TWELFTH ANNUAL REPORT

FEDERAL COMMUNICATIONS COMMISSION

FISCAL YEAR ENDED JUNE 30, 1946

(With Notation of Subsequent Important Developments)

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(As of January 1, 1947)

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LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington 25, D. C., Feb. 8, 1947.

To the Congress of the United States:

The Twelfth Annual Report of the Federal Communications Commission is submitted herewith in compliance with section 4 (k) of the Communications Act.

While this report primarily covers the fiscal year ended June 30 last, certain subsequent developments are mentioned in the introductory summary so that the Congress may be more currently informed.

The return of peace has aroused an unprecedented interest in electrical communications that has taxed the limited funds and personnel of the Commission. The showing made has largely been made possible by extraordinary ingenuity and effort on the part of employees in all levels.

Respectfully,

CHARLES R. DENNY, *Chairman.*

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INTRODUCTORY SUMMARY

HIGHLIGHTS OF FISCAL YEAR ENDED JUNE 30, 1946

Assisting in the reconversion and expansion of the Nation's electrical communications engaged the major attention of the Federal Communications Commission during the fiscal year ending June 30, 1946.

Construction for civilian purposes having been virtually halted during the war, applications to build facilities in the existing systems or in new systems reached an all-time high.

Expansion in the broadcast services as shown at the fiscal year's end: Standard: 961 existing stations, 254 construction permits issued, 659 applications pending; frequency modulation (FM): 55 existing stations, 456 construction permits or conditional grants issued, 250 applications pending; television: 6 existing stations, 24 construction permits issued, 40 applications pending.

Several hundred of the applications were in conflict with one or more applications or existing stations and were designated for hearing.

Authorizations were granted for the construction of 3,000 miles of telephone cable, 16,500 miles of coaxial cable, and 12,200 miles of open wire. Western Union launched an extensive modernization program.

Actual construction of facilities authorized by the Commission, as well as related construction such as radio receivers, was seriously handicapped by shortages of materials.

Many new services were either authorized or actually got under way during the year. Radio to supplement rural wire telephone service and for taxicabs, trucks, private autos, busses and similar vehicles, was authorized on an experimental basis. Several companies were granted authority to experiment with microwave radio relay systems. The Commission began issuing experimental licenses for radar on merchant ships to test its value in promoting the safety of life and navigation at sea. To meet the demands of sharply expanded air traffic, the entire domestic aviation communication system is being revised. The railroad radio service, after several years of experimentation, and after a comprehensive investigation by the Commission, was authorized as a regular service. Most of these new services were made possible by wartime technical developments which permit use of the shorter waves in the radio spectrum.

The Nation's 60,000 amateurs, who had been silenced during the war, were permitted to return to the air.

An all-time peak of 8,000 merchant ships were licensed. The number of police radio stations, some having as many as 200 transmitters, rose to 2,800.

As one step in its effort to provide standard broadcast service to some 21,000,000 Americans who are not now being satisfactorily served, the Commission began a series of hearings to determine what changes if any should be made in the present policies on allocation of clear channels.

On March 7, 1946, the Commission issued a report, "Public Service Responsibility of Broadcast Licensees," which dealt with the problem

of improving broadcast service. It announced that thereafter, in issuing and renewing licenses of broadcast stations, the Commission proposed to give particular consideration to four program service factors relevant to the public interest. These are: (1) the carrying of sustaining programs, including network sustaining programs with particular reference to the retention by the licensees of a proper discretion and responsibility for maintaining a balanced program structure; (2) the carrying of local live programs; (3) the carrying of programs devoted to discussions of public issues; and (4) the elimination of advertising excesses.

After granting Western Union a 1-year rate increase to offset an anticipated loss of about $12,000,000 in 1946, the Commission concluded that the company would need substantially more revenue "if it is to continue in operation as a solvent enterprise and provide satisfactory service on a comprehensive Nation-wide basis."

HIGHLIGHTS OF ACTIVITIES JUNE 30, 1946, TO JANUARY 1, 1947

A public utility radio service was authorized August 12 for power, transit, and petroleum pipe-line companies. As of December 9, reassurance was given that taxicab and truck radio services will be established after further experimentation. Proposed rules and regulations governing diathermy and industrial heating equipment were the subject of a hearing which began December 18 and, on December 26, a frequency was assigned for the immediate use of these devices.

A revised part 1 of the Commission's Rules and Regulations relating to organization, practice, and procedure was published September 4.

Beginning August 16, when it outlined procedure in processing broadcast applications, the Commission at intervals published status lists of pending AM, FM, and television cases.

An order of July 18 withholds until June 30, 1947, assignment of one out of every five Class B, FM channels, and a tentative allocation plan was announced September 3.

On December 9 the United States Supreme Court upheld the right of the Commission to deny renewal of license to WOKO, Albany, N. Y. (mentioned elsewhere in this report).

Petition of the Columbia Broadcasting System seeking authorization of commercial color television was heard by the Commission en banc throughout the week of December 9, and continued into the new year.

An order of December 27 granted Western Union a supplemental rate increase of slightly more than 9 percent. This was accomplished by replacing the 10-percent increase of June 12 with a 20-percent increase. Meanwhile, on September 25, the Commission suspended, until additional funds are obtainable, its special telegraph investigation ordered June 4.

On November 27, a hearing was ordered in the matter of service and frequencies used in radiotelegraph communication between the United States and foreign points.

Acting Chairman Charles R. Denny was appointed Chairman by the President on December 4.

The period since the close of the last fiscal year saw intensive effort to reduce paper work and simplify procedures wherever possible. Forms have been shortened and, in some cases, applications are repro-

duced as part of the license. Also, arrangements were made to issue aviation radio licenses at airports. Other short cuts include renewing special temporary authorizations without issuing new documents, accepting single application where the licensee holds several non-broadcast licenses, eliminating oath requirements for some reports and forms, abandoning fingerprints and proof of citizenship for operators, relinquishing permit requirements for operators of some classes of mobile transmitters, and authorizing use of mobile transmitters in specified numbers instead of individually.

Since the close of the war, more than 200,000 applications covering 40 categories of radio service have been received, and nearly 200,000 authorizations issued. The result is that, at the close of the calendar year 1946, the total number of licensees and permittees was nearing 530,000. During the same period, more than 27,000 pages of tariff filings were received.

CHAPTER I

General

CHAPTER I—GENERAL

1. ADMINISTRATION

The Commission continued to function as a unit, directly supervising all activities, with delegations of responsibility to committees of Commissioners, individual Commissioners, and the Administrative Board. The Commission itself made all policy determinations.

2. COMMISSION MEMBERSHIP

Paul A. Porter relinquished the chairmanship of the Commission on February 28, 1946, to accept Presidential appointment as Administrator of the Office of Price Administration. On the following day the President designated Charles R. Denny as Acting Chairman. Commissioner William H. Wills died on March 6 of that year and, on April 17, Rosel H. Hyde, then General Counsel of the Commission, was sworn in as his successor. On June 15, 1946, the Senate confirmed the renomination of Commissioner Paul A. Walker for another 7-year term.

3. STAFF ORGANIZATION

The Commission's operating organization consists of four departments—Engineering Department, Accounting Department, Law Department, and Secretary's Department (formerly the Office of the Secretary) augmented by four staff service units—a Rules Committee, a Personnel Division, a Budget and Planning Division, and an Office of Information. The Administrative Board, consisting of the General Counsel, Chief Engineer, Chief Accountant, and Secretary of the Commission, was scheduled to be deactivated and its powers delegated to the heads of the respective departments subject to Commission supervision.

Reorganization of the Engineering Department in November-December of 1945, created four branches—Broadcast, Safety and Special Services, and Field and Research. Two new divisions were added to the last mentioned. One, the Frequency Service Allocations Division, makes service allocation of radio frequencies. The Chief of this division represents the Commission on the Interdepartment Radio Advisory Committee, and his division is responsible for maintaining the IRAC secretariat. The other addition is the Laboratory Division, which investigates civilian uses of new devices, conducts wave propagation and allocation studies, develops new monitoring equipment, and tests transmitters for type approval.

4. PERSONNEL

At the close of the fiscal year, the Commission personnel totaled 1,345, of whom 853 were in Washington and 492 in the field. The Engineering Department numbered 727 employees, Accounting 163, Law 111, and 344 were engaged in administrative duties. The Foreign Broadcast Intelligence Service, which numbered 219 employees, was discontinued as a Commission activity on December 30, 1945.

5. APPROPRIATIONS

The Commission received appropriations totaling $5,489,900 during the fiscal year. Of this amount, $662,421 was for the Foreign Broadcast Intelligence Service.

6. LEGISLATION

The only amendment to the Communications Act during the fiscal year was enactment of the Lea-Petrillo bill (Public No. 344, 79th Cong.) which added a new section (506) to title 5 entitled "Coercive Practices Affecting Broadcasting." It prohibits anyone from forcing broadcast stations to add unnecessary employees to pay multiple compensation, to refrain from broadcasting noncommercial or foreign-origin programs, and to pay tribute for or interfere with their use of recordings and transcriptions. Penalties are provided.

7. LITIGATION

Three cases involving the Commission were before the United States Supreme Court during the fiscal year. In one case the Commission was reversed, and its decision was sustained in another. The third case was still pending.

Five cases were before the Court of Appeals for the District of Columbia. One was dismissed on motion of the appellee after the Supreme Court reversed the lower court decision and upheld the Commission, and Commission action was reversed in another. The other three cases were pending.

Of three cases filed in Federal district courts, judgment for the Commission was rendered in one case and the other two were awaiting decision.

Of particular interest were the following Supreme Court cases:

United States et al. v. *New York Telephone Co.*—The Commission appealed from dismissal of its motion for summary judgment and issuance of an injunction setting aside the Commission's order by the statutory three-judge court convened pursuant to section 402 of the Communications Act. (*New York Telephone Co.* v. *United States et al.*, 56 F. Supp. 932.) The Supreme Court affirmed the Commission's order of December 14, 1943, which required the New York Telephone Company to make certain adjustments in its accounts. These adjustments related to certain transactions under which the New York Telephone Co. acquired from the American Telephone & Telegraph Co. properties at a price in excess of original cost less accrued depreciation. The New York Telephone Co. entered in its books the prices charged to it by the present corporation. The Commission disapproved this accounting, holding that in transfers of property between parent and affiliate, the book figures of the former should have been used by the affiliate. The Supreme Court, in reversing the lower court decision, upheld this position of the Commission. (*United States et al.* v. *New York Telephone Co.*, 326 U. S. 638).

Ashbacker Radio Corp. v. *United States.*—The Supreme Court reversed an action by the Court of Appeals for the District of Columbia dismissing an appeal by the Ashbacker Radio Corp. under section 402 (b) (2) of the Communications Act because of an alleged lack of jurisdiction. Ashbacker had appealed denial of its petition for hearing, rehearing and other relief directed against the grant without hearing of an application filed by the Fetzer Broadcasting Co. for authority to construct a new standard broadcast station, mutually exclusive with an application filed by Ashbacker to change the operating frequency of its existing station. The Commission, after comparative consideration of both applications, had granted the Fetzer application and on the same day had designated the Ashbacker application for future hearing. The Supreme Court held that under the facts in the case and the applicable provisions of the Communications Act the Fetzer application could not properly be granted without first having afforded Ashbacker an opportunity for hearing upon its pending application. (*Ashbacker Radio Corp.* v. *United States*, 326 U. S. 327.)

WOKO, Inc. v. *Federal Communications Commission.*—This action involved an appeal by the licensee to set aside an order of the Commission denying renewal of its broadcast station license. The Commission based its decision on the licensee's failure to furnish true information concerning the ownership of 24 percent of the stock in the licensee corporation and its falsification of information submitted to the Commission concerning the ownership of such stock. The licensee's course of misrepresentation and concealment for a period of

approximately 18 years evidenced to the Commission a lack of the qualifications required of a licensee to operate a station in the public interest. The Circuit Court of Appeals for the District of Columbia reversed the Commission primarily on the ground that such action, without a consideration of other factors such as the need for the broadcast service and loss of invested capital which the licensee might incur, was beyond the scope of Commission authority. The Commission's petition for a writ of certiorari to review the lower court decision was granted by the Supreme Court on April 22, 1946. (*WOKO, Inc.* v. *Federal Communications Commission*, 153 F. 2d 623.)

8. PUBLIC SERVICE RESPONSIBILITY OF BROADCAST LICENSEES

On April 10, 1945, the Commission announced a policy of "a more detailed review of broadcast station performance when passing upon applications for license renewals." At the same time, it instituted a study of the subject which culminated in its unanimous adoption, on March 7, 1946, of a report on "Public Service Responsibility of Broadcast Licensees," in which the Commission observed:

> Primary responsibility for the American system of broadcasting rests with the licensee of broadcast stations, including the network organizations. It is to the stations and networks rather than to Federal regulation that listeners must primarily turn for improved standards of program service. The Commission, as the licensing agency established by Congress, has responsibility to consider over-all program service in its public interest determinations, but affirmative improvement of program service must be the result primarily of other forces.

However, the Commission concluded:

> While much of the responsibility for improved program service lies with the broadcasting industry and with the public, the Commission has a statutory responsibility for the public interest, of which it cannot divest itself. The Commission's experience with the detailed review of broadcast renewal applications since April 1945, together with the facts set forth in this report, indicate some current trends in broadcasting which, with reference to licensing procedure, required its particular attention.

Therefore, in issuing and renewing the licenses of broadcast stations of all types, the Commission proposed to give particular consideration to four program factors: (1) The carrying of sustaining programs, including network sustaining programs, with particular reference to the retention by licensees of a proper discretion and responsibility for maintaining a well-balanced program structure; (2) the carrying of local live programs; (3) the carrying of programs devoted to the discussion of public issues, and (4) the elimination of advertising excesses.

9. MONOPOLY

Following public hearings, the Commission ordered reservation, until June 30, 1947, of one out of every five Class B (metropolitan, to the inclusion of rural) FM channels tentatively allocated for various areas throughout the United States. Besides insuring an equitable distribution of FM frequencies and offering opportunity for late comers to enter the field, this policy is in line with recommendations of the Senate Small Business Committee to preclude monopolistic tendencies in this new type of broadcast.

The Commission's multiple ownership regulations, which stem largely from the 1940 report on its chain-broadcasting inquiry, remained unchanged in their effect on standard, FM and television commercial program service. In general, there is a ban on operation of more than one station in either category by the same interest or group in the same area, except under unusual circumstances. There is no set maximum for the number of standard stations operated by the same interest in the country as a whole. However, because of the competitive factor and other considerations, the Commission has denied a network authority to acquire another station to an already considerable list. The maximum number of FM stations which can be operated in the country as a whole by the same individual or concern is six, and for television stations, five. In developing FM, the Commission started off with a "one-to-a-customer" policy but, as more applications were received, this was increased to two, then three, particularly when it meant bringing FM to communities not previously served.

10. FREQUENCY SERVICE-ALLOCATIONS

Before the war, the usable portion of the radio spectrum extended from 10 kilocycles to about 300 megacycles. As a result, there was congestion in bands assigned to certain services. However, the war's electronic and other developments not only made higher frequencies potentially useful but also evolved apparatus to use them. Consequently, in 1945 it was considered practicable to extend the radio "ceiling" to 30,000 megacycles (30,000,000 kilocycles).

The Commission has since made allocations throughout this augmented radio spectrum to enable established services to expand and to accommodate new services. For more effective use of the lower part of the spectrum, encouragement was given to transfer of services from medium and high frequencies to the "very high" (30 to 300 megacycles), the "ultra-high" (300 to 3000 megacycles), or "super-high (3000 to 30,000 megacycles), with suitable provision for postwar application of radar.

Standard (AM) broadcasting, having developed between 550 and 1600 kilocycles, continues in that band, with proposal to add the 540 kilocycle channel if possible. Above 30 megacycles, television broadcasting is provided between 44 and 216 megacycles, together with an experimental allocation for this service between 480 and 920 megacycles; frequency modulation (FM) broadcasting is allocated between 88 and 108 megacycles, while experimental facsimile broadcasting uses 106–108 and 470–480 megacycles, the former being shared with FM.

