expansion with about the same money but with less personnel than it has had in any year since World War II. In the last 5 years, for example, its administrative burden has not only more than doubled but has become more complex.

As a result, the Commission has difficulty in keeping up with its mounting routine and lacks the manpower to deal with many important matters which need policy determination. Any special projects which demand immediate consideration necessitate taking staff members off processing and other work and backlogs develop.

One handicap that is particularly detrimental to expeditious functioning stems from the present ban on the Commission consulting its own keymen on adjudicatory cases in which the latter have no participating connection. In other words, a 1952 amendment to the Communications Act prevents the Commissioners, as a body or individually, from seeking legal, engineering or accounting advice from its respective office heads on problems involved in pending proceedings. Being denied the benefit of the views of these top staff experts, who advise the Commission on other matters falling within their respective fields, causes unnecessary delay and prevents proper utilization of staff services. No other Federal agency is under such an extraordinary separation of functions mandate; it goes far beyond the provisions of the Administrative Procedure Act.

New competitive and economic injury considerations have also added to the Commission's burdens. In addition to hearings required by competitive applications, the Commission must now, under court interpretation of another 1952 amendment to its act, hear protests by

"parties-in-interest" however remote. Until requested legislative relief is afforded, this new requirement clogs its processes besides holding up grants for new stations. Also, there is a mounting number of petitions and counterpetitions, and exceptions and other filings in docket cases, all voluminous, complicated and requiring painstaking consideration.

Requests for new or expanded services pose problems with respect to the "housing shortage" in some portions of the spectrum and changes in frequency allocation and use. These considerations are complicated by the fact that frequency allocations have international as well as domestic impact which necessitates exacting engineering study and industry-Government cooperation.

The mounting number of radio stations not only give but are subject to interference. The interference problem is aggravated by the production of many new electronic devices and "gadgets" which, though not used for communication, release waste energy which can play hob with radio transmission and reception. Projected new equipment must be studied, and some of it approved as meeting radiation limits before being manufactured and put into use.

In the nonbroadcast field, rules must be recast frequently to keep up with new developments—such as, currently, the growing use of microwaves, the expansion of mobile operations, new industrial services, and "split-channel", and other techniques to get greater use from available channels. In this field, too, the utilization of radio for private purposes has progressed to such an extent that the many newcomers must be made to understand and conform to the operating rules.

Then there are problems peculiar to common carrier regulation. That industry is becoming larger and more complex, and its rates and services require constant attention. Its increasing use of radio, extending into mobile operation, and TV program relay, involve many considerations.

Broadcasting presents its own special problems. TV has a critical situation in UHF, subscription TV has been proposed amid much debate, and questions must be resolved about private intercity relay links, and community antenna systems. In AM, certain clear channel problems and, to some extent, questions relating to daytime skyware interference, hinge on ratification of the North American Regional Broadcasting Agreement. Commercial FM stations continued to decrease, causing certain other services to eye unused frequencies in the FM band and elsewhere as a possible avenue for expansion. Increasing use by the military of aural and TV broadcast frequencies is also giving the Commission some concern.

The economic straitjacket in which the Commission must operate has hit its field activities especially hard. Many have had to be curtailed drastically. While monitoring stations continue to police the spectrum, only a sampling job can be done in inspecting radio installations and interference investigation has to be limited to the more serious cases. By the same token, data collected on certain long-range engineering studies have had to be put aside for more pressing current work.

ADDENDA

As of September 30, 1955 the number of broadcast authorizations (not including auxiliary and experimental) had increased to 4,185. Of this number 3,921 were on the air. A breakdown follows:

Service	Authorized	Licensed	On Air
TV commercial	581	144	473
TV educational	24	1	15
AM commercial	2,884	2,757	2,771
FM commercial	555	521	538
FM educational	131	121	124
Total	4,185	3,544	3,921

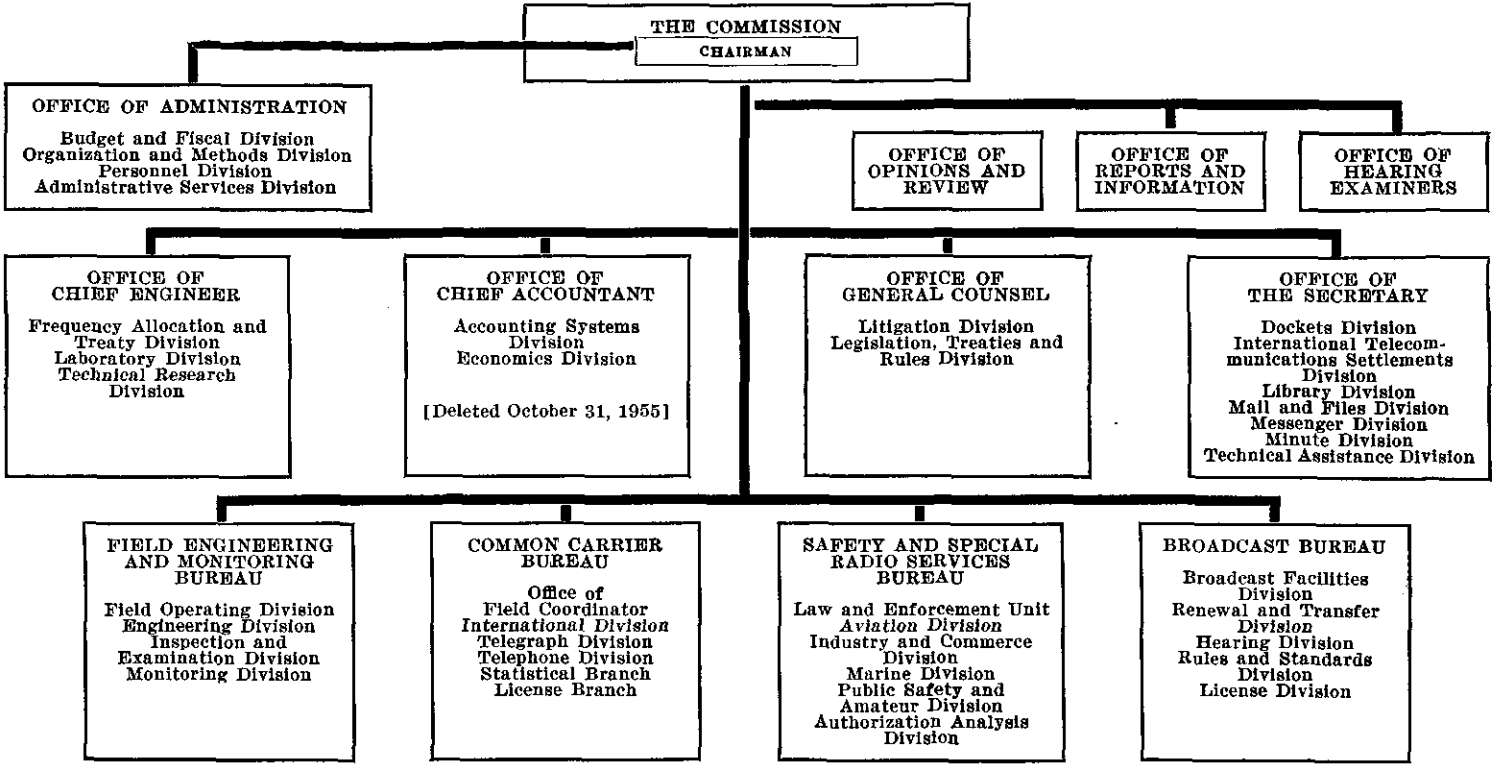
At the same time, the number of authorizations in the nonbroadcast services had risen to:

Marine	52,908	Amateur	139,628
Aviation	44,183	Common Carrier	2,001
Industrial	26,357	Experimental	661
Public safety	19,153	Miscellaneous	2,704
Land transportation	21,608		
		Total	309,203

These nonbroadcast authorizations reflect the use of about two and one-half times that number of transmitters.

FEDERAL COMMUNICATIONS COMMISSION

Organization Chart as of June 30, 1955



General

PREFACE

The Federal Communications Commission, in brief, regulates wire and radio communication between states, and between this country and foreign points.

The soaring use of electrical communication is reflected in the fact that the close of fiscal year 1955 saw our nation dotted with some 800 thousand transmitters in about 60 different kinds of radio services, over 54 million telephones and over 200 million miles of telephone and telegraph wires in domestic use, and more than 80 thousand nautical miles of submarine cables operated by United States cable telegraph companies. In addition, the radio communications industry accounted for more than 1,100,000 radio operator authorizations of different grades.

AUTHORITY

The Federal Communications Commission is an independent Federal agency which was created by Congress and, as such, reports directly to Congress. It operates under the authority of the Communications Act of 1934, as amended. Established in 1934, it unified electrical communication regulation that was formerly done by various Government agencies.

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

PURPOSE

As stated in the Communications Act, the Commission was formed for

> *". . . the purpose of regulating interstate and foreign commerce in communication by wire and radio so as to make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire and radio communication service with adequate facilities at reasonable charges, for the purpose of the national defense, for the purpose of promoting safety of life and property through the use of wire and radio communication, and for the purpose of securing a more effective execution of this policy by centralizing authority heretofore granted by law to several agencies and by granting additional authority with respect to interstate and foreign commerce in wire and radio communication . . ."*

REGULATION

The Communication Act applies

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

The major activities of the Commission include allocating bands of frequencies to the different radio services and assigning specific frequencies to individual radio stations; regulating those radio services and licensing radio stations and radio operators; regulating common carriers engaged in interstate and foreign communication whether by wire, cable or radio; promoting safety through the use of radio on land, water, and in the air; encouraging more effective and widespread use of radio; and helping coordinate wire and radio communication with the national defense program.

Further information about regulation will be found in the chapters dealing with the different services.

COMMISSION

The Commission is composed of seven Commissioners who are appointed by the President and confirmed by the Senate. The normal term of a Commissioner is seven years. Their terms are staggered so that not more than one expires in a year. Not more than four Commissioners may be members of the same political party.

The President designates one of the Commissioners to serve as Chairman. This appointment is not subject to Senate confirmation. The duration of a chairmanship is at the pleasure of the Chief Executive.

The Commissioners function as a unit, directly supervising all FCC activities, and making all policy determinations. The Chairman is responsible for administering the internal affairs of the Commission.

Commission practices conform to the Communications Act of 1934, as amended, to the Administrative Procedure Act, and to other applicable laws.

The following changes occurred in Commission membership during the year:

On September 25, 1954, President Eisenhower appointed George C. McConnaughey to be a member and also Chairman of the Commission. Under recess appointment, Chairman McConnaughey took office on October 4 thereafter. As a Commissioner, he fills out the term of Commissioner George E. Sterling, who resigned as of September 30, 1954, which expires June 30, 1957. Designated Chairman,

he succeeded Commissioner Rosel H. Hyde in that office. His appointment as a Commissioner was confirmed by the Senate on March 14, 1955.

On May 27, 1955, President Eisenhower nominated Richard A. Mack to succeed Commissioner Frieda B. Hennock, whose term expired June 30 of that year. Confirmed by the Senate on June 17, Commissioner Mack took office on July 7.

A list of Commissioners as of June 30, 1955, with their terms of office, appears on the back of the title page to this report. Past and present members, and their tenure of service, are listed in the appendix.

STAFF ORGANIZATION

As a result of a reorganization completed in 1952, the Commission staff is now on a functional and industry basis instead of on professional lines.

In other words, instead of having to relay and coordinate matters between separate legal, engineering and accounting units with consequent delay, as previously, the Commission's four chief operating bureaus—Common Carrier, Safety and Special Radio Services, Broadcast, and Field Engineering and Monitoring—are self-contained administrative units with their own lawyers, engineers, accountants, and other necessary personnel. They can take actions in individual cases that are covered by established rules and policies. But matters of policy, including new broadcast grants, are referred to the Commission.

In addition to these operating bureaus there are seven offices—Secretary, Administrative, Chief Engineer, General Counsel, Hearing Examiners, Opinions and Reviews, and Reports and Information.

The Secretary's office is the designated funnel for incoming and outgoing correspondence, and is responsible for the Commission's records to the inclusion of its minutes and dockets. The Administrative office is the housekeeping unit, dealing with budget and fiscal matters, personnel, organization and methods, and supply. It is under the Chairman.

The Hearing Examiners hear contested and other proceedings in their initial stages, and render initial decisions which the Commission must review, often with additional oral argument, for final determination. The Opinions and Review office summarizes hearing cases and intermediate petitions for the Commission, and drafts appropriate decisions and findings for and at the Commission's direction. The Reports and Information office is the central contact for general information and copies of documents and public notices.

The Offices of Chief Engineer and General Counsel are largely advisory to the Commission. However, the Chief Engineer handles frequency allocation and international treaty matters, engages in technical research, and operates a laboratory. The General Counsel engages in litigation and legislative work, and looks after the legal aspects of treaties and rules.

Further authority was delegated to bureaus and offices during the year so as to relieve the Commissioners of certain routine actions which are largely automatic under the rules and which do not involve policy considerations.

An organization chart of the Commission as of June 30, 1955 appears as a separate page of this chapter.

Subsequently, because its accounting functions are largely integrated into the duties of its operating bureaus, the Commission abolished the Office of Chief Accountant, effective October 31, 1955. Its two divisions were transferred to the Common Carrier and Broadcast Bureaus.

PERSONNEL

Commission employees numbered 1,094 at the close of the fiscal year, which was 52 less than the previous year. Approximately one-third were engaged in field engineering work. Distribution was as follows:

	Washington	Field	Total
Commissioners' offices	45	0	45
Office of Opinions and Review	18	0	18
Office of Hearing Examiners	24	0	24
Office of Reports and Information	4	0	4
Office of Administration	81	0	81
Office of Secretary	58	0	58
Office of General Counsel	20	0	20
Office of Chief Accountant	19	0	19
Office of Chief Engineer	66	20	86
Common Carrier Bureau	73	28	101
Safety and Special Radio Services Bureau	114	0	114
Broadcast Bureau	155	0	155
Field Engineering and Monitoring Bureau	60	309	369
Total	737	357	1,094

A Communications Act amendment of 1952 requires the Commission to supply Congress with biographies of Commission employees added during the year, as well as a list of employees leaving during the year. This information is being furnished as a mimeographed supplement to the printed report.

APPROPRIATIONS AND EXPENDITURES

The Commission received appropriations amounting to $6,911,769 from Congress in fiscal 1955. In addition to the regular appropriation of $6,694,400, there were supplements of $85,000 and $132,369.

The former was to meet a deficiency; the latter provided for retroactive personnel pay increases voted by Congress.

Obligations against the 1955 appropriations were:

Appropriations		*Obligations*	
Regular appropriation (salaries and expenses)	$6,694,400	Personal services	$6,213,901
Supplemental (deficiency)	85,000	Travel	63,280
Supplemental (pay increase)	132,369	Transportation of things	13,577
		Communication services	182,918
		Rents and utilities	51,790
		Printing and reproduction	29,678
Total	6,911,769	Other contractual services	110,044
		Supplies and materials	123,884
		Equipment	118,552
		Land and structures	3,795
		Awards and indemnities	270
		Total obligations	6,911,689
		Savings, unobligated balance	80
		Total	6,911,769

The sources of these funds and the authority for expenditures thereunder were Public Laws 428, 83d Congress; and 24 and 94, 84th Congress.

HEARINGS

The Commission has taken various steps to expedite its hearing process. These include refusal to hear repetitious applications; time-saving procedures when cases are designated for hearing; time limits on motions to enlarge or change issues; provision for the Commission, under certain circumstances, to grant or deny on the basis of written evidence instead of oral testimony; hearing conferences at the start of hearings, and an exchange of written exhibits and information to curtail later oral testimony.

The volume of formalized paper requiring exacting attention in hearing matters is indicated by the fact that as many as 500 exceptions have been filed in a single case, not to mention frequent and often repetitive motions.

Also, in cooperation with the Federal Communications Bar Association, the Commission has drafted a manual to help its hearing examiners achieve more uniformity in rulings on evidentiary matters and avoid the delays and confusion that sometimes arise.

The Commission has asked Congress to amend a section of the Communications Act, inserted in 1952, which established the so-called "protest rule" under which a party in interest is entitled to a hearing on any grant made without hearing. This provision has been used to

keep competitors off the air with resultant delay in starting new broadcast service. Since adding the protest provision, 80 grants have been challenged by claimed parties of interest—72 in broadcast (32 TV and 40 AM), 4 in safety and special services, and 4 in common carrier services.

The Commission will also seek clarification of that portion of the act which created the review staff, so that there will be no question as to its role in assisting the Commissioners in adjudicatory matters. It intends to propose further act changes which will permit the Commissioners to consult with staff officers on legal, engineering and accounting matters when these keymen are not engaged in investigating or presenting an adjudicatory case.

Television cases continued to account for most of the Commission's hearing load. Docket statistics for fiscal 1955 follow:

Class	Pending June 30, 1954	Designated for hearing	Disposed of without hearing	Disposed of following hearing	Pending June 30, 1955
TV broadcast	189	26	18	72	125
AM broadcast	115	114	86	18	125
FM broadcast	0	0	0	0	0
Other broadcast	5	4	5	0	4
Total broadcast	309	144	109	90	254
Common carrier	51	46	19	39	39
Safety and special	29	37	50	1	15
Joint and general	45	43	36	1	51
Total nonbroadcast	125	126	105	41	105
Petitions and rulemaking	27	81	50	0	58
Grand total	461	351	264	131	417

The Commission had 12 hearing examiners at the close of the year, which was five less than at the end of fiscal 1954.

LEGISLATION

Two bills amending the Communications Act were enacted by Congress during the fiscal year. Both had been recommended to Congress as part of the Commission's legislative program.

Public Law 584, 83d Congress, 2d session, was approved on August 13, 1954. It extensively amended part II of title III of the act, which concerns radio equipment and radio operators on board ships, to reflect the requirements of the Safety of Life at Sea Convention (London, 1948).

Public Law 590, 83d Congress, 2d session, was also approved on August 13, 1954. It amended the act to reflect the provisions of the agreement concluded by the United States and Canada for promoting safety on the Great Lakes by means of radio, which came into force

on November 13, 1954. The law also repealed remaining provisions of the Ship Act of 1910 which were no longer necessary.

The following proposals were submitted to the 84th Congress in connection with the Commission's legislative program:

An amendment to section 309 (c) of the act, designed primarily to prevent protests from being used by competitors for the purpose of delaying the institution of new radio and television services. The proposal would give the Commission authority to deny a protest without holding a full evidentiary hearing, where the Commission found that the facts alleged by the protestant, even if proven true, would not constitute grounds for setting aside the grant being protested. It would also give the Commission some discretion to keep a protested grant in effect pending the outcome of the protest hearing. This proposal was introduced as H. R. 5614 and S. 1648. Hearings were held by both the House and Senate Committees on Interstate and Foreign Commerce, and reported favorably by both. H. R. 5614 was passed by the House on July 25, 1955, but no action was taken by the Senate.

Amendments to sections 503 and 504 (b) of the act, to give the Commission authority to impose small monetary forfeitures for violations of the Commission's rules and regulations relating to radio stations other than those in the broadcast service. This proposal was introduced as H. R. 5613 and S. 1549. Hearings were held by the Senate Committee on Interstate and Foreign Commerce.

Amendments to sections 212, 219 (a), 221 (a), and 410 (a) of the act, relating to the Commission's regulatory authority over communications common carriers. The Senate Committee on Interstate and Foreign Commerce held hearings on this proposal (S. 1456), and it was introduced in the House as H. R. 4939.

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

H. R. 4090, which would require the installation of an automatic radiotelegraph call selector on United States cargo ships carrying less than two radio operators. The Commission testified on this proposal before the House Committee on Interstate and Foreign Commerce.

Several bills designed to prevent the use of interstate communications facilities for the transmission of gambling information. Also:

H. R. 4814 and S. 1208, which would amend section 315 of the act so as to prohibit liability from being imposed upon a licensee because of defamatory statements made in a broadcast by a political candidate unless the licensee participated in the broadcast with intent to defame.

S. 636, which proposed a series of amendments to the Federal Corrupt Practices Act dealing with election campaigns. The Commission was heard on this proposal before the Subcommittee on Privi-

leges and Elections of the Senate Committee on Rules and Administration.

Several bills concerning the interception of communications and the admissibility into evidence of intercepted communications. The Commission testified on these proposals before the House Committee on the Judiciary.

The Commission submitted comments to Congress and the Bureau of the Budget concerning more than 55 legislative proposals which had been referred to the Commission for comment. As mentioned elsewhere in this report, it also commented and reported to a Subcommittee of the Senate Committee on Interstate and Foreign Commerce examining problems relating to UHF television stations.

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 courts of appeals (under Public Law 901, 81st Cong., effective January 28, 1951) over suits to enforce, enjoin, set aside, annul or suspend any Commission order with the exception of orders granting or refusing applications for licenses. Section 402 (b) provides for direct appeal from 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 72 cases in which the Commission was a party in the Federal courts. Forty-seven of these were instituted during that period—40 in the Court of Appeals for the District of Columbia Circuit, 4 in the Supreme Court of the United States, 1 in the District Court for the Northern District of Illinois, and 2 in the District Court for the District of Columbia. The other 25 cases were pending at the beginning of the year.

Due to confusion as to whether appeals from denials of protests are properly appealable under sections 402 (a) or 402 (b) of the act, in 5 instances review of the same Commission order was sought in separate actions brought under each subsection. Since these were separate actions, they are listed separately in the discussion and chart. In *Metropolitan Television Company* v. *Federal Communications Commission*, noted thereafter, the court held that appeals from denials of protests are properly under section 402 (b) and not under section 402 (a).

In addition to cases in which the Commission was a party, 10 cases initiated by the Commission which involved criminal violations of the

act were pending in the Federal courts. In disposing of 6 of these, the courts imposed 2 prison sentences, 2 fines totaling $2,600, deferred prosecution of 1 defendant, and acquitted another. Four criminal cases were pending at the end of the year. Forty-two other criminal matters were referred to the Department of Justice.

In the Supreme Court the Commission was affirmed in 3 separate actions, in 2 instances by denial of petitions for writ of certiorari by 2 petitioners, and in 1 instance by reversal of the lower court's findings. In the courts of appeals the Commission was affirmed in 7 cases. Ten decisions were reversed or remanded, 5 cases were dismissed on jurisdictional grounds, 1 was remanded without decision on the merits, and 17 were dismissed by agreement of the parties or as being moot. The District Courts for the Northern District of Illinois and the District of Columbia each dismissed one case on jurisdictional grounds, and in the Southern District of New York the Commission was affirmed by the sentencing of the defendant.

As of June 30, 1955, there were 24 cases pending in the Court of Appeals, 1 in the Supreme Court, and 1 in the District of Columbia Court. A tabulation follows:

	Supreme Court	Court of Appeals (402b)	Court of Appeals (402a)	District courts	Total
Total	4	55	9	4	72
Decisions affirming Commission	3	6	2	3	14
Decisions reversing case		7	2		9
Dismissed on jurisdictional grounds		3	2		5
Remanded without decision on merits		1			1
Dismissed by agreement of parties or as being moot		15	2		17
Cases pending June 30, 1955	1	23	1	1	26

Of the 24 cases pending in the Court of Appeals, 6 were submitted but undecided at the end of the fiscal year.

On account of the death of Paul V. McNutt, a partner in the appellant in *Anthony Wayne Broadcasting* v. *Federal Communications Commission*, No. 12,452, C. A. D. C.; after Commission decision and before decision by the appellate court, the case was remanded to the Commission for determination of the effect of the death upon the Commission's decision preferring Radio Fort Wayne, Inc., for a new TV station on Channel 69 in Fort Wayne, Ind.

Decisions during the year included:

In *Federal Communications Commission* v. *Allentown Broadcasting Corp.*, decided June 6, 1955, the Supreme Court reversed a decision of the appeals court which in turn had reversed a Commission decision granting the application of Easton Publishing Company for a new standard broadcast station in Easton, Pa., and denying the mutually exclusive application of Allentown Broadcasting Corp. The Supreme Court remanded the case to the court of appeals for further

consideration freed from rulings of the lower court found to be erroneous by the Supreme Court. The Commission had made a grant to the Easton applicant on the ground that, since Easton had only 1 local station and Allentown had 3, the need of Easton for a choice of locally originated programs was decisive. The Supreme Court sustained the Commission's position that where mutually exclusive (because of prohibitive interference) applicants seek authority to serve different communities, the Commission must first determine which community has the greater need for additional service and then determine which applicant can best serve that community's need. The court of appeals had ruled that the Commission could select one community over the other only if the applicants were approximately equal in their ability to serve their respective communities.

The Supreme Court also reversed the ruling of the lower court that findings of a hearing examiner based on the demeanor of a witness are not to be overruled by the Commission without a very substantial preponderance in the testimony. The Supreme Court held that this ruling was in error because it adopted for examiners of administrative agencies the "clearly erroneous" rule of the Federal Rules of Civil Procedure applicable to courts, and that findings of fact made by the Commission were to be judged by the test of whether they are supported by substantial evidence in the whole record as that test was set forth in *Universal Camera Corp.* v. *Labor Board*, 340 U. S. 474.

In *Storer Broadcasting Company* v. *United States and Federal Communications Commission*, No. 12,065, decided February 24, 1955, the Court of Appeals for the District of Columbia held invalid that part of the Commission's multiple ownership rules which provides maximum limitations on the number of broadcast stations in which any person may have an interest. While this case specifically pertained to the TV rule, the ruling of the court also has the effect of invalidating the limitations contained in the rules governing the AM and FM services. The court based its decision on the ground that the rule illegally deprives an applicant of the right to a hearing afforded by section 309 (b) of the act, and stated that "the statutory provision means that any citizen who seeks a license for the lawful use of an available frequency has the undoubted right to a hearing before his application may be rejected". The court did not hold that the policy bases of the rules were beyond the Commission's proper consideration, and its decision permits the Commission to determine on a case-to-case basis whether any multiple station owner should be granted an additional license. A petition for a writ of certiorari was filed in the Supreme Court, on the ground that the decision of the Court of Appeals is contrary to existing authority sustaining the Commission's power to make general rules which govern the disposition of individual license applications. The petition was granted October 10, 1955.

In a subsequent case, *City of New York Municipal Broadcasting System* v. *Federal Communications Commission*, No. 12,465, decided May 5, 1955, the same court, upon the authority of the *Storer* decision, held that a Commission rule regulating transmitter equipment could not be enforced without a hearing where a waiver of the rule was requested.

In several cases during the fiscal year the Court of Appeals interpreted section 309 (c) of the act, which, as part of the 1952 amendments, added a new provision providing for the protest of grants made without hearing. The court adopted a liberal interpretation of who is a party in interest with standing to file a protest, reversing certain Commission decisions on this question.

The court held that an existing station is a party in interest to the transfer of control of another station in the same community where it is alleged that the

existing station will be adversely affected by comparison from the new station. *Camden Radio, Inc.* v. *Federal Communications Commission*, 220 F. 2d 191.

The court also held that existing TV stations were parties in interest to the change in transmitter site of another TV station, where it was alleged that this action would result in a change in network affiliations and would result also in a signal of increased strength being transmitted to the city in which a protesting station was located. *Greenville Television Company* v. *Federal Communications Commission*, and *Wilton E. Hall* v. *Federal Communications Commission*, 221 F. 2d 870.

In another radio case, the court held that one station was a party in interest to a Commission action authorizing a change in frequency and an increase in power for another station a considerable distance away, where it was alleged that this would deprive the protesting station of listeners through electrical interference, although this interference was not protected against under the Commission's rules. *Metropolitan Television Company* v. *Federal Communications Commission*, 221 F. 2d 879. The court also decided in this case, as urged by the Commission, that an appeal from the denial of a protest is properly brought under section 402 (b) and may not be brought under section 402 (a).

Finally, in *Clarksburg Publishing Company* v. *Federal Communications Commission*, decided June 9, 1955, the court construed that part of section 309 (c) which provides for a hearing on a protested grant where the facts, matters and things relied upon by the protestant as showing that a grant would not be in the public interest are set forth with particularity. The court held, in substance, that where serious matters involving unresolved factual questions are raised by the protest, an evidentiary hearing must be held, and the Commission may not resolve the questions after oral argument limited to the precise facts alleged in the protest.

In *Music Broadcasting Company* v. *Federal Communications Commission*, 217 F. 2d 339, the Court of Appeals sustained a Commission decision directing radio station WGRD, Grand Rapids, Michigan, to cease pre-sunrise operation pending a hearing on the question of whether the prohibition should be made permanent, because of an undue interference caused to station WING on the same frequency in Dayton, Ohio. Station WGRD was licensed to operate only between local sunrise and local sunset, and was permitted to operate pre-sunrise by a Commission rule which also provides that upon notice from the Commission that undue interference is being caused to another station, the daytime station must refrain from such pre-sunrise operation. The court held that the Commission rule permitting pre-sunrise operation did not give WGRD an absolute authority to do so, and that the Commission order requiring the station to cease such operation was not a modification of its license but merely a requirement that it operate within the terms of its authorization. The court stated that WGRD was entitled to a hearing as to whether it was in fact causing interference to WING, but it was not entitled to a comparative hearing on the question of whether its pre-sunrise operation or that of WING was more in the public interest merely because a Commission rule permitted it to operate during that period in the absence of undue interference to other stations.

In *Chicago Board of Trade* v. *United States and Federal Communications Commission*, decided June 2, 1955, the Court of Appeals sustained a Commission decision permitting new tariff schedules of Western Union Telegraph Company to go into effect. These tariff schedules were for the leasing of facilities consisting of tickers, loops, and circuits. The Chicago Board of Trade, which leases these facilities, petitioned for review. Among the several points on which the

court sustained the Commission, it held that the Commission was correct in determining that the proposed charge was reasonable, in not using the standard for systemwide determinations because that standard is inapplicable to the determination of a single rate among many rates. This is one of many Western Union services and concerns a very small segment of the carrier's business. Therefore, said the court, the reasonableness of the single rate involved depended upon the value, volume, etc., of the particular service involved, and was not to be figured upon the basis of a fair rate of return for the whole system. In sustaining the Commission, the court also held that it was proper for the Commission to accept summary exhibits based upon great quantities of underlying material, since the underlying material was inspected by opposing counsel. The court held that the Commission properly overruled an objection that the exhibits were not the best evidence, since the procedure used fully serves the purposes of the best evidence rule, affords ample opportunity for cross-examination, and at the same time eliminates unnecessary delay and expense. This sort of procedure has also been recommended by the Judicial Conference of the United States and by the President's Conference on Administrative Procedure, as the court pointed out.

In *United States* v. *Everett Frankel* (D. C. R. I.), the defendant was convicted on 2 counts of violating sections 301 and 318 of the act, 47 U. S. C. 301, 318, by operating a mobile radio station without either station license or operator's license. In a significant interpretation of the act, the court instructed the jury that a station license is required for a mobile station irrespective of whether the transmissions from the station are shown to have any interstate effects or interfere with any other interstate signals. The court also pointed out that the defendant acted wilfully and knowingly if he showed complete disregard for the law or failed to make reasonable efforts to discover the nature of the law.

FEES

The Commission has not in the past, and does not now, exact any charge in connection with its licensing or regulatory functions. In compliance with Title V of the Independent Appropriations Act of 1952, augmented by Bureau of the Budget Circular A–25 of 1953, the Commission in early 1954 proposed rule making looking toward the establishment of fees to cover certain of these costs. Thereafter the Senate Interstate and Foreign Commerce Committee resolved that the Commission should suspend this proceeding until July 1, 1955.

CEASE AND DESIST ORDERS

The Commission utilized additional cease and desist orders during the year. Most of these were in connection with nonbroadcasting cases involving interference and other infractions not meriting or not subject to revocation proceedings. This use of cease and desist orders was authorized by an amendment to the Communications Act in 1952. Prior to that time section 312 (a) of the statute provided only for revocation of licenses. The change enables cease and desist orders to be issued in appropriate cases, thus reserving the sterner revocation proceeding for Commission licensees who fail to comply with the initial order to stop.

AUTHORIZATIONS

As of June 30, 1955, the Commission had more than 1,400,000 radio authorizations on its books. The largest group—over 1,123,000—consisted of operator authorizations (over 986,000 commercial operators and over 136,000 amateur operators). Authorizations in the safety and special services passed the 300,000 mark for the first time. Broadcast authorizations approximated 6,300, common carrier radio authorizations approached 2,000, and there were more than 600 experimental authorizations for research and development. These radio authorizations collectively covered the use of about 800,000 fixed and mobile transmitters.

APPLICATIONS AND OTHER FILINGS

About 430,000 applications of all kinds were received by the Commission during the year. The largest group—over 264,000—concerned radio operators (213,000 commercial and 51,000 amateur). The next largest category was in the safety and special services—over 151,000. Broadcast accounted for nearly 7,700, common carriers 5,000, and miscellaneous 1,500.

In addition, the Commission had to consider thousands of petitions and other legal filings in connection with hearing and rule-making proceedings, also more than 18,100 tariffs and 1,600 annual and monthly reports of common carriers and holding companies.

CORRESPONDENCE

More than 1,200,000 separate letters, etc., were received or dispatched through the Commission's Mail and Files Division during the year. Of this number, over 853,000 were incoming and 370,000 were outgoing. These figures do not include mail handled in the field offices, or outgoing correspondence of the Washington office of the Field Engineering and Monitoring Bureau.

Under a law of 1953 which requires Federal agencies to reimburse the Post Office Department for carrying penalty mail, the Commission's annual payment amounted to nearly $30,000.

RELEASES AND PUBLICATIONS

The Commission issues no press releases as such, but reports its business by means of public notices made available each work day at its Washington office. Copies of formal documents (orders, decisions, opinions, etc.) besides being served on the parties involved, are furnished others interested on request. Commission rule making is published in the Federal Register. The Commission does not distribute its printed publications, but they are sold by the Superintendent of Documents (see list in appendix).

Mimeographing in connection with the Commission's regulatory and administrative procedure required nearly 41,600 stencils, 9,400,000 sheets of paper, and 13,400,000 impressions during the year. This volume comprised public notices and documents, also material required for the Commission's own use.

TECHNICAL ASSISTANCE ACTIVITY

The Commission continued its assistance in planning technical study programs for foreign nationals interested in telecommunications. There was more than a 100-percent increase in the main activity and arranging for visits to private industry of recipients of grants from the Foreign Operations Administration, the United Nations, and the International Educational Exchange Service of the Department of State.

As of July 1, 1954, 15 projects were in operation for representatives of 8 countries. During the year, 16 additional projects were started, 7 of which affected additional countries. At the year's close, 23 projects had been completed and 8 others were in operation for nationals of 6 countries.

Because the FOA now presents certificates for completion of these studies, the Commission discontinued its issuance of separate certificates. Since the establishment of this activity in fiscal 1952, more than 50 foreign nationals have completed studies under FCC auspices.

National Defense

GENERAL

"For the purpose of the national defense" is one of the stated objects of the Communications Act which created the Federal Communications Commission. In addition to centralizing regulation of wire and radio communication in the interests of safety of life and property, Congress provided for the control of communication facilities and radiation devices in time of national emergency.

Because quick communication is vital to the national defense, the Commission must see to it that radio and wire services are related to the military and civil defense programs, that communication systems be able to serve the Nation's productive capacity and the public under any eventuality, that illegal and improper operations are discouraged, and that the channels of communication are protected from disturbing interference.

POWERS OF PRESIDENT

In time of war or threat of war, or in other national emergency, the Communications Act gives the President special powers over electrical communication.

In 1951 this authority was extended to include electromagnetic radiations. This was necessary because a great variety of electronic equipment and gadgets, though not used for communication purposes, can give off emissions which not only disrupt regular communication services but could be used as "beams" to guide enemy aircraft, guided missiles and other devices of attack.

Later that same year (1951), the President authorized the Federal Communications Commission to enforce regulations in this connection. Several years previously the Commission had, at the request of the Department of Defense, initiated a program for regulating such radiation in the interests of the defense effort.

CONELRAD PROGRAM

One result is the Commission's "CONELRAD" program, which takes its name from the words "CONtrol of ELectromagnetic RADiation". This system is being set up to govern the procedure of the various radio services in an emergency.

The first service covered in the CONELRAD plan was broadcast. This was announced by the White House in late 1952 and made effective the following May. On an air alert, FM and TV broadcast stations would go off the air, but designated AM stations would broadcast official news, information, and civil defense instructions over 640 or 1240 kilocycles. This procedure would make it impossible for the enemy to get a bearing on any patricular station. At the present time about 1,300 AM stations are voluntary participants in the CONELRAD program, and at their own expense insofar as equipment changes and test operations are concerned.

