



ICAO

**INTERNATIONAL CIVIL AVIATION ORGANIZATION
EASTERN AND SOUTHERN AFRICAN (ESAF) OFFICE**

**THE FIFTEENTH VIRTUAL MEETING OF THE NAFISAT SUPERVISORY BOARD
(NAFISAT-SVB/15) (14 – 15 JULY 2021)**

Agenda Item 8: Future of the NAFISAT Post 2022

(Presented by ATNS)

SUMMARY

The current NAFISAT MOU came into force in December 2015 and provides ATNS and IATA with a network service provision mandate for period of 7 (seven) years. And this year marks four (4) years of continuous aeronautical communications operations on an upgraded NAFISAT VSAT network. This paper shares some highlights of operations in the last four years and proposes plans aimed at safeguarding the VSAT networks sustainability and reliability in the current global pandemic. Besides ensuring a future for the network beyond 2022, these proposals will also steady the network through the journey to economic recovery.

References:

- Operation, maintenance and performance of NAFISAT VSAT Network – WP/ZZ

1. Background

1.1. The NAFISAT VSAT is a closed SATCOMS network providing aeronautical fixed services in the North and East African regions. Primary services provided on the network are primarily:

- 1.1.1. AFTN data services
- 1.1.2. ATS/DS voice services, and
- 1.1.3. AHMS

1.2. The NAFISAT network upgrade was commissioned in March 2017, and this year marks four years of continuous operations on a new IDU 7000 platform. The upgrade project was aimed at addressing the emerging obsolescence issues as well as modernising service provision by ensuring that the network is enabled to carry IP based ATN services and applications in the future, whilst maintaining backward compatibility with legacy applications.

1.3. The technology interventions that were implemented in the 2017 upgrade include the following critical sub-systems:

1.3.1. VSAT Outdoor Unit

- Refurbishment of antennas where required,
- Upgrade of RFT capacity from 20W to 60W

1.3.2. VSAT Indoor Unit

- Replacement of satellite modems from IDU5000 to IDU7000
- Replacement of obsolete Memotec multiplexors to NetPerformer devices
- Extended NMS for local monitoring and generation of network traffic statistics
-

1.4. The network is currently configured as follows:

1.4.1. Network architecture

- Mesh
- MF-TDMA
- Satellite: **IS1002,23/23, 359deg E, 6MHz 3MHz**

1.4.2. Connectivity

- ATS/DS connectivity (FXS/FXO 2w with ACELP-CN 8Kx2) –
- AFTN connectivity (serial RS-232 with 9.6 kbps)
- ATN backbone connectivity (Ethernet IP with 64kbps)
- ATN tributary connectivity (Ethernet IP with 9.6kbps)
- Engineering speech [EOW] (FXS/FXO 2w with ACELP-CN 8Kx2)
- Data circuits for Engineering data (serial V.35 with 64 kbps)

2. Current status of the NAFISAT VSAT Network

2.1. Post-upgrade network performance

As a result of the upgrade, the network continues to operate at the agreed service levels. The benefits of a new and improved network baseline are that member States now have access to a platform that is enabled to deliver traditional services in a more efficient way without the burden of additional costs. Over the last four years the network has seen a rather slow uptake of IP enabled services such as AMHS and member States are encouraged to share their development plans in this regard.

2.2. Interconnectivity with AFISNET

2.2.1. Commendable developments in the harmonisation of interoperability between the SADC, NAFISAT and AFISNET networks are currently underway between ATNS and Asecna. These circuits were retained in the old configuration after the upgrade and are now being reconfigured. The reconfiguration was initiated in June 2020 and is currently in the final stages. The following links are being upgraded:

- Abidjan – Luanda
- Brazzaville – Luanda and Khartoum
- Ndjamena – Khartoum and Tripoli
- Niamey – Addis and Tripoli

2.2.2. The implementation of the links upgrade is governed by the mandate of the Supervisory Committee to ensure continuous interoperability and the MOU established between the SADC/NAFISAT service provider and ASECNA. In summary, the same IDU7000 platform will be utilized on both ends and the links will be migrated to IP. This will enable cross distribution of voice, AMHS and other ATN application on a need basis and ultimately a harmonised digital IP interregional VSAT network.

2.2.3. A comparison of the future state of interoperability between the three VSAT networks is shown in the table below:

| Link | Operational Status | Service | Future service |
|-------------------|--------------------|---------------|----------------|
| Addis-Niamey | Active | AFTN | AMHS |
| Tripoli-Niamey | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Tripoli-Ndjamena | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Nairobi-Brazza | Active | AFTN | AMHS |
| Kinshasa - Brazza | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Khar - Niamey | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Khar- Ndjamena | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Khar-Brazza | Active | AFTN | AMHS |
| Luanda - Brazza | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Luanda - Abidjan | Active | ATS/DS & AFTN | ATS/DS & AMHS |
| Luanda - Accra | Active | AFTN | AMHS |
| Luanda - Dakar | Active | ATS/DS & AFTN | ATS/DS & AMHS |

Table 1. Interoperability between SADC, NAFISAT and ASECNA

2.2.4. This re-engineering of the interconnection links will ensure that service outages which were caused outdated technology are eradicated, however the disparate satellite access methods employed by SADC/NAFISAT and AFISNET still remains a challenge to be addressed.

