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RECENT MARITIME RADIO LEGISLATION IN THE UNITED STATES

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ON May 20, 1937, the President of the United States signed an Act of the 75th Congress known as Public Law No. 97. This Act not only amended several sections of the Communications Act of 1934 but also wrote into that act many new sections. The primary purpose of Public No. 97 is to further safety of life and property at sea. Consideration of its provisions will be assisted by a brief review of earlier radio legislation and international agreements affecting commercial shipping.

For many years the Ship Act of 1910¹, as amended July 23, 1912², was applicable to ocean-going as well as Great Lakes steamers of American registry plying between ports 200 miles or more apart and carrying, or licensed to carry, 50 or more persons, including passengers or crew or both. It was required that the radio installation be capable of transmitting and receiving messages over a distance of at least one hundred miles, and that an auxiliary source of power be provided to permit the operation of the transmitter for a period of at least four hours in the event of the failure of the vessel's main power supply. It was provided that such radio equipment be in charge of two or more qualified radio operators, with one or the other on duty at all times when the vessel was being navigated. "Public No. 97" repealed these general provisions with respect to ocean-going vessels but it left them still expressly applicable to vessels operating on the Great Lakes.

The United States is a party to the International Telecommunication Convention of Madrid, 1932, and the General Radio Regulations annexed thereto. That Convention and its General Radio Regulations made far-reaching provisions relating to the operation and administration of radiotelegraph and radiotelephone services, and the allocation of radio frequencies. However, its effect upon ship radio equipment may be said to be slight, and further discussion is therefore unnecessary for the purposes of this paper.

The Federal Communications Commission, by virtue of authority

¹ Public Law No. 262, 61st Congress, approved June 24, 1910; 36 Stat. 629.

² Public Law No. 238, 62d Congress; 37 Stat. 199.

granted to it by the Communications Act of 1934, has promulgated various specifications and regulations applicable to ship-board radio installations. Most of these regulations are found in its General Orders and its Rules and Regulations.

The International Convention for the Safety of Life at Sea, held in London in 1929, adopted a number of new and important regulations affecting radio in commercial marine service. The United States Senate ratified the Convention on June 19, 1936, and this ratification was deposited with the British Government on August 7, 1936. On November 7, 1936, three months later, the provisions of the Convention became effective for vessels of United States registry.

It is proposed to treat first the provisions of the Safety of Life at Sea Convention rather than Public No. 97, since the former constitute the fundamental regulations, the requirements of which Public No. 97 parallels and, in some instances, exceeds.

The radio provisions of the Convention apply to all ships of *international* voyages, except vessels of less than 1600 tons gross. A cargo ship is "any ship not being a passenger ship," and a passenger ship is defined as any ship which carries more than 12 passengers. Any person carried on a ship, other than its officers and the crew actually required to man and operate it, persons employed to carry on the business of the ship, and persons who have been rescued from shipwreck, distress or similar situations, is deemed a passenger. The Safety Convention made the following requirements as to equipment and the standing of watches:

EQUIPMENT

The chief radio installations required by the Safety Convention are:

1. A main radiotelegraph transmitter with a normal range of at least 100 nautical miles to operate on 500 kc, 375 kc and at least one working frequency in the band 350-485 kc with A-2 (modulated) emission, or B (spark) emission if transmitter installed prior to January 1, 1930.
2. An emergency transmitter similar to the main transmitter except that a normal range of at least 80 nautical miles is required.
3. A main radio receiver, 350 to 515 kc and 100 to 200 kc for reception of A-1 (continuous) waves, A-2 (modulated) waves and B (spark or damped) waves.
4. An emergency receiver, 350 to 515 kc, with provision for using a crystal rectifier (detector).
5. For emergency operation, a source of power supply independent of the ship's main power supply, with a capacity for six hours of operation.

The emergency transmitter and receiver are not required if the main transmitter and receiver also comply with all the requirements for the emergency equipment.

An independent communication system between the radio room and the bridge, emergency lights, seconds-hand clock, spare parts, and tools constitute other equipment required by the Safety Convention.

Passenger vessels of 5000 tons gross and upwards are required to be fitted with an approved radio direction finder.

