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COMMITTEE OF THE INTER-GOVERNMENTAL MARITIME CONSULTATIVE ORGANIZATION

INTERFERENCE LEVEL ON THE RADIOTELEGRAPH DISTRESS FREQUENCY

DIRECTION-FINDING BY SHIPS IN THE 2 Mc/s BAND

1. The International Radio Consultative Committee (CCIR) considered at its Xth Plenary Assembly the above subjects which also appear in Recommendation 27 and Recommendation 31 of the 1960 Conference on Safety of Life at Sea. The conclusions of CCIR appear in Recommendations 429 and 428; copies of these Recommendations are attached hereto.
2. Recommendation 428 recommends technical measures and precautions concerning the installation and calibration of direction-finders capable of taking bearings in the 2 Mc/s band. It is circulated to all Member Governments for their information and for action, as necessary. As this subject is under review by CCIR comments, if any, are invited with a view to implementing Recommendation 31 of the 1960 Conference on Safety of Life at Sea.
3. Recommendation 429 specifies the measures which should be taken to reduce interference on 500 Kc/s. It is circulated to all Member Governments for their information and action, as necessary. This Recommendation concludes the study of this subject by CCIR.

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ANNEX I

Xth Plenary Assembly  
CCIR

RECOMMENDATION 429\*

INTERFERENCE LEVEL ON THE RADIOTELEGRAPH DISTRESS FREQUENCY

The CCIR,

CONSIDERING

- (a) that the Safety of Life at Sea Conference, London, 1960, adopted the following Recommendation (No. 27):

"The Conference, recognizing that at present there is a tendency to increase the maximum power of radiotelegraph installations, and this may lead to an increase in the interference level of the radiotelegraph distress frequency, which may considerably impair the use of this frequency for safety purposes, recommends that the International Telecommunication Union should be invited by the Organization - (i.e. Inter-Governmental Maritime Consultative Organization) - to consider what measures can be taken to prevent such an increase in the interference level";

- (b) the provisions of the relevant Radio Regulations, Geneva, 1959;
- (c) the experience of coast station radio operators and ships' radio officers;

UNANIMOUSLY RECOMMENDS

1. that the following measures should be taken to reduce interference at 500 Kc/s:
- 1.1 messages prefixed by the Safety Signal, TTT, should be sent on a working frequency after an initial announcement on 500 Kc/s, in accordance with Nos. 1107 and 1492 of the Radio Regulations, Geneva, 1959;

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\* This Recommendation concludes the study of Study Programme 171.

- 1.2 coast stations should use their working frequencies to reply to calls from ships on 500 Kc/s, in accordance with Nos. 1116 and 1117 of the Radio Regulations, Geneva, 1959;
- 1.3 coast stations making calls to ships on 500 Kc/s should request ships to reply on their working frequencies, as permitted by Nos. 1023 and 1116 of the Radio Regulations, Geneva, 1959;
- 1.4 No. 1092 of the Radio Regulations, Geneva, 1959, which forbids "CQ" calls to be made in congested areas, should be enforced by Administrations;
- 1.5 greater use should be made of the facilities provided under No. 972 of the Radio Regulations, Geneva, 1959, for reducing power at ships stations, and coast stations as far as practicable should use the minimum necessary power, particularly at night, in accordance with No. 694 of the Radio Regulations, Geneva, 1959;
- 1.6 steps should be taken by Administrations to prevent unnecessary signalling on 500 Kc/s, particularly during distress, in accordance with Nos. 693, 1107 to 1113 inclusive, and 1445 of the Radio Regulations, Geneva, 1959;
- 1.7 for Class A2 emissions on 500 Kc/s the note frequencies used by various stations should, as far as practicable, be spread over the range 450 to 1350 Kc/s;
- 1.8 prolonged calling on 500 Kc/s by ships endeavouring to establish contact with distant coast stations should be avoided by greater use of HF channels or by relaying of messages;
- 1.9 in areas where considerable use is made of 500 Kc/s for calls and replies, the calling frequencies assigned to coast stations should be spread over the band 497 to 503 Kc/s in accordance with No. 1115 of the Radio Regulations, Geneva, 1959;
- 1.10 in Regions 1 and 3, the frequency of 512 Kc/s may be used as a supplementary frequency for calls and replies when 500 Kc/s is being used for distress, in accordance with Nos. 1125 to 1129 inclusive of the Radio Regulations, Geneva, 1959.

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ANNEX II

Xth Plenary Assembly  
CCIR

RECOMMENDATION 428

DIRECTION-FINDING BY SHIPS IN THE 2 Mc/s BAND

[Question 206 (XIII)]

The CCIR,

CONSIDERING

- (a) that according to the Convention for the Safety of Life at Sea (London, 1960), the medium frequency radiotelephony calling and distress frequency of 2182 Kc/s will become of increasing importance to the safety of life at sea;
- (b) that in most distress cases, merchant ships and fishing vessels and other surface craft participate in search and rescue;
- (c) that in addition to ships between 500 and 1600 tons gross tonnage which are already required to be fitted with medium frequency radiotelephone equipment if they do not carry medium frequency radiotelegraph equipment, ships between 300 and 500 tons gross tonnage will also be required to fit such equipment in accordance with Chapter IV, Regulation 4 of the Convention for the Safety of Life at Sea, London, 1960;
- (d) that a large number of ships of more than 1600 tons gross tonnage (which are compulsorily fitted with medium frequency radiotelegraph equipment) are voluntarily fitted with medium frequency radiotelephone equipment and that the number of such ships is increasing;
- (e) that the majority of deep sea fishing vessels are fitted voluntarily with medium frequency radiotelephone equipment;

