INTERNATIONAL CIVIL AVIATION ORGANIZATION
WESTERN AND CENTRAL AFRICAN OFFICE

SEVENTEENTH MEETING OF AFI SATELLITE NETWORK MANAGEMENT COMMITTEE (SNMC/17)

FINAL REPORT

Monrovia, Liberia, 23-25 June 2009

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PART I – HISTORY OF THE MEETING

1. Introduction

1.1 The Seventeenth Meeting of the AFI Satellite Network Management Committee (SNMC/17) was held at the Hotel Provident in Monrovia, Liberia, from 23 to 25 June 2009, at the kind invitation of the Roberts FIR.

1.2 The meeting was opened by Mr. Richilieu Archie Williams, Director General of Liberia Civil on behalf of the Host State. He welcomed the participants and expressed his conviction that SNMC/17 offered an opportunity for the participants to further analyze the adjustments to be implemented in AFISNET network using new technologies. He outlined Roberts FIR achievements in the field of satellite based communications to support their ATM objectives. He commended the spirit of cooperation prevailing between the SNMC members and called on them to enhance the technical data exchange between centres.

2. Officers and Secretariat

2.1 Mr. Sadou Marafa, RO ATM/SAR, Dakar acted as secretary of the meeting. Mrs. Mary A Obeng, RO/CNS, Nairobi, prepared the working papers to be presented by the secretariat.

3. Attendance

3.1 The meeting was attended by 32 participants from 6 States (Ghana, Guinea, Nigeria, Liberia Sierra Leone and South Africa) and 2 International/Interregional Organizations namely ASECNA and Roberts FIR. The list of participants is given at **Appendix A** to this report.

4. Working Language

4.1 The meeting was conducted in the English language.

5. AGENDA

5.1 The following Agenda was adopted:

Agenda Item 1: Follow up on SNMC/16 Conclusions

Agenda Item 2: Review of the Joint Technical team reports

Agenda Item 3: Review of operational statistics of availability for AFISNET-supported links

Agenda Item 4: Review of AFISNET earth stations performance by Administrations/Organizations

- *Stations MTBF and MTTR performance*
- *Submission of turnaround times statistics*

Agenda Item 5: Review/Updating of AFISNET nodes

- *AFS nodes: Location, geographical coordinates*
- *Extended VHF nodes: Location, geographical coordinates, coverage/range*

Agenda Item 6: Submission by AFISNET Administrations/Organizations of basic parameters for all managed IBS links

Agenda Item 7: Guidelines on performance for VSAT network

Agenda Item 8: AFISNET modernization and integration with other regional networks in AFI

Agenda Item 9: Special AFIRAN meeting recommendation 6/19

Agenda Item 10: Any others business

- Status report on:

a) Standardization of the Internet Protocol Suite (IPS)

b) Development of end-to-end performance requirements for the formulation and administration of contracts for obtaining managed services.

6. SUMMARY OF CONCLUSIONS

Agenda Item 1: Follow up on SNMC/16 Conclusions

Conclusion 17/01: Implementation of outstanding conclusions

That AFISNET Administrations and Organizations pursue implementation of, or endeavour to implement, outstanding conclusions from SNMC previous meetings concerning, *inter alia*:

a) the implementation of a corrective action plan to restore system reliability and availability as required:
b) the exchange of personnel between centres;
c) the training of personnel, including language proficiency ;
d) the implementation of coordination and monitoring procedures ;and
e) cooperative actions regarding the AFS circuits implementation/improvement; the following circuits should be considered:

ACCRA – KANO, BRAZZAVILLE-KANO, OUAGADOUGOU -NIAMTOUGOU

Agenda Item 2: Review of the Joint Technical Team report

Conclusion 17/02: AFISNET Network Joint Technical Evaluation and Re-engineering

That:

The Joint Technical Team for AFISNET Network Evaluation and Re-engineering

- be established in three groups as per **Appendix B** to this report
- conduct its tasks in accordance with the terms of reference and work programme agreed to at the SNMC Coordinating Meeting held in Dakar, Senegal on 26 March 2008 and shown in **Appendix C** to this report;

- carry out the evaluation from 15th August to 15th October 2009
- meet in Dakar under ICAO auspices in the first week of November 2009 to finalize its report and establish an action plan for the re-engineering of the AFISNET network

Each State/Administration should nominate two experts to participate in the Joint Technical Team, and forward their names to the ICAO Regional Office.