Where the number of lifeboats carried on a ship exceeds thirteen, one is required to be a motor boat, fitted with an approved radio-telegraph installation. If the number of lifeboats exceeds nineteen, two of them must be motor boats, each fitted with an approved radio-telegraph installation.

WATCHES

The Safety Convention introduced the requirement of a continuous radio watch on cargo ships of over 5500 tons gross and on passenger ships of over 3000 tons gross. The use of an approved auto alarm on the distress frequency of 500 kc at all times when the qualified radio operator or a certified watcher is not on duty is permitted. Cargo ships under 5500 tons and passenger ships under 3000 tons are required to maintain hours of watch as prescribed by their respective administrations, except that cargo ships from 3000 to 5500 tons gross not fitted with auto-alarms are required to maintain at least eight hours' watch per day. In general, watch requirements of ships compulsorily equipped in accordance with the Ship Act were not affected because the Ship Act required a continuous watch by one of two or more operators, and the use of an auto-alarm for any part of the continuous watch was not permitted.

The Safety Convention provides for possible exemption from its requirements in cases where the route or conditions of the voyage would make a radio installation unreasonable or unnecessary. Public No. 97 covers similar situations which are discussed further on in this paper.

Ratification of the Safety Convention by the United States affected about 640 U. S. vessels engaged in international voyages. Nearly all of the ships were already equipped with main, or main and emergency radio installations, and a reasonable period of time was allowed for installing any additional equipment required.

About 600 American ships that were not affected by the Safety Convention or the Ship Act are now covered by Public No. 97. The enactment of Public No. 97 brought into existence the first uniform minimum radio requirements for all ocean-going U. S. ships, both

passenger and cargo, on international or domestic voyages, which come under the provisions of the Act. While Public No. 97 is patterned largely after the radio provisions of the Safety Convention, the new Act provides for higher standards than the Safety Convention in many respects. Before considering the specific requirements of Public No. 97, brief mention will be made of the existing radio regulations that are applicable to ship radio operation. At the present time, the following laws, treaties and regulations apply:

The Ship Act of 1910, as amended in 1912, and the Federal Communications Commission's Rules and Regulations to carry out the provisions of such Act (now applicable solely to vessels navigating the Great Lakes).

The International Telecommunication Convention, Madrid, 1932, and its annexed General Radio Regulations.

The Communications Act of 1934, as amended, and as further amended by Public No. 97.

The general Rules and Regulations of the F. C. C. (excluding Rules 281 and 296 and subparagraph "d" of Rule 284).

The General Orders of the F. C. C.

The International Convention for the Safety of Life at Sea, London, 1929.

The Ship Radiotelegraph Safety Rules of May 21, 1937, issued by the F. C. C.

The Ship Radiotelegraph Safety Rules of May 21, 1937, were issued by the F. C. C. to give effect to Public No. 97. These rules specify the classes of vessels covered by the Act, those specifically excepted by the Act, and the conditions governing requests for exemptions for ships on certain routes. Requirements are also given for radio equipment, operators and watches, inspection procedure, frequency allocations, ship station licenses, etc. The May 21, 1937, Safety Rules, while primarily drafted to encompass the requirements of the new Act, also provide for compliance with the Safety Convention, the Telecommunication Convention of Madrid, 1932, and the General Radio Regulations annexed thereto, and the Commission's general Rules and Regulations.

With the exception of ships specifically excepted, the Communications Act and the Commission's Safety Rules apply to any U. S. vessel navigated in the open sea outside of a harbor or port, and to any U. S. or foreign vessel which leaves or attempts to leave a U. S. harbor or port for a voyage in the open sea, other than a cargo ship of less than 1600 gross tons. Vessels not required to comply are: a ship of war; a ship owned and operated by the United States Government (except

vessels of the United States Maritime Commission, the Inland and Coastwise Waterways Service and the Panama Railroad Company); a foreign "Safety Convention ship" with a valid certificate or exemption; yachts under 600 tons not subject to the radio provisions of the Safety Convention; vessels in tow; and finally, a vessel navigating solely on the Great Lakes or on any bays, sounds, rivers or protected waters within the jurisdiction of the United States, or a vessel leaving or attempting to leave a U. S. port or harbor for a voyage solely on these waters.