The other spectrum between 30 and 30,000 megacycles is divided between Government and non-Government services and labeled "fixed and mobile" so as to provide flexibility in effecting future frequency assignments.

The Commission's proposal of May 21, 1945, for frequency service-allocations below 25,000 kilocycles was the subject of oral argument on the following June 22. During the fiscal year the evidence presented in this docket case (No. 6651) was studied and the Commission, in collaboration with the Interdepartment Radio Advisory Committee, reviewed particular problems in this portion of the radio spectrum.

Implementation of the Commission's report of frequency service-allocations above 25,000 kilocycles proceeded as quickly as possible, consistent with the availability of radio equipment capable of civil use and standardization of devices likely to be used on a world-wide basis, such as altimeters, distance indicators and instrument landing equipment for airplanes flying international air routes, radar beacons and other radio aids to air and marine navigation. The nonavailability of suitable equipment has delayed utilization of some of the bands provided for the non-government services.

11. INTERNATIONAL

An agreement between the United States and the United Kingdom permits the interim use of the 200 megacycle British distance indicator at United States gateways until January 1, 1949. Thereafter, the use of this device will no longer be permitted in this country. The agreement was effected in order to preserve our important frequency allocations which conflict with those required by the British distance indicator. As a further result of this agreement, a program with the objective of developing a 1,000-megacycle distance indicator for aircraft was agreed upon, and several manufacturing concerns are engaged in producing it.

The Commission was represented at the Third Inter-American Radio Conference at Rio de Janeiro, Brazil, in September 1945, which drafted a new Inter-American Telecommunications Convention. This session studied various technical proposals for the next World Telecommunications Conference, including United States proposal for revision of the international frequency service-allocation table. General reaction to it by the participating governments was favorable.

Commission representatives served as United States delegates to an International Meeting on Radio Aids to Marine Navigation (IMRAMN) at London during May 1946, convened for studying electronic devises developed for this purpose in the United Kingdom and other countries. This meeting disclosed that most of the marine radio navigational aids which appear likely to be standardized internationally are provided for in the Commission's frequency service-allocation proposals. The actual choice of particular competitive devices has not been determined finally at the international level, but the United States frequency service-allocation proposals provide for medium frequency loran (long range navigation) as an aid to long-distance navigation, a system of radio beacons in the medium frequency range used in conjunction with shipboard direction finders as a medium distance aid, and shipboard radar with its associated shore beacons for short distance assistance. The shore facilities in the case of all three of these aids are operated by the United States Coast Guard.

In preparation for the World Telecommunications Conference, the Commission not only arranged to provide delegates to that session, and to the preliminary technical conference, but undertook a comprehensive study of records of frequencies transmitted and received by radio stations in the United States and its possessions. The latter undertaking is expected to result in a system which will more adequately meet the requirements imposed upon the Commission by the occupancy of the heretofore little used portion of the spectrum above

40 megacycles, and to also furnish these conferences appropriate frequency data on United States stations.

12. INTERDEPARTMENT RADIO ADVISORY COMMITTEE

The IRAC approved 2,738 new regular frequency assignments and 1,904 deletions of regular assignments, bringing the total number of assignments recommended since its establishment to 43,101. Outstanding regular assignments now total 34,674. During the year the Committee approved 302 changes in assignments, 3,629 temporary assignments, and 350 deletions of temporary assignments, which are not included in the above figures. A total of 9,230 applications and requests was processed by the Committee.

13. FIELD ACTIVITIES

RECONVERSION FROM WAR TO PEACE

As previously reported, a Foreign Broadcast Intelligence Service, created by the Commission for emergency purposes, monitored and analyzed foreign broadcasts for military and other Government agencies while the Radio Intelligence Division guarded against enemy transmission in this country and helped furnish bearings to our aircraft. The FBIS was absorbed by the War Department in December of 1945, but the RID continued to monitor the ether for illegal transmission.

RADIO INTELLIGENCE DIVISION

The Radio Intelligence Division closed the fiscal year with 11 primary monitoring stations and 25 secondary monitoring stations in operation. In maintaining surveillance over the channels of radio communications, it located 117 illegal radio stations. In addition, it aided both Government and industry in tracing sources of interference to radio transmission. Emergency direction finding service was rendered both military and civilian aircraft, and 137 "fixes" supplied to planes requiring such assistance.

Plans were in progress at the end of the fiscal year to merge Radio Intelligence Division and the Field Division into a Field Engineering and Monitoring Division for peacetime functioning.

FIELD DIVISION

Strategically located throughout the United States, including Alaska, Honolulu, and Puerto Rico, the Field Division had 25 district offices, 2 ship offices, 8 primary monitoring stations, 1 field engineering laboratory, and 2 mobile laboratories. Their duties included inspection of radio stations, giving radio operator examinations, making various radio measurements and field-intensity recordings, and conducting related investigations.

14. BOARD OF WAR COMMUNICATIONS

The Board of War Communications (formerly the Defense Communications Board) coordinated plans for the most efficient operation of the country's radio, wire and cable facilities during the national emergency. The Acting Chairman of the Commission is also Acting Chairman of the Board which is representative of public and private interests in that field.

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In addition to assisting in the preparation of orders issued by the Board looking toward the removal or adjustment of wartime restrictions, the Commission also cooperated with the Board in resolving particular problems arising from cessation of hostilities. Various complaints relating to telephone and telegraph priorities were investigated.

CHAPTER II

Standard Broadcast

CHAPTER II—STANDARD BROADCAST

1. POSTWAR EXPANSION

The first postwar year found the broadcast industry, in common with other business, faced with innumerable reconversion problems. The increased demand for standard broadcast facilities on the part of present and prospective licensees taxed the ability of the Commission's limited staff.

An additional workload was imposed by the necessity for carrying on extensive engineering investigations required in connection with the clear channel hearing. The monumental task of collecting and analyzing data needed for the revision of allocation standards would have been impossible without the extensive cooperation of the industry itself, but in spite of the work by engineers furnished by the industry, it has been necessary to keep a Commission staff devoted exclusively to work on matters pertaining to that hearing.

The expiration of the North American Regional Broadcasting Agreement (NARBA), in March of 1946, required investigation of an interim arrangement for cooperation between the North American countries, and such an agreement was consummated at Washington after a conference with members of the State Department, industry engineers, and attorneys and representatives of the foreign governments concerned.

2. APPLICATIONS

On August 7, 1945, the Commission removed wartime restrictions on the use of material and equipment for broadcast station construction and announced that, beginning October 7, it would resume normal

consideration of applications for new stations and changes in existing stations. This action prompted an unprecedented number of requests for construction permits.

At the end of the war there were approximately 319 applications pending for new standard broadcast stations or for major alterations in existing stations. At the time of the August 7, 1945, announcement it was thought that, after a peak in the number of requests by those who had deferred filing applications because of the wartime restrictions had been reached, a subsequent decline would follow. On the contrary, the demand for standard broadcast facilities has remained at approximately the same level and, if anything, has increased from month to month. The increased workload is reflected in the following table:

	Licensed stations	Outstanding construction permits for new stations	Total stations authorized
June 30, 1945	931	24	955
Aug. 7, 1945	936	25	961
June 30, 1946	961	254	1,215

At the close of the fiscal year, applications for a new stations or major changes in existing stations were being handled at the rate of approximately 100 a month. Applications continued to be filed at approximately the same pace. In addition to the work in processing applications, the duties of the Hearing Section have been amplified to a corresponding degree. Approximately 529 applications in hearing status remained to be disposed of.

3. CLEAR CHANNEL HEARING

The general public hearing to determine what changes, if any, should be made in present policies on allocation of clear channels in the standard broadcast band was in progress during the fiscal year, the first session being held for 2 weeks beginning January 14, 1946, with another session in April, and a third session in July.

More than 4,000 pages of testimony and over 300 exhibits are involved. Extensive cooperation with industry engineers was obtained in research and analysis leading to new knowledge of the signal intensities required and obtainable for service. In addition, information as to the present coverage of all standard broadcast stations, which was considered fundamental to a proper decision on the issues of the hearing, was prepared with industry engineers, and freely exchanged between the interested parties to the hearings. Approximately 600 man-days were spent by industry engineers working in the Commission's offices, at no expense to the Government, in preparation of part of this basic study, and at least as much time was spent by industry engineers in their own offices on the remainder of the project.

4. CHANGES IN STANDARD BROADCAST POLICY

Significant changes during the year in Commission policy affecting standard broadcast may be summarized as follows:

(1) Order 107, requiring the operation of standard broadcast stations with reduced power in order to conserve tubes and other equipment, rescinded August 1, 1945.

(2) Order 94–A, providing for relaxation of the minimum operating schedule, rescinded May 9, 1946.

(3) Order 91–C, relaxing operating requirements, rescinded effective August 1, 1946.

(4) Policy statement of February 1, 1946, dismissing applications in direct conflict with sections 3.2, 3.22, and 3.25 (a) of Commission's rules.

(5) Policy statement of June 21, 1946, placing certain class of applications for operation on clear channels, in pending file and deferring action thereon until close of clear channel hearing.

(6) Policy statement of August 9, 1946, placing all applications involving use of 770 and 1030 kilocycles, in pending file and deferring action thereon until the close of clear channel hearing.

5. INTERNATIONAL

Study was continued by industry, the Department of State and the Commission on United States' proposals for a revision of the International Telecommunications Convention, as well as the annexed General Radio Regulations. Proposed revision of article 7 of the General Radio Regulations to enlarge the standard broadcast band to include 540 kilocycles will be considered at the world conference, on which a preliminary five-power meeting in Moscow was scheduled in the fall of 1946.

The third Inter-American Radio Conference at Rio de Janeiro in September 1945 included proposal to allocate frequency bands of 535 to 1605 kilocycles for broadcasting only.

On January 4, 1946, a public meeting was held looking toward a North American Regional Broadcasting Engineering Conference to continue the terms of NARBA, which expired March 29, 1946, and to consider certain Cuban demands for additional broadcast facilities, made at the Rio de Janeiro Conference, affecting nine United States Class I–A channels. On February 4, 1946, the North American Regional Broadcasting Engineering Conference was convened in Washington. On motion of Cuba, the name was changed to the Second North American Regional Broadcasting Conference.

During this session, Cuba made demands on United States clear channels which provoked considerable discussion. The matter was resolved when the Bahama Islands relinquished their use of 640 kilocycles in Cuba in exchange for 1540 kilocycles on which the United States obtaned Class I–A privilege but which was, in turn, granted to the Bahamas subject to certain experimentations and the possible use of another frequency to be suggested by the United States.

The final agreement, signed on February 25, 1946, is known as the Interim-Agreement (Modus Vivendi). It extended for a period of 3 years the provisions of the NARBA except as modified; outlined procedures for the exchange of proposals looking toward a new NARBA; set the date of September 15, 1947, for a third conference to be convened in Canada; established a North American Regional Broadcasting Engineering Committee which, for the first known time in radio history, authorizes engineers of one country to make engineering investigations of the facilities of another country; and granted eight special Class II assignments on Class I–A clear channels.

The eight special Class II assignments given Cuba on regional channels were made within the existing provisions of the NARBA. Of the 10 assignments on Class I–A channels, five United States frequencies were affected— 850 kilocycles, which had been broken down by the Bahamas; 670 and 890 kilocycles, which had not previously been used by any other nighttime stations; and 830 kilocycles on which there is a Mexican nighttime assignment previously made at the Washington Engineering Meeting, January 1941. Haiti was not represented at this conference nor did it sign the final agreement.

Following the Second NARBA Conference, Mexico and Cuba undertook to modify or enlarge their agencies concerned with standard broadcast as evidenced by their increased interest in United States assignment affecting these two countries. Mexico deleted outstanding notifications not in operation and removed two high power stations (XERP and XEAW) from the Mexican-United States border.

Canada, prior to the lifting of the freeze order on United States applications, made assignments for 30 odd new or increased facilities.

In general, the trend of foreign assignments was to increase existing facilities and where possible, with the exception of Canada, to make new assignments not requiring directional antennas.

6. FINANCIAL DATA

Standard broadcast income figures for the calendar year 1945, while showing larger gross revenues, indicated that increased expenses had reduced the net income of networks and station groups below that of 1944.

The following comparison is based upon reports by 4 major and 6 regional networks and 901 stations in 1945 and 4 major and 5 regional networks and 875 stations the year previous:

Standard broadcast

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Networks and standard stations:			
Investment in tangible broadcast property:			
Original cost	$88,101,940	$82,997,650	6.15
Depreciation to date under present owner	46,506,921	42,445,377	9.57
Depreciated cost	41,595,019	40,552,273	2.57
Revenues from sale of network time	133,973,536	129,369,501	3.56
Revenues from sale of nonnetwork time	176,510,510	158,273,246	11.52
Commission's paid representatives, etc	43,923,466	41,303,215	6.34
Revenues from sale of talent, etc	32,777,553	28,959,079	13.19
Total broadcast revenues	299,338,133	275,298,611	8.73
Total broadcast expenses	215,753,845	185,025,760	16.61
Broadcast service income [1]	83,584,288	90,272,851	(7.41)

See footnote at end of table.

Standard broadcast—Continued

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Newworks and their 10 key stations:			
Revenues from time sales	$68, 669, 076	$63, 656, 085	7.88
Revenues from sale of talent, etc	16, 482, 799	15, 374, 364	7.21
Total broadcast revenues	85, 151, 875	79, 030, 449	7.75
Total broadcast expenses	67, 001, 351	58, 746, 703	14.05
Broadcast service income [1]	18, 150, 524	20, 283, 746	(10.52)
Standard stations, excluding 10 key stations of networks:			
Clear channel 50 kilowatts:			
Total broadcast revenues	1, 219, 715	1, 157, 770	5.35
Total broadcast expenses	761, 385	661, 523	15.10
Broadcast service income [1]	458, 330	496, 247	(7.64)
Clear channel 5 to 20 kilowatts:			
Total broadcast revenues	438, 564	421, 803	3.97
Total broadcast expenses	336, 618	292, 269	15.17
Broadcast service income [1]	101, 946	129, 534	(21.30)
Regional:			
Total broadcast revenues	328, 594	307, 493	6.86
Total broadcast expenses	221, 651	193, 113	14.78
Broadcast service income [1]	106, 943	114, 380	(6.50)
Local:			
Total broadcast revenues	94, 374	84, 282	11.97
Total broadcast expenses	71, 818	60, 861	18.00
Broadcast service income [1]	22, 556	23, 421	(3.69)
Number of employees of networks and standard stations (as of Dec. 31)	37, 757	34, 281	10.14
Total compensation for the year	116, 267, 274	99, 773, 425	16, 53

[1] Broadcast revenues less broadcast expenses before Federal income tax.

7. STATISTICS

As of June 30, 1946, there were 961 regularly licensed standard broadcast stations, or 30 more than reported in 1945. However, outstanding construction permits for new stations numbered 254, and 680 applications were pending. Only 4 standard broadcast stations were deleted during the year.

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CHAPTER III

Nonstandard Broadcast

CHAPTER III—NONSTANDARD BROADCAST

1. FREQUENCY MODULATION (FM) BROADCAST

Rapid postwar expansion of FM broadcasting is indicated in the mounting number of authorizations and applications for this new medium of program service.

Removal of the wartime "freeze" on construction enabled the Commission to consider an accumulation of about 600 applications for commercial FM stations. Since most of these had been filed under the old rules and needed additional information, the Commission expedited matters by making conditional grants subject to later approval of engineering and other details. The first group of FM grants on this basis was announced in October of 1945.

The result was that the 48 FM broadcast stations functioning at the close of the war began to be augmented as quickly as materials and personnel could be obtained. At the close of the fiscal year, 55 FM stations were serving 32 cities and surrounding rural areas, 456 new stations had received initial authorizations, and some 250 applications were pending.

Because of reconversion problems, the Commission permitted low-power units to be used by stations while new equipment was being manufactured. At the request of the Senate Small Business Committee, the Commission made a survey of probable prices and delivery

dates for principal items of equipment for FM stations. The results were summarized in a Commission release in December 1945 and later appeared in a booklet issued by the Committee as an aid to those interested in entering this field.

