

SEVENTH ANNUAL REPORT

FEDERAL
COMMUNICATIONS
COMMISSION



FISCAL YEAR ENDED JUNE 30, 1941

(With Notation of Subsequent National Defense
and Other Important Activities)

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON : 1941

For sale by the Superintendent of Documents, Washington, D. C. Price 10 cents

COMMISSIONERS

MEMBERS OF THE FEDERAL COMMUNICATIONS COMMISSION

[As of December 15, 1941]

CHAIRMAN

JAMES LAWRENCE FLY

PAUL A. WALKER
NORMAN S. CASE
T. A. M. CRAVEN

GEORGE HENRY PAYNE
*RAY C. WAKEFIELD
**CLIFFORD J. DURR

*Took office March 22, 1941; succeeded Thad H. Brown, whose term expired June 30, 1940.

**Took office November 1, 1941; succeeded Frederick I. Thompson, whose term expired June 30, 1941.

LETTER OF TRANSMITTAL

FEDERAL COMMUNICATIONS COMMISSION,
Washington, D. C., December 15, 1941.

To the Congress of the United States:

The Seventh Annual Report of the Federal Communications Commission, submitted herewith, is brought up to date in major developments so that the Congress may be more currently informed about the Commission's national defense work and events in radio and wire regulation which have occurred since the fiscal year ended June 30 last.

The war-time emergency and new considerations in the field of electrical communications impose increasing and exacting burdens on the Commission. The showing made has, in large measure, been possible by employee devotion to duty beyond that which might reasonably be expected, even in the face of unusual conditions.

Respectfully,

JAMES LAWRENCE FLY,
Chairman.

[Page IV in the original document is intentionally blank]

TABLE OF CONTENTS

INDEX

Chapter	Page
I. NATIONAL DEFENSE.....	1
II. GENERAL.....	7
III. TELEPHONE AND TELEGRAPH.....	13
IV. STANDARD BROADCAST.....	21
V. NONSTANDARD BROADCAST.....	29
VI. SAFETY OF LIFE AND PROPERTY.....	39
VII. RADIO OPERATORS.....	51
VIII. TECHNICAL STUDIES.....	55
IX. STATISTICS.....	61

[Page VI in the original document is intentionally blank]

GENERAL INDEX

Chapter	Page
I. NATIONAL DEFENSE.....	1
1. Commission's national defense activities.....	1
2. National Defense Operations Section.....	2
3. Foreign Broadcast Monitoring Service.....	3
4. Defense Communications Board.....	5
(a) Organization.....	5
(b) Activities.....	6
II. GENERAL.....	7
1. Administration.....	7
2. Commission membership changes.....	7
3. Staff organization.....	8
4. Personnel.....	8
5. Appropriations.....	8
6. Legislation.....	8
(a) Recommendations to Congress.....	8
(b) Reports to Congress.....	8
(c) New legislation.....	9
7. Litigation.....	10
(a) Record of court cases.....	11
8. Dockets.....	11
9. International.....	11
(a) General.....	11
(b) Interdepartmental Committee on Cooperation With American Republics.....	12
10. Interdepartment Radio Advisory Committee.....	12
III. TELEPHONE AND TELEGRAPH.....	13
1. Telephone.....	13
(a) General regulation.....	13
(b) Telephone rate section established.....	13
(c) Telephone rate reductions.....	13
(d) Other rate cases.....	14
(e) Telephone facilities.....	15
Applications.....	15
Supplementing facilities.....	15
Consolidations.....	15
2. Telegraph.....	15
(a) Applications.....	15
(b) Government message rates.....	16
(c) Investigations.....	16
Trans-Pacific rates.....	16
Pick-up and delivery practices.....	16
(d) Prosecution.....	16
3. Cable.....	16
(a) Effect of the war.....	16
(b) Developments.....	16
4. Radio common carriers.....	17
(a) Radiotelegraph.....	17
(b) Radiotelephone.....	18
5. Tariffs.....	19

Chapter

III. TELEPHONE AND TELEGRAPH—Continued.

Page

- | | |
|--|----|
| 6. Supervision of accounts..... | 19 |
| (a) Restatement of plant accounts on basis of original cost..... | 19 |
| (b) Depreciation..... | 19 |
| (c) Cooperation With Federal and State regulatory bodies..... | 19 |
| (d) Miscellaneous..... | 19 |
| (e) Field Accounting Examinations..... | 20 |

IV. STANDARD BROADCAST.....

21

- | | |
|--|----|
| 1. General..... | 21 |
| 2. North American Regional Broadcasting Agreement..... | 21 |
| 3. Chain broadcasting regulations..... | 22 |
| 4. Newspaper-radio inquiry..... | 25 |
| 5. Multiple station operation..... | 26 |
| 6. Directional antennas..... | 26 |
| 7. Direct measurement..... | 26 |
| 8. Standards of Good Engineering Practice..... | 27 |
| 9. Distribution of broadcast facilities..... | 27 |
| 10. License Period Extended..... | 27 |
| 11. Complaints and investigations..... | 27 |
| (a) "No censorship"..... | 27 |
| (b) Radio facilities for candidates for public office..... | 28 |

V. NONSTANDARD BROADCAST.....

29

- | | |
|---|----|
| 1. General..... | 29 |
| 2. High frequency (FM) broadcast service..... | 30 |
| (a) Authorizations..... | 30 |
| (b) Changes in rules..... | 30 |
| 3. Television broadcast service..... | 32 |
| (a) 1940 situation..... | 32 |
| (b) National Television System Committee..... | 32 |
| (c) 1941 hearing..... | 33 |
| (d) Rules and standards..... | 33 |
| (e) Developments..... | 34 |
| 4. International broadcast service..... | 34 |
| 5. Noncommercial educational broadcast service..... | 35 |
| 6. Studio-transmitter service..... | 36 |
| 7. Relay broadcast service..... | 36 |
| 8. Facsimile broadcast service..... | 37 |
| 9. Developmental broadcast service..... | 37 |

VI. SAFETY OF LIFE AND PROPERTY.....

39

- | | |
|---|----|
| 1. Marine service..... | 39 |
| (a) Great Lakes and inland waters survey..... | 39 |
| (b) Great Lakes radiotelephone service..... | 39 |
| (c) Mississippi River radiotelephone service..... | 40 |
| (d) Radiotelephony in Gulf coast area..... | 40 |
| (e) Coastal radiotelegraph..... | 40 |
| (f) Coastal radiotelephone..... | 41 |
| (g) Coastal-harbor stations..... | 41 |
| (h) Ship radiotelegraph and radiotelephone..... | 42 |
| (i) Emergency marine communication..... | 43 |
| (j) Marine radio equipment..... | 43 |
| 2. Aviation service..... | 44 |
| (a) Domestic aviation..... | 44 |
| (b) Airport traffic control..... | 45 |
| (c) Nonscheduled aircraft..... | 45 |
| (d) Flying school stations..... | 46 |
| (e) International aviation service..... | 46 |
| 3. Emergency service..... | 46 |
| (a) Police..... | 47 |
| (b) Forestry..... | 48 |
| (c) Marine fire stations..... | 48 |
| (d) Special emergency stations..... | 48 |
| 4. Experimental services..... | 49 |
| 5. Alaskan services..... | 50 |
| 6. Miscellaneous services..... | 50 |

Chapter		Page
VII.	RADIO OPERATORS.....	51
	1. Commercial.....	51
	(a) Citizenship inquiries.....	52
	2. Amateur.....	52
	(a) Developments in amateur service.....	53
VIII.	TECHNICAL STUDIES.....	55
	1. Interference from electromedical equipment.....	55
	2. Interference from low-power devices.....	56
	3. "College networks" and other wired radio.....	56
	4. Measuring electrical noise.....	56
	5. High frequency blanketing.....	57
	6. Ground wave propagation.....	57
	7. Ionospheric waves.....	58
	8. Tropospheric waves.....	58
	9. Variable frequency circuit theory.....	58
	10. Electric and magnetic units.....	59
IX.	STATISTICS.....	61
	1. Broadcast financial data.....	61
	2. Broadcast statistics.....	62
	(a) Number of broadcast stations.....	62
	(b) Broadcast applications.....	62
	3. Other radio service statistics.....	63
	4. Common carrier statistics.....	64
	(a) Annual and monthly reports.....	64
	(b) Statistical compilations.....	64
	(c) Wire certificates.....	64
	5. Field activity statistics.....	64
	6. Publications.....	65
	(a) For sale by Superintendent of Documents.....	66

CHAPTER I

National Defense

1. COMMISSION'S NATIONAL DEFENSE ACTIVITIES
 2. NATIONAL DEFENSE OPERATIONS SECTION
 3. FOREIGN BROADCAST MONITORING SERVICE
 4. DEFENSE COMMUNICATIONS BOARD
-

1. COMMISSION'S NATIONAL DEFENSE ACTIVITIES

Solving the many communications problems arising from the Nation's defense effort is a primary concern of the Federal Communications Commission. The rapid expansion of the Army and Navy, especially their air forces, the development of civilian defense plans and projects, the rise of new and perilous conditions on the high seas, the interruption of all direct cable service to the continent of Europe (the United Kingdom, Eire, and the Azores excepted), the need for adequate presentation of United States broadcasts via short waves to other countries, especially in Latin America, the increase in telephone, telegraph, and radio communications traffic concurrent with the defense program—these and a variety of other developments during the past year have profoundly affected the day-to-day business of the Commission. No part of the Commission's work has been left unaffected by emergency requirements, and two new sections—the National Defense Operations Section and the Foreign Broadcast Monitoring Service—have been established to meet particular defense needs.

Typical of the many Commission defense activities are the licensing of and granting additional power to short-wave stations beamed on foreign countries; work with the Interdepartmental Committee on Cooperation with American Republics; the approval of 66 telegraph line-extension applications, 35 of which were for lines to military or naval establishments and one of which concerned a 1,800-mile addition to the 30,000-mile weather-reporting system of the Civil Aeronautics Administration; special studies of our radiotelegraph links with other countries; rapid expansion of the channels available for aviation services, including special frequencies for aviation schools in connection with the Army's pilot-training program; and a variety of technical studies and research projects directly related to national defense needs. Details of these and other defense activities of the Commission will be found throughout the various subdivisions of this report.

The defense program has made necessary the expansion of plant and equipment in a variety of communications fields; and the Commission has sought to expedite and facilitate such expansion in every appropriate way. Shortages of strategic materials and skilled labor essential to communications work have made it especially important to determine which types of expansion are essential to present or anticipated defense requirements.

In addition to aiding in the development of new facilities and services as part of the defense effort, the Commission has been concerned with forestalling any possible misuse of existing facilities. Amateur radio communication in the United States, its territories and possessions was banned December 7, coincident with the outbreak of war with Japan; a Nation-wide system of 24-hour monitoring stations has been established, each station policing a particular area much as a policeman patrols his beat; the citizenship of operators and of many communications employees is being checked; and international carriers are being required to keep on file originals of all overseas cable and radio communications, all of which is discussed in appropriate sections of this report.

In many of its defense activities, the Commission has had the advice and has acted on the request of the Defense Communications Board.

2. NATIONAL DEFENSE OPERATIONS SECTION

The National Defense Operations Section is a new adjunct of the Field Division, which is under the Engineering Department. Created July 1, 1940, the National Defense Operations Section insures a continual and effective policing of all radio communication channels for the purpose of detecting and locating unauthorized stations operating in violation of laws, treaties, or war-time regulations.

Using funds made available from the special emergency and current appropriations, the Commission is setting up 91 monitoring stations at strategically chosen locations throughout the United States, its territories and island possessions. Of these, 11 are primary monitoring stations, and 80 are secondary monitoring stations. Each of the latter is supplemented by a mobile direction-finder intercept station.

For obvious reasons, the locations of these stations are not made public. It may be stated, however, that every State has at least 1 secondary station. Each station is equipped with highly specialized direction finders, recorders, directive antenna arrays, frequency measuring equipment, and associated apparatus. At the close of the fiscal year 10 primary and 78 secondary stations were in operation.

Monitoring to see that radio transmissions obey ordinary ether traffic rules has been a necessary practice since the early days of radio regulation. The various types of radio transmissions are assigned particular ether lanes in which to travel. If one signal strays over its assigned "white line" there is collision with and confusion to other services. Likewise, if a transmission appears in the ether paths without identifying call letters it is as quickly spotted as an auto without license plates trying to traverse a land highway.

Today the Commission's monitoring service must be particularly alert for signals which might be inimical to the national interest. Such a signal may be picked up by a monitoring station or reported by

broadcasters and other licensees—often by amateurs, who do an excellent job of policing their own bands.

When an intruder or "reckless driver" is detected in the ether lanes, direction-finding apparatus is called into play. Three or more monitoring stations collaborate in getting a bearing on the moot signal. Their beams are plotted on a map. Eventually and inevitably two lines will cross. The point, or "fix", marks the general location of the origin of the transmission in question.

The final task of running down the offender is performed by monitoring officers, men highly skilled in radio technique, using automobiles which are fitted with the latest and most efficient type of detection equipment. Included are direction-finders, all-wave receivers, and recorders. All this apparatus can be operated from the auto's battery or, upon being removed from the car, from the power supply of a dwelling, store, or tourist camp.

Operation of the mobile equipment follows much the same procedure employed by the monitoring stations in the first instance. Directional beams finally "fix" at the exact location of the transmitter in question. Even if the hunt narrows to an apartment house, hotel, or other large building a monitoring officer can by using a device carried in his hand or in his pocket proceed from floor to floor and from door to door until he determines the exact room in which the equipment is being used.

Thus, as George Creel commented in a recent issue of *Collier's*, "the Federal Communications Commission has worked out a system by which it polices the ether as methodically and efficiently as a policeman patrols his beat."

The fact that the ether highways are now so effectively policed invites serious complications for the operator or "prankster" who does not conform to requirements of the present emergency. The National Defense Operations Section works very closely with other intelligence and investigative agencies of the Federal Government as well as with *State and municipal law-enforcement bodies*.

At the beginning of an investigation there is no way of knowing whether or not a violation has national security implications. However, defense ether-policing requires each and every case to be investigated thoroughly.

If it is determined that the offense is a minor one, routine proceedings are instituted against the culprit. Should the case have more serious aspects, it is turned over to the appropriate Federal agency.

During the past fiscal year the National Defense Operations Section handled several thousand complaints of various illegal radio operations or suspected violations of radio laws and treaties. A total of 251 transmitters were found to be operating without license.

As the result of monitoring by the National Defense Operations Section, the licenses of four stations were revoked for cause, and the licenses of some two score operators were suspended for violations of emergency regulations.

3. FOREIGN BROADCAST MONITORING SERVICE

The Foreign Broadcast Monitoring Service, created February 26, 1941, by the Federal Communications Commission in cooperation with the Defense Communications Board, is now actively translating,

transcribing, analyzing, and reporting on from 600,000 to 900,000 words transmitted daily by foreign broadcast stations throughout the world as recorded by the Commission's National Defense Operations Section.

Working in three shifts of 8 hours each, a special force of technicians, translators, analysts, and other experts is keeping abreast of overseas broadcasts, 24 hours of the day, 7 days a week. Speeches, news, and entertainment to the inclusion of some musical programs, are carefully watched for intelligence and trends, which are reported immediately to Government officials responsible for counterpropaganda or other action, if necessary.

The importance of listening in on foreign transmissions is attested in the fact that propaganda instigated abroad almost invariably follows the example set in short-wave broadcasts, but follows it with a lag. Almost every political, diplomatic, or military move is presaged by shifts in propaganda treatment. Consequently, through study of the short wave "model" it is often possible to predict such moves. A new course in policy can be reflected in broadcasts long before it is announced officially, or rumored in the press. For example, the altered tone of certain foreign broadcasts gave the first indication that Japan intended to occupy Indo-China.

To keep informed on such trends, the Foreign Broadcast Monitoring Service operates in a sort of "belt line" process.

Four "listening posts" of the FCC's National Defense Operations Section are exclusively attuned to foreign broadcasts. They are so located that each can best hear transmissions from a particular region of the world. Thus, one of these "ears" at Silver Hill, Md., listens to broadcasts from Europe, the Near and Middle East and Africa, with particular attention to transmissions beamed to North America. Another, at Santurce, P. R., intercepts broadcasts directed to Latin America. A third, at Kingsville, Tex., concerns itself with broadcasts from South and Central America, while the fourth, at Portland, Oreg., tunes in on transmissions from the Far East. These monitoring stations have quick communication with a central Washington office by means of radio, telephone, teletype, and telefax.

Monitors record major foreign broadcasts, and information about content significant either from the intelligence or propaganda point of view is flashed immediately to appropriate Government officials. Decentralization of the Foreign Broadcast Monitoring Service force makes each listening post, in effect, a complete unit in itself, with engineers, translators, transcribers, stenographers, and persons who prepare reports. Thus, each can tackle an overseas broadcast as quickly as it is recorded. However, all analysis work is done at the Washington office.

From this central control office, pertinent information is dispatched to a selected list of military and other Government officials in the form of spot bulletins, daily reports with over-all content and analysis, weekly summaries of propaganda methods on the long-range basis, and special reports and analyses.