CONELRAD was extended to the aviation and amateur radio services in early 1954.

On September 24, 1954, a temporary plan was established for voluntary compliance by the international, noncommercial educational FM, experimental and auxiliary broadcast services, and by experimental, public, maritime, public safety, industrial, land transportation, and disaster radio services pending the completion of regulations for those services. It provides an interim system whereby, in event of hostile action, some stations in these services would be enabled to continue essential operation under controlled conditions.

In January 1955 the international and noncommercial educational FM broadcast services, and the citizens and public safety radio services entered the regular CONELRAD plan, followed by the land transportation radio service the following August.

CITIZENSHIP REQUIREMENTS

Oral argument was held in March 1955 on a Commission proposal of June 10, 1954, to make ineligible for licensing any amateur or commercial radio operator who is a member of the Communist Party or of any organization which is required to register as a communist front or which advocates or teaches the overthrow of the Government. The argument was on a proposed report of the Commission of the previous January 21 which looked toward amending the application forms accordingly but eliminating an original proposal to require the submission of fingerprints with applications.

Under the Communications Act, FCC licenses are a privilege of citizenship. They are denied to foreign governments and their representatives, and to any corporation having any officer or director who is an alien, or of which more than one-fifth of the capital stock is owned or controlled by foreign interests.

CLASSIFIED DEFENSE PROJECTS

The Commission is collaborating on certain defense projects which cannot be reported here because of the security classifications given

them by their originating agencies and its own authority under the Communications Act to withhold publication of records or proceedings containing secret information affecting the national defense.

In general, these activities involve the joint efforts of various Federal bodies and the communication industry to cope with potential emergencies, to see that wire and radio media are harnessed to the defense effort and that attack would not deprive us of circuits, and, further, that essential communication facilities are adequately safeguarded.

OTHER DEFENSE ACTIVITIES

The impact of defense activity is felt in all fields of electrical communication.

In the matter of common carrier services, the Commission must see to it that the augmented needs of Government, business and industry are met. At the request of the Office of Defense Mobilization, the Commission has set up priority systems for communication over telephone and telegraph carriers in event of a national emergency.

Also, there are defense aspects in the operation of the safety and special radio services because their stations are largely concerned with protecting life and property on the land, on the sea, and in the air, and in directing the transportation of passengers and products.

Particular defense activities are engaged in by the Radio Amateur Civil Emergency Service, which is for civil defense purposes exclusively; the Disaster Communications Service, which enables Government and private stations to join in essential communication in an emergency; the Special Emergency Radio Service, which furnishes communication for relief organizations, doctors in rural areas, ambulances, etc.; the State Guard Radio Service, which provides radio facilities for state guards in states where the National Guard has been called into Federal service; and the Civil Air Patrol, which is composed of civilian fliers interested in rendering national defense and emergency aid.

Public safety is a major purpose of such long-established regular radio services as police, fire, forestry conservation, and automobile emergency. The amateurs have regional networks for relaying communication in time of fire, flood, or other disaster.

Further information about these individual services will be found elsewhere in this report.

In monitoring and otherwise policing the spectrum, the Commission is called upon to furnish bearings to lost aircraft, trace calls of ships in distress, and maintain constant watch to detect, locate, and close illegal radio transmitters and trace sources of interference to authorized radio services.

The Commission has its own Defense Steering Committee headed by Commissioner Robert E. Lee as Defense Commissioner with Commissioner Robert T. Bartley as first alternate and Commissioner John C. Doerfer as second alternate. Staff members include a Defense Coordinator, with alternate, and representatives of various offices and bureaus. The Commission also has a Supervisor of CONELRAD and a Security Officer.

The Commission as a whole is, of course, active in civil defense activities both in relation to the Government and the community. Its delegated authority provides a line of succession for its officials to act for the Commission during war or other emergency.

Radio's Expanding Horizons

PREFACE

This is an introduction to and an orientation for the following chapters which deal with the use of radio in various fields. It endeavors to present a word picture of the phenomenal development of radio as a whole so that the reader may have a general background for the details of the individual radio services which appear on the ensuing pages.

In substance, these chapters reveal that radio's horizons continue to be pushed back; that radio is expanding at an accelerated pace; that more individuals and businesses want to use this modern Mercury; that a serious "housing" shortage exists in some parts of the radio spectrum; that further refinements and cooperation in radio's use are inescapable; and that science and industry are working hard to evolve equipment and techniques for "doubling up" on frequencies in current use or to go "upstairs" for transmission paths once thought unworkable.

The extent to which radio is being used today is reflected in the more than 60 different classes of radio services which hold more than 300,000 authorizations covering some 800,000 fixed and mobile transmitters. Their operations safeguard life and property; speed and protect transportation on the land, on the water, and in the air; aid industry; furnish broadcast programs; augment common carrier telephone and telegraph facilities; and contribute to research and development. Many stations give localized service; others cover large areas; and still others span the oceans to reach foreign countries.

"FROM THE CRADLE TO THE GRAVE"

The tersest summation of radio's use is to say that it now extends "from the cradle to the grave".

There are radio facilities for calling and otherwise speeding doctors to the homes of expectant mothers. After a baby arrives, radio-equipped vehicles can deliver milk, pick up and deliver diapers, and perform other chores in the interest of the newcomer.

At the close of life, radio is being used for dispatching vehicles in connection with the death and burial of the departed. This includes the movement of funeral corteges at a number of large cemeteries.

These, of course, are extreme examples, for radio plays an increasingly important role in our lives from its Alpha to the Omega. Besides providing entertainment and a hobby for all ages, radio provides a vocation for many; speeds business and personal correspondence; aids industry and commerce; contributes to public protection, and directs transportation of persons and products.

GROUP USES

The extent to which radio has been harnessed for communication purposes is indicated by the following group summaries:

Public Communication.—Domestic and international communication by telephone and telegraph over radio facilities.

Public Safety.—Radio aids to police, fire, highway and forestry protection.

Transportation.—Radio navigational, safety and communication aids for ships and airplanes; radio dispatching for railroads, streetcar systems, taxicabs, buses, and trucks.

Industry.—Radio communication to control and speed the movement of personnel and material in the production and delivery process.

Entertainment.—Programing by commercial, AM, FM and TV broadcast stations.

Educational.—Programing by noncommercial educational FM and TV broadcast stations.

Experimentation.—Use of radio in research, and for the development of equipment and techniques.

DIVERSITY OF USES

The diversification of radio's uses is shown by the following miscellaneous examples:

To control city and highway traffic systems.

To direct movement of crews cleaning city streets, water mains, etc.

To expedite delivery of food, fuel, building material, etc.

To speed repair of home and business office fixtures and appliances.

To dispatch trucks to pick up garbage, dead animals, and other refuse.

To route rural school buses.

To aid beach and other recreation area patrols.

To contact workers on isolated ranches, etc.

To direct the movement of machinery on large farms.

To look for oil on land and under offshore waters.

To spot schools of fish from moving planes and radio their locations to fishing boats.

To control car placements in a parking lot.

To direct motion picture crews on location.

To aid bank and business protective patrol systems.

To relay news between reporters on assignment and their newspaper offices.

To control model airplanes, etc.

To send fingerprints and other information from one police department to another.

To control traffic lights from ambulances, fire apparatus, and police cars on emergency calls.

To communicate between the engine and caboose of long freight trains; between moving trains and wayside stations; and in yard operations.

To control railroad track switches by the engineer on a moving train.

To pick up and deliver telegrams by auto.

To relay telephone and telegraph messages, also TV programs.

To bridge gaps in disrupted wire lines.

To transmit pictures and facsimile.

To control crowds at large regattas, horse shows, golf matches, and other big outdoor events.

To transmit orders from "car hops" to kitchens of drive-in restaurants.

To page doctors and other persons.

To direct firefighters at the scene of a blaze.

To enable garage and automobile associations to provide emergency road service.

To send weather and market reports.

To supervise and control valves, pressures and fluid levels along pipe lines.

To record sunspot cycles, measure radio propagation, and study planetary reflection.

And, to provide emergency communication in time of local, regional, or national disaster.

"WIRED" RADIO AND TELEVISION

There has been a proportionate increase in the number of wire systems which furnish television and radio programs to the public, schools, and business, and other groups.

Community antennas, which operate in areas of poor or no regular TV reception, pick up programs of TV stations that are on the air and relay them by coaxial cable to the homes of subscribers.

So-called "college campus" radio systems send programs that "hug" the power wires of connecting buildings on the same frequencies used for AM broadcast so that they can be picked up by standard broadcast receivers in rooms served by the power line circuit.

Closed-circuit (wired) television operation, in particular, is entering so many new fields that its possibilities appear to be without end. Examples of its uses are:

Furnishing special programs to theaters, hotels, conventions, etc.

Demonstrating surgery and other medical techniques to doctors and students.

Instructing several classes of a school or college at the same time.

Checking signatures, etc., between branches of a bank.

Watching babies in large nurseries.

Guarding prisoners in jails.

Relaying church, concert, entertainment, and other programs to overflow or supplemental audiences.

Demonstrating new products to scattered groups of salesmen.

Observing planes takeoff and land at airports.

Supervising freight car movements.

Relaying "lineups" at police headquarters to outlying precincts.

Detecting unnecessary chimney smoke.

Checking documents in different parts of a large filing system.

Serving industry as a robot eye to follow production and handling processes—such as watching boiler, water-level and other gages from the main control room; detecting delays in the movement of material; and otherwise enabling supervisors to see into several places at the same time.

"Kibitzing" dangerous operations from a safe distance—such as those involving use of atomic energy, furnace combustion, detonation of explosives by the military, etc.

Though not licensed by the Commission, these adjuncts can, and do, cause interference to regular radio communication. For that reason they are subject to rules which limit the amount of energy they may radiate.

RADAR

The use of radar as a navigational aid was spurred by World War II. Since then its application to peacetime purposes has increased rapidly.

It is being installed on many boats, large and small, to show the relative position of a ship to other ships in the area and to the shore. Shore-based radar is used to show ship positions in a harbor and permits instructions being given to vessels not so equipped in order to prevent collisions, aid docking, etc. It is particularly advantageous during fog and other adverse weather conditions.

A form of radar is employed in searching for oil deposits under large bodies of water. These instruments, which are sensitive to variations in both the pull of gravity and the earth's magnetic field, are installed in aircraft which fly over the area. Data so obtained in coordination with land radio location equipment makes it possible to determine the location and composition of hidden deposits.

The Navy employs radar for detecting objects below as well as above water surfaces. The nation's defense is strengthened by a radar system to discern and warn approaching aircraft. Radar is also proving increasingly important in observing the approach and activity of storms for weather prediction purposes.

Radar instruments in air carriers show echo displays which enable pilots to avoid air turbulences associated with thunderstorms and guide them through "soft" spots in the weather without serious reduction of speed and with greater safety and comfort for the passengers.

Speed meters based on radar principles have been developed recently and are utilized in many ways for accurately determining the speed of moving vehicles. Some are used by police departments and insurance companies to check the speed of autos and trucks on highways, while others are employed in railroad yards to determine the speed of freight trains while they are being switched. A more recent development consists of installing radar speed meters at street intersections in such

a way that cars in each traffic lane are counted as they approach and the traffic lights change automatically according to the volume of traffic in each thoroughfare.

INDUSTRIAL, SCIENTIFIC, AND MEDICAL EQUIPMENT

As to most everything else, electronics has been a boon to industry, science, and medicine. Heating equipment using radio-frequency energy is now widely employed for the quick heating of products in the manufacturing process. Welding outfits employ like energy; also diathermy machines used for therapeutic purposes. Specific frequency bands are provided to absorb their excess radiations and so keep them from straying into the regular communication channels to disrupt radio communication locally or many miles distant. As a further precaution, certain types of apparatus in this group are approved by the Commission prior to being manufactured and marketed, thus curbing potential interference at the source.

ELECTRONIC "GADGETS"

Though not used for communication purposes, there is a growing sale of electronic "gadgets" for personal and household convenience. They range from special stoves which cook food from the inside out to garage-door-openers and other remote-control devices. Their technical operation is also governed by rules to prevent radiation which could play hob with regular radio services.

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Common Carrier Services

REGULATION

The Commission regulates interstate and foreign communication by telephone and telegraph, whether by wire, cable, or radio. Communication which is purely intrastate in character is not, in general, subject to Commission jurisdiction, but comes under the authority of state utility commissions.

The Communications Act recognizes two types of carriers—carriers subject to the act, and "connecting carriers". The latter do not operate facilities crossing state or national boundaries nor engage in interstate or foreign communication except through physical connection with other non-affiliated carriers. They are exempt from most provisions of the act which apply to fully subject carriers.

The act requires every subject common carrier to furnish service at reasonable charges upon reasonable request. No carrier may construct or acquire interstate facilities or discontinue or curtail interstate service without Commission approval. All charges, practices, classifications, and regulations in connection with interstate and foreign communication service must be just and reasonable and not unjustly or unnecessarily discriminatory. Affected common carriers file tariff schedules which are subject to review and regulation by the Commission.

The Commission prescribes the forms of records and accounts kept by these carriers. Under this authority, it has established uniform systems of accounts for them to follow.

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

The Commission regulates the interlocking of officers and directors of carriers, it being unlawful for any person to hold office in more than one carrier unless specifically authorized by the Commission. It 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 facilities under provisions of the act which require the licensing of all radio transmitters. This is necessary because radio energy knows

During calendar 1954, the industry handled about 186 million average daily local telephone conversations, while the daily long-distance calls averaged about 6.8 million. A number of calls were reclassified from toll to local as a result of the expansion of local exchange areas. The local and toll call totals increased 3.8 and 5.4 percent, respectively, after adjusting for these reclassifications. Teletypewriter exchange calls increased about 5 percent to reach a total of over 21 million and private line service revenues rose about 22 percent.

Dial equipment usage expanded for both local and toll calls during calendar 1954. At its close, 84 percent of Bell telephones and 60 percent of independent company telephones were dial-operated. Bell operators were dialing more than one-half of all toll calls directly to destination, and 3,350 cities and towns were connected to the toll dialing network, a gain of 900 during the year. The number of large traffic centers equipped for toll dialing rose to 31. Telephone subscribers in 25 different areas could dial calls directly to 14 large metropolitan areas, while in New York, San Francisco, Oakland, and Philadelphia and other areas subscribers could additionally dial their calls directly to many nearby points. With these subscriber dialing services came automatic accounting equipment to record details of each call for subsequent billing purposes.

Bell operating revenues reached a new high of $4,784,500,000 for calendar 1954, an increase of about 8.3 percent over the previous year. Including all companies, the telephone industry total was approximately $5,440,000,000. Consolidated net income applicable to American Telephone and Telegraph Company capital stock amounted to $549,931,223, an increase of 14.9 percent over 1953. Earnings per share increased from $11.71 in 1953 to $11.92 in 1954.

The following table illustrates the expansion of the Bell System:

Year	Telephones	Plant book cost	Revenues	Employees
1940	17, 483, 981	$4, 701, 177, 364	$1, 174, 322, 517	275, 317
1952	39, 413, 889	11, 971, 435, 727	4, 039, 664, 218	579, 500
1953	41, 353, 483	13, 059, 232, 000	4, 416, 729, 614	587, 839
1954	43, 321, 849	14, 131, 277, 000	4, 784, 500, 000	578, 436

It will be noted that in 1954 the number of employees reflected a decrease for the first time in many years.

Services and Facilities

Construction of facilities.—The Bell System spent an estimated $1.4 billion for expansion and improvement of facilities during 1954, a large portion of which went to provide service to new customers with a smaller portion going for replacing older plant with more modern facilities. During the same period, the Long Lines Department spent

a near record $116 million for new plant construction, part of which went for new toll-dialing facilities together with a 5-percent increase in the number of interstate toll circuits.

During fiscal 1955 the Commission granted 126 applications involving estimated expenditures of about $83 million to construct, lease, acquire, and operate wire and cable facilities in connection with interstate and foreign telephone service. Included were six authorizations for acquisition or lease of facilities owned by other companies. The estimated amounts and cost of wire and cable construction authorized by the Commission since 1950 are here shown:

Fiscal year	Number of projects	Cost	Sheath miles of cable	Tube miles of coaxial units	Conductor miles of open wire
1950	141	$13,230,678	399.3	0	3,491
1951	218	45,795,686	957.1	2,704	5,461
1952	323	107,533,688	1,388.7	2,972	5,998
1953	358	89,228,416	1,494.0	5,678	2,006
1954	234	62,985,906	730.0	564	1,337
1955	126	82,947,707	2,669.0	2,375	185

The downward trend in the number of applications during fiscal 1955 resulted, in part, from a revision in the Commission's rules under which carriers may secure continuing authority to undertake small projects without securing prior specific authority. The revised rules provide that carriers who use such continuing authority shall file reports semiannually showing the details of the projects undertaken. For the fiscal year 1955, 226 projects involving estimated gross expenditures of about $900,000 were reported to the Commission.

The Bell System also continued its accelerated microwave construction program during fiscal 1955. The Commission granted 381 applications involving an estimated expenditure of $27 million to provide about 22,200 broad band channel miles for toll telephone and TV service. At the year's end, Bell operated about 6.2 million toll telephone circuit miles over microwave pathways, an increase of about 25 percent during the year. The microwave and coaxial cable systems were being used to provide about 67,000 channel miles of TV program circuits.

Independent telephone companies also continued to expand the use of microwave facilities. The Commission authorized six new systems with an estimated cost of $364,668 to provide 4,130 additional telephone toll circuit miles.

In October of 1954 the Commission authorized the Bell System to construct and operate twin submarine cables between Port Angeles, Wash., and Ketchikan, Alaska, to augment telephone service between the United States and Alaska. The project will cost about $13.6 million.

Curtailment of service.—During fiscal 1955, the Commission granted 5 applications to discontinue, reduce, or impair telephone service, including 2 held over from the previous year. Four of these involved the substitution of 1 carrier for another in providing exchange service, while 1 involved an area where service was no longer required. The Commission also dismissed one application where service was restored after a temporary discontinuance.

Speed of service.—The Bell System reported new attainments in speed of handling toll calls. The average time required for completing such calls dropped from 1.6 minutes in calendar 1953 to 1.4 minutes in calendar 1954 and 97 percent of all toll calls were completed while the calling party held the line.

Acquisitions and consolidations.—The Commission received 23 applications from domestic telephone carriers for authority to acquire the property of another telephone company. After public hearing, 13 of these were granted, together with 9 held over from the previous year. They represented a gross acquisition cost of about $472,000. Of those pending at the close of the year, initial decisions recommended that three be granted and another be denied. Hearings had been scheduled on six applications.

Interlocking directorates.—There were 11 applications for authority to hold positions of officer or director of more than 1 domestic carrier. These applications, together with 1 held over from fiscal 1954, were granted.

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

Foreign attachment case.—Final decision was still pending in the case of *Hush-A-Phone Corp. et al.* v. *American Telephone and Telegraph Company et al.* (Docket 9189), involving the lawfulness of the foreign attachment provisions of the defendants' tariffs insofar as they might be construed to prohibit the use of the Hush-A-Phone device.

Independent telephone company use of radio.—Effective April 27, 1954, section 2(b) of the Communications Act was amended to provide that the Commission should not have jurisdiction over any carrier engaged in interstate or foreign communication solely through connection by wire and radio with another carrier located in an adjoining State. The language before the amendment had been in terms of "physical connection".

In partial justification of the amendment there were allegations that fear of Commission common carrier jurisdiction had discouraged

some independent telephone companies from applying for radio facilities. Late in fiscal 1955 the Commission received and granted the first application from an independent telephone company to use radio to connect across a state line with another telephone company.

Domestic public land mobile radio service.—The number of radio systems authorized for one-way signaling (radio paging) operations increased by 65 percent. At the end of the fiscal year 57 such systems were licensed and 33 others under construction. Of these, 2 are authorized in Puerto Rico and 1 each in Hawaii and Alaska. Technical progress was highlighted by the development of a miniaturized selective-calling pocket-type receiver which is presently undergoing field tests in the New York City area.

Due to the lack of frequencies to accommodate all applicants for one-way signaling systems, it was necessary to hold comparative hearings for the Buffalo, Pittsburgh, Dayton-Cincinnati, and Cleveland-Akron areas. An initial decision was issued in the latter case and final decisions in the others. Final decisions were also made in comparative hearing cases involving the Long Beach-Los Angeles, New York City, and Philadelphia areas. A final decision was issued with respect to one of the parties in the Dallas-Fort Worth case, and the record reopened for the remaining applicants. Hearing and final decision resulted in cases involving Hartford, Conn., and Columbus, Ohio.

The number of miscellaneous (nontelephone company) common carrier land mobile radio systems for two-way communication service increased by 13 percent. As of June 30, 1955, there were 302 such systems authorized in the United States, Puerto Rico, Alaska, and Hawaii. A hearing was held on applications to establish a new system at Anchorage, Alaska. With respect to an application seeking to renew a construction permit in the Rochester, N. Y., area, which was authorized for several years but never constructed, a hearing was held and an initial decision issued denying the application.

In lieu of the usual 2-year license period, the Commission renewed, for 1 year only, the licenses of 22 miscellaneous common carrier stations in the Domestic Public Land Mobile Radio Service, advising them that examination of their annual reports indicated they are not rendering service to the general public, hence the limited renewal, during which time they must furnish public service if they are to qualify for further renewal. In seven other cases, licensees were warned that the facilities which they are authorized to operate must be used for rendering public service if favorable consideration is to be given to any subsequent renewal.

General communications common carriers (telephone companies) expanded the number of land mobile radio systems for 2-way com-

munications by 12 percent. At the end of the fiscal year there were 280 such systems.

One miscellaneous common carrier at Phoenix, Ariz., and the telephone company in the New York City area were authorized to establish developmental land mobile radio systems to be used for development of engineering data on the feasibility of splitting present radio channels in order to permit greater and more efficient use of the radio spectrum.

A rule-making proceeding (Docket 11435) was instituted looking toward establishing eligibility of wireline communication common carriers to obtain licenses in the Power Radio Service for land mobile radio facilities (on a non-common carrier basis) for use in connection with construction, maintenance and repair of public communication facilities. Rule-making proceedings (Docket 10821) instituted during the previous year, looking toward adoption of regulations applicable to domestic common carrier radio operations now authorized on an experimental basis only, have not been finalized.

Rural subscriber and short-haul toll radiotelephone services.—Further growth occurred in these experimental radio services which are intended to furnish domestic public communication service, on VHF frequencies, to points where it is impracticable to provide wireline communication. The rural subscriber radio stations showed an increase of 75 percent and the number of short-haul toll radiotelephone stations increased by 52 percent. As of June 30, 1955, there were, respectively, 84 and 76 stations in these services.

TV pickup and studio links.—Common carriers continued to provide program transmission service to TV broadcasters over TV pickup and studio-transmitter-link microwave radio facilities. At the end of June 1955, 21 and 33 such authorizations, respectively, were held by telephone companies.

Community TV antennas.—The continued expansion of community TV antenna systems in the more remote areas brought several requests by common carriers to construct microwave systems to pick up and relay programs at points near the TV broadcast station to the areas served by the community distribution system. Applications proposing eight such micvrowave relay systems were filed during fiscal 1955 and two were granted. Of those pending, two involved projected service to Rapid City, S. Dak., and a joint hearing was scheduled to determine whether either or both of the links should be authorized. Construction permits issued to J. E. Belknap and Associates for relay service from Memphis, Tenn., to points in Missouri, which were mentioned in the 1954 report, were allowed to expire by the permittee.

Rates and Tariffs

Tariff filings.—At the close of the fiscal year tariffs or concurrences were on file for 389 telephone companies. During the year, 16,465 tariff publications consisting of new or revised tariff pages, supplements, concurrences, revocations or adoption notices were received. The mobile radio tariffs of most wire telephone companies were withdrawn during the year following amendment of Section 221 (b) of the Communications Act, approved April 27, 1954.

Telephone and telegraph priorities.—At the request of the Office of Defense Mobilization, the Commission drafted a priorty system applicable to domestic and international common carriers for handling certain classes of urgent telephone and telegraph messages relating to enemy attack, national defense, or natural disaster involving widespread damage. It was placed in effect on a voluntary basis by the carriers.

Use of telephone answering devices.—Pursuant to the Commission's decision of May 7, 1954 (Dockets 9383 and 9701), the telephone companies amended their tariffs relating to unauthorized telephone attachments to permit the installation and use of customer-owned automatic answering devices in places where the use of such devices is authorized by the local regulatory agency or state commission.

Program transmission rates.—On October 1, 1954, the Bell System established a package rate for video and audio channels for TV transmission, on a monthly contract basis with a minimum daily service period of 8 hours. Prior to this, video and audio channels were offered only in separate tariffs, with the charges for video being on an 8-hour daily basis and charges for audio on a 16-hour daily basis. The charges for 16-hour daily service under both plans are essentially the same. Subsequently, on April 1, 1955, charges for Schedule A audio channels normally used for TV were established on an 8-hour daily basis.

The Bell companies have not yet established regular tariff rates and regulations in connection with the transmission of network TV color programs. They have, however, extended their "Experimental Color Systems" tariff schedules in order to cover color transmissions. In the meantime, studies are being made by the companies and the Commission of the cost of furnishing video program transmission service.

A new classification of TV relay service, designed to meet the needs of TV broadcasters in remote locations who do not desire or cannot afford the high quality service furnished under the regular tariff, was instituted. The new classification provides for the pick up of the signal of a TV station and relaying it by microwave facilities to

the customer station for rebroadcast. Savings in costs due to the off-the-air pickup and the elimination of supervision and monitoring enable the company to provide this service at a lower rate.

Other Regulatory Matters

Depreciation.—The magnitude of depreciation expense charges during any year depends not only on the depreciation rates applied but on the book costs of depreciable plant facilities in service during that year. For the year ending December 31, 1954, depreciation expense charges of the 23 Bell companies amounted to approximately $479,300,000, an increase of $38,385,000, or 8.7 percent over 1953, while the book cost of depreciable plant facilities increased by 8.9 percent.

The Commission's task of prescribing depreciation rates for telephone companies pursuant to Section 220 (b) of the Communications Act is a continuous one. Recent studies indicate that the long downward trend in depreciation rates may be at an end and that those previously prescribed should be reviewed.

One reason for this possible change appears to be that, due to the unexpectedly heavy demand for telephone service following World War II, it was necessary for the Bell companies to conserve available facilities as long as practicable, thereby prolonging service lives. In general, Bell companies have appreciably caught up with the backlog of held orders for service and production by its subsidiary, Western Electric Company, has increased to the point where desirable replacements of plant at greater volumes have begun and are expected to continue for some time. This means shorter service lives than previously forecast for plant facilities now in service.

Another factor which may justify an increase in depreciation rates is the removal cost of plant retired. This factor has had an upward trend since about 1950 coincident with wage increases with no apparent offsetting increase in gross salvage realized.

Bell representatives have indicated that the present dial central office equipment, including the latest crossbar types, will not realize service lives as long as previously assumed because of the development of a fully electronic switching system having no moving parts. This new system is expected to have important advantages over the present dial systems, such as substantial economies in building space, less costly and improved maintenance, more economical ways of handling and ticketing long-distance calls, and the ability to store and to hold a dialed number if the called line is busy and to complete the call after the line becomes released. Finally, a growing popular demand for the latest types of telephones, including sets in color, may shorten the service lives of telephones now in service.

Separation procedures.—The procedures used by Bell companies to separate and apportion their investment and expenses between inter-

state and intrastate operations have been the subject of continuing study by the Commission and the National Association of Railroad and Utilities Commissioners (NARUC) representing the state commissions. The Commission has before it a proposal of the NARUC for a revision in the existing separations procedures which, it contends, will result in a more equitable method of allocated interexchange toll lines book costs and related expenses.

Bell System Federal income taxes.—Western Electric Company was included in the consolidated Federal income tax return of the Bell System for 1954 for the first time in many years. The Bell System elected for the first time to exclude from consolidated taxable income Western's profits on sales charged to the plant accounts of the telephone companies parties to the consolidated tax return. This treatment of Western's profits reduced the consolidated tax liability by approximately $33.5 million and was recorded so as to reduce the book cost of telephone plant of the telephone companies by the same amount. The income tax liability of the telephone companies in future years will be greater than otherwise because of the decision to exclude certain of Western's profits from taxable income. This will result from lower depreciation deductions being allowed for tax purposes.

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

Pensions and relief.—Pension plans of the Bell companies were continued in effect without change. For the Bell System, including manufacturing and research activities, pension and other benefits costs (including Federal taxes for social security benefits) for calendar 1954 amounted to approximately $284 million. This is an increase of about $12 million over 1953. As of December 31, 1954, the Bell pension trust funds aggregated about $1,969 million. At the end of 1954, 35,602 retired employees were receiving service pensions.

An examination was completed of the revised actuarial data underlying certain of the basic actuarial factors used in developing the service pension accrual rates now used by the Bell companies. The report on this examination is under consideration. Of particular interest is the recent upward trend in the rate of earnings on the pension funds and the tendency of employees to retire at a higher age than assumed.

The rate of interest assumed for actuarial purposes is 2¾ percent. This compares with fund earnings of about 3 percent in 1954.

Uniform systems of accounts.—A number of interpretations with respect to the accounting rules were rendered in letters to various carriers. Among these were interpretations relating to the inclusion of standby telephone equipment in operated plant, the appropriate accounting for certain types of revenue received and amounts received as reimbursement for special plant installations. A notice of proposed rule making asked for comments as to whether the amounts of contributions for charitable, educational, social and community welfare purposes should be permitted to be charged to operating expenses. This matter has not yet been decided.

Restatement of plant accounts on basis of original cost.—The accounting for a number of current acquisitions of plant, including some mergers of small companies, was handled in accordance with the Commission's accounting regulations. In addition to accounting for current acquisitions, final disposition was made of an original cost item involving three Bell companies which had been under negotiation for a number of years with the companies and the state commissions. This resulted in a net charge to the earned surplus of the 3 companies involved of over $1,500,000.

The 1954 report mentioned that final accounting for acquisitions of private radiotelephone communications systems which the nontelephone utility or transportation common carrier vendors continue to operate as licensees under lease arrangements was suspended pending determination of the applicability of original cost accounting. It has since been decided that acquisition cost accounting may be applied to these transactions as well as to certain acquisitions of pole lines from electric utilities. However, the applicability of original cost accounting is still under consideration with respect to other acquisitions of plant from certain nontelephone companies where the acquired plant is integrated into the telephone system of the purchaser.

Continuing property records.—Additional reviews and studies were made of the continuing property records of several Bell companies. Particular attention has been directed toward the periodic reconciliations between quantities on the continuing property records and quantities on the plant engineering and other records. In an effort to reduce the costs of making reconciliations and to speed up the reconciliation work, certain of the Bell companies are now using statistical sampling methods of inventorying plant from plant records.

Internal Revenue Code of 1954.—This revised code contains several new provisions that affect both rate making and accounting for car-

riers subject to the jurisdiction of the Commission. The most significant change relates to computing depreciation charges for income tax purposes on plant additions since 1953. The declining-balance method and the sum-of-the-years' digits method are specifically mentioned as permissible for use, as well as any other method or modification of the foregoing methods that is approved by the Internal Revenue Service. The use of any of these methods will result in the payment of lower income taxes at least for a number of years in the future.

Questions have arisen as to the treatment to be accorded such tax reductions in rate proceedings and how they are to be recorded in the accounts. These matters have been the subject of study by the Commission in cooperation with the Depreciation and Accounting Committees of the NARUC. Final regulations have not as yet been issued by the Internal Revenue Service and no conclusion has been reached as to appropriate treatment for regulatory purposes.

NARUC Committee on Depreciation.—The Commission's participation in the activities of this committee consisted of (*a*) consultations and assistance in the preparation of a report, which the committee presented at the national convention of the NARUC in November 1954, dealing with the problem of "economic" depreciation *vs.* depreciation based on original cost; (*b*) special studies and development of technical data on liberalized depreciation permitted under the 1954 Internal Revenue Code; and (*c*) preparation of technical sections of a report on liberalized depreciation to be submitted by the committee at the 1955 NARUC convention.

NARUC Committee on Accounts and Statistics.—The Commission continued to cooperate with the committee on a number of accounting matters of mutual concern to state and Federal regulatory commissions, including completion of proposed accounting systems for electric, gas, and water utilities and a study of accounting problems arising from the 1954 Internal Revenue Code. Progress was made on a joint study, in cooperation with the Bell System, of simplifying the accounting for telephone station apparatus.

Annual and other reports.—The Commission's rules were amended to relieve companies controlling smaller communications common carriers from filing holding-company annual reports. Only companies controlling carriers having annual operating revenues in excess of $2,500,000 are now required to file such reports.

The rules were also amended to eliminate the requirement that communication carriers keep records of franked calls made by employees from company premises.

DOMESTIC TELEGRAPH

General

The domestic message telegraph service is provided substantially by one company, The Western Union Telegraph Company, now in its 105th year. Western Union also owns and operates a substantial ocean-cable system. Landline telegraph services offered to its users are, principally, domestic public, press, and Government message services, a money order service, and private line services.

Although Western Union's private line business increased substantially during the fiscal year, to the point where it is the second largest revenue-producing service offered by that company, the majority of private line telegraph services available nationwide is furnished by the Bell telephone system. Bell also offers teletypewriter exchange service (TWX).

Business of the landline telegraph system continued to improve, due to a full year's operation under increased rates, to generally good business conditions, and to increased sales efforts, particularly in the private line and facsimile telegraph services. Western Union's financial position has materially strengthened and, early in 1955, it adopted a $4 annual dividend rate in contrast with a $3 dividend rate maintained in the 3 previous years.

Western Union's gross landline operating revenues for the calendar year 1954 reached a peak of $209,635,000, although the traffic volume declined to 152,582,000 messages. In 1953, operating revenues amounted to $208,578,000 with 162,188,000 messages handled. Its systemwide net income for calendar 1954, including ocean-cable operations, was $6,471,000, after providing $7,725,000 for Federal income tax.

The net income for 1954 takes into account a nonrecurring net charge of $3,119,000 resulting from a change in the method of accounting, to accrue in advance for vacation pay and other employees' benefits ($6,498,000 gross charges less related Federal income tax reduction of $3,379,000). However, the section of the Internal Revenue Code permitting these advance accruals as deductions for tax purposes was repealed and the 1955 accounts of the company will reflect an increase in the accrued liability for 1954 Federal income tax by approximately $3,500,000 with a corresponding reduction in the reserve for accrued vacations.

The company reported systemwide net income for the calendar year 1953 of $14,469,000, after providing $9,417,000 for Federal income tax. The net income includes a net gain from sales of investments in subsidiary companies amounting to $6,364,000.

For the last half of fiscal 1955, Western Union reported gross operating revenues from landlines operations of $112,967,000, as compared to $109,473,000 for the first half of fiscal 1955. The message load increased slightly to a level of 76 million messages or 0.6 percent in relation to message volume of the previous six months. Systemwide earnings from current operations for the last half of fiscal 1955 amounted to $6,611,000 after providing $6,006,000 for Federal income taxes.

During the last months of fiscal 1955, the telegraph company effected substanial changes in its capital stock and debt structure in order to facilitate trading on the New York Stock Exchange and broaden ownership of its stock, to extend the maturity date of a large segment of debt, and to provide additional funds for continuing expansion of facilities.

Services and Facilities

Western Union modernization program.—As of the end of calendar 1954, Western Union had expended $59.5 million on its mechanization and modernization program which was designed to provide cheaper and more efficient methods of furnishing telegraph service. This program has resulted in estimated savings of $31 million a year at 1953 expense levels.

The construction of 15 reperforator switching centers, completed in 1950, provides for the automatic and semiautomatic relay of telegrams between cities and, in general, eliminates manual retransmission at relay points, thereby providing faster and more efficient service. In order to obtain the fullest advantages of reperforator switching, Western Union, as of June 30, 1955, had furnished 212 branch offices in nonreperforator cities with direct circuit connections to reperforator switching centers for outgoing traffic and 37 branch offices had been similarly equipped for handling both outgoing and incoming traffic. In addition, the company currently is interconnecting tielines of its larger customers into its reperforator switching centers, thereby effecting substantial economies and providing faster service.

