RTCA, Inc.
1828 L Street, NW, Suite 805
Washington, DC 20036 USA

Change No. 3

-to-

RTCA/DO-210D

MINIMUM OPERATIONAL PERFORMANCE STANDARDS FOR GEOSYNCHRONOUS ORBIT AERONAUTICAL MOBILE SATELLITE SERVICES (AMSS) AVIONICS

September 19, 2006

Copies of this document may be obtained from

RTCA, Inc.
1828 L Street, NW, Suite 805
Washington, DC 20036 USA

Telephone: 202-833-9339
Fax: 202-833-9434
Internet: www.rtca.org

Please call RTCA for price and ordering information.

1. Page 7, replace Section 1.3 Operational Applications in its entirety with the following text. Retain sections 1.3.1, 1.3.2, 1.3.3 and related subsections without change.

1.3 Operational Applications

Many applications for AMSS are potentially available; however, cost or other factors may limit users' access to all such applications (e.g., voice as well as data). While applications for service categories will evolve with time, this document defines standards to support minimum implementations of all currently foreseen applications for ATS and AOC.

Safety services operating with channel types other than those specified in this document are expected to be specified by DO-262 and DO-270.

Since the original publication of this document in 1995, satellite communication technology has advanced to the point where a number of services use channel types other than those specified in this document. This document specifically does not apply to new channel types except for the situations in which those channel types share the transmitter capabilities of the "classic" aeronautical channels specified in this document (i.e., P, R, T and C channels). In the condition where transmitter facilities are shared between new channel types and classic aeronautical channels, the emissions requirements of this document apply to both sets of channel types.

2. Page 19, replace the 3rd and 4th paragraphs of Section 2.2.2 with the following text:

The Transceiver Subsystem is defined to include the transmitter and receiver. It includes a radio frequency interface at the antenna port, where it connects to the interconnecting cable, and baseband interfaces with other on-board avionics equipment. If a diplexer/LNA is used, the transmit filter portion of the diplexer is considered to be part of the transmitter, while the receive filter portion of the diplexer and the LNA are considered to be parts of the receiver. The receiver and transmitter are further defined in Sections 2.2.4.1 and 2.2.4.2, with their respective requirements stated in those sections and their subsections.

3. Page 35, replace Section 2.2.4.2.5 in its entirety with the following text including the two sub-sections:

2.2.4.2.5 Harmonics, Discrete Spurious and Noise Density

Transceivers shall meet the Harmonics, Discrete Spurious and Noise Density requirements in either Section 2.2.4.2.5.1 or 2.2.4.2.5.2.

2.2.4.2.5.1 Harmonics, Discrete Spurious and Noise Density for Equipment Utilizing Intermodulation Frequency Control per Section 2.2.4.2.6.1

For transceivers that meet the requirements in Section 2.2.4.2.6.1 regarding frequency selection to control the generation of fifth-order intermodulation products, while transmitting a single modulated signal at the maximum-rated average output power at any frequency per Section 2.2.4.2.10, the composite harmonic, discrete spurious and noise density (including phase noise) at the transmitter output shall not exceed the following:

Composite Harmonic, Discrete Spurious and Noise Density Levels

Frequency (MHz)	Power Density
0.01 to 1525	-135 dBc/4 kHz
1525 to 1559	-203 dBc/4 kHz
1559 to 1585	-155 dBc/MHz
1585 to 1605	-143 dBc/MHz
1605 to 1610	-117 dBc/MHz
1610 to 1610.6	-95 dBc/MHz
1610.6 to 1613.8	-80 dBW/MHz[7]
1613.8 to 1614	-95 dBc/MHz
1614 to 1626.5	-70 dBc/4 kHz
1626.5 to 1660	-70 dBc/4 kHz[2,3,4,6]
1660 to 1660.5	-49.5 dBW/20 kHz[2,4,6,7]
1660.5 to 1670	-49.5 dBW/20 kHz[4,7]
1670 to 1735	-60 dBc/4 kHz
1735 to 12000	-105 dBc/4 kHz
12000 to 18000	-70 dBc/4 kHz

TABLE NOTES:

1. *[Deleted.]*

2. *Within the transmit band, excluding the frequency band within ±35 kHz of the carrier.*

3. *The -70 dBc/4kHz spectrum level in this table is equivalent to -70-10 $\log_{10}$(4000/SR) dBe (relative to the maximum envelope) under the definitions in Section 2.2.4.2.16.*