The volume of international broadcasts is tremendous. The German radio bombards the United States alone with nearly 11 hours of emissions daily, the British send us about 6½ hours, Japan 4½ hours, and Italy more than 4 hours, and a score of other nations in

lesser proportions. Significant to our Foreign Broadcast Monitoring Service are the different treatments accorded the same news by a country in broadcasting to various nations. Seventy-five percent of the programs intercepted from abroad are in languages other than English.

Broadcasting is new to war. In the World War there was only wireless telegraphy to contend with, and to a very limited extent. Today the world is radio conscious, and broadcasting has recognized value for influencing peoples. Yet much the same propaganda methods used before the days of radio have been adapted to broadcast in wartime. Though air technique is different, there is much reliance in the old devices of exaggeration, suppression, distortion, appeals to selfish prides and interests, and exploitation of prejudices and jealousies. Some types of broadcast propaganda are aimed at the masses, while others seek to cultivate groups and factions.

The Foreign Broadcast Monitoring Service is on continual watch for significant news not available in the regular press and radio dispatches, as well as news and comment directed against the United States. It closely examines this material for evidence of changes in foreign policies and military strategies, and shifts in propaganda treatment. The resultant reports identify the major themes and arguments, evaluate the flow of broadcasts, and estimate effects. Upon receiving these reports, respective Government officials can determine any necessary countermove or action. All reports by the Foreign Broadcast Monitoring Service are confidential and not of public issue.

4. DEFENSE COMMUNICATIONS BOARD

Organization

The Defense Communications Board was created by Executive order on September 24, 1940, as a planning body for the coordination of defense communications activities. It has no operating or procurement functions, and reports to the President through the Office for Emergency Management.

Federal Communications Commission Chairman James Lawrence Fly is also chairman of the Defense Communications Board. Other Board members are Herbert E. Gaston, Assistant Secretary of the Treasury in Charge of the Coast Guard, who is secretary of the Board; Maj. Gen. Dawson Olmstead, Chief Signal Officer of the Army; Rear Adm. Leigh Noyes, Director of Naval Communications; and Breckinridge Long, Assistant Secretary of State in Charge of the Division of International Communications.

Assisting the Board are a coordinating committee and a law committee staffed by personnel from the agencies represented on the Board; the Board itself has no paid personnel. The coordinating committee supervises the work of various other committees representing the domestic and international broadcasting industries; telephone, telegraph, cable, and radiocommunications companies; aviation and amateur interests; and Federal, State, and municipal facilities. There are also an Interdepartment Radio Advisory Committee, a Communications Liaison Committee for Civilian Defense, and a Priorities Liaison Committee. Two special advisory groups representing industry and

labor report directly to the Board. Because many of its tasks are concerned with planning for potential military emergencies, some Board activities are not now matters of public record.

Activities

Each of the industry committees has been active in formulating plans for meeting foreseeable defense emergencies. For example, the international radiocommunications committee has surveyed alternative routing of international radio messages in the event that particular routes are interrupted by accident or belligerent action. The cable committee has made special studies of cable repair under wartime conditions. The telegraph committee has been concerned with formulation of plans for message priorities to defense communications, etc. The telephone committee has prepared special studies of maintenance of telephone service under emergency conditions and with particular reference to those telephone lines which now carry radiobroadcasts from networks to stations all over the country; plans for a super-network of telephone connections linking substantially every station in the country, and for regional telephonic networks have been prepared. The broadcasting committee has been concerned with such problems as the maintenance of continuous service during emergency interruption of program circuits or power lines, and with plans to prevent broadcasting stations from becoming beacons for enemy aircraft in areas of military combat. The State and municipal facilities committee is formulating plans for emergency use of fire and police communications systems, including the expansion of existing plant and equipment, the availability of auxiliary power supplies, the protection of communications centers from accident or sabotage and other steps designed to foster the efficiency and dependability of such communications systems. The Liaison Committee for Civilian Defense cooperates with the Office of Civilian Defense in preparing air-raid warning and other defense plans. These are a few of the Board's manifold planning activities.

Studies prepared by the various committees are submitted through the coordinating committee to the Board; frequently the Board takes action in the form of recommendations to the Federal Communications Commission, and the Commission customarily expedites action on such recommendations. Among the Board recommendations acted on by the Commission were the establishment of the Foreign Broadcast Monitoring Service; the setting aside of special frequencies for military pilot training schools; the adoption of various measures to safeguard communications services from possible activities of agents of foreign governments or interests; and the institution of procedures to facilitate the transfer of facilities needed for military purposes.

The Executive order establishing the Board specifically directed it to take no cognizance of matters pertaining to censorship.

CHAPTER II

General

1. ADMINISTRATION
 2. COMMISSION MEMBERSHIP CHANGES
 3. STAFF ORGANIZATION
 4. PERSONNEL
 5. APPROPRIATIONS
 6. LEGISLATION
 7. LITIGATION
 8. DOCKETS
 9. INTERNATIONAL
 10. INTERDEPARTMENT RADIO ADVISORY COMMITTEE
-

1. ADMINISTRATION

The Federal Communications 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.

Authority of individual Commissioners and of the Administrative Board under Administrative Order No. 2 was extended in minor particulars. The Commission adopted Administrative Order No. 3, providing for the execution of functions of the Commission in the absence of a quorum to take care of emergency situations. The Commission, however, provided that the procedure under the latter order would not be followed after September 1941.

2. COMMISSION MEMBERSHIP CHANGES

On March 22, 1941, Ray C. Wakefield of California was sworn in as Commissioner, to succeed the late Commissioner Thad H. Brown, whose term expired June 30, 1940; and on November 1, 1941, Clifford J. Durr of Alabama was sworn in to succeed Frederick I. Thompson, also of Alabama, whose term expired June 30, 1941.

3. STAFF ORGANIZATION

The Commission's staff organization consists of four units:

Accounting, Statistical, and Tariff Department, which supervises tariff and accounting regulation and analysis.

Engineering Department, which, in addition to domestic and foreign engineering phases, supervises the field staff and conducts technical research.

Law Department, which handles legal considerations in broadcast and common carrier regulation, legislation, and rule-making, and conducts investigations and litigation proceedings.

Secretary's Office, which has charge of internal administration, issues licenses and copies of Commission orders and decisions, and maintains records.

The heads of these departments constitute an *Administrative Board* and *Committee on Rules* which handle routine matters in accordance with established Commission policy, and consider and recommend new or revised rules and regulations.

4. PERSONNEL

At the close of the fiscal year, the Commission had 775 employees in Washington (including 257 national-defense employees) and 613 in the field (including 424 national-defense employees). With few exceptions, the Commission's personnel is under Civil Service.

5. APPROPRIATIONS

For the fiscal year, the Commission was appropriated \$4,126,340. Of this amount, \$1,750,000 was for national defense activities, and \$175,000 for relocation of monitoring stations.

6. LEGISLATION

Recommendations to Congress

The Commission made specific recommendations to Congress with respect to new legislation affecting communications, the subject matter of which is indicated hereafter. In addition, the Commission undertook a number of special studies on legislative matters which, upon completion, may necessitate additional proposals. The Commission has adopted the practice of making recommendations as the need arises rather than to present them in connection with its annual report.

Reports to Congress

The Commission continued to cooperate with the Interstate Commerce Committee of the Senate in the proceedings under S. Res. 95, 75th Congress, second session, approved June 19, 1939, which authorized an investigation of the telegraph industry. Extensive hearings were held on this matter during the year and representatives of the Commission furnished testimony. On October 28, 1941, this committee recommended that Congress amend the Communications Act to permit a merger of domestic and international telegraph carriers. This action was premised upon investigation and recommenda-

tions made by the Commission in 1940-1941 on the basis of defense and economic considerations.

Pursuant to Public, 97, 75th Congress, approved May 20, 1937, the Commission was directed to make a special study of the radio requirements necessary or desirable for safety purposes for ships navigating the Great Lakes and the inland waters of the United States, and to report its recommendations and the reasons therefor to Congress. This was done on December 16, 1940, as detailed in another section of this report.

The Commission cooperated with the Attorney General's Committee on Administrative Procedure in connection with the latter's report to Congress early in the fiscal year. Subsequently, the Commission furnished testimony and data for use of the subcommittee of the Senate Committee on the Judiciary in considering the "administrative procedure" bills S. 674, S. 675, and S. 918.

New Legislation

The basic law under which the Commission operates is the Communications Act of 1934, as amended. The following is a summary of legislation during the fiscal year affecting or proposing to affect this basic law:

On May 13, 1941, Senator White of Maine introduced S. Res. 113 proposing that the Senate Committee on Interstate Commerce study the chain broadcasting regulations promulgated by the Commission on May 2, 1941 [mentioned elsewhere in this report] to determine, among other things, the probable effects of those regulations, and to consider whether the Commission was authorized to promulgate and enforce the same. The resolution also requested the Commission to postpone the effective date of the regulations until 60 days after the Interstate Commerce Committee reported to the Senate. Hearings on the White resolution before the Senate Committee on Interstate Commerce were held from June 2 to June 20, 1941, and testimony was given by Chairman Fly, Commissioner Craven, and representatives of the three national network organizations, and of certain stations. The hearings were adjourned on June 20, 1941, subject to call of the committee chairman.

Section 4 (f) relating to the Commission's personnel was amended by Public, 20, Seventy-seventh Congress, first session (H. R. 533) approved March 23, 1941. This act provides compensation for overtime services of inspectors in charge and radio inspectors of the field division, paid by ship owners at whose request the overtime services are furnished.

The Commission supplied comments and assistance to congressional committees near the close of the year on a recommendation that section 353 (b) of the Communications Act be amended to provide that during the emergency proclaimed by the President on September 8, 1939, but not after June 30, 1943, the requirement of 6 months' previous service as a qualified radio operator on board United States vessel be suspended or modified for successive periods of not more than 6 months' duration. Public 155, enacting this provision, was approved July 8, 1941.

Altogether, the Commission commented upon 24 bills directly or indirectly relating to communications regulation.

7. LITIGATION

At the beginning of the fiscal year there were pending 12 cases to which the Commission was a party, 10¹ of which were in the United States Court of Appeals for the District of Columbia and 2¹ in the Supreme Court. During the fiscal year 5 additional appeals were taken to the Court of Appeals from decisions of the Commission, making a total of 15 cases pending in that court in the course of the fiscal year. One suit against the Commission was instituted in the United States District Court for the District of Columbia, 1 suit was brought in a 3-judge court in the United States District Court for the Northern District of Alabama, and 1 suit was brought in a 3-judge court in the United States District Court for the Southern District of New York.

Of the 15 cases in the Court of Appeals, 12 were dismissed and 3 were still pending at the close of the fiscal year. The 2 cases in the Supreme Court resulted in a reversal of the decision of the Court of Appeals which had denied the Commission's motion to dismiss the appeals. The suits in the District Court for the District of Columbia and in the District Court for the Northern District of Alabama were also dismissed; the suit in the District Court for the Southern District of New York was still pending.

The two cases in the Supreme Court involved the question whether the Court of Appeals for the District of Columbia has jurisdiction to entertain appeals from orders of the Commission refusing its consent to an assignment of a radio station license. One of the appeals was taken by the proposed transferor and the other by the proposed transferee. The Court of Appeals had held that it did have jurisdiction of both appeals. On certiorari the Supreme Court reversed the judgment of the Court of Appeals holding that the grant of jurisdiction conferred upon the Court of Appeals by section 402 of the Communications Act of 1934, as amended, does not include appeals from orders of the Commission refusing consent to the assignment of a license. (*Federal Communications Commission v. Columbia Broadcasting System of California, Inc.*, 311 U. S. 132.)

The most important problems raised by the litigation in the Court of Appeals during the current year involved (1) the power of the Court of Appeals under the Communications Act to stay the action of the Commission pending determination of an appeal; (2) the validity under the Communications Act of the Commission's procedure in granting applications without a hearing where electrical interference to an existing station is involved. Both of these problems were raised by the consolidated cases of *Scripps-Howard Radio, Inc. v. Federal Communications Commission* (Nos. 7657 and 7723). These cases were still pending and undecided at the close of the fiscal year.

¹ Included in the cases pending in the Court of Appeals are the 2 cases in the Supreme Court involving interlocutory matters. Since these two cases had not been decided on the merits by the Court of Appeals they are included in the Court of Appeals and the Supreme Court. These cases were finally disposed of by both courts during the fiscal year.

Record of Court Cases

All of the cases adjudicated during the year were decided in favor of the Commission. The following tabulation shows the status of all cases:

Nature of the case	Number	Final decision for Commission	Final decision against Commission	Pending at end of fiscal year
Cases in Court of Appeals.....	15	12	0	3
Cases in Supreme Court.....	2	2	0	0
Cases in District Courts.....	3	2	0	1

¹ See note 1, p. 10.

8. DOCKETS

During the fiscal year the Commission designated 246 cases for hearing, of which number 204 were broadcast, 23 telegraph, 12 telephone, 6 television, and 1 amateur. During that period the Commission heard 49 broadcast, 14 telegraph, 10 telephone, and 3 television docket cases, and oral argument in 36 instances. In the same time 567 motions, petitions, and other pleadings were acted upon, 411 being granted, 91 denied, and 65 dismissed.

9. INTERNATIONAL

General

In view of the world situation, the Commission's International Division has collaborated actively with the Department of State in matters involving international use of radio, wire, and cable services.

The Commission has engaged in a comprehensive survey of international communications facilities operated between the United States and foreign countries and has maintained complete day-to-day information of plant facilities, both cable and radio, and their capacities for handling such traffic.

This was in addition to the work of handling routine records and correspondence relating to international communications; adjusting many cases of international radio interference; compiling lists of international broadcast stations, both United States and foreign; preparing lists of broadcast stations in the North American countries; issuing semimonthly radio service bulletins and notifying the International Telecommunications Union at Berne, Switzerland, of all new radio stations authorized, and frequencies assigned. Also, the Inter-American Radio Office at Habana, Cuba, is kept advised of all changes in broadcast assignments. In addition, the Commission has forwarded to the Inter-American Radio Office copies of its engineering standards, technical information, rules and regulations, and information releases relative to developments in the radio art for distribution to countries of the Western Hemisphere.

Interdepartmental Committee on Cooperation With American Republics

The Commission has been active in the work of the Interdepartmental Committee on Cooperation with the American Republics which has met periodically under the chairmanship of the Under Secretary of State. The Commission has prepared and received committee approval of a proposal to provide six fellowships for citizens of other American Republics. The purpose of the fellowships is to promote better inter-American relations by providing a means of acquainting their qualified and representative communications engineers with the regulatory functions of the Commission and the operations of private commercial communications companies in the United States. The training will include working assignments in the various departments of the Commission and inspection trips to various communication companies' plants. The duration of the fellowships is not expected to exceed one year.

10. INTERDEPARTMENT RADIO ADVISORY COMMITTEE

Representatives of the Commission have devoted much time and effort to the work of the Interdepartment Radio Advisory Committee. This committee is a Government unit established for the purpose of advising the President with reference to the assignment of frequencies to Government radio stations. The Committee, which has met at least once a month, approved the assignment of 6,983 frequencies for Government radio stations during the past year. At the present time there are 21,133 active assignments to Federal radio stations, all of which have been recommended by the committee since its establishment. In addition, the Technical Subcommittee of the Interdepartment Radio Advisory Committee has considered problems involved in the allocation of such frequencies in order that the most efficient use of the radio spectrum may be attained.

CHAPTER III

Telephone and Telegraph

1. TELEPHONE
2. TELEGRAPH
3. CABLE
4. RADIO COMMON CARRIERS
5. TARIFFS
6. SUPERVISION OF ACCOUNTS

1. TELEPHONE

General Regulation

The Commission is charged with the regulation of all telephone and telegraph companies doing business as common carriers in interstate or foreign communication. Such authority extends over wire and radio facilities. War conditions have brought about increased work in connection with international rates and services. In addition to regular supervision and reports on these matters, special studies have been made and particular data assembled.

Telephone Rate Section Established

As the Commission pointed out in its "Report on the Investigation of the Telephone Industry in the United States," made pursuant to Public Resolution No. 8, Seventy-fourth Congress, it is necessary for the Commission to be adequately informed on telephone rate matters in order to take such action as appears necessary in the public interest. To meet this need, a Rate Section has been established in the Law Department. Since its organization, this section has, in cooperation with the Accounting and Engineering Departments, directed its activities to a resolution of the fundamental telephone rate problems. In particular, the section prepared the legal framework for the Commission's proceeding involving interstate toll telephone rates.

Telephone Rate Reductions

By its order of April 1, 1941, the Commission instituted an inquiry into long distance telephone rates of the American Telephone & Telegraph Co. and the associated companies in the Bell System, and

ordered the company to show cause why its rates for interstate telephone service should not be reduced. Thereafter, the company agreed to a reduction in interstate long distance telephone rates which, it is estimated, will save telephone users \$14,000,000 a year, beginning July 10, 1941. Among benefits derived are the elimination of report charges hitherto applicable to uncompleted person-to-person and reversed charge calls; and reduction of overtime charges on person-to-person calls of longer duration than the initial period, so that the charge for overtime period will be the same as for a station-to-station call.

In dismissing the long lines rate case following this rate reduction, the Commission announced that it would continue studies of fact involved in the rate base, the cost of furnishing telephone service and related subjects. Studies of this type have been inaugurated in cooperation with the National Association of Railroad and Utility Commissioners.