Agenda Item 3: Review of operational statistics of availability for AFISNET-supported links

Conclusion 17/03: Analysis of operational statistics of availability

That

a) AFISNET Centres endeavour to submit their monthly AFTN availability statistics to the ICAO Regional office

b) the operational statistics of availability be submitted to SNMC meetings by AFISNET Administrations and Organizations, for review and remedial actions to be implemented for the improvement of the availability of the links.

Agenda Item 4: Review of AFISNET earth stations performance by Administrations/Organizations

Conclusion 17/04: Facility mean time between failure (MTBF)

That AFISNET Administrations and Organizations determine the mean time between failure (MTBF) for their relevant AFISNET facilities using the guidance material concerning reliability and availability of radio-communications aids contained in ICAO Annex 10, Volume I, Attachment F, and report to SNMC meetings.

Agenda Item 5: Review/Updating of AFISNET nodes

Conclusion 17/05: Updating the AFI COM chart

That AFISNET Administrations and Organizations submit to ICAO updates of the COM chart and the associated table attached at **Appendix D** to this report, including AFTN protocol and links transmission speed.

Conclusion 17/06: Geographical data for AFISNET nodes

That AFISNET Administrations and Organizations provide the ICAO Regional Office for Western and Central Africa with detailed information on their managed network nodes, including location, geographical coordinates, frequency of operation, coverage/range (as appropriate) for aeronautical fixed services (AFS) and aeronautical mobile services (AMS) stations as soon as possible, but not later 30th August 2009.

Agenda Item 6: Submission by AFISNET Administrations/Organizations of basic parameters for all managed links

Conclusion 17/07: Basic parameters exchange

That the AFISNET members exchange the parameters for all managed links, as per **Appendix E** to this report.

Agenda Item 7: Guidelines on performance for VSAT networks

Conclusion 17/08: Guidelines on performance for VSAT networks

That AFISNET Administrations and Organizations make use of the guidelines for the performance of VSAT networks as agreed to at the SP AFI RAN 08 meeting and provided in **Appendix F** to this report.

Agenda Item 8: AFISNET modernization and integration with other regional networks

Conclusion 17/09: Interconnection of AFISNET, SADC/2 and NAFISAT networks

That

Ghana to implement the circuit Accra- Luanda **by July 31, 2009** to complete AFISNET and SADCII interconnection

Concerned AFISNET Administrations and Organizations coordinate to migrate IBS links to new generation technology means in order to improve the reliability and the availability of the links.

Conclusion 17/10: IBS carriers bandwidth conversion

That States/Organizations coordinate to lease with INTELSAT for the conversion of IBS initial bandwidth into lease band to be affected to each SNMC member according to its quota part.

Conclusion 17/11: Attendance to INTELSAT training meeting in Dakar

That each administration in AFISNET should endeavour to attend the training on IBS being organized by INTELSAT in Dakar Senegal in July 20 – 21st , 2009.

Agenda Item 9: SP AFI RAN 08 meeting recommendation 6/19

Conclusion 17/12: Follow-up of SP AFI RAN 08 recommendation 6/19

That, in accordance with recommendation 6/19 of the SP AFI RAN 08 meeting, ICAO convene as soon as possible all entities involved with planning, implementation and operation of VSAT networks in the AFI Region a joint meeting for the purpose of harmonization and eventual realization of a seamless AFI communication network supporting all present and future CNS systems.

Agenda Item 10: Any other business

See the report.

PART II: REPORT ON AGENDA ITEMS

Agenda Item 1 : Follow up on SNMC/16 Conclusions

1.1 The meeting reviewed the status of implementation of the ten SNMC /16 Conclusions. It was noted that only conclusion 16/08 was entirely implemented and that all matters dealt in other conclusions are ongoing and to be reconsidered in the present meeting.

1.2 As a follow up of SNMC previous conclusions, ASECNA presented to the meeting a report on the implementation of the rationalized AFS projects in ASECNA area which showed that most links have been upgraded, replacing old IBS modems by news numeric DATUM modems.

