

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



**EIGHTEENTH MEETING OF AFI SATELLITE NETWORK
MANAGEMENT COMMITTEE (SNMC/18)**

FINAL REPORT

Ouagadougou, Burkina Faso, 01-04 June 2010

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PART I – HISTORY OF THE MEETING

1. Introduction

1.1 The Eighteenth Meeting of the AFI Satellite Network Management Committee (SNMC/18) was held at the Splendid Hotel in Ouagadougou, Burkina Faso, from 01 to 04 June 2010, at the kind invitation of ASECNA.

1.2 The meeting was opened by Mr. **Mathieu BOUDA**, Deputy Minister of Transport of Burkina Faso. He welcomed the participants and pointed out the interest SNMC members States have in the outcome of the meeting and expressed that AFISNET has become a good example of cooperation to ensure a cost effective provision of reliable Telecommunications Service for Air Navigation in the AFI region. He outlined SNMC member states achievements, in particular, those pertaining to ASECNA in the field of satellite based communications to support its ATM objectives. He expressed his conviction that with SNMC/18, AFISNET management should reach maturity after 20 years of experience. He recalled the Special AFI/RAN meeting conclusion 6/18 calling for AFISNET evaluation and re-engineering as an opportunity for the participants to further analyze the necessary adjustments to be implemented in the AFISNET network in order to improve communication for Air Navigation purposes. He wished the meeting successful deliberations and declared it opened.

2. Officers and Secretariat

2.1 Mr. **François Xavier SALAMABANGA**, RO/CNS, WACAF served as Secretary of the meeting and therefore prepared the working and information papers to be presented accordingly.

3. Attendance

3.1 The meeting was attended by forty (40) participants from eight (8) States (Burkina Faso, Cameroun, Côte d'Ivoire, Ghana, Kenya, Madagascar, Nigeria and Niger) and two (2) International/Interregional Organizations namely ASECNA and Roberts FIR. One supplier (INEO France) and the Burkina Faso National Telecommunication Regulator attended the meeting.

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 with summaries provided in French during the deliberation on the most important topics.

5. Agenda

5.1 The following Agenda was adopted:

Agenda Item 1: Follow up on SNMC/17 Conclusions

Agenda Item 2: Review of operational statistics of availability for AFISNET-supported links

Agenda Item 3: Review of AFISNET earth stations performance

Agenda Item 4: Review/Updating of AFISNET nodes

Agenda Item 5: Implementation of Special AFIRAN meeting recommendations 6/18 and 6/19

Agenda Item 6: Review of the report of the Joint Technical Team

Agenda Item 7: AFISNET modernization and re-engineering

Agenda Item 8: AFISNET band width re-engineering;

Agenda Item 9: Review of the CNS/SG/3 conclusion related to AFISNET

Agenda Item 10: AFISNET integration with other AFI regional networks (CAFSAT, NAFISAT, SADC/2)

Agenda Item 11: Required Communication Performance for AFISNET

Agenda Item 12: Updating SNMC Form of Agreement.

Agenda Item 13: Any other business

6. Summary of Conclusions

Agenda Item 1: Follow up of SNMC/17 Conclusions

Conclusion 18/01: Implementation of SNMC/17 outstanding conclusions

That:

SNMC member States/Organizations are urged to implement SNMC/17 outstanding conclusions presented in **Appendix B** and pertaining to corrective actions to be undertaken in order to:

- a) Restore and stabilize AFISNET reliability and availability as required;
- b) Improve maintenance coordination and monitoring procedures.

Conclusion 18/02: Maintenance Personnel exchange and Training

That:

SNMC States/Organizations reinforce maintenance personnel exchange and training including language proficiency and develop a maintenance personnel training programme based on the common facilities by the end of December 2010 and ICAO coordinates the finalization of this programme.

Conclusion 18/03: Follow up on the status of implementation of SNMC conclusions

That:

1. SNMC member States forward, quarterly, to the current coordinating State/Organization the status of implementation of SNMC meeting conclusions for compilation and reporting to all stakeholders; and
2. ICAO continues to support States/organizations bilateral arrangements for their implementation.

Agenda Item 2: Review of operational statistics of availability for AFISNET-supported links

Conclusion 18/04: Improvement of Operational availability of AFISNET

That:

SNMC member States/organizations endeavor to clear out all the pending identified AFS deficiencies by the end of year 2010.

Agenda Item 3: Review of AFISNET earth stations performance

Conclusion 18/05: AFISNET earth station Performance Data Collection Form

That:

ASECNA and Ghana CAA develop and submit an Earth Stations Performance Data Collection Form (PDCF) to facilitate collection of stations availability data, taking into consideration the most sensitive components of the network.

Agenda Item 4: Review/Updating of AFISNET nodes

Conclusion 18/06: Updating AFISNET nodes

That:

States/Organizations update their nodes list with their coordinates, the frequency plan and report to ICAO not later than 15 July 2010 and for ICAO to circulate a consolidated file to the stakeholders.

Agenda Item 5: Implementation of Special AFIRAN meeting recommendations 6/18 and 6/19

Conclusion 18/07: Implementation of Conclusion 6/19 of SP AFI RAN

That:

- a) SNMC members States/Organization participate in the AFI VSAT managers meeting called for by Conclusion 6/19 of the SP AFI RAN meeting on the basis of representative (s) from each SNMC members Sate/Organization (ie: NAMA, GCAA, Roberts FIR, ASECNA);

- b) ICAO regional Offices (WACAF and ESAF) initiate suitable arrangements for the venue of the first meeting during which the Terms of Reference and frequency of meetings will be defined;
- c) APIRG indicates the body to which reports of these global meetings will be addressed.

Agenda Item 6: Review of the report of the Joint Technical Team

Decision 18/01: Adoption of the Report of the first meeting of the Joint Technical Evaluation and Re-engineering Team

That;

The Conclusions of the first meeting of the Joint Technical Evaluation and Re-engineering Team be adopted as presented in **Appendix C**.

Agenda Item 7: AFISNET Modernization and Re-engineering

Conclusion 18/08: Implementation of the recommendations of the Joint Technical Team for AFISNET Evaluation and Re-engineering

That:

States/Organizations have urged to implement the recommendations of the report of the AFISNET Joint Technical Evaluation and Re-engineering Team as presented in **Appendix D** by focusing their efforts on the following items:

- a) Clearing current malfunctions;
- b) Upgrade of Multiplexers;
- c) Upgrade of Automatic Messages Switching Systems
- d) Upgrade of VCSS
- e) Redundancy of modems and multiplexers
- f) Calibration of test equipments

Conclusion 18/09: Sharing of technical data

That:

All Administrations/Organizations send relevant technical data on current and intended Automatic Messages Switching and Voice Communication Switching Systems upgrades to ICAO WACAF Office for tabulation and further remittance to administration for their study.

Conclusion 18/10: Continuity of AFTN Service

That:

When upgrading/replacing Automatic Messages Switching Systems, Administrations/Organizations should consider backward integration with existing messages switches with the emerging technology (AMHS) in order to ensure the continuity of AFTN service within the transition (AFTN/AMHS) time.

Conclusion 18/11: ATS-Voice Numbering Plan

That:

When upgrading/replacing Voice Communication Switching Systems Administrations/Organizations should take into consideration the need of an ATS-Voice numbering plan for AFI.

Décision 18/02: Need of a calibration center for AFISNET Test Equipments

That:

A common calibration center for test equipments be established in the WACAF region for the benefit of members States/Organizations as well as external client.

Conclusion 18/12: AFISNET Maintenance Human Factors

That:

AFISNET Administrations /Organizations provide AFISNET maintenance structures with adequate personnel with appropriate training:

- a) Training workshops should be performed in partnership with industry (Satellite Service Providers, facilities vendors....) in order to take benefit from their expertise in the current and emerging technologies;
- b) Training should be in line with ICAO ATSEPS recommended programme followed by licensing of qualified personnel.

Decision 18/03: Updating the mandate of the Joint Technical Evaluation and Re-engineering Team

That:

The Joint Technical Evaluation and Re-engineering Team pursues the task assigned to it by SNMC/17 and completes the study for AFISNET re-engineering by the end of October 2010.

This study will focus on the following items taking into consideration advantages/disadvantages, cost-effectiveness, reliability and safety risks aspects:

- a) AFISNET topology;
- b) AFISNET components;
- c) AFISNET base band and satellite access; and
- d) AFISNET bandwidth optimization.

Meanwhile, States/organizations take the urgent appropriate actions to clear out the pending current deficiencies before the end of year 2010.

Agenda Item 8: AFISNET band width re-engineering;

Conclusion 18/13: Conversion of IBS Band to leased band

That:

States/organizations pursue and complete the implementation of conclusion of SNMC17/10 by adopting the following process:

- a) IBS carrier status of stations be forwarded to ASECNA for compilation and transmission to INTELSAT; and
- b) A Technical/financial meeting be held by SNMC members with INTELSAT to ensure the conversion of IBS band to a leased band.

Agenda Item 9: Review of the CNS/SG/3 conclusions related to AFISNET

Conclusion 18/14: Implementation of CNS/SG/3 draft conclusions related to AFISNET

That:

SNMC members States/Organizations are urged to implement the draft conclusions of CNS/SG/3 related to AFISNET as presented in **Appendix E**;

When updating the current deficiencies status for submission to APIRG/17, ICAO deletes the operating Accra/ Luanda link from the list of AFS deficiencies.