Prior to institution of the above-mentioned rate inquiry, negotiations had been initiated with the New England Telephone & Telegraph Co., the Mountain States Telephone & Telegraph Co., and Northwestern Bell Telephone Co., for the purpose of obtaining greater uniformity in interstate message rates. The interstate rates of these companies had been maintained at a generally higher level than those of the American Telephone & Telegraph Co., and most of the other units in the Bell System. These companies agreed to file reduced rate schedules, effective July 10, 1941, resulting in estimated additional annual savings to the public of approximately \$250,000 with respect to the New England Co., \$316,500 for the Mountain States Co., and \$178,000 for the Northwestern Bell Co.

In previous annual reports, mention was made of an investigation into the interstate service furnished by the Pacific Telephone & Telegraph Co., and its two principal subsidiaries. A proposed report, adopted by the Commission on August 15, 1940, held certain rates "unjust and discriminatory." After consideration of exceptions and briefs, and following oral argument, a final report was adopted February 4, 1941. This report contained the same conclusion, and respondents were ordered to reduce certain interstate rates, effective March 15, 1941, to the level of those of the Long Lines Department of the American Telephone & Telegraph Co., resulting in an estimated saving to the public of approximately \$400,000 a year.

Other Rate Cases

At the request of the Southwestern Bell Telephone Co., the Commission instituted an investigation into the matter of filing certain message rates applicable to interstate traffic in the Kansas City area. The contention of the company was that these rates covered exchange service and, therefore, it was not required to file them with the Commission. After hearing and argument the Commission, on June 3, 1941, held that the rates in question did in fact cover interstate message toll service and should, therefore, be filed with the Commission. The company appealed to the courts.

Hearings were held with respect to the lawfulness of the rates charged for telephone-message traffic handled jointly by certain independent and Bell System telephone companies in Pennsylvania and New Jersey. Decision was pending.

Telephone Facilities**APPLICATIONS**

There were 158 applications from telephone carriers during the fiscal year for extension and consolidation of lines or facilities. From July 1, 1934, to June 30, 1941, more than \$65,000,000 worth of new construction was approved.

SUPPLEMENTING FACILITIES

The second proviso of section 214 (a) empowers the Commission to authorize the supplementing of existing facilities without regard to other provisions of the section. During the year 156 applications were received requesting such authority. Of these, 137 were approved. Two applications were returned to the applicants. Action on 20 applications was pending.

Most of the applications were from the Bell Telephone System, only 13 being filed by other companies. Expenditures for construction in the individual projects approved ranged from a few thousand dollars to \$7,826,000, with a total of \$38,319,399. This is an increase over any previous year in number of applications, total expenditure, and miles of toll cable constructed.

CONSOLIDATIONS

Section 221 (a) provides that telephone carriers desiring to consolidate may file a petition requesting a certificate to the effect that the proposed consolidation, merger, acquisition, or control of the property of one or more telephone companies by another will be in the public interest. Such a certificate exempts carriers from provisions of the Antitrust Act.

There was pending the application of New Jersey Bell Telephone Co. to acquire the capital stock of the Imperial Securities Co., a holding company, which directly or indirectly holds stock control of the Keystone System composed of the Keystone Telephone Co. of Philadelphia, the Eastern Telephone & Telegraph Co. and the Camden and Atlantic Telephone Co. The Keystone System furnishes telephone service, both local exchange and toll, in Philadelphia and vicinity and in southern New Jersey in competition with the Bell Telephone Co. of Pennsylvania and the New Jersey Bell Telephone Co. Lengthy hearings were held and some users of Keystone service have intervened in opposition.

2. TELEGRAPH**Applications**

The year was marked by a large increase in the number of applications for wire telegraph certificates under section 214. Sixty-six such applications were granted, 35 of which authorized extension of lines to military and naval establishments and involved the leasing of approximately 984 miles and the construction of 31 miles of telegraph circuit. One grant authorized the construction of 1,620 miles and the leasing of approximately 197 miles of telegraph circuit, permitting the establishment of a nation-wide weather-reporting system for the Civil Aeronautics Administration. Twenty-one of the applications requested authority for temporary use of approximately 696

miles of leased circuit. In its consideration of seven applications, preliminary investigation indicated that ample facilities were already available and in each instance the applicant was offered opportunity to present its case through hearing but did not request such hearing.

In March 1941 a hearing was held to determine the policy to be followed in the administration of section 214 as applied to applications for extensions of lines and supplementing of facilities by telegraph carriers which present the issue of direct competition between telegraph carriers through the entrance of one company into an area already served by another. Decision of the broad issues presented through these proceedings had not been reached at the end of the fiscal year.

Government Message Rates

As authorized by the Post Roads Act of 1866 and subsequent legislation, the Commission promulgated the annual order fixing rates for the fiscal year for the United States Government telegraph messages. The same ratio has been in effect since January 1, 1940, in most cases 60 percent of the rate applicable to private messages.

Investigations

Trans-Pacific rates.—Hearing was held for the purpose of inquiring into the lawfulness of the rates, classifications, and practices of the telegraph carriers engaged in handling messages between certain trans-Pacific points and the United States. Decision was pending.

Pick-up and delivery practices.—The investigation, mentioned in last year's annual report, of the pick-up and delivery practices of telegraph carriers was continued.

Prosecution

It was necessary for the Commission to turn over to the Department of Justice a case involving unauthorized departure from tariffs filed by a wire telegraph company. The carrier was convicted and fined.

3. CABLE

Effect of the War

The war continues to have a serious effect on the international communications services of American cable companies operating in the European area. No direct cable service is now available between the United States and any country on the continent of Europe although ample direct facilities are still available to the United Kingdom, Eire, and the Azores.

Developments

Several cable companies have been experimenting with a new method of signalling which separates the signalling current into two or more components and in this way transmits the signal in such a form that it arrives substantially less distorted than in the case of normal transmission. This method has given results on certain cables permitting at least 25 percent increase in transmission speed.

4. RADIO COMMON CARRIERS

Licenses in the fixed public radiotelephone and radiotelegraph services, in general, are engaged as common carriers in offering a world-wide radio communications service and a limited domestic radiotelegraph service. The Commission has the duty, in addition to its licensing function, of regulating their rates, practices, classifications of services and tariffs, plus supervision of accounts.

Radiotelegraph

Radiotelegraph service as operated in the United States is highly competitive, yet it is necessarily limited by its state of development and economic demands. The Commission must have full information and facts prior to determination upon any application. Many applications, other than those involving minor changes in equipment and renewal of licenses of existing stations, can be finally acted upon only after extensive hearings. Due to the current war situation and the inability to obtain all the information relative to competitive factors, contracts, etc., the Commission has adopted the policy of granting upon a temporary basis new or supplementary circuits for which it has determined that there is public need.

As a result of modifying licensing procedure for radio common carriers, much of the routine paper work has been materially reduced. However, due to the many temporary authorizations to maintain adequate communications channels to all parts of the world, resulting work in this particular phase has increased.

All radio common carriers have been required to submit records showing the flow of traffic to all parts of the world, the routing of traffic, extensions of existing radio circuits, and the actual use made of the frequencies which are licensed to them for public communications.

The war has curtailed radio communication to and from Europe. Many direct circuits formerly operated from this country have been disrupted, so that indirect rerouting has become necessary. Foreign censorship as well as actual discontinuance of circuits may necessitate rerouting. The Commission has continued to act promptly in granting special temporary authority for the establishment of circuits to new or temporary points in order that important government, diplomatic, as well as commercial messages may be efficiently and expeditiously handled.

Circuits to the following countries were at one time or another disrupted and direct service suspended: Poland, Czechoslovakia, Norway, Denmark, Belgium, Holland, Iceland, Syria, and France. With the exception of Denmark and France all these circuits were out as of June 30, 1941. Additional direct circuits during the past year were established to Finland, Egypt, Belgian Congo, and St. Pierre and Miquelon.

The Commission has authorized special controlled circuits to regulate the heavy flow of incoming press dispatches from various points.

On June 30, 1941, there were 16 domestic radiotelegraph common carriers operating transmitting equipment at 73 locations and approximately an equal number of receiving stations. The majority of companies operate principally in the international field although there is a limited domestic service between 16 major cities of the

United States, between certain points on the Great Lakes serving the maritime interests, between isolated cities and the southwest oil fields, and interisland service in Hawaii and Puerto Rico. Companies operating in the international field still offer service direct to 53 foreign points and indirect service to practically any country throughout the world.

The radiotelegraph companies transmit public correspondence pursuant to tariffs on file with the Commission and service messages incidental thereto which are necessary for the movement of traffic. In addition, these companies handle other types of traffic, such as addressed program material to and from overseas points for rebroadcast to the listening public, facsimile and radio photographs, and multiple addressed press service for reception principally by newspapers and broadcast stations. The latter service is widely used in the United States, thereby providing broadcast stations with news bulletins.

No hearings involving new points of radio communication have been conducted in view of the fact that the majority of requests were for special temporary authority.

New frequencies have been allocated to meet the needs for new circuits. Most of these assignments were the result of increased traffic activity. While no new companies were licensed to engage in telegraph communications for hire, the Commission has authorized many applications for the modernization of equipment.

During the early part of 1941 Press Wireless Inc. abandoned its station at Honolulu, due to the inadequacy of point to point traffic originating in Hawaii, and Globe Wireless closed its station at Guam. The latter station acted merely as a relay for traffic destined to and originating from the Philippine Islands, and as a result of the modernization of equipment at San Francisco, Calif., this station was no longer required.

Radiotelephone

As in the case of the radiotelegraph services, war conditions have affected transoceanic radiotelephone traffic. While the transoceanic messages destined to points in Europe have decreased, the traffic load to South American points has materially increased.

Additional radiotelephone circuits were inaugurated to Madrid, Spain, and Lisbon, Portugal. The direct circuits to Amsterdam and Paris, which were disrupted in the spring of 1940, have not been reestablished.

Since it has become necessary to maintain direct circuits to most countries on a 24-hour basis and to relieve the increase in traffic load to South American points, the Commission has granted additional frequencies for circuits to South America. At the present time nearly all circuits except the London circuit are operating at or near capacity. As in the case of South America, traffic destined for the Philippines and the Far East increased to such a point that additional circuits to Hawaii, the Philippines, and other Far Eastern points were made necessary. Advent of war between the United States and Japan complicated the Pacific service situation.

Radiotelephone service from the United States is rendered to practically all points through facilities of the American Telephone & Telegraph Company, located at three primary distribution centers,

namely, New York, Miami, and San Francisco. Telephone service to points in Europe, Africa, South America, and the Near East, is handled via New York, while that for Asia and Oceania is routed via San Francisco. Messages destined for Central America and northern South America are transmitted from Miami.

Puerto Rico service is furnished by the Radio Corporation of Puerto Rico, San Juan, and in Hawaii by the joint facilities of the Mutual Telephone Co. and R. C. A. Communications, Inc.

5. TARIFFS

At the close of the fiscal year 394 communication carriers of all types had tariffs and concurrences on file with the Commission, an increase of 34 over June 30, 1940. During the year these carriers filed 31,807 concurrences and tariff pages, containing changes in rates, regulations, practices, and classifications of service, or establishing new services. A total of 81 tariff pages were rejected for failure to conform to statutory requirements.

6. SUPERVISION OF ACCOUNTS

Among important activities of the Commission in the field of accounting regulation during the year were the following:

Restatement of plant accounts on basis of original cost.—Substantial progress was made in the review of the restatements of carriers' plant accounts on the basis of original cost and in the determination of the appropriate accounting disposition of the amounts included in plant-acquisition adjustment accounts. (State and Federal regulatory authorities are giving to this subject increasingly active attention in a concerted effort to formulate a cooperative procedure that will result in establishment of uniform practices.)

Depreciation.—The Commission participated in the preparation by the Special Committee on Depreciation of the National Association of Railroad and Utilities Commissioners of a comprehensive report on this subject.

Cooperation with Federal and State regulatory bodies.—The Commission cooperated with the Committee on Accounts and Statistics of the National Association of Railroad and Utilities Commissioners in many other matters considered during the year by that committee.

Miscellaneous.—Substantial progress was made in the following:

Preparation of an annual report form (Form R) for use by radiotelegraph carriers. (Completed.)

Preparation of an annual report form (Form S) for use by noncarrier affiliates of communication carriers.

Determination of suitable retirement units for use by wire-telegraph and ocean-cable carriers.

Revision of the uniform system of accounts for radiotelegraph carriers.

Revision of the uniform system of accounts for class A and class B telephone companies.

Development of a continuing property-record procedure for telephone and radiotelegraph carriers.

Reclassification of telephone companies to provide a separate group for the very large companies.

Preparation of tentative occupational classifications of employees of communication carriers.

Preliminary studies as to the feasibility of procedures that promise to be of service in the work of the Commission were made with respect to the adoption by States of uniform systems of accounts for telephone companies substantially similar to the systems prescribed by the Commission, and the consolidation of corporate financial statements.

Field Accounting Examinations

During the year the Commission's accounting field office made a number of examinations and investigations, the most important of which were: A general examination of the accounts of three radiotelegraph carriers; an investigation of the accounting performed by a large telephone carrier in connection with the restatement of its plant accounts on the basis of original cost; the preparation of historical accounting data for use in connection with the hearing held pursuant to S. Res. No. 95 (76th Congress) concerning the major telephone, wire-telegraph, ocean-cable, and radiotelegraph carriers; the examination of the accounting performed incident to the reorganization of one of the large telegraph carriers; an analysis of international communication by telegraph, radiotelegraph, and radiotelephone carriers covering the period from 1936 to 1939, inclusive; special studies and analyses relating to various asset, reserve, and income accounts of a large telephone carrier; and the preparation of special analytical studies of the operating results of all telephone carriers and systems for use in connection with negotiations for rate reductions.

CHAPTER IV

Standard Broadcast

1. GENERAL
 2. NORTH AMERICAN REGIONAL BROADCASTING AGREEMENT
 3. CHAIN BROADCASTING REGULATIONS
 4. NEWSPAPER-RADIO INQUIRY
 5. MULTIPLE STATION OPERATION
 6. DIRECTIONAL ANTENNAS
 7. DIRECT MEASUREMENT
 8. STANDARDS OF GOOD ENGINEERING PRACTICE
 9. DISTRIBUTION OF BROADCAST FACILITIES
 10. LICENSE PERIOD EXTENDED
 11. COMPLAINTS AND INVESTIGATIONS
-

1. GENERAL

On November 1, 1941, there were 915 standard broadcast stations in operation or under construction—877 and 38, respectively. Sixty-eight new stations were authorized during the fiscal year. The number of receiving sets in use was estimated at more than 50,000,000. The largest number of single-time listeners was estimated to have heard President Roosevelt's address proclaiming an unlimited national emergency. The figure was set at 65,650,000, which eclipsed the previous year's high by more than 15,000,000. On 1941's record occasion, short wave and rebroadcast relayed the Chief Executive's talk to some 20,000,000 listeners in other countries. During this particular broadcast there was a noticeable decline in the number of telephone calls.

2. NORTH AMERICAN REGIONAL BROADCASTING AGREEMENT

Frequency assignments under the North American Regional Broadcasting Agreement became effective at 3 a. m. (eastern standard time) on March 29, 1941. This mutual pact, the first of its kind, has for its purpose the improvement of radio reception throughout North America. It was jointly entered into by Canada, Cuba, the Dominican Republic, Haiti, Mexico, and the United States.

Reallocations of frequencies of domestic stations were in accordance with those established at the January 14-30, 1941, conference between technical representatives of the countries concerned. These, with few

exceptions, conformed with those proposed in the lists submitted by the contracting nations on September 11, 1940. The change was accomplished smoothly due to the cooperation of station licensees, equipment manufacturers, and consulting engineers in making prior adjustments to transmitters and antenna systems.

Though 802 of the 893 standard broadcast stations then authorized in the United States changed frequencies, the shift was made in such manner that the relationship among stations on most channels was not disturbed. Improvement of service is noted primarily in cases of interference from foreign stations, and on certain clear channels where the reallocation involved directional antennas for the mutual protection of two or more high-powered stations.

In some instances, stations with directional antennas were not able to make readjustments by March 29 and were permitted to operate at night with reduced power pending readjustment. In cases where stations were assigned a channel requiring new or different directional antenna, they were enabled to operate with limited power until they could make the necessary installation.

3. CHAIN BROADCASTING REGULATIONS

In May 1940 the Commission completed its 3-year investigation into chain or network broadcasting, during which 96 witnesses were heard, 9,713 pages of testimony taken, and 707 exhibits introduced. The Commission's "Report on Chain Broadcasting," summarizing this 27-volume investigation record, was released May 2, 1941, and was accompanied by eight regulations designed to eliminate the abuses uncovered during the course of the investigation. Following a petition by Mutual Broadcasting System, oral arguments on amendments to the regulations were heard September 12; and on October 11, the Commission issued a "Supplemental Report on Chain Broadcasting," accompanied by modifications of some of the May 2d regulations.

The report found that at the end of 1940, some 465 stations were affiliated with National Broadcasting Company, Columbia Broadcasting System, or Mutual Broadcasting System. As of the end of 1938, less than 3 percent of the nation's total nighttime broadcasting power was utilized by stations not affiliated with one or another of these three network companies.