4. *For wide band spurious the limit is -39.5 dBW/MHz.*

5. *[Deleted.]*

6. *The upper limit for the excess power for any narrow-band spurious emission (excluding intermodulation products) within a 30 kHz measurement bandwidth shall be 10 dB above the power limit in this table.*

7. *Note that the power density is expressed in terms of absolute power (dBW) in some instances, and in terms of relative to carrier power (dBc) in other instances.*

NOTES:

1. *The band 1559 to 1610 MHz is allocated to the Aeronautical Radionavigation Service (ARNS) and Radionavigation Satellite Service (RNSS), and is currently utilized by GPS, GLONASS and related augmentation systems, along with guard bands at the edges. Future systems developing in these services (e.g., other ARNS/RNSS systems,*

augmentation systems) may require the establishment of more stringent protection levels.

2. [Deleted.]

3. [Deleted.]

2.2.4.2.5.2 Harmonics, Discrete Spurious and Noise Density for Equipment without Intermodulation Frequency Control per Section 2.2.4.2.6.1

Transceivers that do not implement the requirements in Section 2.2.4.2.6.1 regarding frequency selection to control the generation of fifth-order intermodulation products shall meet the following composite harmonic, discrete spurious and noise density requirements.

While transmitting a single modulated signal at the maximum-rated average output power at any frequency per Section 2.2.4.2.10, the composite harmonic, discrete spurious and noise density (including phase noise) at the transmitter output shall not exceed the following:

Composite Harmonic, Discrete Spurious and Noise Density Levels

Frequency (MHz)	Power Density
0.01 to 1525	-135 dBc/4 kHz
1525 to 1559	-203 dBc/4 kHz
1559 to 1585	-166 dBc/MHz
1585 to 1605	-150 dBc/MHz
1605 to 1610	-117 dBc/MHz
1610 to 1610.6	-95 dBc/MHz
1610.6 to 1613.8	-80 dBW/MHz[7]
1613.8 to 1614	-95 dBc/MHz
1614 to 1620	-90 dBc/4 kHz
1620 to 1625.5	-80 dBc/4 kHz
1625.5 to 1626.5	-70 dBc/4 kHz
1626.5 to 1660	-70 dBc/4 kHz[2,3,4,6]
1660 to 1660.5	-49.5 dBW/20 kHz[2,4,6,7]
1660.5 to 1670	-49.5 dBW/20 kHz[4,7]
1670 to 1735	-60 dBc/4 kHz
1735 to 12000	-105 dBc/4 kHz
12000 to 18000	-70 dBc/4 kHz

NOTE: All Notes and Table Notes contained in 2.2.4.2.5.1 apply to this section as well.

4. Page 36, replace Section 2.2.4.2.6 in its entirety with the following text including the three sub-sections:

2.2.4.2.6 Intermodulation Products

Transceivers shall meet the Intermodulation Products requirements in either Section 2.2.4.2.6.1 and Section 2.2.4.2.6.2, or else in Section 2.2.4.2.6.3.

2.2.4.2.6.1 Frequency Control Limiting Fifth-Order Intermodulation Products

Transceivers that implement frequency control algorithms for the control of fifth-order intermodulation products shall base those algorithms on the following values for the lowest frequency, f_{LIM}, at which fifth-order intermodulation products may occur, as appropriate for the intended installation and operation of the transceiver.

Transceiver installation / operation	Value for f_{LIM}
Transceivers used on aircraft equipped with GLONASS	1605 MHz
Transceivers used on aircraft not equipped with GLONASS	1585 MHz

Transceivers that implement frequency control algorithms for the control of fifth-order intermodulation products, when operating with one or more active Classic Aero H, H+, I, or L channels, or Non-Classic Channels of any type, shall not transmit on a newly-assigned channel frequency that would produce a fifth-order intermodulation product at a frequency at or below f_{LIM} , as defined in this section.