Agenda Item 10: AFISNET integration with other AFI regional networks (CAFSAT, NAFISAT, SADC/2)

Conclusion 18/15: Interconnection between AFISNET with neighboring Networks

That:

The concerned States/Organizations are urged to complete the interconnection exercise of AFISNET with neighboring networks, in particular ASECNA, to take the appropriate actions in coordination with RVA (DRC) in order to realize the interconnection between the following nodes by the end of year 2010:

- a) Brazzaville/Kinshasa
- b) Bangui/G'Badolite

ICAO WACAF supports the bilateral arrangements between ASECNA and RVA.

Agenda Item 11: Required Communication Performance for AFISNET

Conclusion18/16: RCP for AFISNET

That:

SNMC members take the advantage of RCP requirements stated in ICAO Doc 9869 to improve the provision of VSAT based Aeronautical Mobile Services and ensure the availability of AFISNET hubs and remote VHF stations accordingly.

Agenda Item 12: Updating SNMC Form of Agreement.

Conclusion18/17: Form of agreement and Terms of Reference of AFISNET

That:

The Form of Agreement and the Terms of Reference of AFISNET be circulated by SNMC secretariat as soon as possible;

States/Organizations forward their comments and remarks not later than 3 September 2010;

ICAO compiles and forwards the amended Form of Agreement and Terms of Reference of the SNMC to be signed by the end of December 2010.

Agenda Item 13: Any other business

Conclusion18/18: Audit of AFISNET.

That:

In the framework of the implementation of SP AFI RAN conclusion 6/18 and to consolidate the recommendations within the report of the Joint Technical Evaluation and Re-engineering Team, an AFISNET global audit be conducted in this regards.

- a) ASECNA is to circulate a draft Terms of Reference for the Audit not later than end of September 2010;
- b) SNMC members are to update the draft report and forward to ICAO; and
- c) ICAO is to compile and finalize the Terms of Reference for a call for Tenders.

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 twelve (12) SNMC /17 Conclusions. It was noted that some conclusions have been partially implemented while others need to be implemented. The status of implementation of SNMC/17 conclusions is presented in **Appendix B**. The following conclusion was formulated:

Conclusion 18/01: Implementation of SNMC/17 outstanding conclusions

That:

SNMC member States/Organizations are urged to implement SNMC/17 outstanding conclusions presented in Appendix B and pertaining to corrective actions to be undertaken in order to:

- a) Restore and stabilize AFISNET reliability and availability as required; and**
- b) Improve maintenance coordination and monitoring procedures.**

1.2 Under this agenda the meeting also discussed the issue of maintenance and operational Personnel exchange and training. It was noted that although some efforts have been made by stakeholders, namely: Ghana, Roberts and ASECNA, the rate of Personnel exchange and training remains low compared to the technical challenge experienced by such Personnel. The meeting found that it should be of benefit that member States build a common training programme based on the common components of AFISNET Stations. In this regard, the following conclusion was formulated:

Conclusion 18/02: Maintenance Personnel exchange and Training

That:

SNMC States/Organizations reinforce maintenance personnel exchange and training including language proficiency and develop a maintenance personnel training programme based on the common facilities by the end of December 2010 and ICAO coordinates the finalization of this programme.

1.3 The meeting also recognized that between two SNMC meetings the follow up of the status of implementation of the current conclusions is not formally planned. It was proposed that the current coordinating State/Organization be nominated for such task in accordance with the updated SNMC Terms of Reference. The following conclusion was therefore formulated:

Conclusion 18/03: Follow up of the status of implementation of SNMC conclusions

That:

1. SNMC member States forward, quarterly, to the current coordinating State/Organization the status of implementation of SNMC meeting conclusions for compilation and reporting to all stakeholders; and
2. ICAO continues to support States/organizations bilateral arrangements for their implementation.

Agenda Item 2: Review of operational statistics of availability for AFISNET-supported links

2.1. Under this agenda item the meeting examined the statistics of availability of the links supported by AFISNET presented by the secretariat.

2.1.1 The meeting noted that in a bid to satisfy new ATM requirements involving re-organization of airspace, AFTN bilateral circuits have been realized and should be taken into account when updating the AFI Com chart.

2.1.2 ASECNA presented a comprehensive status of Network availability in its airspace. When reviewing the performance of the AFTN circuits supported by the main AFI centers, the meeting noted important improvement around the Dakar and Niamey main centers while Brazzaville is experiencing a weak availability rate, less than the recommended target value of 97%.

2.1.3 The meeting also noted that the new flight plan format, the requirements of RVSM space management, the automation of flight data processing (including flight plans) and the automation of AIS (including NOTAM messages), recommend that States/Organizations continue their efforts to increase AFS AFTN performance in particular for those current failing circuits.

In this regard, the following conclusion was formulated:

Conclusion 18/04: Improvement of Operational availability of AFISNET

That:

SNMC member States/organizations endeavor to clear out all the pending identified AFS deficiencies by the end of year 2010.

Agenda Item 3: Review of AFISNET earth stations performance

3.1 When discussing this item the meeting agreed that many factors have to be taken into consideration for the assessment of MTBF. It also noted the lack of a common form with a consolidated list of components to be evaluated. The meeting discussed at length the parameters to be considered, and concluded that it was necessary to develop an assessment form to be circulated among member states and adopted. ASECNA and GCAA were tasked to provide SNMC members with a draft form. The meeting therefore reached the following conclusion:

Conclusion 18/05: AFISNET earth station Performance Data Collection Form

That:

ASECNA and Ghana CAA develop and submit an earth stations Performance Data Collection Form (PDCF) to facilitate collection of station availability data taking into consideration the most sensitive components of the network.

Agenda Item 4: Review/Updating of AFISNET nodes

4.1 The meeting discussed the updating of AFS nodes in terms of location, geographical coordinates, and frequency plan. It was stated that these data have been collected in the past and the meeting encouraged the stakeholders to update the data including those related to the new VSAT stations.

4.2 The meeting also recognized that all these data are available and could be sent quickly to the secretariat for compilation.

The following conclusion was arrived at:

Conclusion 18/06: Updating AFISNET nodes

That:

States/Organizations update their nodes list with their coordinates, the frequency plan and report to ICAO not later than 15 July 2010 and for ICAO to circulate a consolidated file to the stakeholders.

Agenda Item 5: Implementation of Special AFIRAN meeting recommendations 6/18 and 6/19

5.1 The meeting decided to examine under agenda item 7, the status of implementation of SP AFI/RAN *Conclusion 6/18* that calls for AFISNET Evaluation and Re-engineering.

5.2 The meeting examined the status of implementation of AFI/RAN *Conclusion 6/19: Planning, implementation and operation of very small aperture terminal (VSAT) networks in the AFI Region* that calls for regular meetings of all AFI network managers.

5.3 The secretariat provided the meeting with the ongoing information pertaining to the neighboring Networks that may be involved in such regular meetings (CAFSAT, NAFISAT, SADC/3...) called for by SP AFI RAN.

5.4 In particular, the meeting noted that the SAT/15 meeting (Lisbon, Portugal, 19-21 May 2010) has set up the CAFSAT Network Management Committee (CNMC) based on the SNMC model so that the similar management exercise of the two networks will be a step towards institution of the global regular meetings called for by SP AFI RAN. The meeting discussed at length the best way for a fruitful participation of SNMC in such meetings.

5.5 It was stated that in order to ensure good participation, consolidated Terms of Reference should be developed for the management of the meetings of each AFI local Sub-

Network. The outcome of those meetings, which can be of common interest to all stakeholders, should serve as inputs for the regular AFI global meetings.

5.6 The meeting also raised concern over of the body to which such meetings should report.

The following conclusion was formulated.

Conclusion 18/07: Implementation of conclusion 6/19 of SP AFI RAN

That:

- a) **SNMC member States/Organizations participate in the AFI VSAT managers meeting called for by conclusion 6/19 of the SP AFI RAN meeting on the basis of representative (s) from each SNMC members Sate/Organization (i.e. NAMA, GCAA, Roberts FIR, ASECNA);**
- b) **ICAO regional Offices (WACAF and ESAF) initiate suitable arrangements for the venue of the first meeting during which the Terms of Reference and frequency of meetings will be defined; and**
- c) **APIRG indicates the body to which reports of those global meetings will be addressed.**

Agenda Item 6: Review of the report of the Joint Technical Evaluation Team

6.1 The secretariat presented the status of implementation of **Conclusion 17/02 of SNMC/17: AFISNET Network Joint Technical Evaluation and Re-engineering** that set up a Joint Technical Team for the Evaluation and the Re-engineering of AFISNET.

6.2 It was noted that the joint technical Team held its first coordinating meeting in Dakar from 13 to 14 April 2010. This meeting developed the practical framework to conduct the evaluation including (Templates, Report frame, List of earth station components to be evaluated, etc.). The meeting approved the conclusions of the joint Technical meeting presented in **Appendix C** through the following decision:

Decision 18/01: Adoption of the Report of the first meeting of the AFISNET Joint Technical Evaluation and Re-engineering Team

That;

The Conclusions of the first meeting of the AFISNET Joint Technical Evaluation and Re-engineering Team be adopted as presented in Appendix C.

Agenda Item 7: AFISNET modernization and re-engineering

7.1 The meeting discussed the implementation of SP AFI/RAN Conclusion 6/18: AFISNET Technical Evaluation and re-engineering, that calls for AFISNET Evaluation and re-engineering through the actions undertaken on the subject since SNMC/17.

7.2 The meeting noted that the joint technical evaluation and re-engineering exercise was successfully conducted from 01 to 30 June 2010, as stated in the relevant report presented in **Appendix D**.

