**ORGANISATION DE L'AVIATION CIVILE INTERNATIONALE**

**DIX-SEPTIEMME REUNION DU GROUPE DE PLANIFICATION ET DE MISE EN OEUVRE DE LA REGION AFRIQUE-OCEAN INDIEN (APIRG/17)**
**(Burkina Faso, 2 - 6 aout 2010)**

**Point 3.3: Communications, Navigation et Surveillance (CNS)**
**Examen du Rapport de la réunion CNS/SG/3**

# Résultats de la huitième réunion du Comite de gestion du réseau de télécommunications par satellite AFISNET (SNMC/18) et activités de suivi

*(Présentée par le Secrétariat)*


**SOMMAIRE**

Cette note de travail présente les résultats de la huitième réunion du Comite de gestion du réseau de télécommunications par satellite AFISNET (SNMC/18), pour examen par le groupe APIRG.

La suite a donner par la réunion se trouve au paragraphe 3.


**Références :**

[1] – Rapport de la réunion SNMC/17

[2] – Rapport de la réunion SP AFI / RAN

[3]– Rapport de la réunion APIRG/16

**Objectifs stratégiques de l'OACI: A, D &E**

## 1. INTRODUCTION

1.1 La huitième réunion du Comite de gestion du réseau de télécommunications par satellite AFISNET (SNMC/18) s'est tenue a l'hôtel Splendide de Ouagadougou, Burkina Faso, du 1 au 4 juin 2010, a l'invitation de l'ASECNA.

1.2 Cette note fournit à la réunion APIRG/17 les résultats de la réunion SNMC/18. L'Appendice A ci-joint contient les conclusions et décisions de SNMC/18 et l'Appendice B contient les conclusions de l'exercice conjoint d'évaluation technique et de la redéfinition du réseau telles qu'elles ont été entérinées par la réunion SNMC/18.

## 2. DISCUSSIONS

### 2.1 Suivi des conclusions de la réunion SNMC/17

2.1.1 La réunion a examine l'état de mise en œuvre des 12 conclusions adoptées par la réunion SNMC /17, et note que certaines conclusions avaient été mises en œuvre tandis

que d'autres conclusions étaient encore en attente de mise en œuvre. L'état de mise en œuvre des conclusions adoptées par la réunion SNMC /17 se trouve a l'Appendice B du rapport de la réunion SNMC/18, qui a formule la conclusion 18/01 figurant a l'Appendice A de la présente note de travail.

2.1.2 La réunion a aussi discute la question de l'échange et de la formation du personnel de maintenance et d'exploitation. Malgré les efforts entrepris par les parties prenantes, notamment le Ghana, la FIR Roberts et l'ASECNA, le niveau d'échange et de formation du personnel reste bas par rapport aux défis techniques auxquels cette catégorie de personnel est confronte. La réunion était d'avis qu'il serait avantageux pour les Etats membres d'élaborer un programme de formation commun base sur les éléments communs des stations AFISNET.

2.1.3 La réunion a aussi reconnu qu'il n'y avait un plan de suivi formel des conclusions entre deux réunions du SNMC, et a propose que l'Etat ou l'organisation assurant la coordination soit désigné pour effectuer le suivi conformément aux termes de référence révisés du SNMC.

**2.2. Examen des statistiques opérationnelles sur la disponibilité des liaisons s'appuyant sur le réseau AFISNET**

2.2.1. Sous ce point de l'ordre du jour, la réunion a examine les **statistiques opérationnelles sur la disponibilité des liaisons s'appuyant sur le réseau AFISNET** telles que présentées par le secrétariat. En examinant la performance des circuits du RSFTA au niveau des centres principaux, la réunion a note des améliorations importantes concernant certains centres principaux tells que Dakar et Niamey, tandis que certains centres principaux comme Brazzaville enregistrent un taux de disponibilité faible, bien inferieur a la valeur minimale spécifiée de 97%.