The definition of a vessel as a passenger or cargo ship is the same as that of the Safety Convention; namely, any ship is classed as a passenger ship if it carries or is licensed to carry more than 12 passengers, while a ship not in this class is considered as a cargo vessel. Special consideration is given to yachts under 600 gross tons which do not go on international voyages and hence are not subject to the Safety Convention. Such yachts may carry or be licensed to carry more than 12 passengers and need not comply with the new Act. A yacht of 1600 gross tons or over is classed as a cargo ship if it carries not more than 12 passengers and is certificated accordingly. Any yacht (or other vessel) up to 1600 tons, not classed as a passenger ship, need not comply regardless of the nature of the voyage.

For convenience, the principal sections of Public No. 97, now a part of the Communications Act of 1934, that relate to radio equipment and radio operators on board ship are reproduced at the end of this paper. The conditions under which a request for exemption will be considered are set forth in Section 352 of that reproduction. A U. S. vessel, which is shown to comply with the Safety Rules after inspection by the Federal Communications Commission, will obtain a ship station license certified to that effect. In addition, U. S. ships which are subject to the Safety Convention are required to carry a Safety Certificate (for passenger vessels) or Safety Radiotelegraphy Certificate (for cargo vessels) or an Exemption Certificate (for exempted vessels). These certificates are issued by the Bureau of Marine Inspection and Navigation of the Department of Commerce, after the F. C. C. has certified to the Bureau that the radio installation complies with the requirements or that the vessel has been exempted. After the initial inspection, each ship radio installation must be inspected at least once each year in order to obtain a renewal of the certificate and of the license certification. Routine additional inspections are also made at frequent intervals.

A passenger vessel under Public No. 97 and the subsequent Safety Rules of the F. C. C. is required to be fitted with a radiotelegraph

installation comprising separate main and emergency transmitters and separate main and emergency receivers.

The main transmitter must have a normal range of at least 200 nautical miles with a minimum antenna power of 200 watts on 500 kc and be capable of A-2 (modulated) emission or B (spark) emission on 500 kc, 375 kc, and at least one working frequency between 350 and 485 kc. This does not prohibit also the use of A-1 (continuous wave) emission and additional working frequencies in the 350-485 kc band, as well as additional frequencies or other transmitters in the assigned low- or high-frequency bands. The emergency transmitter is required to have a range of at least 100 nautical miles, a minimum antenna power of 50 watts, and other characteristics the same as the main transmitter. In addition, the emergency transmitter and emergency receiver must have a source of power supply, independent of the ship-board main power supply or any other electrical system, which is capable of operating the emergency equipment for at least six consecutive hours.

The main receiver must be capable of reception of A-1, A-2, and B emission in the band 350 to 515 kc and the band 100 to 200 kc. The emergency receiver is required to cover the band 350 to 515 kc with A-1, A-2, and B reception, and in addition must be provided with a crystal detector or a crystal receiver which will permit reception in case of failure of all vacuum tubes or power supply for the emergency receiver.

An independent means of communication between the radio room and the bridge is required. A suitable clock provided with a sweep-seconds hand and an emergency light or lights are required in the radio room. Various spare parts, tools, spare antenna material, a three-range d-c voltmeter, fuses, hydrometer, and instruction books are also necessary. The use of an automatic alarm, in lieu of a qualified operator, is not permitted on U. S. passenger ships, since a continuous operator watch is compulsory. Motor lifeboats on passenger vessels are required to be fitted with a complete radiotelegraph installation as outlined previously under Safety Convention requirements. The lifeboat radio equipment must meet the F. C. C. specifications, which call for A-2 emission on 500 kc with a minimum of 75 watts plate input to the stage supplying power to the antenna. The antenna must be an inverted "L" or "T" and not less than twenty feet above the water line, with the maximum practicable length. The lifeboat receiver must cover the band 350 to 550 kc with reception of A-1, A-2, and B waves. A suitable storage battery in the lifeboat to provide continuous operation for at least six hours is required. An approved type of radio

direction finder is also specified for each passenger ship of 5000 gross tons and over.

