

RESOLUTION A.479(XII)

*Adopted on 19 November 1981
Agenda item 10(b)*

**PERFORMANCE STANDARDS FOR SHIPBORNE RECEIVERS
FOR USE WITH DIFFERENTIAL OMEGA**

THE ASSEMBLY,

RECALLING Article 16(i) of the Convention on the Inter-Governmental Maritime Consultative Organization,

RECALLING FURTHER Assembly resolution A.425(XI) on performance standards for differential Omega correction transmitting stations,

RECOGNIZING the need to prepare performance standards for shipborne receivers used for the reception of differential correction signals,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its forty-fourth session,

1. ADOPTS the Recommendation on Performance Standards for Shipborne Receivers for Use with Differential Omega;
2. RECOMMENDS Member Governments to ensure that shipborne receivers for use with differential Omega conform to the performance standards set out in the Annex to the present resolution.

ANNEX

**RECOMMENDATION ON PERFORMANCE STANDARDS FOR SHIPBORNE
RECEIVERS FOR USE WITH DIFFERENTIAL OMEGA**

1 INTRODUCTION

1.1 Receivers for differential Omega intended for navigational purposes on ships with maximum speeds not exceeding 35 knots should comply with the following minimum performance standards.

1.2 In addition to the requirements given in this Recommendation, the system should comply with the general requirements for shipborne navigational equipment (IMCO Assembly resolution A.281(VIII)).

1.3 Differential Omega requires both Omega signals and differential correction signals for correct operation. Receivers used for the reception of the differential correction signals should preferably be combined with the receivers used for reception of the Omega signals. Where separate receivers are used, care should be taken to ensure that the installation meets the overall system performance standards.

2 PERFORMANCE STANDARDS FOR THE RECEPTION OF OMEGA SIGNALS

2.1 Signal reception

2.1.1 The system should provide for reception of Omega transmissions on the frequency of 10.2 kHz. It may additionally provide for the reception of one or more of the other Omega frequencies.

2.1.2 The antenna should be capable of receiving Omega signals from any direction in the horizontal plane at all times.

2.2 Positional information extraction

2.2.1 Means should be provided for synchronizing the system to the Omega transmission format. Automatic or manual means may be used but in any case it should be possible to monitor the synchronization state continuously.

2.2.2 The system should be capable of processing information from at least four Omega stations simultaneously.

2.3 System performance

When a ship is stationary, the instrumental error introduced by the receiver to the measurement of uncorrected phase difference (line of position) on any selected pair of Omega signals should not exceed 0.02 lane widths (2 centilanes). When sailing on a constant heading at speeds up to 35 knots, instrumental error should not exceed 0.04 lane widths (4 centilanes).

2.4 Display of positional information

2.4.1 Equipment which gives positional information in terms of lines of position (LOPs) should be capable of displaying at least three operator-selected LOPs either simultaneously or sequentially with the following facilities:

- .1 a display of at least two whole lane digits and providing a read-out to 0.01 lane width for each pre-selected pair of stations;
- .2 means for setting up initially the whole lane digit counts;
- .3 identification of the selected Omega stations;
- .4 where LOP information is displayed sequentially, provision should be made for holding any one pair of stations on display for as long as required without interruption to the continuous up-dating of LOP counts. Separate visual indication that the display is in the "hold" condition should be provided; and
- .5 where provision is made for manually entering corrections in order to display corrected LOP counts, the applied correction with its polarity sign should be separately displayed at the same time as the corrected LOP.

2.4.2 An alternative method of displaying the positional information may be used, provided that such method conforms in principle to the recommendations of paragraph 2.4.1. In the case where a latitude and longitude display is used, presentation should be as a minimum in the form of degrees, minutes and tenths of minutes. The display should also clearly indicate north, south, east and west. The read-out values of latitude and longitude should be based on the World Geodetic System 1972 (WGS-72).

2.4.3 Means may be provided to transform the computed position based on WGS-72 into data compatible with the datum of the navigational chart in use. Where this facility exists, positive indication should be provided to indicate that the facility is currently in use and means should be provided to indicate the transformation correction.

2.4.4 When a system is designed for operation on a single Omega frequency only it should be provided with means of identifying lane slip sufficient to assist the re-establishment of the correct lane information.

2.5 Displays and indicators

2.5.1 The brilliance of all illumination, except for any warning light, should be adjustable; a common control may be used. The range of adjustment should be such that the display of positional information is clearly readable in bright diffused daylight and at night the brightness is the minimum necessary to operate the equipment.