7.3 Roberts FIR and ASECNA, nominated to coordinate preparation of the final Report of the Joint Technical Evaluation and re-engineering exercise submitted the report to the meeting for discussion and further action.

7.4 The recommendations of the report stated that AFISNET dysfunctions are mainly caused by failure of Automatic Messages Switch Systems, failure or incompatibility between VCSS, lack of calibration of test equipments, and lack of redundancy of modems. The meeting therefore formulated the following conclusion:

Conclusion 18/08: Implementation of the recommendations of the Joint Technical Team for AFISNET Evaluation and Re-engineering

That:

States/Organizations are urged to implement the recommendations of the report of the AFISNET Joint Technical Evaluation and Re-engineering Team as presented in Appendix D by focusing their efforts on the following items:

- a) Clearing current malfunctions;**
- b) Upgrade of Multiplexers;**
- c) Upgrade of Automatic Messages Switching Systems**
- d) Upgrade of VCSS**
- e) Redundancy of modems and multiplexers**
- f) Calibration of test equipments**

7.5 The secretariat informed the meeting that some SNMC neighboring centers, namely SAT states are modernizing their end users interface facilities and that exercise required regional coordination for end to end compatibility and interoperability. It was noted that for the current and forthcoming Messages or Voice Switching systems coordination should be undertaken to ensure their compatibility and interoperability.

7.6 The meeting therefore raised the necessity to collect compile and circulate the technical data to facilitate the interoperability of the systems. In this regard the following conclusion was formulated.

Conclusion 18/09: Sharing of technical data

That:

All Administrations/Organizations send relevant technical data on current and intended Automatic Messages Switching and Voice Communication Switching Systems upgrades to ICAO WACAF Office for tabulation and further remittance to administration for their study.

7.7 The secretariat provided the meeting with the status of implementation of new messages switches in WACAF and its neighboring centers and informed the meeting that CNS/SG/3 took a draft conclusion asking APIRG/17 to create an AFI AMHS implementation Task Force. The meeting examined the status of implementation of the upgrade/replacement of AFTN messages Switches in SNMC centers and recognized that some progress is ongoing in the view of the implementation of AMHS as part of ATN.

7.8 Moreover, the meeting discussed in length the transition (from AFTN to AMHS) exercise and stated on the necessity to ensure AFS/AFTN continuity of service during this transition period. The meeting therefore formulated the following conclusion.

Conclusion 18/10: Continuity of AFTN Service

That:

When upgrading/replacing Automatic Messages Switching Systems, Administrations/Organizations should consider backward integration with existing messages switches with the emerging technology (AMHS) in order to ensure the continuity of AFTN service within the transition (AFTN/AMHS) time.

7.9 The secretariat provided the meeting with the conclusion of SAT/15 meeting which deals with the issue of ATS-Voice numbering Plan in accordance to the ICAO Manual on ATS Ground-Ground Voice Switching and Signaling (**Doc 9804, Chapter 2 Section 2.3**). It was noted that some SAT States have been conducting trials on ATS-Voice switching which needs ATS-Voice numbering Plan.

7.10 It was recognized that the implementation of the Voice Switching in SNMC centers, requires a close coordination between ANSPs.

7.11 The meeting supported the SAT/15 meeting conclusion that calls **APIRG** to create an AFI Working Group to conduct the technical study for the development of a global ATS voice numbering plan for AFI Region and harmonize its implementation frame.

The following conclusion was therefore formulated.

Conclusion 18/11: ATS-Voice Numbering Plan

That:

When upgrading/replacing Voice Communication Switching Systems Administrations/Organizations should take into consideration the need of an ATS-Voice numbering plan for AFI.

7.12 Ghana Civil Aviation Authority drew the participants attention on the need to calibrate the AFISNET Test Equipments in order to ensure the reliability of the parameters measured during maintenance operations. The meeting also noted that in a RVSM managed space context and to comply with SMS requirements, the maintenance operations must obey to some referential rules.

7.13 However the investment for the realization of a Test Equipments Calibration Center is costly for individual ANSP in regard with the number of Test Equipments to be calibrated. The meeting agreed that SNMC members effort can be joined for the creation of a common calibration center for Test Equipments through the following conclusion.

Decision 18/02: Need of a calibration center for AFISNET Test Equipments

That:

A common calibration center for test equipments be established in the WACAF region for the benefit of members States/Organizations as well as external client.

7.14 AFISNET Maintenance Personnel management was deeply discussed by the meeting. It was stated that all the SNMC Maintenance structures are facing lack of either adequate teams or suitable training courses for the maintenance Personnel.

7.15 It was also noted that real opportunities could be taken through partnership with satellite Providers and facilities Vendors for the provision of updated courses.

7.16 The meeting also recommended that the training mechanism be built in line with ICAO ATSEPs recommended programme followed by licensing of qualified Personnel. The following conclusion was formulated.

Conclusion 18/12: AFISNET Maintenance Human Factors

That:

AFISNET Administrations /Organizations provide AFISNET maintenance structures with adequate personnel with appropriate training:

- a) Training workshops should be performed in partnership with industry (Satellite Service Providers, facilities vendors....) in order to take benefit from their expertise in the current and emerging technologies;**
- b) Training should be in line with ICAO ATSEPS recommended programme followed by licensing of qualified personnel.**

7.17 The meeting discussed at length to find the best way to realize the re-engineering of the network based on the joint technical evaluation. It was agreed to update the mandate of the Joint Technical Team tasked to pursue the technical study for the re-engineering. The study should focus on AFISNET topology, components, base-band and satellite access, and bandwidth optimization.

7.18 Meanwhile, the meeting agreed that States/Organizations take the urgent appropriate actions to clear the pending current deficiencies before the end of year 2010.

Thus the following conclusion was formulated.

Decision 18/03: Update the mandate of the Joint Technical Evaluation and Re-engineering Team

That:

The Joint Technical Evaluation and Re-engineering Team pursues the task assigned to it by SNMC/17 and complete the study for AFISNET re-engineering by the end of September 2010.

This study will focus on the following items taking into consideration advantages/disadvantages, cost/effectiveness, reliability and safety risks aspects:

- a) AFISNET topology;**
- b) AFISNET components;**
- c) AFISNET base band and satellite access; and**
- d) AFISNET bandwidth optimization.**

Meanwhile, States/organizations are to take the urgent appropriate actions to clear out the pending current deficiencies before the end of year 2010

7.19 Nigeria provided the meeting with its ongoing domestic VSAT project to support Aeronautical Mobile Service and Surveillance Data transmission. The meeting was moreover

informed that NAMA is modernizing its AFTN system with an option of AMHS compatibility.

7.20 The secretariat informed the meeting that CNS/SG/3 has called for a Task Force to be established in order to coordinate AMHS Implementation in the AFI Region and invited SNMC members to take this information into consideration when planning and implementing their AFS systems.

7.21 It was also noted that the SAT/15 meeting discussed the issue of ATS-Voice numbering plan for AFI and called on APIRG to create an AFI Working Group to conduct the technical study for the development of a global ATS voice numbering plan for the AFI Region and harmonize its implementation frame.

Agenda Item 8: AFISNET band width re-engineering;

8.1 The secretariat presented WP/9 which stated that the obsolete base-band components of AFISNET have been gradually replaced by other modems in the framework of coordinated arrangements between ASECNA, NAMA and Ghana.

8.2 Thus, the major part of the spectrum allocated to the IBS system is currently unused, while States/Organizations continue to be charged for unused IBS bandwidth.

8.3 The meeting examined the status of implementation of Conclusion 17/10 of SNMC/17 calling for IBS band conversion and noted that it has not been implemented. The meeting agreed that each State/Organization should update the current status of usage of IBS frequencies for a technical/financial meeting with INTELSAT.

The following conclusion was formulated:

Conclusion 18/13: Conversion of IBS Band to leased band

That:

States/organizations pursue and complete the implementation of conclusion 17/10 of SNMC17 by adopting the following process:

- a) IBS carrier status of stations be forwarded to ASECNA for compilation and transmission to INTELSAT; and**
- b) A Technical/financial meeting be held by SNMC members with INTELSAT to ensure the conversion of IBS band to a leased band.**

Agenda Item 9: Review of CNS/SG/3 conclusions related to AFISNET

9.1 The meeting provided an opportunity to address the participants on the AFISNET related conclusions of the CNS/SG/3 meeting (Nairobi, Kenya, 26-30 April 2010). The secretariat presented WP/10 that summarized the concerned conclusions and draw the attention of the participants on the fact that these conclusions will be submitted to the APIRG/17 meeting,

9.2 It was noted that the CNS/SG/3 meeting developed three draft conclusions dealing with the provision of Aeronautical Fixed Service (ATS/DS & AFTN) through AFISNET and one draft conclusion related to AFISNET Evaluation and re-engineering as follows:

- Conclusion 03/2 for AFTN links
- Conclusion 03/7& 03/9 for ATS/DS links
- Conclusion 03/11 for AFISNET Network evaluation and re-engineering

9.3 The Ghana Civil Aviation Authority informed the meeting that the Luanda/Accra ATS/DS link has been successfully established.

9.4 For the improvement of Aeronautical Mobile Service (AMS) in the AFI Region the meeting noted that CNS/SG/3 developed the following two draft conclusions that address VHF coverage in airspace of SNMC member States/Organizations and encourage AFI States to cooperate with IATA during the AMS (VHF/HF) Coverage surveys:

- Conclusion 03/14 calling for the completion and the improvement of VHF coverage; ASECNA and NAMA are concerned.
- Conclusion 03/15 urging AFI States to cooperate with IATA during the AMS (VHF/HF) coverage surveys; the forthcoming survey is planned from 7 to 25 June 2010.