13. The meeting recalled the need to comply with all SNMC outstanding conclusions. In this regard, the following conclusion was formulated:

Conclusion 17/01: Implementation of outstanding conclusions

That AFISNET Administrations and Organizations pursue implementation of, or endeavour to implement, outstanding conclusions from SNMC previous meetings concerning, *inter alia*:

a) the implementation of a corrective action plan to restore system reliability and availability as required:
b) the exchange of personnel between centres;
c) the training of personnel, including language proficiency ;
d) the implementation of coordination and monitoring procedures ;and
e) cooperative actions regarding the AFS circuits implementation/improvement; the following circuits should be considered:

ACCRA – KANO, BRAZZAVILLE-KANO, OUAGADOUGOU -NIAMTOUGOU

Agenda Item 2: Review of the Joint Technical team reports

2.1. It was recalled that, as per SNMC Conclusion 16/07, AFISNET member Administrations and Organizations should establish a Joint Technical Evaluation Team which would conduct a comprehensive assessment of the network potential for current and future requirements and applications, and report to the "next SNMC meeting".

2.2 Meanwhile a SNMC Coordinating Meeting was held in Dakar, Senegal on 26 March 2008, at which Terms of Reference and a work programme were developed for the Joint Technical Evaluation Team. Since them no concrete action was undertaken to carry out the evaluation.

2.3 Furthermore, the last special AFI RAN 08 meeting, informed of the matter, urged ICAO and States involved in AFISNET to follow–up on SNMC conclusion 16/07. It was indicated that the Joint Technical Evaluation would be completed by the end of March 2009.

2.4 The meeting discussed best ways to conduct the evaluation as soon as possible and agreed to the following conclusion:

Conclusion 17/02: AFISNET Network Joint Technical Evaluation and Re-engineering

That:

The Joint Technical Team for AFISNET Network Evaluation and Re-engineering

- **be established in three groups as per Appendix B to this report**
- **conduct its tasks in accordance with the terms of reference and work programme agreed to at the SNMC Coordinating Meeting held in Dakar, Senegal on 26 March 2008 and shown in Appendix C to this report;**
- **carry out the evaluation from 15th August to 15th October 2009**
- **meet in Dakar under ICAO auspices in the first week of November 2009 to finalize its report and establish an action plan for the re-engineering of the AFISNET network**

Each State/Administration should nominate two experts to participate in the Joint Technical Team, and forward their names to the ICAO Regional Office.

Agenda Item 3 : Review of operational statistics of availability for AFISNET-supported links

3.1 The secretariat presented the statistical data received at the ICAO Regional office. Supplementary statistics were provided by ASECNA, Ghana and Roberts FIR. Based on that, the meeting acknowledged that a general improvement can be noted as far as AFS availability rates are concerned.

3.2 However, it was noted that ACCRA – KANO, BRAZZAVILLE-KANO, OUAGADOUGOU –NIAMTOUGOU links were still bad-performing.

3.3 The meeting recalled also that States should regularly send the monthly Statistics to the ICAO Regional office in view of a centralized monitoring of the network's performance.

The meeting therefore adopted the following conclusion.

. Conclusion 17/03: Analysis of operational statistics of availability

That

a) AFISNET Centres endeavour to submit their monthly AFTN availability statistics to the ICAO Regional office

b) the operational statistics of availability be submitted to SNMC meetings by AFISNET Administrations and Organizations, for review and remedial actions to be implemented for the improvement of the availability of the links.

Agenda Item 4: Review of AFISNET earth stations performance by Administrations/Organizations

4.1 Under this agenda item, no working paper or presentation was submitted to the consideration of the meeting. Yet, the meeting deemed the SNMC conclusion 16/03 related to the subject matter still valid and reformulated it as follows:

Conclusion 17/04: Facility mean time between failure (MTBF)

That AFISNET Administrations and Organizations determine the mean time between failure (MTBF) for their relevant AFISNET facilities using the guidance material concerning reliability and availability of radio-communications aids contained in ICAO Annex 10, Volume I, Attachment F, and report to SNMC meetings.

Agenda Item 5: Review/Updating of AFISNET nodes

5.1 The meeting was reminded with the need to have each region's ICAO COM Chart to be part of the regions' FASID. In order to implement the charts, they must be updated before insertion in to the FASID document.