Telegraph channel mileage in operation as of June 30, 1955, approximated 3,515,500 miles, including 143,500 miles added during fiscal 1955, which is more than double the channel mileage at the end of 1946. Over 80 percent of this channel mileage has been derived from applying carrier current systems to physical circuit facilities or voice frequency channels. Use of carrier equipment enables the company to obtain up to 20 telegraph channels from one voice frequency channel. Carrier circuits are generally superior to physical wire circuits with respect to both reliability and stability. Over 72 percent of telegraph channel miles derived from carrier are on voice

frequency channels leased from the Bell System, and the remainder are on Western Union-owned facilities.

Since World War II, Western Union has supplemented wire operation with the use of its microwave radio beam transmission system linking Washington, New York, Philadelphia, and Pittsburgh. There are 124,850 telegraph channel miles in operation on these facilities. The company has acquired tower sites in various sections of the country for extension of this system and recently announced plans to expand it to Cincinnati and Chicago.

Rapid growth has been experienced in the lease of private wire systems. For instance, Western Union now furnishes over three times as much private line service as it did in 1944. Facilities leased to subscribers for private wire telegraph service increased from 1,493,600 miles in 1954 to 1,763,000 miles in 1955, an increase of 18 percent.

The installation of deskfax (facsimile) and other direct wire connections continued at a rapid pace. A deskfax installed on the desk of the user speeds the delivery and pickup of telegrams, stimulates telegraph usage and provides maximum customer convenience. Deskfax installations were completed to 6,470 additional customers' offices, bringing to 20,000 the total number of such units. Company plans call for expansion of this figure to more than 26,000 in calendar 1955. Teleprinter-operated direct wire connections to customers were increased from 22,586 to 23,380. The large and continuing increase in direct customer connections, principally deskfax tieline installations, has reduced materially the need for messenger and telegraph office handling.

Western Union announced that, to supplement its research and development, it has purchased a one-third interest in Microwave Associates, Inc., a firm in which American Broadcasting-Paramount Theatres, Inc., also has a third interest. Microwave Associates is an organization devoted to research and manufacturing in electronics.

Construction of wire facilities.—The Commission approved five Western Union requests for wire telegraph construction and extensions. The applications involved the leasing of 222,017 telegraph channel miles at an annual rental of $233,217 and the construction of 91,625 telegraph channel miles and associated equipment at a cost of approximately $3,170,000.

Curtailment of service.—During the year, 924 applications for reductions in hours of service or closure of public telegraph offices were filed by Western Union as compared to 1,202 the previous year. In addition, 137 applications were pending at the beginning of the year. Of the total, 947 applications were granted, two were granted in part and one was denied in part, two were denied, 11 were with-

drawn and 100 were pending at the end of the year. In most cases, substitute service was made available where curtailments in service were made. Western Union estimates that savings at the rate of about $7 million a year in expenses have resulted from office closures and hour reductions from 1947 through 1954.

Speed of service.—Pursuant to Commission rules, Western Union reports monthly the average speed of service (office relay drag) attained in handling messages through 25 large message centers and the average origin-to-destination speed of service (time filed to time delivered, or first attempt) on messages terminating at those cities. A comparison of the speed of service performance reported by Western Union for 1954 and 1955 follows:

	Average speed in minutes	
	Fiscal 1954	Fiscal 1955
Origin to destination: Delivered by:		
Telephone	43.7	39.6
Messenger	47.2	43.0
Private tieline	37.9	34.4
Office relay drag	8.4	7.3

To a large extent, this improvement in speed of service is a result of the company's expediting efforts in its 15 reperforator switching centers, through which approximately 96 percent of all messages flow. For instance, the company attained during each month of the year a faster monthly average speed of service at its reperforator centers than had been reported during any previous year. At the present time, the company is studying the feasibility of establishing origin-to-destination speed objectives with a view of improving the overall service and reducing the number of excessive delays.

To the extent possible, the Commission makes spot-checks of service conditions but, due to limitations placed on personnel and funds, these investigations are, of necessity, confined to the most urgent cases. Commission field engineering personnel in 17 district offices assisted by making 34 routine inspections of speed of service performance of Western Union offices and agencies during their regular field inspection trips. Similar inspections were made by the Common Carrier Bureau field offices in New York, San Francisco, and St. Louis at 203 Western Union offices located in or near those cities. The bureau headquarters and field offices' staff made a limited number of inspections of service conditions following the closure of branch offices.

Rates and Tariffs

Domestic telegraph rates.—As reported in 1954, Western Union filed new and increased rates, to become effective July 15 and August

1, 1954, for interstate message telegraph and money order services, foreign money order service, and certain other interstate services. The revised rates were designed to produce total additional revenue of about $10 million a year from interstate and intrastate traffic.

On July 1, 1954, the telegraph company filed revised tariff schedules, effective August 15, 1954, containing certain new and increased charges and regulations applicable to the United States-Canada and St. Pierre-Miquelon Islands telegraph message and money order services. It is estimated that the United States-Canada rate revisions would produce additional annual revenues of approximately $316,000. On August 2, 1954, it filed revised tariff schedules, effective September 1, 1954, containing new and increased charges and regulations for interstate press messages between points within the continental United States. These changed press charges, according to the company, would result in about $150,000 additional annual revenue.

Western Union contended that these increased revenues were required to offset wage increases and to restore the company's earning position to the approximate level of the first half of 1953. After careful review of comprehensive data regarding the telegraph company's requirements and operations generally, the Commission permitted the tariff schedules to become effective on the dates indicated.

Ticker rental charges.—As indicated in the last annual report, the Chicago Board of Trade had appealed the Commission's decision of April 22, 1954 holding that Western Union's increased rates for normal speed "tickers" were just and reasonable and that its new rates for high speed "tickers" had not been shown to be unreasonable or otherwise unlawful (Docket 10274). On June 2, 1955, the United States Court of Appeals for the District of Columbia Circuit affirmed the Commission's decision. The court held that when rates of a minute segment of a huge business are in issue, the regulatory agency is not required to make findings relating to the rate of return for that segment. The court concluded that its study of the Commission's conclusions and underlying findings disclosed that the appeal involved chiefly matters requiring the exercise of regulatory judgment by the Commission and that the bases for these judgments were readily ascertainable and rested upon ample evidence.

Tariff schedules.—A total of 35 domestic telegraph carriers had tariffs or concurrences on file with the Commission at the end of the year. These carriers filed 939 tariff publications during the year, establishing or changing rates, regulations, practices, and classifications of service.

Other Regulatory Matters

Original cost of plant and continuing property records.—Reviews were completed of (1) the methods and procedures applied and the accounting performed in connection with Western Union's restatement of its plant and equipment on the basis of original cost, (2) the reclassification of plant and equipment in conformity with primary plant accounts as prescribed in the uniform system of accounts, and (3) the concurrent establishment of a continuing property record system. These studies confirm that Western Union has complied substantially with the applicable rules and regulations.

Depreciation.—Following staff review of service lives and salvage values of Western Union's plant and equipment, in the light of existing conditions, the Commission on January 28, 1955, prescribed new depreciation rates for Western Union landlines plant, retroactively to January 1, 1955. The new rates are expected to result in annual depreciation charges of approximately $10,937,000, and represent a reduction of $273,000 annually, or 2.5 percent. The previous prescription of depreciation rates for Western Union's landlines plant was January 1, 1948.

Pensions.—To ease the burden of financing pension costs, particularly in the future, Western Union adopted, effective January 1, 1955, a plan for partial funding of employee pensions. The plan is subject to Internal Revenue Service approval as qualifying for tax exemption, and will be submitted to this Commission for its consideration. The company's previous pension plan was on a pay-as-you-go basis. Based on available actuarial data, aggregate annual pension costs under the partial funding plan are expected to be greater than the previous pension plan through the year 1965, after which time they will be less. Total pension costs are expected to reach a peak of $13,000,000 in 1973, after which they will level off.

Capital structure changes.—Toward the end of the fiscal year Western Union took advantage of its greatly improved credit and investment position and effected substantial changes in its capital stock and debt structure, whereby additional equity capital was obtained and the interest rate was reduced. The company refinanced its outstanding funded debt of $37,000,000 through private institutional sale of $38,500,000 of 4⅛ percent debentures maturing on June 1, 1980. The company split its common capital stock four for one, changed its par value from $10 per share to $2.50 per share, and increased authorized shares by 1,580,000, bringing the authorized total to 7,000,000. At the close of the fiscal year Western Union proposed, subject to Securities and Exchange approval, to offer 1,000,000 new shares of stock

to shareholders. After the proposed issue, the company will have over 6,000,000 shares of common stock outstanding.

Uniform system of accounts.—Progress has been made on a proposed combined system of accounts for wire-telegraph, ocean-cable, and radiotelegraph carriers. A partial draft has been sent to the affected carriers for comment.

Miscellaneous accounting matters.—In addition to continuing review of telegraph carriers' accounting methods and procedures, the accounting for the following special items was studied and approved: (*a*) discontinuance of the 12-year special amortization plan with respect to the unprovided-for depreciation on plant prematurely retired under the company's modernization program, and (*b*) final adjustments incident to the 1943 merger of Postal and Western Union.

INTERNATIONAL TELEGRAPH AND TELEPHONE

General

During fiscal 1955, 4 cable and 6 radiotelegraph carriers with terminals in the continental United States were engaged in international telegraph operations between this country and the rest of the world. Through these facilities and their connections with foreign carriers, the United States public was provided with telegraph message service to and from almost every place on the globe. Four of the United States carriers also provided private line service (by means of leased cable and radio channels) with a number of foreign countries. Radiotelegraph communication was available with ships at sea through the coast stations of 4 international radiotelegraph carriers and of 5 other carriers engaged exclusively in marine communication services.

International telephone service was provided by American Telephone and Telegraph Company between the United States and over 100 foreign and overseas points, more than half of which were served by direct radiotelephone circuits. There is also radiotelephone service to ships at sea.

International telegraph and telephone services were provided to and from United States territories and possessions on a basis generally comparable with the international services to and from the continental United States.

The upturn in volume of United States international telegraph message traffic which began in mid-1953 continued through calendar 1954. The message volume handled by the ten cable and radiotelegraph carriers advanced to a total of 521,827,659 paid words in 1954, representing an increase of about 2.1 percent or 10,571,166 paid words over the 1953 level. The improvement in message volume was

reflected in industry-wide message revenues (including the revenues from the foreign radiotelegraph operations of one cable carrier devoted principally to message handling), which increased to $53,277,718 in calendar 1954, or about 5.9 percent above the $50,281,291 for the previous year. Revenues from leased channels, international teleprinter exchange, and other direct customer-to-customer services continued to show substantial increases during 1954 in line with those noted for the 2 preceding years. The revenues from these services, as well as other nonmessage services furnished by the several carriers, increased about 12 percent during calendar 1954 to a total of $10,583,398.

Total industrywide operating revenues reached a new high of $63,811,116 in 1954, an increase of about 6.8 percent over 1953, while operating expenses increased only about 2.7 percent. Thus, net operating revenues of the industry, before Federal income taxes, advanced to $9,157,197 for a new postwar record high, representing an increase of about 40.7 percent over the previous high of $6,509,445 in 1953. As of December 31, 1954, the several international telegraph carriers had a total gross investment in communications plant and equipment of $133,666,677, and a net investment, after depreciation allowances, of $57,679,105.

Calendar 1954 saw a continuation of the growth in the number of international telephone calls. During that year a new high of 1,134,902 chargeable calls were handled between the United States and foreign overseas points, an increase of about 7.8 percent over 1953. The revenues for such service (including associated landline charges) amounted to $11,440,183 in 1954, or about 4.8 percent above 1953.

International Services

Telegraph.—Submarine cables operated by United States companies provide direct telegraph service to European and Latin American points. At present there are no such cables in operation to Pacific points. At the close of fiscal 1955, United States companies were operating direct radiotelegraph circuits to 85 foreign and overseas points. Through interconnection between the United States cable and radio facilities and those of foreign carriers, telegraph traffic is relayed to practically every country in the world not served by direct circuits.

The past year saw an increased trend toward use of the "customer-to-customer" type of services offered by the telegraph carriers. Representative of those services are "TEX" (international teletypewriter exchange) and "IMCO" (international metered communication). In these services the carrier furnishes a communication channel between the United States and a foreign point so that customers at both ends

of the circuit can communicate directly by means of equipment installed in their premises. Charges for these two types of service are on a "per minute" and "per letter" basis, respectively. Also widely used is the "leased line" type of service where the customer leases a channel for a given period of time, usually by the month with a minimum daily use.

Under international agreement, each country is required to provide for the settlement of accounts for vessels under its registry of tolls for radiotelegraph traffic exchanged with coastal stations of other administrations. This function for United States ships is carried out by the International Telecommunications Settlements Division of the Commission. In fiscal 1955 this division accounted for the following messages and made the following disbursements:

Messages on hand beginning of period	25,478
Messages received during period	132,641
	158,119
Messages processed during period	144,115
Messages on hand June 30, 1955	14,004
Cash on hand at beginning of period	$66,588.83
Cash received from United States companies	206,492.31
Total	273,081.14
Cash disbursed during period	213,721.82
Cash on hand for disbursement June 30, 1955	59,359.32

Telephone.—Direct international telephone service is provided to 59 foreign countries and overseas points by means of radio. Canada and Mexico are served by interconnecting wire lines and Cuba by submarine cable. Alaska is served by the Alaska Communications System. In addition, over 50 points are served by relay through various foreign facilities.

During the year work was started on installing the coaxial telephone cables referred to in last year's report. Two cables (1 for each direction) across the north Atlantic, scheduled for completion late in 1956, will provide 36 two-way telephone channels between the United States and Canada and the British Isles. Preliminary work has also started on installing two similar telephone cables between Port Angeles, Washington, and Ketchikan, Alaska. The Commission issued a cable landing license for the latter on October 20, 1954. Still another such link, authorized September 7, 1955, will extend from the Pacific coast to Hawaii.

Experiments are being conducted with "over-the-horizon" transmission on microwave frequencies. These experiments look toward

use of microwaves to provide many channels of communication, including transmission of TV programs, over paths where the use of intermediate relay stations would be impractical. The first such authorization by the Commission is for tests between the southern tip of Florida and Cuba, a distance of approximately 150 miles. The conventional "line-of-sight" microwave relay systems, as used throughout the United States, require the stations to be spaced much closer.

Applications.—Licensees in the International Fixed Public Services filed a total of 264 applications during the year for additional frequencies, points of communication, installation of additional equipment, program service, etc., as compared with 405 applications the previous year. The Commission acted on 292 applications. This reduction is due largely to the fewer number of applications for new frequencies. This results from the fact that during the year all licensees transferred their operations to "in band" frequencies and so ended the flood of applications occasioned by implementation of the Atlantic City table of frequency allocations.

Radio Interference.—The increased congestion of the high frequency radio spectrum (3 to 30 megacycles), caused by implementation of the Atlantic City table and by increasing use of radio services throughout the world, has resulted in a corresponding increase in the number of interference cases. The Commission has been instrumental in aiding the operating agencies concerned, both United States and foreign, to reach satisfactory agreements for alleviation of interference problems.

Docket Cases

Mackay circuits to The Netherlands and Portugal.—The 1954 annual report noted that further hearings had been held in the so-called "Three Circuits Case" concerning applications by Mackay Radio and Telegraph Co. to establish radiotelegraph circuits to The Netherlands and Portugal which would compete with existing circuits operated by RCA Communications, Inc. This proceeding (Docket 8777) had been remanded to the Commission for further consideration after the Supreme Court held that the Commission's grant of such authority could not be based upon a finding that there was a national policy in favor of competition in this field. On June 22, 1955, the Commission reaffirmed its grant, finding that Mackay competition to the points at issue was reasonably feasible and that there were grounds for a reasonable expectation that such competition would have a beneficial effect. The Commission noted that it was not establishing a general policy with respect to duplicate direct radiotelegraph circuits, but

would require any applicant to demonstrate at least that there is reasonable expectation that such competition may have some beneficial effect.

Western Union-Globe and Tropical contracts.—In 1954 it was reported that an appeal had been taken to the courts from the Commission's decision in Docket 9292 holding that certain contracts entered into with Globe Wireless, Ltd., and Tropical Radio Telegraph Co., respectively, by Western Union for the exchange of certain international telegraph traffic were violative of Section 222 of the Communications Act and the international formula and ordering such companies to cease and desist from the transfer of traffic pursuant to such contracts. On December 8, 1954, the United States Court of Appeals for the Second Circuit affirmed the Commission's decision. Pursuant to order of the Commission, the parties are negotiating an agreement with respect to damages due the complainants (Commercial Pacific Cable Co., Mackay Radio and Telegraph Co., The Commercial Cable Co., All America Cables and Radio, Inc., and RCA Communications, Inc.), as well as a plan of reparations.

International formula complaints.—Several complaints were filed relating to the international formula governing the distribution by Western Union, among the various international carriers, of outbound international telegraph traffic filed at Western Union offices.

By letter of April 7, 1955, RCA Communications, Inc., requested that the Commission, on the basis of the decisions in Docket 9292 (*Western Union-Globe and Tropical contracts*), require Western Union to cease handling, over its cable system via London, traffic destined to various points in the Far East included in "Area C" under the formula, and that such traffic be distributed to the carriers entitled under the formula to traffic to that area, of which Western Union was not one. Following an answer by Western Union and a reply by RCAC, the Commission on May 26, 1955 released a memorandum opinion and order denying the RCAC request, pointing out that the formula was not intended to deprive any carrier of the right to handle traffic over established routes to points it had served prior to the prescription of the formula, and that Western Union was entitled to serve the points in question. On June 24, 1955, RCAC petitioned for reconsideration.

On April 8, 1955, RCAC filed a formal complaint (Docket 11364) with respect to such traffic, requesting that the Commission order Western Union to transfer to RCAC sufficient traffic to make up RCAC's deficiency under the formula or make other restitution. Consideration of the formal complaint is awaiting disposition of the RCAC petition for reconsideration.

On March 1, 1955, RCAC filed a petition and memorandum (Docket 11298) asking a ruling by the Commission with respect to the lawfulness under section 222 of the act and the international formula of certain practices of Western Union relating to solicitation and routing of outbound international messages which tend to favor the Western Union cable division. It requested reparations. That matter is also under consideration.

In 1954 RCAC filed a petition (Docket 10984) requesting a ruling that Western Union was in violation of both the international formula as well as the formula with respect to the distribution of telegraph traffic destined to Canada, because Western Union failed to transfer to RCAC certain traffic destined for transpacific points which Western Union had received from Canadian National Telegraphs in Canada. Further pleadings were filed in January 1955. The matter is still under consideration.

On April 4, 1955, Western Union requested that the Commission prescribe certain changes in the international formula, alleging that in its present form and as interpreted by some of the carriers it is unjust, unreasonable, or not in the public interest. Western Union referred to its letter of February 27, 1951, written in response to the Commission's inquiry of the carriers in 1950 as to their views with respect to possible revision of the formula, as substantially containing its present views on how the formula should be revised. This matter is likewise under study.

Western Union divestment.—The previous annual report referred to the pendency of an initial decision in Docket 10151, which involves an investigation, on the Commission's own motion, into the requirement set forth in Section 222 of the act for the divestment by Western Union of its international telegraph operations. An initial decision issued December 20, 1954, proposed that Western Union be directed to (1) present to the Commission within 12 months a plan for divestment of its submarine cables; (2) cease its international telegraph business within 18 months, and (3) make periodic reports on its negotiations for divestment. The Commission was asked for oral argument prior to final decision. The date for oral argument has not been set. On July 5, 1955, Western Union announced that it had negotiated a plan to sell its international cable facilities. The details have not been finalized and the entire proposal is subject to Commission approval.

Metropolitan area tieline service.—Reference was made in the 1953 annual report to this consolidated proceeding involving a complaint by Western Union against effective provisions in tariffs of RCAC

(Docket 10335), and similar proposed provisions in the joint tariffs of All America Cables and Radio, Inc., The Commercial Cable Co., and Mackay Radio and Telegraph Co. (Docket 10378), for furnishing teleprinters, at the expense of the carriers, to customers located in "metropolitan areas" of New York, Washington, and San Francisco. The defendants' tariffs formerly limited furnishing teleprinters to customers located within the "corporate limits" of such cities. The issues involve the clarity and lawfulness of the tariff provisions in question and the effect of the practices upon the international formula. At a prehearing conference on March 3, 1955, the parties agreed to explore the possibility of resolving the issues without the necessity of a hearing and a few days later agreed on a satisfactory tariff provision. Accordingly, the defendants filed revised tariffs, effective June 1, 1955. providing that the carriers would furnish teleprinters to customers at Washington National Airport and to Government and intergovernmental organizations whose offices are located within 10 miles of the respective carriers' operating offices in Washington, and to other customers of the respective carriers within the "corporate limits" of the three cities mentioned. Accordingly, Western Union requested that its complaints be dismissed, and the proceeding was terminated May 17, 1955.

Tariff Schedules, Contracts and Division of Tolls Statements

Carriers furnishing international and marine communications services submitted the following filings: 689 tariff schedules, 43 contracts, 330 amendments to contracts, 117 reports of negotiations with foreign administrations and carriers, 244 division of tolls statements, and 23 applications for permission to file tariff schedules on less than 30 days' notice.

Rate Level and Structure

In December 1954, a petition was filed for a review and revision of the international rate level and structure. While the matter was being studied, an increase in the level of revenues and earnings took place. Accordingly, a further request was made that the petition be held in abeyance or dismissed without prejudice. On June 1, 1955, the latter action was taken.

Other Regulatory Matters

Depreciation.—Further progress was made, through cooperation with the carriers, in conducting studies and developing information necessary for the Commission to prescribe annual depreciation rates for the international telegraph carriers. As a result, the Commission,

for the first time, prescribed annual depreciation rates, effective January 1, 1954, for the ocean-cable plant of Western Union. It is expected that depreciation rates for some other carriers will follow in fiscal 1956. Continued consideration was also given to the reasonableness of the book depreciation reserve, the depreciation accounting practices, and the depreciation rates and charges of these carriers.

Continuing property records.—All but one international telegraph carrier had completed its property record at the end of fiscal 1955. This carrier expects to do so next year. Studies designed to verify the form and content, as well as to evaluate the regulatory effectiveness, of the property records of the radiotelegraph and ocean-cable carriers were continued. They disclosed certain deficiencies in the records of some carriers and the latter have taken corrective measures. The Commission revised its system of accounts for the international telegraph carriers to provide relief from filing certain material applicable to property records.

Relief and pensions.—Studies were pursued to ascertain the effect of pension costs upon allowable operating expenses for rate-making purposes. One large carrier proposed to adopt a partial funding program, and this plan was analyzed to determine the reasonableness of the additional cost.

Reclassification of plant.—Except for certain adjustments applicable to the plant of several carriers, which are now under study, the plant and equipment of the international telegraph carriers has been reclassified on the basis of original cost. This reclassification is required by the systems of accounts applicable to them.

Miscellaneous accounting matters.—The Commission continued to study the reasonableness of the international telegraph carriers' accounting practices and procedures. These studies are designed to assure rule compliance as a means toward attaining proper rate regulation. Among the matters given consideration were (a) traffic-damage claims, (b) plant retirements and installations, and (c) removal from the carriers' rate bases of all plant and equipment not used or useful in rendering public communication service.

STATISTICS

General

Reports were filed on an annual basis by 366 common carriers and 6 controlling companies for the calendar year 1954. Considerable financial and operating data taken principally from these reports are published annually in a volume entitled "Statistics of the Communications Industry in the United States" (see appendix list of Commission

publications sold by the Superintendent of Documents). The larger telephone and telegraph carriers also file monthly reports of revenues and expenses, and summaries of these data are published monthly by the Commission.

Telephone Carriers

The annual reports received from common carriers include those from 60 telephone carriers and 296 carriers engaged in rendering mobile radiotelephone service. Selected financial and operating data concerning telephone carriers for the year 1954 as compared to 1953 are shown in the following table:

Telephone carriers [1]

Item	1953	1954	Percent of increase or (decrease)
Number of carriers	54	52	
Investment in plant and equipment (as of Dec. 31)	$13,749,883,288	$14,898,749,385	8.36
Depreciation and amortization reserves	$3,618,085,781	$3,836,431,835	6.03
Net investment in plant and equipment	$10,131,797,507	$11,062,317,550	9.18
Local service revenues	$2,777,053,634	$2,983,316,809	7.43
Toll service revenues	$1,641,990,139	$1,796,011,175	9.38
Total operating revenues	$4,628,117,965	$5,013,180,966	8.32
Operating expenses	$3,222,873,105	$3,436,376,578	6.62
Taxes	$838,052,515	$929,143,694	10.87
Net operating income after all taxes	$567,191,745	$647,660,094	14.19
Net income	$496,507,445	$569,599,735	14.72
Dividends declared	$398,972,071	$449,585,317	12.69
Company telephones:			
Business	13,394,632	13,889,031	3.69
Residence	30,448,066	32,063,238	5.30
Number of calls originating during the year:			
Local [2]	69,978,334,496	72,932,452,573	[3]
Toll [2]	2,268,968,227	2,374,742,694	[3]
Number of employees at end of October	625,832	614,369	(1.83)
Male	215,080	219,533	2.07
Female	410,752	394,836	(3.88
Total compensation for the year	$2,378,679,557	$2,496,657,341	4.96

[1] Data shown relate to telephone carriers whose annual operating revenues exceed $250,000. Intercompany duplications, except in minor instances, have been eliminated.

[2] Partly estimated by reporting carriers.

[3] The number of calls shown are not comparable, as many calls were reclassified from "Toll" to "Local" during 1954, due to enlargement of numerous local calling areas.

Telephones by States

More than 52,800,000 telephones were in use domestically at the start of the calendar year 1955. According to the American Telephone and Telegraph Co., more than 43,300,000 were owned by the Bell System and nearly 9,500,000 by independent companies.

A tabulation follows:

State	Total number of telephones	Distribution of telephones			
		By ownership		By type of service	
		Bell system	All other	Business	Residence
Alabama	546,400	480,100	66,300	151,300	395,100
Arizona	235,600	228,300	7,300	84,900	150,700
Arkansas	298,000	230,200	67,800	93,700	204,300
California	4,979,800	4,127,400	852,400	1,608,900	3,370,900
Colorado	536,800	519,700	17,100	170,300	366,500
Connecticut	966,200	19,500	946,700	267,300	698,900
Delaware	153,000	153,000		46,900	106,100
District of Columbia	537,500	535,600	1,900	253,500	284,000
Florida	1,029,700	699,100	330,600	377,200	652,500
Georgia	767,000	667,800	99,200	235,400	531,600
Idaho	164,000	128,900	35,100	46,000	118,000
Illinois	3,485,500	2,920,600	564,900	1,091,400	2,394,100
Indiana	1,362,700	809,400	553,300	348,200	1,014,500
Iowa	917,500	561,400	356,100	189,300	728,200
Kansas	701,900	542,600	159,300	170,000	531,900
Kentucky	576,000	388,100	187,900	152,100	423,900
Louisiana	682,900	654,700	28,200	193,000	489,900
Maine	251,100	226,500	24,600	65,200	185,900
Maryland	867,600	852,700	14,900	242,500	625,100
Massachusetts	1,827,000	1,823,200	3,800	528,100	1,298,900
Michigan	2,487,900	2,247,800	240,100	650,400	1,837,500
Minnesota	1,042,400	802,900	239,500	259,500	782,900
Mississippi	287,900	277,300	10,600	83,500	204,400
Missouri	1,335,100	1,105,200	228,900	362,500	972,600
Montana	181,400	158,600	22,800	52,600	128,800
Nebraska	450,900	227,400	223,500	108,600	342,300
Nevada	68,400	35,200	33,200	28,600	39,800
New Hampshire	166,900	158,200	8,700	43,300	123,600
New Jersey	2,111,100	2,071,800	39,300	589,600	1,521,500
New Mexico	172,000	143,500	28,500	69,700	102,300
New York	6,764,400	6,283,300	481,100	2,259,900	4,504,500
North Carolina	758,000	422,600	335,400	215,900	542,100
North Dakota	144,100	94,600	49,500	36,200	107,900
Ohio	3,138,800	2,075,400	1,063,400	802,500	2,336,300
Oklahoma	672,600	581,200	91,400	200,800	471,800
Oregon	536,600	429,600	107,000	155,000	381,600
Pennsylvania	3,799,700	3,208,500	591,200	997,600	2,802,100
Rhode Island	273,400	264,900	8,500	78,600	194,800
South Carolina	356,500	271,700	84,800	108,700	247,800
South Dakota	170,500	128,000	42,500	40,900	129,600
Tennessee	787,600	691,000	96,600	215,400	572,200
Texas	2,415,700	2,024,300	391,400	766,500	1,649,200
Utah	248,700	234,500	14,200	71,200	177,500
Vermont	103,700	90,600	13,100	27,500	76,200
Virginia	899,800	722,400	177,400	268,400	631,400
Washington	893,500	714,900	178,600	259,200	634,300
West Virginia	413,600	364,600	49,000	106,400	307,200
Wisconsin	1,150,800	835,200	315,600	306,100	844,700
Wyoming	95,600	86,800	8,800	30,900	64,700
Grand total	52,813,800	43,321,800	9,492,000	15,511,200	37,302,600

Land Line Telegraph

The following table sets forth financial and operating data relating to the domestic land line operations of the Western Union Telegraph Company for the calendar year 1954 as compared to 1953. The data

pertaining to its cable operations are included in a later table relating to ocean-cable carriers.

The Western Union Telegraph Company [1]

Item	1953	1954	Percent of increase or (decrease)
Investment in plant and equipment (as of Dec. 31)	$289,448,249	$300,125,917	3.69
Depreciation and amortization reserves	$128,776,085	$130,182,872	1.09
Net investment in plant and equipment	$160,672,164	$169,943,045	5.77
Message revenues	$174,649,515	$173,819,586	(0.48)
Total operating revenues	$208,578,008	$209,634,899	0.51
Operating expenses, depreciation and other operating revenue deductions	$193,863,321	$194,657,236	0.41
Net operating revenues	$14,714,687	$14,977,663	1.79
Provision for Federal income taxes	$5,743,000	$6,207,167	8.08
Net income (or deficit)	[2] $13,242,117	[2] $4,479,468	(66.17)
Net income (landline and cable systems)	[2] $14,468,603	[3] $6,470,898	(55.28)
Dividend (landline and cable systems)	$3,690,143	$3,730,406	1.09)
Number of revenue messages handled [4]	162,187,632	152,581,589	(5.92)
Number of employees at end of October	38,957	37,009	(5.00)
Total compensation for the year	$139,488,909	$137,520,793	(1.41)

[1] Represents data for land-line operations. *Figures covering cable operations are included in the table* below relating to ocean-cable carriers.
[2] Net income reflects net gains from sale of investments of $6,363,993 (net sales $8,580,993 less tax $2,217,000).
[3] After allowance for a charge of $3,319,000 ($6,498,000 less $3,379,000 tax saving) due to establishment of an estimated liability for vacation pay and other employee benefits.
[4] Includes domestic transmission of transoceanic and marine messages (about 8,438,000 in 1953 and about 8,502,000 in 1954).

Radiotelegraph and Ocean-Cable Carriers

There are shown in the accompanying tables financial and operating statistics selected from the annual reports filed by the United States radiotelegraph and cable carriers furnishing international communications services. These tables compare the figures for the calendar year 1954 to those for the previous year.

Radiotelegraph carriers

Item	1953	1954	Percent of increase or (decrease)
Number of carriers	7	7	
Investment in plant and equipment (as of Dec. 31)	$39,129,876	$40,265,004	2.90
Depreciation and amortization reserves	$17,705,958	$17,774,111	0.38
Net investment in plant and equipment	$21,423,918	$22,490,893	4.98
Message revenues:			
Domestic [1]	$1,857,041	$1,868,433	0.61
Transoceanic	$21,235,725	$21,810,481	2.71
Marine	$1,528,362	$1,449,877	(5.14)
Total operating revenues	$30,237,680	$31,204,268	3.20
Operating expenses, depreciation and other operating revenue deductions	$27,309,420	$28,117,065	2.96
Net operating revenues	$2,928,260	$3,087,203	5.43
Provision for Federal income taxes	$2,780,734	$2,236,552	(19.57)
Net income	$2,477,000	$2,262,287	28.67
Dividends declared	$400,000	$400,000	
Number of revenue messages handled:			
Domestic [2]	49,421	54,735	10.75
Transoceanic	10,712,257	10,838,042	1.17
Marine	964,824	940,715	(2.50)
Number of employees at end of October	6,008	5,940	(1.13)
Total compensation for the year	$23,468,678	$24,014,980	2.33

[1] Includes revenues from the domestic transmission of transoceanic and marine messages, and revenues from domestic classification messages (primarily Canadian and Mexican).
[2] Represents domestic classification messages (primarily Canadian and Mexican).

Ocean cable carriers (including cable operations of Western Union)

Item	1953	1954	Percent of increase or (decrease)
Number of carriers	3	3	
Investment in plant and equipment (as of Dec. 31)	$92,038,045	$93,401,673	1.48
Depreciation and amortization reserves	$57,641,617	$58,213,461	0.99
Net investment in plant and equipment	$34,396,428	$35,188,212	2.30
Message revenues:			
Domestic [1]	$160,853	$190,320	18.32
Trasoceanic	$21,312,199	$23,240,617	9.05
Total operating revenues	$29,488,941	$32,606,848	10.57
Operating expenses, depreciation and other operating revenue deductions	$25,907,756	$26,536,854	2.43
Net operating revenues	$3,581,185	$6,069,994	69.50
Provision for Federal income taxes	$1,527,000	$2,617,833	71.44
Net income	$912,930	$3,070,941	236.38
Dividends declared [2]		$883,670	
Number of revenue messages handled:			
Domestic [3]	90,145	98,729	9.52
Transoceanic	9,926,457	10,446,064	5.23
Number of employees at end of October	5,678	5,874	3.45
Total compensation for the year	$14,038,363	$15,226,644	8.46

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

International Telegraph Traffic

The volume of United States international telegraph traffic handled by the cable and radiotelegraph carriers during calendar 1954 totaled 521,827,659 paid words. Of this volume, a total of 265,293,369 paid words were transmitted to foreign and overseas points, while a total of 256,534,290 paid words were received in the United States. The six radiotelgraph carriers accounted for 271,087,424 paid words or about 51.9 percent of the industry volume, and the remaining 48.1 percent, or 250,740,235 paid words, was handled by the four cable carriers. The following table sets forth the traffic volume, in words, exchanged between the United States and each of the principal countries of the world during calendar 1954.

