



**INTERNATIONAL CIVIL AVIATION ORGANIZATION  
WESTERN AND CENTRAL AFRICAN OFFICE**

**SEVENTEENTH MEETING OF AFI SATELLITE NETWORK MANAGEMENT COMMITTEE  
(SNMC/17)  
(Monrovia, Liberia, 23-25 June 2009,)**

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**Agenda Item 7:- Guidelines on Performance for VSAT network**

*Presented by Secretariat*

<b>SUMMARY</b>
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This information paper seeks to remind States the guidelines for the specification for the VSAT nodes as given by SPFIRAN
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**1. Introduction**

1.1 The SPFIRAN meeting Durban, South Africa. 24-29 November 2008 discussed at length the need to discourage the purification of different VSAT nodes. The meeting agreed on guidelines for the implementation of the VSAT nodes in the existing networks.

**2. Discussion**

2.1 Appendix L to the report of the SPAFIRAN meeting gave the required guidelines (see the **attached Appendix**). With the re-engineering of the AFISNET and the implementation of new nodes, States are urged to take into consideration the guidelines as stated in the appendix, in order to promote connectivity with adjacent nodes.

**3. Action to be taken by the Meeting:**

- a) The meeting to take note of the above information.

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## Appendix

### Guidelines on Performance of Very Small Aperture Terminal (VSAT) Networks

#### 1. Introduction

1.1 Digital communication networks based on very small aperture terminal (VSAT) are being increasingly used in the provision of aeronautical ground-ground communications in areas where terrestrial communication systems are unavailable, unreliable or uneconomical. VSAT networks are generally flexible, scalable, versatile, easy to implement/operate and cost-effective in certain areas, terrains or conditions.

1.2 On the other hand, a wide variety of often incompatible architectures, configurations, access techniques, management, operation schemes and protocols are used in different VSAT networks. Moreover, almost all VSAT networks available in the market employ some proprietary products. As a result, in general, non-identical VSAT networks are not interoperable.

1.3 There are no international standards governing VSAT networks. A number of International Telecommunication Union (ITU) recommendations relating to radio frequency or other aspects of communication systems are applicable to VSATs and are often complied with by VSAT vendors. Such compliance should not, however, be interpreted as a indication of compatibility with other products.

1.4 ICAO has not standardized the physical layer of communications, therefore there are no provisions for VSATs, nor for terrestrial-based systems-like cable, microwave relay system or optical fibre.

1.5 Noting the above, States or organizations that plan to implement VSAT networks for the provisions of aeronautical ground-ground communications, are advised to:

- a) ascertain that VSAT is in fact the preferred and most cost-effective means of communication in the geographical area(s) or interest;
- b) take into consideration Conclusion 5/16 of ALLPIRG/5; and
- c) use the performance requirements states in the ensuing paragraph as a guide to planning, system design and evaluation activities.

#### 2. Performance requirements

2.1 Many factors influence the architecture, configuration and system design of a VSAT network. The end user is however mainly interested in the quality or performance of the communication service that is being provided and not so much in the technical details. As such, the user should state the desired basic performance requirements at the very early stage of planning to enable VSAT system design to proceed accordingly. Such performance requirements, once agreed upon by all parties concerned, would be used as a basis for further evaluation and continuing monitoring of the network.

2.2 In general, there is a direct relationship between performance and cost. This is particularly important for VSAT networks as there are also many parameters involved in achieving a given performance level. For example, insisting on higher availability implies duplicate terminals using

different satellites. Similarly, a very low bit error rate requires large earth station antennas, high power transmitters and large satellite transponder bandwidth. All those directly translate to significantly higher acquisition and operation costs.

2.3 The minimum performance targets stated below are generally suitable for aeronautical ground-ground communication and can be achieved with “reasonable” resources and cost. The stated performance parameters apply to the overall communication service as seen by the end user of a digital VSAT network.

Availability  $\geq 99.8\%$   
(see Note 1)

Bit error rate (BER)  $\leq 1$  in  $10^7$   
(see Note 2)

One-way latency  $< 400$  ms  
(see Note 3)

Call blocking probability  $\leq 2.5 \times 10^{-3}$  (or 1 in 400 attempts)  
(see Note 4)

Call set-up time  $\leq 2$  s

*Note 1.— The above shows the required overall availability of the communication service to the end user. It includes the consideration of all scheduled/non-scheduled maintenance and sun outages.*

*Note 2.— BER is applicable to the physical layer of communications. Forward error correction (FEC) may be employed to achieve this figure.*

*Note 3.— The above implies that for voice communications, only a single satellite hop should be used. The major contributor to the latency is the propagation delay of approximately 240 ms (a single hop). Voice compression and encoding also introduce additional delays.*

*Note 4.— The above applies to a normal switched voice communications environment. In certain operational scenarios, it may be necessary to guarantee the availability of a voice circuit upon demand by employing priority/pre-emption techniques or dedicated satellite resources.*

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