5.2 With new technologies emerging in VSAT systems, it is important to review both the protocols and the transmission speeds being used in the AFISNET network. States should be aware of the implementation of TCP/IP protocols being implemented in other ICAO regions. The meeting was informed that AFI will hold AMHS Workshop next year to pave way for the implementation of AMHS systems in AFI.

The following conclusion was formulated:

Conclusion 17/05: Updating the AFI COM chart

That AFISNET Administrations and Organizations submit to ICAO updates of the COM chart and the associated table attached at Appendix D to this report, including AFTN protocol and links transmission speed.

5.3 The meeting was appraised that CNS/AIRS section (ICAO HQ Montreal) has developed a web base program to manage frequency usage and protection in all ICAO Regions. The database will be posted in ACP website whereby States frequency manager can assess and clear frequencies. The system will also automatically update the database.

5.4 For the effective implementation of the program, all VHF nodes, in particular, the extended range VHF nodes must be registered in the database. SNMC/16 formulated conclusion 16/04 urging States to forward the information to the ICAO Regional office. However the information in the Regional office is not complete. The information to be forwarded should contain all the operational VHF nodes and the geographical coordinates. With the aid of the program the effective VHF coverage could be calculated.

5.5 ASECNA and Roberts FIR presented to the meeting their data available on the matter. The meeting agreed to the following conclusion:

Conclusion 17/06: Geographical data for AFISNET nodes

That AFISNET Administrations and Organizations provide the ICAO Regional Office for Western and Central Africa with detailed information on their managed network nodes, including location, geographical coordinates, frequency of operation, coverage/range (as appropriate) for aeronautical fixed services (AFS) and aeronautical mobile services (AMS) stations as soon as possible, but not later 30th August 2009.

Agenda Item 6: Submission by AFISNET Administrations/Organizations of basic parameters for all managed links

6.1 The meeting recalled that SNMC conclusion 16/05 called on Administrations/Organizations to update the necessary basic parameters concerning all their managed links and forward them to the ICAO WACAF regional office.

6.2 The Roberts FIR made a powerpoint presentation on their basic VSAT parameters.

6.3 The meeting was of the view that these parameters should be listed precisely for a common understanding of the issue and be also exchanged between AFISNET member in order to improve the interoperability of the systems. The following conclusion was formulated in this sense.

Conclusion 17/07: Basic parameters exchange

That the AFISNET members exchange the parameters for all managed links, as per Appendix E to this report.

Agenda Item 7: Guidelines on performance for VSAT networks

7.1 The meeting was informed that the SP AFI RAN 08 meeting Durban, South Africa. 24-29 November 2008 had discussed at length the need to discourage the proliferation of different VSAT nodes. As a result the SP AFI RAN 08 meeting agreed on guidelines for the implementation of the VSAT nodes in the existing networks.

7. 2. Appendix L to the report of the SP AFI RAN 08 meeting gave the required guidelines. 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 Appendix F to this report, in order to promote connectivity with adjacent nodes. The meeting adopted the following conclusion:

Conclusion 17/08: Guidelines on performance for VSAT networks

That AFISNET Administrations and Organizations make use of the guidelines for the performance of VSAT networks as agreed to at the SP AFI RAN 08 meeting and provided in Appendix F to this report.

Agenda Item 8: AFISNET modernization and integration with other regional networks

8.1 The meeting reviewed the status of the interconnection between AFISNET, NAFISAT and SADC II VSAT networks. All the circuits have been implemented except Accra –Luanda which is in the process of implementation. Ghana confirmed that the implementation of that link is on going under a contract with ATNS (South Africa) and that it will be completed by the end of July 2009.

8.2 The meeting noted that most of the links in the AFISNET network have been migrated from IBS ageing technology to new generation means including numeric modems which improved the performance of the network significantly. The few links still on IBS modules are experiencing daily spare parts and maintenance problems.

8.3 It was also indicated that the migration from IBS could allow to release bandwidth capacity and the various members could request for its conversion into a lease band proportionally to their own bandwidth.