United States—international telegraph (radio and cable) traffic in words, 1954 (includes traffic transiting the United States)

Country	Number of words	
	Outbound from U. S.	Inbound to U. S.
EUROPE, AFRICA, AND THE NEAR EAST		
Algeria	173,785	113,632
Arabia	853,099	889,396
Austria	1,231,263	1,078,360
Belgian Congo	285,723	267,217
Belgium	4,656,232	3,920,353
British East Africa	304,019	292,031
British West Africa	226,212	236,866
Czechloslovakia	430,459	462,740
Denmark	1,666,305	1,135,795
Egypt	1,587,136	1,527,205
Ethiopia	243,044	166,597
Finland	533,812	524,943
France	14,793,157	13,119,398
French West Africa	120,137	101,761
Germany	13,350,808	13,001,104
Greece	1,778,481	1,130,687
Hungary	226,434	305,898
Iceland	267,751	287,614
Iran	670,501	1,341,792
Iraq	285,753	278,498
Ireland	771,320	876,560
Israel	2,456,418	2,029,724
Italy	9,746,223	7,737,303
Lebanon	854,064	893,333
Liberia	485,197	576,942
Luxembourg	113,314	104,250
Morocco—French	560,445	526,594
Morocco—Tangier	487,008	351,412
Netherlands	7,513,305	6,213,043
Norway	2,632,923	1,876,560
Persian Gulf	404,108	476,802
Poland	980,606	710,813
Portugal	1,070,837	900,501
Rhodesia	110,040	125,450
Roumania	160,795	64,918
Spain	3,460,818	2,066,215
Sweden	3,198,605	2,765,429
Switzerland	7,237,075	5,826,856
Syria	240,519	202,657
Transjordania	289,057	257,824
Trieste, Free Territory of	143,908	113,165
Turkey	1,221,416	1,093,629
Union of South Africa	2,508,534	2,616,413
U. S. S. R.	5,306,977	2,277,862
United Kingdom	45,915,943	46,779,796
Yugoslavia	940,288	792,804
All other places	1,158,166	1,702,665
Total	143,652,020	130,241,407
WEST INDIES, CENTRAL, NORTH, AND SOUTH AMERICA		
Argentina	5,925,181	6,880,324
Bahamas	868,515	1,034,695
Barbados	228,046	175,266
Bermuda	877,476	829,133
Bolivia	682,525	730,325
Brazil	10,342,032	11,479,133
British Guiana	192,854	196,587
British Honduras	125,189	161,822
Canada	9,287,493	11,478,824
Canal Zone	678,695	484,914
Chile	2,281,040	2,160,676
Colombia	5,644,037	4,862,116
Costa Rica	1,066,974	796,983
Cuba	5,997,036	8,534,666
Dominican Republic	1,317,390	1,192,380
Ecuador	1,398,038	974,839
Guatemala	1,750,092	1,809,518
Haiti	974,077	822,104
Honduras Republic	840,047	1,091,353
Jamaica	1,011,631	773,341
Mexico	2,065,246	1,192,622
Netherlands West Indies	961,702	1,128,641
Nicaragua	887,617	710,492
Other British West Indies [1]	179,203	116,418
Panama	1,214,213	1,113,201
Paraguay	270,192	326,264
Peru	2,186,650	1,985,062
Puerto Rico	4,178,785	3,811,303
Salvador	1,019,319	786,933
Surinam	133,997	123,404
Trinidad	781,902	549,965
Uruguay	2,154,046	2,116,619
Venezuela	7,847,689	9,359,281
Virgin Islands	247,117	234,918
All other places	194,958	113,222
Total	75,811,004	80,137,344
ASIA AND OCEANIA		
Afghanistan	191,840	74,676
Australia	3,483,575	3,073,619
Burma	625,430	139,287
Ceylon	415,300	353,822
Formosa	1,240,285	1,362,607
Guam	421,311	585,213
Hawaii	4,759,428	4,159,926
Hongkong	1,825,093	1,683,922
India	4,209,184	3,698,600
Indochina	384,184	640,826
Indonesia	1,865,608	2,031,613
Japan	14,790,338	14,476,802
Korea	807,322	1,111,533
Malaya, Federation of	1,357,805	1,148,535
New Zealand	1,193,675	948,311
Okinawa	479,783	690,656
Pakistan	1,459,014	1,483,337
Philippines	4,935,384	6,150,576
Thailand (Siam)	961,066	1,067,547
All other places	333,902	303,881
Total	45,739,527	45,185,283
Unknown destination or origin	90,818	970,256
Grand total	265,293,369	256,534,290

[1] Points not listed separately.

Common Carrier Applications

The number of applications filed with the Commission by common carriers during the fiscal year totaled nearly 5,000 (exclusive of Alaskan and marine mobile). They were in the following categories:

Class	Pending June 30 1954	Received	Disposed	Pending June 30, 1955
RADIO FACILITIES				
Domestic public land mobile	74	1,298	1,274	98
Fixed public telephone (domestic)	0	10	10	0
Fixed public telephone (international)	10	57	64	3
Fixed public telegraph (domestic)	0	4	4	0
Fixed public telegraph (international)	26	207	228	5
Canadian registration	0	16	16	0
Developmental	0	35	33	2
Subtotal	110	1,627	1,629	108
WIRE FACILITIES				
Telephone extensions	0	139	133	6
Telegraph extensions	0	26	26	0
Telephone reductions	2	9	7	4
Telegraph reductions	109	927	951	85
Subtotal	111	1,101	1,117	95
MISCELLANEOUS				
Interlocking directorates	1	11	12	0
Jurisdictional determination	0	0	0	0
Submarine cable landing licenses	1	1	2	0
Petitions or motions (nondocket)	1	1	2	0
Experimental common carrier	64	2,218	2,216	66
Subtotal	67	2,231	2,232	66
Total	288	4,959	4,978	269

Safety and Special Radio Services

GENERAL

The Safety and Special Radio Services comprise all of the varied and extensive radio activities administered by the Commission with the exception of broadcast, common carrier and experimental operations. They constitute the largest number of radio stations authorized by the Commission.

These services may be grouped into the following general classes:

Safety services.—Marine, Aviation, Police, Fire, Forestry-Conservation, Highway Maintenance, Special Emergency, and State Guard.

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

Land Transportation services.—Automobile Emergency, Highway Truck, Interurban Passenger, Interurban Property, Railroad Taxicab, Urban Passenger, and Urban Property.

Miscellaneous services.—Amateur, Disaster Communications, and Citizens.

These groups represent the private use of radio communication facilities by the general public for business and safety purposes as distinguished from the direct public service rendered by common carriers and broadcasters. The privilege of giving localized radio service in this category is not exclusive, but is granted for shared use of frequencies on the basis of the applicant's eligibility.

They provide communication by ship and marine shore stations; aircraft and aeronautical ground stations; state and municipal police, fire and highway departments; disaster organizations; public utilities; for petroleum exploration, drilling, and production; pipelines; by many types of manufacturing enterprises; in railroad, bus, truck, and taxicab operations; by amateurs and other individuals.

The most extensive employment of radio has been in the fields of industry and commerce. The adaptation of radio techniques to industrial and transport operations has developed rapidly and ranges from the employment of small portable equipment for directing warehouse crews or steam-shovel operators to complex radio facilities and million-dollar systems for controlling big pipeline operations.

The number of stations is one index to the activity and regulatory workload in these services. In 1940 their number (exclusive of commercial and amateur operators) was less than 10,000. At the outbreak of World War II it was under 13,000. In 1949 the total had increased to 143,000, and to 262,000 in 1954. Today these authorizations exceed 300,000, representing the use of more than 767,000 fixed and mobile transmitters.

MARINE RADIO SERVICES

Safety at Sea

International Convention for Safety of Life at Sea and Title III, Part II, of Communications Act.—On August 13, 1954, Public Law 584, 83d Congress (S. 2453), which was based on recommendations of the Commission, was adopted by Congress to implement the radio provisions of the International Convention for the Safety of Life at Sea (1948). Its principal effect was to add to the compulsory ship radio requirements of the Communications Act provision that (1) cargo ships between 500 and 1,600 gross tons must carry prescribed radiotelephone or radiotelegraph installations; (2) vessels of 1,600 or more gross tons must be equipped with a radio direction finder; and (3) United States coastwise vessels and foreign nonconvention ships in our ports must meet radiotelegraph requirements applicable to ships subject to the convention.

It is estimated that the first requirement added about 175 ships to those compulsorily equipped with a radio installation, while the second requirement increased from approximately 50 to 1,200 the number of United States vessels that are compulsorily equipped with radio direction finders. To implement these changes to the act, the Commission on April 14, 1955, amended its rules to provide detailed requirements for compulsorily installed radiotelephone equipment and, on June 22 thereafter, with respect to compulsorily installed radiotelegraph equipment.

New Great Lakes Agreement.—On November 13, 1954, the Agreement for the Promotion of Safety on the Great Lakes by Means of Radio (a treaty between the United States and Canada) came into force and a related section of the Ship Act of 1910 was simultaneously repealed by Public Law 590, 83d Congress. This statute was also sponsored by the Commission. The agreement compels several hundred United States ships, as well as ships of Canada and other countries, to carry radiotelephone installations for safety purposes and establishes an international radiotelephone safety system on the Great Lakes. The repealed act section provided a radiotelegraph

safety system for only a few Great Lakes passenger ships. The Commission amended its rules, effective November 13, 1954, to implement the Great Lakes agreement. Public Law 590 also made certain changes to facilitate the administration of the agreement. Among other matters, the principle of the Title III, Part II, forfeiture provisions was extended to cover Great Lakes violations.

Proposed safety at sea legislation.—A bill (H. R. 4090), introduced February 16, 1955, would amend Part II of Title III of the Communications Act to require the installation of an automatic radio call selector on United States cargo ships carrying less than two qualified operators. The Commission submitted comments to the House Committee on Interstate and Foreign Commerce, after testing at its laboratory a specimen device offered by one manufacturer. The Commission did not support adoption of the bill.

Another bill (H. R. 3111), introduced January 26, 1955, would amend Part II of Title III of the Communications Act to require that vessels compulsorily equipped with radio installations report their positions once every 24 hours. The Commission's comments called attention, among other matters, to the lack of a United States system or an international system for effective use of the position reports required by the bill.

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

Three applications for extension were received during the year for Great Lakes vessels and 48 for other vessels navigated on ocean voyages or on international voyages in Puget Sound. Original or renewal exemption from compulsory radiotelegraph requirements was granted to 7 passenger ferries navigated in Puget Sound, 2 vessels (each approximately 1,800 gross tons) navigated on short coastal voyages, 8 vessels engaged in oil well drilling operations in the Gulf of Mexico, and 2 small sport-fishing passenger vessels of less than 100 gross tons. All of these vessels were equipped with radiotelephone intallations. Applications filed in behalf of 6 coastwise lumber-carrying cargo vessels and 3 Great Lakes vessels were denied. As yet, no exemption from the Great Lakes Agreement has been granted to any United

States ship. The remainder of the applications were either covered by existing blanket exemptions or were pending at the end of the fiscal year.

The telegraph alarm signal, transmited by the distress signal (to actuate an auto alarm on vessels not maintaining a continuous listening watch) for the purpose of alerting operators to receive the subsequent distress message, was used effectively in many cases. Radiotelephony also was used extensively to summon aid, particularly by small vessels in need of Coast Guard assistance.

Distress studies.—Studies of distress communication are used to strengthen the Commision rules and to otherwise promote use of marine radio for safety of life and property. These studies showed that the international radiotelegraph distress signal (SOS) was used throughout the world, not less than 216 times during the year. This was by or on behalf of 160 foreign ships, 26 United States ships, 16 foreign aircraft and 14 United States aircraft.

The telegraph alarm signal, transmitted before the distress signal (to actuate an auto alarm on vessels not maintaining a continuous listening watch) for the purpose of alerting operators to receive the subsequent distress message, was used effectively in many cases. Radiotelephony also was used extensively to summon aid, particularly by small vessels in need of Coast Guard assistance.

The distress studies also showed a considerable amount of actual and potential interference to distress calls. This was due to misuse of the radiotelegraph and radiotelephone distress frequencies by vessels not in distress or not rendering distress assistance. A corrective program included dissemination of instructional material through publications and radiotelegraph broadcasts to ship station operators.

Improved auto alarms.—Two new types of auto alarms, developed to meet revised standards of the Safety Convention, were tested and type-approved by the Commission.

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

Three stations remain in the first group. These are at Long Beach, Los Angeles harbor, and San Francisco. While developmental reports show that these stations reduce delay to ships entering and leaving port during bad weather, the absence of such stations at other major ports appears to be due to economic factors. The number of stations in the second group continued to increase during the year.

As of June 30, 1955, more than 2,600 United States ships were authorized to use radar.

Radio Aids to Navigation

Marine radio communication systems.—The following figures (as of June 30, 1955) reflect the more important categories of stations which provide general marine radio communication:

	Public coast	Limited coast
Telephony in 2–3 megacycle band	48	3
VHF telephony	39	148
HF long-distance telephony	5	0
Telegraphy (various frequencies)	28	2

Great Lakes weather transmissions.—Because of a need on the Great Lakes for more ship-shore use of the 2–3 megacycle frequency band for commercial radiotelephone messages, the Commission confined scheduled marine weather transmissions from shore stations on those lakes to 2514 kilocycles and discontinued weather transmissions on the other 2-megacycle channel previously used for this service. Public ship-shore service is improved since more time is available for handling messages in this band. Ship stations may communicate with coast stations on other 2-megacycle frequencies at the same time that weather schedules are being transmitted. Transmission of marine weather schedules by Great Lakes stations on frequencies having long distance characteristics has not been changed.

Implementation of Geneva frequency plan.—Progress continued to be made in implementing the 1947 international frequency allocations for the maritime mobile service in the frequency bands below 27 megacycles in accordance with the Geneva Agreement of 1951. All the new ship high frequency radiotelegraph bands have been inaugurated—the ship calling bands in 1954, and the cargo and passenger ship working bands on January 1, 1955 and January 15, 1955, respectively. All licensed coast telegraph stations are now operating on their new internationally approved frequencies. Full time (instead of day only) use of the exclusive telegraph frequencies by coast and ship stations in the band 2035–2107 kilocycles was authorized on June 1, 1955. Internationally approved radiotelephone frequencies between 4000 and 23,000 kilocycles for United States stations high seas ship-shore service are virtually implemented.

Intership frequencies.—The Commission made a new intership frequency, 2830 kilocycles, available in the Gulf of Mexico area in lieu of 2738 kilocycles. As a result, congestion on 2738 kilocycles in the Atlantic and Pacific coast areas was relieved to some extent.

Certain stations in the aeronautical service experienced harmful interference on 5476.5 kilocycles caused by the second harmonic emis-

sions of ship stations operating on 2738 kilocycles. To remedy this, the Commission requires a certification that the equipment for transmitting on 2738 kilocycles meets certain second harmonic attenuation levels. To preclude a like situation from occurring with respect to the aeronautical frequency 5656.5 kilocycles, a similar certification is also required for transmitters on 2830 kilocycles.

Ship-Shore radiotelephone public correspondence.—Various rule-making proceedings and authorizations resulted in the activation, in accordance with the Geneva Agreement, of new 2-megacycle frequencies for public correspondence radiotelephone service at several ports. Improvements in ship-shore service have resulted or will soon occur at Boston, Miami, Mobile, New Orleans, Galveston, San Francisco, Eureka (California); Seattle; The Dalles, Umatilla (Oregon), and Pasco (Washington).

New VHF public coast stations.—Two new VHF (very high frequency limited range) public coast stations were established, one at Bodkin Point (near Baltimore), and the other at Grand Isle, Louisiana. The Commission authorized VHF public coast stations on the Great Lakes at Hancock, Port Huron, Escanaba, East Tawas, and Marquette, Michigan; and Green Bay, Wisconsin, and set for hearing similar applications for Toledo, Milwaukee, and Cleveland because of duplication of service aspects. Certain competing common carriers protested, and the Commission postponed the effective dates of the protested grants pending a consolidated hearing with respect to all of the applications.

Operation in 152–162 megacycle band.—Following rule-making proceedings in 1954, the Commission prohibited assignment of certain of these VHF frequencies to persons not operating the vessels on which the ship stations would be located. The Lake Carriers' Association petitioned to repeal the rule, alleging that the rule has a detrimental effect on the full development of a Great Lakes VHF system because most vessels whose radio stations are licensed in the name of a communication company are not taking advantage of the availability of the business and operational frequency— 156.5 megacycles— due to licensing complexities arising out of the rule. The petition was the subject of a rule-making proceeding which was pending as of June 30, 1955.

Multichannel and type acceptance in 152–162 megacycle band.—In accordance with rules promulgated some years previous, all ship stations operating in the 152–162 VHF megacycle band were to comply by January 1, 1955, with regulations requiring multichannel and type-accepted VHF equipment. A number of vessel owners indicated involuntary noncompliance as of that date and were given

limited additional time to permit modification or delivery of equipment accordingly. However, as of June 30, 1955, the requirements were applicable to all stations affected.

Interim licenses.—The Commission, realizing the need of many boat owners to obtain immediate licensing of their ship radio installation for safety and other purposes, provided for the granting of interim radiotelephone ship station licenses by FCC field engineering offices pending action at Washington on formal application for a regular term license.

Public Fixed and Maritime Stations in Alaska

Because of the scarcity of wire line facilities, Alaskan communities depend largely on radiotelephone and radiotelegraph for safety and business communication. Frequencies are allocated for communication between communities, between communities and the Alaska Communication System (ACS), and between coast and ship stations. The main intra-Alaska communication trunklines are operated by ACS under the Department of Defense. The ACS routes message traffic to all parts of the world. The Commission maintains liaison with it in coordinating communications facilities in Alaska to serve the public interest.

Following an on-the-spot survey and informal conferences with Alaskan interests during the early part of fiscal 1955, the Commission proposed a comprehensive revision of Part 14, Rules Governing Public Fixed Stations and Stations of the Maritime Services in Alaska. Subject to these rules are several hundred Alaskan radio stations furnishing public service between communities, between ships and shore stations, and between ships. Although these rules are not applicable to United States Government stations, they do regulate, to some extent, communication between non-Government stations and, public service stations of the ACS.

After rule-making proceedings in which pertinent comments, mostly from Alaskan licensees, were considered, the rules were finalized, effective June 20, 1955. They are expected to bring about more effective communication through improved techniques for using the limited number of available frequencies, and by the employment of a new zone plan of frequency assignments. The zone plan is based upon division of the Alaska area into six specific zones and is designed to facilitate sharing of frequencies by geographical separation between zones allotted the same frequencies. The rules also reflect the establishment of a 4-year station license term instead of the present 2-year term, and provide for a change-over period until May 1, 1957, for those stations licensed prior to the effective date of the new rules. Enforcement of the new regulations is expected to require con-

siderably increased inspection and monitoring by the Commission's field offices.

Although the revised rules go a long way toward modernizing the regulation of radio communications in Alaska, there are still questions of policy to be resolved regarding the historical requirements that all non-Government stations in these services must be open to public correspondence and the relationship between such stations and public service stations of the ACS.

At the close of the fiscal year there were, exclusive of Government stations, 466 public fixed stations and 320 public coast stations authorized in Alaska.

Radio Technical Commission for Marine Services

The Radio Technical Commission for Marine Services (RTCM) is a cooperative association of Government-industry marine telecommunication agencies. Seven Government departments and approximately 130 industry agencies are represented. It conducts studies through special committees of experts. Its objective is the resolution of marine telecommunications problems by mutual agreement. Its findings are in the nature of recommendations to all organizations concerned.

The FCC, along with the other member organizations, has requested the RTCM to make certain technical studies in order to have coordinated Government and industry recommendations as a guide.

The RTCM, at the request of the Commission, conducted a study and issued a report on May 17, 1955, on a plan for the standardization of marine radiotelephone channel designators.

The RTCM on March 15, 1955 reported the result of special committee study of a commercially adaptable rapid and positive all-weather marine identification device to aid in the reduction of marine casualties and facilitate the safe movement of vessels in congested and restricted areas.

The RTCM organized special committees to study four marine problems at the request of the U. S. Study Group XIII of the International Radio Consultative Committee (CCIR). The RTCM has, accordingly, submitted recommendations concerning a marine identification device, bearing and position classification for HF and VHF direction finding, technical characteristics of frequency modulated VHF maritime equipments, and testing of 500-kilocycle radiotelegraph auto-alarm receiving equipment on board ships. Its recommendations, if acceptable to the Department of State, will formulate the basis for the United States position at the eighth plenary meeting of the CCIR at Warsaw in 1956.

Another special RTCM committee was established this past year to conduct studies on a broad basis for a future developmental program for the marine radio services.

Two other special committees have continued their studies of reliable short-range radiotelephone system for bridge-to-bridge communication on all types of vessels; and minimum specifications for 2-megacycle radiotelephone equipment.

The Treasury and State Departments requested and received the RTCM's recommendation on the question whether the United States should extend an invitation to have another International Meeting on Marine Radio Aids to Navigation (IMMRAN) in the United States.

An RTCM Committee prepared material for the guidance of the members of the United States observer delegation sent by the Department of State to the Baltic and North Sea Radiotelephone Conference at Goteborg, Sweden, which convened in September 1955.

The Commission assists in the support of the RTCM by furnishing office space and the full-time services of an electronics engineer as the Executive Secretary. FCC Commissioner Webster is the Vice Chairman of the RTCM, as well as the FCC member of the executive committee.

AVIATION SERVICES

General

The Aviation Services provide radio facilities for communication essential to aircraft operation and safety of life and property in the air. They operate Aircraft radio stations, Aeronautical Enroute and Aeronautical Fixed radio stations, Operational Fixed stations, Aeronautical Utility mobile stations, Flight Test stations, Flying School stations, Aeronautical Advisory stations, Aeronautical Public Service stations, Civil Air Patrol land and mobile stations, and Radionavigation stations which comprise radio beacons, radar services, direction finding systems, traffic control operations, approach and instrument landing systems, radio altimeters, and distance measuring devices.

Aviation Organizations and Conferences

During fiscal 1955 the Commission continued active participation in various interagency radio coordinating and policy groups, both on a domestic and international scale, in order to deal with the many new problems which arise as a result of increasing telecommunications developments. These groups include, but are not limited to, the Air Coordinating Committee (ACC), the International Civil Aviation Organization (ICAO), and the Radio Technical Commission for Aeronautics (RTCA).

Air Coordinating Committee.—The ACC is a Federal interdepartmental committee responsible for coordinating United States policy

in the field of aviation. The committee was established primarily to examine and make recommendations on aviation problems affecting more than one participating agency. It is composed of standing committees, panels, subcommittees, ad hoc committees, and working groups. Inasmuch as many of the problems submitted to the ACC relate to aeronautical telecommunications, the Commission participates as a member of the following committees: Technical Division; Airspace—Rules of the Air and Air Traffic Control; Aeronautical Communications and Electronic Aids; Search and Rescue; Aerodrome, Air Route, and Ground Aids; and Airmen Qualification.

The Commission is also represented on the Air Traffic Control and Navigation Panel which was established by the ACC on recommendation of the Congressional Aviation Policy Board and the President's Air Policy Commission to guide the program for providing all-weather air navigation and traffic-control facilities as well as a national air defense system.

Some of the current activities of the ACC in which the Commission participates are: studies of applications for the construction of antenna towers which may be a hazard to air navigation, and the effect of tall antenna towers to air navigation; formulating policy for the guidance of the United States representative to the ICAO on international aeronautical telecommunications problems; preparation of positions for the guidance of the United States representatives to ICAO conferences and meetings; preparation of a national plan to integrate available search and rescue facilities in a cooperative network to offer greater protection of life and property of citizens; and consideration of a report of the Air Navigation Development Board on evaluation of the VOR/DME and TACAN air navigation systems and the probable effect on the future air navigation common system.

By continuing to participate actively in the affairs of the ACC, the Commission has been successful in furthering industry's advancement in aeronautical communication and in coordinating the requirements of the aviation industry with the policies of the United States.

International Civil Aviation Organization.—The Commission took an active part in the preparation of United States positions for four international communications meetings held under the sponsorship of the ICAO, and furnished a representative who participated in two of the meetings; i. e., the Third North Atlantic Regional, held at Montreal, October 5–29, 1954, and the Special European-Mediterranean, held at Paris, November 16–27, 1954.

The year's end found Commission helping to prepare the United States position for the First Pacific Regional Air Navigation meeting scheduled to convene at Manila, October 27, 1955; the Third Carib-

bean Regional Air Navigation meeting, tentatively scheduled for April 4, 1956, at Cuidad, Trujillo; and the Second Air Navigation Conference, at Montreal, beginning August 30, 1955.

The Extraordinary Administrative Radio Conference (EARC) of the International Telecommunication Union (ITU) Geneva, 1951, concluded an agreement which allocated exclusive frequencies for the Aeronautical Mobile Route (R) service. Commission implementation of the new frequencies for this service was virtually completed during fiscal 1955 on both a national and international basis.

Radio Technical Commission for Aeronautics.—The RTCA is a nonprofit cooperative association comprising United States aeronautical and areonautical-communication agencies both industrial and governmental. It functions under a joint agreement by the Government and non-Government agencies represented on its executive committee.

The general membership of RTCA, known as the Assembly, is composed of over 100 aeronautical telecommunication agencies. Membership in the assembly is wholly voluntary and is open to any domestic organization actively identified with any phase of aeronautical telecommunications.

During the past year the RTCA had under study such problems as: Implementation of the VHF Utilization plan and review of transition period communication requirements; high altitude grid plan for VOR/DME frequency pairing; minimum performance standards for airborne electronic equipment for the transition period common system; re-evaluation of VOR airways lateral separation procedures; helicopter air navigation, communication, and traffic control; committee organizations and functions; and study of possible interference from TV in the UHF band.

Aircraft Radio Stations

These stations are installed on both aircarrier and private aircraft. More than 2,600 aircarrier stations and 27,300 private aircraft stations are authorized.

En Route and Fixed Aeronautical Radio Stations

The facilities, of which nearly 1,400 are authorized, provide the necessary communication for the safe, expeditious, and economical operation of aircraft. Aeronautical land stations are used for communicating with aircraft whereas aeronautical fixed stations engage in point-to-point communication.

In the domestic United States, aeronautical fixed stations are used primarily as "back up" circuits for land-line facilities; however, in international operations they provide a primary service.

Civil Air Patrol Radio Stations

These stations are used in connection with Civil Air Patrol activities and emergencies pertaining to the protection of life and property. They are also used by members of the CAP in connection with air shows, missing aircraft search missions, training missions, and communication systems at encampments, bases, and official meetings. There are over 11,100 authorized CAP stations.

Airdrome Control Stations

These stations, numbering over 500, are used for transmitting necessary control instructions to aircraft arriving at and departing from airports. Such control is necessary in maintaining safe separation of aircraft to prevent collision and to provide an efficient flow of air traffic into and out of airports. These stations also may communicate with aeronautical mobile utility stations installed aboard vehicles essential to the operation of an airport.

Aeronautical Mobile Utility Stations

These stations are 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 such vehicles as necessary. There are 150 of these stations.

Aeronautical Navigational Aid Radio Stations

These stations transmit special radio signals for enabling an aircraft to determine its position with reference to the navigational facility involved. Included are radio beacons, radio direction finders, radio ranges, localizers, glide paths, marker beacons, and ground control approach stations. There are nearly 300 of these stations.

Flying School Radio Stations

Flying school radio stations aboard aircraft and on the ground are used for communicating instructions to flight students or pilots while actually operating an aircraft. They number 14.

Flight Test Radio Stations

A flight test radio station, of which there are 159, is a station aboard an aircraft or on the ground used for the transmission of communications in connection with the test of aircraft or major components of an aircraft.

Aeronautical Advisory Radio Stations

These ground radio stations, now more than 460, provide advisory communication service to aircraft regarding the condition of runways, types of fuel available, wind conditions, available weather data or other information which may be necessary in connection with their safe and expeditious operation. They also may be used for com-

municating with private aircraft engaged in organized civil defense activities in event of enemy attack.

Aeronautical Public Service Radio Stations

Public service aircraft stations, over 300 in number, provide a means for public correspondence between private individuals aboard aircraft in flight and persons on the ground, affording communication similar to that available by use of the public telephone. These stations connect to the land-line telephone system through the facilities of public coast stations.

PUBLIC SAFETY RADIO SERVICES

The Public Safety Radio Services consist of the Police Radio Service, Fire Radio Service, Forestry-Conservation Radio Service, Highway Maintenance Radio Service, Special Emergency Radio Service and the State Guard Radio Service. Except for a few eligible groups in the Special Emergency Radio Service and volunteer fire departments or other private organizations which provide fire protection service, these services are available only to governmental subdivisions such as states, counties, cities, towns, etc.

The public safety services have continued to grow to the point where extensive networks joining cities, counties and states extend from one end of the country to the other. Aided by matching funds furnished by the Federal Government for civil defense measures, many governmental licensees in these services have expanded their systems, and installed additional facilities including independent power supplies for use in the event the power systems may be damaged or otherwise become inoperative. Also, many smaller communities which otherwise would not be in a financial position to install radio have done so with matching Government funds and now are operating radio systems on a day-to-day basis for emergency communication in connection with their official duties and at the same time are joining in mutual aid plans to cover not only the day-to-day business but also to be prepared to cope with the problems which would arise from a civil defense emergency.

The public safety services showed an increase of over 2,700 new systems for the fiscal year. The magnitude of this increase is apparent when it is appreciated that many stations can be covered by a single license. For example, some of the licenses held by state government departments include over 600 transmitters. On an average there are approximately 15 radio transmitters licensed per system. Consequently the nearly 18,500 public safety authorizations reflect the use of more than 201,000 transmitters.

During the year the Commission proposed rule making which would reduce the channel separations in the 30–50 and 152–162 megacycle bands applying to the land mobile services including the public safety

group. Accompanied by a general tightening of technical equipment standards, this move is designed to permit more frequency assignments in a given area and greater utilization of the frequency spectrum for services experiencing a frequency shortage.

Police Radio Service

The Police Radio Service, with over 9,700 authorizations, is the largest public safety service. In addition to the many mobile systems and radiotelegraph networks that cover large parts of the country, there is an ever-increasing use of microwave equipment to improve communication systems and to expand radiotelephone communication between cities which are linked into ever expanding networks for mutual assistance. Police departments are continuing to experiment with closed circuit television, radar, traffic devices, and other electronic apparatus to enhance the safety of life and property. This service is available only to instrumentalities of government and governmental institutions which are authorized to maintain their own police departments.

Fire Radio Service

The Fire Radio Service not only is available to governmental agencies, but also to volunteer fire departments. In this service, too, there is stress on preparation to meet the demands that arise in connection with civil defense duties. There are over 3,300 authorizations.

Forestry-Conservation Radio Service

The Forestry-Conservation Radio Service is available only to states, territories, possessions, and other governmental subdivisions such as counties, cities, towns and similar governmental entities, and persons or organizations charged with specific forestry-conservation activities. It has nearly 3,000 authorizations.

Radio is an indispensable tool in coordinating the activities of a forestry-conservation endeavor. The areas to be protected are extensive and isolated. Wire line communication is not only limited but unreliable due to storms, falling trees, etc. It is imperative that prompt aid be dispatched to the scene of a forest fire. Every minute's delay adds to the danger.

To cope with this situation radio-equipped forest rangers in fire observation towers can locate a fire by triangulation, advise headquarters which may then dispatch a few men and some light equipment including a portable radio transmitter oftentimes by airplane to the scene. Men and equipment can be parachuted to the ground where an immediate appraisal of the fire can be made and reported by radio. Fortunately, many of these fires can be controlled quickly by the initial task groups as a result of rapid radio communications and prompt coordination of activities.

Highway Maintenance Radio Service

The Highway Maintenance Radio Service is available only to instrumentalities of government such as cities, towns, counties, and state governments for the purpose of transmitting communications directly relating to public safety and the protection of life and property and those essential to official activities relating to the maintenance, supervision, and operation of public highways. The more than 1,300 authorizations reflect increased use of this service by city and county governments. More users are expected as soon as the Commission makes a final decision on the channel spacing for the 30-50 and 152–162 megacycle bands.

Special Emergency Radio Service

The Special Emergency Radio Service is available to disaster relief organizations, physicians, and veterinarians having a regular practice in a rural area, ambulance operators, beach patrols, persons or organizations operating school buses having regular routes into rural areas, communication common carriers for standby facilities, emergency repair of public communications facilities, and persons or organizations maintaining establishments in remote areas.

This service has shown a steady increase concentrated primarily in the disaster relief category. It is being utilized to provide liaison communication between the other public safety radio services and other civil defense communications. There are over 1,500 special emergency authorizations.

State Guard Radio Service

Licenses in this service are issued only to the official state guard or comparable organizations, and only where such organization has been created by law and is subject to the control of the Governor or highest official of the creating governmental entity. This service, with 188 authorizations, is relatively inactive inasmuch as its principal need does not arise until the National Guard is inducted into active service and the state guard begins to discharge duties normally performed by the National Guard.

DISASTER COMMUNICATIONS SERVICE

The frequency band 1750 to 1800 kilocycles is allocated to the Disaster Communications Service to be used to replace or supplement regular communication facilities disrupted or overburdened by the occurrence of disaster, war, or other emergency.

Eligibility in this service requires a showing that the station is a part of an organized local or regional disaster communications plan. United States Government stations may be authorized to operate disaster stations.

During an emergency or disaster, all communications necessary to relief work or to the civil defense, including personal messages concerning people directly affected, may be transmitted. At other times, communications are limited to drills and tests necessary to assure the proper functioning of the equipment and the system.

Over 300 disaster communications stations are now licensed under 31 approved disaster communications plans. They employ nearly 1,200 transmitters.

INDUSTRIAL RADIO SERVICES

Various groups of industrial users of radio are provided for in subparts of Part 11 of the rules governing the Industrial Radio Services. They embrace the Power, Petroleum, Forest Products, Motion Picture, Relay Press, Special Industrial, Low Power Industrial, and Industrial Radiolocation Radio Services. They represent nearly 25,000 authorizations covering the use of over 180,000 transmitters.

During the fiscal year much time and effort was devoted to a proceeding looking toward amending the Special Industrial Radio Service rules. After evaluating the more than 100 comments, the Commission in October of 1954 adopted a Proposed Report and Order which gave interested persons an opportunity to file exceptions and to request oral argument. More than 80 exceptions were received and virtually all were accompanied by request for an oral argument. A number of the exceptions were satisfactorily eliminated in a conference between the Commission and the interested parties. The remaining exceptions were argued before the Commission in February 1955.

As a result, the Commission on September 7 revised the special industrial rules, effective November 1. They spell out in detail eligibility in this service for those engaged in agriculture, heavy construction, building construction, manufacturing and mining; also a number of particular activities such as those incidental to petroleum operations; delivery of fuel oil, butane gas and ice; servicing and repairing of heavy machinery, etc.

Those eligible in the Special Industrial Radio Service may normally operate only outside of standard metropolitan areas of 500,000 or more population. However, some exceptions are made. First, there is a general exception on showing that the transmitter will be used in an area of low population removed from the urbanized section of the metropolitan area involved. Also, there are exceptions to permit persons engaged in construction activities to use radio within metropolitan areas for on-the-job communication. Similarly, persons engaged in manufacturing activities may employ radio within the yard area. The new rules liberalize the old concept of "yard area". Licensing of microwave systems will continue on a case-by-case basis pending the formulation of regular rules.

The Commission realizes that, in order to deal with the increasing need for industrial radio, a general study and evaluation of the entire field will have to be undertaken. In the light of radio's advances, the Commission is exploring all available means of augmenting the number of frequencies in order to make fuller use of the radio spectrum.

An amendment to the power radio service rules clarified the eligibility status of persons operating irrigation systems, making definite provisions for their licensing in that service. A proposed amendment would provide for the use of power radio by communications common carriers in connection with their installation, construction, and maintenance activities.

LAND TRANSPORTATION RADIO SERVICES

During the year a major revision of the rules governing the Land Transportation Radio Services was completed, after an extensive rule making proceeding. It combined into a new Motor Carrier Radio Service the previous Intercity Bus, Urban Transit and Highway Truck Radio Services. No appreciable changes were made in the Railroad, Taxicab and Auto Emergency Radio Services.

The new motor carrier rules embody basic changes in policies governing the use of radio by carriers of property operating on the public streets or highways. Under the old highway truck rules, all persons transporting property on a route basis were eligible to use radio outside of standard metropolitan areas of 500,000 or more population. Included in this group were common and contract carriers and private truckers. The Commission recognized that private truckers who engage in trucking activities in connection with other businesses more properly belonged in one of the industrial services or the citizens service than in the land transportation services. Accordingly, these persons were severed from the new motor carrier service and provisions were made for most of them in the pending revision of the special industrial rules.

The Commission also recognized that under certain conditions common and contract carriers of property for hire should be allowed to use radio in connection with their operations within urban areas. The new motor carrier rules provide for such operation on frequencies in the 450–460 megacycle band. Frequencies in the 40-megacycle band have been made available to carriers of property for use solely in connection with their interurban operations.

The provisions for the use of radio by the carriers of passengers (railroad, street car, bus, and taxi) remain substantially unchanged in the Motor Carrier Radio Service. However, the former designation of urban transit has been changed to urban passenger, and intercity bus to interurban passenger.

At the year end the land transportation services (exclusive of citizens) totaled nearly 7,700 authorizations with nearly 140,000 transmitters.

CITIZENS RADIO SERVICE

Due to the changing complexion of the Citizens Radio Service as increasing numbers of business organizations seek its facilities, several problems have arisen which may lead to rule revisions. One stems from the fact that, at present, an applicant is not required to submit detailed information on the intended use of radio in connection with the operation of a business. Another is the matter of station location differing from the applicant's mailing address, and also the proposed area of operation of mobile units. A third consideration is the establishment of a policy regarding authorizations for remote control of stations within this service. The questions are presently under study by the Commission.

At the year end the citizens service had over 12,300 authorizations with 21,300 transmitters.

AMATEUR RADIO SERVICE

The radio amateur is truly a pioneer in radio. Many fundamental radio discoveries and refinements are attributed to him. A great number of the electronics and communications specialists of today were in the beginning, and many still are, licensed "hams".