2.5.2 Where the figures of a digital display are built up of individual parts (e.g. segments) then a facility should be provided which makes it possible to check all the segments of each figure. During such checking the operation of the equipment, except for the display, should not be interrupted.

2.6 Power supply

2.6.1 It should be possible to supply the receiver from the usual power supplies available on board ships: alternating current 100-115-220-230V \pm 15%, 50 or 60 Hz; direct current 24-32V \pm 15%.

2.6.2 The receiver should be fitted with a built-in emergency supply which should be capable of being automatically substituted with no break to the normal supply described in 2.6.1 above. This emergency supply should be capable of supplying the equipment during at least 10 minutes.

2.7 Warning devices

2.7.1 If the receiver is of the type which requires the operator to select the Omega stations whose signals will be employed to generate position information, a warning device should be provided to indicate the absence of a signal from a selected station.

2.7.2 If the receiver is of the type which automatically selects the most suitable Omega signals from those received, a warning device should be provided to indicate the lack of sufficient usable signals for normal equipment operation.

2.7.3 Provision may be made to indicate which Omega signals are being received at a strength sufficient to be employed in position fixing.

2.7.4 The equipment should be fitted with a warning device for indicating main power supply failure which remains active until reset by the operator.

2.8 Controls

2.8.1 All controls should be of such size as to permit normal adjustments to be made easily. The controls should be clearly identified.

2.8.2 Where the inadvertent operation of a control could lead to failure of the equipment or false position-fixing information, the control should be protected from accidental operation.

2.9 Human errors

The number of manual calculations needed to transform the uncorrected Omega signals into a charted position should be kept to a minimum. Reliable automatic correction of Omega data is preferable. For navigational purposes, a reliable automatic transformation of Omega information into geographical co-ordinates is preferable. In this case due regard should be taken of possible additional errors which may be introduced by this process.

2.10 Auxiliary equipment

Single frequency (10.2 kHz) receivers should, and other receivers may, have an output to peripheral equipment, e.g. LOP or co-ordinate recorder, or path plotter. For this output, position data should be in digital form according to the format defined in CCITT Opinion V24.

3 ADDITIONAL PERFORMANCE STANDARDS FOR THE RECEPTION OF DIFFERENTIAL OMEGA

3.1 Reception of signals

3.1.1 The system should provide for reception of differential Omega corrections for the basic frequency of 10.2 kHz. It may additionally provide for the reception of corrections for one or more of the other Omega frequencies.

3.1.2 The receiving equipment for differential Omega corrections should be able to receive corrections transmitted in accordance with the performance standards for differential Omega correction transmitting systems (resolution A.425(XI)) and should indicate the Omega transmissions for which differential corrections are available.

3.1.3 Correction receivers should operate satisfactorily when the electric field received from the transmitting station is 10 microvolts per metre or greater, day and night, in the conditions for atmospheric noise as defined by CCIR for the band 285-415 kHz. Correction receivers should have a selectivity, or protection devices, allowing acceptable reception of correction information when interfering signals are present. Operation should also be possible when the interfering signal is a non modulated carrier frequency, at a level 20 dB above the wanted signal, on any frequency outside a band of ± 200 Hz centred on the nominal frequency of the correction transmitting station.

3.1.4 The antenna for the reception of differential Omega corrections may be combined with the antenna described in paragraph 2.1.2. The antenna for the reception of differential Omega corrections (whether the same as the one described in paragraph 2.1.2 or not) should provide satisfactory reception of correction signals in the conditions described above and from any direction in the horizontal plane.

3.2 Extraction of position data

3.2.1 Means should be available for the synchronization of the system with the differential Omega correction transmission format. It is possible to use automatic or manual means but, in any case, it should be possible to monitor the state of synchronization.

3.2.2 The system should be capable of processing information relating to at least four Omega stations simultaneously.

3.3 System operation

3.3.1 Instrumental errors introduced by the correction receiving equipment should not be greater than those accepted for Omega receivers, according to paragraph 2.3 above.

3.4 Position information display

3.4.1 The system Omega and differential Omega may be in two forms:

- .1 Separate Omega and differential Omega receivers.
 - .1.1 The user may only add the differential Omega corrections to the raw data from his Omega receiver before plotting his position on the chart.
 - .1.2 The user may enter differential Omega corrections into the Omega receiver under the conditions described in paragraph 2.4.1.5.
- .2 Combined Omega and differential Omega receivers.
 - .2.1 The combined receiver may separately display Omega and differential Omega data. The user may combine them as described in paragraph 3.4.1.1.
 - .2.2 The combined receiver may, under the control of the user, automatically add differential Omega corrections to raw Omega data.