During frequency allocation hearings in the previous fiscal year, FM received important consideration. This service had started on the 42–50 megacycle band, but troublesome sky-wave interference developed. "Public interest," pointed out the Commission, "requires that FM be established in a permanent place in the radio spectrum before a considerable investment is made by the listening public in receiving sets and by the broadcasters in transmitting equipment." Accordingly, in June of 1945, the Commission allocated the band 88 to 106 megacycles for FM, including 70 channels for commercial FM service and 20 channels for noncommercial educational FM broadcast. In addition, the band 106–108 megacycles (10 channels) was made available to facsimile with provision that it might later be utilized by FM.

In January of 1946, the Commission heard a petition requesting restoration of the old FM band. Upon analyzing the testimony and data, the Commission concluded that the use of two bands for FM broadcasting was undesirable, that interference would continue to be a serious problem on the old band, and that an excellent FM service would be provided in the high band. Accordingly, stations on the 42–44 megacycle band were given until January 1, 1947, to make the transition.

During the summer of 1945, the Commission held conferences and hearings to determine what changes were desirable for FM, and these were incorporated in new rules and engineering standards adopted the following August and September. Channel and power assignments were made in the new band, with provision for use of interim equipment until full construction authorized by the new assignment could be completed. Having thus encouraged early commencement of this new service, the Commission in July of 1946 warned that if grantees and permittees were not diligent in getting started they would be subject to hearing to determine whether their grants should be cancelled.

At the beginning of 1946 it was estimated that about half a million FM receivers (most of them capable of receiving standard broadcast) were in use. A Commission survey in February indicated that only 9 percent (1,800,000 sets) of the contemplated 1946 receiver production would include FM. Accordingly, manufacturers were urged to provide a greater percentage of sets capable of receiving the new service.

Equitable distribution of FM facilities was provided in a tentative Nation-wide allocation plan for the 60 metropolitan and rural channels. This was used as a basis in making assignments and in designating for hearing applications for areas where the number of requests exceeded the number of available channels.

In May 1946 the Commission announced proposed rules reducing the then three classes of FM stations to two, to be termed Class A (formerly community) and Class B (formerly metropolitan and rural), which were adopted in July.

Following a hearing in July 1946 on requests for reservation of FM channels, the Commission announced that it would reserve, until June 30, 1947, every fifth channel in cities or areas where five or more Class

B channels were tentatively allocated. No allocation plan or reservation policy applies to the 20 Class A channels, and it is expected that these channels will be available indefinitely for all but the most congested areas.

2. TELEVISION BROADCAST SERVICE

When the return of peace permitted consideration of new radio station construction, 158 requests for commercial television facilities awaited Commission action. Most of these applications were incomplete and none could be processed until new rules and regulations and engineering standards had been formulated and adopted.

Between VJ–day and December of 1945, the Commission's staff and representatives of the television industry cooperated in providing a television station assignment plan which, through equitable distribution of facilities throughout the country, assures the most efficient use of the 13 channels between 44 and 216 megacycles allocated to this type of broadcast. This joint effort culminated in the adoption, in November and December 1945, of new rules and engineering standards calculated to aid the development of commercial television service.

There was some difference of opinion in the industry as to whether postwar television emphasis should be placed on experimentation in the higher frequencies above 480 megacycles, where wider channels are available for color and for black-and-white pictures of greater detail, or whether television should proceed with monochrome in the lower frequencies (44–216 megacycles).

The industry had urged that television channels be shared with several low-power services in the special and emergency fields. In the early months of 1946 considerable attention was given to a plan for the shared use of television channels by other services. However, due to the incomplete information available on the needs and character of the proposed sharing services, a satisfactory arrangement had not been evolved by the end of the fiscal year.

Six television stations were on the air during the war. Between December 1945 and March 1946, they changed channels to conform with the allocations set forth in the Commission's new rules and regulations.

Of the 158 applications for new television stations on file at the end of the war, approximately 80 were subsequently withdrawn. The reasons given were either a desire to wait for color television or that television required a greater capital outlay than the applicants had anticipated.

Sixty-five other applications were for facilities in 11 metropolitan districts where the number of requests exceeded the channels allocated. These were designated for hearing. By the end of the fiscal year substantially all such hearings had been concluded, or hearings were made unnecessary by application withdrawals or by reason of channels being found to accommodate the remaining applicants.

By May of 1946, a considerable number of applications not subject to hearing had been brought into conformity with the new rules and engineering standards so that by the end of the fiscal year there were 24 construction permits outstanding and 40 more applications were being processed.

Television development was aided during the year by further extension of the coaxial cable system of the American Telephone & Telegraph Co. A network video program on Lincoln's Birthday in 1946 was made possible by completion of the New York-Washington section of this cable. New radio relay devices also offer possibility of carrying television programs far from their place of origin. Meanwhile, attention is being given to the possibility that television, as well as facsimile, may some day be linked with telephony so that parties to telephone conversations may see as well as hear.

3. INTERNATIONAL BROADCAST SERVICE

During the fiscal year all international broadcast stations continued to be programmed and operated by the Federal Government. This direction was assumed by the Office of International Information and Cultural Affairs of the Department of State when it absorbed elements of the Office of War Information and the Office of Inter-American Affairs which controlled these stations during the war.

Cessation of hostilities enabled six transmitters leased from common carriers to be returned to their former uses. Simultaneolsly, program hours were reduced on the remaining 37 transmitters and the program emphasis shifted from psychological warfare to troop entertainment and news. Even with the reduced number of transmitters an acute shortage of frequencies still exists in this service, requiring the continuation of broadcasting on frequencies formerly assigned to other services.

In the closing months of the year, meetings of the Security Council, the Economic and Social Council, the Atomic Energy Commission, and the Health Commission of the United Nations were broadcast, as well as commentary and summaries of United Nations proceedings in French and English. Three transmitters were devoted to speeding this material to listeners in many nations, and the programs were rebroadcast by several domestic standard broadcast stations.

4. NONCOMMERCIAL EDUCATIONAL BROADCAST SERVICE

Noncommercial educational broadcast stations are licensed principally to school systems and universities for furnishing educational programs to units in a school system, as well as educational and entertainment programs to the public. Twenty channels have been allocated for this service (88–92 megacycles) as a part of the FM broadcast band.

The 6 licensed stations are presently employing equipment in the old noncommercial educational band of 42 to 43 megacycles preparatory to moving to the new band. A total of 24 stations had been authorized in this service by the end of the fiscal year.

Since 18 applications were pending, it appears that a much larger number will come into being next year as postwar plans of schools and universities develop. Present information indicates that most states have plans for operation of statewide FM educational networks, some of which will link state, county, and municipally operated stations to obtain wide coverage for educational FM programs.

Because noncommercial educational FM broadcast stations employ the same type of transmitting equipment used by commercial FM

stations, and since FM receivers sold to the public include both the noncommercial educational and regular commercial FM channels, equipment may be obtained more economically and the two FM services grow mutually.

5. FACSIMILE BROADCAST SERVICE

Facsimile provides for the reception of printed matter and pictures by the use of specially designed radio receivers. Operation continued on an experimental basis during the past year, and it appears that equipment and reproduction have been considerably improved. The technique has been developed to a point where print approximating the size of newspaper type can be reproduced with clarity.

Frequency allocations provide that facsimile broadcasting may be authorized on any channel within the 88–108 megacycle band as a service separate from aural broadcasting. FM stations may, of course, be authorized to transmit facsimile.

During the year three stations continued facsimile experimentation in the 25 megacycle band formerly allocated for this purpose, and several FM stations were authorized to conduct experimental facsimile transmissions on their regularly assigned FM channels. Although the band of 470 to 480 megacycles has also been set aside for experimental facsimile, no stations have as yet been authorized for this range.

No rules or engineering standards have been adopted for operation of facsimile on a regular or commercial basis, but manufacturers of facsimile equipment are now preparing recommended standards for consideration by the industry and the Commission. Uniform standards must, of course, be provided so that all facsimile broadcast stations will transmit a signal which is capable of operating facsimile reproducing equipment of any make. Upon such standardization and the promulgation of rules for this service, it is expected that facsimile broadcasting will become a very useful public service.

6. REMOTE PICK-UP BROADCAST SERVICE

Remote pick-up [formerly known as relay] broadcast stations are employed for furnishing a program circuit from pick-up points to the main station when wire circuits are not available. During the war years such equipment had limited use, but interest and activity in this service are now increasing. During the fiscal year 27 applications for such stations were granted, bringing the total number of stations authorized to 573. In July 1946 the frequency allocations for the 152–162 megacycle band were proposed, including 14 channels of 60 kilocycle width for relay broadcast use.

7. ST (STUDIO-TRANSMITTER) BROADCAST SERVICE

To provide large service areas, some FM broadcast transmitters are located on mountain tops because of the importance of antenna height to coverage. Telephone lines are not always available or adequate for program circuits, and ST broadcast stations are used for transmitting the programs from the studio to the transmitter. No new

ST stations were authorized during the year, due principally to delayed FM broadcast station construction at such locations.

Following the frequency allocation hearing, the band of 940 to 960 megacycles was allocated for this service, which subsequently was modified to 940–952 megacycles. No ST broadcast stations have as yet been constructed for use of this new band, but it is expected that a considerable number will be employed as soon as additional FM broadcast stations are placed in operation.

8. DEVELOPMENTAL BROADCAST SERVICE

Developmental broadcast stations are useful in connection with equipment development, propagation tests, and other experimentation requiring radio transmission. For example, FM broadcast transmitters and antennas are tested to compare operating characteristics with theoretical predictions. During the year some developmental broadcast stations have conducted measurements of radio wave propagation in the new FM band, employing various types of transmitting antennas. At the end of the fiscal year 34 developmental stations were authorized.

9. STATISTICS

At the close of the fiscal year there were 825 nonstandard broadcast stations, an increase of 65 over the previous year. A total of 89 new stations were added as compared with 24 deleted. The following tabulation shows these licensed stations by classes:

	As of June 30, 1945	Added	Deleted	As of June 30, 1946
High frequency (FM—commercial)	53	9	0	62
High frequency (experimental)	2	0	1	1
Television (commercial)	9	18	2	25
Television (experimental)	47	11	0	58
International	38	0	1	37
Noncommercial educational	12	12	0	24
Facsimile	3	0	0	3
Relay (high-frequency)	299	18	9	308
Relay (low-frequency)	261	9	5	265
Studio transmitter (ST)	8	0	1	7
Developmental	27	12	5	34
Class II (experimental)	1	0	0	1

CHAPTER IV

Common Carriers

1. TELEPHONE (WIRE AND RADIO)
2. TELEGRAPH (WIRE, CABLE, AND RADIO)

CHAPTER IV—COMMON CARRIERS

1. TELEPHONE (WIRE AND RADIO)

SERVICE AND FACILITIES

Construction of wire facilities.—An extensive construction program was necessary during the year to meet increasing public demand for telephone service. In addition to 16 applications on hand from the preceding year, the Commission received 253 new requests for wireline construction, acquisition, extension, and leased projects. Of this number, 249 were approved, including 239 construction applications. The increase in wire construction is indicated in these figures for the past 3 years:

Fiscal year	Projects	Cost	Miles of *cable*	Miles of *coaxial units*	Miles of *open wire*
1944	121	$9,582,239	574.8	0	7,968
1945	210	70,091,140	2,378.3	7,902	2,963
1946	239	78,896,450	3,193.8	16,580	12,261

The Bell System added approximately 2,478,000 miles of toll message channels, which increased its previous total by 22.7 percent. About 90 percent of the new channels were provided with carrier systems. The emergency type "EB" carrier systems were used to provide 800,000 channel miles.

Planned wire projects.—The American Telephone & Telegraph Co.'s program for installing 6,000 to 7,000 miles of coaxial facilities was mentioned in previous annual reports. During the year the Commission authorized construction of 2,150 route miles of coaxial cable carrying 16,780 coaxial cable miles and involving an expenditure of $41,624,000. Coaxial cables are designed for the transmission of high frequencies suitable for telephone, telegraph, radio broadcasting and television transmission.

Volume and speed of toll service.—Telephone toll traffic continued to grow to new peak levels. During the year the Bell System handled 850,000,000 toll-board calls and 669,000,000 short-haul calls. These figures represent increases over the preceding year of 16.4 and 7.7 percent, respectively. The average time required to complete toll-board calls in June 1946 was 3.2 minutes, a decrease of 0.2 of a minute compared with a year ago.

Use of recording devices.—On October 31, 1945, the Commission instituted an investigation into the use of recording devices in connection with interstate and foreign message toll service. As the result of public hearings held January 10–11, 1946, the Commission on August 6 of that year proposed the use of such devices under conditions which will assure that the parties concerned will have adequate notice that the conversation is being recorded; that this notice will be given by means of an automatic tone warning supplemented by a special directory listing, and that under such conditions there is no violation of section 605 of the Communications Act which prohibits the interception and divulgence of wire and radio communications. The Commission further decided that these devices should be physically connected to and form part of the equipment provided and serviced by the telephone companies.

Interstate and foreign telephone toll service at Maryville, Mo., and surrounding rural areas.—As the result of formation of the Nodaway Telephone Corp., which acquired properties of the Hanamo Telephone Co. and the People's Telephone Exchange, Inc., interstate and foreign telephone service is now available to the former subscribers of both companies. Consequently, the Commission dismissed its proceedings in this matter.

DOMESTIC RADIOTELEPHONE SERVICES

Service to remote communities by radio and power-line carriers.—To bring telephone service to areas where it is uneconomic or otherwise impracticable to extend wire line facilities, the Commission established, on an experimental basis, the rural radiotelephone and short distance toll radiotelephone services. The first installation in the rural service was effected by the Mountain States Telephone & Telegraph Co. at Cheyenne Wells, Colo.

Authorizations to provide experimental service in the short distance telephone service have been granted to several companies. Typically, these cover the use of radio links to supplement wire circuits through such places as Death Valley and over water areas as between Nantucket Island and the mainland.

As a further step to make telephone service available to families in rural areas, the telephone companies are testing, particularly in the area of Jonesboro, Ark., and Selma, Ala., the practicability of telephone messages "hitch hiking" over the rural electric power lines.

Mobile radiotelephone service.—In addition to a large number of construction permits for experimental facilities to operate in the urban and highway mobile radiotelephone service (see experimental radio services), the Commission granted the first license of this nature in June 1946 to the Southwestern Bell Telephone Co., permitting it to provide experimental service at St. Louis, Mo. Considerable expansion and development of the service is forecast by similar applications filed by telephone companies operating in many other cities.

Point-to-point radio relay.—The Commission authorized construction, by the American Telephone & Telegraph Co., of an experimental radio relay system between New York and Boston of a type suitable for telephone, telegraph, or television transmission. The Raytheon Manufacturing Co., International Business Machines Corp., General Electric Co., RCA Communications, Inc., and Federal Telecommunications Laboratories have been granted experimental authorizations of this type, and additional applications were pending.

Domestic program transmission service.—Press Wireless, Inc., which is engaged primarily in the handling of press traffic, was denied application to transmit program material by radio to broadcast stations in the United States.

INTERNATIONAL RADIOTELEPHONE CIRCUITS

New radiotelephone circuits were established to connect the United States with Barbados, Egypt, France, Germany, Japan, Netherlands, New Zealand, Norway, and the Philippine Islands. There was no direct radiotelephone circuit with Barbados, Egypt, New Zealand, and Norway prior to the war. New circuits were authorized between Puerto Rico and the Netherlands West Indies, and between the United States and Austria. At the close of the fiscal year, there were 9 licensed radiotelephone stations.

RATES AND TARIFFS

Rate reduction.—Following negotiations by the Commission with the American Telephone & Telegraph Co., the Bell System agreed to various rate reductions, effective February 1, 1946, which are estimated to save the public more than $20,000,000 annually. The principal reduction was in interstate rates for distances between 340 and 2,140 miles, saving users about $16,000,000 a year. In addition, reductions amounting to $1,500,000 a year were made in certain short-haul interstate toll call rates for distances under 40 miles. Reduction of teletypewriter exchange message rates for distances beyond 350 miles will save TWX users $1,000,000 annually. This reduction resulted in a transcontinental 3-minute initial period rate of $1.75. Private line telephone, telegraph, and telephotograph rates were also cut approximately $1,700,000 per year by a new rate plan similar to that in effect for long distance telephone service.