2.3. AHMS Roll-out

The network service provider is ready for the full-scale implementation of modern services such as AMHS, and States are encouraged to share their infrastructure development plans and readiness in this regard. The following AMHS trials have been conducted in the last three(3) years to validate the NAFISAT VSAT network capability:

- Johannesburg – Dakar not tested – planned on the AFISNET
- Johannesburg – Cairo
- Johannesburg – Addis Ababa Not successful
- Johannesburg – Nairobi

2.4. Current status of the Sana' a NAFISAT terminal

The Sana' a NAFISAT terminal remains on the old network configuration (**IDU5000**) as the site is inaccessible due local conditions. Challenges are still experienced with regards to maintenance site visits and dispatching of spares, and as a result:

- The network service provider may not be in a position to adhere to performance SLA with regards to this terminal.

2.5. Installation of a new NAFISAT terminal in Juba

The implementation of the Juba terminal which was planned for 2019/20 period has been delayed due to travel restriction and lockdown imposed by the COVID-19 pandemic. The following links from Juba are still outstanding:

- a. ATS/DS
 - Khartoum
 - Addis
 - Nairobi
 - Entebbe
 - Kinshasa
 - Brazzaville
 - N'Djamena"
- b. AFTN
 - Nairobi

3. Post 2022 NAFISAT VSAT Network Roadmap

- 3.1.1. The network service provider has developed a roadmap for the future of NAFISAT VSAT leading towards the year 2022 and beyond. The formulation of this roadmap is aimed at providing technically feasible response to current economic difficulties that the aviation industry finds itself and ensuring the that the network remains sustainable operationally and financially. The impacts of the global COVID-19 pandemic has necessitated a rethink in the balancing of service provision, safety of operations and affordability.

3.1.2. Member States are invited to consider the proposed plans regarding maintenance and support of ongoing operations, forecasted network infrastructure investments against a global aviation recovery forecast which is expected around 2023/2024. The network service provider’s roadmap is presented in two (2) timeframes:

- Short-to-Medium term goals
- Long-term goals

3.1.3. Short-to-medium term goals

a. Operations in the last two years have shown worrisome trends in the reliability of some aspects of the network. It is the view of the network provider that these some identified components will require replacement and improvements in network security. These proposed interventions will ensure that the useful life of the infrastructure can be extended to at least the year 2024. The following components are earmarked :

- Replacement of RFTs
- Upgrade of FAD interfaces
- Replenishment of FAD spares
- Deployment of cybersecurity measures (routers)
- Enhanced SLA with OEMs for LRU repairs

b. The network service provider has conducted a financial implications study for the life extension and is presented in the table below:

| Investment Forecast | 2022/2023 | 2023/2024 | 2024/2025 | |
|--|-----------|-----------|-----------|-------------------|
| <u>Potential Network Investment (2022-2024): Critical Hardware Replacements</u> | | | | |
| | | | | Totals |
| SADC | \$ 42 500 | \$ 42 500 | | \$ 85 000 |
| NAFISAT | \$ 42 500 | \$ 42 500 | | \$ 85 000 |
| | | | | \$ 170 000 |
| <u>Enhanced Maintenance & Support: Improved SLA for LRU repairs</u> | | | | |
| | | | | |
| SADC | \$ 35 000 | \$ 36 050 | \$ 37 132 | \$ 108 182 |
| NAFISAT | \$ 35 000 | \$ 36 050 | \$ 37 132 | \$ 108 182 |
| | | | | \$ 216 363 |

Table 2. SADC/NAFISAT Life extension financial implications.

c. The 2016 upgrade of the NAFISAT network introduced capabilities necessary to enable the distribution of IP applications. The ATNS backbone and tributary circuits are currently implemented and this will further enable service innovation. The following services will be operationalized in the short to medium term:

- Network-wide AMHS
 - Voice-over-IP trials
 - Centralized Aeronautical Database (CAD) data distribution
 - Surveillance data sharing (Space-based ADS-B)
- d. Studies have been conducted in the last two (2) to ascertain the feasibility of deploying the above services on the network. The results of these studies indicate that the capacity of the network is sufficient to carry the proposed services however provision of value-added services (CAD and ADS-B) will be on the back of bilateral agreements with the interested member States. The key assumptions for the study include:
- Progressive uptake of new services by Member States between 2021 and 2024
 - Availability and readiness of end-user infrastructure
 - No FIR crossing tariff increase up to 2024

3.1.4. Long term goals (2025 and beyond)

- a. The evolution of the NAFISAT network in the long term is of significant importance, especially with the advent of the 4th Industrial Revolution and the inevitable structural changes in the global aviation environment as a result of the COVID-19 pandemic. Foresightedness is required to ensure that the ambitious dream of a Single African Sky remains attainable whilst maintaining a delicate balance between innovation and economic realities.
- b. As a result, the network service provider has taken an explorative view of the future of the network with the aim of investigating possible recovery scenarios of the industry and how the network will adapt and respond to these. At a high level, the following aspects are being investigated:
- Satellite communications contingencies – The network services provider is investigating the concept of CRV as implemented by the APAC region as a back-up to VSAT
 - Bandwidth efficiency – The introduction of more data intensive IP applications necessitates research and studies into advanced satellite modem technology which will result in efficient use of scarce satellite resources.
 - The proliferation of technologies such as 5G may present both threats and opportunities, and studies have been initiated to ascertain potential impacts on the VSAT network.
 - NAFISAT VSAT Network Replacement – the replacement of the network shall be informed by the studies above.

4. Suggested actions to be taken by the Meeting

It is requested that:

- a) The meeting to take note of the current developments in the NAFISAT network.
- b) The Supervisory Board endorse the proposed short to medium term roadmap and share their readiness plans to deploy modernised and value-added services
- c) The Supervisory Board endorse the proposed short to medium term roadmap goals and provide a mandate the network service provider to proceed with detail planning and implementation thereof.
- d) The Supervisory Board endorse the proposed long-term roadmap goals and provide inputs in the identified areas of study and research.