Most NBC and CBS affiliates had contracts binding them to their networks for 5 years, but binding on the networks for only 1 year. The May 2d regulations limited such contracts to 1 year. The October 11th regulations increased the term to 2 years, and also increased the license period of all stations from 1 year to 2.

The report found that affiliation contracts bound network affiliates, especially those of NBC and CBS, exclusively to one network so that many stations were barred by their network contracts from broadcasting any other network program even though they had time available and the other network was willing. The May 2d regulations prevent such exclusive restraints. The report also noted that some stations had a contractual right to keep neighboring stations from broadcasting those network programs which they rejected, thus depriving listeners in that community of particular network programs. Such practices were banned.

The report found that CBS kept under option substantially all the more desirable broadcasting hours of most of its outlets, so that it could oust any non-CBS program from a particular period on affiliated stations after 28 days' notice. NBC optioned the choice hours of most of its stations, thus similarly handicapping non-NBC programs. The time under option vastly exceeded the time actually used by the networks. Under the May 2d regulations, such time options were not permitted. The October 11th regulations modified this ban to permit nonexclusive options during certain hours. Under the regulation as modified, the station may option a certain portion of its available hours to one or more networks and the time so optioned will be available to the first taker among the networks holding option upon 56 days' prior notice. The option contract with any network may not restrict the granting of a similar option to other networks. Thus the efficacy of the option as a business convenience is retained while the nonexclusive feature prevents its use to restrict competition. Under both the May 2d and the October 11th regulations, networks remain free to purchase as much time outright as they care to use.

The report noted that, in addition to the various stations affiliated with the networks by contract, NBC was itself the licensee of 10 stations, including two each in New York, Chicago, Washington, and San Francisco, while CBS was the licensee of eight stations. Mutual did not own any stations, but rather was owned and operated by certain of its station outlets. Under the May 2d regulations the Commission will not license to a network more than one station in a single service area, nor will it license one station in communities where the stations are so few or of such unequal desirability that competition would be substantially restrained by the licensing of a station to a network.

The report found that the ownership of two networks, the Red and the Blue, by NBC concentrated excessive power in the hands of one network management, and constituted restraint of competition. It noted that the Blue network was in fact used as a buffer against competition for the Red. The May 2d regulations in effect required NBC to divest itself of one of its networks, so that the Blue could become a full-fledged, independent and competing entity rather than a mere adjunct of the Red. The October 11th regulations suspended the effective date of this provision, in order to make possible the disposition of the Blue as a unit, without impairment.

Various other restraints on stations were also uncovered during the investigation and appropriately dealt with in the May 2d regulations. One cumulative effect of the restraints uncovered was artificially to close the door to new networks. The regulations were designed to make possible the establishment of additional networks and enhanced network service.

The May 2d regulations became effective immediately with respect to new contracts between stations and networks, and were to have become effective after 90 days with respect to existing practices, except that the effective date of the regulation requiring the networks to dispose of certain network managed and operated stations could be postponed in particular instances from time to time to permit orderly disposition of properties. The effective date of the regula-

tions was later stayed, and the Commission's October 11th order made November 15 the effective date of the regulations as amended.

The report concluded:

We have exercised our jurisdiction upon the premise, generally accepted by the public and the industry, that the network method of program distribution is in the public interest. We subscribe to the view that network broadcasting is an integral and necessary part of radio. The regulations which we are promulgating are designed to preserve without loss the contribution of network broadcasting to the public and to the affiliated stations, while ensuring that licensees will exercise their responsibilities under the law. We believe that these regulations will foster and strengthen network broadcasting by opening up the field to competition. * * *

Radio broadcasting is a competitive industry. The Congress has so declared it in the Communications Act of 1934, and has required the fullest measure of competition possible within physical limitations. If the industry cannot go forward on a competitive basis, if the substantial restraints upon competition which we seek to eliminate are indispensable to the industry, then we must frankly concede that broadcasting is not properly a competitive industry. * * * We believe, however, that competition, given a fair test, will best protect the public interest. That is the American system.

Commissioners Case and Craven dissented from the report and from the supplemental report. In a minority opinion they held that the Commission is, in the main, "without jurisdiction to promulgate regulations which undertake to control indirectly the business arrangements of broadcasting licensees" and expressed fear that "the revolutionary change proposed by the majority will result in the destruction of the present excellent national program distribution system and the substitution therefor of some new kind of system, the effects of which the majority does not adequately visualize." Further declaring that the Commission, through its licensing powers, is enabled to deal with any abuses, the minority saw no reason why the Commission should not extend the license period to the full statutory limit of 3 years so as to "create an atmosphere of greater stability in the industry" and, at the same time, "in no way detract from the Commission's power to proceed by revocation against licensees who contravene the standard of public interest." With respect to the dual NBC network, the minority recommended negotiations looking to their voluntary segregation but found no record to support new regulation to control the relations between networks and affiliates. Asserting that broadcasting "must be kept free from unnecessary Government restraints," the minority report concluded that "this is no time to embark upon a new and untried course."

The "Report on Chain Broadcasting," containing the full text of the majority and minority opinions, and of the May 2d regulations, is for sale by the Superintendent of Documents, at 30 cents a copy. Copies of the supplemental report and of the October 11th regulations may be procured from the Commission.

In October 1941, NBC and CBS brought suit before a three-judge court in the District Court for the Southern District of New York, to enjoin and set aside the chain broadcasting regulations. Mutual entered the case in opposition to the NBC and CBS suit. On November 12, the Commission, under stipulations entered into with NBC and CBS, postponed the regulations pending court decision on plaintiffs' request for a preliminary injunction.

4. NEWSPAPER-RADIO INQUIRY

In view of the increasing number of applications by newspapers to operate FM (frequency modulation) broadcast stations, the Commission on March 20, 1941, ordered an investigation to determine what policy or rules, if any, should be promulgated in this connection, and also with respect to future acquisition of standard broadcast stations.

The general question of joint control of newspapers and broadcast stations has long been a topic of interest in Congress and has arisen from time to time in connection with particular decisions of the Commission. Thus the Commission has been called upon to decide whether in a community with only one daily newspaper and no radio station the public interest will be better served by licensing a proposed station to the newspaper with existing facilities for gathering news and procuring advertising revenues, or to a nonnewspaper applicant who will introduce an independent and competing medium for community service and for the dissemination of information and opinion.

In deciding whether or not to license a station to a newspaper, a variety of considerations may be relevant in determining the public interest, convenience, and necessity. For example, newspaper ownership of a station may make available to the listening public a wider supply of news due to the licensee's superior news-gathering facilities, or, on the other hand, the newspaper's desire to protect its newspaper investment may cause it to limit the broadcasting of news in the interest of wider newspaper circulation. While the unified operation of newspaper and station might bring financial stability to the joint enterprise, it might also result in unfair competitive advantages and eventual monopoly.

Such questions are inescapable so long as applications from newspapers for radio stations continue to be submitted to the Commission. They may be settled, as in the past, in the consideration of particular cases as they arise, or they may be the subject of a general determination of Commission policy or of new legislation.

The need for a thorough consideration of such questions was prompted by the fact that out of 99 applicants for FM licenses prior to June 30, 1941, 43 were from newspapers or persons associated with newspapers.

In order to obviate separate hearings on so many cases and to obtain relevant facts upon which to base future general guidance, the Commission, pursuant to its order No. 79 of March 20, postponed consideration of current applications by newspaper interests for FM stations and new standard broadcast facilities pending institution of the general inquiry.

Hearings were originally scheduled to begin on June 25, but actually commenced on July 23, to which date they had been postponed on petition by a committee representing certain newspaper publishers. Hearings were held before the Commission en banc between July 24 and October 25, and were subsequently recessed to December 4. On August 14, the United States District Court for the District of Columbia ordered a witness to testify under a subpoena which the respondent had previously ignored. Appeal was taken.

Preliminary exhibits submitted by the Commission staff, subject to revision, indicated that out of 880 standard broadcast stations, the

licensees of 66 were newspapers, 177 were owned to the extent of 50 percent or more by newspaper interests, and 55 others were in a greater or lesser degree associated with newspapers. In more than 90 communities, it was indicated, the only radio station was licensed to or associated with the only newspaper enterprise. Some 150 stations were associated with newspaper-radio chains, each such chain consisting of more than one newspaper and more than one radio station.

Three possible courses of action for the Commission are indicated as a result of its inquiry: (1) Use of the expert knowledge thus acquired as an aid to subsequent determinations in particular cases, (2) formulation of rules or statements of policy for the guidance of the Commission, or (3) recommendations to Congress for appropriate legislation.

5. MULTIPLE STATION OPERATION

A ban on the operation of more than one standard broadcast station in any service area by a single interest or group of interests was set forth in a proposed rule announced August 5, 1941. The contemplated rule would apply to such multiple operation whether the stations were operated by one person or corporation, or by persons or corporations under common control, and "control" would be defined as "actual working control in whatever manner exercised," whether or not majority stock ownership is involved. Unlike multiple-ownership rules governing FM and television, the proposed standard broadcast rule would not limit multiple operation where the service areas of the stations under common management are distinct.

Oral arguments on the proposed rule were held October 6, 1941. If adopted, the rule would become effective immediately with respect to new grants and 6 months from the date of adoption with respect to existing stations, with provision for further extension in particular cases if necessary for the orderly disposition of properties.

6. DIRECTIONAL ANTENNAS

Nearly 25 percent of all standard broadcast stations last year used directional antennas as compared with 14 percent the year previous.

The directional antenna has proven beneficial in simultaneously providing maximum service in certain directions and causing a minimum extent of interference in other directions to services on the same or adjacent frequencies. (It is not considered feasible from an economic or allocation viewpoint for stations operating on local channels to use directional antennas.) In addition to new directional antenna installations, the major portion of those in use were readjusted or rebuilt because of the North American Regional Broadcasting Agreement frequency shifts.

7. DIRECT MEASUREMENT

Under section 3.51 of the Rules and Regulations, effective June 1, 1941, each standard broadcast station is required to determine operating power by direct measurement of its antenna power. With few exceptions covered by this rule, stations are now determining power by this so-called "direct method," which provides that the power supplied to the antenna be the same as that power for which the station is licensed.

When the operating power is determined by the power supplied to the last radio frequency amplifier tube or tubes of the transmitter ("indirect method"), the power supplied to the antenna may vary over wide limits, depending upon the adjustment of the transmitter. For example, of two stations authorized to operate with 100 watts power, one may supply only 75 watts to the antenna while the second may supply 150 watts or twice the actual power even though the input power to the vacuum tubes is the same in each case. Operation by the "direct method" tends to improve the quality of transmission since it eliminates adjusting the transmitter so as to sacrifice quality for power.

8. STANDARDS OF GOOD ENGINEERING PRACTICE

There have been no major changes in the Standards of Good Engineering Practice, which became effective August 1, 1939. Several minor changes have been made in keeping with technical developments.

9. DISTRIBUTION OF BROADCAST FACILITIES

The Rules and Standards operative since August 1, 1939, together with reallocations due to the North American Regional Broadcasting Agreement and the cooperative efforts of stations on the various regional channels mutually to reduce interference by means of directional antennas, have resulted in considerable change in the distribution of broadcast facilities. Since these changes are still being made at a rapid rate, a detailed study of population and areas served has not been considered warranted, particularly in view of the large number of new applications with resultant complications.

10. LICENSE PERIOD EXTENDED

On October 11, 1941, in connection with its "Supplemental Report on Chain Broadcasting" (previously referred to), the Commission extended the normal license period of standard and relay broadcast stations from 1 to 2 years.

11. COMPLAINTS AND INVESTIGATIONS

"No censorship"

The Commission has emphasized frequently that it exercises no power of censorship over radio communications. Thus it neither requires the broadcasting of particular programs nor bans them; program selection is in the first instance the function of the broadcasters licensed to operate stations.

However, the Commission is concerned to see that licensees use their power of program selection in the public interest. It is especially concerned with the maintenance of free speech on the air, and with the maintenance of well-rounded rather than one-sided presentations of controversial public issues. It welcomes complaints wherever they are verified and factually supported.

Of the thousands of complaints received annually, the bulk do not meet these requirements, or are clearly beyond the cognizance of the Commission. Complaints alleging unfair trade practices are customarily referred to the Federal Trade Commission.

Refusal of time on the air was the source of an especially large number of complaints during the year, largely by reason of issues arising out of the war. At the request of members of the Senate Committee on Interstate Commerce, the Commission undertook to analyze more than 40,000 programs dealing with controversial foreign policy issues broadcast during the period January through June 1941. The results of this analysis were not yet completed when this report went to press.

"The public interest—not the private—is paramount" in radio broadcasting declared the Commission in reprimanding a certain station for past partisanship practices. In its decision and order covering this case it added: "Under the American system of broadcasting it is clear that responsibilities for the conduct of a broadcast station must rest initially with the broadcaster. It is equally clear that with the limitations in frequencies inherent in the nature of radio, the public interest can never be served by a dedication of any broadcast facility to the support of * * * partisan ends. Radio can serve as an instrument of democracy only when devoted to the communication of information and the exchange of ideas fairly and objectively presented * * * Freedom of speech on the radio must be broad enough to provide full and equal opportunity for the presentation to the public of all sides of public issues."

Radio Facilities for Candidates for Public Office

The Communications Act provides that if a broadcast station shall provide use of its facilities to one candidate for a particular public office, it shall afford equal opportunity to all other candidates for the same office. The nature of the complaints received by the Commission falling within this provision of the law and the disposition made of them, in connection with the 1940 political campaign, is reflected in the Sixth Annual Report. On November 15, 1941, the Commission clarified its rules so as to define a "legally qualified candidate" within the meaning of section 315 of the Communications Act.

Nonstandard Broadcast

1. GENERAL
 2. HIGH FREQUENCY (FM) BROADCAST SERVICE
 3. TELEVISION BROADCAST SERVICE
 4. INTERNATIONAL BROADCAST SERVICE
 5. NONCOMMERCIAL EDUCATIONAL BROADCAST SERVICE
 6. STUDIO-TRANSMITTER SERVICE
 7. RELAY BROADCAST SERVICE
 8. FACSIMILE BROADCAST SERVICE
 9. DEVELOPMENTAL BROADCAST SERVICE
-
-

1. GENERAL

There have been important developments in the nonstandard broadcast field, notably in the high frequency, television, international, and noncommercial educational broadcast services.

The past year saw the inauguration of a commercial broadcast service using frequency modulation (FM) on the high frequencies between 42,000 and 50,000 kilocycles. In the New York City area applications for FM stations have exceeded the number of channels available.

Television development permitted the adoption of transmission standards which, besides permitting current commercial operation, provide sufficient flexibility to take care of improvements now in the laboratory stage. Accordingly, the Commission adopted rules and standards for commercial television effective July 1, 1941. Color television has also been successfully demonstrated.

United States international broadcast stations have improved their service to foreign countries. This makes possible the presentation of the cause of democracy, particularly in South America, on a level comparable with the transmissions from government-owned stations of other nations.

Progress in FM broadcasting was reflected in new applications and grants for educational broadcast facilities to operate on a non-commercial basis. Five of the 35 FM channels have been set aside for such educational use.

The Commission established the ST (studio-transmitter) service by which licensees of high frequency and international broadcast stations can employ radio for high quality program transmission from the studio to the transmitter. This is the first service established exclusively for frequencies above 300,000 kilocycles.

2. HIGH FREQUENCY [FM] BROADCAST SERVICE

A review of the steps leading to the authorization, in the spring of 1940, of frequency modulation (FM) on a commercial basis was included in the Sixth Annual Report of the Commission. Further refinements have been made in receivers, transmitting equipment, and antenna systems. At the close of the fiscal year approximately 14 manufacturers were active in the production of FM receivers. Available information indicates that as of November 1941 there are some 120,000 FM receivers in public use, with production estimated at about 1,500 sets a day. The majority of the FM receivers now sold receive standard band as well as FM broadcast.

Authorizations

The first construction permits for commercial high frequency (FM) broadcast stations were issued by the Commission on October 31, 1940. As of December 1, 1941, there were 67 commercial FM authorizations and 43 applications pending. Eleven construction permits had been granted for stations for the New York City area, and pending applications far exceeded remaining facilities there.

Of interest are two particular authorizations. The first is for a station to be located on Mount Washington, N. H., antenna elevation 6,300 feet, which will serve an area of 31,000 square miles. Approximately three-fourths of a million people are within satisfactory service range of this station who do not have satisfactory reception of standard broadcast stations. The second permit is for construction of a station on Clingman's Peak, N. C., antenna elevation 6,875 feet, to cover 69,400 square miles. In this area, particularly in the summer months, standard band coverage is not adequate during the daytime. High frequency broadcast stations have distinct possibilities for rural coverage, particularly where high natural transmitter sites are available and the standard band coverage is relatively poor because of static and low ground conductivity.

Changes in Rules

For the purpose of obtaining more effective use of the limited number of channels available for high frequency broadcast stations, the Commission on October 3, 1940, amended the rules so as to clarify requirements as to the areas to be served. The rules previously contemplated that the service area should be commensurate with the common cultural, economic, social, or other characteristics which would justify service to the area as a unit. This principle, while fundamentally sound, did not permit for administrative purposes any quantitative definition of such area in any specific case.