Press private line teletypewriter service.—On July 24, 1946, the Commission dismissed, without prejudice, a complaint filed in 1940 by Transradio Press, Inc., attacking the lawfulness of Bell System charges for press private line teletypewriter service. The Commission concluded that, as a result of rate reductions made since 1940, the complaint had been substantially satisfied.

"Service charges" by hotels, etc.—In view of the fact that the United States Supreme Court, in May of 1945, upheld the Commission's jurisdiction over "service charges" or "surcharges" by hotels, apartment houses and clubs on interstate and foreign telephone calls, and since various hotels and hotel associations did not press their previously filed complaints, questioning prohibition of such charges, the Commission, on May 10, 1946, dismissed further proceedings.

Reductions in overseas rates.—As a result of negotiations by the Commission with the American Telephone and Telegraph Co., a

pattern of reduced rates for the initial 3-minute period for overseas message toll telephone rates was agreed to as follows:

Air miles	Day	Night and Sunday	Air miles	Day	Night and Sunday
0–500	$4.50	$3.00	2,001–3,000	$9.00	$7.50
501–1,000	6.00	4.50	Over 3,000	12.00	9.00
1,001–2,000	7.50	6.00			

Such day rates were established between the United States and 29 foreign countries: Argentina, Australia, Belgium, Brazil, Chile, Denmark, Egypt, Eire, France, Germany, Great Britain, Hawaii, Italy, Japan, Netherlands, New Zealand, Norway, Paraguay, Peru, Philippine Islands, Portugal, Puerto Rico, Salvador, Spain, Sweden, Switzerland, Union of Soviet Socialist Republics, Uruguay, and Venezuela. By the close of the year the stipulated night rates were in effect to Eire and Great Britain.

During the year, the American Telephone & Telegraph Co., RCA Communications, Inc., and Press Wireless, Inc., filed amended traffic schedules reducing their rates for program transmission services between this country and various foreign points.

Bell System license contracts.—As part of a broad review of factors entering into the cost of telephone service, members of the Commission's staff cooperated with a subcommittee of the Special Committee on Telephone Regulation of the National Association of Railroad and Utility Commissioners in studying the services performed by the American Telephone & Telegraph Co. for its associated companies and long lines department incident to "license" contracts.

Division of revenue contracts.—Inquiry into the division of interstate telephone toll revenues between the American Telephone & Telegraph Co. and its associated companies has been made, and the Commission's program calls for continuing cooperative studies with State commissions on the separation of telephone plant and expenses in this connection.

SUPERVISION OF ACCOUNTS

Original cost restatements and disposition of plant acquisition adjustments.—Application of the Commission's regulations has accomplished adjustments of net book cost of plant through charges to income, surplus or other accounts, thus reducing previously overstated costs by the carriers. These adjustments amount to more than $12,000,000 for all telephone companies whose accounting is subject to regulation under the Communications Act. In addition, and as a result of the Supreme Court decision noted in Chapter I, the New York Telephone Co. was required to adjust its net book cost by more than $4,000,000, principally by charges to surplus and credits to depreciation reserve. By the same token, arrangements have been made with other Bell System companies that are expected to result in similar adjustments amounting to $16,000,000.

Continuing property records.—Studies are being continued jointly with the State commissions and the telephone industry with a view to developing procedures consistent with the uniform system of accounts that will (*a*) provide a continual and perpetual record of quantities and costs of plant as of a certain date and reflect changes subsequent

to that date, (*b*) provide data for determination of original cost of plant retired, (*c*) serve as a basis of inventories with a minimum of field work and as a basis for summarized plant records, and (*d*) furnish pertinent data necessary for determining plant mortality, service lives and depreciation charges.

Relief and pensions.—Preliminary study was made of revisions in the Bell System actuarial computations and the resultant changes in payments into pension-trust funds. The matter of additional lump-sum payments into these funds received consideration. Study was also being given to request by the Bell companies to discontinue separate accounting for service-pension payments to employees retired before the adoption of the accrual plans of accounting for pensions. Further studies were made as to the propriety of the methods used by certain carriers to determine the adequacy of their pension-trust funds, and to the practice of charging current operating expenses with the cost of pensions based on service prior to the adoption of a pension plan. Other studies involved consideration of whether pension plans contained provisions which might discriminate against certain classes of employees.

Uniform system of accounts.—Several amendments were made to the uniform system of accounts prescribed by the Commission. Included were provisions which simplified the accounting for large numbers of relatively low-cost items of materials. In cooperation with several State Commissions, progress was made toward a general revision for Class A and Class B telephone companies.

Miscellaneous.—Other activities of the Commission in this field include:

Providing for the maintenance of an index of the records of telephone companies that are required to be preserved.

Revision of the annual report form (Form M) for telephone companies to eliminate certain detailed information not deemed necessary during the continued shortage of personnel and to clarify certain requirements, particularly with respect to the reporting of Federal income taxes.

ECONOMICS AND STATISTICS

Economic studies.—In continuing study of telephone service throughout the country, data relating particularly to the availability of telephone service on farms was collected and analyzed. On several occasions, technical and economic data on this subject were made available to Congressional committees considering bills to extend telephone service to rural areas. Additional information was obtained during the year through the cooperation of the Department of Agriculture and the Bureau of the Census. These facts, together with various data prepared by the telephone industry, are currently being analyzed.

Statistics and general studies.—Annual reports containing financial and operating data for 1945 were filed by 153 common carriers and 36 controlling companies. Included were 125 telephone, 14 wire-telegraph and ocean cable, and 14 radio-telegraph carriers.

"Statistics of the Communications Industry in the United States," published anually by the Commission and obtainable from the Superintendent of Documents, contains detailed information on the subject. Some financial and operating highlights from annual reports of telephone carriers are here shown.

Telephone carriers

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Investment in plant and equipment	$6,060,028,722	$5,856,316,360	3.48
Depreciation and amortization reserves	$2,167,674,373	$1,987,628,404	9.06
Net investment in plant and equipment	$3,892,354,349	$3,868,687,956	.61
Local service revenues	$1,108,350,679	$1,052,143,699	5.34
Toll service revenues	$867,579,478	$766,160,211	13.24
Total operating revenues [1]	$2,075,410,511	$1,904,406,470	8.98
Operating expenses [1]	$1,380,348,934	$1,234,521,876	11.81
Taxes, including income and excess profits	$420,740,213	$438,581,635	(4.07)
Net operating income after all taxes	$274,321,589	$231,303,259	18.60
Net income	$190,157,344	$183,740,662	3.49
Dividends paid	$192,813,713	$185,670,632	3.85
Company telephones:			
Business	8,723,714	8,339,007	4.61
Residential	15,598,560	15,044,664	3.68
Average number of calls originating per month:			
Local [2]	3,405,052,934	3,225,654,898	5.56
Toll [2]	147,612,394	132,586,772	11.33
Number of employees at end of October:	398,665	365,308	9.13
Male	109,778	102,230	7.38
Female	288,887	263,078	9.81
Total pay roll for the year	$936,689,151	$807,110,401	16.05

[1] Intercompany general service and license fees and rents, amounting to approximately $37,000,000 for 1945, and $35,000,000 for 1944 have not been eliminated.
[2] Partly estimated by the reporting carriers.

2. TELEGRAPH (WIRE, CABLE, RADIO)

SERVICE AND FACILITIES

Construction of wire facilities.—During the year, 73 applications for wire telegraph construction certificates were filed with the Commission, which had 6 on hand from the preceding year. Of these, 75 were granted and 4 were pending. Authorizations involved the construction of 404,345 channel miles of carrier systems at an estimated cost of $1,960,749, the leasing of 3,100 miles of telegraph channels and 7,994 miles of telephone channels at an annual rental of $296,645, and the removal of 5,500 miles of wire and 588 miles of pole originally costing $513,364.

Modernization plan of Western Union.—The Commission embarked upon an informal investigation of the $60,000,000 modernization plan of the Western Union Telegraph Co. This program, by which Western Union expects to reduce its operating costs and to improve service, contemplates the construction of 2,700,000 miles of telegraph radio-relay systems and the leasing of some 1,000,000 telegraph channel miles from the Bell System, which would permit it to dispose of the greater part of its extensive pole and wire lines. In addition, provision is made for establishing 30 large message centers equipped with reperforator-switching systems, where the relaying of messages will be largely automatic, and for the improvement of methods of terminal handling. The program calls for completion by the end of 1949. Under its order of June 4, 1946, the Commission is inquiring into the progress being made in this program and the specific benefits which may be expected to accrue to the public and to Western Union. (See also "Rates and Tariffs.")

Investigation of interstate telegraph service.—In approving Western Union's petition for a rate increase (see "Rates and Tariffs"), the Commission regarded such relief as a "temporary expedient" which would not of itself solve the company's basic difficulties and felt it necessary to take stock of the domestic telegraph problem so that appropriate measures may be invoked. Accordingly, the Commission ordered a comprehensive investigation into all phases of Western Union's present and future operations. In so doing, the Commission pointed out that such an exhaustive inquiry could not be conducted under current limitations on Commission funds and personnel, hence it would have to seek additional money.

Speed of service.—The quality of service provided by Western Union declined somewhat during the year. The average time required in a message center to relay the fastest 95 percent of ordinary full-rate messages was 9.4 minutes in 1946 as compared with 8.7 minutes in 1945. The average percent of such messages completed in 15 minutes was 84.3 and 88.1, respectively. The average time required by the Bell Telephone System to establish teletypewriter exchange connections between subscribers remained at 1.6 minutes.

Domestic radiotelegraph.—Paralleling activities in the development of radiotelephony, the Western Union Telegraph Co., American Telephone & Telegraph Co. and certain organizations which are not communications common carriers have been granted experimental authorizations looking to the development of microwave radio relay systems capable of handling telegraphic as well as other types of communications. (See also "Experimental Radio Services.")

Western Union is testing an experimental microwave chain between New York and Philadelphia solely for the purpose of accumulating technical data. Insofar as commercial operation of a microwave relay system is involved, Western Union's planned first step is the development of a triangular system connecting those two cities and Pittsburgh and Washington. Necessary sites have been acquired and installation is progressing as rapidly as equipment is made available, with the expectation that the system may be ready for service in March 1947. Additional microwave expansion is later contemplated between Pittsburgh, Cleveland, Chicago, and Cincinnati.

Discontinuance, reduction or impairment of service.—On July 18, 1945, an informal conference was held on proposed rules to implement an amendment to section 214 of the Communications Act, which provides that no carrier (telegraph or telephone) subject to the act shall discontinue, reduce or impair service to any community without first obtaining authority from the Commission.

During the year, 329 applications of this nature were received in addition to the 47 then pending. Of this number, 276 were granted. In most cases where service was terminated, alternate service was available.

Delivery of telegrams.—Upon consideration of complaints that telegrams were being delivered in New York City by mail, and by telephone to unauthorized third persons, the Commission on February 7, 1946, instituted investigation into Western Union's delivery practices. Eight days thereafter the Commission amended its order to investigate the methods used by all telegraph carriers subject to the act in delivering telegrams by means other than messenger or tie-line,

and forwarding telegrams between cities by mail and special messengers. On May 29 the proceedings were broadened to include a general investigation of the lawfulness of charges, classification, regulations and practices in connection with the pick-up and delivery of telegrams.

RATES AND TARIFFS

Western Union rate increase.—Following public hearings, the Commission allowed Western Union, effective June 12, 1946, a flat over-all increase of 10 percent in its domestic interstate rates but denied Western Union's request to eliminate the 20 percent rate differential on Government messages. It found that Western Union was currently operating at a deficit and anticipated a loss of about $12,000,000 in 1946 if its rates were not raised. The Commission concluded that Western Union would need substantially more revenue than it requested "if it is to continue in operation as a solvent enterprise and provide satisfactory service on a comprehensive Nation-wide basis." It pointed out, in particular, that Western Union was faced with increasing competition from telephone and teletypewriter exchange services and air-mail services, besides being affected by increased wage costs and reductions in international telegraph rates. The Commission is not satisfied that the modernization program is the answer to Western Union's problems. However, in view of prevailing economic conditions and Western Union's dire need for additional revenue, the Commission granted the rate increase for 1 year pending developments.

SUPERVISION OF ACCOUNTS

Original cost restatement of plant accounts and establishment and maintenance of continuing property records.—Adjustments made since 1938 have reduced Western Union's net book cost by approximately $77,000,000 (exclusive of about $43,000,000 pertaining to former Postal Telegraph plant). Further adjustments were deferred pending the effects of the modernization program on the adequacy of the company's depreciation reserves.

Uniform system of accounts.—Chief among amendments affecting domestic telegraph carriers was elimination of the requirement for detailed statements of traffic damage claims. Compilation of a list of retirement units, now in progress, will simplify property retirement accounting procedure of wire-telegraph and ocean-cable carriers.

Depreciation.—This subject received particular attention in view of the prospective premature retirements of Western Union plant under its modernization program, for which only partial depreciation has been provided. Preliminary studies have been made of the company's proposal to amortize the unprovided for loss in service value of plant to be retired.

Relief and pensions.—Studies were continued with respect to the propriety of the methods and accounting pursued by certain carriers in determining and recording the cost of maintaining pension and other benefit plans.

Miscellaneous.—The annual report form (Form O) was modified to eliminate about 30 pages of detailed data not now deemed sufficiently important to warrant reporting to the Commission.

The period of 6 months required for retention by domestic telegraph carriers of copies of telegraph messages was continued. Such carriers are required to retain these messages for an additional six months upon request by persons having bona fide interest in them.

Regulations governing the preservation of records were amended to require the maintenance of an index by the domestic telegraph carriers of records which must be preserved under the rules of the Commission.

STATISTICS

Annual reports were filed by 28 wire-telegraph, ocean-cable and radiotelegraph carriers. Certain selected financial and operating items, compiled from the Western Union report, are shown in the succeeding table. Adequate data was not filed by that company to permit segregation of its ocean-cable and wire-telegraph operations. Statistical data relating to ocean-cable carriers will be found under the succeeding "International" section of this chapter.

The Western Union Telegraph Co.

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Investment in plant and equipment	$387,956,082	$389,128,095	(0.30)
Depreciation and amortization reserves	$169,983,442	$165,010,602	3.01
Net investment in plant and equipment	$217,972,640	$224,117,493	(2.74)
Domestic service revenues	$166,544,597	$158,032,270	5.39
Foreign service revenues	$10,183,208	$12,199,047	(16.52)
Total operating revenues	$192,892,138	$185,903,644	3.76
Operating expenses, depreciation, and other operating revenue deductions	$181,410,369	$166,277,089	9.10
Net operating revenues	$11,481,769	$19,626,555	(41.50)
Income and excess profits taxes	$140,000	$3,831,000	(96.35)
Net income	[1] $5,148,533	[1] $8,316,229	
Dividends declared	$2,432,594	$2,166,747	12.27
Revenue messages transmitted:			
Domestic	245,157,962	233,188,694	5.13
Foreign	4,935,657	5,515,588	(10.51)
Number of employees at end of June	61,956	63,818	(2.92)
Total pay roll for the year	$130,654,745	$116,130,330	12.51

[1] Deficit.

INTERNATIONAL

International Conferences

Third Inter-American Radio Conference, Rio de Janeiro, September 1945.—Most of the work here involved revisions to the International Telecommunication Convention and the General Radio Regulations, the latter including allocations and registration of frequencies for submission at the World Telecommunications Conference scheduled for 1947. Adopted was a new international mechanism for frequency registration, proposals for study of very-high-frequency broadcast, establishment of an inter-American network of monitoring stations, and principles favoring fair, reasonable, and equitable rates.

Bermuda Telecommunications Conference, November-December 1945.—The resultant Bermuda Agreement provided for augmenting radiotelegraph circuits between the United States and certain British points. Division of tolls was fixed on a 50–50 basis over direct circuits after deduction of terminal charges. It was also agreed that

tariffs and accounts would be on a dollar-sterling basis, instead of the former gold-franc basis.