These conclusions are presented in **Appendix E**.

9.5 The meeting noted that these CNS/SG/3 meeting conclusions are to be taken into account by SNMC members in order to clear the current deficiencies. The following conclusion was formulated:

Conclusion 18/14: Implementation of CNS/SG/3 draft conclusions related to AFISNET

That:

SNMC member States/Organizations are urged to implement the draft conclusions of CNS/SG/3 meeting related to AFISNET as presented in Appendix E pending APIRG/17 approval;

When updating the current deficiencies status for submission to APIRG/17 ICAO deletes the operating Accra/ Luanda link from the list of AFS deficiencies.

Agenda Item 10: AFISNET integration with other AFI regional networks (CAFSAT, NAFISAT, SADC/2)

10.1 The meeting was provided with the status of interconnection between AFISNET and its neighboring Networks (CAFSAT, NAFISAT, and SADC/3) and noted that the interconnection was completed as planned. AFISNET is now linked to CAFSAT, NAFISAT and SADC/3 through a balanced interconnection procedure.

10.2 However, in order to clear some remaining unimplemented circuits the interconnection of AFISNET (Brazzaville & Bangui) with stations located in DRC (Kinshasa & G'badolite) should be undertaken.

The following conclusion was formulated:

Conclusion18/15: Interconnection between AFISNET and neighboring Networks

That:

The concerned States/Organizations are urged to complete the interconnection exercise of AFISNET with neighboring networks and in particular for ASECNA to take the appropriate actions in coordination with RVA (DRC) to realize the interconnection between the following nodes by the end of year 2010:

- a) **Brazzaville/Kinshasa**
- b) **Bangui/G'Badolite**

ICAO WACAF supports the bilateral arrangements between ASECNA and RVA.

Agenda Item 11: Required Communication Performance for AFISNET

11.1 Under this agenda the secretariat briefed the meeting with the concept of Required Communication Performance (RCP) to support Aeronautical Mobile Service provision through satellite based remote VHF stations.

11.2 The meeting took note of this information and concluded that this concept is a helpful tool for the provision of AMS in the framework of RVSM and SMS requirements. The following conclusion was then formulated:

Conclusion18/16: RCP for AFISNET

That:

SNMC members take advantage of RCP requirements stated in ICAO Doc 9869 to improve the provision of VSAT based Aeronautical Mobile Service and ensure the availability of AFISNET hubs and remote VHF stations accordingly.

Agenda Item 12: Updating SNMC Form of Agreement.

12.1 The secretariat provided the meeting with a draft Form of Agreement and Terms of Reference for AFISNET through WP/13. This form is presented in **Appendix F**.

12.2 The meeting decided that this proposal should be circulated for input before its final approval.

Therefore the following conclusion was formulated:

Conclusion18/17: Form of agreement and Terms of Reference of AFISNET

That:

- a) **The draft Form of Agreement and Terms of Reference of AFISNET be circulated by SNMC secretariat as soon as possible;**

- b) States/Organizations forward their comments and remarks not later than 3 September 2010; and
- c) ICAO compiles and forwards the amended Form of Agreement and Terms of Reference of the SNMC to be signed by the end of December 2010.

Agenda Item 13: Any other business

Technical Audit of AFISNET

13.1 The meeting was informed by ASECNA that the Agency plans to conduct an external technical audit of AFISNET nodes located in its centers.

13.2 The meeting applauded this exercise and noted that in order to reach successful results such audit should be global and should involve the whole AFISNET nodes.

13.3 ASECNA was invited to circulate the draft Terms of Reference of the audit for inputs and compilation by the secretariat.

The following conclusion was formulated:

Conclusion 18/18: Technical Audit of AFISNET.

That:

In the framework of the implementation of SP AFI RAN conclusion 16/18 and in order to consolidate the recommendations within the report of the Joint Technical Evaluation and Re-engineering Team, an AFISNET global technical audit be conducted.

In this regard:

- a) ASECNA is to circulate draft Terms of Reference for the Technical Audit not later than 30 September 2010;
- b) SNMC members are to review the draft report and forward comments to ICAO; and
- c) ICAO to compile and finalize the Terms of Reference for a call for Tenders.

SNMC Next Meeting

1. Since its inception, SNMC meetings are hosted by States/Organizations successively with no formal schedule. In view of the expected future Terms of Reference the meeting tasked the secretariat to develop a draft schedule of future meetings over the next 5 years. This template is presented in **Appendix G**.

2. The meeting welcomed the offer of Ghana to host the next SNMC/19 meeting. ICAO will coordinate with Ghana on the precise venue and dates, and SNMC members notified in due course.

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APPENDIX B: Follow up SNMC/17 Conclusions.

Conclusions	Implementation Status	Remarks
<p>Conclusion 17/01: Implementation of outstanding conclusions</p> <p>That AFISNET Administrations and Organizations pursue implementation of, or endeavour to implement, outstanding conclusions from SNMC previous meetings concerning, <i>inter alia</i>:</p> <ul style="list-style-type: none"> c) the implementation of a corrective action plan to restore system reliability and availability as required; d) the exchange of personnel between centres; e) the training of personnel, including language proficiency ; f) the implementation of coordination and monitoring procedures ;and g) cooperative actions regarding the AFS circuits implementation/improvement; the following circuits should be considered: <p>ACCRA – KANO, BRAZZAVILLE-KANO, OUAGADOUGOU -NIAMTOUGOU</p>	<ul style="list-style-type: none"> a) Still valid b) Still valid c) Still valid d) Still valid e) Pending 	
<p>Conclusion 17/02: AFISNET Network Joint Technical Evaluation and Re-engineering</p> <p>That:</p> <p>The Joint Technical Team for AFISNET Network Evaluation and Re-engineering</p> <ul style="list-style-type: none"> • 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 	<ul style="list-style-type: none"> Completed On going 	

<p>AFISNET network</p> <p>Each State/Administration should nominate two experts to participate in the Joint Technical Team, and forward their names to the ICAO Regional Office.</p>	<p>Deadline delayed</p> <p>Meeting held on 13-14 April 2010</p> <p>Completed</p>	
<p>Conclusion 17/03: Analysis of operational statistics of availability</p> <p>That</p> <p>a) AFISNET Centres endeavour to submit their monthly AFTN availability statistics to the ICAO Regional office</p> <p>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.</p>	<p>Completed</p> <p>Completed</p> <p>Completed</p>	<p>NAMA to send regularly the data</p>
<p>Conclusion 17/04: Facility mean time between failure (MTBF)</p> <p>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.</p>	<p>Still Valid</p>	
<p>Conclusion 17/05: Updating the AFI COM chart</p> <p>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.</p>	<p>Still Valid</p>	
<p>Conclusion 17/06: Geographical data for AFISNET nodes</p>	<p>Still Valid</p>	

<p>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.</p>		
<p>Conclusion 17/07: Basic parameters exchange</p> <p>That the AFISNET members exchange the parameters for all managed links, as per Appendix E to this report.</p>		Status to be provided by states /Organizations
<p>Conclusion 17/08: Guidelines on performance for VSAT networks</p> <p>That AFISNET Administrations and Organizations make use of the guidelines for the performance of VSAT networks as agreed to at the SP AFIRAN 08 meeting and provided in Appendix F to this report.</p>	On going	
<p>Conclusion 17/09: Interconnection of AFISNET, SADC/2 and NAFISAT networks</p> <p>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.</p>	Pending Still valid	Depending on the Joint Technical evaluation exercise results
<p>Conclusion 17/10: IBS carriers bandwidth conversion</p> <p>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.</p>	Still Valid	

<p>Conclusion 17/11: Attendance to INTELSAT training meeting in Dakar</p> <p>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.</p>	Completed	
<p>Conclusion 17/12: Follow-up of SP AFI RAN 08 recommendation 6/19</p> <p>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.</p>	Still valid	CAFSAT Network is now provided with a CAFSAT Network Management Committee. Arrangement to be made for this meeting



INTERNATIONAL CIVIL AVIATION ORGANIZATION
WESTERN AND CENTRAL AFRICAN OFFICE

**AFISNET JOINT TECHNICAL EVALUATION AND RE-ENGINEERING
TEAM LEADERS MEETING**

(Dakar, Senegal, 13-14 April 2010)

Draft Conclusions

Conclusion 1: Implementation of the previous regional meetings conclusions (APIRG/16 Report, SPI/AFI/RAN Report, SNMC/16 & 17 Reports)

That:

SNMC States/organization endeavor to implement the joint Technical evaluation and re engineering pertaining to AFISNET in the framework of the conclusions of APIRG, SPI/AFI/RAN, SNMC/16 & 17) before the next SNMC/18 meeting scheduled for 1-3 June 2010.

Conclusion 2: Terms of Reference and work programme of AFISNET Joint Technical Team

That:

The joint technical team conducts the evaluation of AFISNET as agreed in the reviewed Terms of reference and work programme as presented in appendix XXX.

Conclusion 3: Evaluation charts

That:

The joint technical evaluation be conducted using the charts presented in Appendix xxx in order to harmonize the evaluation process of the teams.

Conclusion 4 : Evaluation Report Framework

That:

The joint technical evaluation be conducted using the report framework adopted as Appendix xxx in order to harmonize the reports of the evaluation teams.

Conclusion 5: Evaluation planning

That:

The joint technical evaluation be conducted within the plan adopted as Appendix xxx and to adhere to the given time frame.

Conclusion 6: Expert availability for the evaluation period

That:

SNMC States/Organization should take the appropriate actions to ensure the availability of the experts within the stated time frame.