Hence the conclusions:

Conclusion 17/09: Interconnection of AFISNET, SADC/2 and NAFISAT networks

That

Ghana to implement the circuit Accra- Luanda by July 31, 2009 to complete AFISNET and SADC II interconnection

Concerned AFISNET Administrations and Organizations coordinate to migrate IBS links to new generation technology means in order to improve the reliability and the availability of the links.

Conclusion 17/10: IBS carriers bandwidth conversion

That States/Organizations coordinate to lease with INTELSAT for the conversion of IBS initial bandwidth into lease band to be affected to each SNMC member according to its quota part.

Conclusion 17/11: Attendance to INTELSAT training meeting in Dakar

That each administration in AFISNET should endeavour to attend the training on IBS being organized by INTELSAT in Dakar Senegal in July 20 – 21st , 2009.

Agenda Item 9: SP AFI RAN 08 meeting recommendation 6/19

9.1 Under this agenda item, the meeting's attention was drawn to Recommendation 6/19 of the SP AFI RAN 08 meeting which called all VSAT network managers to hold regular coordination meetings.

9.2 The meeting commended the idea of a coordination meeting between AFISNET, CAFSAT, NAFISAT and SADC II networks managers to be held as soon as possible and formulated the following conclusion:

Conclusion 17/12: Follow-up of SP AFI RAN 08 recommendation 6/19

That, in accordance with recommendation 6/19 of the SP AFI RAN 08 meeting, ICAO convene as soon as possible all entities involved with planning, implementation and operation of VSAT networks in the AFI Region a joint meeting for the purpose of harmonization and eventual realization of a seamless AFI communication network supporting all present and future CNS systems.

Agenda Item 10: Any other business

10.1 Under this item, meeting was recalled that AFI States had requested ICAO to develop specifications and guidelines for contracting Air Navigation services which the Civil Aviation Authorities cannot perform or its best done by specialized entity. ICAO has identified ATM objectives for specified Airspace. Guidelines for defining the required communication support have also been identified in ICAO Doc 9869 which is the Required Communication Performance Manual. States are encouraged to define the ATM objectives of their Airspaces

and subsequent required Communication needed to support the ATM objectives. This should be a component in the managerial contract.

10.2 The Roberts FIR made a powerpoint presentation on its history, beginning from the eighties to their return in Monrovia after relocation in Freetown and Conakry due to the crisis experienced in the region.

SNMC Next Meeting

10.3 The meeting welcomed the offer of ASECNA to host the next SNMC/18 meeting. ICAO will coordinate the venue and dates with ASECNA. The SNMC members will be notified of the dates and venue of this meeting in due course.

SEVENTEENTH MEETING OF AFI SATELLITE NETWORK MANAGEMENT COMMITTEE (SNMC/17)

(Monrovia, 23 - 25 June 2009)
List of Participants

COUNTRY/ORGANIZATION	NAME OF PARTICIPANT	POSITION	E-mail/Phone
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Appendix B

SEVENTEENTH MEETING OF AFI SATELLITE NETWORK MANAGEMENT COMMITTEE (SNMC/17)

(Monrovia, 23 - 25 Jnue 2009)

The Joint Technical Team for AFISNET Network Evaluation and Re-engineering composition and work programme

Group(*)	Centers to evaluate	Starting Date	Ending date	Focal point
1	Dakar Roberts Abidjan	15th August	15th October	ROBERTS FIR
2	Niamey Accra Lagos Ouagadougou	15th August	15th October	GCAA
3	Brazzaville Douala Kano Libreville N'Djamena	15th August	15th October	ASECNA

(*) Each group could be made of two experts from each state/organization .

APPENDIX C

AFI SATELLITE TELECOMMUNICATION NETWORK (AFISNET)

Joint Technical Evaluation of the network

Terms of Reference

1 –Objectives:

1.1 The main objectives of the joint technical evaluation are to:

a) identify deficiencies and non-ICAO, WMO and ITU compliant elements/features;

b) make recommendations and proposals concerning the short-term, mid-term and long-term solutions and strategies to be implemented, such as using appropriate human resource management, training policies and modern technologies, for achieving an enhanced, efficient, high performance, secure, CNS/ATM capability and cost-effective network, meeting interoperability and seamlessness requirements ; and

c) evaluate the anticipated costs in view of a comprehensive project document to support a collective financing mechanism.