2.2.2 Notant la nécessité d'améliorer la disponibilité des plans de vol dans le nouveau format, la prise en compte des besoins lies a la gestion de l'espace aérien RVSM, l'automatisation du traitement des donnes de vol (y compris les plans de vol) et l'automatisation de l'AIS (y compris les messages NOTAM), la réunion a instamment prie les Etats et organisations de poursuivre leurs efforts tendant a améliorer les performances du service fixe (RSFTA), surtout la ou les performances requises ne sont pas réalisées.

**3. Examen des performances des stations terriennes du réseau AFISNET**

3.1 La réunion SNMC est convenue que plusieurs facteurs devaient être pris en compte pour évaluer la durée moyenne entre les pannes du système (MTBF). Elle a aussi reconnu qu'il n'y avait pas de formulaire commun avec une liste consolidée des composants à évaluer. Elle a longuement discute des paramètres à prendre en considération, et a conclu qu'il était nécessaire d'élaborer un formulaire d'évaluation à distribuer aux membres pour adoption. L'ASECNA et 'Autorité de l'aviation civile du Ghana (GCAA) ont été charges de soumettre un projet de formulaire aux membres du SNMC.

**4. Examen des développements concernant les stations du réseau**

4.1 La réunion a discute des développements concernant les nœuds du service fixe en termes d'emplacement, coordonnées géographiques et plan de fréquences. Ces données avaient déjà été recueillies dans le passé, et les parties prenantes ont été encouragées à fournir des données à jour, y compris celles concernant les nouvelles stations VSAT.

4.2 La réunion est aussi convenue que toutes ces données étaient disponibles et pouvaient être rapidement communiqués au secrétariat pour compilation.

**5. Mise en œuvre de la recommandation 6/19 de la réunion spéciale AFI/RAN (SP AFI RAN 2008)**

5.1 La réunion a examine l'état de mise en œuvre de la recommandation 6/19 de la SP AFI RAN: Planification, mise en œuvre et fonctionnement des réseaux VSAT dans la région AFI, qui demande la tenue de réunions régulières entre tous les gestionnaires de réseaux de la région.

5.2 La réunion a été informée des développements concernant les réseaux voisins d'être impliques dans de telles réunions (CAFSAT, NAFISAT, SADC/3…) SP AFI RAN 08.

5.3 En particulier, la réunion a tenu compte du fait que la réunion SAT/15 (Lisbonne, Portugal, 19-21 mai 2010) a établi un Comite de gestion du réseau CAFSAT (CNMC) sur le modèle du SNMC pour que les deux réseaux soient gérés selon le même modèle, ce qui constituerait une étape vers la tenue des réunions régionales recommandées par la réunion SP AFI RAN.

**6. Moyens d'assurer une bonne participation aux réunions SNMC.**

6.1 Il a été convenu qu'en vue d'assurer une bonne participation, des termes de référence consolides devraient être élaborerais pour la gestion des réunions de chaque sous-réseau de la région AFI. Les résultats de ces réunions qui peuvent intéresser toutes les parties prenantes, fourniront des renseignements pertinents aux réunions régionales périodiques de la Région AFI.

**7. Organe approprie pour les comptes rendus aux réunions régionales**

**Examen du rapport de l'équipe chargée de l'évaluation technique conjointe**

7.1 La réunion SNMC/18 a examine l'état de mise en œuvre de la conclusion 17/02 de la réunion SNMC/17: Evaluation technique et redéfinition conjointes, instituant l'équipe d'évaluation technique et redéfinition du réseau AFISNET.

7.2 L'équipe d'évaluation technique conjointe a tenu sa première réunion de coordination à Dakar, du 13 au 14 avril 2010. Cette réunion a établi le cadre pour la conduite de l'évaluation du système et de la stratégie (modèles, format de rapport, Liste des éléments des stations terriennes à évaluer, etc.). La réunion a approuve les conclusions de la réunion technique conjointe contenues dans l'Appendice C de son rapport.

***Mise en œuvre de la recommandation 6/18 de la réunion spéciale AFIRAN : Modernisation et redéfinition du réseau AFISNET***

7.3 La réunion a discute de la mise en œuvre de la recommandation 6/18 de la réunion SP AFI/RAN: Evaluation technique et redéfinition du réseau AFISNET, qui renvoie a la mise en œuvre des conclusions de la réunion SNMC/17.7.4 . Le groupe a note que cet exercice avait été conduit de manière satisfaisante du 1 au 30 juin 2010, comme cela est indique dans l'Appendice D du rapport de la réunion SNMC/ 18.