Conclusion 7: Evaluation funding

That:

Each SNMC State/Organization funds their experts for their participation to the evaluation process as mandated by the regional and sub regional meetings (APIRG, SPI/AFI/RAN, SNMC) within the stipulated plan as presented in appendix xxxx

Conclusion 8: Final Report Meeting

That:

The Joint Technical Team should meet in Dakar WACAF on the 17th & 18th of May 2010 in order to harmonize and finalize their findings for submission to the next SNMC meeting scheduled for 1-3 June 2010.

ASECNA/GCAA /NAMA/ROBERTS FIR

JOINT TECHNICAL EVALUATION OF AFISNET

DRAFT REPORT

May 2010

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GLOSSARY

8-PSK 8- Phase Shift Keying

A

AAC Aeronautical Administrative Communications
AFISNET Africa Indian Sub NETwork ocean area
AFTN Aeronautical Fixed Telecommunication Network
AMSS Aeronautical Message Switching System
ANSP AeroNautical Service Provider
ASR Air Safety Report
ASECNA Agency for the Safety of Air Navigation in Africa and Madagascar
ATN Aeronautical Telecommunications Network
ATS Air Traffic Services

B

BW Bandwidth
BER Bit Error Rate

F

FDMA Frequency Division Multiple Access
FTDMA Frequency Time Division Multiple Access
FEC Forward Error Coding

G

GCAA Ghana Civil Aviation Authority
GNSS Global Navigation Satellite System

I

ICAO International Civil Aviation Organization
INTELSAT INTernational TELEcommunication SATellite

M

MF-TDMA Maintained Frequency – Time Division Multiple Access
MCPC Multiple Channel Per Carrier
MOL2P Multiplexeur Optimisant la Liaison avec Priorité à la Parole

N

NAFISAT North Eastern AFI VSAT network
NAMA Nigeria Airspace Management Agency
NMS Network Management System

O

OPMET Operational Meteorological data exchanges

P

PEP Performance Enhancing Proxies

Q

QoS	Quality of Service	
QPSK	Quadrature Phase Shift Keying	R
RS	Reed Solomon Error Correction Code	S
SADC	Southern African Development Community	
SCPC	Single Channel Per Carrier	T
TCP	Transmission Control Protocol	
TDMA	Time Division Multiple Access	V
VCSS	Voice Communication Switching System	
VSAT	Very Small Aperture Terminal	

1 PREAMBLE

1.1 BACKGROUND

In order to improve Air Navigation Safety in the Western and central Africa region, the satellite based Telecommunications network called AEROSATEL (renamed AFISNET) was conceived between 1986 and 1987 by ICAO and funded by European Union in 1992. At the beginning eight stations for Nigeria, one for Ghana and six for ASECNA countries (Cameroon, Central Africa, Congo, Gabon, Niger and Chad) were implemented by ALCATEL.

Afterwards, the network was widened with the implementation of new stations in Dakar, Abidjan, Roberts FIR, Antananarivo and in other countries in western, Central, southern and northern Africa, Indian ocean (Maurice Island, Ile de la Reunion) and in Europe (Las Palmas, Toulouse).

As of today AFISNET comprises more than seventy (70) earth stations of B standard (11m), F2 (7.30m), F1 (3.7-4.5m) operating mainly in FDMA / SCPC mode in mesh/star topology.

AFISNET migrated successfully from satellite IS-903@325.5° East to satellite IS-10-02@359° East and is currently operating on transponders 20 EH/ 20 EH and 23 EH/ 23 EH and is fully interconnected to NAFISAT and SADC-2.

In the meantime, some domestic networks are using different protocols, satellite access as appeared in Ghana (FTDMA), Nigeria (TDMA), ASECNA (TDMA) and Roberts FDMA.

1.2 PURPOSE OF THE EVALUATION

- Evaluate the physical and operational performances of AFISNET
- Take corrective action in addressing malfunctioning of AFISNET nodes
- Preparation of the AFISNET audit

1.3 ASSIGNED OBJECTIVES

In accordance with the term of reference, the main objectives of the network evaluation are to:

- Identify its deficiencies and non-ICAO, WMO and ITU compliant elements/features;
- make the appropriate recommendations and proposals regarding the short-term, mid-term and long-term solutions and strategies to be implemented using appropriate modern technologies for achieving an enhanced, efficient, high performance, secure, CNS/ATM capable and cost-effective network, meeting interoperability and seamlessness requirements; and
- evaluate the anticipated costs in view of a comprehensive project document to support a collective financing mechanism

1.4 METHODOLOGY

In accordance with the conclusions 16/07 and 17/02 and the SP RAN AFI/8 the SNMC established a joint technical team in order to conduct a comprehensive assessment of the network potential for current and future requirements and applications.

The first meeting of the joint technical Evaluation and Re-engineering team leaders was held in WACAF (Dakar 13-14 April 2010) and adopted the evaluation framework including the charts, the planning and the technical subgroups.

The joint technical team comprising representatives from ASECNA (Agency for the Safety of Air Navigation in Africa and Madagascar), NAMA (Nigeria Airspace Management Authority), GCAA (Ghana Civil Aviation Authority), Roberts FIR carried out the evaluation of AFISNET.

Samples of eleven (11) earth stations were identified for the evaluation process.

2 PRESENTATION OF AFISNET (SERVICES, APPLICATIONS, TOPOLOGY)

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:

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

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

- Aeronautical Telecommunications Network (ATN)
- GNSS augmentation data transmission.
- Computer-to-computer data exchanges (ICC) between ATS Flight Data Processing Systems (FDPS); and
- Air/ground data link applications (ADS/CPDLC, ADS-B, DFIS, VDL...)

2.1 DESCRIPTION AND EVALUATION OF SERVICES AND APPLICATIONS

2.1.1 DESCRIPTION AND EVALUATION OF THE AFTN

2.1.1.1 OPERATIONAL ASPECT

The Joint Technical Evaluation Team noted that most of the required AFTN circuits are implemented through direct satellite links with a minimum speed rate of 2400 bps, through X25 and/or V24 protocols and alphabet ITA2 or IA5. Bilateral circuits are also implemented and are taken into account in the AFTN routing table in order to improve the availability of AFTN service.

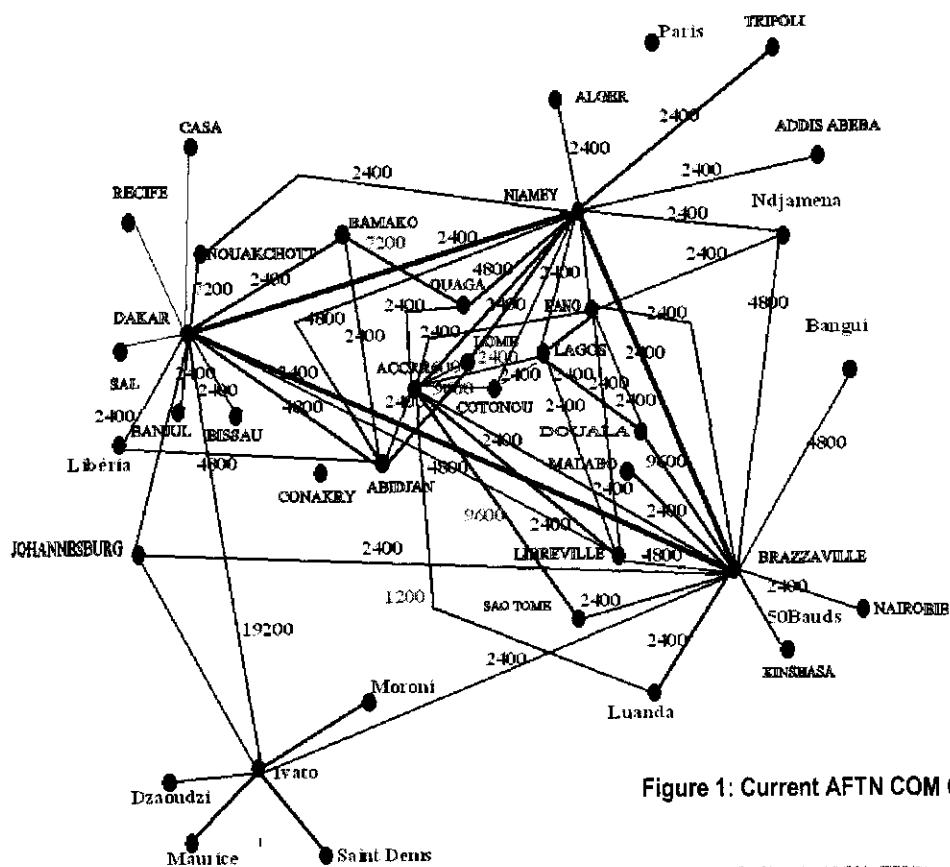


Figure 1: Current AFTN COM Chart

7200 Indirect (OUA-BKO)

Nevertheless the operational status recorded during the evaluation and the statistics provided by the visited sites indicated:

- A relative important number of AFTN circuits are performing below the required minimum of 97% and others are fluctuating between 80 and 97%.
- Instabilities on some links (Accra- Ouagadougou, Accra- Brazzaville, Kano-Brazzaville, etc);
- Several AFTN circuits have been out of service for a long time (Kano-Accra, Ndjamena-Maiduguri, Brazzaville-Luanda
- The lack of appropriate synchronization tool for Aeronautical Messages Switching Systems has resulted in difficulties to get accurate transit time statistics; however the transit times from the European CFMU are under five minutes.
- None concordance in transmit and receive messages statistics for the same circuit with difficulties to analyse the loss of messages ;
- Some AMSS statistics are not always accurate;
- Human errors are impacting on the accuracy of statistics.
- X25 AFTN circuits are being migrated to V24.