A measure of the area of social and economic influence of the city is the retail trade area, the extent of which has been the subject of

study by various market research organizations. A number of trade area delineations have been recognized by the Commission for determining, by the Commission and applicants, the areas which should be served. There are approximately 625 "basic trade areas" in the United States, each of which is entitled to one or more stations serving the area in its entirety. The requirement that stations of the same city should serve substantially the same area has been retained.

However, the Commission has established "limited trade areas" for the purpose of permitting stations in cities which are not considered principal cities of "basic trade areas" to serve the sphere of economic and social influence of such cities. These areas are in general much smaller than "basic trade areas."

Twenty-two channels were made available for stations serving basic and limited trade areas centering about cities which have a population of over 25,000. In addition, 6 channels have been reserved for basic and limited trade areas in which the city of the station has a population of less than 25,000.

Seven channels have been assigned for stations to serve primarily large rural areas which cannot be served satisfactorily otherwise, due to technical or economic limitations. These stations may serve principal cities in "basic trade areas" and other cities provided they do not sacrifice their rural service in so doing.

A "special service area" classification has been established for unusual cases not falling within the foregoing categories, where a definite need therefor is shown and where unfair competition will not arise.

On March 20, 1941, the Commission amended the rules to permit stations to be authorized on a temporary basis to serve less than the "basic trade areas" but at least the metropolitan district of the city upon showing that there is a need for relaxing the basic requirements. This made possible the inauguration of FM service to cities having very large basic trade area in parts of the country where trading centers are widely separated. The Commission also made available 3 frequencies, principally reserved for cities of less than 25,000 population, for use in cities of greater population which are adjacent to metropolitan districts of more than 1 million.

On December 9, 1940, the Commission conducted an informal engineering conference to consider rating high frequency broadcast transmitters. It resulted in an agreement between equipment manufacturers and the Commission. Consideration was also given to the practical problems related to the technical performance of stations.

The Commission also announced a policy of permitting new high frequency broadcast stations to operate with temporary installations. In many cases the complete equipment has not been immediately available, partly due to material shortages and to national defense obligations assumed by transmitter manufacturers. In this way stations may begin rendering service without waiting for delivery and installation of the final equipment. Provision was made for commercial operation of experimental stations at which frequency modulation was initially field tested, the licensees of which had been issued commercial construction permits.

Beginning October 1, 1941, FM was authorized for use by ship, coastal and emergency services using the ultra-high frequencies.

3. TELEVISION BROADCAST SERVICE

Television transmission is accomplished by systematically breaking down the image of the scene to be transmitted into very small picture elements and transmitting signals proportional to the light and shade in rapid succession. The converse process takes place at the receiver where the image is reconstructed. This is done so rapidly that the eye perceives the result as a complete picture. It is fundamental that the receiver follow the breaking down or "scanning" process. To accomplish this it is necessary for the transmitter to send keying or "synchronizing" signals to maintain the original relationship of the transmitted picture units. The receiver is more intimately related to the transmitter than in any other kind of broadcasting.

There are a number of ways in which the picture can be broken down for transmission. Likewise, there are a number of ways in which synchronization is attained. All of these factors go to what is generally called "transmission standards."

Obviously, it is essential that all receivers be capable of receiving all transmissions, and that the best possible uniform system of standards be agreed upon. It is also important that these standards incorporate sufficient flexibility to accommodate future technical developments.

1940 Situation

At hearings held in January and in April of 1940, the Commission found the industry divided upon the basic question whether television was ready for commercial broadcasting, and also found the industry at odds as to transmission standards. Some believed that television had not reached the point where it could offer sufficient entertainment value to justify commercial operation and that standardization would result in the freezing of the science at the then level of efficiency. Others were determined to proceed at all costs with the launching of television on a large scale.

In its report of May 28, 1940, on the April hearing, the Commission declared:

As soon as the engineering opinion of the industry is prepared to approve any one of the competing systems of (television) broadcasting as the standard system the Commission will consider the authorization of full commercialization. That a single uniform system of television broadcasting is essential—so far as the basic standards are concerned—must also be amply clear. The public should not be inflicted with a hodgepodge of different television broadcasting and receiving sets.

Television entered the past fiscal year with a wide divergence in the industry on the matter of adopting standards. Because the situation was one which threatened to hold up coordinated television development indefinitely and to delay public service on a widespread basis, the Commission offered its cooperation to the industry along lines in furtherance of the achievement of higher standards by research and development.

National Television System Committee

First, it provided for new experimental television stations in various sections of the country to engage in practical demonstration of competing systems. Later it cooperated with the Radio Manufacturers Association (RMA) in creating the National Television

System Committee (NTSC). The RMA felt that "because of the inadequacy of the various suggested standards for television" all existing systems should be explored and developed, and new standards formulated. The NTSC was given this task for which it was well adapted, being organized from representatives of national technical organizations and companies broadly interested and experienced in the television field. The NTSC reconsidered all questions relating to television standardization and made report to the Commission on January 27, 1941. This report was the result of 5,000 man-hours of work and represented 60 meetings of the NTSC and its committees. Distribution of the proceedings of the committee involved 500,000 sheets of material.

1941 Hearing

The following day the Commission announced that a public hearing would be held beginning March 20, 1941, to consider the various engineering standards suggested, and also to determine when television broadcast stations should be permitted to broadcast commercial programs as a public service.

At this hearing the Commission found the industry had reached agreement that television broadcasting was ready for standardization. The standards as finally proposed by the NTSC at the hearing represent, with but few exceptions, the undivided engineering opinion of the industry. Some difference of opinion existed among broadcasters as to the date when commercial operation should begin. However, the Commission was of the opinion that the reasons advanced by some for the delay were not controlling. Other leading figures in the industry expressed the view that developments warranted prompt standardization and commercialization.

The standards proposed by the NTSC provided for most of the improvements held out as readily possible a year ago for monochrome transmissions (black and white pictures). These standards fix the line and frame frequencies at 525 and 30, respectively. The 525 lines provide for greater detail in the pictures transmitted than the 441 lines advocated a year ago. They give substantially equal resolution and more fully exploit the possibilities of the frequency bands allocated for television. Different line and frame frequencies will probably be required for color transmissions. This, however, is a matter for future consideration after color transmissions have had adequate field tests.

Previously one of the weakest phases of the proposed television standards was the synchronizing pulse which frequently caused the loss of the picture under interference conditions. A few weeks before the March hearing, developments were brought forth for greatly intensifying the synchronizing signals transmitted.

Rules and Standards

On April 30, 1941, the Commission promulgated rules incorporating television transmission standards recommended by the National Television System Committee. Provision was made for the use of frequency modulation on the sound carrier; previously amplitude modulation had been considered. Incorporated were alternative standards for the synchronizing waveform and the manner of trans-

mission—namely, by amplitude modulation or frequency modulation. These alternatives permit universal reception by present receivers. Rules were adopted for commercial operation effective July 1, 1941.

Stations licensed for commercial operation are required to operate a minimum of 15 hours per week. Provision has also been retained for licensing television stations on an experimental basis, as well as experimental color transmissions.

As in the case of FM broadcast stations, no person or group may operate more than one television station in a given area. However, whereas a maximum of six scattered FM stations may be under the same control, the more limited television channels make three such stations the limit for the main television band.

The Commission's order accompanying the rules and standards provided that experimental television stations previously authorized would be issued construction permits for commercial operation upon a showing that the station construction would meet the new requirements. At the close of the fiscal year, two such stations received authorizations to begin 15 hours per week commercial operation. Five other stations, located in Los Angeles, Chicago, Philadelphia, New York City, and Schenectady, were converting their experimental stations into commercial stations. Seventeen others holding construction permits for experimental stations in various parts of the country indicated their intention to start commercial service as soon as possible. By November 1 there were 8 commercial authorizations.

The Commission also announced that on or before January 1, 1942, the Commission would consider further restricting the standards with respect to the alternatives in regard to synchronizing signals. Consideration will also be given at this time to test data with respect to color transmissions and to recommendations as to standards which may be adopted for color television.

Developments

On January 6 and 7, 1941, the Commission witnessed television demonstrations in Philadelphia and New York City. In Philadelphia there was demonstrated a new method of transmitting synchronizing signals. It indicated a considerable advance in holding received pictures in place under adverse interference conditions. In New York City the Commission witnessed a home television receiver employing a projection cathode ray tube giving pictures 13½ by 18 inches and also viewed large-screen telepictures 15 by 20 feet for theatres and other public places. Demonstration of three-color television was also witnessed.

4. INTERNATIONAL BROADCAST SERVICE

International developments have spurred domestic interest in international broadcasting. Private organizations are now very active in presenting the United States viewpoint in the world radio forum which other nations have long used to advantage.

International broadcast stations in this country have made substantial advances in providing technical facilities and acceptable programs for promoting international goodwill and understanding.

Considerable emphasis has been placed upon the service to Central and South America. One organization which operates a national network has made arrangements for a number of stations in Latin America to rebroadcast the programs received from its international broadcast station. By way of reciprocity, the United States network will rebroadcast programs originating in South America.

The Commission has given particular cooperation to international broadcast licensing looking toward the improvement of service. It has striven to improve the technical operation of these stations, thus increasing the signal strength and bettering reception in foreign countries. Increases in power and installation of highly directive antennas have been encouraged. On September 1, 1941, there were 11 high-powered United States international broadcast stations, each capable of delivering international programs with at least 50 kilowatts of power. Two of these stations have increased their power to approximately 100 kilowatts and similar increases by other stations are contemplated. In addition, the Commission has aided the licensees in the design of new antennas directed to specific foreign countries in order that clearer and more intelligible signals may be received in all parts of the globe.

The Commission's rules requiring a minimum power of 50 kilowatts for international broadcast service became effective July 1, 1941. With a view to further improvement, the Commission in August 1941 modified its rules to permit greater flexibility in the use of frequencies available to this service. It is now possible to assign more than one frequency in the band to a single domestic licensee. This will enable the licensee, should interference be experienced on one frequency, to shift to another frequency not subject to the same degree of interference.

5. NONCOMMERCIAL EDUCATIONAL BROADCAST SERVICE

As of September 1, 1941, seven noncommercial educational broadcast stations were operating or authorized. They were affiliated with the Boards of Education of New York City, San Francisco, Cleveland, and Chicago; the San Diego Unified School District, and the Universities of Kentucky and Illinois.

As previously reported, the Commission in providing for a commercial broadcast service on the high frequencies allocated five adjacent channels for noncommercial educational broadcast stations. In this way, educational broadcasting may take advantage of FM transmission.

The Commission's rules for noncommercial educational broadcast stations require that the program service include units of an educational system. For example, a station owned and operated by a municipal school board should transmit classroom material to schools throughout the city. However, the rules permit transmissions to the general public, including entertainment as well as adult education programs. With the increasing distribution of FM receivers, boards of education and educational institutions will find FM transmitting facilities increasingly useful. It has been estimated that the cost of installing a school radio system is no more than the cost of adding an additional classroom.

To provide a further incentive for this kind of broadcasting, arrangements were made by the holder of the patent rights on the present system of frequency modulation to require payment of but nominal royalties on transmitters used by nonprofit educational stations.

6. STUDIO-TRANSMITTER SERVICE

The Commission's rules require that the high frequency FM broadcast stations meet a substantially uniform response between 30 and 15,000 kilocycles. While it is generally agreed that this requirement can be met insofar as equipment itself is concerned, considerable difficulty is encountered in obtaining wire circuits between the studio and transmitter. In addition, many desirable FM transmitter sites are found on tops of hills and mountains removed from existing telephone circuits. Installation of wire lines would be costly.

The Commission eliminated this "bottleneck" in the achievement of high fidelity transmission by establishing a new service for this purpose. Rules adopted on March 12, 1941, provide for the licensing of an ST (studio-transmitter) station for the purpose of transmitting programs from the studio to the transmitter of the station. Twenty-three 600-kilocycle channels were provided between 330,000 and 346,000 kilocycles for such service.

ST stations are required to use FM and directional antennas meeting certain specifications. Some experimentation is required in order to finally arrive at a definite evaluation of the usefulness of this service. Accordingly, stations are licensed on an experimental basis.

The Commission later amended its rules so as to make ST service available to international broadcast stations. Inasmuch as there are but few international broadcast stations in the United States, additional ST stations operated by them impose no serious requirements upon available frequencies. By the same token, international broadcasts are subject to fewer mechanical and other interruptions.

7. RELAY BROADCAST SERVICE

The relay broadcast service made possible many programs of standard broadcast stations which would not otherwise have been feasible because of lack of suitable wire facilities. A total of 498 authorizations for relay broadcast stations were outstanding at the close of the year. The license period of relay broadcast stations was, on October 11, 1941, extended for two years to conform with similar extension of the standard broadcast license.

Several relay broadcast licenses were issued to provide emergency studio-transmitter circuits when regular wire connections were disrupted.

Section 3.408 (d) of the Rules Governing Standard Broadcast Stations, which requires prior Commission authority before standard and high frequency stations may rebroadcast programs of stations of other classes, was suspended at the instance of the Secretary of War to permit such stations to rebroadcast transmissions from Government stations without first securing written authority of the Commission. In this connection, section 4.21 of the Rules Governing Relay Broad-

cast Stations was also suspended to permit use of relay broadcast stations from points under jurisdiction of military and naval establishments.

8. FACSIMILE BROADCAST SERVICE

There were but four outstanding licenses for facsimile broadcast stations at the close of this year as compared with 16 stations a year ago. There were four special experimental authorizations to standard broadcast stations to transmit facsimile signals during the experimental period instead of seven a year ago. At these stations very few regular transmissions are being made.

The Commission provided for multiplex transmission of facsimile signals by high frequency (FM) broadcast stations. However, technical difficulties have been encountered in mutual interference of aural and facsimile reception.

9. DEVELOPMENTAL BROADCAST SERVICE

The term "Developmental Broadcast Service" is used to define a station used to carry on development and research along lines other than those prescribed by other broadcast rules.

Of particular interest was the grant, on an experimental basis, of application by a certain firm in New York City for a developmental subscriber broadcast service on 117,650 kilocycles. This concern plans to furnish programs without advertising, but will restrict reception of the same by transmitting an accompanying "pig squeal" (discordant sound) which can only be eliminated by special receivers leased from the broadcaster. This proposal is unique in broadcasting annals. It will constitute a pioneer effort to exact charge for service directly rather than indirectly from the listener. The Commission deemed the idea worthy of investigation, and authorized the experiment.

[Page 38 in the original document is intentionally blank]

CHAPTER VI

Safety of Life and Property

1. MARINE SERVICES
 2. AVIATION SERVICE
 3. EMERGENCY SERVICE
 4. EXPERIMENTAL SERVICES
 5. ALASKAN SERVICES
 6. MISCELLANEOUS SERVICES
-
-

1. MARINE SERVICES

Great Lakes and Inland Waters Survey

Under date of December 16, 1940, the Commission reported to Congress on the special study of radio requirements for ships navigating the Great Lakes and inland waters. In that report, it is recommended that no legislation be enacted with respect to the Great Lakes pending treaty negotiations with the Canadian Government. In the same report, it is recommended also that appropriate legislation [similar to that contained in Title III, part II of the Communications Act] be enacted to require radio equipment on ships navigating exclusively on bays and sounds adjacent to the open sea.

Great Lakes Radiotelephone Service

Because of the large number of coastal-harbor and ship telephone stations of the United States and Canada which intercommunicate and operate within comparatively short distances of each other, and due to the necessity of sharing certain radio telephone frequencies, particularly the common calling and safety frequency 2182 kilocycles, there exists a definite need for joint regulatory measures. The basis of such regulation has been formed from time to time by informal conferences and exchanges of views between representatives of this Commission and the Canadian Government.

Such an informal conference was held at Toronto on March 12 and 13, 1941, which was attended by representatives of commercial radio communication companies of the United States and Canada, representatives of the Lake Carriers' Association, and Dominion Marine Association, and the United States and Canadian shipmasters' associations. Following this conference, some needed changes in operating practices were placed into effect by the Commission on April 1, 1941. These have considerably reduced interference on the calling and intership frequencies.

Mississippi River Radiotelephone Service

Following analysis of the record of an informal hearing at Memphis on October 28, 1940, and upon completion of a detailed engineering study concerning related frequency allocation matters, the Commission allocated six frequencies between 2000 and 12000 kilocycles for assignment to ship and coastal-harbor telephone stations on the Mississippi River and connecting inland waters. These frequencies have transmission characteristics which will permit communication on the Mississippi River system and connecting Intra-coastal Waterway over distances up to several hundred miles.

Three coastal-harbor stations have been licensed for public telephone service with river vessels, and five applications are on file. In addition, the Inland Waterways Corporation, a governmental enterprise, has requested authority to use radiotelephony for communication with its 37 ship stations through the medium of the land station owned and operated by this organization at Memphis.

At the Memphis hearing it was shown that 60 vessels operating on the Mississippi River system had licensed radio stations on board. Seventeen of these vessels had telegraph equipment only, 21 had telephone equipment only, and 22 had both telephone and telegraph equipment. It was conservatively estimated, however, that the total number of towboats on the Mississippi River and its tributaries exceeds 500.