2.2.4.2.6.2 Intermodulation Products for Equipment Utilizing Intermodulation Frequency Control per Section 2.2.4.2.6.1

Transceivers that have multi-carrier capability and that meet the requirements of Section 2.2.4.2.6.1 regarding frequency selection control shall meet the following requirement. When transmitting two equal amplitude unmodulated carriers with a total combined power level up to the Maximum Allowable Multi-carrier Average Output Power of the transmitter, the power level of each intermodulation product shall not exceed the following:

Maximum Intermodulation Product Levels

Frequency (MHz)	IM Level
Below 1525	-115 dBc
1525 to 1559	-155 dBc
1559 to 1585	-135 dBc
1585 to 1605	-118 dBc
1605 to 1610	-86 dBc
1610 to 1614	-64 dBc
1614 to 1697.5	-24 dBc
1697.5 to 1716	-30 dBc
1716 to 1735	-35 dBc
1735 to 18000	-85 dBc

TABLE NOTE:

1. [Deleted.]

NOTES:

0. The requirements in Section 2.2.4.2.6.1 ensure that neither 3rd nor 5th order intermodulation products can occur below f_{LIM}.

1. The Ground Earth Station (GES) should not assign to an AES any combination of frequencies which would cause the AES to inhibit transmission.

2. The band 1559 to 1610 MHz is allocated to the Aeronautical Radionavigation Service (ARNS) and Radionavigation Satellite Service (RNSS) and is currently utilized by the GPS, GLONASS and related augmentation systems, along with guard bands at the edges. Future systems developing in these services (e.g., other ARNS/RNSS systems, augmentation systems) may require the establishment of more stringent protection levels.

3. [Deleted.]

4. [Deleted.]

2.2.4.2.6.3 Intermodulation Products for Equipment without Intermodulation Frequency Control per Section 2.2.4.2.6.1

Transceivers that have multi-carrier capability and that do not meet the requirements of Section 2.2.4.2.6.1 regarding frequency selection control shall meet the following requirement.

When transmitting two equal amplitude unmodulated carriers with a total combined power level up to the Maximum Allowable Multi-carrier Average Output Power of the transmitter, the power level of each intermodulation product shall not exceed the following:

Maximum Intermodulation Product Levels

Frequency (MHz)	IM Level
Below 1525	-110 dBc
1525 to 1559	-144 dBc
1559 to 1585	-135 dBc
1585 to 1605	-119 dBc
1605 to 1610	-86 dBc
1610 to 1614	-64 dBc
1614 to 1620	-44 dBc
1620 to 1625.5	-34 dBc
1625.5 to 1728.5	-24 dBc
1728.5 to 1735	-30 dBc
1735 to 1762.5	-80 dBc
1762.5 to 18000	-85 dBc

NOTE: Notes 1 through 4 of Section 2.2.4.2.6.2 apply to this section.

5. Page 142, in Section 2.4.4.3.6, replace the existing words: "Measurement Procedure" with "Measurement Procedure for Section 2.2.4.2.6.2".

Replace the sentence "This test applies only to multichannel transceivers." with the sentence "This test applies only to multichannel transceivers that utilize frequency control per Section 2.2.4.2.6.1.".

In the existing "Step 5" replace "Repeat steps 1 through 5" with "Repeat steps 1 through 4".

In the existing "Step 6" replace "Repeat steps 1 through 4" with "Repeat steps 1 through 5".

Following the existing "Step 8" add the following:

Measurement Procedure for Section 2.2.4.2.6.3

This test applies only to multichannel transceivers without frequency control per Section 2.2.4.2.6.1.

Step 1. After connecting the equipment as shown in Figure 2-29, command the transceiver to output a single unmodulated carrier at maximum allowable multi-carrier average power level at the Mid-Band test frequency.

Step 2. Reduce the power output of the channel unit by 3 dB at the transmitter output as measured by the power meter.

Step 3. Turn off this carrier and select another channel unit at a frequency separated from the first frequency at approximately 1 MHz. Adjust the new channel unit output level to be the same as with the first channel.

Step 4. Turn on the first channel unit again so that both units are operating. Use the spectrum analyzer to measure the intermodulation products resulting from the two signals with the measured single carrier power level as a reference.

Step 5. Repeat Steps 1 through 4 for reduced commanded output levels in 5 dB steps to 15 dB below maximum allowable output.

Step 6. Repeat Steps 1 through 5 for channel frequency separations of 100 kHz and 10 kHz and at the transmit test frequencies specified in Section 2.4.4.1, Item i, at all three frequency separations.

Step 7. Repeat Steps 1 through 5 with one carrier tuned to the highest frequency at which the transceiver is capable of operating and the other carrier tuned to the lowest frequency at which the transceiver is capable of operating.