The rules for cargo vessels are in general similar to those outlined above for passenger vessels with the following exceptions: A direction finder is not required. The use of an approved automatic alarm is permitted on cargo vessels, provided at least an 8-hour watch per day in the aggregate is maintained by a qualified radio operator. The automatic alarm is required to be in operation whenever the operator is not on watch while the ship is being navigated outside a harbor or port, including periods when the direction finder is in use. A separate emergency transmitter and receiver are not required on cargo vessels, provided the main installation complies with all the provisions affecting the emergency installation. Where a main transmitter on a cargo vessel is thus affected, this is sometimes accomplished by providing storage-battery, emergency-power supply to operate the transmitter at 50 watts output. The main receiver normally uses storage batteries for filament supply and dry batteries for plate supply, and if also arranged for crystal-detector reception, will comply with the requirements for the emergency receiver, provided six hours reserve battery capacity is available.

The Safety Rules also provide for the use of type "B" emission (spark sets) with 1000 watts input to the transformer for the main transmitter and 500 watts input to the transformer for the emergency transmitter. Spark set operation however is limited to transmitters that were installed prior to January 1, 1930. No new installations of spark sets are permitted on U. S. vessels. The high technical standards of the Safety Rules can be appreciated when it is realized that most of the foreign administrations do permit the installation of spark sets.

The principal sections of the Communications Act of 1934, relating to radio equipment and radio operators aboard ship, that became a part of Title III of that Act by the passage of Public No. 97, are as follows:

PART II—RADIO EQUIPMENT AND RADIO OPERATORS ON BOARD SHIP

SHIP RADIO INSTALLATIONS AND OPERATIONS

Sec. 351. (a) Except as provided in section 352 hereof, it shall be unlawful—

- (1) For any ship of the United States other than a cargo ship of less than sixteen hundred gross tons, to be navigated in the open sea outside of a harbor or port, or for any ship of the United States or any foreign country, other than a cargo ship of less than sixteen hundred gross tons, to leave or attempt to leave any harbor or port of the United States for a voyage in the open sea, unless such ship is equipped with an efficient

radio installation in operating condition, in charge of and operated by a qualified operator or operators, adequately installed and protected so as to insure proper operation, and so as not to endanger the ship and radio installation, as hereinafter provided, and in the case of a ship of the United States, unless there is on board a valid station license issued in accordance with this Act;

- (2) For any passenger ship of the United States of five thousand gross tons, or over, to be navigated outside of a harbor or port, in the open sea, or for any such ship of the United States or any foreign country to leave or attempt to leave any harbor or port of the United States for a voyage in the open sea, unless such ship is equipped with an efficient radio direction finder apparatus (radio compass) properly adjusted in operating condition as hereinafter provided, which apparatus is approved by the Commission;

- (b) A ship which is not subject to the provisions of this part at the time of its departure on a voyage shall not become subject to such provisions on account of any deviation from its intended voyage due to stress of weather or any other cause over which neither the master, the owner, nor the charterer (if any) has control.

Sec. 352. (a) The provisions of this part shall not apply to—

- (1) A ship of war;
 - (2) A ship of the United States belonging to and operated by the Government, except a ship of the United States Maritime Commission, the Inland and Coastwise Waterways Service, or the Panama Railroad Company;
 - (3) A foreign ship belonging to a country which is a party to the Safety Convention and which ship carries a valid certificate exempting said ship from the radio provisions of that Convention, or which ship conforms to the radio requirements of such Convention or Regulations and has on board a valid certificate to that effect;
 - (4) Yachts of less than six hundred gross tons not subject to the radio provisions of the Safety Convention;
 - (5) Vessels in tow;
 - (6) A vessel navigating solely on the Great Lakes, or on any bays, sounds, rivers, or protected waters within the jurisdiction of the United States, or to a vessel leaving or attempting to leave any harbor or port of the United States for a voyage solely on the Great Lakes, or on any bays, sounds, rivers, or protected waters within the jurisdiction of the United States.
- (b) The Commission may, if it considers that the route or the conditions of the voyage or other circumstances are such as to render a radio installation unreasonable or unnecessary for the purposes of this part, exempt from the provisions of this part any ship, or any class of ships, which falls within any of the following descriptions:
 - (1) Passenger ships which in the course of their voyage do not go more than twenty nautical miles from the nearest land or more than two hundred nautical miles between two consecutive ports;
 - (2) Cargo ships which in the course of their voyage do not go more than one hundred and fifty nautical miles from the nearest land;

- (3) Passenger vessels of less than one hundred gross tons not subject to the radio provisions of the Safety Convention;
- (4) Sailing ships.