Radiotelephony in Gulf Coast Area

During the latter part of 1940 the Commission received reports that severe interference was being caused to intership telephone communication by stations used on oil drilling rigs and moored vessels in connection with industrial oil operations in the coastal waters and marshes of Louisiana and Texas. This marshland bordering the Gulf of Mexico is an extensive area generally accessible only by boat and subject to severe storms. A large portion of the area is of such a swampy nature as to make construction and maintenance of wire lines impracticable. It was further reported that the ship-shore service through established coastal-harbor stations at New Orleans and Galveston did not fully meet the needs of some of the oil companies and barge lines.

Accordingly, an informal hearing was held at Houston on May 5 and 6, 1941. At the close of the fiscal year, the record of this hearing and other related information were being analyzed and studied by the Commission's staff preparatory to the submission of appropriate recommendations. In the meantime the Commission has temporarily authorized continued operation of the ship stations in question and has been advised that the licensees of the coastal-harbor stations at New Orleans and Galveston are attempting to overcome the alleged deficiencies of the ship-shore service rendered in this area.

Coastal Radiotelegraph

As of June 30, 1941, there were 55 coastal telegraph stations, exclusive of those in Alaska. Fifty-two of these stations were licensed for public service and three for limited (governmental) service.

A public coastal service license was issued for a station at Mobile, thereby renewing the coastal service at that port, which, during the

previous year, had been discontinued by another licensee. The operation of the commercial coastal telegraph station at Agana, Guam, was discontinued voluntarily. Public coastal telegraph service is now rendered at Agana by the previously established naval radio station.

The aggregate volume of ship-shore paid message traffic handled through licensed coastal telegraph stations of the United States has diminished under present international conditions.

On March 1, 1941, regulations became effective which clarified the status of the relatively small number of coastal stations not licensed for public correspondence. The service of these stations is now classified as "limited (governmental) coastal" service. In addition to their normal service they are now required to acknowledge all safety calls and distress messages, and are permitted to transmit messages relating to the safety of navigation, life, and property, to any other station in the maritime mobile service.

Coastal Radiotelephone

There has been no change in the number of coastal telephone stations previously reported. These stations, four in number, are relatively inactive due to the withdrawal from commercial service or loss by disaster of many ocean-going passenger ships. For this reason the licensee of these stations is planning to use some of the frequencies normally employed for coastal service to supplement the regular fixed (point-to-point) public radiotelephone service to South America and other areas.

Coastal-Harbor Stations

The Commission licensed new public coastal-harbor stations at Portland and Astoria, Oreg.; Cape Girardeau, Mo.; Delaware City, Del.; Charleston, S. C.; and Kahuku, Hawaii. The license for the limited (governmental) coastal-harbor station at New Orleans was voluntarily surrendered. The coastal-harbor station at Mackinac Island was moved to Rogers City, Mich. As a result of extensive public hearings in May 1940, new coastal-harbor stations were authorized in the Great Lakes area at Detroit, Port Huron, and Houghton, Mich. and at Buffalo, N. Y. At the same time additional frequencies (above 3,000 kilocycles) were assigned to the existing stations at Lake Bluff, Ill.; Port Washington, Wis.; Duluth, Minn.; Rogers City, Mich., and Lorain, Ohio. The Commission, after formal hearings, denied applications for authority to construct coastal-harbor stations at Manistee and Marine City, Mich.; West Dover, Ohio; and Youngstown, N. Y.

During the year a permit was granted for a new coastal-harbor station near Eureka, Calif., for operation on the same frequency and to supplement the station near San Francisco, Calif. These two stations are to be interconnected by landwire as a means of avoiding mutual interference, in a manner similar to the Portland and Astoria stations on the Pacific coast and the two stations located at Ocean Gate and Delaware City, respectively, on the Atlantic coast.

As of June 30, 1941, there were 28 coastal-harbor stations in the United States, Hawaii, and Puerto Rico licensed to provide public

radiotelephone service, distributed geographically as follows: Atlantic coast, 8; Pacific coast, 6; Great Lakes, 5; Gulf coast, 3; Mississippi River, 2; and Hawaii and Puerto Rico, 1 each.

Ship Radiotelegraph and Radiotelephone

As of June 30, 1941, there were 5,214 ship radio stations of all classes, representing an increase of 19 percent over the 1940 figures. This reflects the increased use of radiotelephone equipment by many types of voluntarily equipped vessels, including cargo steamers, tow-boats, ferries, dredges, fishing boats, and yachts. The majority of telephone-equipped vessels are navigated on the Great Lakes and coastal and inland waters. On the other hand, most ocean-going merchant vessels and a few large passenger ships on the Great Lakes, under statutory requirement, are equipped with radiotelegraph installations.

The Inter-American Radio Communications Arrangement as revised at Santiago, Chile, 1940, provides for allocation in the Northern Zone of the frequency 2638 kilocycles for intership communication and the frequencies 2636 and 2640 kilocycles for aeronautical stations. Accordingly, the Commission, on September 4, 1940, modified its rules to permit the use of 2638 kilocycles frequency for radiotelephone communication between vessels except on the Great Lakes and inland waters. The limitation thus imposed is considered necessary to avoid interference to the service of inland aeronautical stations operating on 2636 and 2640 kilocycles. The action taken in allocating 2638 kilocycles for intership communication was intended to relieve to some extent the increasing interference on the intership telephone frequency 2738 kilocycles. Since the latter frequency is used by more than 3,000 ship stations operated generally within the territorial waters of this country, the Commission found it necessary to impose further limitation. This limitation consists of an amended rule approved on April 1, 1941, providing that use of the intership frequency 2738 kilocycles shall be confined solely to the exchange of distress and safety communications. Any communication on the intership frequencies 2638 and 2738 kilocycles is restricted to a period not exceeding five minutes except in actual distress.

The allocation of long-distance frequencies to ship telegraph stations was modified on July 24, 1940, to provide several series of harmonically related high frequencies between 3000 and 23000 kilocycles for the national defense services as well as for ship stations. The basic effect of this change was to provide for the construction of transmitters of simplified design and reduced cost. A secondary advantage was gained by the fact that 64 telegraph frequencies in the band 3000-23000 kilocycles are now assigned to commercial ship stations in comparison to 48 frequencies previously assigned.

On March 1, 1941, certain regulations became effective which require that licensed ship stations must render a service of public correspondence; either in conformity with established tariffs or without charge for the service of the particular ship station, at the option of the station licensee. This imposes an obligation on the part of every ship station to transmit messages for any person on board. Relay of messages by ship stations for the benefit of other stations in the mobile service is permissive but not obligatory.

Emergency Marine Communication

Abnormal conditions prevailed in the use of radiotelegraphy at sea for distress purposes during the fiscal year. Certain areas designated as "combat areas" were not open to navigation by vessels of United States registry. Consequently, American ships were not in a position to render assistance to the large number of vessels which foundered in those waters. However, all incidents have not been confined to the designated combat areas, and American vessels responded to several radiotelegraph calls for assistance elsewhere. Radio silence is usually maintained by ships of belligerent nations upon receipt of a message indicating the shelling or torpedoing of a vessel in their vicinity in order not to betray their own position to an enemy raider or submarine. Consequently, it is impossible to evaluate properly the use of radiocommunication for distress purposes or to estimate the total number of lives or amount of property saved by its use during this period.

There were no major cases involving use of radio for distress communications within continental waters. There were, however, 24 distress cases within these waters in which the automatic-alarm signal figured. These signals actuated auto-alarms on 55 United States cargo vessels. Including disasters due to hostilities, there were 101 transmissions of auto-alarm signals by various ships and coastal telegraph stations, each of which actuated auto-alarms on at least one United States ship.

Marine Radio Equipment

Increased demands upon manufacturers of radio and electrical equipment because of the national defense has caused delay in equipping some vessels. Unusually hazardous conditions at sea have stimulated production of emergency lifeboat radio equipment of small size and light weight which is now available for voluntary installation. Four new types of ship telegraph transmitters were approved by the Commission.

On January 2, 1941, the Commission promulgated requirements and type tests for the approval of any automatic-alarm signal keying device that may be developed for use on board certain classes of ocean-going vessels. Regulations provide that beginning January 1, 1943, each passenger ship, and beginning January 1, 1944, each ship subject to title III, part II of the Communications Act, shall be fitted with an approved "automatic-alarm-signal keying device." This is defined as a device capable of automatically keying the radiotelegraph transmitter on board a ship at sea so as to transmit the international auto-alarm signal to actuate alarms. Investigation has revealed that on numerous occasions the auto alarm signal has been improperly transmitted by hand and in those instances it failed to serve the purpose intended. An additional safeguard provided by this device is the possibility of its continued operation after a ship has been abandoned. In this way rescue ships would have additional time to obtain direction-finder bearings.

Inspection of ship stations has disclosed that seawater coming into contact with the nonconducting material supporting the antenna lead-in wire in some cases causes a serious loss of transmitting power. The Commission is receiving cooperation from several manufacturers

of insulating products who have submitted selected samples of antenna lead-in insulators for official tests.

A questionnaire survey was made to obtain information on the major technical details of available ship radiotelephone equipment. It was determined that there were at least 20 companies engaged in the manufacture and sale of a total of 80 types of equipment ranging from \$99.50 to \$2,450 in sale price.

Preparatory work on the Standards of Good Engineering Practice for Ship Stations was continued and the proposed Standards for Antennas and Transmitters were tentatively completed.

2. AVIATION SERVICE

Domestic Aviation

Aviation communication service has changed since the days when airways were marked by bonfires maintained by farmers along the routes. Radio has today become almost as indispensable as fuel for large-scale aviation activities. The present world crisis has intensified the already complicated conditions in aviation communications operations. The number of civilian and military planes requiring communications service, and the extent to which radio is relied upon, have increased so much as to tax the capacity of available portions of the radio spectrum. Accordingly, constructive suggestions have been solicited by the Commission and many informal conferences with private fliers, transport operators, and representatives of the industry have been held.

At the beginning of the fiscal year, 18 transport companies using six domestic radio chain communication systems were in scheduled operation over routes more closely knitting the United States. All radio range stations and many marker stations, localizer stations, airport stations, and aeronautical stations are now under supervision of the Civil Aeronautics Administration.

The following table of radio stations in the domestic aviation service shows only nongovernment commercial stations licensed by the Federal Communications Commission:

Station type	June 30, 1940	June 30, 1941
Aircraft.....	1,294	2,140
Aeronautical.....	345	438
Aeronautical fixed.....	141	210
Airport control.....	82	75
Flying school.....	13	25

The increased number of stations licensed in the aviation service made it desirable to stagger the expiration date of station licenses. Increased use of radio by ship telephone stations and the establishments of coastal-harbor stations, together with growth in the use of aircraft for short-distance flights between the coast and outlying islands, made it desirable that ship telephone frequencies as well as ship telegraph frequencies be made available to aircraft.

The volume of domestic and international air travel required reassignment of certain frequencies allocated to chain aviation sys-

tems. An arrangement with Canada permitted six frequencies having Canadian priority being assigned for use on the international routes between Montreal, Canada, and New York, N. Y., and between Toronto, Canada, and New York, N. Y. The use of Canadian frequencies appeared to be the only solution, as channels now available for domestic communications are too greatly loaded to permit this additional service in connection with the Canadian routes.

Airport Traffic Control

At major terminal points, such as New York, Philadelphia, Chicago, Los Angeles, the problem of airport traffic control involves radio communication necessitating accuracy in relaying radio messages and still greater responsibility during periods of low ceilings that require instrument flights and blind landings.

Newly built airports are found inadequate almost immediately upon completion. In the case of LaGuardia Field, N. Y., there are approximately 300 landings and take-offs per day, the bulk of which occur between noon and dusk. The runways can be used only by one aircraft at a time. During such periods of congestion, the radio operator at the airport control station has had to require as many as 20 planes to circle at various altitudes at one time, each remaining aloft awaiting its turn to land.

There was a total of 2,655 airports, landing fields, and seaplane bases in the United States at the beginning of the fiscal year. Of this total approximately 25 percent were municipal airports, 20 percent were commercial landing fields, and the balance were military or miscellaneous Government and a few private fields. Airport radio control stations are being installed at major points, and many are being changed over to the ultra-high frequencies now available for airport control purposes. There were 75 airport control stations licensed at the close of the fiscal year which utilize instrument landing, marker beacons, and localizer equipment authorized by the Commission.

The ultra high frequencies available for airport control stations have been set up on a long-range assignment plan designed to meet the progressive use and future needs of aviation service, particularly the needs of nonscheduled fliers. It is desirable that as many points as possible use a single frequency and the number of additional frequencies necessary for point-to-point flying be limited to a minimum. In cooperation with the Civil Aeronautics Administration, the frequency assignment plan was developed so the majority of airports can be assigned a single frequency. With few exceptions, any one of the civil airways may be flown by the use of no more than four frequencies. Under such a system, the simplest type of fix-tuned receiver can be used in the aircraft installation. Airports not located on any of the civil airways or having no frequency designation under the assigned plan will be the subject of individual study.

Nonscheduled Aircraft

Under the provisions of the Communications Act, a license is required from the Commission for the operation of an aircraft radio station. Such operation can be carried on only by a citizen holding

a radio operator's license. These licenses are in addition to the certificate of registry of the aircraft and the pilot's license required and issued by the Civil Aeronautics Administration.

Though the private flyer has been relatively slow to realize the importance of 2-way radio, the number of aircraft stations licensed to nonscheduled flyers has increased from 837 to 1,653. With the installation of this equipment, the pilot has communication facilities with airport control stations and the benefit of the complete radio air navigational aids maintained by the Government. Indications are that the civil pilots training program will produce a large number of private owners of aircraft educated in the use of radio transmitters.

Flying School Stations

Flying school station licenses have been issued to applicants desiring radio communication facilities for the instruction of student pilots in flight. There were 25 stations of this class at the close of the fiscal year. This type of station has proved beneficial in the civil pilots training program. Of the four frequencies available for this service, one was set aside for soaring societies for use in connection with glider activities. During one meeting of glider enthusiasts, a special temporary airport station was necessary to enable a traffic control operator to warn away motor-driven aircraft. In this instance, radio communication was authorized both on the glider frequency of 39060 kilocycles and the airport control frequency of 278 kilocycles.

International Aviation Service

Notwithstanding the turbulence of world affairs and curtailment of scheduled commercial aviation service to the North European sector, progress has been made in new routes, extended routes, and better service to other parts of the world. The radio frequencies designated for intercontinental routes at the International Telecommunications Convention (Cairo revision), are now used in a coordinated system of communication essential for the safe operation of transport aircraft. There is a total of 284 terminals and 191 ground stations serving these international routes.

At the close of the fiscal year a study was being conducted of the communications necessary for all international routes in order to plan for their expansion and to assure that frequencies in adequate numbers would be available to carry the increasing communication requirements.

3. EMERGENCY SERVICE

The emergency service comprises stations operated by public and private organizations for the protection of life and property. This classification includes state, municipal, interzone, and zone police radio facilities and those engaged in marine fire, forestry, and special emergency protection. Increase in licenses for this service maintained the pace set the previous year.

The growth of this service in the past year is demonstrated below:

Class of station	Total, fiscal year 1940	Total, fiscal year 1941	Increase	
			Units	Percent
Municipal police.....	1,053	1,196	143	14
State police.....	246	513	267	108
Zone police.....	64	69	5	8
Interzone police.....	27	30	3	11
Special emergency.....	309	340	31	10
Forestry.....	617	807	190	31
Marine fire.....	12	6	-6	-50
Total, all classes.....	2,328	2,961	633	27

The emergency service has the second largest number of applications of any service, being exceeded only slightly by the ship services. A total of 7,263 applications were received last year as contrasted with 5,747 in the previous period.

Police

There are at this time 39 intermediate and 29 ultra high frequencies allocated to various police services. All of the police stations operating on the ultra high frequencies, with the exception of those using frequency modulation, are now assigned in the emergency service on a regular basis. These stations have added greatly to the efficient operation of the modern police department.

With the assignment of all 68 available frequencies, the very large number of stations has caused the problem of interference to remain of paramount importance. It should be pointed out that the term "municipal police station" does not mean one transmitter only. The group method of assignment generally includes the main station and any number of mobile units up to two hundred or more under one license.

Experience gained during the year further proved the value of the ultra high frequencies for land, mobile, and portable-mobile units. Improved design and construction has made possible an increase in the cruising range of the mobile units and thereby increased the effectiveness of police protection. This is especially gratifying to the smaller police departments with their limited budgets and lack of personnel. The increase in range has also made feasible the use of these frequencies by the state police organizations for necessary two-way communication, especially in remote rural areas where telephone service is not available.

In the past year the available zone and interzone frequencies have proved ample for point-to-point police communication by means of radiotelegraph. The most effective use of these frequencies is by the state police systems and the large municipalities. Those police departments which have installed zone and interzone facilities have been able to clear necessary and urgent traffic through a system as fast and reliable as any point-to-point service.

The use of mobile transmitters and car-to-car communication has been responsible for the apprehension of numerous law breakers who

otherwise might have escaped the "one-way" system of police radio. The cooperative use of several municipal police systems having their mobile units in well-planned and coordinated networks around the larger cities and closely built-up county areas provides large-scale protection.

Forestry

Radio has proved to be an important adjunct in forest conservation work. It is particularly valuable in preventing forest fires by its ability to dispatch men and equipment to the scene before fires reach a serious stage.

