SOUTH AFRICAN CIVIL AVIATION AUTHORITY	**REPUBLIC OF SOUTH AFRICA** CIVIL AVIATION AUTHORITY	CAA Private Bag x08 Waterkloof 0145
Tel: (012) 346-5566 Fax: (012) 346-6059 E-Mail: mail@caa.co.za	**AERONAUTICAL INFORMATION CIRCULAR**	**AIC** 25/3 04-02-20

OPERATION OF AIRCRAFT

NAVIGATION AND LANDING AIDS

SPECIFICATIONS FOR AIRBORNE VOR AND ILS RECEIVERS

☞ *Indicates changes.*

☞ *This AIC replaces AIC 25/3 dated 98-02-15.*

1. ***Introduction***

In view of the expansion of commercial FM broadcast services as well as the extension of the present ILS termination date of 1 January 1998 as contained in ICAO Annex 10, to the year 2010, it has become necessary to introduce certain minimum specifications with regards to airborne ILS/VOR receivers.

The possibility of radio interference to ILS was recognized during the development of Category III ILS in the 1960's. At that time, the greatest threat was thought to come from industrial, scientific and medical (ISM) sources, e.g. from harmonics of radio frequency heaters. In one State a considerable amount of research and development (R&D) defined an acceptable level of interference in the ILS band, resulting in a requirement for the radio environment in the vicinity of Category II runways to be decision at the International Telecommunications Union (ITU) Conference to release the band from 100 – 108 MHz to FM broadcasting in some regions raised questions about the compatibility of this high power service with the relatively low power ILS localizer in the adjacent band.

Similar concerns were raised with regards to the immunity of VOR receiver equipment to the same FM broadcasting interference.

2. ***FM broadcasting***

At the 1979 International Telecommunication Union (ITU) Conference the frequency band allocated to broadcasting in Europe was extended to 108 MHz, thereby broadly alighting the Radio Regulations governing the use of this band in all three ITU regions. As a consequence of this decision, studies and tests were carried out to determine the extent of any conflict between these services and the aeronautical services operating in the adjacent bands 108 – 137 MHz (ILS, VHF omnidirectional radio range (VOR) and communication services).

It was established that under certain conditions the performance of airborne receivers could be degraded. The impact of ILS receivers was of particular concern and it was found that interference could be caused by two main mechanisms.

(a) spurious emissions from the broadcast transmitter which could not be discriminated from the wanted signals; and
(b) high level broadcast signals causing intermodulation and desensitization within the receiver.

3. ***Action Required***

To safeguard the correct operation and performance of aeronautical avionics, new signal protection criteria were developed and agreed upon. These place constraints on the emission characteristics of FM broadcast transmitters and the aviation community produced new technical standards in Annex 10 for ILS, VOR and VHF communication receivers. These new standards require the localizer and VOR receiving systems of all aircraft utilizing these facilities at international airports to comply with the new specifications by 1 January 1998 (see Annex 10, Volume 1, Chapter 3, sections 3.1.4 and 3.3.8). A copy of these paragraphs is attached in Annexure A of ease of reference.

If these specifications are not complied with, the possibility of interference in certain areas, especially those with a high VHF FM broadcast transmitter density, becomes a reality. In such cases the reliable operation of VOR and ILS receivers can be adversely affected with a resultant loss of integrity as well as accuracy.

☞ *3.1 Aircraft operations can apply to the Commissioner for extention of the deadline, with suitable motivation.*

COMMISSIONER FOR CIVIL AVIATION

ANNEXURE A

INTERFERENCE IMMUNITY PERFORMANCE FOR VOR AND ILS LOCALIZER RECEIVER PERFORMANCE

Note: The contents of this annexure is extracted from ICAO Annex 10 paragraphs 3.1.4 and 3.3.8. The requirements for both types of receivers are identical.

1. After 1 January 1998, the VOR and ILS receiving systems shall provide adequate immunity to interference from two signal, third-order intermodulation products caused by VHF FM broadcast signals having levels in accordance with the following:

$$2N_1 + N_2 + 72 = 0$$

for VHF FM sound broadcast signs in the range 107.7 – 108.0 MHz

and

$$2N_1 + N_2 + 3\,(24 - 20 \log (\Delta f/0.4)) = 0$$

for VHF FM sound broadcasting signals below 107.7 MHz,

where the frequencies of the two VHF FM sound broadcasting signals produce, within the receiver, a two signal, third-order intermodulations product on the desired VOR or ILS frequency.

N_1 and N_2 are the levels (dBm) of the two VHF FM sound broadcasting signals at the VOR and ILS receiver inputs. Neither level shall exceed the desensitization criteria set forth in paragraph 2 below.

$\Delta f = 108.1 - f_1$, where f_1 is the frequency of N_1, The VHF FM sound broadcasting signal closer to 108.1 MHz.

2. After 1 January 1998, VOR and ILS Localizer receiving systems shall not be desensitized in the presence of VHF FM broadcast signals having levels in accordance with the following table:

Frequency (MHz)	***Maximum level of unwanted signal at receiver input***
88-102	*+ 15 dBM*
104	*+ 10 dBm*
106	*+ 5 dBm*
107.9	*- 10 dBm*

The relationship is linear between adjacent points designated by the above frequencies.

☞ *Note 1: The relationship is linear between adjacent points designated by the above frequencies.*

☞ *Note 2: Guidance material on immunity criteria to be used for the performance quoted in 1. and 2. above is contained in ICAO Annex 10, Attachment C of Part 1, 2.2.9 and 3.6.5.*