7.5 La réunion a examine le rapport final de l'exercice conjoint d'évaluation technique et de redéfinition du réseau. Les principales recommandations mettent l'accent sur les problèmes suivants du réseau AFISNET:

- Défaut du système de commutation automatique des messages
- Défaut ou incompatibilité entre systèmes VCSS;
- Défaut de calibration des équipements d'essai ; et
- Absence de redondance au niveau des modems.

La réunion est convenue que le SNMC devait résoudre les carences ci-dessus.

7.6 Le secrétariat a informe la réunion que certains centres voisins, notamment les centres des Etats de la région SAT étaient en train de moderniser leurs interfaces d'utilisateurs et que cet exercice requérait une compatibilité et une interopérabilité de bout-en-bout. Une coordination était nécessaire pour les systèmes de commutation de la voix et des messages actuels et futurs. D'où la nécessité de recueillir, compiler et distribuer les données techniques pour faciliter l'interopérabilité des systèmes.

7.7 The secrétariat a fourni a la réunion l'état de mise en œuvre de nouveaux centres de commutation de messages dans la zone WACAF et les centres adjacents, et a informe la réunion que la réunion CNS/SG/3 avait formule un projet de conclusion demandant a la réunion APIRG/17 de créer une équipe de travail sur la mise en œuvre de l'AMHS dans la Région AFI (voir WP/6). La réunion a examine l'état de mise en œuvre des améliorations ou des remplacements des commutateurs des messages RSFTA dans les centres supervises par le SNMC et a reconnu que des progrès étaient en cours en vue de la mise en œuvre de l'AMHS en tant qu'élément de l'ATN.

7.8 De plus, la réunion a discuté du plan de transition du RSFTA vers l'AMHS, et a conclu qu'il était nécessaire d'assurer la continuité de service pendant la période de transition.

7.9 La réunion a examine la conclusion de la réunion SAT/15 concernant le plan de numérotation ATS voix conformément au Manuel de l'OACI sur les communications vocales ATS (Doc 9804, Chapitre 2 Section 2.3). Certains Etats de la région SAT étaient en train de conduire des essais dans ce domaine ou il est nécessaire d'avoir un plan de numérotation.

7.10 La mise en œuvre de la commutation vocale requiert une coordination très étroite entre fournisseurs de services de navigation aérienne.

7.11 la réunion a appuyé la conclusion de SAT/15 demandant au groupe APIRG de créer un groupe de travail AFI charge de mener une étude technique pour l'élaboration d'un plan de numérotation global pour les communications vocales dans la Région AFI, et harmoniser le cadre de la mise en œuvre.

7.12 la réunion est convenue de la nécessité de calibrer les équipements de test du réseau AFISNET en vue d'assurer la fiabilité des paramètres mesures pendant les opérations de maintenance. La réunion a aussi note la nécessité de se conformer aux exigences SGS dans un environnement RVSM conformément aux dispositions de la norme 7.1.13. Toutefois, vu le niveau élève de l'investissement correspondant a la mise en place d'un centre de calibration d'un équipement de test pour un seul fournisseur de services de navigation aérienne, en tenant compte du nombre d'équipements, la réunion a estime que la coopération entre membres du réseau était la meilleure solution en vue d'un centre de calibration régional.

7.14 La gestion du personnel de maintenance du réseau AFISNET a été discute par la réunion, qui a mis en exergue le manque d'équipes adéquates ou de cours de formation appropries pour le personnel de maintenance.

7.15 Des opportunités de partenariat existent avec les fournisseurs de satellites et de systèmes en vue de l'élaboration d'un programme de formation à jour.

7.16 La réunion a aussi recommande qu'un mécanisme de formation soit établi conformément au programme de l'OACI (ATSEP) suivi par la délivrance d'une licence au personnel qualifie.