The amateur may enjoy activity in many phases of radio communication. He may experiment with complicated electronic equipment, or promote international goodwill by exchanging greetings and making friends with amateurs in all parts of the world. He is continually striving to improve his equipment and to improve his operating skill. Where international regulations permit, he transmits messages free of charge to and from members of the Armed Forces and their families at home. Traditionally, he is always available to furnish much needed, and often the only means of, communication at the scene of an emergency or disaster. He furnishes radio equipment, and he plans and practices for civil defense communications.

For the "ham" beginner, the 1-year Novice Class license is available to those who can send and receive code at 5 words per minute and successfully answer simple questions about radio and regulation. While operation is limited in scope, the experience and knowledge gained as a Novice often enables the amateur to obtain a General Class license with its greatly expanded operating privileges and 5-year term. A Technician Class license is available to those interested in experimental operation above 50 megacycles.

The number of amateur operator licenses has grown from more than 80,000 in 1949 to over 136,000 to date. At the end of the fiscal year more than 136,700 amateur operator licenses of different classes and

more than 139,000 amateur station licenses were on the Commission's books. Included in these are an estimated 4,000 authorizations which have expired but are renewable because they are within the one-year grace period.

Amateurs effectively police their own service. Of their large group, few were cited for technical and operational infractions. The licenses of five amateurs were suspended for more serious violations.

Amateurs are continuing to render much needed communication service during emergencies. Since its inception in 1952, the Radio Amateur Civil Emergency Service (RACES) has grown steadily. The RACES is the means whereby "hams" may serve their communities and their country in providing communication for civil defense. In recognition of their importance to defense, amateurs authorized in RACES may continue certain operation in time of war or other national emergency when normal peacetime amateur activity is shut down.

During the year 164 RACES plans were approved, making a total of 281 such plans with 2,077 stations and 3,800 transmitters authorized in that service.

More than 57 instances of amateurs furnishing emergency communication at the scene of natural disasters in fiscal 1955 are known to the Commission. During the 1954 Carol, Edna and Hazel hurricanes, more than a thousand amateurs manned fixed, portable and mobile amateur radio stations and often were the sole means of communication to a stricken area. Many others, unreported, provided needed emergency contact.

During the year amateur rules were amended to permit operation in the 3.5 megacycle frequency band from Pacific island possessions. Operation with AØ omission, permitting duplex telephony, was provided in the 50-megacycle amateur band. The Technician Class operator was given operating privileges in that band. A 25 kilocycle expansion of a Novice frequency band provided operation from 7150 to 7200 kilocycles. The required 30-day wait for an amateur operator examination after a failure was removed in the case of an examination given under Commission supervision following an examination given by a volunteer examiner. Examination credit for the amateur operator code element was extended to holders of commercial third class telegraph permits, and applications for renewal of RACES station authorizations were required to be submiteed on Form 481.

In rule making status at the year's close was the matter of amending the amateur rules to make ineligible persons who are members of the Communist Party or allied organizations, and persons who are not of good moral character.

Two pending petitions propose to amend the rules to remove the 50-watt power limit on amateur operation in the 420–450 megacycle band.

PRIVATE MICROWAVE RADIO SYSTEMS

Action was initiated during the year looking toward establishing a permanent license policy for private microwave systems. At the request of the Commission, surveys of manufacturers and users of microwave communications equipment were conducted by the Radio-Electronics-Television Manufacturers Association and the American Petroleum Institute, respectively. These surveys produced helpful background information on both the technical characteristics of microwave systems operating on frequencies above 890 megacycles and the present and planned operational usages of private systems.

Based on this data, a preliminary working draft was prepared and a series of Government-industry conferences was held. As a result, revisions of the proposed rules are contemplated.

CONSTRUCTION PERMITS WAIVED

On August 31, 1955, the Commission amended its rules to waive construction permit requirements in the Safety and Special Radio Services with certain exceptions. This was done because equipment used in most of these services is of the "package" variety and does not involve any substantial construction. It was authorized by amendments to the act in 1954.

Excepted are operational fixed, land radiopositioning, public coast and limited Class I and Class II coast, shore radiolocation, radio navigation, radar and Alaskan fixed public stations, all of which involve engineering considerations; also all stations erecting new antennas or changing existing antennas above a certain height.

LAW AND ENFORCEMENT UNIT

The name of this unit was changed from Law Enforcement Unit to Law and Enforcement Unit to reflect more adequately its functions which include advising the bureau chief on legal and legislative matters, centralization of the bureau's enforcement and compliance activities, and consultation with bureau units on legal problems.

Enforcement efforts have centered on achieving compliance with the Communications Act and the Commission's rules by educating licensees to their responsibilities. When this process fails, or in case of willful or flagrant violations, official warnings are issued, and when these prove insufficient, revocation proceedings have been instituted.

The elimination of harmful interference to the aviation services caused by second harmonic radiations emitted by marine radio stations has continued to be a major effort involving numerous modifications of licenses. This program has begun to show results in terms of reduced interference, and it is anticipated that the time required to be devoted to this particular enforcement activity will now decline.

It is believed that passage of proposed legislation to permit the imposition of small monetary penalties for rule infractions would be a very effective tool in the safety and special services enforcement program.

STATISTICS

Stations in Safety and Special Radio Services

Stations in the Safety and Special Radio Services (exclusive of experimental, which are treated in a separate chapter) exceeded 300,000 at the close of the fiscal year. This represents a net increase of about 38,000 during the year. The numbers of authorized stations in the various services are shown in the following table.

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

Class of station	June 30, 1954	June 30, 1955	Increase or (decrease)
Amateur and disaster services:			
Amateur	123,287	[1] 139,993	16,706
Disaster	283	317	34
RACES	754	2,077	1,323
Total	124,324	142,387	18,063
Aviation services:			
Aeronautical and fixed group	1,986	2,082	96
Aircraft group	28,392	30,228	1,836
Aviation auxiliary group	125	150	25
Aviation radionavigation land	255	287	32
Civil air patrol	9,396	11,108	1,712
Total	40,154	43,855	3,701
Industrial services:			
Agriculture	9	9	0
Forest products	1,034	1,144	110
Industrial radiolocation	128	143	15
Low power industrial	673	933	260
Motion picture	32	43	11
Petroleum	5,505	6,178	673
Power	7,562	8,132	570
Relay press	68	82	14
Special industrial	6,587	8,190	1,603
Total	21,598	24,854	3,256
Land transportation services:			
Automobile emergency	305	411	106
Citizens	7,054	12,334	5,280
Highway truck	832	1,084	252
Interurban passenger	76	64	(12)
Interurban property		42	42
Railroad	1,219	1,405	186
Taxicab	4,361	4,526	165
Urban passenger	98	105	7
Urban property	66	31	31
Total	13,945	20,002	6,057
Marine services:			
Alaskan group	963	786	(177)
Coastal group	210	243	33
Marine auxiliary group	59	74	15
Marine radiolocation land	17	17	0
Ship group	45,050	49,594	4,544
Total	46,299	50,714	4,415
Public safety services:			
Fire	1,627	2,337	710
Forestry conservation	2,686	2,967	281
Highway maintenance	1,088	1,330	242
Police	8,728	9,725	997
Public safety (combined)		29	29
Special emergency	1,429	1,839	410
State guard	139	188	49
Total	15,697	18,415	2,718
Grand total	262,017	300,227	38,210

[1] The number of amateur authorizations shown above includes an estimated 4,000 authorizations which have expired but are renewable because they are within the one year "grace" period.

Applications in Safety and Special Radio Services

More than 151,000 applications for stations in the Safety and Special Radio Services were received during 1955. This represents an increase of 10,587 applications compared to the previous year. The number of applications received in each service is shown below:

Class of station	Received 1954	Received 1955	Increase or (decrease)
Amateur and disaster services:			
Amateur	64,051	77,263	13,212
Disaster	173	40	(133)
RACES	769	1,568	799
Total	64,993	78,871	13,878
Aviation services:			
Aeronautical and fixed group	3,156	2,121	(1,035)
Aircraft group	19,998	17,438	(2,570)
Aviation auxiliary group	150	107	(43)
Aviation radionavigation land	155	180	25
Civil air patrol	3,161	3,037	(124)
Total	26,620	22,873	(3,747)
Industrial services:			
Agriculture	17	10	(7)
Forest products	633	538	(95)
Industrial radiolocation	158	155	(3)
Low power industrial	445	524	79
Motion picture	12	29	17
Petroleum	3,232	3,482	250
Power	4,126	3,964	(162)
Relay press	43	48	5
Special industrial	4,579	5,419	840
Total	13,245	14,169	924
Land transportation services:			
Automobile emergency	260	289	29
Citizens	928	1,280	352
Highway truck	669	645	(24)
Interurban passenger	50	20	(30)
Interurban property		271	271
Railroad	790	562	(228)
Taxicab	2,576	2,248	(328)
Urban passenger	60	54	(6)
Urban property		74	74
Total	5,333	5,443	110
Marine services:			
Alaskan group	529	1,130	601
Coastal group	344	448	104
Marine auxiliary group	85	72	(13)
Marine radiolocation land	17	20	(3)
Ship group	19,906	18,331	(1,575)
Total	20,881	20,001	(880)
Public safety services:			
Fire	1,152	1,434	282
Forestry conservation	1,362	1,110	(252)
Highway maintenance	734	1,000	266
Police	5,454	5,200	(254)
Public safety (combined)		37	37
Special emergency	927	1,119	192
State guard	42	73	31
Total	9,671	9,973	302
Grand total	140,743	151,330	10,587

Of 9,353 pending applications at the close of fiscal 1955, only 248 were 3 months or more old, and 22 of these were in hearing. The pending total includes 837 renewals filed prematurely.

Transmitters in Safety and Special Radio Services

Approximately 768,000 transmitters were authorized to operate in the Safety and Special Radio Services as of January 1, 1955. Of these, 172,000 land and fixed stations represent an increase of 19,000, and 595,000 mobile units represent an increase of about 96,000, or a total increase of 115,000 transmitters during the calendar year.

Class of station	Land or fixed transmitters	Mobile station transmitters	Total transmitters
Amateur and disaster services:			
Amateur	127, 257		127, 257
Disaster	531	641	1, 172
RACES	1, 241	2, 482	3, 723
Total	129, 029	3, 123	132, 152
Aviation services:			
Aeronautical and fixed group	2, 114		2, 114
Aircraft group		28, 758	28, 758
Aviation auxiliary group	21	842	863
Aviation radionavigation land	265		265
Civil air patrol	2, 973	6, 995	9, 968
Total	5, 373	36, 595	41, 968
Industrial services:			
Agriculture	9		9
Forest products	758	8, 935	9, 693
Industrial radiolocation	83	140	223
Low power industrial		8, 469	8, 469
Motion picture	19	351	370
Petroleum	4, 772	24, 607	29, 379
Power	5, 849	69, 706	75, 555
Relay press	40	918	958
Special industrial	4, 479	51, 136	55, 615
Total	16, 009	164, 262	180, 271
Land transportation services:			
Automobile emergency	317	3, 499	3, 816
Citizens		21, 300	21, 300
Highway truck	728	10, 941	11, 669
Intercity bus	50	918	968
Railroad	1, 125	22, 780	23, 905
Taxicab	4, 314	92, 572	96, 885
Urban transit	82	2, 348	2, 430
Total	6, 616	154, 358	160, 974
Marine services:			
Alaskan group	1, 057		1, 075
Coastal group	239		239
Marine auxiliary group	71	7	78
Marine radiolocation land	18		18
Ship group		49, 735	49, 735
Total	1, 385	49, 742	51, 127
Public safety services:			
Fire	1, 590	28, 916	30, 506
Forestry conservation	2, 675	23, 281	25, 956
Highway maintenance	894	11, 170	12, 064
Police	6, 929	118, 682	125, 611
Special emergency	1, 477	5, 424	6, 901
State guard	166	197	363
Total	13, 731	187, 670	201, 401
Grand total	172, 143	595, 750	767, 893

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Broadcast Services

REGULATION

The Communications Act gives the Commission more limited control of broadcasting than of common carrier operation. Broadcasting regulation is largely technical in nature and is in two phases.

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

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

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.

The act precludes Commission censorship of programs, also control over rates charged for air time, salaries paid artists or personnel, accounting methods and, in general, the day-by-day functioning of broadcast stations. There are some exceptions—such as provision in the act relating to equal opportunity for broadcasts by political candidates, and certain law injunctions against lotteries, obscenity and fraud over the air.

Under the act, it is the duty of the individual broadcaster to operate in the public interest. That means, in addition to living up to technical requirements, he should give a well-rounded program service, with

opportunity for local expression and discussion of matters of local concern.

The Commission does not prescribe any percentages of time which should be devoted to particular subjects, such as news, education, religion, music, public issue, etc. That is something which can vary with the locality. However, the Commission does periodically review the overall performance of a station—engineeringly and otherwise—when it applies for renewal of its license, to determine whether it has lived up to its obligations and the promises it made in obtaining permission to use the public's airwaves.

TELEVISION (TV) BROADCAST SERVICE

Development of TV

Since the lifting of the "freeze" on construction of new television stations on April 11, 1952, the number of TV stations in operation has jumped from 108 to 458.

In 1952, 63 markets had 1 or more local stations—in most cases 1; today there are over 4 times as many communities with their own video facilities. Two hundred and fifty-two communities have at least 1 TV outlet, and 100 communities have 2 or more.

The number of TV receivers in use has grown from 20 to 35 million, and it is estimated that over 90 percent of the people are now within service range of at least one station. A large portion of the public—perhaps as much as 75 percent—is served by 2 or more stations. The public has already invested over 10 billion dollars in TV receiving equipment, and the annual volume of TV advertising, set sales, servicing and operating combined runs close to four billion dollars a year.

In view of TV's record in the short span of three years, the Commission's concern today is not, as it was in 1952, whether an adequate TV service can be developed—for it is already big business—but, rather, how to develop more fully the industry's potentialities and the abilities and ingenuity of the American broadcasters to meet the needs and desires of the American public.

TV Problems

Any new rapidly expanding industry has problems. Television is no exception. Its startling growth has created many complexities. Today there are substantial obstacles, such as economic difficulties, in bringing a first local outlet to hundreds of smaller communities as well as in expanding the number of competing services in the larger communities. A major barrier is the high cost of programing at this stage, which makes the securing of a substantial amount of network and other paying programming a prerequisite to successful station

operation. Of even greater importance is the failure, thus far, of UHF stations to become integrated with established VHF stations into an economically sound nationwide service.

During the past year the Commission has been studying and analyzing the current TV situation to determine what should be done to aid its further growth. A number of specific actions have been taken and others are contemplated.

The Commission has given particular attention to the plight of UHF broadcasters and to devising ways and means for assisting them to operate on a comparable basis with VHF stations. The inability of UHF to compete with VHF is evidenced by the fact that of 325 UHF station grants, only about one-third are in operation. Many authorized UHF stations were not constructed, or quit operations, and many of the operating stations are in a precarious financial condition.

In March of 1955 the Commission submitted a preliminary report to the Senate Interstate and Foreign Commerce Committee, which is studying VHF-UHF and television network problems, outlining the steps the Commission has and is taking to promote TV's growth within the structure of the existing allocation system.

Meanwhile, outstanding construction permits for UHF stations have been extended to January 16, 1956.

The Commission was almost current on its TV processing line. Applications for new stations which did not raise legal, financial or technical questions were acted upon within 4 to 6 weeks after being filed. Applications for major modifications were acted upon within 2 to 3 weeks. Because of personnel limitations, there were delays in processing license applications; however, the operations of these applicants were not delayed since their program test authority enables them to give service pending action on their requests for regular licenses.

At the year's close, there were 582 commercial TV station authorizations, which was 9 more than in 1954. The net gain in operating stations was 46.

Deintermixture

A number of petitions requested deintermixture of UHF and VHF channels in certain cities where UHF stations find it difficult to compete with existing VHF stations. These proposals suggested that the commercial VHF channel assignments in certain areas be deleted so that only UHF stations could operate. Some wanted the VHF commercial assignment in a community exchanged with the UHF educational reservation; others proposed that the VHF assignment be deleted or assigned elsewhere. They argued that this would provide more balanced competition in the various communities, and would

strengthen UHF by enabling it to go forward in a number of markets until combination UHF-VHF receivers are generally available.

On November 10, 1955, the Commission denied 35 such petitions pending a general rule-making proceeding to consider possible solutions, on a nationwide basis, to the difficulties hindering expansion of TV service. It invited proposals for changes in standards concerning station separations, power, antenna height, directional antennas, etc., and their effect on existing stations, educational reservations, and receivers.

Booster Operation

One of the problems of UHF broadcasters competing with VHF is unequal coverage. As compared with VHF, the signals from UHF transmitters have less tendency to fill in areas which are not in direct line of sight with the transmitting antenna. Consequently, there are places which although lying within the area that would normally be served by a UHF station, are "shadowed" by intervening terrain and so deprived of service.

A "booster" operation contemplates the use of amplifying transmitters operating on the same channel as the main transmitter and dependent upon the latter for the generation of carrier frequencies and modulation. Booster operation has been permitted on an experimental basis, but the Commission's rules do not now authorize it as a regular service. The Commission instituted rulemaking on March 30, 1955, to determine whether UHF booster operation would be a feasible means for filling in such shadow areas.

"Satellite" Operation

A new policy was adopted by the Commission on August 5, 1954, to increase the incentive for constructing UHF stations in areas which might otherwise not be able to support them. Under this policy, UHF stations which propose to originate no local programing and to confine their programing to the rebroadcasting of programs of established stations may be authorized. These so-called "satellite" stations are required to meet all applicable rules and differ from other TV stations only in that they would not be required to originate local programs.

Since the high cost of the necessary equipment for programing is one of the chief deterrents to parties interested in establishing new UHF stations, permitting stations to duplicate the programing of another station should help to overcome this obstacle. It is anticipated that many of the satellites authorized on this basis will in time be able to add local programing and so become full-fledged TV stations. A few VHF satellites have also been authorized on this basis.

Maximum Power for UHF

The Commission is also considering, in a rule-making proceeding instituted June 22, 1955, another means for improving UHF service. It has proposed that the maximum permissible power for UHF stations be increased from 1 megawatt to 5 megawatts. Information concerning UHF receiver sets and their tuning mechanism is being collected to explore the possibility of further improving UHF reception.

Low Power

On June 22, 1955, the Commission took an additional step to encourage the establishment of local TV service in areas where operation might not otherwise be economically feasible by amending its rules to permit UHF or VHF stations to operate with lower power. The minimum visual effective radiated power now permitted by this change is minus 10 dbk (100 watts) at any antenna height. By lowering power requirements, stations can be constructed in small communities at a modest investment, particularly if they are also permitted to operate without originating local programs.

Intercity Relays

The Commission has been considering ways by which the cost of intercity transmission of TV programs can be reduced. At the present time, network programming appears to be a requisite for successful operation of most TV stations, including those located in relatively small communities which are removed from the main network lines and radio links. Stations in communities distant from program service points contend that the common carrier mileage charges for connecting them to network program service points prohibit profitable operation. Under the present rules, the operation of private television intercity relay systems to connect with program service points is permitted only on an interim basis until adequate common carrier facilities are available.

On September 15, 1954, the Commission instituted rule making on a proposal looking toward the relaxation of these rules to permit broadcasters more freedom in establishing private intercity relay systems. In this proceeding, consideration is also being given to the suggestions of the telephone company to furnish a cheaper method of off-the-air pickup and retransmission of network programs to stations.

Antenna Location

The Commission's present rules governing the location of antennas of TV stations place no restrictions an antenna placement other than requiring adequate coverage of the city to be served and mileage separations from other stations. As a result, some stations have

placed their transmitters at some distance from the city served and in the direction of and to also serve larger cities. This often deprives less populated areas of services contemplated by the assignment table. On November 9, 1955, the Commission denied a proposal that TV transmitters be located within five miles of the nearest boundary of the principal city to be served.

Subscription TV

Subscription ("pay-as-you-see" or "toll") television contemplates a program service to only those who will pay for it. This would be accomplished by transmitting a distorted picture and unintelligible sound which cannot be normally received on any television receiver not equipped with a decoding or unscrambling device. There are different subscription systems. They differ both in the techniques used to scramble and unscramble pictures and also in the manner of collecting payments for the programs furnished. During the past 5 years the Commission has authorized experimental testing of several systems. However, the Commission's rules do not permit TV stations to furnish such a service on a regular basis.

On February 11, 1955, the Commission, in response to several petitions, invited comments as to whether its rules should be amended to authorize TV stations to render a subscription service. Any such authorization involves a basic change in the American system of broadcasting and raises substantial questions of a legal, technical and policy nature. Those filing comments in the proceeding were asked to direct their attention to certain questions. Among these were whether subscription TV would encourage the larger and more effective use of radio; what impact it would have on advertiser-sponsored broadcasting; how it would affect broadcast of news and diverse views on controversial issues; what safeguards are necessary to insure that the public would continue to receive well-balanced TV programing without charge; what is necessary to prevent monopolistic control, and whether it should be open to all stations. The nature and extent of regulation necessary to protect the public interest as well as the type of service and hours of operation must also be resolved.

In addition, the Commission sought comment on several basic legal considerations, including such questions as whether additional legislation would be required to institute a subscription service, the form of any necessary legislation, and whether toll-TV should be classified as "broadcasting", "common carrier", or otherwise under the Communications Act. Technical data relating to the operation of proposed systems; the possibility of degradation of and interference to the regular free TV service; and the adverse effect on receivers in the hands of the public must be studied.

Information was also sought as to the means and methods of those organizations intending to engage in subscription operations; the cost to the viewing audience; the needs of TV broadcasters for additional revenue and program resources from such a service; its anticipated capacity to increase the use of TV channels and bring the public programs now unavailable; the types of programs to be broadcast for a fee and who would control their production and distribution; patent control and licensing arrangements; and the roles to be played by the motion picture industry and the networks.

Filings in this connection have been more voluminous than in any previous docket case in the Commission's history, with more than 25,000 formal documents, letters, postcards, etc., filling nearly 70 reference volumes. The time for filing replies to the original comments submitted expired on September 9, 1955. After the Commission has had an opportunity to study all these comments, it will specify in subsequent notices any further proceedings as may be necessary, including oral hearing and the time and nature of demonstrations of subscription TV systems.

Community Antenna TV Systems

So-called "community antenna systems" or any other closed-circuit TV system which is operated solely over wires may be installed and operated at the present time without Commission authorization. Community antennas do not transmit on the air, but pick up or receive TV programs off the air and send them by means of wire or coaxial cable to customers paying for the service. Usually such systems are used for bringing TV to subscribers in communities where the direct reception of regular TV stations is nonexistent or difficult.

At the present time, community antenna systems are private enterprises, which are not regulated or licensed by the Commission and their activities may be varied or discontinued at will by their operators. However, all wired TV systems are required to operate so that no harmful interference is caused to authorized radio services. The Commission has a current rule-making proposal to restrict the radiation from such systems. The Commission is also considering a petition which requests that the status of community antenna systems under the Communications Act be clarified. The question whether such services constitute common carrier or some other operation which comes within the Commission's jurisdiction is under study.

At the close of the fiscal year, industry estimates that nearly 400 community antenna systems were serving between 250,000 to 300,000 homes. The total number of viewers was estimated at approximately one million.

Color TV

The Commission adopted its present compatible color TV standards on December 17, 1953. They were developed by the National Television System Committee (NTSC), representative of engineers, scientists and others in interested industries. This system is "compatible" in the sense that existing black-and-white receiver sets can receive color transmissions in monochrome without adaptation.

The Commission rules do not require stations to devote any minimum hours to color broadcasting. Nevertheless, many promising developments took place the past year in color telecasting, and the total number of hours devoted by stations to colorcasts has increased. More stations have become equipped to carry color programs, and many have facilities for local film and live color telecasting, as well as for network color programs. The telephone company has also reengineered and reequipped additional relay links for color networking.

Color receivers now being produced have 19 and 21-inch picture tubes as compared to the 15-inch tubes. There has also been a considerable decrease in the price of color sets, and new techniques in production and increased sales promise further cost reductions to the public.

Noncommercial Educational TV

The Commission has recognized that educational institutions require more time than commercial interests to prepare for TV operation and has placed no limit on the duration of assignment of the 258 channels now reserved for noncommercial educational TV operation. However, while a public statement issued on May 11, 1953 reaffirms that these reservations were for an indefinite and unlimited time, the Commission pointed out that this period should not be excessively long and the reservations should be surveyed from time to time.

While several requests for shifts of educational reservations have been granted in rule-making proceedings, the Commission has in the past denied requests to transfer educational channels to commercial use. However, on June 1, 1955, for the first time it instituted rule making to consider a petition seeking the shifting of the VHF educational channel reservation in Des Moines, Iowa, to a UHF channel in order to make the VHF channel available for commercial use there. The resulting comments are under consideration. Other pending petitions request reassignment of educational reservations.

Noncommercial educational TV authorizations netted four for the year, bringing their total to 34. Eleven of these were in operation, or five more than in 1954. Fourteen applications were pending as the year's close. TV educational channels now total 258.

The first and only educational TV station to surrender its permit was KTHE, University of Southern California, Los Angeles (Channel 28). It had been operating.

STANDARD (AM) BROADCAST SERVICE

AM Shows Continued Gain

The number of authorized AM stations continued to increase, showing a net gain of 143 for the year, which brought their number to 2,840. Those on the air totaled 2,732, which was 149 more than the previous year.

North American Regional Broadcasting Agreement (NARBA)

All countries in North America, except Mexico and Haiti, signed this treaty in 1950. It is intended to regulate the assignment and operation of AM broadcasting stations in this region so as to minimize interference. To become effective, the agreement must be ratified by three of its major signers—the United States, Canada, and Cuba. Cuba did so in 1951. In February of that year the agreement was submitted to the United States Senate, where it was referred to the Committee on Foreign Relations. Except for the hearings held by a subcommittee in July of 1953, no other action has been taken.

This new pact was negotiated to replace an interim agreement which extended and modified the provisions of the first NARBA (1937) until 1949. Since then the Commission has adhered to a policy, formalized in 1951, of taking no action in making new assignments or modifying existing assignments which would be inconsistent with the new NARBA.

Other signatory countries have, in general, followed a like procedure. This has made it possible to operate existing stations and to authorize new stations without undue conflict. Any problems have been resolved by negotiation, with mutual observance of the agreement. However, there are indications that some countries may be departing from this procedure because of the delay in effecting the agreement. If this trend continues it can result in United States stations receiving more undesirable foreign interference. Implementation would have reduced present interference to a great extent.

Since the signing of the NARBA, the United States and Mexico have exchanged views and conferred with respect to the solution of mutual AM broadcast problems. Since Mexico is not a party to the 1950 NARBA, negotiations have sought an agreement with respect to Mexico's adherence to NARBA or to its entry into a separate bilateral agreement with the United States. A series of meetings were held in Washington in 1954 for the purpose of negotiating an interim

agreement with Mexico. This objective not having been attained, a further conference took place in Mexico City November 4–December 17, 1954, and reconvened in Washington on July 7, 1955. There was prospect that the latter meeting, which was in progress at the time this report was prepared, would be successful.

Clear Channels and Daytime Skywave Interference

The Commission is nearing the completion of rule making concerning daytime skywave transmissions (Docket 8333). This proceeding was instituted in 1947 when an accumulation of skywave data suggested modification of the technical standards governing skywave transmission of AM radio signals during daytime hours. In the same year, the proceeding was consolidated with the clear-channel proceeding (Docket 6741). During their pendency, the Commission's policy has been to withhold action on applications for new and increased daytime and limited-time stations on clear channels on which the United States has priority for dominant Class I stations under international agreements.

In 1953 the Commission found it expedient to sever the two proceedings. On March 11, 1954, it proposed making certain changes in future allocation of stations on clear channels. New stations would be required to restrict radiation to a specified degree in the direction of the service areas of domestic dominant Class I stations in order to reduce potential interference from skywave transmission shortly after sunrise and shortly before sunset. In addition, no new limited-time facilities would be authorized to operate past sunset.

On July 15, 1954, the Commission held an oral argument on the question of whether these amendments should be adopted. On January 26, 1955, it tentatively adopted them and invited comments as to whether the restrictions should be applied to the operations of existing stations. These comments are now being studied preparatory to a final determination.

In another rule-making proceeding affecting clear channels, the Commission revised its rules, on December 3, 1954, to permit assignment of Class II stations operating unlimited time in Alaska, Hawaii, Puerto Rico, and the Virgin Islands on frequencies assigned to dominant clear channel stations in the United States. These assignments may be made provided they do not cause interference to stations within the continental United States. The allowable signal levels are the same as permitted stations in foreign countries under NARBA. These new rules open up unlimited time use of many frequencies in the territories which are already available to stations in foreign countries located closer to the United States than the territories themselves.

Revision to "10 Percent Rule"

On August 4, 1954, the Commission amended the requirements of its so-called "10 percent rule" governing the assignment of Class II, III or IV AM broadcast stations. This rule is designed for more effective utilization of available frequencies, to further protect existing stations against objectional interference, and to limit the degree of interference which proposed AM stations may receive to their normal service areas from existing stations to 10 percent. However, it permits new assignments, even though they cannot comply with these criteria, when they would give a community its first nighttime service or when more than 25 percent of their primary service area would receive initial primary nighttime service.

FREQUENCY MODULATION (FM) BROADCAST SERVICE

Less Commercial FM Stations; More Educational FM Stations

Commercial FM stations continued to decrease. Their total at the close of the fiscal year was 552, which was 17 less than at the same time in 1954. Of these, 540 were on the air in contrast with 553 the year previous.

However, the number of noncommercial educational FM stations continued to gain. There were 127 such authorizations at the year end, which was a gain of 4 for the year. Those operating numbered 124, or seven more than in 1954.

Functional Music

On March 2, 1955, the Commission amended its rules to permit FM broadcasters to engage in certain types of specialized nonbroadcast operations as an adjunct to their regular FM broadcast service in order to obtain additional revenue. The newly authorized service is limited to special programing of music, news, time, weather reports and similar subjects designed primarily for reception by industrial, mercantile, transportation and other business organizations and individuals subscribing to the service. This is generally referred to as "functional music" operation and includes three types of services—"background" music to commercial and industrial organizations, "storecasting" in stores, and "transitcasting" to passengers on public vehicles such as streetcars.

FM broadcasters desiring to furnish this type of subscription service must apply for a Subsidiary Communications Authorization (SCA) under which they may transmit such specialized programing on a multiplex basis at any time, or on a simplex basis for a one year period following the effective date of the rules (to July 1, 1956). Stations may furnish these programs on a simplex basis only during

the time not devoted to the required minimum of 36 hours of FM broadcasting a week and the minimum requirement of 5 hours of broadcasting a day. Prior to these amendments, FM broadcast stations were required to broadcast a minimum of 42 hours a week, with at least 6 hours daily.

When the station is operating on a simplex basis, subscribers must own or rent special receivers activated by an inaudible supersonic (beep) signal to cut or amplify certain portions of a station's transmissions. Another type of special receiver is required to receive multiplexed programs.

Other requirements are imposed for operation under an SCA to insure the technical quality of the main FM broadcast service, to effect the complete control by the FM broadcaster over all program material transmitted, and to insure observance of Commission rules and policies with respect to controversial issues and political broadcasts.

Form 318 has been designed for use for FM broadcasters to apply for a permit to establish an SCA service, to modify an SCA, to renew an SCA, and to assign or transfer an SCA. The first such grants were made October 12, 1955 to WPEN–FM, Philadelphia, and WWDC–FM, Washington, D. C. By November 16 the total was 20.

Facsimile Broadcast

Under the Commission rules, FM stations may transmit still pictures, graphs, and printed or written matter to the general public on a simplex or multiplex basis. Such transmissions are called "facsimile" or "fax" broadcasting. Multiplex facsimile may be transmitted at the same time as an aural program is being broadcast, but simplex facsimile can be transmitted only when no aural program is being broadcast.

While in the past a few authorizations have been granted for transmission of facsimile, during the year no interest was shown in this service, and no stations are now engaged in facsimile broadcasting.

AUXILIARY BROADCAST SERVICES

The auxiliary broadcast services relate to the use of the portable or mobile radio transmitting apparatus to pick up program material outside a regular studio, to the use of permanently installed transmitting equipment to provide program transmission circuits between the studios and transmitters of AM, FM, and TV broadcast stations, and to the use of private intercity relay circuits for network operation for FM and TV stations in lieu of common carrier coaxial cable or microwave facilities.

Remote Pickup Broadcast Stations

These auxiliaries are used by broadcast stations for on-the-spot coverage of news events. Although used primarily by AM and FM stations, these adjuncts are now being utilized by TV stations for relaying the aural portion of pickups, for communicating with field crews setting up TV pickup equipment, and for dispatching and cueing pickup crews to and at the scenes of such events.

Equipment employed for this purpose ranges in power from a fraction of a watt to a few hundred watts and is mostly self-powered. It can also provide emergency communication in the event of disruption of normal circuits. Authorizations cover 281 such stations.

Aural Broadcast STL Stations

These studio-transmitter links furnish a circuit for relaying programs between the studio and the transmitter of an aural broadcast station. Such a service permits AM and FM stations to locate their transmitters in areas which are most favorable for signal propagation regardless of the availability or suitability of wire line program circuits. During the year three such applications were granted.

FM Broadcast Intercity Relay Stations

These stations provide intercity relaying of programs to FM stations where the special high-quality circuits required by these stations are not available from common carriers. No new stations were authorized during the year.

TV Pickup Stations

These are visual remote pickup stations used by TV licensees for making on-the-spot broadcasts. They are particularly useful to telecasters since their use eliminates the expensive special cables which are necessary for TV transmission and permits the relaying of program material which would otherwise be limited in most cases to that produced in studios. The widespread coverage given sporting events by TV stations would not be possible without the use of these pickups. Forty-one were authorized during the year.

Television STL Stations

These studio-transmitter links perform the same service for TV stations as aural broadcast STL stations do for AM and FM stations. As in the case of pickup stations, they are particularly useful to TV operation, since a physical link between the studio and transmitter would be very costly. The Commission granted 97 such stations during the year.

TV Intercity Relay Stations

These stations provide a means for relaying TV program material between cities. Commission policy in general requires that such relaying be handled by common carriers. However, its rules permit the operation of private intercity relays systems by TV stations on an interim basis where it can be shown that common carrier facilities are not available.

Twenty-three private TV intercity relay stations were granted during the year on showing that common carrier facilities were not available. A number of applicants also stated that the cost of common carrier facilities, even if available, would be beyond their means (see "Intercity Relays" in section of this report dealing with television for rule making to relax present requirements).

EXPERIMENTAL BROADCAST SERVICES

Broadcasting is a dynamic industry and each day sees some new development in equipment or techniques. Every major development, however, has been preceded by experimentation. The Experimental Broadcast Services provide means for carrying on this research and testing. Stations in these services are concerned primarily with the technical phases of broadcasting, the development of new apparatus and techniques, or obtaining engineering data which will be useful to the industry and to the Commission.

Experimental TV Stations

Any experimental operation involving the transmission of transient visual images in connection with TV broadcasting is classed as an experimental TV station.

Considerable research was conducted during the year in the operation of low-powered TV "boosters" in the UHF bands, and with other low-powered apparatus designed to convert signals received on one channel (usually VHF) to a channel in the UHF band for amplification and retransmission.

Experimentation also continued with various forms of "subscription TV". Manufacturers continued to use experimental authorizations for the development and testing of new TV transmitting equipment. Interest in super-power for UHF stations was developing, and 1 application was pending for authority to test equipment capable of providing an effective radiated power of 5 million watts.

Developmental Broadcast Stations

Experimental operation in connection with the development of new apparatus and techniques in connection with the aural broadcasting services (AM and FM) is classed as developmental broadcast.

Activity in this field was, for the most part, limited to the evolving and testing of transmitting equipment by manufacturers.

Experimental Facsimile Broadcast Stations

There was no activity in this field during the year.

MILITARY BROADCAST STATIONS

For a number of years the Department of Defense has operated radio broadcast stations at military establishments outside of the continental United States in order to provide entertainment for and contribute to the morale of military personnel stationed at these bases. Such service has, for the most part, been provided at isolated places, including territorial possessions having little or no primary service from stations licensed by the Commission.

The rapid development of television has led to a desire on the part of the military to establish TV stations, not only at overseas bases, but also at remote posts within the continental United States. Several military TV stations have been placed in operation after consultation with the Commission. Others are in the planning stage. The Commission is watching these developments closely in order to guard against encroachments which would have an adverse effect on the private broadcast industry.