- (f) that an increasing number of ships are being fitted with direction-finding equipment capable of taking bearings in the 2 Mc/s band;
- (g) that direction-finding and especially homing by ships is important in cases of distress;
- (h) that the Conference on Safety of Life at Sea, London, 1960, in Recommendation 31, drew the attention of Contracting Governments to the studies being undertaken under Question 206, (XIII), by the CCIR;
- (i) that technical studies in several countries have shown:
  - (ia) that direction-finding, or at least homing is usually possible in the 2 Mc/s band on many ships;
  - (ib) that compared with the problems of direction-finding by ships in the lower parts of the medium frequency band, the main cause of error in direction-finding in the 2 Mc/s band is re-radiation from various parts of the ships' superstructures, masts, downleads, halyards, stays, derricks, etc., and from other antennae;
  - (ic) that errors caused by re-radiation effects, however, should be constant if the disposition and electrical conditions of the re-radiators are constant and that such errors can be taken into account by calibrating the direction-finder;
  - (id) that direction-finding and homing is easier on board small ships than on larger ones, because an increase in the size of ships and their superstructures, masts, etc. as given in (lb), leads to an increase of disturbing resonance effects;
  - (ie) that a reliable direction-finder calibration can be more readily obtained if it is restricted to a specific frequency such as 2182 Kc/s, instead of a wide frequency band;

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(if) that even in those cases (such as on board large vessels with strong re-radiation effects) where omnidirectional direction-finding even on a specific frequency is difficult or impossible, homing will nearly always be possible;

UNANIMOUSLY RECOMMENDS

1. that the following technical measures and precautions should be observed when installing direction-finders capable of taking bearings in the 2 Mc/s band:
  - 1.1 the antenna system, including the sense antenna, of the direction-finder should be erected as far as possible away from any re-radiators;
  - 1.2 the direction-finder antenna system should, preferably, be installed on the fore-and-aft line of the ship;
  - 1.3 if the direction-finder antenna system is fitted on a mast, it should, preferably, be installed symmetrically on top of the mast and not to one side of it;
  - 1.4 the effects caused by re-radiating antenna wires can be minimized by providing properly located isolating switches for the antennae;
  - 1.5 re-radiation from the rigging (e.g. stays, wire ropes, etc.) should be reduced by the insertion of insulators such that the resonant frequency of the longest portions is above the highest frequency used for direction-finding;
  - 1.6 the formation of "closed loops", e.g. by the rigging, should be avoided by inserting insulators at appropriate points;
  - 1.7 in order to avoid electrically doubtful connections, the connecting points of movable parts of the rigging, and connections between masts and derricks, wire ropes, etc, should be short-circuited as far as possible;
2. that the following measures and precautions should be observed in the calibration of direction-finders for the 2 Mc/s band:

- 2.1 the rigging, downleads, derricks, halyards, etc., should be in their sea-going positions;
- 2.2 any antennae that affect the direction-finder should, preferably, be isolated and other antennae which cannot be isolated (e.g. because of operational requirements) should be in the same conditions as they will be when bearings are being taken at sea; the condition and electrical arrangement of all antennae should be noted on the direction-finder calibration charts;
- 2.3 calibration should be carried out in an area well clear of the shore and of other ships. If a shore-based transmitter is used, calibration should be carried out on a line passing through that station and crossing the coastline approximately at right angles. The transmitting antenna should radiate vertically polarized waves from a single element, and care should be taken to avoid re-radiation from any object in the vicinity. The distance between the transmitting antenna and the direction-finder should be great enough to avoid the calibration being affected by the induction field of the transmitting antenna;
- 2.4 care should be taken to ensure that the direction-finder gives the correct sense on all bearings and frequencies concerned;
- 2.5 the direction-finder calibration should, as a general rule, cover the full 360 degrees and as far as possible should be made at sufficiently small bearing intervals (say, in steps of a few degrees) to detect any sudden changes in the calibration curve (e.g. re-entrant portions where two or more different corrections exist for the same indicated bearing);
- 2.6 The calibration of the frequency of 2182 Kc/s should be carried out on a frequency as near as possible to 2182 Kc/s, special attention being paid to Radio Regulation 1325 (Geneva, 1959) and to the avoidance of interference to established operations in adjacent channels;

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3. that the calibration should be checked periodically, especially if the condition of the rigging, etc., has been altered since the last calibration;
4. that on board ships equipped with a direction-finder whose frequency range includes the 2 Mc/s band, a calibration should be made to determine if the direction-finder could be used without modification for omnidirectional direction finding, or at least for homing on the frequency of 2182 Kc/s;
5. that when Administrations encourage the use of direction-finders on board ships, capable of operating in the 2 Mc/s band, or at least on the international radiotelephony distress and calling frequency of 2182 Kc/s, they should also encourage the provision of suitable facilities for the calibration of such direction-finder equipment;
6. that the Director of CCIR be invited to bring this Recommendation to the attention of IMCO. Reference is made to Recommendation 31 of the Convention for the Safety of Life at Sea, London, 1960;
7. that Administrations should bring the above recommendations to the attention of those responsible for the provision, installation, and maintenance of direction-finders on ships;
8. that Administrations should continue the study of Question 206 (XIII).

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When the above precautions and technical measures have been taken, under good conditions an accuracy of about  $\pm 2^\circ$  can be attained in taking bearings in the 2 Mc/s band by reception of "ground" waves on board ships of less than about 800 tons gross tonnage. In unfavourable conditions, for example, when the ship is pitching and rolling, an accuracy of about  $\pm 5^\circ$  can be obtained. On larger ships, the accuracy may be worse, but in most cases it should usually be possible to use the direction-finder for homing purposes on 2182 Kc/s. Bearings taken by reception of skywaves, although variable in azimuth and sharpness, are useful for homing into the ground wave range by utilizing their average value.