7.17 La réunion a discute longuement des voies et moyens de réaliser la redéfinition du réseau en se basant sur l'évaluation technique conjointe. Elle est convenue de réviser le mandat de l'équipe technique chargée de poursuivre les études sur la redéfinition, en mettant l'accent sur la topologie du réseau AFISNET, les composants, les techniques d'accès en bande de base et au satellite, et l'optimisation de la bande passante.

7.18 En attendant, il a été demande aux Etats et organisations de prendre des dispositions urgentes en vue d'éliminer les carences actuelles avant la fin de l'année 2010.

## 8 Redéfinition de la bande passante du réseau AFISNET

8.1 La réunion a reconnu que les composants obsolètes de la bande de base du réseau AFISNET avaient été progressivement remplaces par d'autres modems dans le cadre d'arrangements entre l'ASECNA, NAMA et le Ghana. Ainsi, une partie importante du spectre alloue au système IBIS est actuellement inutilisée, alors que les Etats et organisations continuent d'être factures pour la partie non utilisée de la bande IBS.

8.2 La réunion a examine l'état de mise en œuvre de la conclusion 17/10 de SNMC/17 appelant a la conversion de la bande IBS et a note qu'elle n'avait pas été mise en œuvre. La réunion est convenue que chaque Etat/Organisation devrait mettre à jour l'état d'utilisation des fréquences IBS en vue d'une réunion technique et financière avec INTELSAT.

## 9. Examen des conclusions de CNS/SG/3 concernant le réseau AFISNET

9.1 La réunion a été une occasion d'informer les participants sur les conclusions ci-après de la réunion CNS/SG/3 (Nairobi, Kenya, 26-30 avril 2010) relatives au réseau AFISNET:

- Conclusion 03/2 sur les liaisons RSFTA
- Conclusion 03/7& 03/9 sur les liaisons ATS/DS
- Conclusion 03/11 sur l'évaluation et la redéfinition du réseau AFISNET

9.2 Concernant l'amélioration du service mobile aéronautique (SMA) dans la Région AFI, la réunion a note que la réunion CNS/SG/3 avait formule les deux recommandations ci-dessous relatives à la couverture VHF dans l'espace aérien géré par les Etats et organisations membres du SNMC, et a encourage les Etats AFI à coopérer avec l'IATA lors des enquêtes régionales sur le SMA (couverture VHF/HF):

- Conclusion 03/14 sur l'achèvement et l'amélioration de la couverture VHF; l'ASECNA et NAMA sont concernées.
- Conclusion 03/15 appelant a la coopération des Etats avec l'IATA lors des enquêtes sur la couverture du SMA (VHF/HF); la prochaine enquête était prévue du 7 au 25 juin 2010.

9.3 La réunion a note que ces conclusions de la réunion CNS/SG/3 devaient être prises en compte par les membres du SNMC dans la résolution des carences actuelles.

## 10. Intégration d'AFISNET avec les autres réseaux régionaux (CAFSAT, NAFISAT, SADC/2)

10.1 La réunion a analyse l'état de l'interconnexion entre le réseau AFISNET et ses réseaux voisins (CAFSAT, NAFISAT, et SADC/2) et note que cette interconnexion avait été réalisée comme prévu. Le réseau AFISNET est désormais relie aux réseaux CAFSAT, NAFISAT et SADC/2 a travers une interconnexion équilibrée.

10.2 Toutefois, en vue de réaliser quelques circuits non mis en œuvre, il faudrait interconnecter AFISNET (Brazzaville & Bangui) aux stations situées en RDC (Kinshasa & G'badolite).

## 11. Performance de communication requise pour le réseau AFISNET

11.1 Le concept de performance de communication requise (RCP) a été introduit à la réunion, pour appuyer la fourniture du service mobile aéronautique grâce aux stations VHF déportées.

11.2 La réunion a note cette information et a conclu que ce concept était un outil indispensable a la fourniture du SMA dans le contexte du RVSM et du SGS.

## 12. Amendement de l'accord relative au SNMC.

12.1 La réunion a discute le projet d'accord et des termes de référence d'AFISNET figurant a l'Appendice F du rapport de la réunion SNMC/18 , et a décidé que cette proposition devait être distribuée aux membres pour commentaires avant la fin du mois de décembre 2010.

