



NIGERIAN AIRSPACE MANAGEMENT AGENCY

CIRCUIT AVAILABILITY STATISTICS FOR THE TWENTY SEVENTH ICAO- AFI SATELLITE NETWORK MANAGEMENT COMMITTEE MEETING (SNMC/27)

**25-29 NOVEMBER 2019
ACCRA, GHANA**



Introduction

Nigerian Airspace Management Agency (NAMA) is the sole Air Navigation Service Provider (ANSP) in Nigeria with the vision to be one of the leading ANSP in the World and mission to provide safe efficient and economic Air Navigation Service to airspace users through deployment of new technology and dedicated workforce.

For the reliability of the aeronautical fixed and mobile services in the Accra, Brazzaville, Kano, N`djamena, and Niamey FIR, a satellite telecommunication network for central and western Africa named initially AEROSATEL and now AFISNET was initiated by ICAO and funded by the European Union (EU).



It was implemented by Alcatel Telspace from 1992 to 1995. In Nigeria, Kano and Lagos have one Intelsat standard B earth stations (Antenna of 11m) each and six Intelsat standard F2 earth stations (Antenna of 7.3m) in Abuja, Ilorin, Jos, Maiduguri, Port-Harcourt and Sokoto. Recently, Jos and Enugu are connected to AFISNET through NSS-12 satellite.

The stations operates on C-band (6/4 GHz) through IBS carriers at 64kb/s using $\frac{3}{4}$ forward error coding on IS 10-02 and NSS-12. The stations facilitates transfer of voice and data air traffic information with other stations within the network and additionally provide coverage for extended range VHF communication in Nigeria for domestic ATC operation.

