INTERNATIONAL CIVIL AVIATION ORGANIZATION
WESTERN AND CENTRAL AFRICAN OFFICE

TENTATIVE WORK PROGRAMME

(Dakar, 17 - 19 December 2007)

Agenda Item 6: **Guidelines on performance for VSAT networks**

Evolution of aeronautical ground-ground communications

(Presented by the Secretariat)

1. Introduction

1.1   This paper provides a brief assessment of the situation with development and evolution of aeronautical ground-ground communications. The purpose of the paper is to identify major gap(s) or problem(s) that impede the development of the desired air navigation infrastructure in support of global air traffic management.

2. Background

2.1   The term "aeronautical fixed service (AFS)"has traditionally been used to refer to the infrastructure, systems or applications that are used for ground-ground (i.e. point-to-point or point-to-multipoint) voice and text/data communications. Some elements of the AFS are briefly described in the ensuing paragraphs. Special systems like satellite broadcast of WAFS products are not discussed in this paper.

2.2   The aeronautical fixed telecommunication network (AFTN), though nowadays considered obsolete and antiquated, has been and still is the main workhorse of the AFS. Despite its shortcomings (e.g. low speed and obsolete technology), AFTN provides global connectivity between all aeronautical entities and is, in fact, part of the aviation culture. The problems with the AFTN are:

   a) dedicated low-speed circuits that make up the bulk of the network are increasingly not available/cost-effective any more;

   b) emerging operational requirements (e.g. transmission of binary data, graphics and lower-case characters) cannot be supported;

   c) it is based on a niche market that doesn't lend itself to any modification or reconfiguration; and

   d) due to the antiquated technology, it cannot be integrated with other and more modern communication systems or application.

2.3   Common ICAO data interchange network (CIDIN) that was introduced in Annex 10 in mid 1980s, was thought at that time to be the future backbone of aeronautical communications. However, it was only implemented in a limited scale (mainly in Europe and to a less extent in its neighbouring regions). Moreover, the implementations diverged in their specifications and plenty of in-house

engineering has been needed to maintain CIDIN/CIDIN and CIDIN/AFTN communications. Again, CIDIN is considered obsolete nowadays.

2.4   ATS message handling system (AMHS) was the next "future system" that was introduced by ICAO in the early 2000s. AMHS can be considered as the ground-ground element of the aeronautical telecommunication network (ATN) that has been tailored specifically for purpose of message exchange. Several States/organizations have embarked on the implementation of the AMHS, though some of those implementations have deviated from the current ICAO provisions. AMHS has been on newer technology but compared to the simple E-mail, it is far less capable and far more expensive. Also, AMHS is a niche market with a very small pool of technical expertise. The current basic AMHS doesn't even support the transmission of binary data, graphics and so on. Activities are ongoing in ICAO to allow the use of the Internet Protocol (IP) and the transmission of binary attachments in the AMHS.

2.5   It is needless to say that various gateways and protocol converters have had to be used to provide interconnectivity between AFTN, CIDIN and AMHS users. Moreover, many other non-Standardized locally devised schemes have also been used to provide text/data communications. For example, in some areas, some commercial communication networks are utilized to mimic the AFTN while in some other areas, an Internet-based web-mail application is used to send/receive AFTN messages.

2.6   Finally, amendment proposals are in progress for Annexes 3 and 15 to permit the use of the Internet for exchange of MET and AIS information. In fact, many States are already using Internet for that purpose as it is the only medium that is widely available, fully capable of supporting all types of binary data (e.g. colours or graphics) and cost-effective. It is foreseen that with the increasing use of the Internet, the requirements for dedicated ground-ground communication systems will decrease.

2.6   In summary, a mixture of technologies, protocols, systems, applications and services have and are being used to provide text/data communications with varying degree of performance and cost-effectiveness. The term "Standardization by ICAO" has already lost its initial meaning due to the variety of possible "standardized" solutions or non-standard locally-devised schemes. When it comes to modernizing the communications infrastructure in a less developed area, this is a major point of concern as there is no clear indication of what the "end state" is supposed to be.

2.7   Voice communication systems used between air traffic services units (ATSUs) are also elements of the AFS. Those systems have been subject of little Standardization by ICAO but in general are based on dedicated circuits that are only used for a fraction of the time and are therefore not cost-effective. Activities are underway in ICAO to pave the way for the use of more cost-effective techniques for voice and data communications (e.g. Voice over Internet Protocol (VoIP)).

3.   Future of ground-ground communications

3.1   The communication technology is advancing at an extremely rapid rate. New products and services are constantly being offered to the public with unprecedented capabilities, performance and capacity with at ever decreasing costs.

3.2   The aviation community on the other hand insists on having its own dedicated and closed communication systems that have insufficient capacities and are in general, outdated, expensive and of inferior performance. The reason for insisting on being separate from the communications has generally been the need to ensure safety and security. This type of reasoning, however, is becoming increasingly questionable.

3.3   The effort by ICAO to "catch up" with the technology has generally been futile because in addition to the relatively long Standardization process, it often takes many years for any new system to become widely implemented. In other words, by the time a new communication system is widely implemented, it is most probably obsolete.

3.3   Noting the above, there are two main options for the manner ICAO could continue its work on the Standardization of ground-ground communications:

a) constantly produce new SARPs in light of advancing technology; or

b) adopt a new Standardization regime wherein only high level requirements such as. message formats, address management and quality of service (QoS) requirements are specified.

3.4   Based on the points discussed so far, it can be concluded that option a) would lead to a convoluted set of SARPs for different solutions that become increasingly irrelevant with time. Option b) on the other hand, would firmly establish the requirements for safety and security without restricting the implementation options. It is noteworthy that currently there are no formal performance requirements for the ground-ground communication systems, which is another point of concern.

4.   Conclusion

4.1   There is no real need for ICAO to Standardize technologies/protocols for aeronautical ground-ground communications. Unlike air-ground communications wherein interoperability (often in a limited spectrum environment) must be ensured with the clear definition of the signal-in-space, communications between aeronautical users on the ground are just like any other ground communications and do require any special techniques (e.g. for saving spectrum). What needs to be defined by ICAO is a system for definition of message formats (for data), user addresses (e.g. based on location indicators and 3-letter designators) and Quality of Service (QoS) mapped to operational requirements.

5.   Recommendations

5.1   It is recommended that an activity be initiated to revamp the provisions related to aeronautical ground-ground communications with the objectives of: reducing relevant Annex 10 provisions to a set of message formats (for data), addresses (based on current location indicators and 3-letter designators) and required communication performance (RCP) values.

5.2   It is also recommended that the States be promptly advised about the aforementioned efforts since without a clear indication from ICAO, many are likely to embark on major upgrading projects that only renew low-speed AFTN and direct speech circuits (e.g. the planned VSAT project in the MID Region).

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