## 13. Questions diverse: Audit technique du réseau AFISNET

13.1 L'ASECNA a informe la réunion de son projet d'effectuer un audit technique externe des nœuds du réseau AFISNET situes dans ses centres. La réunion a encourage cette initiative tout en attirant l'attention sur la nécessité d'impliquer toutes les stations du réseau en vue d'obtenir des résultats concluants.

13.2 L'ASECNA a été invitée à faire circuler le projet de termes de référence de l'audit pour commentaires et compilation par le secrétariat.

## 14. Prochaine réunion du SNMC

14.1 Jusqu'a présent, les réunions du SNMC sont abritées par les Etats et organisations selon un calendrier non formel. Compte tenu des futurs termes de référence du comite, la réunion a charge le secrétariat d'élaborer un calendrier de réunions pour les cinq prochaines années. Ce modèle est présenté à l'Appendice G du rapport.

14.2 La réunion a accueilli très favorablement l'offre du Ghana d'abriter la prochaine réunion (SNMC/19). L'OACI coordonnera avec le Ghana le lieu et les dates précises de la réunion, et en informera les membres du SNMC en tempos utile.

## 15. Suite a donner par la réunion APIRG

**15.1 La réunion est invitée a:**

a) Noter les informations fournies dans la présenté note de travail;

b) Noter le travail accompli par les Etats membres du SNMC qui constitue un mécanisme sous-régional des fournisseurs des services de navigation aérienne de la Région AFI dans le domaine du service fixe et du service mobile aéronautique;

c) Encourager les Etats et Organisations concernes a mettre en œuvre les conclusions de la réunion SNMC/18 et d'autres conclusions en souffrance du SNMC, et en particulier la conduite de l'exercice d'évaluation technique conjointe et de redéfinition du réseau AFISNET conformément a la recommandation 6/18 de la réunion spéciale AFI/RAN;

d) Faire siennes les conclusions de la réunion SNMC/18 relatives aux actions à entreprendre au niveau régional (plan de numérotation du réseau ATS vocal, mise en œuvre de l'AMHS…);

e) Fournir aux membres du SNMC les éléments indicatifs et le soutien nécessaire à la mise en œuvre des dispositions pertinentes de l'OACI.

## APPENDIX A

**LIST OF CONCLUSIONS AND DECISIONS OF THE SNMC/18 MEETING**

**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.

**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.

**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)**

**Conclusion18**/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.

**APPENDIX B : REPORT OF THE JOINT TECHNICAL EVALUATION AND RE-ENGINEERING**

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**

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

**O**

| | |
|---|---|
| **OPMET** | **Operational Meteorological data exchanges** |

**P**

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|---|---|
| **PEP** | Performance Enhancing Proxies |

**Q**

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|---|---|
| **QoS** | Quality of Service |
| **QPSK** | Quadrature Phase Shift Keying |

**R**

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|---|---|
| **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 |

