RESOLUTION A.425(XI) adopted on 15 November 1979
PERFORMANCE STANDARDS FOR DIFFERENTIAL OMEGA CORRECTION TRANSMITTING STATIONS

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PERFORMANCE STANDARDS FOR DIFFERENTIAL OMEGA CORRECTION
TRANSMITTING STATIONS

THE ASSEMBLY,

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

RECOGNIZING the potential of differential Omega correction transmissions for improving the accuracy of the Omega radionavigation system,

FURTHER RECOGNIZING the desirability of a single world-wide standard for stations transmitting differential Omega corrections,

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

1. ADOPTS the recommendation on performance standards for differential Omega correction transmitting stations, set out in the Annex to the present resolution;

2. RECOMMENDS that Member Governments intending to establish stations for the transmission of differential Omega corrections ensure that such stations conform with the performance standards set out in the Annex to the present Resolution.

ANNEX

PERFORMANCE STANDARDS FOR DIFFERENTIAL OMEGA CORRECTION TRANSMITTING STATIONS

1 INTRODUCTION

1.1 Differential Omega correction transmitting stations are stations which provide facilities for the reception of Omega signals, the computation of the corrections to be applied to the Omega signals, the modulation of a radio frequency carrier by the corrections and the transmission of the modulated signal.

1.2 Differential Omega correction transmitting stations should conform to the following minimum performance standards.

2 RECEPTION OF OMEGA SIGNALS

2.1 The Omega reception antenna should be so sited and installed that it is capable of receiving the navigation signals from all Omega stations which could be used in the service area. Sensitivity and freedom from interference should be such as to support phase measurement with the accuracies normally expected in the service area.

2.2 The Omega receiver should be capable of receiving the 10.2 kHz Omega transmissions. It should also receive the other Omega frequencies for which it is considered necessary to transmit corrections in the region.

3 COMPUTATION OF CORRECTIONS

3.1 <u>Chart datum and Omega transmission velocity</u>

3.1.1 The theoretical phases, which form the base for establishing the corrections, should be determined:

.1 by means of calculating the geodetic distance on the basis of the Omega station co-ordinates and those of the Omega reception antenna referred to in paragraph 2.1, based on the data of the world geodetic system WGS 72;

.2 by using the following propagation speeds of the waves at the Omega frequencies in question:

v = 300 574 km/sec (the conventional charting base) for the frequencies of 10.2 kHz and 13.6 kHz;

v = 299 630 km/sec for the frequency of 11.33 kHz;

v = 299 680 km/sec for the frequency of 11.05 kHz.

3.2 The correction to be transmitted should be computed by subtracting the theoretical value of the phase of the Omega signal established in paragraph 3.1 from the phase of the Omega signal actually received at the correction station.

4 TRANSMISSION CHARACTERISTICS

4.1 Mode of transmission

4.1.1 Narrow spectrum sub-carrier phase modulation should be used to modulate the carrier frequency of the differential Omega transmitter.

4.2 Characteristics of transmission

4.2.1 Taking into consideration CCIR Report 777, the frequency of the transmitter should be between 250 and 500 kHz in an appropriate band allocated to radionavigation. The carrier frequency should be a multiple of 100 Hz with a stability which complies with the requirements of the Radio Regulations for radiodetermination stations.

4.2.2 The bandwidth should be compatible with the existing transmissions in the band and should comply with the requirements of the Radio Regulations. The correction data and, where appropriate, identification data should be transmitted by modulating sub-carrier, which themselves modulate the carrier.

4.2.2.1 The sub-carrier(s) used should have a low frequency equal to or less than 30 Hz.

4.2.2.2 The sub-carrier(s) should modulate the carrier with a narrow spectrum phase modulation with a modulation index less than 0.6.

4.2.2.3 The data flow which modulates the sub-carrier(s) should have a narrow spectrum.

4.2.2.4 The two latter characteristics should be such that the total band width occupied by the transmission (99 per cent of the energy) is contained within plus or minus 50 Hertz around the carrier.

4.3 Transmission of station corrections

4.3.1 General

4.3.1.1 The transmitted corrections should be in the form of separate phase corrections for each Omega signal and use an analogue method with the format given in the Appendix and synchronised to the Omega format.

4.3.1.2 The selection of signals for which corrections should be provided shall be the responsibility of the national authority which should consider such factors as modal interference, long path interference, prevailing signal to noise ratio and local navigation requirements.

4.3.1.3 The selection criteria used, as well as a list of specific signals to be transmitted by each station, should be published in appropriate nautical documents.

4.3.2 Transmission of the decimal part of the correction

4.3.2.1 For each Omega station whose reception on a frequency of 10.2 kHz is of sufficient quality, a sub-carrier signal of 20 Hz should be transmitted for the duration of the corresponding Omega segment. The phase of this sub-carrier represents the value of the correction, degree for degree.

4.3.2.2 If the corrections affecting other Omega navigation frequencies are transmitted in addition to those which are based on the frequency of 10.2 kHz, the procedure should be identical but supplementary sub-carriers should be used, as shown in the Appendix.

4.3.3 Transmission of the integer part of the correction

4.3.3.1 The transmitted differential correction of 10.2 kHz signals may include the integer number of cycles.

4.3.3.2 If the integer is included a unique sub-carrier frequency of 8 Hz should be transmitted during the appropriate time segment and phase shifted by a value corresponding to 1/6 of the phase shift value of the 20 Hz carrier as shown in the following table:

Range of correction (centicycles)	-300	-200	-100	0	+100	+200
Phase shift of 8 Hz sub-carrier (degrees)	- 50	- 33 1/3	- 16 2/3	0	+ 16 2/3	+ 33 1/3

4.3.3.3 Doubt on the validity of the integer number must result in the cessation of the 8 Hz sub-carrier during the appropriate time segment.