CHAIN BROADCASTING RULES AND NETWORK STUDY

On June 22, 1955, the Commission amended its chain broadcasting rules to remove a restriction which operated to preclude TV stations from contracting with the networks for particular programs when a station with overlapping coverage in another community had contracted for "first call" on the same network programs. Since, at this stage in TV development, network programing is essential to the profitable operation of most stations, and in many cases, to their very survival, it was desirable to remove this restraint on competition among stations for TV network programing.

The Commission had long recommended to Congress that it be given funds to conduct an overall study of the broadcast industry—including a review of the chain broadcasting rules—to develop factual information necessary to determine the effectiveness of its present rules and the need for any revision. The Independent Offices Appropriation Act, 1956, earmarked $80,000 to be used by the Commission to begin a study of radio and television network broadcasting. On July 22, 1955, the Commission designated Chairman George C. McConnaughey and Commissioners Rosel H. Hyde, Robert T. Bartley and John C. Doerfer as a committee to conduct this study.

MULTIPLE OWNERSHIP RULES

One of the actions taken by the Commission in September of 1954 to encourage the development of the UHF band was the liberalization of its multiple ownership rules. The revised rules increased the maximum number of commercial TV stations any one interest could own from five to seven, and provided that not more than five of the seven could be in the VHF band. This revision was intended to encourage multiple owners of TV stations to enter the UHF field and to lend their knowledge and resources to its development. Since the adoption of these rules, multiple owners have acquired UHF outlets in important markets such as Milwaukee, Portland (Oregon), and Miami.

The multiple ownership rules also preclude common interest in more than 7 commercial AM, or 7 commercial FM stations; or the same person or group from operating more than 1 network, or more than 1 AM, FM, or TV station in the same service area.

On February 24, 1955, the United States Court of Appeals for the District of Columbia Circuit in *Storer Broadcasting Company* v. *United States and Federal Communications Commission*, No. 12,065, held that the Commission's multiple ownership rules were invalid to the extent that they impose maximum limits on interests in broadcast stations. On May 23, 1955, the Commission petitioned for a writ of certiorari to review this decision in the Supreme Court of the United States. To date, the Supreme Court has not taken action on this petition.

POLITICAL BROADCASTS

On September 2, 1954, the Commission revised its political broadcast rules to implement the 1952 amendments to Section 315 of the Communications Act. The new rules are intended to insure that legally qualified candidates for public office are afforded the opportunity to use the facilities of broadcast stations at a rate no higher than that paid by commercial advertisers under comparable circumstances. This and other obligations imposed by section 315 of the act and the Commission's rules are limited solely to the rates charged legally qualified candidates for public office.

As an aid to broadcasters and political candidates, the Commission on September 8, 1954 issued a pamphlet, "Use of Broadcast Facilities by Candidates for Public Office", setting forth the provisions of the law and rules and summarizing some of the determinations made of questions with respect to their application.

"PARTY IN INTEREST" PROTESTS

Commission apprehension, expressed to Congress before Section 309 (c) of the Communications Act was amended in 1952, has been

realized in the way that this section is being used to delay and impede its processes, and to deny the public expected and long-awaited service—especially TV.

Supported by court rulings, this particular provision has the effect of entitling any party claiming economic injury to a hearing on any application that the Commission has granted without a hearing and, further, requiring that the grant be stayed while the protestant is being heard. In consequence, it has been seized upon by unsuccessful TV applicants, AM and FM stations, and even nonbroadcast interests, to hold up TV grants that were previously uncontested.

It became so evident this provision was being used in many cases solely as a device to block broadcast grants and to keep competitors off the air as long as possible that the Commission sought remedial legislation of Congress. Such a bill passed the House and another received Senate subcommittee approval but Congress adjourned without taking final action.

HEARINGS

On July 15, 1954, the Commission made substantial revisions to its rules relating to broadcast hearing procedures in order to simplify and speed up hearings on competitive applications. These revisions were the result of the Commission's experience with hearing procedures previously in use and were undertaken after consultation with representatives of the practicing bar. The changes may be summarized briefly:

Requirement of a prehearing exchange between applicants, and submission to the examiner by each applicant of his direct case in written form;

Expanded use of the prehearing conference procedure, with a removal of the requirement that applicants submit points of reliance;

Elimination of the requirement in prehearing letters that each applicant submit detailed supplementary information prior to commencement of the hearing; and

Extension of the time between the designation and commencement of a hearing from 30 to 60 days with a corresponding change in the cutoff date for filing competing applications.

The requirement for exchanging supplementary information between competing applicants prior to the commencement of a hearing was deemed no longer necessary because of the elimination of the requirement respecting submission of points of reliance. The extension of the prehearing interval was necessary in order to provide applicants with sufficient time to prepare their written cases in advance of the actual hearing. The Commission also provided for a prehearing conference both prior to and subsequent to the exchange of

exhibits by the parties, with the initial conference covering a wide variety of matters.

These revisions materially expedite the hearing process since each applicant is required to exchange with the other parties to the proceeding his entire direct case in writing in the form of exhibits prior to the oral portion of the hearing. The many advantages of this were cited in the first report of the President's Conference on Administrative Procedure, published January 26, 1954. The procedure adopted by the Commission also limits the direct oral testimony with respect to the applicant's affirmative case.

These new procedures do not require broadcast hearings to commence with the actual presentation of proof, nor are applicants required to make a preliminary submission of detailed information supplementing their applications in specified categories, as was formerly the case. The requirement that the parties state the matters upon which they propose to rely has also been eliminated. However, the Commission still makes findings upon the basic legal, financial, technical, etc., qualifications of the applicants before the applications are designated for hearing, thus eliminating lengthy testimony on which no actual controversy exists.

On April 1, 1955, the Commission amended its procedural rules governing adjudicatory cases. These revisions limit the length of pleading and briefs filed in certain cases, and the length of time allotted to parties for oral argument. The amended rules provide that in adjudicatory proceedings which have been designated for hearing the Commission will not accept pleadings which exceed 15 double-spaced typewritten pages in length, unless good cause is established in a separate pleading.

The amended rules also provide that briefs or memoranda accompanying exceptions to or statements of initial decisions be limited to 50 double-spaced typewritten pages, unless permission is obtained for greater length. Briefs in reply to exceptions are subject to the same limitations. With respect to exceptions to initial decisions, the Commission announced that existing rules requiring each exception to contain specific reference to the page in the transcript, exhibit or order on which it is based, would be more strictly enforced.

In addition, the amended rules provide that Commission orders designating cases for oral argument shall specify the amount of time allotted to each party. Any person may petition for extension of this time, and such petitions will be granted if good cause is shown. Formerly, the normal time allotted to each party for oral argument was 20 minutes. The new rule permits a more flexible arrangement and more administrative efficiency since the Commission now examines each case at the time it is designated for oral argument and makes an

allotment of time to each of the participating parties based on the particular circumstances of the case.

The Commission has drafted a hearing manual designed to promote uniformity in the introduction and use of evidence in comparative broadcast proceedings and, on October 19, 1955, proposed to incorporate it by reference to its rules of practice and procedure.

OTHER BROADCAST RULE CHANGES

In addition to the rule, changes and rule-making proceedings heretofore reported, the following are some of the other important revisions made and rulemaking proceedings instituted which affect the broadcast service.

During the fiscal year, the Commission received approximately 100 petitions requesting amendments to the TV assignment table. Following rulemaking proceedings, 50 changes were made. These proposals no longer consist primarily of simple channel shifts but frequently entail wholesale channel changes as well as amendments to other rules. With the further development of TV and the advent of more stations, the complexity of these rule-making proposals may be expected to increase.

In October of 1954, changes were made in the procedure for processing applications for TV stations to make it in accord with new practices and policies. The new procedure provides for processing TV applications in the order in which they are accepted for filing, as in the case of AM and FM applications. The temporary processing procedure for handling the backlog of applications that existed after the lifting of the TV "freeze" was deleted as well as the "antistraddling rule" which was then necessary to insure that a licensee or permittee would make his channel available to others before seeking another channel.

On May 13, 1955, the Commission specified a 2-year retention period for various records which broadcast stations must maintain. While the rules provide that program and operating logs must be kept for two years, they were previously silent on the retention period of other records.

On May 19, 1955, the Commission incorporated various portions of the Standards of Good Engineering Practice in the broadcast rules. It is codifying its AM and FM standards and preparing a revised edition of Part 3.

The Commission has under study a petition which requests that the rules be revised to permit all AM stations on regional frequencies to commence operation with their daytime facilities at 5 a. m., or local sunrise, whichever occurs earlier, and to cease daytime operation at 7 p. m. or local sunset, whichever is later. The present rules gener-

ally provide that daytime stations cannot sign on before local sunrise and must sign off before local sunset. They also require unlimited time stations on regional frequencies to use their nighttime facilities (generally with reduced power or directional antenna or both) after local sunset. Under the pending proposal, unlimited time stations which operate with reduced power or directional antenna at night would be permitted to operate with their daytime facilities during the proposed daytime hours.

The Commission instituted rulemaking on December 8, 1954, looking toward providing bandwidth definitions and emission limitations for AM and FM broadcast stations. Present rules and standards do not define the bandwidth utilized by aural stations, nor do they set forth any definite limit on their spurious emissions (energy released on other than their assigned channels). The purpose is to curb interference to other broadcast stations and to stations operating in other services.

Rulemaking initiated December 16, 1954, looks to revising license application form (FCC Form 302) to reflect new requirements with respect to TV upper sideband measurements and out-of-band TV emissions, to include questions concerning color operation, and to delete the exception to filing financial data in certain instances.

On July 20, 1955, the rules were amended to permit VHF stations in Zone I to employ maximum power with antenna heights up to 1,250 feet above average terrain, instead of 1,000 feet as previously stipulated. However, a number of petitions for reconsideration and requests for stay were filed and the effective date has been postponed.

New rules of May 19, 1955, establish procedure for "type acceptance" of broadcast transmitters. This form of approval is based on an examination of certified test data submitted by the manufacturer of the transmitter or by a licensee employing the transmitter. An application for a construction permit which specifies a "type-accepted" transmitter need not be accompanied by diagrams and a detailed description of the transmitter.

A current rulemaking proceeding proposes procedures for "type approval" (by laboratory test) of TV frequency and modulation monitors. Present rules prescribe methods for type approving such AM and FM monitors, but not for those in TV.

STATISTICS

Current Broadcast Authorizations

The fiscal year closed with broadcast authorizations collectively exceeding 6,000 for the first time. Their 6,257 total represented a net gain of 419 for the year.

The biggest growth for program outlets was 143 for AM, making its total 2,840. Commercial TV's net gain was 9, giving it 582. A gain of 4 brought educational TV's total to 34. Commercial FM showed a net loss of 17, bringing its total down to 552, but educational FM gained 4, to increase its number to 127. The remaining 2,107 authorizations were for broadcast adjuncts, of which remote pickup facilities accounted for 1,546.

Authorizations for the different classes of broadcast services were:

Class	June 30, 1954	June 30, 1955	Increase or (decrease)
Commercial AM	2,697	2,840	143
Commercial TV	573	582	9
Educational TV	30	34	4
Auxiliary TV	397	516	119
Experimental TV	18	15	(3)
Commercial FM	569	552	(17)
Educational FM	123	127	4
Remote pickup	1,384	1,546	162
Studio-transmitter link	45	43	(2)
Developmental	2	2	0
Totals	5,838	6,257	419

These figures do not include international broadcast stations, which are in a state of flux.

There is no separate facsimile broadcast service, but commercial FM stations can engage in facsimile operation and there is provision for facsimile experimentation. Also, beginning July 1, 1955, FM stations can apply for "Subsidiary Communications Authorization" to engage in functional (background) music operations.

Broadcast Authorizations by States and Territories

Texas continues to lead all States in total number of broadcast authorizations, according to a mid-June tabulation of Commission records. Texas then had 277 AM, FM, and TV authorizations collectively. California came second with 241, and Pennsylvania third with 221.

In the AM list, Texas is also at the top with 212 such authorizations, followed in turn by California with 155, Pennsylvania with 133, North Carolina with 124, New York with 110 and Florida with 109. Every territorial possession (including Guam) has AM grants. Puerto Rico's 25 AM authorizations are more than those in each of a dozen States.

The FM commercial list is headed by Pennsylvania (44), followed by New York (43) and California (39).

In educational FM, California and Indiana are tied in first place with 11 each. Six States are without any FM authorizations—Montana, Nebraska, North Dakota, South Dakota, Vermont, and Wyoming. Hawaii has both commercial and educational FM authorizations.

All States—also Alaska, Hawaii and Puerto Rico—have TV authorizations. The commercial TV authorization list is headed by Texas with 41, followed by Pennsylvania with 36 and California with 35.

New York tops the educational TV list with 7 grants, followed by Alabama and Connecticut with 3 each.

A list of broadcast authorizations by States and Territories follows:

Broadcast authorizations by States

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
Alabama	92	16	1	11	3	123
Arizona	31	2	1	7	0	41
Arkansas	52	6	0	7	0	65
California	155	39	11	35	1	241
Colorado	44	5	1	8	1	59
Connecticut	25	6	0	8	3	42
Delaware	8	1	0	1	0	10
District of Columbia	6	8	0	6	0	20
Florida	109	21	4	21	1	156
Georgia	99	17	1	15	0	132
Idaho	25	2	0	5	0	32
Illinois	89	32	5	20	2	148
Indiana	56	21	11	16	0	104
Iowa	59	11	4	12	0	86
Kansas	44	2	5	8	1	60
Kentucky	65	11	4	9	0	89
Louisiana	60	12	1	13	0	86
Maine	16	1	0	7	0	24
Maryland	33	7	1	7	0	49
Massachusetts	54	16	5	10	1	86
Michigan	79	22	4	19	2	126
Minnesota	54	5	1	9	0	69
Mississippi	62	3	1	7	0	73
Missouri	69	9	1	19	1	99
Montana	29	0	0	4	0	33
Nebraska	28	0	0	7	0	35
Nevada	14	1	0	4	0	19
New Hampshire	13	4	0	2	0	19
New Jersey	24	6	2	5	1	38
New Mexico	33	2	1	4	0	40
New York	110	43	6	29	7	195
North Carolina	124	33	3	16	1	177
North Dakota	18	0	0	6	0	24
Ohio	81	34	9	28	2	154
Oklahoma	51	2	4	13	2	72
Oregon	59	8	3	8	0	78
Pennsylvania	133	44	7	36	1	221
Rhode Island	12	5	0	3	0	20
South Carolina	57	16	1	11	0	85
South Dakota	17	0	0	3	0	20
Tennessee	86	11	2	11	0	110
Texas	212	16	7	41	1	277
Utah	22	2	2	3	0	29
Vermont	13	0	0	1	0	14
Virginia	74	18	3	12	0	107
Washington	63	6	3	14	1	87
West Virginia	44	11	0	11	0	66
Wisconsin	71	13	8	14	1	107
Wyoming	19	0	0	1	0	20

Broadcast authorizations by Territories

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
Alaska	13	0	0	4	0	17
Guam	1	0	0	0	0	1
Hawaii	13	1	2	5	0	21
Puerto Rico	25	0	0	3	1	29
Virgin Islands	3	0	0	0	0	3

Broadcast Authorizations by Cities

Cities having 10 or more broadcast authorizations total 54. New York City leads with 37 AM, FM, and TV authorizations collectively, followed by Chicago with 35, Los Angeles with 29, and Philadelphia with 23.

New York and Chicago head the AM list with 16 authorizations each, followed by Los Angeles with 13, and New Orleans with 11.

In the commercial FM field New York leads with 11, followed by Chicago (10), Washington (8), and Cleveland, Detroit, Los Angeles, and Philadelphia (7 each).

Philadelphia, Boston, Dallas, and Louisville each have 3 educational FM authorizations.

Los Angeles has the most commercial TV grants (8), followed by New York and Chicago (7 each), and Washington (6).

The 34 current educational TV grants are to Andalusia, Birmingham and Munford, Ala.; Berkeley, Calif.; Denver, Colo.; Bridgeport, Hartford, and Norwich, Conn.; Miami, Fla.; Chicago and Urbana, Ill.; Manhattan, Kans.; Cambridge, Mass.; Ann Arbor and Detroit, Mich.; St. Louis, Mo.; New Brunswick, N. J.; Albany, Binghamton, Buffalo, Ithaca, New York, Rochester, and Syracuse, N. Y.; Chapel Hill, N. C.; Cincinnati and Columbus, Ohio; Oklahoma City and Tulsa, Okla.; Pittsburgh, Pa.; Houston, Tex.; Seattle, Wash.; Madison, Wis., and San Juan, P. R.

The following tabulation indicates the number of broadcast stations authorized in the particular cities listed. It does not include stations in adjacent communities which also serve those cities.

	AM	FM		TV		Total
		Commercial	Educational	Commercial	Educational	
New York	16	11	2	7	1	37
Chicago	16	10	1	7	1	35
Los Angeles	13	7	1	8	0	29
Philadelphia	10	7	3	3	0	23
Cleveland	8	7	1	5	0	21
San Francisco	10	5	1	5	0	21
Boston	10	4	3	3	0	20
Washington	6	8	0	6	0	20
Atlanta	8	5	1	4	0	18
Detroit	5	7	1	4	1	18
Portland (Oreg.)	10	5	0	3	0	18
Seattle	10	3	1	3	1	18
Denver	10	2	0	4	1	17
Minneapolis-St. Paul	10	2	1	4	0	17
New Orleans	11	3	0	3	0	17
Pittsburgh	7	4	1	4	1	17
Baltimore	8	2	1	5	0	16
Dallas	7	3	3	3	0	16
Houston	8	2	1	4	1	16
San Antonio	9	4	0	3	0	16
Birmingham	8	3	0	3	1	15
Jacksonville	9	3	0	3	0	15
Miami	6	4	1	3	1	15
St. Louis	8	1	1	4	1	15
Buffalo	6	4	0	3	1	14
Cincinnati	6	2	0	5	1	14
Louisville	7	0	3	4	0	14
Richmond	8	4	0	2	0	14
Rochester	6	2	0	5	1	14
Des Moines	6	3	1	3	0	13
Fresno	7	3	0	3	0	13
Memphis	9	1	0	3	0	13
Milwaukee	7	1	0	5	0	13
Oklahoma City	7	0	1	4	1	13
Salt Lake City	7	2	1	3	0	13
Shreveport	7	3	0	3	0	13
Columbus (Ohio)	5	2	1	3	1	12
Honolulu (Hawaii)	6	1	2	3	0	12
Tampa	6	3	1	2	0	12
Tulsa	6	0	1	4	1	12
Albuquerque	6	1	1	3	0	11
Baton Rouge	5	3	1	2	0	11
Columbia (S. C.)	5	2	1	3	0	11
Kansas City	7	1	0	3	0	11
Knoxville	6	1	2	2	0	11
Madison (Wis.)	4	3	1	2	1	11
Providence	6	2	0	3	0	11
Scranton	5	2	1	3	0	11
Grand Rapids	6	2	0	2	0	10
Nashville	7	1	0	2	0	10
Savannah	6	2	0	2	0	10
Spokane	6	1	0	3	0	10
Syracuse	5	1	1	2	1	10
Toledo	4	3	1	2	0	10

Broadcasting Since 1949

The following table shows the number of authorized, licensed and operating broadcast stations, and pending applications, at the close of each of the past 7 fiscal years; also the number of stations deleted during those years:

Year	Grants	Deletions	Pending applications	Licensed	CP's on air	Total on air	CP's not on air	Total authorized
COMMERCIAL AM								
1949	200	55	382	1,963	43	2,006	173	2,179
1950	194	70	277	2,118	26	2,144	159	2,303
1951	118	35	270	2,248	33	2,281	104	2,385
1952	60	25	323	2,333	22	2,355	65	2,420
1953	187	23	250	2,439	19	2,458	126	2,584
1954	148	29	226	2,665	18	2,683	114	2,697
1955	161	18	304	2,719	13	2,732	108	2,840
COMMERCIAL FM								
1949	57	212	65	377	360	737	128	865
1950	35	169	17	493	198	691	41	732
1951	15	91	10	534	115	649	10	659
1952	24	36	9	582	47	629	19	648
1953	29	79	8	551	29	580	21	601
1954	27	54	5	529	24	553	16	569
1955	27	44	6	525	15	540	12	552
EDUCATIONAL FM								
1949	18	7	9	31	3	34	24	58
1950	25	4	3	61	1	62	20	82
1951	19	6	2	82	1	83	12	95
1952	12	2	2	91	1	92	12	104
1953	13	1	3	106	0	106	10	116
1954	9	2	1	117	0	117	6	123
1955	7	3	1	121	3	124	3	127
COMMERCIAL TV								
1949	15	7	338	13	56	69	48	117
1950	0	8	351	47	57	104	5	109
1951	6	0	415	81	26	107	2	109
1952	0	1	716	96	12	108	0	108
1953	381	6	572	101	97	198	285	483
1954	174	81	200	104	298	402	171	573
1955	67	58	127	137	321	458	124	582
EDUCATIONAL TV								
1952	0	0	1	0	0	0	0	0
1953	17	0	29	0	1	1	16	17
1954	13	0	17	0	6	6	24	30
1955	5	1	14	1	10	11	23	34

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

Broadcast Applications

Broadcast applications totaled nearly 7,700 in fiscal 1955, which was some 300 less than in 1954. Applications for new TV stations decreased from 106 in 1954 to 58 in 1955. Applications for new AM stations increased from 227 to 330, and applications for new FM sta-

tions rose from 33 to 37. Of all AM applications, 114 had to be designated for hearing in 1955 as compared with 84 in 1954. TV applications designated for hearing decreased from 255 to 26.

Nonhearing broadcast application statistics for fiscal 1955 follow:

Class	On hand June 30, 1954	Received	Granted	Dismissed, denied, or returned	Designated for hearing	On hand June 30, 1955
AM						
New stations	156	330	160	70	79	222
Major changes	132	203	120	55	23	152
Transfers	42	562	506	46	4	52
Renewals	246	1,131	982	96	2	299
Licenses	76	428	408	20	1	76
Other	70	936	895	74	5	35
AM total	722	3,590	3,071	361	114	836
FM						
New stations	6	37	34	2	0	7
Major changes	15	111	116	5	0	5
Transfers	10	67	69	0	0	8
Renewals	75	246	253	4	0	64
Licenses	14	108	112	0	0	10
Other	8	130	137	0	0	1
FM total	128	699	721	11	0	95
TV						
New stations	31	58	39	12	9	30
Major changes	24	197	171	11	8	34
Transfers	17	124	122	3	5	13
Renewals	23	56	65	3	0	11
Licenses	77	123	94	3	0	103
Other	80	954	948	31	4	53
TV total	252	1,512	1,439	63	26	244
Miscellaneous						
New stations	73	459	455	10	0	67
Major changes	15	223	216	2	0	20
Transfers	32	239	213	4	0	54
Renewals	146	435	469	11	0	101
Licenses	264	430	256	29	0	409
Other	3	77	69	4	0	7
Miscellaneous total	533	1,863	1,678	60	0	658
Grand total	1,635	7,664	6,909	495	140	1,833

FM and TV figures include noncommercial educational stations. Miscellaneous includes relay and studio links, experimental, etc.

Pending Broadcast Applications

About 1,800 broadcast applications were pending at the close of fiscal 1955 as compared to 1,600 in 1954. Of the 1955 total, 65 percent were less than 3 months old.

The age of a pending broadcast application depends largely upon the particular problems it presents. Principal reasons for delays are: pending hearing or hearing decision; awaiting outcome of specific rulemaking; involvement in legislation or litigation; correspondence with nonconforming applicants; tardiness of applicants in furnishing additional information; restudies required by changed applications; negotiations between parties; resolvement of conflicting applications, and requests of applicants to hold up action.

The age of broadcast applications pending at the end of fiscal 1955 is shown in the following table:

Service	Under 3 Months	3 to 12 Months	12 to 24 Months	Over 24 Months	Total
AM					
New stations	94	72	22	34	222
Changes	51	41	20	40	152
Renewals	247	34	9	9	299
Other	135	13	5	10	163
AM total	527	160	56	93	836
FM					
New stations	6	0	0	1	7
Changes	4	0	1	0	5
Renewals	59	5	0	0	64
Other	16	1	0	2	19
FM total	85	6	1	3	95
TV					
New stations	9	7	5	9	30
Changes	26	6	2	1	35
Renewals	10	0	0	1	11
Other	89	40	25	15	169
TV total	134	53	32	26	245
Miscellaneous					
New stations	41	12	14	0	67
Changes	18	2	0	0	20
Renewals	77	13	4	7	101
Other	129	146	149	46	470
Miscellaneous total	265	173	167	53	658
Grand total	1,011	392	256	175	1,834

Receiving Sets

Broadcast receiving sets are not subject to Commission licensing. However, the Commission does endeavor through cooperative effort to curb interference to or from these receivers in their relation to radio communication operations in general.

Industry estimates that more than 120 million radio (audio) receivers are in use, including approximately 10 million FM sets and over 30 million sets in automobiles. Television receivers in use approximate 35 million, of which number about 15,000 are equipped to get color transmissions (which appear in monochrome on regular sets). In 1955 the Department of Commerce reported that two-thirds (32 million) of the 48 million households in this country had one or more TV sets, which was six times the number in 1950.

Networks

The Commission does not license broadcast networks as such. However, individual station licensees are subject to the so-called "chain broadcasting rules" adopted by the Commission in 1941 to promote competition in broadcasting.

The major networks are the American Broadcasting Co.; Columbia Broadcasting System, Inc.; Mutual Broadcasting System, Inc.,

and National Broadcasting Co. There are many regional, state, and group networks.

The Senate Interstate and Foreign Commerce Committee on August 5, 1954, instituted an inquiry of radio and TV network broadcasting. Congress appropriated the Commission $80,000 to begin a network study in fiscal 1956. On July 22, 1955, the Commission designated a committee of four of its members to institute and direct this study—Chairman George C. McConnaughey and Commissioners Rosel H. Hyde, Robert T. Bartley, and John C. Doerfer.

Broadcast Industry Financial Data

In the calendar year 1954, the grand total revenues of the broadcasting industry (radio and television) passed the $1 billion mark for the first time on record. The industry's total revenues (which are derived from the sale of time, talent, and program materials to advertisers) were reported at $1,042,500,000.

The year 1954 marked the first time in 16 years that the radio industry failed to establish a new alltime high for total revenues which declined to $449.5 million, or 5.4 percent below 1953. Total revenues of the television industry continued upward in 1954, however, to reach $593 million, or 37 percent above 1953. As a result, TV's revenue total in 1954 surpassed radio's alltime high of $475.3 million which was reached in 1953.

Total radio and TV profits of $132.1 million in 1954 were 7.4 percent above 1953. Television broadcast profits of $90.3 million were 32.8 percent higher while radio profits declined to $41.8 million or by 24 percent. All profit figures are before payment of Federal income tax.

The following tables show the comparative calendar year 1953–54 financial data for the radio and television broadcast industries:

All Networks and Stations, 1953–54

Item	1953 (millions)	1954 (millions)	Percent increase [or decrease] in 1954
Total broadcast revenues	$908.0	$1,042.5	14.8
Radio[1]	475.3	449.5	(5.4)
Television	432.7	593.0	37.0
Total broadcast expenses	785.0	910.4	16.0
Radio	420.3	407.7	(3.0)
Television	364.7	502.7	37.8
Broadcast income (before Federal income tax)	123.0	132.1	7.4
Radio	55.0	41.8	(24.0)
Television	68.0	90.3	32.8

[1] Radio includes AM and FM broadcasting.

Note. 1954 radio data cover the operations of 4 nationwide networks and 3 regional networks, 2,554 AM and AM–FM and 43 independent FM stations. 1953 data are for the same networks and 2,434 AM and AM–FM and 45 independent FM stations. 1954 TV data cover the operations of 4 networks and 410 stations; 1953 data are for the same networks and 334 stations.

Nationwide Networks only, 1953–54

(Including owned and operated stations)

	1953 (millions)	1954 (millions)	Percent increase or (decrease) in 1954
Broadcast revenues			
Radio	$92.6	$84.5	(8.7)
Television	231.7	306.7	32.4
Total	324.3	391.2	20.6
Broadcast expenses			
Radio	83.2	77.0	(7.5)
Television	213.7	270.2	26.4
Total	296.9	347.2	16.9
Broadcast income (before Federal income tax)			
Radio	9.4	7.5	(20.2)
Television	18.0	36.5	102.8
Total	27.4	44.0	60.6

Note 1. Radio data include the operations of 16 network-owned stations in 1953 and 1954.
Note 2. Television data include the operations of 16 stations in 1953 and 1954.

AM Radio [1] *Broadcast Revenues, Expenses, Income and Investment, 1953–54*

[In thousands]

Item	4 nationwide networks and their stations [2]		3 regional networks and their stations [2]		All other stations [3]		Industry total	
	1953	1954	1953	1954	1953	1954	1953	1954
Total broadcast revenues	$92,654	$84,484	$4,679	$4,109	$377,252	$360,192	$474,585	$448,785
Total broadcast expenses	83,220	76,981	3,702	3,462	331,867	325,890	418,789	406,333
Total broadcast income (before Federal income tax)	9,434	7,503	977	647	45,385	34,302	55,796	42,452
Investment in tangible broadcast property:								
Original cost	24,602	21,714	1,712	1,737	249,926	255,331	276,240	278,782
Depreciation to date	13,480	11,701	1,209	1,074	113,258	120,557	127,947	133,332
Depreciated cost	11,122	10,013	503	663	136,668	134,774	148,293	145,450

[1] Excludes independently operated FM stations, 45 in 1953 and 43 in 1954.
[2] Includes the operations of 22 network-owned stations in 1953 and 21 network-owned stations in 1954.
[3] Includes 2,412 stations in 1953 and 2,534 stations in 1954.

FM Broadcast Revenues, Expenses and Income, 1953–54

Item	1953		1954	
	Number of stations	Amount (millions)	Number of stations	Amount (millions)
FM stations operated by:				
AM licensees:				
Reporting no FM revenues	412		355	
Reporting FM revenues	137	$1.3	130	$1.1
Non-AM licensees	45	.8	43	.8
Total FM stations	594	2.1	528	1.9
FM broadcast expenses				
FM stations operated by non-AM licensees	45	1.6	43	1.4
Industry total		(1)		(1)
Total FM broadcast income (before Federal income tax)				
FM stations operated by non-AM licensees	45	(.8)	43	(.6)
Industry total		(1)		(1)

[1] In view of the difficulty in a joint AM-FM operation in allocating FM operation expense separately from AM station operation expense, licensees of such stations were not required to report FM station expense separately. As a result, FM industry totals for expense and income are not available. AM-FM licensees, however, were requested to report separately the revenues, if any, attributable to FM station operation if such data were readily available. In only a few instances did AM-FM licensees state they were unable to segregate the FM revenues.
( ) Denotes loss.

TV Broadcast Revenues, Expenses and Income, 1954

(In thousands)

Item	4 networks and their 16 owned and operated TV stations	380 other TV stations	Total 4 networks and 396 TV stations [1]
Revenues from the sale of time:			
Network time sales:			
Nationwide networks	$177,212	$64,013	$241,225
Miscellaneous networks and stations			
Revenue from network time sales	177,212	64,013	241,225
Non-network time sales to:			
National and regional advertisers and sponsors	46,849	129,917	176,766
Local advertisers and sponsors	22,542	97,589	120,131
Total revenues from non-network time sales	69,391	227,506	296,897
Total revenues from time sales	246,603	291,519	538,122
Deduct—Commissions to regularly established agencies, representatives, brokers and others	[2] 47,504	38,413	85,917
Net revenues from time sales	199,099	253,106	452,205
Revenues from incidental broadcast activities:			
Talent	75,850	9,137	84,987
Sundry broadcast revenues	31,731	24,014	55,745
Total revenues from incidental broadcast activities	107,581	33,151	140,732
Total broadcast revenues	306,680	286,257	592,937
Total broadcast expenses of networks and stations	270,159	232,478	502,637
Broadcast income before Federal income tax	36,521	53,779	90,300

[1] Excludes data for 14 stations with less than $25,000 in time sales. Such stations report only total revenues and total expenses.
[2] Of this amount $36,757,871 is applicable to the total sale of network time.

Radio Interference

INTERFERENCE PROBLEM

The subject of interference to radio transmission and reception merits a separate chapter. That is because interference has become one of the most vexing problems confronting electrical communication today. It affects all types of services and involves consideration of a growing number of electronic devices and gadgets.

With some 800,000 authorized transmitters, it is difficult enough to see that radio transmissions do not collide with one another. But this engineering task is magnified by the accidental or careless release of emissions by apparatus using radio-frequency energy for various noncommunication purposes.

Many of these units employ power far in excesse of the maximum permitted broadcast stations, and their combined energy exceeds the total transmitter power for all forms of radio communication. In many cases the radiations from such equipment have skip-jumped clear across the continent to disrupt communication thousands of miles away. This is a particular menace to radio messages on which the safety of life and property depend.

CAUSES OF INTERFERENCE

Offending unlicensed equipment falls into two general groups. One group embraces industrial, scientific, and medical equipment typified by industrial heaters, diathermy machines, arc welders, and similar items. The other group covers restricted radiation devices such as carrier current (wired) communication systems, also remote-control operation of garage doors, phonograph record players, etc.

Causes of interference are multitude. To name a few: defective or obsolete light bulbs or radio tubes; defective interior or exterior electric circuits; broken wires and insulators; oscillating AM or FM receivers; inadequately shielded or improperly installed or adjusted TV sets; radio equipment inadvertently left "on"; defective antenna systems; homemade record players; electric fences; home and factory heating equipment; college campus "broadcast" systems; community antenna systems; electric signs, razors, heating pads, thermostats and other household equipment; ignition effects of passing planes, auto-

mobiles, streetcars and buses; draw bridges; faulty transformers and insulators; and weather disturbances.

A particular interference headache concerns television reception. Of all broadcast reception apparatus, that for video is most susceptible to receiving—also giving—interference. Also, many TV interference complaints come from persons who attempt to receive stations far beyond their normal range.

DEALING WITH INTERFERENCE

In the old days, Commission monitoring was largely confined to listening in on dot-dash telegraph messages, which could be deciphered by ear and be traced as easily. Today, complicated apparatus is required to distinguish between types of emissions; several monitoring stations are needed to "fix" (plot) the general area where a questionable signal originates; mobile direction finders are employed to further trace the source, and sometimes hand-carried detectors must be used for the final run-down. All of this takes a lot of time and effort—at the taxpayers' expense—and some cases can be resolved only after months of effort.

The mounting number of interference complaints makes it impossible for the FCC's limited field investigative staff to give attention to every individual case. Consequently, priority is given to those cases endangering radio services which protect life and property—such as marine, aviation, police, and fire—and to those involving illegal transmitters and unlicensed operators.

As a result, the Commission has sought the cooperation not only of radio users but also of manufacturers, distributors, and retailers of apparatus which can cause interference. This is particularly helpful in the majority of cases where trouble can be prevented or minimized by using more adequate shielding, or by installing a wave trap, filter, or some other equally simple contrivance. The Commission also tests and type-approves certain equipment in advance of manufacture to reduce the likelihood of interference when the apparatus is put in operation. In cases of wilful and reckless violation it can, and does, resort to show cause orders or other proceedings.

On the whole, industry and users are equally aware of the interference problem and work with the Commission for mutual solution. One example is the continued progress made in organizing Commission-sponsored local TVI (Television Interference) committees. There are now 437 such committees functioning in 412 communities, with additional committees being established. Amateur radio operators, TV set owners, broadcasters, manufacturers, retailers, and others concerned thus work together to deal with TV interference at the local level.

Though the amateur radio operator is often the popular suspect when local TV interference develops, it is the Commission's observation and experience that only about 10 percent of this interference is due to "hams," and they are quick to cooperate in remedying the trouble.

More detailed information about interference and its control will be found in the following chapters of this report dealing with Field Engineering and Monitoring, Research and Laboratory, and Frequency Allocation.

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Field Engineering and Monitoring

GENERAL

The Field Engineering and Monitoring Bureau, broadly speaking, is the Commission's regulatory arm, rendering a technical service in behalf of the Government, station licensees, and the public. Additionally, it performs licensing functions for radio operators and certain classes of stations; also many specialized services involving the location and disclosure of unlicensed stations, the investigation and solution of thousands of interference complaints, and long-range direction finding including the furnishing of bearing "fixes" to lost aircraft and ships.

As a result of consolidation and geographical reorganization, there are now 6 regional field engineering offices, and ship offices have been reduced from 2 to 1. Otherwise the field "plant" remains the same with 24 district offices, 6 suboffices, and 18 monitoring stations.