World Telecommunications Conference.—Preparations for revisions to the International Telecommunication Convention (Madrid, 1932) and to the General Radio Regulations (Cairo, 1938), to which the United States is a party, and study of the General Telegraph Regulations (Cairo, 1938), to which the United States has not adhered, covered proposals for reorganizing the International Telecommunications Union by setting up permanent committees and boards to deal with such matters as frequency registrations, collection and dissemination of information on rates and traffic, and study of technical phases of radio, telegraph, and telephone. Proposed revisions of the Radio Regulations provide for a new frequency allocation table and changes governing operations. Analysis of the Telegraph Regulations is directed toward the question of whether the United States can adhere to any international regulations which would affect private carriers and, if so, what revisions in existing regulations should be proposed.

Service and Facilities

General.—The Commission participated in the work of the Telecommunications Coordinating Committee, which is made up of representatives of Government departments and private agencies and acts in an advisory capacity for the coordination of United States policy in the field of international communications.

Radiotelegraph circuits.—War-disrupted radiotelegraph communication was reestablished between this country and Austria, Czechoslovakia, Germany, Hungary, Poland, and Japan; new circuits were opened to Bulgaria, Korea, Tangier, and Yugoslavia; and circuits were authorized to French IndoChina and Java. Some circuits which served China during the war were closed and most of the traffic to that country is now handled over three competitive circuits to Shanghai. Globe Wireless, Ltd., reestablished former circuits to Hawaii and the Philippines.

To enable it to review the postwar needs of radiotelegraph circuits to overseas points, the Commission on March 7, 1946, invited carriers to file applications for regular authority to communicate with foreign points as of December 1, 1946.

Ocean Cables

Cable facilities.—Cable communication with continental Europe was restored in 1945, at which time direct facilities were made available to France and Italy, service to the latter country being provided over a former enemy-owned cable between Italy and the Azores. Service to the United Kingdom, Eire, and the Azores had not been interrupted. Operation of a major portion of the trans-Pacific cable was resumed to bring regular commercial service to the Philippines via Midway and Guam.

Divestment of Western Union cables.—On September 18, 1945, the Commission granted Western Union's petition for an extension of 1 year in which to divest itself of international telegraph operations, which had been provided for in the merger of Western Union and Postal in 1943.

Rates and Tariffs

Telegraph rates to foreign countries.—Effective May 1, 1946, ceiling rates of 30 cents a word for full rate messages and 6½ cents a word for ordinary press messages were established by the principal international radiotelegraph and cable carriers to more than 80 foreign countires, outside of the British Empire. Previous rates ranged from 33 cents to $1.15 per full-rate word. On June 1, 1946, pursuant to the Bermuda Agreement, rates to the British Empire were similarly reduced. Ceiling rates for other classifications of messages were established as follows: code, 20 cents a word; deferred, 15 cents, and letter, 10 cents.

On the same dates, "country-to-country" rates from the United States were established so that the rate from gateway cities applied to traffic from any place in the United States. Previously, users in the United States outside of the gateway cities were generally required to pay from 2 to 4 cents a word more than users in the gateway cities.

In consequence, the charges for full-rate telegrams from any place in the United States to any place in the world now do not exceed 30 cents a word. Rates of 20 cents a word apply to full-rate messages to countries in Europe, Central and South America, the West Indies, Japan, Korea, and the principal commercial centers of China and the Philippines. Approximately 90 percent of the total outbound traffic is destined to countries to which the 20-cent rate applies.

With respect to rates for messages from foreign countries to the United States, maximum rates of 30 cents a word for full-rate messages and 6½ cents a word for ordinary press messages were reciprocally placed in effect by the British Empire. At the same time, rates from the British West Indies, Bermuda, and British Honduras were reduced to 20 cents a full-rate word. Effort is being made to obtain reductions to a maximum rate of 30 cents per full rate word from other places in the world where higher rates prevail.

At various times during the year, reduced rates of 3, 4, and 5 cents a word were established for ordinary press messages from United States gateways to various countries. The new 3-cent rate applies to Great Britain, Ireland, and the Virgin Islands; the 4-cent rate, to Austria, Czechoslovakia, Estonia, France, Germany, Holland, Hungary, Latvia, Lithuania, Poland, Switzerland, U. S. S. R., Yugoslavia, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dutch West Indies, Ecuador, Guatemala, Honduras, Nicaragua, Panama, Paraguay, Peru, Salvador, Uruguay, and Venezuela; and the 5-cent rate to Bulgaria, Italy, Norway, Sweden, Korea, and Japan. Reductions in in-bound press rates from most of these countries were also effected during the year and many of them now approximate the out-bound rates to these countries.

The over-all matter of international telegraph rates is still under Commission investigation in Docket 6569.

Supervision of Accounts

Original cost restatements and disposition of plant acquisition adjustment.—Studies to determine proper original cost adjustments were continued by the international carriers with review by the Commission. Most of the carriers completed reclassification of their plant accounts in accordance with the prescribed system.

Uniform system of accounts.—Several amendments were made to simplify requirements without sacrificing the records of essential information.

Depreciation.—Studies of the changes in, and the propriety of, the depreciation rates and the adequacy of the depreciation reserves of the international telegraph carriers were continued.

Relief and pensions.—Past-service pension costs were excluded from the operating expenses of Radiomarine Corp. of America and RCA Communications, Inc. Pension costs in excess of normal accruals on the full-service basis were excluded from the current operating expenses of All America Cables & Radio, Inc., and the Commercial Cable Co.

Commercial Cable Co. accounting.—The Commission ordered this company to suspend all charges and credits with respect to its plan for accounting for the reduction of its capital surplus accounts. Progress was made toward a final determination of the accounting performed by this company with respect to its surplus accounts.

Miscellaneous.—Annual report forms (Form O, applicable to ocean-cable carriers, and Form R, applicable to radiotelegraph carriers) were revised to reflect changes in the methods of classifying employees.

The time international telegraph carriers are required to retain copies of messages was reduced to a period of 6 months, subject to an additional 6 months upon request of persons having a legitimate interest in them.

Regulations were amended to require maintenance by international telegraph companies of an index of records they must preserve.

Statistics

Some selected financial and operating data compiled from the annual reports filed by principal international carriers are set forth in the following tables:

Radiotelegraph carriers

Item	1945	1944	Percent increase (or decrease), 1945 over 1944
Investment in plant and equipment	$28,306,309	$26,836,664	5.48
Depreciation and amortization reserves	$16,474,588	$16,066,358	2.54
Net investment in plant and equipment	$11,831,721	$10,770,306	9.86
Continental and insular fixed revenues	$1,009,337	$876,240	15.19
Foreign fixed service revenues	$16,569,471	$11,713,889	41.45
Marine service revenues	$84,646	$25,087	237.41
Total operating revenues	$22,456,125	$16,784,362	33.79
Operating expenses, depreciation, and other operating revenue deductions	$15,638,109	$12,682,987	23.30
Net operating revenues	$6,818,016	$4,101,375	66.24
Income and excess profits taxes	$6,299,881	$4,934,666	27.67
Net income	$2,383,450	$1,664,327	43.21
Dividends declared	*$850,000*	[1] *$1,555,000*	*(45.34)*
Revenue messages transmitted:			
Continental and insular fixed	673,504	518,314	29.94
Foreign fixed	9,776,611	6,351,607	53.92
Marine	65,705	10,120	549.26
Number of employees at end of year	4,617	3,359	37.45
Total pay roll for the year	$14,170,688	$10,244,629	38.32

[1] Includes $246,420 charged to capital surplus.

Ocean cable carriers

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Investment in plant and equipment	$78,464,039	$78,566,248	(0.13)
Depreciation and amortization reserves	$56,718,975	$56,017,268	1.25
Net investment in plant and equipment	$21,745,064	$22,548,980	(3.57)
Domestic services revenues	$825,348	$682,846	20.87
Foreign service revenues	$14,175,518	$15,494,684	(8.51)
Total operating revenues	$15,802,177	$16,908,473	(6.54)
Operating expenses, depreciation and other operating revenue deductions	$13,146,794	$12,308,622	6.81
Net operating revenues	$2,655,383	$4,599,851	(42.27)
Income and excess profits taxes	$1,346,403	$1,977,032	(31.90)
Net income	$2,830,175	$2,591,056	9.58
Dividends declared	$20,141	[1] $5,491,093	(99.63)
Revenue messages transmitted:			
Domestic	648,310	527,633	22.87
Foreign	4,947,349	4,343,052	13.91
Number of employees at end of year	3,456	3,200	8.00
Total pay roll for the year	$6,990,632	$6,179,706	13.12

[1] Includes $3,535,926 charged to capital surplus.

Cable operations of Western Union are not adequately segregated in its annual report. Hence, such data are not included in the above figures. Number of messages and amounts of revenues obtained from its cable operations for the past 2 years were as follows:

Item	1945	1944	Percent increase or (decrease), 1945 over 1944
Foreign service revenues	$10,183,208	$12,199,047	(16.52)
Foreign revenue messages transmitted	4,935,657	5,515,588	(10.51)

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CHAPTER V

Safety and Special Services

CHAPTER V—SAFETY AND SPECIAL SERVICES

1. MARINE SERVICES

GENERAL

The past year saw wartime restrictions on the use of marine radio communication removed through cancellation by the Board of War Communications of its Orders Nos. 1 and 2 which, for security reasons, controlled the ship, coastal and marine relay radio services throughout the emergency. As a result, many stations are again rendering public service.

A tremendous advance was made in the electronic art during the war especially in the development of aids to navigation which are now available for experimental use. Because of the responsibility placed upon the Commission to obtain maximum effectiveness from the use of radio communications, these developments are being studied with a view to their peacetime application.

NEW RADIO DEVICES

To expedite determination of their value in promoting safety and navigation at sea, and at the same time encourage developmental progress, the Commission granted a number of experimental licenses for radar stations on merchant ships. Six manufacturers have produced radar equipment for use in the merchant marine service. The Commission will collect, analyze, interpret, and translate into action the facts now being discovered through operational research. It was rep-

resented at an informal international meeting at London from May 7 to 22, 1946, which discussed collaboration and standardization of new radio navigation aids.

EQUIPMENT TRENDS AND DEVELOPMENTS

The trend in commercial marine radiotelegraph communications equipment has continued in the direction of "unit" type installations. These combine the ship radio equipment into a single cabinet permitting convenience and flexibility in operation and maintenance. Generally, the newer equipment shows substantial improvement over prewar equipment, particularly with respect to over-all efficiency, the use of modern electron tubes and the degree of frequency stability of the radio transmitters. Ship radiotelephone equipment used primarily by small vessels for ship-to-ship and ship-to-shore communication has changed very little in over-all design for several years. However, some improvement in frequency stability has been noted.

EQUIPMENT TYPE APPROVAL

The Commission approved two new types of ship radiotelegraph transmitters, two receivers and one automatic alarm signal keying device. This equipment was designed primarily for ship use.

FREQUENCY ASSIGNMENTS

During the war, a majority of the commercial coastal telegraph stations serving ships at sea were temporarily taken over by the Government. A number of these stations have been reactivated and in each case an attempt was made to provide the frequencies held prior to the war. This has been difficult and in many cases practically impossible since many of the frequencies involved were still in Government use. The problem is further complicated by the scarcity of frequencies below 23,000 kilocycles. Consequently, restoration of service has necessitated coordination of each proposed frequency assignment with interested Federal agencies through the IRAC (Interdepartment Radio Advisory Committee). This factor also enters into consideration of applications for new coastal stations.

The Commission obtained informal agreement concerning the use of 7 frequencies in the Newfoundland area and 10 frequencies in the Bahamas area for short-distance maritime radiotelephone service. The frequencies involved represent some duplication of channels used in the United States for the same type of service. However, little interference is expected due to flexibility in permitting small vessels, including pleasure craft, to communicate with Bahamas area coastal harbor stations with the same type equipment used for communication with United States coastal harbor stations.

One effect of the Commission's general frequency allocation on the maritime mobile service has been to provide a substantial increase in frequencies above 25 megacycles, both for communication services and for aids to navigation. A final report on frequencies below 25 megacycles was in preparation at the close of the fiscal year.

SHIP STATIONS

An all-time peak of 8,028 merchant ship radio stations were licensed during the year. In peacetime the Commission is charged

with enforcement and administration of regulatory statutes and treaties governing radio on board merchant vessels, including the Communications Act of 1934, the International Convention for the Safety of Life at Sea, the General Radio Regulations annexed to the International Telecommunications Convention, the Ship Act which is applicable only to certain steamers plying the Great Lakes, and rules and regulations, implemented by the Commission's Rules Governing Ship Service. During the war, the Commission cooperated with the military not only in enforcing these safety provisions but also in giving technical and administrative aid in furtherance of the safety of life at sea under war conditions.

DISTRESS

With the lifting of emergency restrictions, studies of marine disasters have been resumed in accordance with the Commission's responsibility pursuant to section 4 (o) of the Communications Act. There was but one major marine disaster during the last fiscal year.

On February 4, 1946, the S. S. *Yukon*, with 386 passengers and a crew of 120, struck a rock at Cape Fairfield, Alaska. The radio operator on watch, who was 18 years of age, immediately started his main radio transmitter and had it warmed up and ready upon the order of the master to transmit the distress message, which was received by the coastal telegraph station at Victoria, B. C. The ship's main transmitter functioned less than 8 minutes when power failed. It took approximately 2½ hours to clear and rig an emergency antenna and put the emergency transmitter on the air. Direction finder bearings were obtained from the transmissions which aided the Coast Guard cutters, Navy tugboats, and Army planes and barges dispatched to the scene. The vessel broke in two approximately 8 hours after the vessel struck and the after section, on which was located the radio room and the ship's auxiliary electric generator, sank. Eleven lives were lost, but the prompt use of radio in summoning assistance was largely responsible for saving the lives of several hundred people.

EXEMPTIONS

The Commission is authorized by the International Convention for the Safety of Life at Sea and the Communications Act to grant exemptions from prescribed radio requirements when the vessels concerned are navigated within certain specified limits and provided the Commission considers that the route and conditions of the voyage or other circumstances are such as to render compliance unreasonable or unnecessary. During the fiscal year 1937 such applications were received of which 18 were granted, including a renewal for 1 year of the exemption previously granted all United States passenger vessels up to and including 15 gross tons.

WAIVERS

In order to facilitate the temporary conversion of ships from cargo to passenger status, the Commission permitted the use of portable lifeboat radio installations on a number of ships in lieu of permanently installed motor lifeboat radio installations. Twenty-three such authorizations were granted on a temporary basis for periods ranging from 30 days to 3 months and usually covering in each case one voyage made to expedite the movement of passengers in the national interest.

RULE CHANGE

The Commission examined its Rules Governing Ship Service with a view to eliminating wartime provisions and to making the rules more closely reflect peacetime requirements without sacrificing safety considerations. To this end the Commission deleted subsection 8.115 (1) which had been promulgated as a means for radio operators to test the ship's emergency transmitter. A new subsection was added to section 8.81 which allocates the frequency 37,580 kilocycles to ship telephone stations for communication with coastal harbor stations and with other ship stations.

COASTAL STATIONS

At the close of the year, 45 coastal telegraph stations were licensed, exclusive of those in Alaska. Three of these were for limited (governmental) coastal telegraph service and the remaining 42 stations for public coastal telegraph service. Thirteen coastal telegraph stations, relieved from Navy restrictions, were relicensed for public service.

During the same period, 37 coastal harbor stations were authorized, exclusive of those in Alaska. Two were for limited (governmental) coastal harbor service and the remaining 35 for public coastal harbor service. New public coastal harbor stations were established near Quantico, Va., and Pittsburgh, Pa. Some expansion in the use of very high frequencies took place on the Great Lakes. Approximately 40 Great Lakes ships may now communicate on an experimental basis. Four coastal telephone stations were licensed for public service, representing no change in the number of stations of this class.

MARINE RELAY STATIONS

Twenty-nine marine relay stations were licensed. Of the 13 coastal telegraph stations reactivated, all were authorized to render marine relay service except station WNW at Philadelphia, Pa.

ALASKAN POINT-TO-POINT AND COASTAL STATIONS

Nearly 760 applications were received for the construction or operation of stations in Alaskan point-to-point and coastal stations. The following stations were authorized in the fixed public and public coastal services in that territory: Coastal harbor, 157; coastal telegraph, 26; point-to-point telegraph, 82; point-to-point telephone, 265.