4.3.3.4 If the integer is not included a unique sub-carrier of 8 Hz without pha shift should be transmitted during the appropriate time segment. Any abnormal condition, such as a rate of change exceeding 0.03 cycle per minute, must resul in the cessation of the 8 Hz sub-carrier.

4.4 Identification

4.4.1 The transmission should be identified by means of amplitude modulation of the carrier. The amplitude modulation should not include spectral component in the range 0-50 Hz and the depth of modulation should not exceed 80 per cent.

4.4.2.1 An additional code should be used when differential Omega corrections are transmitted by a time-shared radiobeacon.

4.4.2.2 The additional code should comprise a low frequency sub-carrier signal with a duration between 2.3 and 2.7 sec. The value of the frequency used for this code should enable the radiobeacon to be identified. Six different frequency values should be used: 11, 12, 13, 14, 15 and 16 Hz.

4.4.2.3 Transmission of such additional code by the corrections transmission station is not necessary if the carrier used is continuous.

4.5 Radiated power

4.5.1 Except when a differential Omega station is associated with a radiobeacon the power of which is determined by international agreement, the power should be chosen with reference to the service area required and should be consistent with the satisfactory operation of other radio transmitters operating on the same or adjacent frequencies. The antenna should be capable of radiating signal adequate for the service area.

4.6 Update time

4.6.1 The transmission of differential Omega correction signals should preferal be continuous. Where continuous transmission is not practicable, a time interva between successive intervals not exceeding 3 minutes is desirable. However, an interval not exceeding 6 minutes is acceptable.

4.6.2 It is desirable that a period of at least 25 seconds, without interruptic is available for the transmission of corrections to permit the transmission of 2 complete Omega cycles and the additional station code.

5 ADDITIONAL REQUIREMENTS

5.1 Failure of system

5.1.1 Means should be provided for the early detection of errors in the system. Detection of errors should immediately cause the transmission of incorrect data to cease.

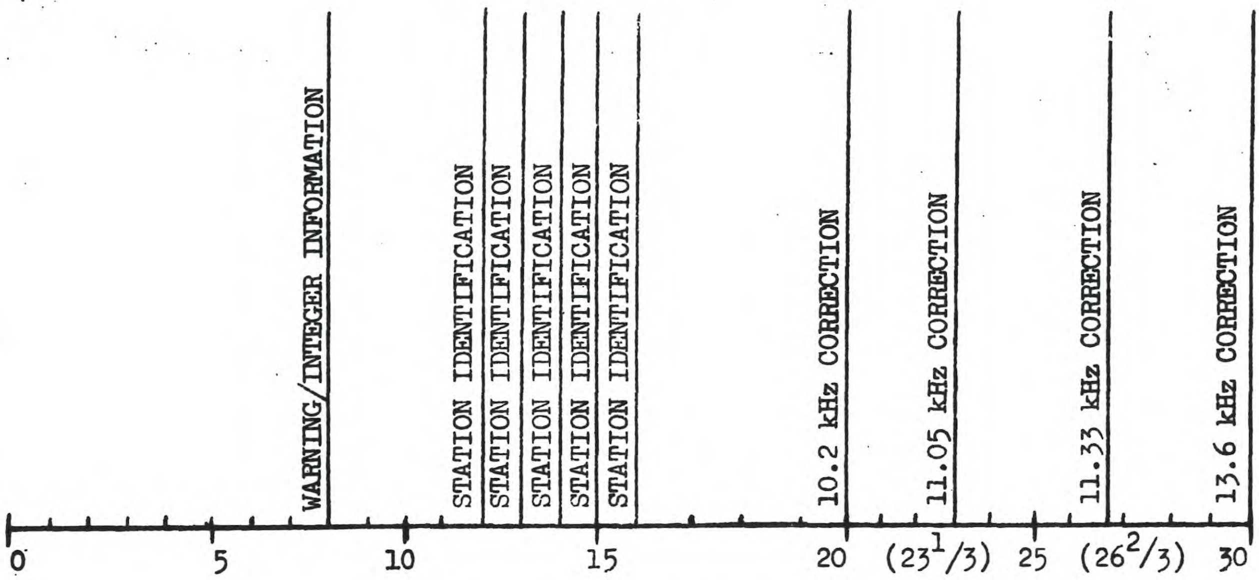
5.2 Instrumental accuracy

5.2.1 Instrumental errors should not exceed $\pm$ 0.5 sec.

APPENDIX

FORMAT OF A DIFFERENTIAL OMEGA TRANSMISSION

FREQUENCY COMPONENTS OF A DIFFERENTIAL OMEGA TRANSMISSION



Frequency of sub-carrier (Hz)

TIME COMPONENTS OF A DIFFERENTIAL OMEGA TRANSMISSION

10.2 kHz correction	A	B	C	D	E	F	G	H	(20 Hz sub-carrier)
13.6 kHz correction	H	A	B	C	D	E	F	G	(30 Hz sub-carrier)
11.33 kHz correction	G	H	A	B	C	D	E	F	($26^2/3$ Hz sub-carrier)
11.05 kHz correction	F	G	H	A	B	C	D	E	($23^1/3$ Hz sub-carrier)

Differential Omega format identical to, and synchronous with format.

← 10 seconds →

COMPOSITION OF RADIOBEACON (IN TIME)

2.3-2.7 seconds	10 seconds	10 seconds	10 seconds
Identification sub-carrier (where necessary)	Complete set of differential corrections	additional complete set of differential corrections	further complete sets of differential corrections

← approximate duration of long dash of typical radiobeacon →

further transmissions (as time permits)