The Washington headquarters consists of the Office of the Chief of the Bureau and four divisions—Field Operating, Engineering, Monitoring, and Inspection and Examination.

MONITORING

Monitoring Facilities

The monitoring and direction-finder network consists of 10 primary and 8 secondary monitoring stations (see list in appendix of this report).

All of these stations are now equipped with remote-controlled, long-range high-frequency direction finders with the exception of the Anchorage secondary monitoring station. Four types of direction finders are presently in use—the fixed adcock Type MH/HH, the Type B and the improved Type C adcock, and seven of the monitoring stations have medium-frequency direction finders.

The Lexington, Ky., secondary monitoring station was relocated at Chillicothe, Ohio. This station has been connected to the teletype network and will have a more elaborate installation than the average secondary and a larger staff to handle its work.

In line with the Commission's program of moving monitoring stations now on leased property to Government-owned land, the Muskogee, Okla., secondary monitoring station is being shifted to the former

site of the Burton Auxiliary Air Field near Ambrose, Tex. This property was obtained without cost to the Commission through the assistance of General Services Administration and the U. S. Corps of Engineers. It consists of 283 acres well suited for long-range direction finder work due to its flatness and remoteness from industrial plants. The relocated station will be read by January 1956.

The moving of the Anchorage monitoring station to Federal property at Pt. Campbell, near Anchorage, Alaska, is approaching completion.

Six acres of additional land were purchased for the Spokane, Wash., secondary monitoring station.

Monitoring for Defense

Since the Commission's direction-finder network is the only coordinated system capable of performing certain functions, the demand for its services by defense agencies has continued to increase. Through such cooperation, the Commission materially assists the defense effort and obviates the need for a duplicate system. Department of Defense monitoring contracts with the FCC totaled $275,500 in 1955. These funds were expended largely for personal services.

Monitoring Surveys

The United States is committed by international agreements to furnish technical data concerning radio frequency usage and band occupancy to the International Telecommunication Union (ITU) at Geneva. This information is essential to a logical frequency allocation plan for communication between countries.

The Commission's monitoring stations have been the principal United States source of data for the International Frequency Registration Board (IFRB) of the ITU. However, in 1955 several commercial operating companies participated in this program.

The Commission made 36 monitoring surveys during the year, which is nine less than in 1954. The 1955 figure does not reflect the true workload since 6 surveys were set up to run concurrently into most of next year. They are designed to check the extent of international compliance on newly implemented frequency bands. The monitoring network sacrificed lower priority work to make all of the surveys requested by other Commission bureaus. Some were for 3-day periods, but many ran for weeks and 6 extended into fiscal 1956.

The system for handling monitoring identification index slips (Form 955) has been revised and such reports resulting from cruising are now combined with those for surveys. Data from these slips are forwarded to the ITU. The information they contain is necessary for domestic allocation work as well as for international discussion. A total of 154,739 slips were submitted during the year.

Monitoring for Interference

Since radio transmissions cannot be confined to geographical boundaries, the solution of interference problems often requires the services of the Commission's entire monitoring and direction-finding network. During the year more than 3,700 requests for such services were received as follows:

	Fiscal 1954	Fiscal 1955
U. S. Air Force	150	287
U. S. Army	109	139
U. S. Navy	52	60
U. S. Coast Guard	66	64
Civil Aeronautics Administration	88	65
Other Government agencies	26	38
Law enforcement agencies	13	24
Commercial airlines	186	177
Commercial concerns	398	462
Foreign governments	13	38
Total major cases	1,101	1,378
Miscellaneous (minor cases)	1,898	2,348
Grand total	2,999	3,726

The following are examples of widespread interference cases that were solved quickly through monitoring:

Aeronautical Radio, Inc., at Honolulu reported a signal causing interference to an air-ground communications frequency. The FCC direction-finder net pin-pointed the source as an airline transmitter at Wilmington, N. C., some 4,800 miles distant. The airline was notified within 20 minutes after receipt of the complaint.

The Coast Guard reported an unidentified signal disrupting ship-shore communication. In 9 minutes the net fixed the source at Alexandria, Va. The offending transmitter was shut down and repaired.

The Navy Search and Rescue officer at Pearl Harbor, Hawaii, complained of a steady signal disturbing a vital distress frequency. The offending transmitter was traced to Midway Island. Its immediate repair made the frequency usable again within a few minutes.

Direction Finding

Long-range direction-finder bearings are the only practical way of locating many sources of interference which cannot be identified otherwise, such as electromagnetic radiations from electronic heaters and diathermy equipment, unmodulated carriers, experimental or complex emissions, and illegal stations. These transmissions are a potential danger to radio communication services besides having possibilities of being used as clandestine transmitters.

Balloon tracking work for the military gave the monitoring stations a heavy load. Such bearings totaled 107,032 during the year as compared to 104,477 bearings in 1954.

The Commission's participation in the air-sea search and rescue program resulted in 1,387 bearings being taken in 110 emergency cases. There was an increase in requests for emergency location of small boats. Some typical air-sea search and rescue operations are listed below:

Emergency assistance to planes.—The Coast Guard requested a "fix" on an Air Force C54 plane over the Atlantic Ocean approximately 120 miles from Charleston, S. C. It was carrying 39 persons and losing altitude. The FCC furnished 2 "fixes," the first within 10 minutes after receipt of the alert. With this assistance the rescue plane was able to locate the craft and escort it to a safe landing.

The Civil Aeronautics Administration at Oakland, Calif., sought FCC assistance for a Navy plane having engine trouble and lost while en route to Travis Air Force Base, Calif., from Hawaii. The pilot was having difficulty in maintaining altitude in the strong winds. Two "fixes" were furnished, the first within 12 minutes after the initial bearing on the aircraft. This enabled a rescue plane to contact the disabled aircraft and guide it in safely.

Emergency assistance to ships.—The Coast Guard requested FCC aid for a fishing vessel, sinking several hundred miles north of Bermuda. One estimated position and several "fixes" were obtained. A rescue plane and a Coast Guard cutter were dispatched to the scene and all aboard the sinking craft were saved.

The Coast Guard at Honolulu asked FCC help to locate a fishing sampan, with engines disabled, lost somewhere west of the Hawaiian Islands. With the assistance of the "fix", a Coast Guard cutter was able to locate the disabled vessel and tow it to Honolulu for repairs.

Another Coast Guard request involved a vessel with its engine room flooded and pumps inoperative near San Salvador in the Bahamas. With the aid of three fixes, the Coast Guard was able to locate the vessel. The pumps and engine were repaired and it proceeded to Kingston under its own power.

Other Monitoring Cases

Although the majority of FCC's monitoring cases arise from some sort of interference, there are others which involve the location of illegal transmitters. There are also many special surveys and fact-finding assignments to assist other bureaus of the Commission or other agencies of the Government.

Monitoring stations processed 5,768 noninterference cases in 1955 compared to 6,084 last year.

Field offices and monitoring stations were able to solve 6,664 cases compared to 6,568 last year. This was without reference to either Washington or the monitoring network as a whole.

Additional Monitoring Statistics

	Fiscal 1954	Fiscal 1955
Alerts, unknown or suspicious signals	8,111	6,730
Identification file slips	83,523	154,739
Monitoring citations served	6,939	11,192

INSPECTIONS

Due to budgetary limitations, fewer inspections of radio stations were accomplished during fiscal 1955 than in 1954.

Broadcast Station Inspections

The transmitting equipment of broadcast stations is now inspected at intervals as permitted by curtailed travel itineraries. The technical functioning of each station is observed and its engineering records of such operation, past and present, are reviewed in order to assure that each station has been operated efficiently and in compliance with technical rules, standards, and terms of its license. These inspections assist materially in assuring an adequate technical broadcast service to the listening and viewing public. Likewise, the inspections reveal whether the station's antenna towers—some of which are over 1,500 feet in height—are properly painted and lighted. Inspections also develop whether interference to other broadcast stations or to stations of other classes (such as those in the safety services) due to improper technical adjustments is actual or imminent.

Six hundred and sixty-one broadcast station inspections were made during 1955, and 309 discrepancies were noted, as compared to 533 inspections and 181 discrepancies in 1954.

Ship Radio Inspections

Accuracy and reliability of operations of the radio equipment, when called upon in an emergency, is a prime requisite for the safety of life and property in the maritime service. To maintain this standard, inspections of radio equipment on board passenger ships and certain freight vessels are made by Commission engineers under the provisions of the Communications Act and the Safety of Life at Sea Convention.

The FCC's marine inspection, in terms of geographical area, includes the continental United States and its possessions. The Commission has licensed radio installations on approximately 50,000 vessels, from voluntarily equipped pleasure craft to compulsorily equipped ocean liners.

Since 1953 the frequency of ship radio inspections has been curtailed because of a 50-percent decrease in field personnel available for

this work. The Commission now inspects American passenger ships at 6-month intervals, and United States cargo ships once each year. Great Lakes ships—passengers and cargo—are inspected once a year. Scheduled inspection of voluntarily equipped vessels has decreased. Inspection of ships of nonconvention countries has been discontinued, and ships of convention countries are inspected only on request.

During the past 2 years, inspections of the required main and emergency safety radio installations on ships were:

	U. S. ships		Foreign ships	
	1954	1955	1954	1955
Compulsory Ship Stations				
Number of stations	1,219	1,800	0	0
Number of inspections [1]	2,146	1,708	402	381
Number of deficiency notices served	1,378	1,089	150	191
Number of violations corrected during inspections [2]	2,288	2,149	319	330
Voluntary Ship Stations				
Number of stations	41,000	47,959		
Number of inspections	91	163		
Number of deficiency notices served	39	122		

[1] Not including "call-backs" to verify correction of violations.
[2] For which deficiency notices were not served.

In addition, field engineers completed 1,420 inspections of lifeboat portable radiotelegraph equipment, at the request of the Coast Guard, for the purpose of certifying such equipment for issuance of safety equipment certificates by that agency.

The Commission's field office commenced issuance on November 13, 1954, of Great Lakes Agreement Radiotelephony Certificates. A total of 95 such certificates were issued during fiscal 1955. On December 13, 1954, the field offices began direct issuance of Society Radiotelegraphy and Safety Radiotelephony Certificates, in accordance with the provisions of the International Convention for the Safety of Life at Sea, London, 1948. During fiscal 1955, a total of 1,186 Safety Radiotelegraphy Certificates were issued to United States ocean-going ships and 315 to foreign ships. During the same period, 11 Safety Radiotelephony Certificates were issued.

Other Radio Station Inspections

A total of 4,202 inspections of other than broadcast and ship radio stations were made during the year contrasted with 6,622 such inspections in 1954. Technical discrepancies totaling 722 were discovered and reported to the licensees as compared to 1,514 the year previous.

SMALL BOAT INTERFERENCE PROBLEM

The Commission's monitoring, inspection and certification program has made some progress in curbing interfering harmonics by

ship radio transmitters, but the number of vessels involved is so great that serious interference is still caused to safety aviation frequencies.

A recent report from the Canadian Department of Transport emphasizes the chaotic condition that exists on the radiotelephone distress frequency of 2182 kilocycles, especially from radiotelephone operation on small boats. Thousands of such craft are used for pleasure or for commercial purposes, principally in the fishing business. Radio is incidental to their operation except as it may be required for safety purposes.

The users of this small boat radio equipment are not trained technicians. Their owners and crew members continually violate the Commission's rules. Their improper transmissions, which now invade Canada, include obscene and profane language as well as interference to actual distress operations.

Many small boats refrain from identifying their transmissions as required by both domestic and international law, thus preventing the Commission from taking disciplinary action. Limited monitoring and inspections by Commission personnel from Coast Guard vessels has produced some results. But, because of insufficient staff to deal with the large number of boats in operation, the situation is growing worse in spite of the Commission's efforts to indoctrinate small boat owners through "user committees", distribution of more than 100,000 pieces of information, and talks and other contacts by FCC officials in the interest of self-regulation.

In addition to the large number of licensed vessels whose operations are in need of surveillance, there are thousands of small craft using unlicensed radio equipment which add to the confusion on the ship frequencies. The Commission is studying the prospect of recommending legislation which might help relieve this situation. However, it feels that these conditions can be brought under control only with an adequate staff which will be able to seek out and take action against the most chronic violators.

INTERIM SHIP STATION LICENSES

Effective August 2, 1954, the Commission's field offices began the issuance of "90-day" interim ship radiotelephone licenses. This procedure permits the boat owner who wishes to sail immediately to obtain the required radio operating authorization without the necessity of waiting for issuance of the full-term license by Washington.

Such requests are required to be accompanied by a related formal application for a new or modified ship station license in the band 1600–3500 kilocycles on board a vessel not required to be fitted with a radiotelephone installation by international agreement. As of June 30, 1955, field offices had issued a total of 3,686 such interim licenses.

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INVESTIGATIONS

Radio direction-finding cars with special equipment to aid in locating unauthorized radio stations and for running down sources of interference to radio reception are based at 33 of the Commission's field offices and monitoring stations. These mobile units are manned by engineers skilled in tracing such signals to their source, and in conducting necessary investigations. Such investigations grow out of observations and long-range direction finder "fixes" by Commission monitoring stations, or as a result of complaints or reports from the public, radio stations, or military and other Government agencies.

Interference Complaints

During fiscal 1955, the number of interference complaints handled by investigative units was 17,962 as compared to 18,037 in 1954. Of these, 15,733 involved interference to broadcast reception. In general, the greater number concerned TV. Complaints were received not only of interference to TV, but also of interference from radiating TV receivers to neighbors' AM broadcast receivers.

Less numerous, but frequently of major importance to safety of life and property, were the other 2,229 complaints of interference to communication and radio navigation services on land, sea and air. Such complaints included interference to aeronautical radio navigation facilities, to airport control towers, to distress channels for ships at sea, to radio communication with trains, and to police and fire departments and other vital services.

Because it is necessary to give priority to interference to safety services and to cases involving illegal radio activity, it was not always possible to conduct prompt or complete investigation of every complaint of interference to broadcast reception. In such instance, local "self-help" was encouraged, such as cooperative checking between neighbors to locate interference from a radiating TV receiver.

The 437 Commission-sponsored TV interference committees now established in 412 communities throughout the nation were of outstanding assistance to TV viewers. Sixty-seven of these committees were added in fiscal 1955. The committees are composed of local citizens, manufacturers' representatives and TV set owners; however, the majority of the membership is composed of radio amateurs who have made a great contribution to the Commission and to the public in offering their services free of charge in this very important undertaking. By rendering such assistance to their communities, these TVI committees have enabled the Commission's limited field staff to devote more attention to other urgent duties and to the more serious TV interference cases.

While some serious cases of interference occurred as a result of radiation from industrial, scientific and medical equipment utilizing radio frequency energy, the total number of such cases investigated decreased from 576 in fiscal 1954 to 223 in fiscal 1955.

This reduction has come about, in part at least, as a result of continued efforts of Commission engineers to eliminate the cause of such unnecessary and harmful interference. As part of this effort, 5,093 offices using medical diathermy equipment were visited during the year. Although equipment which complies with the Commission's rules was in use in most offices, 1,040 obsolete noncomplying diathermy machines were encountered and were removed voluntarily from service.

The effect of spurious radiations from radio transmitters is illustrated by a complaint of serious interference to aircraft navigation aids in Ohio where the interference was traced to radio frequency harmonics from an international broadcast station near Cincinnati.

Serious interference to communication of a major airline was localized to the general vicinity of Louisville, Ky., by means of radio bearings taken by Commission monitoring stations located hundreds of miles apart. A mobile unit then traced the interference to an industrial heater in a factory at Louisville. The equipment was removed from operation.

Interference which disrupted airport communication at Renton, Wash., was traced to a radio frequency type arc welder a mile from the airport. A similar welder was responsible for jamming CAA reception and interfering with two airlines at Minneapolis.

Serious interference to distress frequency reception of ships in the Pacific was traced to an industrial heater, near Seattle, used for treating roller bearings for chain saws.

Illustrative of the widespread interference sometimes caused by spurious radiations from defective receiving equipment is an instance which occurred at Barstow, Calif. Interference to Channel 10 over a large part of the community was traced to radiation from a defective TV receiver "booster". The Barstow Chamber of Commerce thanked the Los Angeles Field Office on behalf of the hundreds of persons whose TV reception has been bettered.

Aside from the annoyance and safety hazards created by radio interference, its seriousness from an economic viewpoint is illustrated by the statement of a company near New York that interference to its reception was costing the company $1,000 a day.

Investigation of Unlicensed Stations

One hundred and five unlicensed stations were located by mobile investigative units in 1955 as compared to 52 in 1954. The operator

of an unlicensed transmitter at a Rhode Island race track was sentenced to one year, placed on probation and fined. The operator of an illegal transmitter at a Florida race track is awaiting trial after being indicted by the grand jury in Miami.

Among unlicensed TV stations found was one located on an Indian reservation in Washington State, and another was atop a 9,000-foot mountain near Kingman, Ariz.

The lack of technical skill on the part of an unlicensed would-be broadcaster in Minneapolis, Minn., was responsible for interference to airline communications as well as broadcast frequencies.

When a masculine voice was observed on a Los Angeles station using a call assigned to a licensed girl amateur at San Francisco, investigation disclosed an unlicensed station which was quickly located and silenced.

While not all instances of unlicensed operation result in criminal prosecution, a number of cases involving operators of illegal stations detected during 1955 have either been referred to the U. S. Attorney General for possible prosecution or are being considered for possible legal action.

INDUSTRIAL, SCIENTIFIC, AND MEDICAL SERVICE

Administration of Part 18 of the rules progressed during the year although there were many instances when operators were reluctant to take the necessary steps to bring their equipment into compliance. Only one related cease and desist order was necessary. This was directed to an operator of electric arc welding equipment which caused interference to broadcast reception.

Other welders throughout the country caused interference to authorized radio services but in these instances no legal action was necessary. In most of these cases it was found that welding equipment was not installed and operated in accordance with the manufacturer's instructions as required by the rules. Some users were unaware of the rules or that welders can be a potential source of interference to authorized radio services. Manufacturers of welders cooperated by aiding users in eliminating interference and in properly installing and certifying the offending welders.

Console models of electronic heating equipment appeared in greater numbers and it became evident that amendments to the rules would be necessary to permit mass certification of heaters that are identical in construction.

No objections to the diathermy rules were received as in the previous years, and very few inquiries were received concerning those rules. This is an indication that the Commission's requirements for diathermy equipment are becoming well known.

Misunderstanding of the miscellaneous rules applicable to epilators (hair removers) appears to have been eliminated. Apparatus operating in accordance with the rules caused no difficulties.

Reports from manufacturers indicate that ultrasonic equipment is finding varied application in industry, science, and therapy. Ultrasonic equipment has caused no interference problems.

RESTRICTED RADIATION DEVICES

The use of restricted radiation devices continued to find new applications. In one instance a blind inventor developed an electronic cane to guide the blind. Some garage door openers now operate between 230 and 290 megacycles, where smaller antennas can be used and more combinations of radio and audio frequencies are possible.

The number of TV "community antenna systems" is now reported to exceed 400. These systems, operating in poor signal areas, utilize a favorably located receiving antenna and then feed the received signal through coaxial cables directly to subscribers' TV receivers. Or, instead of picking up programs of TV stations on the air, special "TV film" can be run through appropriate equipment and associated distribution cables so that it will appear on subscribers' TV receivers as a TV program.

Engineering surveys in fringe areas where community TV systems are used indicate that considerable interference to AM broadcast reception results from horizontal oscillator radiation by television receivers and by radiation from community antenna cables which conduct horizontal oscillator energy. Additionally, leakage from some cable systems caused interference to direct reception of television signals.

Numerous college campus "wired-wireless" systems, erroneously referred to as broadcast stations, used for distributing programs of news, music, advertising, etc., by carrier current on wire circuits over the campus, require continuing attention. These systems oftentimes are not properly engineered. The need for making field intensity measurements is borne out by the considerable number of campus carrier systems found radiating in excess of the limits allowed by Part 15 of the rules. After reducing power some colleges complained of insufficient coverage of the campus which indicates the need for more careful design and construction if such systems are to operate within the regulations.

Thousands of "wired-wireless" intercommunication systems are used in homes and offices. Sample field intensity measurements indicate that when these systems operate over unshielded power circuits they frequently radiate in excess of the allowable limits.

Radio interference caused by leakage from rural electric power lines was a problem in some areas; however, the operators of the lines almost always cooperate toward reducing this type of interference.

With the many new types of low power devices and systems that are being developed for operation without a license it has become apparent that amended rules are necessary to establish conditions and standards under which such apparatus may function without causing disturbance in the radio spectrum.

COMMERCIAL RADIO OPERATORS

General

Radio transmitting equipment of all types (except Government) used in the United States and its territories must be licensed by the Commission and, in general, must be operated by persons who hold Commission-issued operator licenses. The grade of radio operator license required is determined by the class of station and the complexity of its equipment as well as the degree to which the station serves to promote safety of life and property. Only citizens of the United States may be issued radio operator licenses.

The duties of radio operators are many and varied. They include the handling of routine and emergency communications, the manipulation of controls of radio transmitting equipment, the keeping of radio station operating records and the performance of complex technical duties that may critically affect the proper operation of the transmitting equipment and the service of the station. At some stations a single class of operator is employed to perform all types of duties; at others the duties are subdivided among operators of different classes who perform limited duties according to the needs of the particular station and the grade of operator license held.

Waivers have been granted by the Commission relieving radio operator requirements for certain "pushbutton" types of station transmitters.

During the year the Commission raised the license requirements for operators of radiotelephone equipment on board certain classes of Great Lakes ships to conform to the Agreement for the Promotion of Safety on the Great Lakes by Means of Radio. The radiotelephone third-class operator permit now required is usually held by the master and several of the deck officers of each ship affected. The permit is issued upon passing a nontechnical written examination on basic radio regulations and on practice and procedure in mobile radiotelephone communication.

The Commission also changed the operator requirements for a group of oceangoing ships from 500 to 1,600 gross tons which must now carry radiotelephone installations for safety purposes. Under

the amended provisions there must be at least one third-class radiotelephone operator on board each ship affected.

The Commission instituted further rule-making proceedings looking toward requiring third-class operators for ship and aircraft radiotelephone stations with antenna powers from 50 to 250 watts. This is in conformance with international radio regulations. Operators of these stations are graded, broadly speaking, according to the communication range of the stations and consequent potential impact on other stations with which they must share the use of radio channels.

Operator Suspensions and Denials

Remedial action was taken by the Commission against 13 commercial radio operators through suspension of their licenses. In eight of these cases, hearings were requested by the operators and the suspensions were held in abeyance pending the outcome of the hearings.

Four commercial radio operator applications were denied for failure of the applicants to furnish information with respect to their alleged affiliation with subversive groups and two other applications were designiated for public hearing for the same reason.

The Commission proposed on June 10, 1954, to deny commercial radio operator licenses to members of subversive groups and oral argument on this proposal was heard on March 7, 1955 (see chapter on National Defense).

Operator Examinations

Examinations are offered to radio operator candidates daily, quarterly, semiannually or annually at examination points throughout the United States and its territories. The places and times of these examinations are published in a "Radio Operator Examination Schedule" which may be obtained from any of the district engineering field offices shown in the appendix of this report.

Commercial operator type examinations and amateur (General and Extra grade) examinations are given at these examination points.

An increase was noted in the number of amateur operator examinations given during the year. A total of 46,238 such examinations were conducted in 1955, while 42,004 were given in 1954 (see section of chapter on Safety and Special Radio Services which deals with amateurs).

Since August 17, 1954, the Commission has not issued Temporary Limited Second Class Radiotelegraph Operator Licenses which had previously been available to certain applicants. This class was originally established to meet the demand for radio operators during World War II and was reestablished during the Korean hostilities. Issuance of this emergency type of operator license was discontinued following the Korean armistice.

Commercial Radio Operator Authorizations

Of 213,368 applications received in fiscal 1955, commercial radio operator authorizations of all classes, totaling 188,504, were issued as compared to 179,140 in 1954. This represents a significant increase, bringing the total of outstanding commercial licenses to more than 986,000 at the close of the year. This was 144,000 more than at the close of fiscal year 1954. Comparative figures by grades of licenses follow:

Class of license	June 30, 1954	June 30, 1955	Net increase or (decrease)
Radiotelegraph:			
1st class	5,628	6,183	555
2d class	9,538	10,083	545
3d class	1,992	2,063	71
Temporary limited, 2d class [1]	641	635	(6)
Radiotelephone:			
1st class	49,602	53,415	3,813
2d class	29,540	32,333	2,793
3d class	18,027	25,214	7,187
Restricted radiotelephone operator permits [2]	649,121	795,011	145,890
Aircraft radiotelephone operator authorizations [1]	77,999	61,426	(16,573)
Totals	842,088	986,363	144,275

[1] Issuance of this class of license discontinued.
[2] Issued for lifetime of operator.

FIELD ENGINEERING PROJECTS

A number of improvements were made to monitoring stations. Additional all-metal long-range direction finder structures were built and installed. Progress was made toward improving the remote controlled rotating adcock direction finders to increase the speed and accuracy of establishing fixes on radio stations. Radiotelegraph communication for long-range direction finder coordination was improved by installation of higher powered transmitters in Alaska at the Anchorage and Fairbanks monitoring stations. Higher-powered transmitters were also installed at Laurel, Md., Twin Falls, Idaho, and Fort Lauderdale, Fla. Radioteletype facilities are being established for communication between Livermore, Calif., and monitoring stations in Alaska and Hawaii. An improved spectrum analyzer for measuring the bandwidth of emissions of radio signals was acquired and placed in service at the Laurel monitoring station.

A program to provide field offices with portable frequency measuring equipment, sufficiently accurate to enforce rigid tolerances now required of radio stations, has been continued by procurement of accurate portable instruments for use in the 200 kilocycles to 20 megacycles frequency range. Two sets of precision frequency measuring equipment and associated receivers were purchased for mobile coverage of frequencies in the 1000 to 10000 megacycle range. Further progress was made toward providing improved portable direction

finding and receiving facilities for field engineers conducting investigations of interference and unauthorized radio transmissions.

A mobile television monitoring unit to be used for enforcement of Commission engineering standards for TV stations was developed, constructed and has been put in service. It is equipped with a variety of complex electronic equipment for making precision engineering measurements of TV signals which will be accomplished by moving the unit into the service areas served by individual stations. Such mobile monitoring facilities are essential since the fixed monitoring stations cannot monitor transmissions of distant TV stations.

Field intensity recording for determining propagation characteristics of VHF and UHF signals was continued at about the same level as the previous year at selected monitoring stations. However, more emphasis was placed on the UHF television broadcast bands. Special surveys and measurements were made for interference studies and enforcement of Commission rules, particularly as regards the reduction and elimination of spurious emissions from authorized radio transmitters and from other sources of interference to radio services.

ANTENNA OBSTRUCTION MARKING

The Antenna Survey Branch administers Part 17 of the rules which concern the construction, marking, and lighting of antenna towers and their supporting structures. The primary functions of this branch are to apply the criteria of Subpart B of those rules to all proposals for new or modified antenna structures and to refer proposals that exceed these criteria to appropriate Regional Airspace Subcommittees (ASP) of the Air Coordinating Committee (ACC) for special aeronautical study by aviation interests outside of the Commission. The branch approves conforming antennas and prescribes, when necessary, obstruction markings in order to minimize their potential hazard to air navigation.

The number of antenna proposals processed in fiscal 1955 exceeded all previous years, totaling 9,131, an increase of over 100 applications per month above fiscal 1954. Notwithstanding this increase, fewer antenna proposals were referred to ASP for special aeronautical study due to the decline in the number of TV applications which generally involve higher towers having a greater probability of requiring special aeronautical study.

The number of applications for antenna processing reached a record high during fiscal 1955, totaling 9,856, an increase of more than 200 applications per month over fiscal 1954. Antenna proposals for broadcast and common carrier services decreased slightly while safety and special radio proposals increased from 5,357 to over 8,000.

At the close of the year, 28 tall TV towers—1,000 feet in height and higher—were in operation; construction permits for 13 additional towers over 1,000 feet in height were outstanding, including the combined tower of WFAA–TV and KRLD–TV in Dallas, Tex., which is under construction to a height of 1,521 feet. The Commission held hearings on applications involving two additional high towers. They were KSWS–TV, Roswell, N. Mex., for 1,610 feet, and KGEO–TV, Enid, Okla., for 1,356 feet. The Commission designated for hearing the Deep South Broadcasting Co., WSLA, Selma, Ala., proposal for 1,993 feet. An application on file by WHAS, Inc., WHAS–TV, Louisville, Ky., proposes a 2,003-foot tower.

The Commission amended Part 17 to require construction permitees whose antennas require obstruction markings to mail a postcard notification to the Coast and Geodetic Survey advising the start of antenna construction in addition to the previous requirement for notification of the completion of such construction.

The Commission proposed rulemaking to amend Section 17.14 of its rules which presently exempts certain antenna structures from special aeronautical study. It provides that such exemptions will not apply when any increase in height to an existing antenna structure is involved.

The Commission has been advised by the Airspace Subcommittee that certain proposed antenna structures which were given aeronautical approval by the subcommittee are considered "critical obstructions". Since a necessary premise to such approvals is substantial accuracy by the applicant in his determination of the exact location and height of such structures, a public notice was issued setting forth the Commission policy that construction permits which authorize antennas that are considered to be "critical obstructions" will require an affidavit by a qualified surveyor setting forth the geographic coordinates and the overall height of the structure above mean sea level.

Statistics of antenna construction proposals processed during the year follow:

Services	Pending July 1, 1954	Received in ASB	Cleared by ASB	Pending June 30, 1955 [1]
Broadcast:				
AM	28	734	717	45
FM	0	113	112	1
TV	29	602	611	20
International	0	1	1	0
Experimental	0	6	6	0
Total	57	1,456	1,447	66
Safety and special radio services	159	8,065	7,358	866
Common carrier	5	335	326	14
Grand total	221	9,856	9,131	946

[1] Totals in this column include totals shown in last column of the next table.

The number of proposals referred to the Airspace Subcommittee for special aeronautical study was:

Services	Pending at airspace July 1, 1954	Sent to airspace during year	Received from airspace during year	Pending at airspace June 30, 1955
Broadcast:				
AM	18	128	120	26
FM	0	8	8	0
TV	21	75	82	14
International	0	0	0	0
Experimental	0	0	0	0
Total	39	211	210	40
Safety and special radio services	18	176	166	28
Common carrier	2	19	17	4
Grand total	59	406	393	72

[Page 144 in the original document is intentionally blank]

Research and Laboratory

TECHNICAL RESEARCH

General

The Commission, through its Technical Research Division, studies engineering problems relating to technical standards for the various radio services, and miscellaneous radio-frequency devices, studies wave propagation, reviews equipment specifications, and administers to the Experimental Radio Service. In these tasks, it uses technical information obtained from other Government agencies, university research departments, industrial laboratories, etc. Lists of equipment acceptable for use in the various services are published, besides being available for inspection at the various offices of the Commission.

Division representatives continued to participate on Panel II of the Telecommunications Planning Committee, which is sponsored by the Office of Defense Mobilization to coordinate development and application of new and improved systems of communication within the Government.

Government-industry committees.—The division also cooperated with the Radio Propagation Advisory Committee, organized in 1953. This committee works to resolve new problems involving radio wave propagation, with special emphasis on VHF and UHF television. It is also concerned with field strength measurement and frequency allocation standards. The Commission's Chief Engineer is the Chairman of RPAC. Other members include engineers from the Commission, other Government agencies, industry, and consulting engineers who practice before the Commission.

The division was represented on various committees of URSI (International Scientific Radio Union) and CCIR (International Radio Consultative Committee), the Executive and Budget Committees of CRPL (Central Radio Propagation Laboratory), Committee C63 of the American Standards Association, and in technical meetings of the Radio Technical Commission for Marine Services, the National Association of Radio and Television Broadcasters, the Radio Technical Commission for Aeronautics, and the Radio-Electronics-Television Manufacturers Association.

VHF and UHF propagation research.—Two kinds of measurements are vital in determining allocation patterns for television and

other services operating in the VHF and UHF regions. One concerns measurement of the area surrounding the station wherein satisfactory grades of service would be provided by the station; the other deals with measurement of field strengths far beyond the normal service area for determining the amount of interference which a distant station may cause. These measurements, along with theoretical considerations, furnish propagation information essential to achieving the most efficient utilization of frequency space.

A system of measurement standards for determining serviceable signals from VHF and UHF broadcast stations has been in effect for a decade. These measurements, usually undertaken by TV stations and consulting engineers, are a source of valuable information concerning radio transmission of energy as applied to station allocation principles. A file of these measurements has been established, and the industry has been invited to submit measurements voluntarily for the use of the Commission, the industry, and others interested.

This system, however, has not been entirely satisfactory for measurement of UHF broadcast stations. The Commission has worked closely with the Radio Propagation Advisory Committee to develop a better system of measuring both UHF and VHF broadcast stations. If such a system is developed, it would be incorporated in the Commission's rules and standards.

As for the second kind of measurements, the diverse monitoring installations of the Commission are especially adaptable to the continuous recording of field strengths of TV and other radio stations at long distances. During the fiscal year these recordings were made of eight UHF stations, and eight VHF and FM broadcast stations. New methods of recording were developed during the year, and special instruments were constructed for analysis purposes.

Much time was spent in developing new VHF–UHF tropospheric propagation curves as well as techniques for predicting service signal strengths under specific terrain conditions. There remains an urgent need for UHF propagation information based on actual measurements.

A study is in progress on the relative merits of normal line-of-sight microwave relays as compared with tropospheric scatter relays which operate over greater distances.

The division continues to supervise a project under contract with the Army Signal Corps, and prepares reports on the information obtained for the use of the Signal Corps, but which is also of interest to the Commission.

Sunspot cycle recording.—Field strength recordings on AM broadcast frequencies were continued during the year on a reduced scale at three FCC monitoring stations. Because of the pressure of more

urgent VHF and UHF propagation research, these records have been put aside for later analysis.

Experimental Radio Services

The Communications Act of 1934 requires the Commission "to provide for experimental uses of frequencies, and generally encourage the larger and more effective use of radio in the public interest". The Experimental Radio Services (covered by Part 5 of the rules) is one of the mechanisms for carrying out this mandate.

These services provide for two categories of experimentation. One permits basic research in the radio-electronic art, while the other is for the development of a new service or for improvements in an existing service.

Experimental stations are used by universities and research laboratories for ionosphere research and propagation studies, particularly on frequencies above 30 megacycles using scatter techniques. Considerable attention is being given to meteor trails and other localized ionization effects in the ionosphere.

Stations operated by manufacturers are engaged in developing new radio and electronic techniques. Development of narrow band communication equipment is being pushed by most manufacturers. New and improved radio aids to navigation—in particular in the band 90 to 110 kilocycles—are being investigated. Other work includes the continued study and improvement of microwave equipment, with special stress on multichannel equipment.

Experimental stations are also used extensively by sales engineers to make field strength and coverage surveys for determining the equipment requirements and the antenna location needed to provide optimum performance.

Many experimental stations are operated by persons engaged in developing or testing equipment under contract with the Government. Most of these contracts are with the Department of Defense and a large part of this work is classified.

Under a 1953 revision of the rules, no frequencies are specifically allocated for experimentation. Instead, any frequency—with certain exceptions designed to protect safety communications and aids to navigation—may be used for experimentation provided no harmful interference is caused to the stations regularly licensed on that frequency.

With the expanded use of radio, it is becoming increasingly difficult to find frequencies for experimentation. This problem has caused the Commission to start a study to determine what, if any, changes should be made in its frequency allocation policy and the assignment procedures governing experimental operations.

Statistics covering the Experimental Radio Services for fiscal years 1952–55 are given below:

	Stations	Applications
June 30, 1952	369	915
June 30, 1953	444	1,055
June 30, 1954	586	975
June 30, 1955	625	1,447

Since a separate license is required for each experimental project and the license is deleted when the project is completed, activity in this field cannot be measured by the number of stations licensed at the year end. Rather, the measure of activity must be based on the number of applications handled.

During the year it was found necessary to simplify the experimental records in order to keep abreast of the large volume of applications. Accordingly, the separate count of research and developmental stations was discontinued.

Rulemaking was finalized on two experimental matters. Educational institutions were permitted to use microwave frequencies between 2900–3246 megacycles for instructional purposes. Requests of this nature can now be handled by the staff. Authority was also delegated to the Chief Engineer to act on certain requests to operate experimental stations without announcement of call letters.