2.1.1.2 TECHNICAL ASPECTS

The evaluation of the aeronautical message service (AFTN link availability, AFTN message availability, OPMET availability) shown that:

- Most of the AMSS were not synchronized to the general hour's system of the ANSP Technical Block. (transmit time was not possible to be assessed).
- The AMSS of some sites are outdated.
- Even the basic functionalities are not provided by the Aeronautical Messages Switching Systems, they must be upgraded on several sites where they have been in operation for more than ten years and cannot support some essential functionality (operational statistics based on the message type for example, management of messages tolerance as recommended by ICAO Annex 10 Volume 2, etc).

However, the mission was informed of the project relating to the implementation of a GPS clock on systems and operational services by some ANSP at ASECNA and NAMA.

2.1.2 DESCRIPTION AND EVALUATION OF ATS/DS

2.1.2.1 OPERATIONAL ASPECT

The Joint Technical Evaluation Team evaluated the ATS/DS in terms of implementation and performances and found out that:

- Most of the ATS/DS links are implemented through direct satellite links, however some links are still implemented by routing with double or triple hops (Ouagadougou/Abidjan, Bamako/Abidjan, Roberts/Bamako, Ouagadougou /Bamako) and are not reliable;
- Even though the performances are generally good, several links are not working properly and recorded long connection time. Time to establish communication, notably (Kano/Accra, Abidjan/Ouagadougou, Lagos/Libreville);
- ATS/DS links used direct or indirect connection with numbering through the VCS or PABX systems; if possible they should be implemented directly.
- Basically, most of the centers use Voice Communications Switching System, nevertheless some are out of date and don't work properly and faced spare parts problems;
- Several links are connected out of the VCCS due to incompatibility (FXS/FXO, E&M) or lack of capacity;

- The PoBox supplied at the beginning of the network is no longer used and the ANSP are implementing new VCSS;

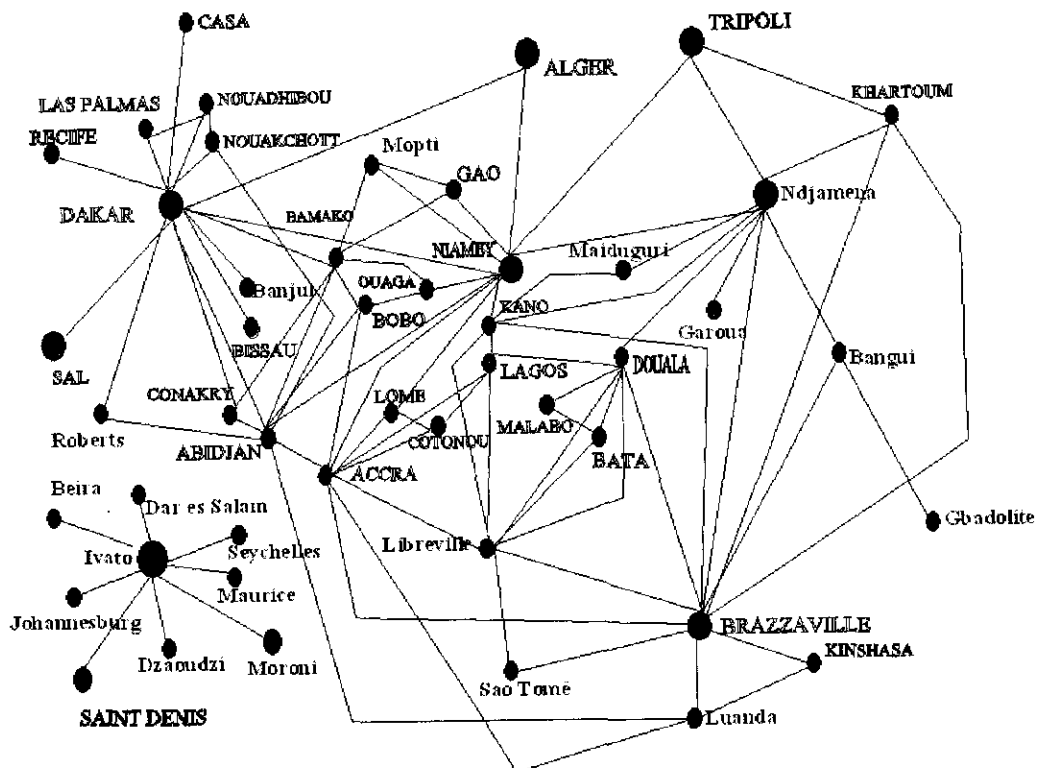


Figure 2: Current ATS/DS Links Chart

2.1.2.2 TECHNICAL ASPECT

The mission noted that:

- Some centers, are not yet equipped with VCSS and use many telephone sets installed generally in isolated ways in the controller's working Table, providing a difficult working environment for the controller.
- The installation project of VCSS is ongoing in Douala and Libreville
- Some of the centers are VCSS equipped with limited capacities making it impossible to integrate supplementary ATS/DS links.
- Most of the VCSS were not synchronized to GPS Clock Switch.
- The difficulties to implement some ATS/DS links are due to the interoperability issues between some ANSP VCSS.

The Joint technical Team noted ongoing VCSS projects in Kano, Douala, and Libreville.

Recommendations

Administrations/Organization:

- Should synchronize their VCSS to GPS clocks.
- Should accelerate the projects of implementing new VCSS.
- Should upgrade their VCSS in order to allow the integration of new ATS/DS links.
- Should solve the interoperability/interfacing aspects between ANSP VCSS by making their VCSS fully compliant with the "recommended switching and signalling system" as specified in ICAO Doc 9804 AN/762.

2.1.3 DESCRIPTION AND EVALUATION OF REMOTE VHF

ASECNA, GCAA, NAMA and Roberts FIR took advantage of AFISNET to extend their VHF coverage by deploying remote VHF via VSAT. As of today, more than fifty remote VHF stations have been implemented and are working normally under various conditions. These networks are built on star topology; around the hub stations with redundancy architecture guaranteeing an utmost availability of the service.

Based on the survey carried out by the controllers during the Joint Technical Evaluation, we came to the conclusion that the remote VHF providing air/ground communications are in good conditions. The quality (strength and clarity) of voice were evaluated and are between 3 and 5 when the remote stations are in operational mode.

However some deficiencies were recorded in the operation of remote VHF. The ASR (Air Safety Report) and the results of the last IATA/ANSP VHF/HF availability survey indicated sometimes lack of VHF or insufficient VHF coverage, low quality of the VHF. Some stations stay out of service for a long time. Most of the deficiencies regarding extended VHF coverage are in majority related to maintenance problems.

Extended VHF coverage projects are ongoing in Roberts FIR and in ASECNA areas to improve the VHF availability (densification).

- Power Supply problems;
- Delays in repairing stations failures ;
- Hostile environment (isolated sites)

2.1.4 DESCRIPTION AND EVALUATION OF THE ARCHITECTURE AND HARDWARE

AFISNET operates on the satellite IS-10-02@359°E on transponders 20EH /20EH and 23EH /23EH and is built as a mesh /star network topologies operating on SCPC/ FDMA access. Based on the services requirement, AFISNET operate on 19.2 Kb/s, 32 Kb/s and 64 Kb/s carriers.

The following diagram provides the current architecture derived from the existing equipment and services.

2.1.4.1 HARDWARE

2.1.4.1.1 MULTIPLEXERS

The mission noted that most of the multiplexers in used were put into service more than ten (10) years ago. Some of these multiplexers (MICOM for example) are no longer manufactured consequently; their spare parts are no longer available.

The job cards of each equipment, after the installation were not available, that is why the MTTR and MTBF were not available in order to establish the availability ratios of the multiplexers.

The mission is also aware about the migration project of MICOM multiplexers in ASECNA, by the new generation of multiplexers available on the market.

In most of the sites multiplexers are not redundant in order to ensure the reliability of the links.

2.1.4.1.2 SATELLITE MODEMS

Currently different modems are deployed in many AFISNET nodes. Notably: FASTCOM, DATUM, COMTECH, COMSTREAM and PARADISE. Some of these modems operate in L band and C band (70 and 140 MHz).

2.1.4.1.3 UP/DOWN CONVERTER

The mission has inventoried the following types of UP/DOWN Converters: ADVANTECH, MITEQ, and ALCATEL. The mission noted the usage of many additional amplifiers and splitters in cascaded connections.

2.1.4.1.4 SOLID STATE POWER AMPLIFIER (SSPA)

The recorded SSPAs have been in service for ten (10) and are presently experiencing signs of aging deficiencies and they have to be progressively replaced.

2.1.4.1.5 ANTENNA CONTROL UNIT ACU/MORIZATION UNIT (MU)

Those units have been put in service since the installation of the earth stations and deserve to be modernized.

2.1.4.2 TEST EQUIPMENTS

The joint technical evaluation has noted that almost all the test equipment used for maintenance purposes weren't calibrated since their acquisition.

2.1.4.3 SPARE PARTS

The JTE noted the unavailability of spare parts for all types of equipment in operation and backup equipments in some centers.

2.1.5 ENVIRONMENT

The visited earth stations are working in relatively, good conditions with ambient temperature and an uninterrupted supply of clean energy. However most of them don't have hygrometer and thermometer sensors.

2.1.6 HUMAN FACTORS

The earth stations should compose of staff in quantity and quality to be able to face adequately the different technical challenges. But most of the time, the Technical and operational staff did not benefit from adequate training in satellite techniques, unless occasional site and factory trainings often quick and not in depth.