2 - Network functionalities

Functionalities

2.1 The network was originally designed to support the following communication services in accordance with the Air navigation plan for the Africa-Indian Ocean (AFI) Region:

1) ATS Direct Speech between adjacent FIRs;
2) Aeronautical Fixed Telecommunications Network (AFTN);
3) Operational meteorological data exchanges (OPMET);
4) Operational Aeronautical Information Services exchanges.
5) Support for remote VHF voice;
6) Aeronautical Administrative support (AAC);

2.2 In addition to these services, the following communications will also be progressively supported by the network:

1) Aeronautical Telecommunications Network (ATN)
   - Air/ground data link applications : ADS/CPDLC, ADS-B, DFIS, VDL or SSR Extended Squitter - ES1090
   - Ground-ground applications: AMHS, AIDC.
2) Computer-to-computer data exchange (ICC) between ATS Flight Data Processing Systems (FDPS); and
3) GNSS augmentation data transmission.

3 – Reference documentation

3.1 The joint technical evaluation shall be conducted using relevant provisions contained in ICAO, WMO and ITU standards, recommendations, regulations, manuals and procedures (ICAO Annexes, WMO Technical Manual on GTS – Doc 386, ITU Radio regulations), AFI Air navigation plan (Doc 7474), AFI CNS/ATM plan (Doc 003), APIRG Reports, SNMC Meeting Reports, European Union Evaluation Mission Report (2003), and Report on Technical Evaluation of AFISNET Network, ICAO Special Implementation Project (2006).

4 – Expectations

4.1 The joint technical evaluation shall provide a detailed description and analysis of the current network features, performance and operating/maintenance costs. The following constituents shall be addressed:

a - Technical

- Availability, continuity and reliability requirements;
- System maintainability;
- Frequency plan;
- Spectrum management;
- Adequacy of available bandwidth for AFTN, ATS/DS, service channels and other voice services;
- Architecture, satellite access techniques, protocols;
- Configuration management;
- Interoperability requirements;
- Ability to accommodate CNS/ATM emerging technologies (ATN applications) and SADIS operations;
- Bit-oriented protocols (BOPs).

b - Operational

This part of the joint technical evaluation shall clearly show up the advantages and disadvantages associated with the current network. In this connection, the following issues shall particularly be analyzed:

- Quality of service for ground-to-ground applications and air-to-ground applications, based on ICAO and WMO requirements;
- Network security, confidentiality and data integrity;
- AFTN transit times against the agreed requirements;
- Implementation of TCP/IP protocol stack.

The joint technical evaluation shall clearly establish the extent to which the network performances are SARPs-compliant and meet users' needs.

System configuration and performance assessment

4.2 The joint technical evaluation shall assess and provide advice on, and not limited to, the following:

- **AFTN/GTS**
  - Suitability of network topology taking into consideration ICAO specifications concerning continuity of services;
  - Routing tables;
  - Message switch performance assessment (dialogue, conflicts, etc.);
  - Congestion, loss of AFTN messages, propagation times and quality of service (QoS).
- **ATS/DS**
  - Topology conformance to ICAO specifications to ensure continuity of services
  - Implementation of voice links using Frame relay protocol stack.
  - Priority management, connection time, and quality of service.
- **AMS**
  - Extended VHF coverage
- **CNS/ATM**
  - Possibility of implementing a number of CNS/ATM functionalities (AMHS, AIDC, ADS/CPDLC, D-FIS, etc.) and meeting availability, reliability integrity and continuity performance criteria using the network infrastructure.

Enhancements

4.3 After a critical analysis of the network, showing the network capabilities and limitations, the joint technical evaluation shall propose corrective measures and/or adequate solutions to rectify any reported deviations (as required), and formulate proposals for the network re-engineering. These shall include use of appropriate human resource management policies, suitable technologies and topologies for ATS communications (ATSC) and aeronautical administrative correspondence (AAC), system reliability, data integrity, as well as network management, administration, operations, monitoring and maintenance policies, including development of a common software tool for technical statistics.