OPERATORS, WATCHES, AUTO-ALARM

- Sec. 353. (a) Each cargo ship required by this part to be fitted with a radio installation and which is not fitted with an auto-alarm, and each passenger ship required by this part to be fitted with a radio installation, shall, for safety purposes, carry at least two qualified operators.
- (b) A cargo ship, required by this part to be fitted with a radio installation, which is fitted with an auto-alarm in accordance with this title, shall, for safety purposes, carry at least one qualified operator who shall have had at least six months' previous service in the aggregate as a qualified operator in a station on board a ship or ships of the United States.
 - (c) Each ship of the United States required by this part to be fitted with a radio installation shall, while being navigated outside a harbor or port, keep a continuous watch by means of qualified operators: PROVIDED, HOWEVER, That in lieu thereof on a cargo ship fitted with an auto-alarm in proper operating condition, a watch of at least eight hours per day, in the aggregate, shall be maintained by means of a qualified operator.
 - (d) The Commission shall, when it finds it necessary for safety purposes, have authority to prescribe the particular hours of watch on a ship of the United States required by this part to be fitted with a radio installation.
 - (e) On all ships of the United States fitted with an auto-alarm, said apparatus shall be in operation at all times while the ship is being navigated outside of a harbor or port when the operator is not on watch.

TECHNICAL REQUIREMENTS

Sec. 354. The radio installation and the radio direction-finding apparatus required by section 351 of this part shall comply with the following requirements:

- (a) The radio installation shall comprise a main and an emergency or reserve installation: PROVIDED, HOWEVER, that on a cargo ship, if the main installation complies also with all the requirements of an emergency or reserve installation, the emergency or reserve installation may be omitted.
- (b) The ship's radio operating room and the emergency or reserve installation shall be placed in the upper part of the ship in a position of the greatest possible safety and as high as practicable above the deepest load water line, and the location of such room or rooms shall be approved by the Bureau of Marine Inspection and Navigation, Department of Commerce.
- (c) The main and emergency or reserve installations shall be capable of transmitting and receiving on the frequencies and types of waves designated by the Commission pursuant to law for the purpose of distress and safety of navigation.

- (d) The main installation shall have a normal transmitting and receiving range of at least two hundred nautical miles, that is to say, it must be capable of transmitting and receiving clearly perceptible signals from ship to ship over a range of at least two hundred nautical miles by day under normal conditions and circumstances.
- (e) Sufficient power shall be available at all times to operate the main radio installation efficiently under normal conditions over the range specified in subsection (d) of this section.
- (f) The emergency or reserve installation shall include a source of energy independent of the propelling power of the ship and of any other electrical system and shall be capable of being put into operation rapidly and of working for at least six continuous hours. For the emergency or reserve installation, the normal range as defined in subsection (d) of this section shall be at least one hundred nautical miles.
- (g) There shall be provided between the bridge of the ship and the radio room, and between the bridge and the location of the direction finding apparatus, when the direction finding apparatus is not located on the bridge, an efficient means of communication independent of any other communication system of the ship.
- (h) The direction finding apparatus shall be efficient and capable of receiving clearly perceptible radio signals and of taking bearings from which the true bearing and direction may be determined. It shall be capable of receiving signals on the frequencies prescribed for distress, direction finding, and radio beacons by the General Radio Regulations annexed to the International Telecommunication Convention in force and in new installations after the effective date of this part, such other frequencies as the Commission may for safety purposes designate.

LIFEBOATS

Sec. 355. Every motor lifeboat, required to be equipped with radio by treaty or convention to which the United States is a party, by statute, or by regulation made in conformity with a treaty, convention, or statute, shall be fitted with an efficient radio installation under such rules and regulations as the Commission may find necessary to promote the safety of life.

NOTE:—Previous issues of the RCA REVIEW described various types of shipboard radio equipment which have been developed to meet the new requirements:—“Safety of Life at Sea”, July, 1936, by Charles J. Pannill; “Automatic Alarm”, January, 1937, by Byrnes and Martin; and “300-Watt Marine Radio Telegraph Transmitter”, April, 1937, by Byrnes.