Control of Man-Made Interference

Man-made interference may be defined as spurious—that is, unwanted—radiation of electromagnetic energy within the radio spectrum which is not useful for the intended purpose of the radiating source. Examples include oscillator radiation from superheterodyne receivers, sweep-circuit radiation from TV receivers, harmonic radiation and out-of-channel sideband radiation from transmitters, and radiation from the many devices which generate radio frequency energy for local use, such as heaters, diathermy machines, certain types of arc welders, and many others.

The effective use of the radio spectrum requires a carefully engineered allocation plan so that licensed radio stations can operate harmoniously together. However, the most expert plan can be made unworkable if electronic and electrical devices are permitted to radiate excessive amounts of radio frequency energy.

As pointed out in the special chapter of this report dealing with interference, the control of this unwanted radiation is one of the most complex problems facing the Commission, the solution of which is made particularly difficult because of the number and diversity of devices involved. These devices can be separated into two groups.

First is the group of devices which generate radio frequency energy to operate noncommunications equipment on the spot. They include all electronic heating equipment (such as industrial and diathermy), certain types of arc welders, oscillators in radio receivers, sweep-circuit generators in television receivers, plus a host of others. Many of these devices (the industrial heaters particularly) generate more radio frequency power than the most powerful standard broadcast station.

The second group includes the multiplicity of electrical and electronic labor-saving "gadgets" that have become a part of our daily life. Every rotating machine, every switch and every spark plug is a source of interference. Individually, no one small device seems to be important, but together their total radiation produces a high level of noise or interference. Since their use increases with population density, this man-made noise level is much more evident in urban areas than it is in rural areas. This fact has long been recognized in the AM broadcast field, where the Commission's engineering standards specify that in an urban area the minimum signal required for satisfactory service is about 2000 uv/m whereas in a rural area it can be as low as 100 uv/m.

The Commission has approached the regulation of this unwanted radiation in three steps. Most of its present rules contain standards for spurious radiation from licensed transmitters. It has promulgated special rules for industrial, scientific and medical equipment, and it is expanding its rules to take care of restricted radiation devices.

The field of spurious radiation is enormous in scope. The offending devices are so diverse and widespread that every industrial activity and every individual is directly concerned. Their regulation presents many exceedingly complex and difficult legal, technical, economic, and administrative problems. The Commission must, therefore, make haste slowly in this field, and has engaged in extensive correspondence and consultation with industry for the dual purpose of explaining the need for regulation and of soliciting support for this mutually beneficial program.

Technical Standards

The Technical Research Division, in collaboration with the FCC bureaus concerned, developed improved technical standards for the various radio services. Proposed rules for revised technical standards in the common carrier, public safety, industrial and land transportation radio services operating in the 25–50 and 152–162 megacycle bands were issued.

Their purpose is to reduce the frequency bandwidth occupied by stations in services from 40 to 20 kilocycles. Such a reduction would

approximately double the number of channels available for assignment and, thereby, accommodate an increased number of stations. The technical standards necessary to make such improved frequency utilization possible represent the best performance practicable in the present state of the art. The proposed standards include reduced FM frequency deviation, specification of audio response characteristics and tighter frequency stability requirements. The values selected for these important operating parameters were specified after detailed study of equipment capability and theoretical considerations.

As part of the continuing program for minimizing interference caused by out-of-channel radiation from stations in all services, proposed standards were issued for suppression of spurious emissions from FM and AM broadcast stations. Comments filed in response to these proposals are now being reviewed. The adoption of required bandwidth and spurious emission measurements in connection with type acceptance of transmitters will enable the Commission to determine that these transmitters comply with the rules in this regard.

Techenical standards for microwave systems are now under consideration. These systems usually consist of chains of stations which relay signals by narrow beams of radiation from one point to another. They are often used along pipe and power lines to carry operating messages and instructions. There has been FCC participation in joint Government-industry conferences to collect current data on the performance of operating microwave systems and to obtain opinions and recommendations concerning rules which should be adopted for this service, which has been operating on a developmental basis.

Still under consideration is further action on proposed rules in the maritime mobile service to specify limitations on spurious emissions for ship stations below 500 megacycles and to extend equipment type acceptance requirements to include transmitters in this service below 30 megacycles. Similarly, further action is being considered concerning technical standards and type acceptance requirements for the domestic public radio service, pursuant to proposed rulemaking.

Industrial, Scientific, and Medical Equipment

This equipment is regulated by Part 18 of the Commission's rules, first adopted in 1947. Regulated under this part are medical diathermy, industrial heating, certain types of arc welders, cyclotrons, and other particle accelerators, and many others. These rules provide frequencies on which such equipment may operate with unlimited radiation without causing interference to radio communication and impose limitations on radiation on frequences outside these bands.

During the past year the Commission amended Part 18 to provide special regulations and type approval for ultrasonic equipment. This

equipment, developed in the last few years, generates radio frequency energy which is applied to a special kind of crystal or to a rod of magnetic material which is thereby caused to vibrate at ultrasonic frequencies, and is used largely for cleaning and flaw detection in industry and for medical purposes. Under these new rules, which became effective March 1, 1955, the Commission has type approved 11 pieces of medical ultrasonic equipment and is testing several industrial ultrasonic items.

The problem of radio frequency stabilized arc welders still confronts the Commission. Industry and the Commission are cooperating in seeking a solution. These machines are designed to weld stainless steels and certain non-ferrous metals, such as aluminum, in an inert gas atmosphere. Because they use spark gap oscillators to initiate and stabilize the arc, they produce a broad band of interference. The situation is aggravated by the fact that many of these welders are operated in the vicinity of airports.

Although considerable reduction of arc-welding interference has been brought about by the efforts of industry acting through the Joint Industry Committee for High Frequency Stabilized Arc Welders, a permanent solution is still not in sight. In July 1954, the Commission requested the Joint Technical Advisory Committee (JTAC) to lend its assistance. An interim report holds out hope that operation with a reduced duty cycle may be helpful. This approach is now being investigated by both groups.

Based on enforcement activities during 1953–54 which showed that the industrial heating regulations were inadequate, the Commission started work on a rule-making proceeding which will clarify the requirements and establish a type-acceptance procedure for certain of these heaters. It is anticipated that these revisions will insure a greater degree of compliance and thereby improve the interference situation considerably.

Restricted Radiation Devices

These devices are regulated by Part 15 of the Commission's rules, adopted in 1938. Although intended basically for the regulation of certain "gadgets" used in the home, such as wireless record players and remote control units, the rules have been applied with a fair degree of success to radiation from other apparatus, such as carrier current systems, wired wireless systems, wireless microphones, radio-controlled garage-door openers and the like.

Since 1949 the Commission has been struggling with the problem of amending these rules to take into account the continually growing number of devices producing spurious radiations. Action had to be suspended from time to time in order to use available manpower on

of achievement of desired reception. It also studies the interference to radio reception produced by other electrical equipment. It develops special monitoring equipment used by Commission engineers in the field, and calibrates signal generators, field intensity sets and other apparatus used in enforcement and investigation activities. Various proposals to change television signal standards or frequency allocations are studied to determine their impact upon the operation of the millions of receivers now in use by the public.

The laboratory is also engaged in studying new uses of radio. For example, during the year extensive tests were made on an automatic radiotelegraph call receiver. This is a selective device intended to ring bells on a ship when the ship is called by another station or when a distress, urgency, or safety transmission is to be made. This work was in connection with congressional hearings on H. R. 6004, 83d Congress, 2d session, and H. R. 4090, 84th Congress, 1st session, which would require that such a device be installed on certain ships.

Following is a summary of other activities of the laboratory during the year:

Type Approval Testing

The Commission's rules require that equipment covered by certain applications must comply with detailed performance specifications. In some cases these are designed to reduce the likelihood of generation of interference, and in others they are intended to assure that certain compulsory equipment is capable of functioning under emergency conditions. The tests to prove compliance with the specifications may be so difficult or expensive that they cannot reasonably be required of individual users. On proper application, a manufacturer may request that the Commission issue a certificate of type approval covering a new model of such equipment. After type approval, units identical to the approved type need not be tested in detail.

During the year there were type approval tests of 28 medical ultrasonic treatment devices, 6 medical diathermy units, and 8 epilators (hair-removal devices). In the industrial field, an ultrasonic equipment for the degreasing of mechanical parts was submitted for test.

A number of new models of equipment using the citizens radio band were tested. These included five mobile communication units intended for use in automobiles, one base station unit for communication with automobile units, four "walkie-talkie" units, one transmitter intended to control a garage door opener, one to control model aircraft, one to operate traffic lights ahead of an emergency vehicle such as fire apparatus, and one burglar alarm.

Five new models of marine radar equipment were examined for spurious emissions which might interfere with essential radio com-

munication equipment on shipboard. A radiotelegraph auto alarm for reception of distress signals aboard ship was tested.

Tests were made on a new type of frequency monitor for AM broadcast stations. This device uses electronic means to count the number of cycles occurring in a precisely known length of time.

Calibration of Measuring Equipment

Certain measuring equipment is used in laboratory tests in which accuracy of results is of great importance. The same types are also employed by the Field Engineering and Monitoring Bureau in its enforcement of the rules. During the year the laboratory made necessary repairs and calibration measurements of 9 standard signal generators and 5 field strength meters for its own use, and on 8 standard signal generators and 9 field strength meters for field use.

Radio Propagation

The laboratory continued to assist in radio field strength recording activities. Nine special receivers were modified to provide the characteristics needed. Measurements were made at four of the monitoring stations where recording equipment is operated, to verify the accuracy of the recorded values. Recordings of the strengths of the signals of two distant UHF stations were continued at the laboratory.

Experiments were made to find a relation between antenna height and recorder indication on one of the UHF channels being recorded. Mobile field strength measurements were made to determine the area of coverage of a UHF television station in Salisbury, Md. Surveys were made to test the relative coverage of two Baltimore VHF stations at the picture and sound frequencies in order to gain information concerning color TV problems.

Assistance to Field Enforcement

The laboratory assists in the enforcement activities of the Field Engineering and Monitoring Bureau.

During the year it measured the characteristics of two filters intended for reduction of TV interference and three miniature transmitters suspected of illegal operation.

The development of equipment and techniques for a mobile TV monitoring unit was substantially completed. This unit is equipped to make performance tests on TV broadcast stations in the field to assure that their transmissions are in accordance with Commission standards.

A new spectrum analyzer was adapted for use at the monitoring stations, and its performance evaluated. This new analyzer will make observations on the bandwidth of a great number of signals for which no previous facilities were available.

Cooperation With Other Groups

In the effort to reduce interference and to advance the utlity and efficiency of radio communication, the Laboratory Division is represented on the following committees: IRE Committee 10 on Industrial Electronics; IRE Committee 27 on Radio Frequency Interference and its Subcommittees 27.1 on Basic Measurements and 27.3 on Radio and TV Receivers; IRE Subcommittee 15.4 on Pulse Modulated Transmitters; AIEE Subcommittee on Induction and Dielectric Heating; ASA Committee C63, Subcommittee No. 1 on Techniques and Developments for Measuring Radio Noise; RTCM Special Committee 29 on Testing of Radiotelegraph Auto Alarm Receivers; and URSI Committee I on Radio Measurements and Standards.

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Frequency Allocation

GENERAL

Constant study of the radio spectrum is required so that allocation and use of channels keeps pace with advancements in electronics so as to render maximum and proficient service. Continual change is the price of progress.

The radio spectrum has varying characteristics throughout. Consequently, one group of frequencies may be useful to a particular service but not to others. For that reason, bands must be allocated to those services for which they are best suited. Some of these bands have to be subdivided and resubdivided to serve more specific purposes.

Because radio transmissions cross national boundaries, there must be international agreement on the allocation of frequencies for the different radio services, and standardized assignments and operating procedures in such international services as aviation and marine. There must be like cooperation between nations to minimize interference by stations of one country to those of other countries. The United States is the world's largest user of radio communication facilities, so international concord and coordination are essential in protecting our interests.

The Commission's national frequency records, comprising approximately 135,000 IBM listings and 60,000 5 x 8 card records, were brought up to date as of July 1, 1955, for the first time in 6 years. Semiannual listings reflecting these assignments were furnished the Commission's Washington and field offices, non-Government licensees, and all Government agencies using radio.

During the year 53,306 separate listings, reflecting Government and FCC stations, were registered with the International Frequency Registration Board of the International Telecommunications Union (ITU). Six hundred and fifty-two unsatisfactory findings of the board were processed. This required additional technical information from the licensees and the Government agencies involved to justify request for favorable findings. One hundred additional findings by the board are now under study.

INTERNATIONAL FREQUENCY ALLOCATION

As was the case for the past four years, the Commission has been chiefly concerned in the international field with carrying out domes-

tically the provisions of the Geneva Agreement (1951) to which some 65 countries are parties. This task is virtually completed insofar as the Commission's licensees in the aeronautical mobile, amateur, fixed, and maritime mobile services are concerned. In the high frequency broadcast service, all stations licensed by the Commission are now assigned frequencies within the internationally agreed broadcast bands. However, within those bands there has not been developed any channeling or plan of assignment that is mutually acceptable to all user countries from the standpoint of number of frequencies and hours of availability.

NATIONAL FREQUENCY ALLOCATION

Coincidental with bringing into force the new Atlantic City table of frequency allocations within the United States, the need for major revisions in Alaskan communications practices became apparent. Coordination and cooperation between the Commission's Alaskan licensees, Government users of radio in Alaska and Canadian authorities enabled the Commission to rewrite its rules to improve the distribution of frequencies and to make other changes which are expected to add to the flexibility and reliability of radio communications in Alaska.

Action was also initiated during the year to reallocate certain portions of the FM and TV broadcast bands in Alaska for the joint use of Government operations and the Commission's point-to-point licensees. This move was made in the interests of better frequency management and spectrum conservation inasmuch as there had been no demand for extensive broadcasting in Alaska. Furthermore, there is more than ample spectrum space to accommodate TV broadcasting needs in Alaska for the indefinite future.

Increased emphasis has been given to frequency utilization studies of the VHF and UHF land mobile bands. The results are expected to lead to improved frequency management and more efficient utilization of these bands by an everexpanding land mobile service. For example, a comprehensive proposal to reduce channel separations in the land mobile service and thereby make room for new users was pending at the close of the year.

The Commission's table of frequency allocations was amended to permit test of a newly developed technique termed "tropospheric scatter" which permits "over-the-horizon" communication on frequencies normally considered suitable only for line-of-sight distances. This radical development is expected to have wide application in years to come. An interim authorization, pending the development of equipment to operate on even higher frequencies, has been granted in the International Fixed Public Radiocommunications Service for

point-to-point communications from Florida to Cuba in the UHF TV band between 716 and 890 megacycles in expanding public telephone facilities between these two countries.

FCC-GOVERNMENT FREQUENCY COORDINATION

During the year approximately 4,000 engineering studies were conducted on frequency assignments proposals involving joint Government-civil interference problems. It was noted that the various "rules of thumb" employed by most Government agencies to protect their existing communication systems were generally relaxed to permit at least trial operation on a frequency-separation differential much less than that customarily used in previous years.

For example, it is not uncommon to at least obtain agreement for a trial operation on 2 multiplex (MUX) circuits 5 kilocycles apart in frequency in the same general area. Such trend may be accounted for by (1) overcautiousness in the past, (2) improvement of equipment, and (3) operating advancements which can tolerate a certain amount of interference.

Approximately 275 civil versus Government interference cases were handled during the year. The majority were resolved with the cooperation of the using parties.

The staff concerned with these matters attended approximately 150 frequency management meetings between Government and non-Government representatives. This includes regularly scheduled meetings of the Interdepartment Radio Advisory Committee (IRAC) and its Frequency Assignment Subcommittee (FAS) in addition to special meetings on particular projects.

INTERNATIONAL FREQUENCY COORDINATION

The world-wide program for rearrangement of radio stations throughout the spectrum, according to internationally agreed procedure, was promoted by Commission action in contacting some 34 countries to determine their schedules for moving some 300 of their stations into frequency bands under treaty provisions. The Commission was in turn contacted by some foreign administrations requesting similar information about the movement of United States stations into designated frequency bands.

The Geneva Agreement of 1951, among member countries of the International Telecommunication Union, tells how this program is scheduled to be carried out so as to bring into force the Atlantic City (1947) radio regulations. Most of the foreign assignments previously in conflict with United States operations have now been cleared, due partly to 550 letters and radiograms exchanged between the Commission and foreign administrations.

The thousands of United States police, fire, industrial and other radio stations operating on frequencies between 30 and 460 megacycles in areas near the Canadian border received continuing protection by Commission action in exchanging technical data and engineering comments with the Canadian Department of Transport. This procedure, which began in 1950, has assisted the Commission and the Canadian authorities to make assignments in a manner to avoid large scale interference from developing along the border.

Similar coordinating action occurred on a lesser scale with other foreign administrations, all with the same objective of promoting the use and benefit of radio for Commission licensees.

When the Commission decided to terminate the regular use of type A2 (tone modulated telegraphic) emission by coast stations in the frequency band 415–490 kilocycles and by ship stations and coast stations in the maritime bands between 2200 and 17,000 kilocycles in order to enhance the use of this spectrum space by all users, it had been assured that Canada would take similar action, and it made strong representations to other governments for the same purpose. The result is that these portions of the spectrum are less crowded, because each station can now carry on the same amount of communication with a signal which uses a narrower channel. This is an example of international cooperation and coordination which redounds to our benefit.

INTERNATIONAL INTERFERENCE AND INFRACTIONS

The radio "highways" or frequency channels in the spectrum used by United States stations are kept as clear as possible of road blocks caused by interfering or improperly operating foreign stations.

In the past year this was done by taking prompt and effective action to resolve 316 interference cases involving in each case a foreign station and a Commission licensed station. Each case required the recording of data documented internationally and nationally, together with formal representations to foreign telecommunication officials, either directly or through diplomatic channels. The Department of State has been most helpful and cooperative in taking these matters up with the proper officials of foreign administrations.

For the purpose of further resolving international interference problems affecting the United States, progress was made, with the cooperation of affected communication companies, toward adoption of new uniform procedures to help bring about even more rapid and effective international action. Completion of this program should benefit United States utilization of radio frequency resources.

Other radio obstacles were prevented from developing by forwarding directly to appropriate foreign officials, in accordance with inter-

nationally agreed procedures, some 1,700 treaty infraction reports by Commission monitoring stations. These are reports showing that the specified foreign station is operated improperly, technically or administratively, so that its signals monopolize traffic lanes in the spectrum which could be employed by other stations operating properly. The corrective action, which is generally taken by the foreign administration concerned upon receiving these reports, serves as a preventive against the development of hundreds of full-fledged international interference cases.

Through these activities, the safety of life and property in the air and on the sea is enhanced.

INTERNATIONAL FREQUENCY USAGE DATA

In competition with many thousands of others throughout the world, United States radio stations must frequently confirm their actual use of a frequency assignment, such as for purposes of having a complaint of international interference resolved in their favor. Since considerations of this nature are based generally upon listings and data published in Geneva by the International Telecommunication Union, it is important for the Commission to see that correct and current data reflecting actual use of the spectrum is made available to the ITU. For this purpose, approximately 100,000 items from reports of the Commission's monitoring stations were processed and forwarded to the ITU.

INTERNATIONAL CONFERENCES AND MEETINGS

Preparation was made for 10 international telecommunication conferences and meetings during the year. Commissioners and staff personnel participated with United States delegations for a number of these.

Additionally, 28 meetings are expected to be held in the future, work on some of which is already under way. A few of these represent international discussions conducted by official communications rather than by an actual assembly. Agreements thus reached are nonetheless important in their effect on the United States.

All international conference participation is under Department of State sponsorship.

The Commission furnished 2 delegation chairmen and 8 representatives for the following 5 conferences and meetings:

Name	Place	Date
CCIT, Study Group XI	Geneva	June 30–July 9, 1954.
ICAO North Atlantic Regional Air Navigation Meeting	Montreal	Oct. 5–Oct. 29, 1954.
U. S.-Mexico Broadcasting Conference 1st Session	Mexico City	Nov. 4–Dec. 17, 1954.
ICAO Special European-Mediterranean Communications meeting.	Paris	Nov. 16–27, 1954.
URSI Spring Meeting	Washington	May 3–5, 1955.

Preparatory and follow-up work occurred, without personnel participation, for the following five conferences and meetings:

Name	Place	Date
ICAO SEA Communications Coordinating Committee, Informal Meeting.	Bangkok	Oct. 18–27, 1954.
U. S.-Mexico Meeting on CONELRAD	Colorado Springs	Fall 1954.
CCIR, Study Group I	Brussels	Mar. 22–Apr. 6, 1955.
CCIR, Study Group XI	do	Mar. 22–Apr. 6, 1955.
ITU Administrative Council, 10th Session	Geneva	Apr. 23–May 21, 1955.

The following 28 listings are conferences or discussions projected for the future with which the Commission is concerned:

Name	Place	Date
CCIT, Study Group X	Geneva	July 4–13, 1955.
U. S.-Mexico Broadcasting Conference, 2d Session	Washington	July 6, 1955.
ICAO Air Navigation Conference, 2d Session	Montreal	Aug. 30, 1955.
Baltic and North Sea Radiotelephone Conference	Gotegorg	Sept. 1, 1955.
ICAO Pacific Regional Air Navigation Meeting	Manila	Nov. 1, 1955.
U. S.-Canada Meeting on CONELRAD	Undetermined	1955.
ICAO North Atlantic Consol Advisory Panel	do	1955.
ITU Administrative Council, 11th Session	Geneva	Apr. 21, 1956.
CCIR, 8th Plenary Assembly	Warsaw	Aug. 23–Sept. 27, 1956.
ICAO Fourth European-Mediterranean Regional Air Navigation Meeting.	Undetermined	1956.
ICAO Third Caribbean Regional Air Navigation Meeting	do	1956.
ICAO North Atlantic Consol Advisory Panel	do	1956.
ICAO North Atlantic Ocean Station Conference	do	1957.
ICAO AGA/OPS/COM Air Navigation Conference	do	1956 or 1957.
U. S.-CANADA Meeting on CONELRAD	do	1956.
U. S.-Cuba Meeting on CONELRAD	do	1956.
U. S.-Mexico Meeting on CONELRAD	do	1956.
International Telegraph and Telephone Consultative Committee, 1st Plenary Assembly.	Geneva	1956.
ITU Administrative Telegraph and Telephone Conference	Undetermined	Undetermined.
ICAO African-Indian Ocean Regional Air Navigation Meeting.	do	1957.
ICAO South East Asia Regional Air Navigation Meeting	do	1957.
URSI 12th General Assembly	Boulder, Colo	August 1957.
U. S.-Bahamas Meeting on CONELRAD	Undetermined	1957.
U. S.-Bermuda Meeting on CONELRAD	do	1957.
U. S.-Haiti Meeting on CONELRAD	do	1957.
U. S.-Jamaica Meeting on CONELRAD	do	1957.
ITU Plenipotentiary Telecommunication Conference	do	Undetermined.
ITU Administrative Radio Conference	do	Do.

Appendix

FIELD OFFICES

Fifty-eight field offices are operated by the Federal Communications Commission.

Of this number, 55 are under the Field Engineering and Monitoring Bureau. These embrace 6 regional offices, 24 district offices with 6 suboffices and 1 ship office, and 18 monitoring stations.

The remaining three field offices are used by the Common Carrier Bureau for accounting purposes.

The nature and location of each field office are shown on the following list:

FIELD ENGINEERING AND MONITORING BUREAU

Regional Offices	*Headquarters*
Region 1	954 Federal Bldg., New York 14, N. Y.
Region 2	718 Atlanta National Bldg., Atlanta 3, Ga.
Region 3	323–A Customhouse, San Francisco 26, Calif.
Region 4	802 Federal Office Bldg., Seattle 4, Wash.
Region 5	P. O. Box 1142, Lanikai, Oahu, Hawaii
Region 6	832 U. S. Courthouse, Chicago 4, Ill.

District Offices	*Address*
1	1600 Customhouse, Boston 9, Mass.
2	748 Federal Bldg., New York 14, N. Y.
3	1005 New U. S. Customhouse, Philadelphia 6, Pa.
4	500 McCawley Bldg., Baltimore 2, Md.
5	402 Federal Bldg., Norfolk 10, Va.
6	718 Atlanta National Bldg., Atlanta 3, Ga.; (suboffice) 214 Post Office Bldg., Savannah, Ga.
7	312 Federal Bldg., Miami 1, Fla.; (suboffice) 409–410 Post Office Bldg., Tampa 2, Fla.
8	608 Federal Bldg., New Orleans 12, La.; (suboffice) 419 U. S. Courthouse and Customhouse, Mobile 10, Ala.
9	324 U. S. Appraisers Bldg., Houston 11, Tex.; (suboffice) 329 Post Office Bldg., Beaumont, Tex.
10	500 U. S. Terminal Annex Bldg., Dallas 22, Tex.
11	539 U. S. Post Office and Courthouse Bldg., Los Angeles 12, Calif.; (suboffice) 15–C U. S. Customhouse, San Diego 1, Calif.; (ship office) 326 U. S. Post Office and Courthouse, San Pedro, Calif.
12	323–A Customhouse, San Francisco 26, Calif.
13	433 New U. S. Courthouse, Portland 5, Oreg.
14	802 Federal Office Bldg., Seattle 4, Wash.
15	521 New Customhouse, Denver 2, Colo.

District Offices	*Address*
16	208 Uptown Post Office and Federal Courts Bldg., St. Paul, 2 Minn.
17	3100 Federal Office Bldg., Kansas City 6E, Mo.
18	826 U. S. Courthouse, Chicago 4, Ill.
19	1029 New Federal Bldg., Detroit 26, Mich.
20	328 Post Office Bldg., Buffalo 3, N. Y.
21	502 Federal Bldg., Honolulu 1, Hawaii.
22	322–323 Federal Bldg., San Juan 13, P. R.
23	53 U. S. Post Office and Courthouse Bldg., Anchorage, Alaska; (suboffice) 6 Shattuck Bldg., Juneau, Alaska.
24	Briggs Bldg., 415 22d St. NW., Washington 25, D. C.

Primary Monitoring Stations	*Secondary Monitoring Stations*
Allegon, Mich.	Searsport, Maine
Grand Island, Nebr.	Spokane, Wash.
Kingsville, Tex.	Twin Falls, Idaho
Millis, Mass.	Fort Lauderdale, Fla.
Santa Ana, Calif.	Chillicothe, Ohio
Laurel, Md.	Muskogee, Okla.
Livermore, Calif.	Anchorage, Alaska
Portland, Oreg.	Fairbanks, Alaska
Powder Springs, Ga.	
Lanikai, Oahu, Hawaii	

COMMON CARRIER BUREAU

New York, N. Y., 90 Church St.
St. Louis, Mo., 815 Olive St.
San Francisco, Calif., 180 New Montgomery St.

PUBLICATIONS

The Commission's printed publications are available from the Superintendent of Documents, Washington 25, D. C., at nominal cost. They are not distributed by the Commission.

Included are rules and regulations governing the different classes of radio and other services. Each part covers a particular service. On the back page is a form which, when filled out and forwarded to the Commission, entitles the purchaser to receive any subsequent changes to the part or parts purchased until a complete revision is printed.

A list of these printed publications follows:

Title	*Price*
Communications Act of 1934, with Amendments and Index, revised to May 1954	$0.70
Amendments to September 1955	.30
Federal Communications Commission reports (bound volumes of decisions and reports exclusive of annual reports):	
Volume 5, November 16, 1937, to June 30, 1938	1.50
Volume 6, July 1, 1938, to February 28, 1939	1.50
Volume 8, March 1, 1940, to August 1, 1941	1.50
Volume 11, July 1, 1945, to June 30, 1947	3.75
Volume 12, July 1, 1947, to June 30, 1948	3.50
Volume 13, July 1, 1948, to June 30, 1949	4.25

Title	Price
Annual reports of the Commission:	
Thirteenth Annual Report—Fiscal year 1947	$0.25
Fourteenth Annual Report—Fiscal year 1948	.30
Fifteenth Annual Report—Fiscal year 1949	.35
Sixteenth Annual Report—Fiscal year 1950	.40
Seventeenth Annual Report—Fiscal year 1951	.40
Eighteenth Annual Report—Fiscal year 1952	.40
Nineteenth Annual Report—Fiscal year 1953	.50
Twenty-first Annual Report—Fiscal year 1955	[1]
Statistics of the communications industry:	
For the year 1943	.35
For the year 1945	.50
For the year 1946	.55
For the year 1947	.75
For the year 1948:	
Sections A and B	1.00
Section B—Broadcast only	.35
For the year 1949—Sections A and B	1.00
For the year 1950—Common Carrier only	.50
For the year 1951—Common Carrier only	.40
For the year 1952—Common Carrier only	.50
For the year 1953—Common Carrier only	.50
Report on Public Service Responsibility of Broadcast Licensees (Blue Book), 1946	.40
An Economic Study of Standard Broadcasting, 1947	.40
Study Guide and Reference Material for Commercial Radio Operator Examinations	.75
Digest of Radio Regulations and Instructions for Restricted Radiotelephone Operators	.05
Figure M3, Estimated Ground Conductivity in the United States, set of 2 maps	3.50
Rules and Regulations:	
Part 0, Organization, Delegation of Authority, etc., revised; effective October 15, 1954	.15
Part 1, Practice and Procedure	[2]
Part 2, Frequency Allocations and Radio Treaty Matters; General Rules and Regulations, revised; effective July 1, 1955	.25
Part 3, Radio Broadcast Services (includes AM, FM and TV engineering standards), revised to Jan. 2, 1956	[1]
Part 4, Experimental and Auxiliary Broadcast Services, revised to June 1, 1955	(.15)
Part 5, Experimental Radio Services, revised; effective March 17, 1953	.10
Part 6, Public Radiocommunication Services (Other Than Maritime Mobile), revised; effective July 1, 1949	.10
Part 7, Stations on Land in the Maritime Services, revised; effective August 1, 1955	[1]
Part 8, Stations on Shipboard in the Maritime Services, revised; effective August 1, 1955	[1]

[1] *In the process of printing*—available at Superintendent of Documents at a later date.
[2] Not available at present.

Title	Price
Rules and Regulations—Continued	
Part 9, Aviation Services, revised; effective July 14, 1953	$0.10
Part 10, Public Safety Radio Services, revised; effective December 18, 1953	.15
Part 11, Industrial Radio Services, revised; effective July 29, 1953	.15
Part 12, Amateur Radio Service, revised; effective November 20, 1953	.20
Part 13, Commercial Radio Operators, revised; effective November 30, 1954	.10
Part 14, Public Fixed Stations and Stations of the Maritime Services in Alaska, revised; effective June 20, 1955	.10
Part 15, Restricted Radiation Devices	[3]
Part 16, Land Transportation Radio Services, September 1955 edition	[1]
Part 17, Construction, Marking, and Lighting of Antenna Structures, revised to June 3, 1953	.05
Part 18, Industrial, Scientific, and Medical Service, revised; effective September 4, 1953	.10
Part 19, Citizens Radio Service, revised; effective February 1, 1955	.05
Part 20, Disaster Communications Service, September 1955 edition	[1]
Part 31, Uniform System of Accounts for Class A and Class B Telephone Companies, revised to May 12, 1948	.40
Part 33, Uniform System of Accounts for Class C Telephone Companies, revised to May 12, 1948	.30
Part 34, Uniform System of Accounts for Radiotelegraph Carriers, revised to October 14, 1949	.20
Part 35, Uniform System of Accounts for Wire-Telegraph and Ocean-Cable Carriers, revised to October 14, 1949	.25
Part 41, Telegraph and Telephone Franks, revised to December 4, 1947	.05
Part 43, Reports of Communication Common Carriers and Certain Affiliates, revised; effective September 21, 1953	.05
Part 45, Preservation of Records of Telephone Carriers, effective October 1, 1950	.10
Part 46, Preservation of Records of Wire-Telegraph, Ocean-Cable, and Radiotelegraph Carriers, effective October 1, 1950	.10
Part 51, Occupational Classification and Compensation of Employees of Class A and Class B Telephone Companies, revised to October 10, 1951	.05
Part 52, Classification of Wire-Telegraph Employees, effective July 11, 1944	[3]
Part 61, Tariffs, Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communication Service, revised to August 1, 1946	.10
Part 62, Applications Under Section 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 December 30, 1946	[3]
Part 64, Miscellaneous Rules Relating to Common Carriers, revised to July 16, 1948	.10

[1] In the process of printing—available at Superintendent of Documents at a later date.
[3] Obtainable temporarily from the Federal Communications Commission without charge.

NOTE.—The Commission's Annual Report for 1954 is out of print and is no longer available.

Because of their number and constant state of flux, radio station lists cannot be supplied by the Commission. However, on request, it will furnish a fact sheet about commercial sources of such lists, also one on communications commercial publications and services.

Also available from the Commission are the following nonprinted information primers concerning the FCC and its various fields of activity:

"An ABC of the FCC"
"A Short History of Electrical Communication"
"Radio Broadcast Primer"
"Safety and Special Radio Services Primer"
"Common Carrier Primer"
"Use of Broadcast Facilities by Candidates for Public Office"
"Radio Station Calls"

In addition, various fact sheets are issued about the individual safety and special radio services, and about amateur and commercial radio operators. Examples are:

"Citizens Radio Service"
"Private Aircraft Radio Stations"
"Amateur Radio Service"
"How to Obtain a Ship Radiotelephone License"
"Ship Radiotelephone"
"Study Questions for Amateur Novice Class Examinations"
"Industrial Radio Services and Land Transportation Services"
"Special Emergency Radio Service"
"Information Concerning Commercial Radio Operator Licenses and Permits"

Though none of these can be furnished in quantity, a single copy may be obtained upon individual request to the "Secretary, Federal Communications Commission, Washington 25, D. C." for reproduction in whole or in part.

TREATIES AND OTHER INTERNATIONAL AGREEMENTS

Applicable Federal laws, international treaties, and arrangements relating to radio, to which the United States is a party, were formerly listed in this section. Those interested are now referred to the revised tabulation in Part 2 of the Commission's Rules and Regulations Governing Frequency Allocations and Radio Treaty Matters; General Rules and Regulations, which can be purchased from the Superintendent of Documents.

PAST AND PRESENT COMMISSIONERS

Past and present members of the Federal Communications Commission, and their terms of service, are listed below:

Commissioners	*Terms of service*
*Eugene O. Sykes	July 11, 1934–Apr. 5, 1939
Thad H. Brown	July 11, 1934–June 30, 1940
*Paul A. Walker	July 11, 1934–June 30, 1953
Norman S. Case	July 11, 1934–June 30, 1945
Irvin Stewart	July 11, 1934–June 30, 1937
George Henry Payne	July 11, 1934–June 30, 1943
Hampson Gary	July 11, 1934–Dec. 24, 1934
*Anning S. Prall	Jan. 17, 1935–July 23, 1937
T. A. M. Craven	Aug. 25, 1937–June 30, 1944
*Frank R. McNinch	Oct. 1, 1937–Aug. 31, 1939
Frederick I. Thompson	Apr. 13, 1939–June 30, 1941
*James Lawrence Fly	Sept. 1, 1939–Nov. 13, 1944
Ray C. Wakefield	Mar. 22, 1941–June 30, 1947
Clifford J. Durr	Nov. 1, 1941–June 30, 1948
**Ewell K. Jett	Feb. 15, 1944–Dec. 31, 1947
*Paul A. Porter	Dec. 21, 1944–Feb. 25, 1946
*Charles R. Denny	Mar. 30, 1945–Oct. 31, 1947
William H. Wills	July 23, 1945–Mar. 6, 1946
*Rosel H. Hyde	Apr. 17, 1946–
Edward M. Webster	Apr. 10, 1947–
Robert F. Jones	Sept. 5, 1947–Sept. 19, 1952
*Wayne Coy	Dec. 29, 1947–Feb. 21, 1952
George E. Sterling	Jan. 2, 1948–Sept. 30, 1954
Frieda B. Hennock	July 6, 1948–June 30, 1955
Robert T. Bartley	Mar. 6, 1952–
Eugene H. Merrill	Oct. 6, 1952–Apr. 14, 1953
John C. Doerfer	Apr. 15, 1953–
Robert E. Lee	Oct. 6, 1953–
*George C. McConnaughey	Oct. 4, 1954–
Richard A. Mack	July 7, 1955–

*Served as Chairman.
**Served as Interim Chairman.

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