# Preamble

## 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.

## 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

## 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

## 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.

## 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…)

## Description and evaluation of services and applications

### Description and Evaluation of the AFTN

### 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.

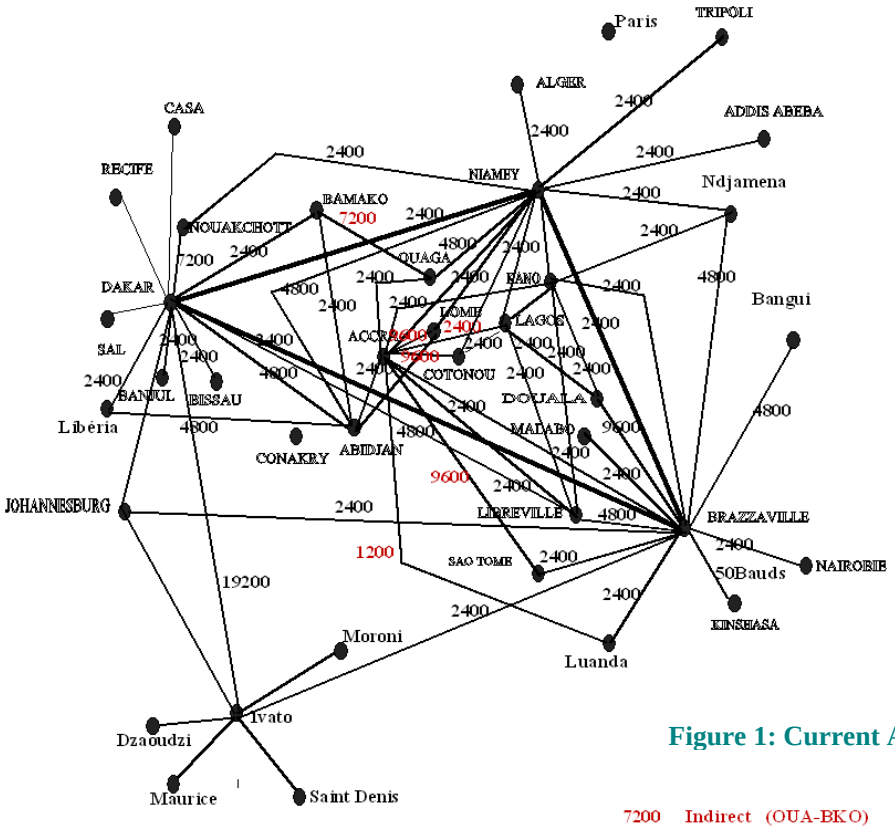


**Figure 1: Current AFTN COM**

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.