3.4.2 Where the differential Omega receiver gives correction information for LOPs, it should be able to display the corrections for at least 3 LOPs selected by the user, either simultaneously or sequentially in the following manner:

- .1 Display of from 0 to 99 centilanes of correction, providing reading for 1 centilane for each station pair selected.
- .2 If found necessary, display combined with the display described in paragraph 3.4.2.1 of the integer part of the correction.
- .3 Identification of the selected Omega stations.
- .4 Where LOP information is displayed sequentially, provision should be made for holding any one pair of stations on display for as long as required without interruption to the continuous up-dating of LOP counts. Separate visual indication that the display is in the "hold" condition should be provided.
- .5 Where provision is made for manually entering corrections in order to display corrected LOP counts, the applied correction with its polarity sign should be separately displayed at the same time as the corrected LOP. In addition the user should be clearly advised whether corrections are applied or not.
- .6 Where means are provided for automatically entering the differential Omega corrections, the user should be clearly advised whether corrections are applied or not.
- .7 Means should also be provided to ensure that differential Omega corrections can only be applied to raw Omega data.

3.4.3 Alternative methods of displaying the positional and correction information may be used as mentioned in paragraphs 2.4.2 and 2.4.3, provided that such methods conform in principle to the recommendations of paragraphs 2.4.1 and 3.4.2.

3.4.4 Where automatic receiving systems are used:

- .1 The selection of Omega stations in such a system should be automatic. The system should be capable of evaluating the quality of Omega signals directly received as well as that of the corrections for each Omega station. It should establish the position information through the use of all available information from the various stations while taking account of the quality of each one. The operator should however have the possibility to control the choice of stations manually.

- .2 Position data should be automatically obtained when a position estimated from dead-reckoning or another means has been introduced. The acceptable uncertainty on the estimated initial position is essentially related to the number of Omega frequencies that the system may directly receive on board. This acceptable uncertainty should be clearly known by the operators.
- .3 Even if it uses Omega corrections only on the frequency 10.2 kHz, an automatic receiver should preferably be capable of directly receiving Omega signals on the frequencies 10.2 kHz and 13.6 kHz. It could also, although it is not essential, work with the frequencies 11.33 kHz and 11.05 kHz.
- .4 An automatic system of differential Omega should preferably be capable of correcting the dispersion which results, at a distance from the correction transmitting station of more than 200 nautical miles, from variations of the propagation velocity of Omega waves between day and night.
- .5 An automatic system should be so designed that differential Omega corrections can only be applied to raw Omega data.
- .6 It is desirable for the system to give an indication of quality of the positional data displayed.

3.5 Displays and indicators

Indication and display devices should conform with the recommendations of paragraph 2.5.

3.6 Power supply

Power supply devices should conform with the recommendations of paragraph 2.6.

3.7 Warning devices

3.7.1 The Omega and differential Omega systems should be fitted with the warning devices mentioned in paragraph 2.7.

3.7.2 Warning should be given:

- .1 when the correction transmitting station transmits no correction for any of the selected stations;
- .2 when correction information for any of the selected stations is not correctly received on board;
- .3 when correction information has not been updated during the last period of six minutes for any of the selected stations.

3.7.3 A warning may be given with the 8 Hz modulation is not present.

3.7.4 For those receivers mentioned in paragraph 3.4.4, the recommendation of paragraph 3.7.2 is replaced by an alarm if the quality of position data is unacceptable.

3.8 Controls

Controls should conform with the recommendations of paragraph 2.8.

3.9 Human errors

3.9.1 The number of manual calculations needed to transform the uncorrected Omega signals into a charted position should be kept to a minimum.

3.9.2 Differential Omega correction should be directly applied to raw Omega data, excluding the usual corrections applicable to Omega use.

3.9.3 Automatic correction of raw Omega data by the corrections received from differential Omega stations is preferable. As for Omega alone, due consideration should be given to possible additional errors resulting from the transformation into geographical co-ordinates.

3.10 Auxiliary equipment

3.10.1 Omega and differential Omega systems may be fitted with an output for connexion with peripheral equipment such as LOP or co-ordinate recorders, or path plotters.

3.10.2 Such a facility is desirable with receivers working only with frequency 10.2 kHz and with automatic equipment. On this output position data should be in the form of a digital message according to the format defined in CCITT Opinion V24.