3 SUMMARY CONCLUSIONS AND PROPOSALS

Compare to the initial architecture and topology, AFISNET has experienced a significant and deep evolution at the base band level, the large band and the RF equipment. The analogical ALCATEL multiplexer have been entirely replaced by digital MICOM/ MOL2P multiplexers since 2000 and the migration is still ongoing with the introduction of MEMOTEC type multiplexer.

To harmonize the networks, AFISNET States/Organizations should agree on the choice of a new generation multiplexer as the MICOM/ MOL2P are not currently manufactured and the spare parts are limited.

In all the sites the IBS modems and transpositions equipments have been decommissioned and replaced by modern satellite modems and transposition equipments, with modern protocols and efficient modulation (QPSK, 8-QPSK...). DATUM modems are currently the most used in majority of the sites visited whereas COMTECH EF DATA is used in Roberts FIR and PARADISE in NAMA domestic stations. These equipments are performing very well and are recording good reliability.

All the RF subsystems have been upgraded with SSPA which are performing quite well. States/Organizations should have a progressive upgrading plan of these equipments before they reach the end of their span.

Terminal equipments (AMSS, VCSS...) and human factors contributed greatly to the level of performance of the networks. AFISNET States/Organizations must address this issue and provide the necessary training required to operate modern equipment.

During the evaluation, some deficiencies were identified and addressed; others require more time or a deeper investigation. However these deficiencies are often due to lack of coordination or language barrier.

Even with these deficiencies, services are provided with relative satisfactory; all of the above concerns need to be adequately addressed for a smooth transition of the network into the new satellite communications technology to optimize the network in terms of efficiency and bandwidth. The evolution should take into account the existing status of the network including the improvement done by each States/Organization in diversified circumstances.

- First solution : Using the current satellite access FDMA, migrate the users access (SCPC) to MCPC
- Second solution : changing the satellite access type from FDMA to TDMA

The two solutions have to be evaluated in term of cost and operational impact.

4 RECOMMENDATIONS OF THE JOINT TECHNICAL EVALUATION TEAM

The joint technical evaluation exercise was conducted on the framework of the agreed templates adopted by all members present in the Dakar meeting.

The teams are pleased to bring to ICAO notice that, we were well received in all the stations visited; technical staffs were extremely willing to readily make available required information/data. Overall, all the stations visited are robust and are working normally. However, since aeronautical services require the utmost from each telecommunication node, the team is recommending the following:

4.1 UPGRADE OF THE AUTOMATIC MESSAGES SWITCHING SYSTEMS

The States/Organizations should upgrade and synchronize their Automatic Messages Switching Systems in order to be fully compliant with ICAO standard as they are almost reaching the end of their lifespan in order to provide reliable statistics tools to assess rightly the performances of the network.

4.2 ELIMINATING OF THE AFTN AND ATS/DS CIRCUITS DEFICIENCIES

As a matter of emergency, the States/Organizations should improve the availability of AFTN circuits performing less than 97% and restore the faulty circuits identified during the evaluation process particularly: Kano/Accra, Brazzaville/Kinshasa, Brazzaville Luanda, Brazzaville/Accra, Accra/Ouagadougou, Accra/Libreville, Libreville/Kano, etc.

4.3 UPGRADE OF THE VCSS

As soon as possible the States/Organizations unless it has been done, should upgrade their VCSS in order to improve the availability of the ATS/DS links.

They should coordinated and take into account *interface issues when implementing new systems* in order to eliminate the problem of compatibility and interoperability

4.4 MAINTENANCE OF REMOTE VHF STATIONS

The States/Organization should improve the maintenance procedure of remote VHF to reduce the unavailability of remote VHF stations and should expedite the implementation of new remote VHF stations to provide a good coverage of the airspace

4.5 MAINTENANCE AND OPERATIONAL PROCEDURES BETWEEN ADJACENT CENTERS

Standard Operational and maintenance Procedures should be established and applied between adjacent centers in order to minimize the impact of coordination on the performances of the network; the procedure manuals should be made readily available between the adjacent centers.

4.6 REDUNDANCY AND MIGRATION OF THE MULTIPLEXERS

In order to improve the reliability of all the satellite links, the States/Organizations should plan the migration of current multiplexers as they are reaching the end of their lifespan and some manufacturers have ran out of business; so they should agree to choose robust multiplexers which allow dynamic routing for the management of the service channels and adopt multiplexers redundancy in their project

4.7 REDUNDANCY OF THE MODEMS

In order to enhance the reliability of the links, States/Organizations should ensure the redundancy N+1 of satellite modems, and should coordinate for the technology choices in order to avoid incompatibility/interoperability problem before implementing new satellite links; Administrations/Organization should promote the usage of satellite modems in L band (wide spectrum) during the implementation of new satellite links.

4.8 SPARE PARTS AVAILABILITY

Spare parts should be made readily available at all stations and the means used to transport spares from one node to the other should be greatly improved in order to shorten down time of aeronautical services.

4.9 TEST EQUIPMENTS

Administrations/Organization should make the necessary arrangements in order to calibrate all the test equipments.

4.10 PLANNING OF THE SSPA /ACU/MU REPLACEMENT

Administrations/Organization should plan the progressive replacement of SSPA, ACU and MU as they are reaching the end of their lifespan.

4.11 UP/DOWN CONVERTER

Administrations/Organization should provide their earth stations with the active combiner/ amplifiers and splitters equipped with many inputs (12 or 24 inputs) in order to optimize the satellite modems operation.

4.12 SUPERVISION

Administrations/Organization should equip their earth stations with global supervision system of each functional component of the earth station for the purpose of remote control maintenance operations.

4.13 HUMAN FACTORS

States/Organizations should endeavour to provide adequate training for all technical and operational staff in satellite communications including AFTN, ATS/DS and remote VHF.

Moreover, states/organizations should harmonize training programs for all technical and operational staff.

4.14 APPLICATION OF SAFETY CASE IN THE IMPLEMENTATION OF NEW ATM CHANGES

With new ATM changes (installation of new equipments) states/organizations should ensure the maintenance of the air traffic services provision and to demonstrate through a safety assessment, that the safety of any significant change to the ATM systems will meet acceptable levels as required in ICAO Annex 11 in order to guarantee at least the same level of service before ATM changes.

4.15 IMPLEMENTATION OF THE FUTURE AFISNET CENTRAL FLOW MANAGEMENT UNIT (CFMU)

By taking into account:

- the current communications services in accordance with air navigation plan for the AFI region (AFTN, OPMET, AAC) supported by the AFISNET;
- the future services which will be progressively supported by the current network (AFISNET) (AMHS, GNSS and augmentation data transmission, Computer-to-computer data exchanges (ICC) between ATS Flight Data Processing Systems (FDPS), Air/ground data link applications (ADS/CPDLC, ADS-B, DFIS, VDL...);
- loss of operational messages between AMSS of adjacent operational centres;
- the erroneous operational statistics provided by the AMSS of the operational centres due to software conception default which do not respect ICAO practices and standard;
- great delays of putting back in service the AFTN links due to technical aspects of coordination between ANSP;

- ...

States/Organizations should envisage and anticipate the implementation of future AFISNET Central Flow Management Unit by step, with many levels in order to handle all the operational aeronautical data which will contribute to the safety of air navigation.

- Level 1: integrated system should be able to process flight plans, OPMET, environment data, airways and aerodrome cartography, SID procedures, STAR procedures coming from all the ANSP AMSS, in order to solve all the problems listed above before forwarding these data to the corresponding ANSP AMSS.
- Level 2: integrated system should be able to process future ATM services (AMHS, GNSS and augmentation data, ICC between ATS FDPS, ADS-B data sharing, DFIS, VDL...)
- Etc.

APPENDIX E

DRAFT CONCLUSIONS OF CNS/SG/3 MEETING RELATED TO SNMC ACTIVITIES

I- Conclusions related to CNS/SG/3 agenda item 4: Aeronautical Fixed Service (AFS)

Conclusion 03/2 - AFTN

That Concerned States/Organizations (DRC, ASECNA, Nigeria and Ghana) endeavor to eliminate all the outstanding deficiencies as soon as possible but not later than the end of December 2010. The current outstanding deficiencies are the following AFTN circuits:

- *Brazzaville/Kinshasa*
- *Kano /Accra*

Conclusion 03/7 - ATS/DS

That concerned States and Organizations (Angola, Ghana, DRC, Rwanda, Burundi, Algeria, Libya, ASECNA, Morocco and France) take the appropriate action and implement the following AFI ANP ATS/DS circuits:

- *Luanda/Accra*
- *Luanda /Atlántico;*
- *Kigali/Goma;*
- *Bujumbura/Goma;*
- *Kigali/Bukavu ;*
- *Algier/Tripoli*
- *Ouagadougou/Niamtougou;*
- *Nouadhibou/Dakhla ;*
- *Dakar/Rochambeau ;*
- *Bangui/Gbadolite.*

Conclusion 03/9- ATS/DS

That concerned States/Organizations (ASECNA, Nigeria and Ghana) endeavor to eliminate as soon as possible but not later than end of December 2010, the current outstanding deficiencies noted in the following ATS/DS circuits:

- *Kinshasa / Brazzaville*
- *Kano/Accra*
- *Accra/Libreville*
- *Brazzaville / Accra*
- *Maiduguri / N'Djamena*

Inside these conclusions the topics related to AFISNET is red colored.