The United States Forest Service, the State departments of conservation, and private agencies owning and operating forest lands, are equipping additional hundreds of fire-lookout towers with radio. Portable and mobile equipment furnish reliable and instantaneous communication between bases and crews. The number of stations authorized in the forestry service has increased from 617 to 807, a gain of 31 percent in the past year. Present allocation to this service consists of 11 ultra high frequencies and 4 intermediate frequencies.

Marine Fire Stations

Marine fire stations are licensed primarily for intercommunication between fire headquarters and fire boats. Such a station justifies its existence by permitting rapid dispatching of marine fire-fighting apparatus to the scene of fires and explosions aboard ships or at docks.

The use of marine fire radio facilities has resulted in an appreciable saving to the public. It permits continuous communication to fire-fighting boats, enabling their direction and recall if the fire is brought under control by other means or if the alarm is false. The number of authorizations for this class of station has decreased, chiefly due to the coordination of various such units into single systems. This has resulted in greater efficiency. The protection is further aided by the use of patrol and report duty rather than by holding large fleets available at fixed locations awaiting call.

Special Emergency Stations

Special emergency stations are authorized for organizations established for relief purposes in emergencies and which have a disaster communication plan; for persons having establishments in remote locations which cannot be reached by other means of communication; and for public utilities for emergency dispatching of repair and relief crews to the scenes of failures and serious damage which may cause death or personal injury and destruction of public property. These stations may not be used for the handling of routine or non-emergency communications.

It has been demonstrated that through the use of special emergency radio stations the operation of utilities can be coordinated in a public emergency and, in addition to the prevention of damage, these stations make possible expeditious rehabilitation. Various telephone companies have provided special emergency stations located at strategic

points throughout the country. These are portable in nature and are completely self-contained, so that in the event of damage to any communication system they can rapidly be established at a break and communication reestablished.

The Commission has allocated four intermediate frequencies and 10 ultra high frequencies for this service, and has licensed 340 such stations in the past year. This is a gain of 10 percent over the number licensed in the previous year.

4. EXPERIMENTAL SERVICES

One of the most important activities of the experimental radio services during the year was in connection with the production of radio equipment for the national defense. This included experimentation in all phases of the radio art, from the investigation of unsolved technical problems to the testing and calibrating of complete radio installations.

Considerable interest has been shown in the application of frequency modulation to services other than broadcast. At the close of the fiscal year 74 authorizations had been granted to municipal police, 45 to State police, and 60 to special emergency. These authorizations provide for the installation of approximately 1,126 radio transmitters together with the necessary auxiliary equipment. Valuable information has been obtained from the operation of these stations.

Another development being tested under actual service conditions is the use of relay or repeater circuits. These circuits furnish a practical method of materially extending the effective coverage of a communication network. In general, these relay stations are located at high elevations and are provided with directive antennas. The transmitters are automatically controlled by a sensitive receiver tuned to the frequency of the control stations. Messages originating at the control station automatically place the repeater stations in operation, which, in turn, retransmits the messages to the next repeater station or to the terminus.

An interesting application of the use of repeater stations is in connection with the new 160-mile Pennsylvania Turnpike. To link this highway for instantaneous communication, it is proposed to establish a radio network consisting of 52 radio stations, 7 of which will be unattended relay or repeater stations, 4 unattended frequency modulated land stations, 15 amplitude modulated fixed stations and 26 portable-mobile stations.

A message originating at one of the interchanges or at the main headquarters at Harrisburg will be transmitted by means of a fixed station in the usual manner. This message will be received at one of the repeater stations and will automatically place the repeater transmitter on the air. This, in turn, will actuate the next repeater station and thus relay the message over the entire length of the highway. Four frequency modulated transmitters will retransmit the message direct to the mobile units within the area covered by each of these stations. Messages originating in any of the patrol cars will likewise be relayed over the highway.

5. ALASKAN SERVICES

Following is a table indicating the number and type of stations in the various services in Alaska for the past three fiscal years:

Service	1939	1940	1941
Fixed public	300	342	321
Public coastal.....	150	167	159
Aviation.....	210	246	112
Special emergency.....	0	6	6
Experimental.....	0	0	2

A hearing held at Fairbanks and Juneau, beginning October 2, 1939, found that the generally unsatisfactory condition of aviation communication services in Alaska could best be remedied by the operators themselves. On this basis, coordinated use of radio communications has progressed with the organization of "Alaska Aeronautical Radio, Inc.," at Juneau, serving all of southeast Alaska, and "Fairbanks Aeronautical Radio," serving the airport at Fairbanks. These organizations are still in the process of taking over the independently licensed stations, rearranging the locations for the most effective use by aircraft flying the various routes, and modernizing the equipment with increased power where needed. It is expected that eventually a coordinated aviation communication service will be available anywhere in Alaska similar to that in successful operation in the United States.

6. MISCELLANEOUS SERVICES

In general, there has been little change in the miscellaneous services during the fiscal year. This is reflected in the following tabulation of the number of stations licensed in each of the various classes:

Service and station class	1940	1941
(1) Geophysical service:		
Geological stations.....	304	269
(2) Special press service:		
Relay press stations.....	7	7
Mobile press stations.....	3	4
(3) Intermittent service:		
Motion picture stations.....	12	12
Provisional stations.....	3	7

The destruction of the swinging bridge across the Narrows, Pierce County, Wash., during a wind storm was widely publicized. In connection with the original construction of this bridge, one fixed provisional station was located at Tacoma with five portable-mobile provisional stations in use at various locations on the project. These authorizations have been reinstated to assist in the reconstruction. Provisional stations were useful in the construction of petties at Gray's Harbor, Washington, being employed to dispatch and direct work boats and barges.

CHAPTER VII

Radio Operators

1. COMMERCIAL
 2. AMATEUR
-

1. COMMERCIAL

World events show that communication facilities, civil as well as military, must be maintained at full effectiveness and indicate how important to the national security are the thousands of individuals employed in their operation. Skilled radio operators must be available in adequate numbers. Several Federal agencies have contributed to this end in various ways, including the inauguration or expansion of practical training courses.

The Commission has encouraged operators to maintain their licenses. The required showing of service for renewals has been suspended by Order 77. Thousands of applicants are examined for radio licenses monthly. Increased work in this connection has been facilitated by the apparatus used for code tests, the use of multiple-choice forms in most of the written examination elements, cooperation of other Federal agencies in conducting examinations, particularly at remote points, and nonassembled examinations for the lowest class of license, supervised by chosen State or municipal officials for subsequent grading by the Commission's staff.

Six classes of license continued to be issued during the year. Three are radiotelegraph classes, of which the highest is open only to a person aged 21 or more having at least a year of experience as a manual radiotelegraph operator at ship or coastal stations. Three are radiotelephone classes, of which the highest is required for operators at broadcast stations while the lowest is acceptable for police, aircraft pilots, and others who are engaged in routine operation of radio equipment but do not adjust or service it.

This lowest class of license or restricted radiotelephone permit is now held by about 60,000 individuals, which reflects the greatly increased use of radio, particularly for police and other services concerned with the safety of life and property. The other 5 classes of license divide among 20,000 individuals, of whom about 9,000 hold a radiotelegraph class.

While this means that the latter number are qualified by license for the vital service of marine radio, it by no means indicates that all of these licensees are currently available for such assignment.

Many are engaged in other vital services, as suggested by the fact that more than 4,000 of them also hold radiotelephone licenses. During the year the Commission has engaged in the collection of more definite information regarding each license holder, including employment and citizenship.

Citizenship Inquiries

Congress authorizes issuance of radio licenses to citizens of the United States only. By its Order 75 the Commission called upon each licensed radio operator and each applicant for new or renewed license to file prescribed forms furnishing identification, including fingerprints and record of citizenship. Through cooperation of communications companies, similar information was obtained from employees in a position to intercept or handle international communications. Returns from both sources exceed 150,000.

In some instances prior citizenship claims were apparently fraudulent. In other cases it appears that the Commission's inquiry and resulting efforts to obtain records of birth, naturalization or other basis of citizenship, have revealed to numerous individuals that they are not technically citizens, although they may have long resided in the United States and exercised the rights and duties of citizens, including military service. Much more numerous are persons who are presumably citizens of the United States but who find it very difficult to furnish record of that fact. Considerable effort has been made to aid such persons by suggestions and independent inquiries. The Commission has been greatly aided by the very substantial cooperation of the Immigration and Naturalization Service, the Passport Division of the Department of State, the Tabulating Division of the Bureau of Accounts, the military departments, and numerous other offices.

The Commission's order in this connection did not itself void any outstanding license. On the contrary, the practice has been to maintain validity, to extend licenses or to issue temporary authorizations to those needing them, while allowing ample time to search for records, and to settle questions that arise in some cases involving several generations, foreign births, and application of the laws governing immigration, naturalization, and derivative citizenship.

2. AMATEUR

Amateurs generally filed the requested showings and were encouraged to maintain their interest and licenses. To continue these while allowing time for citizenship inquiries and orderly consideration, the Commission by its Order 76 extended the expiring licenses of any amateur who filed showing and applied for license renewal. Its Order 77 suspended a rule requiring a showing of use or operation to qualify for renewed license, and its Order 81 further greatly simplified the required application for such purpose by amateurs who had been called to the colors.

The Commission received upwards of a hundred applications daily for new, renewed, or modified amateur licenses; the total during the year exceeded 40,000, counting as 1 a form that commonly comprises 2 applications—for license as an amateur operator and license of an

amateur station. About 10,000 of these were returned to applicants for various reasons or not honored because the related examinations failed to show passing grades. Counting operators and stations separately, there were issued upwards of 50,000 licenses, in nearly all instances for a 3-year term. Most of the issues were renewals or modifications; about a fourth were new licenses.

Amateur licenses are now held by about 60,000 persons distributed throughout the States, territories, and possessions, being several times the number authorized by all other countries combined.

Radio amateurs of the United States have not only greatly exceeded all others in numbers, but have generally enjoyed greater privileges. The war has necessarily brought temporary restraint to their activities. Communication by amateurs is now suspended generally for the duration of the war, pursuant to action by the Commission on December 7, 1941, the day that Japan declared war upon the United States. This ban applies to all amateurs except those who may be permitted by the Commission to function in special national defense categories upon specific recommendation of the Defense Communications Board.

Even before the war broke, only a relatively small number of amateurs, as discerned by the Commission's monitoring service, had violated preliminary restrictions. During the fiscal year the Commission found it necessary to revoke the licenses of four amateurs and suspend the licenses of 40 others.

The amateurs generally have cheerfully accepted emergency conditions, understanding the necessity for war's restrictions and appreciating the recognition of amateur accomplishments as indicated by the effort to sustain their privileges as far as practicable.

Developments in Amateur Service

Widespread interest was noted in connection with the development and testing of self-powered transmitting equipment for use in handling emergency communications. Attention was focused on establishing new emergency communication networks and expanding existing ones with a view of providing speedy communication facilities throughout the United States, its possessions and territories. Close cooperation was maintained with the military and civilian defense authorities, as well as with relief organizations, by a large number of amateurs interested in net operation, who offered their services and facilities to furnish emergency hook-ups in the event of armed attack, floods, hurricanes and other situations when normal communications are disrupted or impaired.

Many amateur stations are affiliated with the Army Amateur Reserve System, the Naval Communications Reserve and other organizations which devoted much time to handling communications through the medium of the International Morse Code. Amateurs interested in improving their skill in the reception and transmission of communications in code found membership in these organizations of immense value for training purposes.

Numerous improvements in amateur station equipment were evident, which in a measure accounted for the large increase in the number of amateur radiotelephone stations operating in the amateur service prior to the outbreak of war.

[Page 54 in the original document is intentionally blank]

CHAPTER VIII

Technical Studies

1. INTERFERENCE FROM ELECTROMEDICAL EQUIPMENT
2. INTERFERENCE FROM LOW-POWER DEVICES
3. "COLLEGE NETWORKS" AND OTHER WIRED RADIO
4. MEASURING ELECTRICAL NOISE
5. HIGH FREQUENCY BLANKETING
6. GROUND WAVE PROPAGATION
7. IONOSPHERIC WAVES
8. TROPOSPHERIC WAVES
9. VARIABLE FREQUENCY CIRCUIT THEORY
10. ELECTRIC AND MAGNETIC UNITS

1. INTERFERENCE FROM ELECTROMEDICAL EQUIPMENT

Considerable progress was made during the year toward a solution to the problem of interference to radio reception caused by the operation of high-frequency electromedical equipment. A conference was held in Washington during the latter part of 1940, which was attended by representatives of the medical profession, manufacturers of diathermy machines, the radio industry, and the Government. At this meeting general agreement was reached as to the frequencies suitable for therapeutic treatments. There was agreement also on all other matters with one exception—the frequency stability or "tolerance" to be prescribed. As a result, a subcommittee was appointed to give further study and submit final recommendations.

Another committee was appointed to make further study of the possibilities of shielding and other physiological factors in connection with the problem. The major work of these committees has been concluded and their reports are expected soon.

While the above-mentioned committees were active, the consent of Government departments, through the Interdepartment Radio Advisory Committee, was obtained to the assignment of the frequencies 13,600, 27,320, and 40,980 megacycles for use by diathermy machines with a tolerance of 0.05 percent of the operating frequency.

There still remains the determination of the relative cost of diathermy machines in order to meet this latter specification. This is a design problem which can best be solved through the collaboration of the radio and diathermy machine manufacturers.

2. INTERFERENCE FROM LOW-POWER DEVICES

The rules and regulations governing devices of this type were tentatively adopted in November 1938. Such apparatus is used at very low power for remote control by radio over extremely short distances, such as opening and closing garage doors, turning radio sets on and off, etc. The rules, if strictly adhered to, preclude the possibility of interference to radio reception. At the time of the adoption of these rules it was stipulated that they were not to be considered as final but that the Commission would continue to study and assemble information regarding the character and effects of the radiation involved.

Improper design or use of equipment has resulted in a considerable number of complaints of interference during the year, particularly in the case of radio-controlled phonograph record-players and certain electric signs used for advertising. A committee composed of engineers representing the various divisions of the Engineering Department was therefore organized to give particular study to this problem.

3. "COLLEGE NETWORKS" AND OTHER WIRED RADIO

In this type of system communication is effected not by the transmission of radio waves through space but by the transmission of radio frequency currents via wire lines. Radiation of energy from the lines capable of causing interference is prevented by proper shielding of the lines in metal conduits.

An interesting adaptation of this system has recently been made by undergraduate students at some 30 colleges in the United States. Programs are transmitted from a central location to the dormitories, fraternity and sorority houses on the college campus. The various systems are joined in a single organization called "The Intercollegiate Broadcasting System." Preliminary investigation indicated that these "college networks" are well engineered and supervised. No interference has been reported as a result of their use.

Other adaptations have been the so-called "carrier call systems" and the "radio nurse" for interoffice communication or communication in institutions. When carefully designed, these systems may be operated with negligible interference-producing potentialities—no greater than that of the ordinary well-designed superheterodyne radio receiver.

No rules and regulations have been promulgated governing this type of wired communication. However, the systems, if used on open lines or if improperly designed, are capable of causing very serious interference. The committee at work upon the problem of low power radio-frequency electrical devices is therefore including carrier current systems in its study with a view to determining the need for regulation in the event of extension of the use of this principle of communication into other fields.

4. MEASURING ELECTRICAL NOISE

Much experimental work has been done in recent years by engineers in the United States, Canada, and Europe in efforts to bring about

uniformity in methods and standardization of equipment for measurements of electrical noise.

Electrical noise, i. e., that produced by electrical machinery, is a limiting factor to good reception in many radio services. The power required for satisfactory reception in these services depends upon the noise encountered in different localities which varies over wide limits. The problem is one in which Commission engineers have been active.

As a result of measurements and equipment tests made in the United States and Canada, tentative standards for noise measurements were proposed for adoption in each country during the year. These proposed standards differed in some detail in the electrical constants chosen for the equipment, which would have rendered the interpretation of data exchanged between the two countries very difficult if not impossible. It was therefore decided to repeat the tests, both in the United States and Canada, utilizing like equipment for the measurements. It is hoped that agreement can be reached within the present year.

5. HIGH FREQUENCY BLANKETING

The blanket area of a broadcast station may be defined as that area adjacent to the transmitter in which its signal is sufficiently strong to cause interference to the reception of signals of other stations designed to serve that area.

Investigation of such interference was made as a result of precautions taken in considering applications for new frequency modulation (FM) stations to insure good reception in residential areas. With the cooperation of two Washington stations, measurements were made of the "crosstalk." The latter is not typical of that usually encountered with amplitude modulation (standard broadcast) stations. This crosstalk is not likely to be anticipated or observed until after the location of stations on alternate adjacent channels serving the same area, and therefore should be considered prior to making any such assignments.

Radio operating companies and manufacturers are cooperating with the Commission in its study in order that blanketing in the FM service may be reduced to a minimum.

6. GROUND WAVE PROPAGATION

The ground wave is defined as that portion of a radio wave which is ordinarily affected by the presence of the ground. It does not include ionospheric (sky) waves or tropospheric waves hereafter mentioned. Ground waves are responsible for the primary service areas of standard broadcast stations operating on the lower frequencies and also of high frequency and television broadcast stations operating in the ultra high frequencies. The study of their behavior is therefore a continuing one.