MOBILE PRESS STATIONS

There were three licensed mobile press stations, representing no change from the previous year.

SHIP INSPECTIONS

The Commission's field staff has the responsibility for making detailed inspections of the radio installations aboard cargo and passenger vessels. During the fiscal year 13,788 separate ship inspections were conducted. Of these, 12,765 were domestic vessels, 1,023 were foreign, resulting in the serving of 8,769 violation notices of which 6,296 were cleared. In addition, 6,959 minor discrepancies were cleared during inspection.

2. AVIATION RADIO SERVICES

Termination of the war created an immediate demand for air transportation far in excess of the capacity of existing facilities. To meet the situation, airlines took advantage of available surplus military cargo aircraft to supplement aircraft then in operation. In addition to the regularly scheduled airlines, a great many corporations have been formed for nonscheduled freight and passenger charter operations. The air traffic situation is further complicated by an increase in private flying invited by removal of restrictions on the use of gasoline and the availability of new and war surplus aircraft.

The increased volume of aircraft operations is already taxing radio facilities to the limit and, in order to accommodate future expansion, the entire domestic aviation communication system is being revised. Very-high frequencies are being placed into service, new communication and traffic control procedures are being adopted, and every effort is being made to bring domestic aviation communications to the maximum of engineering efficiency.

NEW TELECOMMUNICATION AIDS

During the war many new telecommunication aids to aviation were developed primarily for military application. Some of these have already been adapted to commercial operation and many others offer attractive possibilities. Radio altimeters have been licensed by the Commission on an experimental basis for use aboard scheduled aircraft including those flying the North Atlantic. Also, "loran," a long-range radio navigation system, is now in use in commercial United States transoceanic aircraft. Other potentialities are anticollision devices, storm-area indicators, and many short-range navigation devices.

The Radio Technical Commission for Aeronautics, of which the Commission is a member, is taking the lead in guiding the activities of the industry and Government research laboratories in the study of radio operation problems of air operation and the application of wartime developments. It is expected that a coordinated telecommunication system will be developed which will provide the maximum of communications and control and a minimum of equipment weight and occupancy of scarce communication frequencies.

INTERNATIONAL AVIATION SERVICE

International air traffic has rapidly expanded as a result of the ending of hostilities and the availability of new and surplus aircraft. Fifteen new international aeronautical routes have been opened by 10 United States airlines, and there is an almost daily increase in the number of new companies organized to begin international operations on a nonscheduled basis. Air carriers in the international field have increased the number of aircraft station licenses from 90 to 150. In addition, 85 aircraft radio station licenses have been issued to organizations new to this field. Eight new gateway aerodromes have been approved by the Civil Aeronautics Board to handle international air traffic.

The Provisional International Civil Aviation Organization (PICAO) has published communications and other standards to serve as the basis for a standard world-wide aviation operation. These are

to be supplemented by standards having regional application. At the close of the fiscal year, the North Atlantic and European-Mediterranean regions were the only two that had been organized. The organization of the Caribbean area was scheduled for August of 1946, the African-Middle East for October, and additional regions of the world will be organized shortly. The aim of this organization is to achieve maximum standardization in communications and operating procedures with a minimum of regulation. The ultimate aim is to insure uniformity of world-wide operation so that an aircraft of any nation may fly anywhere and receive the same grade of service. United States participation in this organization is committed to an ultimate system which will permit American flag aircraft to meet foreign competition for world business.

The increased demand upon the already inadequate number of frequencies available to international air routes will require regrouping of the present assignments and precise re-engineering of the communication facilities of the air lines in order to get utmost performance out of that portion of the spectrum used for international aviation.

Plans for the International Telecommunications Union meeting indicate that the aviation industry will be allocated sufficient frequencies to make possible safe aircraft operation on a world-wide basis. Another objective is to insure that the radio regulations promulgated by the Union will provide maximum flexibility not only within the aviation service but in inter-service communications such as occur in air-sea-rescue operations.

DOMESTIC AVIATION SERVICE

It was necessary for the domestic aviation industry to revise its thinking in order to meet the communication needs of the rapidly growing number of aircraft. The Commission, on its part, has revised its operating practices in order that licenses may be issued promptly and in a manner that will result in advantageous use of frequencies. Although the full effects remain to be felt, major changes have been made which will result in simplification of the licensing procedure and better service to the public.

The Commission is making every effort to keep its rules abreast of the rapidly growing industry, and frequent changes will be necessary to meet new and unforeseen conditions. Its effort is directed toward a common target; namely, a complete radio navigation and communication equipment in an integrated unit properly coordinated so that aircraft may find safe and adequate communications and navigation aids wherever they fly.

The handling of applications is in many respects a minor activity in the aviation service since, as the adequacy of planning and regulation increases, the number of applications increase. Hence, the number of applications filed does not give a good index of activity in the aviation service. During this fiscal year a total of 6,205 aviation authorizations were issued, which represents more than a 20 percent increase over the 5,089 authorizations issued during the previous fiscal year and there is every indication that the peak has not been reached. The various classes of aviation authorizations are discussed in more detail below.

AIRCRAFT RADIO STATIONS

There were 3,763 itinerant aircraft radio stations licensed at the end of the year, and applications were being received at the rate of nearly one thousand a month. In order to handle this volume and at the same time fulfill its obligation of maintaining a high standard of safety, the Commission inaugurated a number of streamlined procedures. Among these was adoption of a simplified application form from which a license may be mechanically reproduced, thus opening the way to ultimately providing 1-day license service to private planes but, due to the more complex and varied licenses used for passenger aircraft, more time will be required to fully implement the procedure.

In addition, 1,292 radio stations were licensed for use aboard air carriers and 146 Alaskan aircraft radio stations, making a total of 5,201 aircraft radio station authorizations outstanding at the close of the fiscal year.

AERONAUTICAL RADIO STATIONS

Aeronautical radio stations provide the non-Government ground radio facilities which permit air-to-ground and ground-to-air communications with aircraft in flight within the United States, its territories and possessions, and between the United States and Canada. Aeronautical radio stations are primarily used by scheduled aircraft for the safety of life and property in the air; however, these stations, under the Commission's regulations, also must serve itinerant aircraft upon request. While other individuals or organizations may be eligible for aeronautical radio station licenses, at this writing nearly all existing stations are licensed to Aeronautical Radio, Inc., a nonprofit organization comprised of all United States scheduled and many nonscheduled air carriers as well as international air carriers. Aeronautical radio stations located in our territories and possessions are operated by the scheduled or nonscheduled airlines in the area involved.

There were 697 aeronautical stations in the United States at the end of the fiscal year, and 64 in Alaska.

AERONAUTICAL FIXED RADIO STATIONS

Aeronautical fixed radio stations handle ground point-to-point communications in connection with and relating solely to the actual aviation needs of the licensees. Substantially all aeronautical fixed radio stations serving the domestic commercial airlines in the United States are licensed to Aeronautical Radio, Inc.

As of June 30, 1946, there were 91 such stations in the United States and 59 in Alaska—a decrease of 7 stations in the United States and no change in Alaska. This decrease is due to the greater use of wire lines for communications. In the early days of aviation, the airlines placed major dependence upon point-to-point radio circuits in handling messages with respect to aircraft movement, to spot weather, etc. From the point of view of conservation of frequencies, this was undesirable because wire circuits could achieve the same end. However, the airlines at that time could not economically support leased wire services and a wire communication service rendered on a basis of a message system did not offer adequate speed. With increasing volume of aircraft operation and with adequate revenue, the airlines are now in

a position to afford wire service. As this condition developed, the volume of radio transmission exceeded the capacity of the frequencies available. Aeronautical fixed services were replaced by wire lines and the frequencies formerly used by aeronautical fixed communication were transferred to the more important air-ground communication service for which there is no wire substitute.

AIRPORT CONTROL RADIO STATIONS

The airport control station is the communications medium between an airport control tower and aircraft in the immediate vicinity for the purpose of controlling air traffic.

While the Civil Aeronautics Administration operates a majority of these stations, the development of the community "airpark" type of airport and the transfer of military fields to the public has resulted in a substantial increase in the number of such stations operated privately or by municipal or state governments. Forty-five airport control stations were licensed by the Commission by the close of the fiscal year.

During the year, very-high frequencies were placed into service for airport control purposes at many locations. The control of taxiing aircraft and airport utility vehicles has in the past been conducted by airport control stations on the same frequencies used for the control of aircraft taking off and landing. To relieve traffic congestion in this service and in the interest of safety, two separate channels in the very-high frequency band have been set aside for this purpose.

Special equipment for instrument flight and landing is normally installed and operated by the Civil Aeronautics Administration. However, these facilities have been augmented by two airport control stations operated by domestic airlines for the purpose of pilot training.

RADIO MARKER STATIONS

Radio marker stations aid air navigation by marking a definite point or obstruction on the ground. For the most part, stations of this type are associated with the airways and airports and are operated by the Civil Aeronautics Administration. In certain instances, private licensees have considered it advantageous to mark local navigational points, and four radio marker stations were licensed by the Commission.

FLYING SCHOOL RADIO STATIONS

Flying school radio stations communicate with students and pilots during flight training. Such stations are licensed only to bona fide flying schools and soaring societies and their use other than for instructional purposes and the promotion of safety of life and property is prohibited. Five flying school stations held licenses at the close of the fiscal year. This small number may be attributed to the closing of flying schools used to train military pilots. It is expected that this number will increase, since many air-minded veterans are resuming activity.

FLIGHT-TEST RADIO STATIONS

Flight-test stations aboard aircraft undergoing test and flight-test stations on the ground are used for essential communications in connection with the testing of aircraft. Such stations are licensed only to manufacturers of aircraft and major aircraft components.

The 37 flight-test stations licensed at the end of the fiscal year mostly operate on specially assigned frequencies made available through the cooperation of the War and Navy Departments.

3. EMERGENCY RADIO SERVICE

The emergency radio service, which was established to provide emergency radiotelephone communications involving the protection of life and property, includes seven classes of stations: municipal police, State police, zone police, interzone police, municipal fire, forestry, and special emergency. The first four classes are licensed to instrumentalities of government and primarily serve the emergency communication needs of the police departments.

POLICE RADIO STATIONS

The usual municipal police radio station consists of a land transmitter and a group of mobile transmitters installed in vehicles operated by the police system. The State police radio station is similar except that more than one fixed transmitter is required to provide reliable communication over the entire State.

In order to link the municipal and State police stations, zone and interzone stations, using radiotelegraphy, are used. The country has been divided into zones, with the zone boundaries usually coinciding with the State boundaries. Zone stations communicate with each other and with their interzone station which, in turn, can communicate with other interzone stations. The message traffic usually relates to stolen cars, missing persons, arrests and identification. The growth of police radio stations is indicated in the following tabulation for the last five years:

	1942	1943	1944	1945	1946
Municipal police	1,672	1,708	1,906	2,051	2,243
State police	378	431	452	477	507
Zone police	85	94	88	85	88
Interzone police	33	30	31	30	30
	2168	2263	2477	2643	2868

Some licensees operate as many as 200 or more mobile transmitter and receiver units under one license. It is estimated that approximately 23,000 mobile units are authorized for operation in this service. The increase in State police stations is due to expansion of existing facilities and installation of several new State communications systems. The increase of 198 stations in the municipal police class represents additional cities and counties which have installed their own communications systems. A large number of these new stations are authorized to use frequencies in the 152–162 megacycle band which have recently become available on a regular basis.

The number of frequencies allocated for police radio stations in that part of the spectrum above 25 megacycles has been increased from 29 to 132. In addition to the previously listed figures, municipal and State police departments are authorized to operate approximately 125 radio control and automatic repeater stations on an experimental basis. Additional channels have been allocated for this purpose on frequencies above 900 megacycles.

MUNICIPAL FIRE RADIO STATIONS

Though municipal fire radio stations numbered only 25 at the end of the fiscal year, this number is expected to increase considerably. In consideration of the testimony presented at the allocation hearing and in view of the radio's contribution to increasing efficiency in fire fighting, the number of frequencies available for assignment to this class of station was increased from 3 to 40 channels. Until recently, authorizations have been limited to cities with populations of 150,000 or more, while fire departments in smaller cities have used police radio facilities where available.

Radio communication can be utilized between the central fire station and the mobile fire-fighting units in the same manner as police radio systems. A new development is the use of the portable pack, or "walkie-talkie," which enables a squad chief at the scene of a fire to direct his men within or around a building. New York City, for example, already has 22 such fire-fighting units.

FORESTRY RADIO STATIONS

Forestry radio stations are authorized to Government and private instrumentalities responsible for the protection of forest areas. A total of 1,018 stations held licenses at the end of the fiscal year. These stations are operated by the State forestry or conservation departments to detect and control forest fires, protect watersheds, and conserve wildlife and natural resources in the forests. At the present time only slightly more than one-half of the States have forestry radio facilities.

Radio affords a more reliable communication circuit between fire towers than land lines which are subject to damage by storms, falling limbs, fire and many other causes. This service should benefit from recent improvements in low power mobile transmitting and receiving equipment and the very lightweight "handie-talkie" equipment.

SPECIAL EMERGENCY RADIO STATIONS

Special emergency radio stations are utilized principally by public utilities such as electric power and urban transit systems. These organizations operate over 80 percent of the authorizations of this class. Such stations may communicate in emergencies jeopardizing life, public safety, and property. However, rules and regulations were being drafted to establish a regular service for public utilities. Among organizations which have indicated interest are Rural Electrification Cooperatives, private gas and electric-power companies, oil pipeline operators, and petroleum companies. In the case of urban transit companies, bus, street railway, and interurban systems, radio tests show definite value for supervision, repair and traffic control. Direction of maintenance vehicles and restoring service disrupted by storm are two principal applications of this type of station. Both the Bell System and Western Union utilize trailers equipped with portable power units and antennas to bridge gaps in their systems while repairs are being made. The range of such operations may extend 20 miles but usually cover a distance of 3 or 4 miles to serve a particular project. A few special emergency stations have been operated by relief agencies such as the Red Cross during times of flood or other large scale emergencies.

4. RAILROAD RADIO SERVICE

The railroad radio service, which started operation on December 31, 1945, is a new radiocommunication service to increase the safety and efficiency of railroad operations. Railroad radio has been experimented with for several years, but decision to establish the service on a regular basis was not made until a comprehensive investigation, which culminated in a public hearing in May 1944, demonstrated both its need and general practicability.

Rules and regulations to govern the railroad radio service became effective on December 31, 1945, after a series of conferences with the industry and a further public hearing. Sixty frequency channels were provided for exclusive railroad use, with additional channels available on a shared basis with other services.

Since establishment of this service, many railroads have requested reclassification of their previous experimental authorizations. New applicants are undertaking extensive installation programs which will require several years to complete. The growth of this service has been impeded somewhat by the lack of suitable radio equipment for use on railroad rolling stock.

The most popular use for railroad radio at this time is in yard and terminal areas. Direct radio links between the dispatcher's office and switch engines are increasing the speed with which operations may be completed, thereby improving both freight and passenger service and reducing costs. This type of operation requires relatively little administrative change, and can be effected as quickly as equipment becomes available.

Systems along the rights-of-way are more expensive to install and maintain, and their use must be coordinated with the manual or automatic block signal systems existing on slightly more than half of the main line trackage of the nation. However, it is this latter type of train radio service which, due to the increased element of safety, is expected to become the most important use of radio by the railroad industry. Accordingly, this class of station has been given priority in frequency assignment, a decision which has the concurrence of the Association of American Railroads.

There are approximately 124 authorizations for railroad radio systems in the experimental service in addition to 32 authorizations in the regular railroad service. Since each authorization may represent from 1 to 100 or more units, the actual number of transmitters authorized is much greater than these figures indicate.

Wartime developments in the basic principles of very high frequency radio transmission are reflected in the design of specialized equipment with sufficient mechanical strength and freedom from electrical failure to withstand the rigorous demands of railroad service.