**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.

**Description and Evaluation of ATS/DS**

**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;

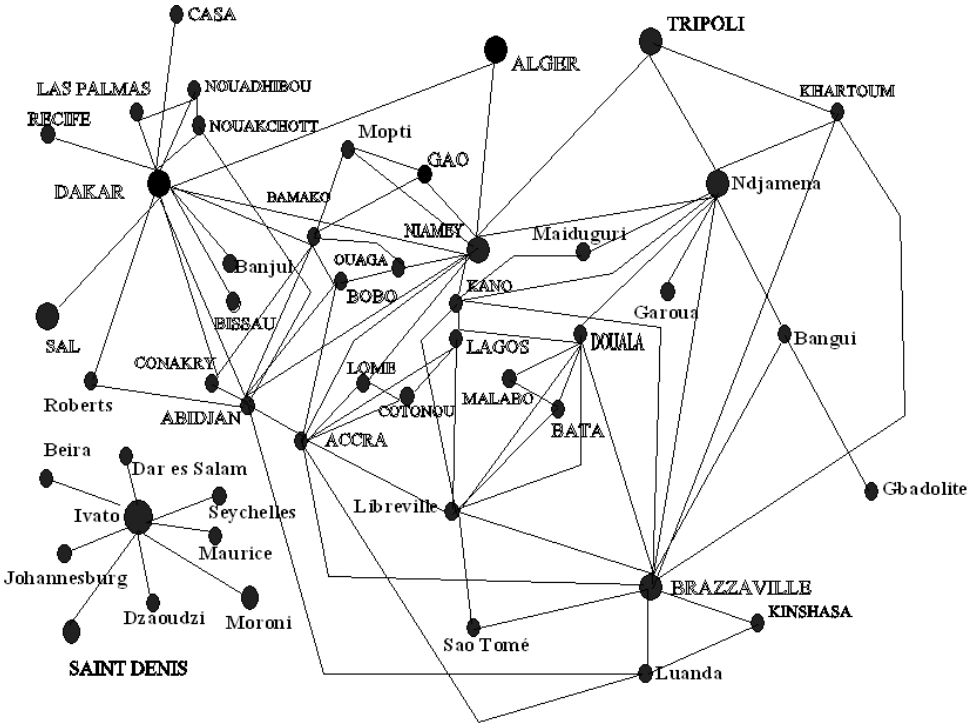


**Figure 2: Current ATS/DS Links Chart**

**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 in 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.

**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 )

**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.

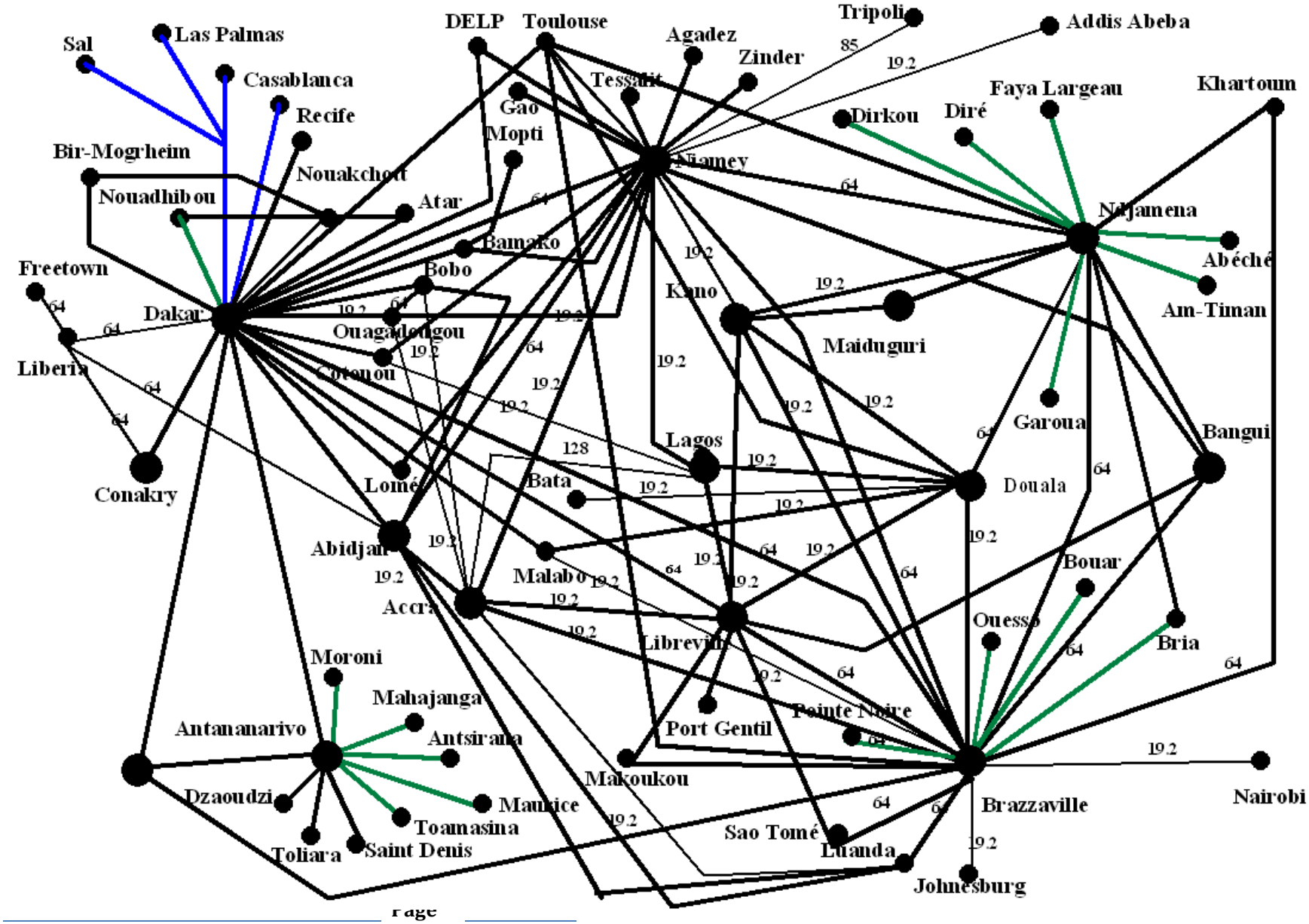


Figure 3: Current Composite Satellite Links Chart

**Hardware**

*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.

*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).

*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.

*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.

*Antenna Control Unit ACU/Motorization Unit (MU)*

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

**Test Equipments**

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

**Spare Parts**

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

**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.

**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.

## 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.

## 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:

### 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.

### 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.

### 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

**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

**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.

**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

**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.

**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.

**Test Equipments**

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

**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.

**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.

**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.

**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.

**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.

**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.