The graphical methods of computing ground wave field intensities mentioned in the Sixth Annual Report have come into general use both in this country and abroad. Studies during the year have consisted mainly in clarification and illustration of their use, through computation of curves of field intensity versus distance for the typical conditions and various cases which arise in practice.

7. IONOSPHERIC WAVES

An extensive study of ionospheric (sky) wave propagation in the frequency range comprising the standard broadcast band has been in progress for 5 years.

Ionospheric waves are those responsible for reception at night at great distances in rural areas from clear channel stations. A knowledge of their behavior is essential in allocation problems because such waves are also responsible for the restricted primary service areas of regional and local broadcast stations at night.

It is known from previous studies that broadcast sky wave transmission varies substantially throughout the 11-year sunspot cycle. The experimental data necessary for the formulation of the theory are being received daily as a result of a sunspot cycle survey. Plans for this survey were made specifically to facilitate separate evaluation of those factors believed responsible for fading, the variation of field intensity with frequency, time, distance, the seasons, and the years, as well as the effects of latitude and the earth's magnetic field, in order to obtain a better understanding of the mechanism of propagation. It is expected, therefore, that this study will continue throughout a complete cycle of solar activity. If the study is successfully completed it will represent the most comprehensive investigation of sky wave propagation at broadcast frequencies ever made. The field intensity records on hand now number 15,419 and the noise records, 4,721.

8. TROPOSPHERIC WAVES

Knowledge of the behavior of tropospheric waves is of importance in the assignment of frequencies and the location of stations operating on the ultra high frequencies. These waves bear a similar relation in ultra high frequency wave propagation to the ionosphere (sky) waves which occur at night in the standard bands. In each case they are responsible at times for transmission from a station far beyond its normal ground wave range, causing interference at the longer distances as well as fading. For this reason the study of tropospheric waves mentioned in the Sixth Annual Report has been continued.

9. VARIABLE FREQUENCY CIRCUIT THEORY

Development of the high frequency broadcast service progressed during the year at a phenomenal rate. The fundamental principles in transmission and reception of frequency modulated signals are very different from those of amplitude modulated signals. As a result, many new conceptions and some misconceptions have grown up with the rapid advance of this new form of radio communication.

A knowledge of the behavior of electric circuits (i. e., the currents produced in them when under the influence of applied voltages produced by FM signals and particularly the effects when the desired signal is accompanied by various types of noise, or other undesired or interfering signals) is of fundamental importance to the Commission in the assignment of frequencies and the location of stations in order that interference may be minimized.

A comprehensive study of variable frequency electric circuit theory has been under way for some time and is now nearing completion.

10. ELECTRIC AND MAGNETIC UNITS

The International Electrotechnical Commission (I. E. C.) meeting at Scheveningen, Brussels, in June 1935 adopted the meter, kilogram, and second as the basic units of length, mass, and time, this action becoming effective in January 1940. The question of the electrical unit to be adopted was left open, opinion being divided between the international ohm and coulomb. The question of rationalization of the units was also undecided.

While the United States has not officially adopted this system of units, called the MKS Georgi system, there is evidence that it will gradually come into use in this country. Textbooks and papers are appearing in increasing numbers in which the MKS system is used.

The Commission has been interested in this action because it represents a step toward a goal which engineers, physicists, and teachers have striven without avail for many years, namely, the adoption of a single system of units satisfactory alike to the mathematician and physicist and also to the engineer and laboratory experimenter.

[Page 60 in the original document is intentionally blank]

CHAPTER IX

Statistics

1. BROADCAST FINANCIAL DATA
2. BROADCAST STATISTICS
3. OTHER RADIO SERVICE STATISTICS
4. COMMON CARRIER STATISTICS
5. FIELD-ACTIVITY STATISTICS
6. PUBLICATIONS

1. BROADCAST FINANCIAL DATA

The broadcast business in the United States reached a new high of \$154,823,787 in the calendar year 1940, which was an increase of \$24,855,761, or 19 percent, over the figures for 1939, according to financial data filed with the Commission. This amount was for sale of time only, as reported by three major networks, five regional networks, and 765 stations. In addition to time sales, the industry derived \$13,181,948 from the sale of talent and other services during 1940, which was \$1,862,696 better than the year previous.

In consequence, the broadcast service income (operating profit) of the entire industry increased in 1940 by more than \$9,000,000 over 1939, or about 39 percent.

The three major networks (National, Columbia, and Mutual) reported combined time sales of \$71,919,428 for the year, which is up about 15 percent over 1939. The National Broadcasting Co., through its dual networks, accounted for \$37,137,823, while the shares of Columbia and Mutual in the total business were \$31,181,444 and \$3,600,161, respectively. They paid to stations under contract and to regional networks \$22,123,760 compared to \$18,023,195 the year previous. The combined broadcast service income as reported by National, Columbia, and Mutual, including the operations of their networks and stations, was \$13,705,043 before Federal income tax. After provision for Federal income tax the net income was \$3,918,772 and \$5,006,634 for National and Columbia, respectively, and a loss of \$39,712 for Mutual.

The purely non-network business of the industry (i. e., time sold to local and national advertisers by the 765 stations) was \$81,897,236, bettering the previous year by \$14,109,409, or 20 percent. The broadcast income of 734 stations not operated by or for the networks amounted to \$19,123,609, being up \$6,345,817, or half again as much as for 1939.

A total of 187 stations lost money in 1940. These stations had total time sales of \$8,402,886, total expenses of \$9,778,019, and lost in the aggregate \$1,551,812. These figures include losses for 26 of 62 new stations, the remaining 36 having operated at a profit. However, the number of stations losing money was under the figure for 1939, when 227 stations lost \$2,220,471. Sixty-one stations have lost money every year since 1937.

As of December 31, 1940, the industry employed 26,824 persons. The year's payroll was \$58,616,059.

2. BROADCAST STATISTICS

The following tables and listing have to do with statistics for the broadcast industry for the fiscal year ended June 30, 1941:

Number of broadcast stations

Class of station	As of July 1, 1940	New	Deleted	As of July 1, 1941
Standard broadcast	847	68	18	¹ 897
High frequency broadcast	50	49	30	² 69
Low-frequency relay	225	19	15	229
High-frequency relay	278	19	28	269
Developmental	7	1	0	8
Television	26	26	5	³ 47
International	13	1	2	12
Facsimile	16	0	12	4
Noncommercial educational	3	2	0	5
Class II—Experimental	0	1	0	1
S. T. (Studio-transmitter)	0	4	0	4
Total stations	1,465	190	110	1,545

¹ Of the total number of standard broadcast stations, 750 operate unlimited time, 22 limited time, 56 daytime only, and the rest share time or operate specified time.

² Includes 49 commercial high frequency (FM) broadcast stations.

³ Includes 2 commercial television broadcast stations.

Broadcast applications

Service	Applications received	Applications granted	Special authorizations
Standard	4,281	3,784	746
Relay	732	741	79
High frequency (FM)	433	83	152
Television	128	103	35
International	88	79	40
Noncommercial educational	28	12	10
Developmental	24	18	2
Facsimile	6	7	0
S. T. (Studio-transmitter)	4	4	0
Totals	5,724	4,831	1,064

NOTE.—Figures include formal and informal applications for new stations, construction permits, modification of construction permits, assignment of construction permits, licenses, renewal of licenses, assignment of licenses, transfer of control, installation of equipment, determination of operating power by direct method, special experimental authorizations, etc. Standard broadcast application figures include 590 Form 335's (chain broadcasting); grants include 875 extensions of licenses. Developmental grants include one class II experimental broadcast station.

3. OTHER RADIO SERVICE STATISTICS

Statistics for fiscal year ended June 30, 1941

	Applica- tions received	Author- izations issued	New sta- tions author- ized	Total sta- tions June 30, 1941
Ship service.....	7,462	5,125	1,442	5,214
Aviation:				
Aeronautical.....	1,106	1,133	41	438
Aeronautical fixed.....	431	457	12	210
Aeronautical and aeronautical fixed.....	74	0	0	0
Public aeronautical.....	0	0	0	0
Public aircraft.....	0	0	0	0
Aircraft.....	4,446	4,484	1,080	2,140
Airport.....	163	188	18	75
Flying school.....	106	38	20	25
Instrument landing.....	0	0	0	0
Marker beacon.....	0	0	0	0
Subtotal.....	6,326	6,300	1,171	2,888
Emergency service:				
Municipal police.....	3,963	2,926	250	1,196
State police.....	966	858	215	513
Zone police.....	156	174	5	69
Interzone police.....	85	89	3	30
Special emergency.....	1,414	1,355	103	340
Forestry.....	646	638	246	807
Marine fire.....	33	17	0	6
Subtotal.....	7,263	6,057	822	2,961
Experimental:				
Class 1.....	513	386	53	216
Class 2.....	822	578	165	231
Class 3.....	4	1	1	1
Subtotal.....	1,339	965	219	448
Point-to-point telegraph:				
Public.....	367	331	0	69
Press.....	70	52	0	3
Private.....	0	0	0	0
Agriculture.....	10	7	0	7
Subtotal.....	447	390	0	79
Point-to-point telephone:				
Public.....	56	59	0	15
Alaskan service:				
Fixed public.....	543	490	60	321
Experimental.....	2	2	0	2
Special emergency.....	6	6	0	6
Aviation.....	222	292	8	112
Coastal.....	279	275	28	159
Subtotal.....	1,052	1,065	96	600
Coastal service:				
Coastal telegraph.....	115	86	0	52
Marine relay.....	65	71	0	37
Coastal telegraph and marine relay.....	5	0	0	0
Coastal harbor.....	67	161	8	32
Coastal telephone.....	13	7	0	4
Limited governmental service (coastal telegraph).....	7	6	13	13
Subtotal.....	272	331	11	128
Miscellaneous service:				
Geological.....	354	319	23	269
Motion picture.....	15	14	2	12
Provisional.....	25	19	4	7
Mobile press.....	7	4	1	4
Relay press.....	9	11	0	7
Subtotal.....	410	367	30	299
Total.....	24,627	20,659	3,791	12,632

1 Class of service changed from private coastal telegraph.

4. COMMON CARRIER STATISTICS

Annual and Monthly Reports

Annual reports for the calendar year 1940 (containing comprehensive information of a financial and statistical nature) were filed by 216 companies, an increase of 49 over the number for the previous year. Of these companies, 137 were telephone carriers, 16 were wire-telegraph or ocean-cable carriers, 20 were radiotelegraph carriers, and 43 were holding companies. Monthly reports also were filed during the calendar year by 115 companies, of which 98 were telephone carriers, 8 were wire-telegraph or ocean-cable carriers, and 9 were radiotelegraph carriers. There were filed during the fiscal year for the first time certain data requested in 2 new annual report forms that had been prepared by the Commission for use by miscellaneous classes of small communication carriers and by class C telephone carriers. In certain instances, telephone carriers that are not subject to the complete jurisdiction of the Commission voluntarily filed annual and monthly reports for use by the Commission in preparing statistical compilations.

Statistical Compilations

Statistical data of communication carriers and holding companies for 1940 are published in a separate volume, "Statistics of the Communications Industry in the United States," which may be purchased from the Superintendent of Documents.

The following statistical summaries were issued by the Commission during the year:

Statistics of the communications industry in the United States, 1939.

Summary of monthly reports of large telephone carriers in the United States.

Summary of monthly reports of wire-telegraph, ocean-cable, and radiotelegraph carriers.

Salary report of telephone and telegraph carriers and holding companies, 1939.

Telephone hand-set charges and changes since January 1, 1940.

Various other statistical studies were made during the year relative to domestic and international telegraph traffic and to employees of telegraph carriers, and progress was made in the preparation of classifications of telephone, telegraph, cable, and radiotelegraph employees.

Wire certificates—Fiscal year ended June 30, 1941

	Received	Granted
Telephone.....	146	122
Telegraph.....	105	110
Total.....	251	232

5. FIELD-ACTIVITY STATISTICS

Outstanding in the work of the Field Division during the year was its contribution to the formation of the National Defense Operations Section. (See Chap. 1.) Engineers and investigators from the field staff provided the nucleus of the new section. In addition, the

entire division participated in the training of new personnel, as well as the engineering problem of providing specialized equipment required in this national defense activity.

Although the regular field personnel for a time was cut almost in half as a result, the Routine Operations Section continued to make regular and special investigations, conduct operator license examinations, and perform other routine functions.

In its routine functioning the Field Division made more than 18,500 inspections during the fiscal year. Of this number, 11,097 were ship stations (7,256 on vessels of United States and 3,841 on vessels of foreign registry); 5,054 radiotelegraph stations, 343 radiotelephone stations, and 2,159 broadcast stations. In the ship inspections 4,310 violation and advisory notices were served, and 3,631 violations were cleared during inspection. As a result of the land-station inspections, 1,455 violation notices were served.

More than 35,000 frequency measurements were made—20,065 radiotelegraph, 634 radiotelephone, and 14,778 broadcast. Monitoring resulted in 1,434 violation notices and 113 harmonic notices being served.

Nearly 47,000 applicants for radio operator licenses were examined (exclusive of class C amateurs). Of this number 35,671 were applicants for commercial licenses, 30,269 being in the radiotelephone classifications. Applicants for classes A and B amateur radio licenses totaled 11,203. As a result of examinations, 35,360 operators received commercial licenses—32,439 telephone and 2,921 telegraph.

Routine investigations numbered 3,864—comprising 2,386 telegraph, 226 broadcast, 201 unlicensed operation, 630 interference, and 421 miscellaneous cases. Only 86 of these cases had not been closed at the end of the fiscal year.

6. PUBLICATIONS

With few exceptions, all printed publications of the Commission are sold by the Superintendent of Documents, Government Printing Office, Washington.

Exceptions are several general information or special handbooks, which are obtainable from the Commission upon request. These include "Radio—A Public Primer," which was issued in February 1941 as a companion pamphlet to "An ABC of the FCC," which appeared the year previous.

In June 1941 the Commission issued its first booklet for operators and licensees of radiotelephone stations on board ships. Titled "Information Regarding Ship and Coastal-Harbor Radiotelephone Service," and likewise available without cost, it gives essential facts about this safety service. Another gratis publication is the "Study Guide and Reference Material for Amateur Radio Operator License Examination," issued in 1940.

Printed Matter for Sale By Superintendent of Documents

Following is a list of Commission publications available from the Superintendent of Documents at Washington, with price indicated:

	Price
Communications Act of 1934 with amendments.....	\$0. 15
Federal Communications Commission Reports, Decisions, and Orders, exclusive of annual reports:	
Volume 1—July 1934, July 1935.....	1. 00
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.....	(*)
Annual Reports:	
First Annual Report—Fiscal year 1935.....	. 15
Third Annual Report—Fiscal year 1937.....	. 30
Fifth Annual Report—Fiscal year 1939.....	. 30
Sixth Annual Report—Fiscal year 1940.....	. 20
Seventh Annual Report—Fiscal year 1941.....	. 10
Study Guide and Reference Material for Commercial Radio Operator Examinations.....	. 15
Standards of Good Engineering Practice Concerning Standard Broadcast Stations.....	. 30
Statistics of the Communications Industry in the United States.....	. 30
Report on Chain Broadcasting.....	. 30
Commission Rules and Regulations:	
Part 1—Practice and Procedure.....	. 10
Part 2—General Rules and Regulations.....	. 10
Part 3—Rules Governing Standard and High Frequency Broadcast Stations.....	. 10
Part 4—Rules Governing Broadcast Services (Other Than Standard Broadcast).....	. 10
Part 5—Experimental Rules.....	. 05
Part 6—Rules Governing Fixed Public Radio Services.....	. 05
Part 7—Rules Governing Coastal and Marine Relay Services.....	. 05
Part 8—Ship Rules.....	. 10
Part 9—Rules Governing Aviation Services.....	. 05
Part 10—Rules Governing Emergency Radio Services.....	. 05
Part 11—Rules Governing Miscellaneous Radio Services.....	. 05
Part 12—Rules Governing Amateur Radio: Stations and Operators.....	. 10
Part 13—Rules Governing Commercial Radio Operators.....	. 05
Part 14—Rules Governing Radio Stations in Alaska (Other Than Amateur and Broadcast).....	. 05
Parts 31 and 32—Uniform System of Accounts Class A and Class B Telephone Companies, Units of Property Class A and Class B Telephone Companies (1 pamphlet).....	. 15
Part 33—Uniform System of Accounts for Class C Telephone Companies.....	. 15
Part 34—Uniform System of Accounts for Radiotelegraph Carriers.....	. 25
Part 35—Uniform System of Accounts for Wire-Telegraph and Ocean-Cable Carriers.....	. 35
Part 41—Rules Governing Telegraph and Telephone Franks.....	. 05
Part 42—Rules Governing the Destruction of Records.....	. 10
Part 43—Rules Governing the Filing of Information, Contracts, etc., of Telecommunication Carriers.....	. 05
Part 61—Tariffs: Rules Governing the Construction, Filing and Posting of Schedules of Charges for Interstate and Foreign Communications Service.....	. 10
Part 62—Rules Governing Application under section 212 of the Act to Hold Interlocking Directorates.....	. 05

*Price not set at time this listing was compiled.