5. EXPERIMENTAL RADIO SERVICES

GENERAL

The experimental radio services are divided into three classes of stations, each of which is designed to provide facilities for specific types of experimentation. Class 1 stations are primarily for development of equipment such as antenna, tubes, methods of transmission,

and to study phenomena directed to the general advancement of radio. Class 2 stations are authorized for the initial development of a new service, or a new method of operation within an established service. Stations in both classes are licensed to individuals or to corporations desiring to follow a prescribed program of research which shows possibilities of improving some phase of radio or of the existing services. Class 3 stations are open to persons interested in radio technique to the extent of conducting experiments on their own behalf.

The experimental service is a proving ground for new or proposed services. When sufficient information has been secured from experimental operation, the Commission formulates rules and policies necessary to place the service on a regular basis.

WARTIME DEVELOPMENTS

During the war substantially all developments were directed toward meeting the needs of the military and, as a result, practically no equipment was developed for commercial use. Commercial and military needs differ widely although the principles in the design of equipment are similar. Also, much of the surplus equipment does not operate on the frequency bands available for commercial operation nor can it be converted readily. Examples are the magnetron and klystron tubes developed for particular frequency ranges for radar and super high frequency transmissions. However, the knowledge and techniques developed during the design of such military equipment are being applied to producing equipment to meet commercial needs.

There is a wide field for experimentation in frequencies above 30,000 megacycles, but exploration has been delayed by lack of proper equipment. As a result, most of the experimentation has been confined to frequencies below 10,000 megacycles, and experimentation above 300 megacycles already far exceeds the spectrum space available.

On the premise that equipment for operation in the higher bands will soon be available, many new services have been proposed. Included are the general mobile service, the industrial service, the rural radiotelephone service, the short distance toll telephone service, the citizens' radiocommunication service, and low-power provisional stations in the intermittent service. All these are presently being operated as parts of the experimental services.

RADAR

One of the most valuable technical developments of the war is radar. Since being released from a confidential status, it has attracted much interest from ship owners, aircraft-operating companies and geological-exploration companies. One of the principal uses of radar is as an anticollision device for use by ships and aircraft. It also gives exact position fixing. Due to changes in frequency allocations and the differing needs of commercial users, much of the military radar is not satisfactory for commercial use. New models and types are being developed and designations by the manufacturers indicate, to some extent, specific uses such as: teleran, radiovisor, navar, navaglobe, navaglide, navascreen, and fathometer. This is one of the larger fields of electronic equipment and research at present.

MICROWAVE RELAY

Microwave transmissions showed great expansion during the past year. As new tubes and circuits are developed it is expected that a still greater increase in experimentation and application will ensue. In particular, the microwave frequencies provide an economical means of transmitting wide bands of frequencies over great distances by means of intermediate repeater stations. It will be possible to transmit high quality FM and television programs for rebroadcast by local outlets. In addition to transmitting commercial radio programs, these microwave stations can be used to carry many telephone, telegraph, and special news transmissions now carried by wire lines. One of the factors weighing heavily in favor of the microwave circuits is their ability to transmit much wider bands of frequencies than can be accommodated by existing wire facilities.

Many applications evince interest in microwave circuits. Among these are the existing communications common carriers, television stations and networks, the aviation, railroad, and petroleum-pipeline industries, and law enforcement agencies. Each group proposes different methods of using the available frequencies. The request for assignment in the microwave bands has already indicated that this portion of the radio spectrum will be crowded. In addition to persons proposing to install microwave relay systems, various applicants look to operating facilities on a common carrier basis in competition with existing communications common carriers.

The rapid expansion of microwave systems raises many questions of policy which must be resolved before the service can be established on a regular basis. Studies are being made to determine the practicability of replacing all heavily loaded long distance wire and telegraph lines with microwave relay stations. Sufficient information on costs of installation of microwave relay chains versus the comparative costs for the maintenance and replacement of wire and cable lines is not yet available.

GENERAL MOBILE SERVICE

Need for a communication service for trucks and busses in urban areas and along the nation's major highways has existed for many years. The Commission has allocated frequencies in the 30–44 megacycle band for the highway stations and frequencies in the 152–162 megacycle band for the urban stations in this potential service. At the same time it indicated that rural radiotelephone service and the short distance toll telephone service would also secure frequencies in the 152–162 megacycle band. Since the general mobile service is still in the experimental stage, no determination of policy has been made as to the final form it will take.

Using assigned frequencies, the telephone companies are testing service in urban areas and along highways. They propose service to individuals and groups on a common carrier basis at published charges. In addition to authorizations issued to numerous telephone companies for installations in a large number of cities to provide urban mobile service, grants have been made for service on highways between major cities.

In a similar manner, individuals and organizations contemplate furnishing radio service to their own mobile units. The associations generally comprise groups having similar service requirements. For example, the National Bus Communications, Inc., requested that frequencies assigned for intercity passenger bus use in the 30–44 megacycle band in the general mobile (highway) service be made available for the intercity passenger bus industry directly or through its communication organization formed for that purpose. The Commission held a hearing in this matter on June 6, 1946, but had not issued a decision by the end of the fiscal year. Intercity truck organizations have indicated that they need an industry system patterned after that proposed by the bus organization.

Other firms propose to use radio for communicating with their mobile units engaged in such enterprises as hauling ready mixed cement, delivering merchandise, doctors' communication systems, armored cars, taxicabs, river and harbor boats, and other miscellaneous uses.

The taxicab industry has received many grants to operate in the urban mobile service. They were among the first to recognize the advantages and claim that the saving in "dead" mileage and resultant increase in efficiency may permit a reduction in fares.

Organizations proposing to establish highway mobile systems have indicated a need for wire lines or microwave radio relay circuits to effectively operate radio systems over the intercity highways. Equipment is now being produced which should speed this development.

RURAL RADIOTELEPHONE SERVICE

Considerable progress is being made in using radio to bring telephone service to isolated places. Previously, it was impossible, because of economic or technical reasons, to extend wire lines to remote hamlets. To fill this void, the Commission recognized a new type of radio service designated as the rural radiotelephone service. It should find its greatest application in connecting individual subscribers with a central telephone exchange, thus making it possible to link rural areas with the telephone system.

Since this service is to enable individual subscribers to tie in with existing wire-line facilities, it is anticipated that substantially all of these installations will be made by the telephone company operating in the areas concerned. A pioneer service was when the Mountain States Telephone Co. made an installation at Cheyenne Wells, Colo., to serve isolated ranches in that vicinity.

Parallel with the rural radiotelephone service, the Commission has tentatively recognized a new type of service designated as short-distance toll telephone service to connect isolated communities by radio in lieu of wire lines. As in the case of rural radiotelephone service, these facilities will normally be made available through the existing telephone companies. Authorizations have been granted to the Southern California Telephone Co. to conduct experiments to determine the feasibility of establishing this type of service at Death Valley, Calif. While provisions were made to operate this service on the frequencies allocated to the general mobile service, recent tests indicate that the microwave frequencies may prove more suitable; so the Southern California Telephone Co. has installed a microwave system between Santa Catalina Island and Avalon, Calif.

CITIZENS' RADIOCOMMUNICATION SERVICE

A proposed citizens' radio communication service is intended primarily to provide facilities for personal utilizaton of radio. Hunters, fishermen, farmers, amateur sportsmen, yachtsmen, surveyors, doctors, and many others will find such a service adaptable to their needs. However, some commercial enterprises may derive benefit.

While the Commission has not yet prescribed the types of uses which may be permitted, it is contemplated that in addition to two-way voice communication these facilities may be used for signaling and control devices such as burglar and fire alarms, model aircraft, garage doors, boats, lights, etc. Field strengths in excess of that permitted under the Commission's rules regarding the operation of low-power radio frequency devices will be employed, thereby enabling control of objects at greater distances.

A number of authorizations have been issued for the development of equipment to operate in the citizens' radio communication service. No applications, however, have been filed proposing to operate stations under actual service conditions. It is expected that this service will expand rapidly when appropriate equipment is available.

INDUSTRIAL RADIO SERVICE

Meanwhile, the Commission appreciates the need for short-distance radio communication in many businesses and industries such as construction, manufacturing, mining, agriculture, and related activities. In these fields there are many unexploited uses of radiocommunication which will reduce operating costs or provide increased protection of life and property. Several experimental authorizations have been issued proposing to explore the merits of radio in this connection and more are anticipated. The frequencies provided for the industrial service are primarily for short-distance reception on portable receivers and are limited to the approximate line-of-sight.

LOW-POWER PROVISIONAL RADIO STATIONS

Another class of station to provide radiocommunication over very short distances for business and industry was discussed in the Commission's allocations report (Docket 6651). Known as the low-power provisional station, it would be limited to a peak power of 5 watts and use frequencies in the bands between 30 and 40 megacycles. This potential service should be welcome in meeting particular requirements.

6. STATE GUARD RADIO STATIONS

The War Emergency Service, which was composed of three classes of stations, civilian defense, civil air patrol, and State guard, was proposed to be discontinued November 15, 1945. However, on recommendation by the War Department that State guard stations be permitted to continue operation for proper training and functioning pending reactivation of the National Guard, the Commission issued Orders Nos. 127–A and 127–B to retain the rules and regulations applicable to State guard radio stations and operators until July 1, 1947. Twenty-eight States hold State guard radio station licenses at the present time. Each of these licenses authorizes the operation, by State guard personnel only, of from 40 to 200 or more low-power portable or mobile stations.

7. MISCELLANEOUS RADIO SERVICES

The miscellaneous radio services embrace the geophysical, special press, and intermittent radio services which, in turn, cover five classes of stations, each of which provides a separate and distinct radiocommunication service: geological, mobile press, relay press, motion picture, and provisional. Approximately 97 percent of the stations authorized in the miscellaneous radio services are classed as geological and provisional.

GEOLOGICAL RADIO STATIONS

The number of geological stations increased from 411 to 485. As in the case of other mobile communication systems, a "station" includes several mobile or portable transmitter and receiver units. Practically all of the geological stations are licensed to oil companies and geophysical-exploration companies. Such stations are operated for communication and special emissions in connection with the investigation of the earth's surface and the physical characteristics of the underlying strata.

Geological stations are becoming more important to the petroleum industry in operations leading up to the initial drilling of wells. As the more obvious and easily discovered petroleum sources are exhausted, the producers must resort to more scientific and complicated methods of ascertaining the presence of oil pools. In prospecting for oil, the geological class of station is also being used for communication by work crews.

PROVISIONAL RADIO STATIONS

Provisional radio stations afford communication relative to the safety of life or property or other matters of practical public necessity. Initially, this class of station was used experimentally on large construction jobs such as bridges and dams. Their use has expanded to include essential communications in connection with operations of oil companies engaged in drilling operations in isolated areas and other locations such as in the water-covered section of Louisiana and off the coast in the Gulf of Mexico.

The number of provisional stations increased during the year from 142 to 189. Approximately 750 separate radio transmitter-receiver units operate under these authorizations.

RELAY PRESS RADIO STATIONS

The relay press class of station provides a service to newspapers and press associations paralleling the service rendered broadcast stations by the remote broadcast pick-up stations. They furnish news gathering agencies with a means of transmitting news reports and releases from remote or isolated locations where no other communication facilities are available.

During the past few years only a limited activity has been evident in the operation of the small number of licensed relay press stations. However, some additional authorizations have been issued and correspondence with news associations indicates further interest.

MOTION-PICTURE RADIO STATIONS

Motion-picture radio stations are used for communicating on location in areas where no other facilities are available and for essential

local communications incidental to the actual filming. These stations also offer communications pertaining to the safety of life and property. As in the case of relay press stations, motion picture stations have been used very little during the past year. However, applications have been received from one of the major film studios for several additional stations.

8. STATISTICS

Exclusive of the broadcast services and amateur and commercial operator licensing noted elsewhere in this report, the Commission received more than 36,000 applications during the fiscal year and authorized more than 5,700 stations of various types, bringing the total number of stations (with the exceptions noted) to nearly 22,000. A breakdown of these stations follows:

Class of station	Applications	New stations	Total stations
Aircraft	10,226	2,111	5,201
Aviation ground	1,446	301	1,004
Police	5,471	225	2,868
Fire	71	13	25
Forestry	1,365	69	1,018
Special emergency	959	255	821
Experimental	3,092	344	956
General mobile (experimental)	612	418	418
Fixed public telephone	101	6	23
Fixed public telegraph	680	12	54
Wire service extensions	363		
Wire service reductions	292		
Railroad	158	156	156
Coastal and marine relay	169	14	118
Alaska coastal	267	26	183
Alaska fixed public	487	74	347
Geological	282	74	485
Provisional	380	47	189
Miscellaneous	79	5	28
State guard	27	9	28
Ship	10,019	1,565	8,028
Total	36,546	5,723	21,950

In addition to the 13,788 separate ship inspections previously noted, 7,017 other radio inspections were made. Of this number, 3,690 were emergency stations, 1,683 aircraft and aeronautical stations, 1,361 broadcast stations, and 283 miscellaneous stations. As a result, 1,890 violation notices were served.

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CHAPTER VI

Radio Operators

CHAPTER VI—RADIO OPERATORS

1. COMMERCIAL OPERATORS

In conformity with section 303 (1) of the Communications Act of 1934, as amended, the Commission established six classes of commercial operator licenses. To alleviate the wartime shortage of radiotelegraph operators, the Commission established by Order 97 the temporary limited radiotelegraph second-class operator license and by Order 123 the temporary emergency radiotelegraph second-class operator license. When peace relieved this shortage, Commission Order 136, dated June 20, 1946, suspended issuance of these temporary licenses but continued outstanding licenses of both classes until their date of expiration.

Under the provisions of section 353 (b) of the act, the holder of a radiotelegraph first- or second-class license may not act as chief or sole operator on a cargo vessel until he has had at least 6 months of satisfactory service as a qualified ship radiotelegraph operator. The Commission, through Order 83 and subsequent extensions including Order 83–H, suspended this requirement until December 31, 1945. However, a survey of the availability of radiotelegraph operators indicated that this suspension was no longer necessary and, effective January 1, 1946, radiotelegraph operators acting as chief or sole operators must comply with the provisions of section 353 (b) of the act.

Unavailability of first-class commercial radiotelephone operators invited Commission Order 91–C of January 19, 1943, which permitted broadcast stations under certain conditions to employ commercial radio operators of any class. When radiotelephone first-class operators again became available, the Commission on April 26, 1946, promulgated Order 91–D, which canceled Order 91–C, effective August 1, 1946.

The Commission's rules require commercial and amateur radio operators to show actual operation of licensed radio stations before li-

censes can be renewed. Because of the difficulties in meeting this requirement during the war, the Commission, through its Order 77 dated December 7, 1940, suspended this provision. Further extensions were given, the last of which was to expire on December 31, 1946.

Radio operators are required to file applications for renewal of licenses prior to expiration date. Because many licensed radio operators were either in the military service or engaged in war activities, considerable difficulty was experienced in determining the expiration date of their licenses. Accordingly, the Commission on January 2, 1945, adopted Order 124 which provided for the renewal of commercial radio operator licenses other than temporary emergency radiotelegraph second-class licenses upon filing a proper application with the Commission prior to December 31, 1945, and within a period of 1 year from the date of expiration. Subsequently, the Commission Order 128 extended these provisions to cover the renewal of numerous expired commercial radio operator licenses held by persons serving or who have served in the armed forces or the merchant marine or have been employed outside of the United States. This order, dated August 28, 1945, permitted such licensees to obtain renewals of their expired licenses provided the latter were valid on December 7, 1941, and that application for renewal was filed on or before June 30, 1946; later extended to December 31, 1946, by Order 128–A of June 20, 1946.

To obviate conducting examinations and issuing licenses to approximately 500,000 railroad employees in connection with the new railroad radio service, the Commission, by Order 126 of August 21, 1945, waived the commercial radio operator requirements for the operation of railroad radio stations. However, commercial radio operator licenses were still required for adjustments to railroad transmitting apparatus which might affect its proper operation.

After studying operator requirements for all classes of radio stations, it was decided that in view of the relatively low-power and improved stability characteristics of present radio equipment used in the portable and mobile units in the experimental, emergency, miscellaneous, and railroad services, it would be possible to dispense with the need for licensed operators in portable and mobile stations without detrimental effect on these services. So, on May 10, 1946, Commission Order 133 dispensed with requirements for commercial radio operator licenses for the operation of such stations.