5 – Project requirements

Duration

5.1 The joint technical evaluation shall be completed within three (3) months.

Work programme

5.2 The work programme for the conduct of the joint technical evaluation shall include the following site visits, taking into consideration their roles in the regional communication infrastructure (AFTN main centres) and/or air traffic management system (flight information centres, area control centres), or associated interface problems.

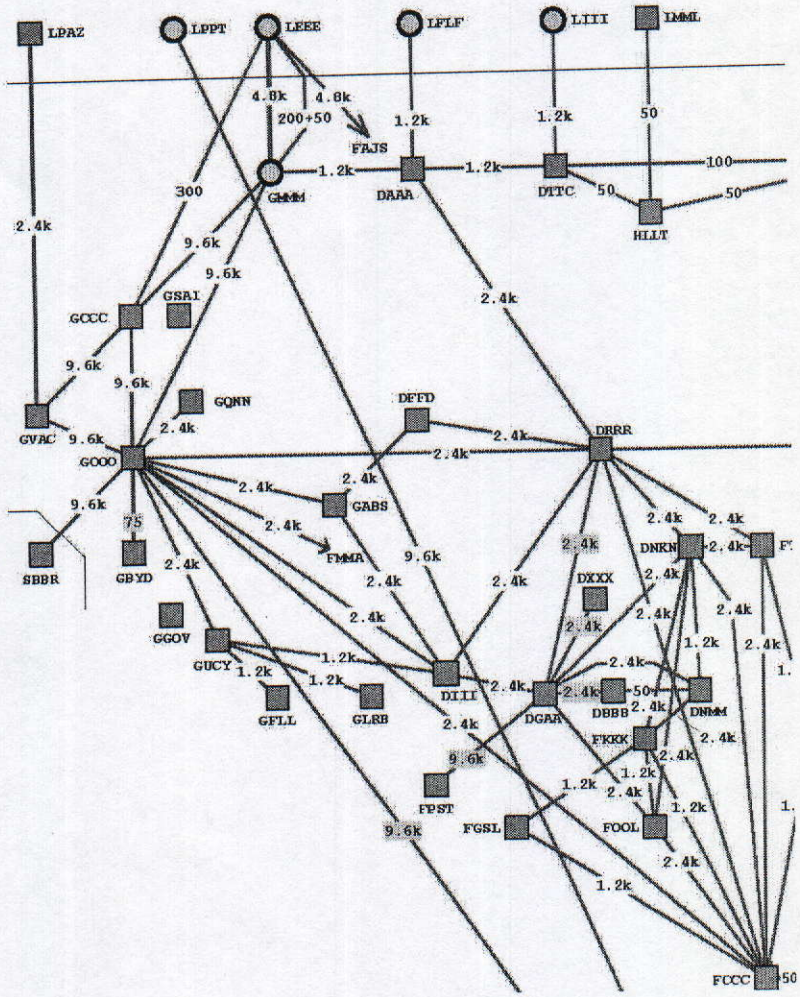
Centre	Responsibilities			Team Leader
	Area Control Centre/ Flight Information Centre	AFTN Main Centre	Network Control Centre	
1. Abidjan	X			**Roberts FIR**
2. Accra	X			**ASECNA**
3. Brazzaville	X	X		**GCAA Ghana**
4. Roberts	X			**ASECNA**
5. Dakar	X	X	X	**Roberts FIR**
6. Douala	X			**NAMA Nigeria**
7. Kano	X			**ASECNA**
8. Lagos	X			**ASECNA**
9. Libreville	X			**GCAA Ghana**
10. Ndjamena	X			**NAMA Nigeria**
11. Niamey	X	X		**GCAA Ghana**
12. Ouagadougou	X			**NAMA Nigeria**

Joint Technical Evaluation Report

5.3 The draft Report on the joint technical evaluation shall be circulated to concerned AFISNET Administrations and Organizations through the ICAO Regional Office, Dakar for their comments before it is finalized.