Conclusion 03/11 – AFISNET Network

That AFISNET States/Organizations make an effort in implementing the various conclusions of the previous relevant meetings (Conclusion 16/07 of SNMC/16; Conclusion 6/18 of SPI/AFI/RAN; Conclusion 17/02 of SNMC/17; Conclusions of the Joint Technical Team) to modernize the Network by evaluating and re-engineering AFISNET.

II-Conclusions related to agenda Item 5 - Aeronautical Mobile Service (AMS)**Conclusion 03/14**

That:

The following States and Organisations, DRC, Congo (ASECNA), Chad (ASECNA), Nigeria and Angola improve and complete their VHF coverage as stated in AFI Navigation Plan

Conclusion 03/15

That:

- *States urge to cooperate with IATA during the AMS (VHF/HF) coverage surveys.*
- *IATA to forward the survey forms to ICAO for comments before the collection of data.*

**AFI SATELLITE NETWORK MANAGEMENT COMMITTEE
(SNMC) FORM OF AGREEMENT**

ARTICLE 1: The AFI Satellite Network Management Committee (SNMC) is composed of the following members:

- Nigeria Airspace Management Agency (NAMA);
- Agency for Safety of Air Navigation in Africa and Madagascar (ASECNA)
- Ghana Civil Aviation Authority (GCAA)
- Roberts FIR;
- International Civil Aviation Organization (ICAO)

The Administrations mentioned above must be represented at the Director level in their own organizations.

Observers are listed in the Terms of Reference of SNMC and may comprise:

- Air Navigation Service Providers;
- Satcom Facilities Providers;
- Satellite Spectrum Providers;
- International Organization (ATU, ITU, SITA.);
- Airlines Association (IATA);
- Satcom Facilities Maintenance Personnel Association (IFATSEA).

ARTICLE 2: The SNMC will meet every year or more frequently if required by the members, at one of the network centers and the working languages will be English and French.

ARTICLE 3 :

- (i) SNMC coordinating activities shall be developed by a Coordinator nominated by the State/organization who have hosted the SNMC meeting;
- (ii) The Coordinator shall be responsible for :
 - a) Liaising with the various administration for the efficient operation of the network
 - b) Liaising with the equipment and the satellite providers as the need may arise
 - c) Undertaken such other sanction as may deemed necessary

- d) Ensure the implementation of the objectives of the SNMC
- e) Act as an arbitrator among members

ARTICLE 4 : The SNMC members manage the following stations :

- For NIGERIA: Kano, Lagos, Maiduguri, Jos, Ilorin, Port Harcourt, Sokoto, Abuja
- For GHANA: Accra
- For ASECNA: Abidjan, Bangui, Brazzaville, Cotonou, Dakar, Douala Libreville, Lome, N'djamena, Niamey and Ouagadougou
- For ROBERTS FIR: Roberts
- For FRANCE : Reunion, Mayotte

This list is not exhaustive and may be modified according to the operational needs and extensions of the network.

ARTICLE 5 : The SNMC's objectives are as follows :

- Ensure the complete AFISNET implementation
- Verify that the earth stations of the network meet aeronautical telecommunication required performances
- Harmonize reporting methodology procedure
- Judge the necessity and redeployment of the technical assistance
- Encourage cooperation, in various fields, between network centers, e.g., training, spare parts exchange, and fault location/repairs
- Study the extension of the network to other African countries.
- Propose the network integration and interoperability with other African networks
- Liaison and planning with satellite telecommunications providers.

ARTICLE 6 : The SNMC members may have experts accompany them to meetings. These experts will be chosen according to their experiences and competence in various civil aviation related fields: aeronautical telecommunications, air traffic control, meteorology, etc...

ARTICLE 7 : The SNMC Terms of Reference completes this present Form of Agreement as guidelines for SNMC Workprogramme.

ARTICLE 8 : The SNMC is not financially autonomous. Each Administration makes adequate financial provision according to its participation in the committee's activities.

ARTICLE 9 : This agreement becomes effective from the date at which all Administrations have signed.

ARTICLE 10 : In case legal disagreements arise due to the execution of the present protocol, members will be expected to seek a friendly settlement amongst themselves.

For NAMA

Abuja,

For ASECNA

Dakar,

For GCAA

Accra,

For ROBERTS FIR

Roberts,

For ICAO

Dakar,

TERMS OF REFERENCE OF THE SATTELITE NETWORK MANAGHEMENT COMMITTEE (SNMC)

1. Mandate of the Satellite Network Management Committee

- 1.1 Decide on the network concept and topology in accordance with the relevant ATM operation requirements and based on ICAO SARPs and guidance materials.
- 1.2 Ensure the continued operation of the AFISNET network, meeting the CNS/ATM plan requirements of the AFI /MID /EUR Regions while taking into consideration CNS/ATM plans of adjacent regions, and including approval of deployment plans and/or extension plans.
- 1.3 Decide on type and levels of service to be provided, and monitor the performance of the Network providers (facilities and leased band) to ensure that service delivery meets the Required Service Performance Level (RSPL) and the Required Communication Performance criteria previously pre-determined when applicable, in accordance with the Manual of Require Communication Performance (RCP Doc. 9869).
- 1.4 Ensure that participating States/Organizations provide statistics on the Network Performance, and investigate service delivery complaints from users.
- 1.5 Review and take the appropriate actions to clear the service dysfunctions within the RSPL /RCP defined criteria in line with ATM PBN and SMS requirements.
- 1.6 Monitor the harmonization of the implementation of facilities and services and, where necessary, ensure interregional connectivity, taking due account of cost/benefit analysis, business case development and financing issues:
 - Study the extension of the network to other countries.
 - Propose the network integration and interoperability with other neighboring networks

- 1.7 Monitor and harmonize the Network maintenance operation and management by defining a cooperation methodology between network centers in regard with:
- Maintenance personnel team training and exchange, redeployment if necessary of a technical assistance;
 - spare parts exchange, fault location/repairs, and turnaround time
 - Development and modernization of AFISNET after a Joint Technical Evaluation and Re-engineering team assessment.
- 1.8 Review and adopt the annual follow up on the meeting conclusion and update the future work programme.
- 1.9 The report of the Satellite Network Management Committee is to be addressed to SNMC members States/organizations

2. Composition and organization of the Committee

2.1 Members

The Satellite Network Management Committee (SNMC) is composed of member States/Organizations hosting/operating AFISNET nodes namely:

- **NAMA (Nigeria)**
- **ASECNA (16 members States)**
- **Roberts FIRs (Liberia, Sierra Leone, Guinea)**
- **GCAA (Ghana)**

2.2 Observers

Observers as composed below can join the Committee:

- Air Navigation Service Providers (**ATNS-South Africa, ENANA-Angola, ENNA-Algeria, Mauritius FIR; GCAA-The Gambia, ENNA-Sao Tome & Principe, AENA-Spain, DGAC-France**);
- AFISNET Satcom Facilities Providers;
- Satellite Spectrum Providers (**INTELSAT**);
- National Frequency Regulators;
- Airline Associations (**IATA**);
- Maintenance Personnel Association (**IFATSEA**);

- Neighboring Networks Committees (**CAFSAT, NAFISAT, SADC...**).

- 2.3 The Chair of the Committee shall be elected by the Committee from among the Committee members every year. The Chair may be re-elected for no more than two periods of one year each. The mandate as Chair of the Committee shall not exceed three years.
- 2.4 ICAO shall be the Secretary of the Committee.
- 2.5 To ensure that the Committee functions optimally, the designated representatives of Air Navigation Service Providers should have experience in the provision of air navigation infrastructure and services. Advisors may accompany the Representative.

3. Participation by International Organizations

Moreover those listed in paragraph 2, the Committee may invite representatives of appropriate regional and international organizations (**ATU, ITU, EUROCONTROL, SITA...**) to attend meetings in the capacity of observer.

4. Establishment and Dissolution of Contributory Bodies

- 4.1 In order to assist in its work, the Committee may establish bodies, e.g. task forces, charged with preparatory work on specific issues. Representation in such contributory bodies should be by specialists in the subjects concerned and familiar with the issues under consideration.
- 4.2 The establishment and work of contributory bodies shall be governed by the following provisions:
- a) A contributory body shall only be formed when it has been clearly identified that it is likely to make a substantial contribution to the resolution of the issue in question.
 - b) A contributory body shall be given clear and concise terms of reference describing its task and an expected target date for its completion.

- c) The composition of a contributory body shall be such that, although intended to be as small as possible, all participating States and any organization deemed to be able to make valid contributions shall be given an opportunity to participate in it.
- d) A contributory body shall be dissolved as soon as it has either completed its assigned task or it has become apparent that work on the subject in question cannot be usefully continued.

5. Working arrangements

- 5.1 The Committee ordinary meeting will be hosted by one of the State\organization and held at least once a year;
- 5.2 The committee can hold in case of absolute necessity extraordinary meetings to clear out urgent problems that may be a threat to the service provided by the network;
- 5.3 The invitation letter to the meetings is issued by the Secretariat in coordination with the hosting State/Organization.
- 5.4 Decisions shall be reached by consensus.
- 5.3 Two-thirds of members shall constitute a quorum and, where a quorum is not achieved, decisions will be reached through correspondence under the Chair Person coordination.

APPENDIX G: Template for SNMC future venue

SNMC Meeting	Year	Hosting State/Organization	Remarks
SNMC/19	2011	Ghana	
SNMC/20	2012	Nigeria	
SNMC/21	2013	Roberts FIR	
SNMC/22	2014	ASECNA	
SNMC/23	2015	Ghana	
SNMC/24	2016	Nigeria	
SNMC/25	2017	Roberts FIR	