Commission Order 75–D of January 23, 1946, eliminated the requirement of proof of citizenship as a prerequisite to issuance of a commercial radio operator's license as originally required by Order 75.

During the fiscal year the Commission conducted an extensive survey to determine the possible further simplification of its commercial radio operator requirements, the results of which are being analyzed with a view to possible revision of its rules and regulations.

At the close of the fiscal year, the six categories of commercial radio operators represented approximately 314,000 outstanding licenses and permits, broken down as follows:

Radiotelephone licenses first and second class)	41,434
Restricted radiotelephone permits	248,465
Radiotelegraph licenses (first and second class) and restricted radiotelegraph permits, but not including special wartime authorizations	24,476
Total	314,375

2. AMATEUR RADIO SERVICE

Operation of amateur radio stations, suspended as a wartime measure, was resumed as quickly as the military released frequencies borrowed from the amateurs during the emergency. The first band to be restored was 112 to115.5 megacycles, reactivated for amateur use by Commission Order 127 of August 21, 1945. It was made available to all amateur stations whose licenses were valid at any time during the period of December 7, 1941, to September 15, 1942.

Other frequencies were returned by Commission Orders 130 to 130–G inclusive. Order 130–H, which became effective July 1, 1946, made the following frequency bands available for amateur use: 3500 to 4000 kc., 7150 to 7300 kc., 14100 to 14300 kc., 27.185 to 27.455 mc., 28.0 to 29.7 mc., 50.0 to 54.0 mc., 144 to 148 mc., 235 to 240 mc., 420 to 430 mc., 1215 to 1295 mc., 2300 to 2450 mc., 5250 to 5650 mc., 10,000 to 10,500 mc., 21,000 to 22,000 mc., and any frequencies above 30,000 megacycles.

Order 130, approved November 9, 1945, extended the validity of amateur station licenses affected by Order 127 for an additional period ending May 15, 1946, and added six additional frequency bands. This order also canceled Order 72 of June 5, 1940, prohibiting amateur radio stations from communicating with operators of foreign radio stations; Order 73 dated June 7, 1940, and amendments, prohibiting operation of amateur portable and mobile stations on frequencies below 56 megacycles; Order 87–A, dated January 9, 1942, which prohibited all amateur operation, and Order 87–B dated September 15, 1942, suspending the issuance of renewed or modified amateur station licenses.

Order 130–F, adopted April 17, 1946, provided that the term of each amateur station license, which was valid between December 7, 1941, and September 15, 1942, should run concurrently with the term of the amateur operator license held by the licensee of the station.

Amateur licensees have long been required to file with the Commission an application for modification of license to change the permanent location of a station. Due to the transitory conditions brought about by the war, many amateurs were at locations other than that specified in the station licenses at the time the Commission reactivated the amateur radio service. This resulted in the filing of a large number of applications which, because of its limited staff, the Commission was unable to process. For administrative expediency, the Commission on April 10, 1946, adopted Order 132 which authorized amateur station licensees (whose station license terms were extended by Order 130–F and earlier orders) to operate at locations other than those specified on the license, provided advance written notice was given to the FCC engineer in charge of the district for which the station license was issued and to the engineer in charge of the district in which operation was intended.

Because many amateurs were either in the military service or engaged in war activities, difficulty was experienced in determining the expiration date of their operator licenses and the timely filing of application for renewals. To meet this problem, the Commission adopted Order 115 on May 25, 1943, and Order 115–A on November 28, 1944, which extended the license term. Subsequently, the Commission clarified and extended these provisions by Order 115–B, dated

November 28, 1945, which provided that amateur operator licenses which, either by their own terms or as extended by Orders 115 and 115–A, would expire during the period December 7, 1945, to December 7, 1946, be continued for a period of 1 year from the date on which they would otherwise expire.

On November 28, 1945, the Commission issued Order 131 canceling its Orders 99 dated June 8, 1942; 99–A dated June 27, 1942; 99–B dated October 5, 1943; and 101 dated June 19, 1942, which required registration of unlicensed inoperative transmitters.

Studies and conferences resulted in revising the Rules Governing Amateur Service, effective April 1, 1946. These rules increased the normal license period from 3 to 5 years from the date of issuance of a new, renewed or modified license thereafter. They also established a new system of assigning identifying call letters, prefixed by K or W, to amateur stations in order to make available thousands of additional calls without exceeding five symbols. To help accomplish this, the number of amateur call letters areas was increased from 9 to 10.

At the close of the fiscal year the number of amateur licenses was approaching the 70,000 mark.

3. EXAMINATIONS

Examinations were given to an unprecedented number of applicants for all classes of commercial licenses. A total of 76,629 applicants were examined (exclusive of class C amateur) as compared to 64,260 for the previous year. Of these, 69,706 were applicants for commercial licenses including 64,893 radiotelephone and 4,813 radiotelegraph. Applicants for amateur class A and B radio operator licenses totaled 6,923. As a result of the examinations 63,106 commercial operator licenses were issued, 59,711 telephone and 3,395 telegraph.

CHAPTER VII

Technical Studies

CHAPTER VII—TECHNICAL STUDIES

1. TECHNICAL INFORMATION DIVISION

The Technical Information Division continued to initiate studies of radio wave propagation and of atmospheric and man-made electrical noises as an essential aid in allocating frequencies in the best interests of radio services and the general public. It also furnished technical information necessary in effecting improvements in radio and wire communications generally.

SUNSPOT AND NOISE MEASUREMENTS

During the fiscal year, field intensity measurements had progressed only through the first stages of summarizing. However, data obtained has made it possible to describe the nature and extent of broadcast service in greater detail than heretofore. The most conspicuous application was in preparing exhibits for the clear channel hearing (Docket 6741). Maps were introduced to show the extents and grades of broadcast service from all domestic stations as limited by sky wave, ground wave and self-interference (distortion and fading), and atmospheric and man-made noises. An additional application of these materials was reflected in a critical and theoretical essay of the extent to which engineers can define grades of service and the accuracy with which these grades can be predicted. When additional personnel became available, work was begun on a revision of the United States Ground Conductivity Map.

LOW-FREQUENCY RECORDING

This program was not expanded during the year because of more urgent problems involving standard and very-high frequency broadcasting. The 200-kilocycle noise recorder at Grand Island, Nebr., has been in continuous operation since October 1943. Consideration is now being given to combining this project with the sunspot cycle

study so as to have a single comprehensive noise recording program embracing the entire range of the spectrum in which experienced. The insufficiency of the data taken to date as a measure of the geographic distribution of atmospheric noise and difficulty of correlating noise measurements with thunderstorm data indicate the need for wider distribution of measuring locations. Similarly, it is proposed to incorporate measurements of the field intensities of aeronautical beacon stations and other available stations in the low-frequency range.

VERY-HIGH FREQUENCY RECORDING

Measurement continued of the field intensities of selected FM broadcast stations and some very-high frequency experimental stations. Recordings of bursts and sporadic E-layer transmissions from FM station WGTR, Paxton, Mass., have been made continuously at the Commission's field office at Laurel, Md., since February 1943, and at the field offices at Allegan, Mich., Atlanta, Ga., and Grand Island, Nebr., since September 1943.

TROPOSPHERIC EFFECTS

To serve allocation hearing and for the preparation of engineering standards of coverage and interference for FM and television stations, it was necessary during the summer of 1945 to expand the recording program, particularly as to the effects at locations nearer to the transmitter than provided originally. Station WGTR at Paxton and stations WABC-FM and WABD at New York City were operated 18 hours daily, and two experimental stations, W2XRA and W2XRY, were constructed at New York City by the Raytheon Co. Recorders were operated at Princeton, N. J., by the RCA Laboratories and facilities for recording were provided at Iowa City by the University of Iowa. Additional recorders were set up at Commission field stations at Andalusia, Pa., Roanoke, Va., Atlanta, Ga., Montgomery, Ala., New Orleans, La., Cleveland, Ohio, and Grand Island, Nebr. Further tests will include the measurement at Princeton, N. J., Southampton, Pa., Laurel, Md., and Atlanta, Ga., of 47 and 106 megacycle transmissions provided by the Bamberger Broadcasting Co. at New York. Simultaneously, continuous measurements are being made at the same points of 700 megacycle transmissions from the Columbia Broadcasting System in New York City.

MOBILE SURVEYS

One of the difficulties which attended analysis of this study was to determine the effects of tall buildings and structures near the transmitter. A mobile survey made along the ground in cars indicated that some effect was present, but the variations of the measurements due to terrain and structures near the receiving point made it impossible to evaluate the effect. An aircraft survey, made on the present transmitters in New York City, in conjunction with the Army Air Forces at Wright Field gave much better results and permitted a reasonable estimate of this effect.

SPORADIC E-LAYER REFLECTIONS

The continuous recording of FM station WGTR, previously referred to, provided an opportunity to compare the occurrence of spo-

radic E reflections at 44 megacycles during the period September 1943 through August 1944, the latter year showing about a 20 percent decrease in occurrence. Under the expanded program, no sporadic E reflections were obtained at 107 megacycles and but one brief period of 10 minutes at low intensity was experienced at one recording site at 84 megacycles as compared to several hours of occurrence at comparable intensity at 44 megacycles. The expanded program also verified, in general, the expected variations in occurrence and intensity with distance from the transmitter. Some differences in occurrences were noted for different recorder locations at comparable distances from the transmitter, which may be due to differences in reflection at various latitudes. This is not definitely known, however, as there are other possible explanations for the effect.

BURST PHENOMENA

As already reported, "burst" signals continue to appear on recordings made of distance stations for the purpose of detecting sporadic E and tropospheric effects. The rates and intensities of the occurrences of bursts are not being analyzed at present because of their purely academic interest and lack of bearing upon FM and television allocations. However, they have aroused considerable interest in scientific circles and many requests have been received for past or future analyses. Correlation between audible bursts and visible meteors is still being undertaken, but no coincidences in addition to the 13 previously reported have been observed.

2. LABORATORY DIVISION

The Laboratory Division was organized in March 1946 to study civilian uses of radar and other war-born developments as they affect frequency allocations, to study wave propagation, to develop new monitoring equipment and to test all types of radio apparatus, including diathermy and industrial heating equipment requiring type approval.

During its 4 months of operation this division tested 15 models of diathermy machines, conducted 7 field intensity surveys on high-powered industrial RF heater installations for the purpose of establishing effectiveness of shielding to prevent interfering radiations, made 4 field intensity surveys of experimental FM stations to determine the limits of the good service area, and made 2 type-approval tests on modulation monitors.

Extensive studies on the interference possibilities of diathermy and industrial heating equipment resulted in standards being recommended. Three radar sets received from the armed services are being tested to determine their utility for civilian use and the possibility of interference to other services.

At the end of the fiscal year 16 projects required laboratory study and development. They include study of image response and blanketing in typical FM receivers, study of the suitability of 21 and 26 megacycles for transmitting time signals, study to determine the feasibility of "stratovision" broadcasting and broadcast relaying, propagation end equipment study of the limitations applying to the citizens' radio service looking towards the establishment of rules and standards for this service, development of equipment for the field intensity re-

cording at Southampton, Pa., determination of the errors for indicating instruments used at very high frequencies, study of the band width occupancy in the radio spectrum of loran signals, determination of the accuracy of a type of portable heterodyne frequency meter considered for purchase by the Commission, and measuring characteristics of radar type antennas to determine their suitability for field intensity measurement purposes.

APPENDIX

PUBLICATIONS

Following is a list of Federal Communications Commission publications which may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., unless otherwise indicated:

Title	*Price*
Communications Act of 1934 with amendments and index, revised to June 14, 1945	$0.15
Federal Communications Commission reports (bound volumes of decisions and orders exclusive of annual reports):	
Volume 2—July 1935–June 1936	2.00
Volume 3—July 1936–February 1937	2.00
Volume 4—March 1937–November 15, 1937	1.50
Volume 5—November 16, 1937–June 30, 1938	1.50
Volume 6—July 1, 1938–February 28, 1939	1.50
Volume 7—March 1, 1939–February 29, 1940	1.50
Volume 8—March 1, 1940–August 1, 1941	1.50
Volume 9—August 1, 1941–April 1, 1943	1.25
Volume 10—April 1, 1943–June 30, 1945	(1)
Annual reports of the Commission:	
First Annual Report—Fiscal year 1935	0.15
Third Annual Report—Fiscal year 1937	0.30
Fifth Annual Report—Fiscal year 1939	0.30
Twelfth Annual Report—Fiscal year 1946	(1)
Statistics of the communications industry:	
For the year 1939	0.25
For the year 1940	0.20
For the year 1942	0.35
For the year 1943	0.30
For the year 1944	0.40
Report on Chain Broadcasting	0.30
Report on "Public Service Responsibility of Broadcast Licensees"	0.25
Standards of Good Engineering Practice:	
Concerning Standard Broadcast Stations, revised to June 1, 1944	0.65
Concerning FM Broadcast Stations, revised to January 9, 1946	0.10
Concerning Television Broadcast Stations, revised to December 19, 1945	0.10
Study Guide and Reference Material for Commercial Radio Operator Examinations	0.15
Rules and regulations:	
Part 1, Rules Relating to Organization and Practice and Procedure, effective September 11, 1946	(2)
Part 2, General Rules and Regulations, revised to December 19, 1944	0.10
Part 3, Rules Governing Standard and High-Frequency Broadcast Stations, revised to October 5, 1940	0.10
Part 4, Rules Governing Experimental and Auxiliary Broadcast Stations, effective September 10, 1946	(3)
Part 5, Rules Governing Experimental Radio Services, revised to October 28, 1943	(2)
Part 6, Rules Governing Fixed Public Radio Services, revised February 20, 1943	0.05
Part 7, Rules Governing Coastal and Marine Relay Services, revised April 5, 1941	(3)

For footnotes see page 62.

Rules and regulations—Continued *Title*	*Price*
Part 8, Rules Governing Ship Service, revised to May 31, 1943	$0.15
Part 9, Rules Governing Aviation Radio Services, revised to November 1, 1942	.05
Part 10, Rules Governing Emergency Radio Services, revised to October 16, 1944	(2)
Part 11, Rules Governing Miscellaneous Radio Services, effective January 1, 1939	.05
Part 12, Rules Governing Amateur Radio Service, revised to May 9, 1946	.10
Part 13, Rules Governing Commercial Radio Operators, effective July 1, 1939	.05
Part 14, Rules Governing Radio Stations in Alaska (other than Amateur and Broadcast), revised to April 2, 1942	.05
Part 15, Rules and Regulations Governing All Radio Stations in the War Emergency Service, revised to April 2, 1942	.05
Part 16, Rules and Regulations Governing Railroad Radio Service, effective December 31, 1945	(2)
Part 17, Rules Governing Stations in the Utility Radio Service, effective September 12, 1946	(2)
Part 31–32, Uniform System of Accounts for Class A and Class B Telephone Companies—Units of Property Class A and Class B Telephone Companies, revised to August 1, 1946	(1)
Part 33, Uniform System of Accounts for Class C Telephone Companies, effective January 1, 1939	.15
Part 34, Uniform System of Accounts for Radiotelegraph Carriers, effective January 1, 1940	.25
Part 35, Uniform System of Accounts for Wire-Telegraph and Ocean-Cable Carriers, effective January 1, 1943	.35
Part 41, Telegraph and Telephone Franks, effective August 11, 1939	.05
Part 42, Rules Governing the Preservation of Records, revised to May 27, 1943	.10
Part 43, Rules Governing the Filing of Information, Contracts, etc., of Telecommunications Carriers, revised to September 29, 1943	.05
Part 51, Classification of Telegraph Employees, effective July 25, 1944	.05
Part 52, Classification of Wire-Telegraph Employees, effective July 11, 1944	.05
Part 61, Tariffs, Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service, revised to September 29, 1943	(1)
Part 62, Rules Governing Applications under Section 212 of the Act to Hold Interlocking Directorates, effective September 1, 1939	.05
Part 63, Extension of Lines and Discontinuance of Service by Carriers effective March 18, 1944	.05
Part 64, Miscellaneous Rules Relating to Common Carriers, revised to September 19, 1946	(2)

[1] In the process of printing—available at Government Printing Office at a later date.
[2] Obtainable from the Federal Communications Commission, Washington 25, D. C., without charge.

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