APPENDIX D

AFI COM CHART



AFTN TABLE

STATE	STATE	TYPE OF LINK	PROTOCOL	TRANSMISSION SPEED
MAIN CENTRE				
Abidjan				
	Accra	AFISNET		
	Dakar	AFISNET		
	Niamey	AFISNET		
	Casablanca	AFISNET		
Accra				
	Abidjan	AFISNET		
	Cotonnou	AFISNET		
	Kano	AFISNET		
	Lagos	AFISNET		
	Lome	AFISNET		
Bamako				
	Dakar	AFISNET		
		AFISNET		
Bangui				
	Douala	AFISNET		
	Brazzaville	AFISNET		
Banjul				
	Bissau	AFISNET		
	Dakar	AFISNET		
Brazzaville				
	Bangui	AFISNET		
	Dakar	AFISNET		
	Douala	AFISNET		
	Johannesburg	AFISNET		
	Kinshasa	AFISNET		
	Luanda	AFISNET		
	Libreville	AFISNET		
	Malabo	AFISNET		
	Nairobi	AFISNET		
	Niamey	AFISNET		
	N'Djamena	AFISNET		
	Sao Tome & Principe	AFISNET		
Conakry				
	Freetown	AFISNET		
	Robertsfield	AFISNET		

Cotonnou				
	Accra	AFISNET		
	Lome	AFISNET		
	Niamey	AFISNET		
Dakar				
	Abidjan	AFISNET		
	Bamako	AFISNET		
	Banjul	AFISNET		
	Bissau	AFISNET		
	Conakry	AFISNET		
	Freetown	AFISNET		
	Niamey	AFISNET		
	Nouak Chott	AFISNET		
	Roberts	AFISNET		
	Sal	AFISNET		
	Sam	AFISNET		
Douala				
	Yeondi	AFISNET		
	Bamgui	AFISNET		
	Libreville	AFISNET		
	Malabo	AFISNET		
Kano	**Kano**			
	Accra	AFISNET		
	Lagos	AFISNET		
	Niamey	AFISNET		
Kinshasa				
	Brazzaville	AFISNET		
Lome	**Lome**			
	Accra	AFISNET		
	Cotonou	AFISNET		
	Niamey			
Libreville				
	Brazzaville	AFISNET		
Malabo				
	Brazzaville	AFISNET		
	Sao Tome & Principle	AFISNET		
Nouakchott				

	Dakar	AFISNET		
Robertsfield				
	Conakary	AFISNET		
	Dakar	AFISNET		
	Freetown	AFISNET		
Niamey				
	Accra	AFISNET		
	Algeria	AFISNET		
	Cottonnou	AFISNET		
	Kano	AFISNET		
	Lagos	AFISNET		
	Lome	AFISNET		
	N'Djamena	AFISNET		
	Ouagadougou	AFISNET		
Ouagadougou				
	Niamey	AFISNET		

APPENDIX E: AFISNET LINKS BASIC PARAMETERS, example.

SITE: Brazzaville
Date: 21/08/2009

Support/Service Focal point	Type of equipments	Technical parameters	LINK PARAMETERS				
			Brazzaville	Libreville	Douala	N'djamena	Niamey
- SATELLITE MODEM	DATUM	IF Frequency					
		Modulation	QPSK				
		FEC	3/4				
		Speed	64 KBPS				
		Interface	RS 232				
		BER	10^{-7}				
Multiplexor	MICOM	N° DLCI	123				
		Carrier	UP				
		DLCI	UP				
		Priority AFTN	Low				
		Priority ATS/DS	High				
- AFTN SYSTEM	AFTN Switch (AMS 1500)/ SAGEM	Protocol of Transmission	V/24 Asynchronous				
		Speed of transmission	2400 bps				
		Alphabet/	IA5				
		Heading	SOH				
		Bits/character	2400				
		Parity	None				
		Stop bit	1.				
- ATS/DS		Codage	G 729				
		Interface	E&M 4 wires				
			FXS				
		Battery	Local				
Coordination focal point	TECHNICAL RADIO	Name/Surname					
		Phone number					
		E-mail address					
	TECHNICAL NETWORK	Name/Surname					
		Phone number					
		E-mail address					
	OPERATIONAL	Name/Surname					
		Phone number					
		E-mail address					

APPENDIX F

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 sin 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 >= 99.8%
(see Note 1)

Bit error rate (BER) <= 1 in 10^{-7}
(see Note 2)

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

Call blocking probability <= 2.5 x 10^{-3} (or 1 in 400 attempts)
(see Note 4)

Call set-up time <= 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 laency 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.