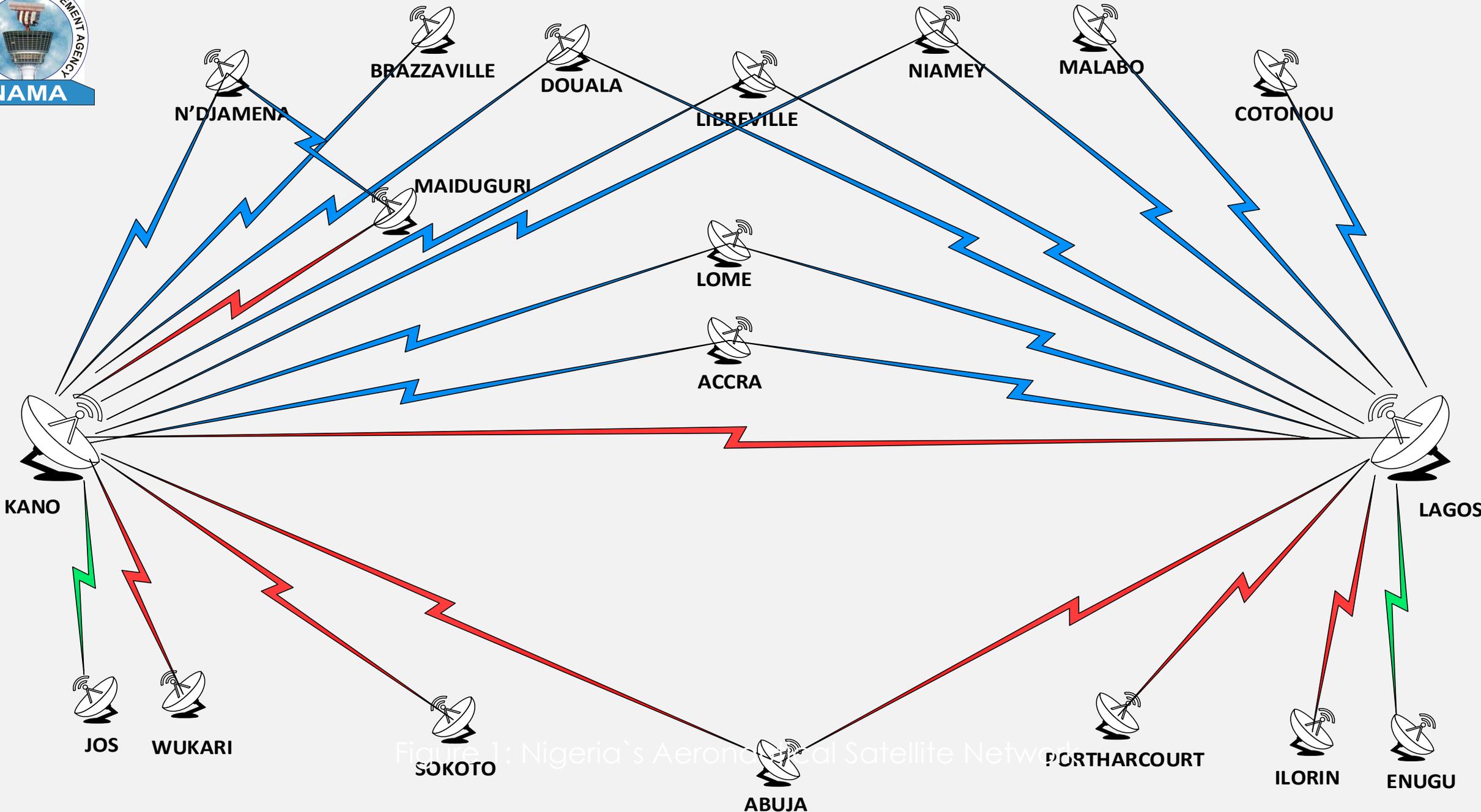


Figure 1: Nigeria's Aeronautical Satellite Network



After the site acceptance and commissioning in 1995, the earth stations have undergone the following transformation:-

- The upgrading and optimization of legacy Alcatel (S+Dx) base band unit to Multiplexer (Mol 2P) to increase the AFTN data speed from 50 to 1200 bauds for National link and 2400 bauds for International link. There was provision of additional voice engineering service telephone for maintenance coordination.
- The obsolete 286 processor/DOS based AIT SOFTWARE of the AFTN terminal were also upgraded with Pentium terminals/Windows XP OS to improve data processing which enhances quick service delivery.



- The 500W High Power Amplifier (HPA) and 125W Varian Amplifiers with Travelling Wave technology (TWT) were replaced with Solid State Power Amplifier (SSPA) 200 and 50 Watts. The change has reduced energy consumption rate and also removed the problem for searching very expensive and scarce traveling wave tube (TWT).
- In November 2004, the stations migrated from IS 903 @ 325.5 degree east to IS10-02 @ 359 degree east to harmonized and integrate all the stations for seamless and effective communication.
- Paradise MODEM, an integrated unit has replaced the Alcatel MODEMs and U/D Converters designed based on modular architecture.



Maintenance Management

The objective of maintenance is to avoid failure. It is inevitable that parts might wear and lose their specification, which makes performance deteriorate. If this is not amended rationally, it may affect the quality of service or could even result to serious irreversible failure. We carried out daily operational and preventive maintenance. Checks of different parameters are made by testing and taking measurements with spectrum analyzer, which are recorded on the maintenance sheet.



Maintenance Management – Cont.

In order to monitor the performance of the entire SATCON network, ICAO APIRG/18 meeting held in 2012 endorsed a performance monitoring strategy based on a four levels reporting index:

- **Level 1:** Space segment (CO + NO)/NO)
- **Level 2:** Radio frequency and related equipment (Eb/No)
- **Level 3:** Multiplexers or interfaces base band equipment
- **Level 4:** User Terminal Equipment.



Maintenance Management – Cont.

Currently, NAMA monitors the performance of her network through hourly checking of vital parameters [Eb/No, Bit Error Rate (BER), Signal to Noise Ratio (C_0+No/No)...] which are recorded on daily basis at 1500UTC and value of the present are compared with previous to determine the health of the link.

These statistics gives a clear view of the progress of service availability, identify deficient links, and forms the basis to strategize on mitigating the low performance of circuits whose availability fail to meet the required percentage.



Equipment Operational Status

The earth station is operational even though it has become very obsolete. The success is attributed to the following factors:-

- effective cooling systems
- steady power supply
- conducive environment and;
- competent maintenance personnel.



Circuit Availability Report

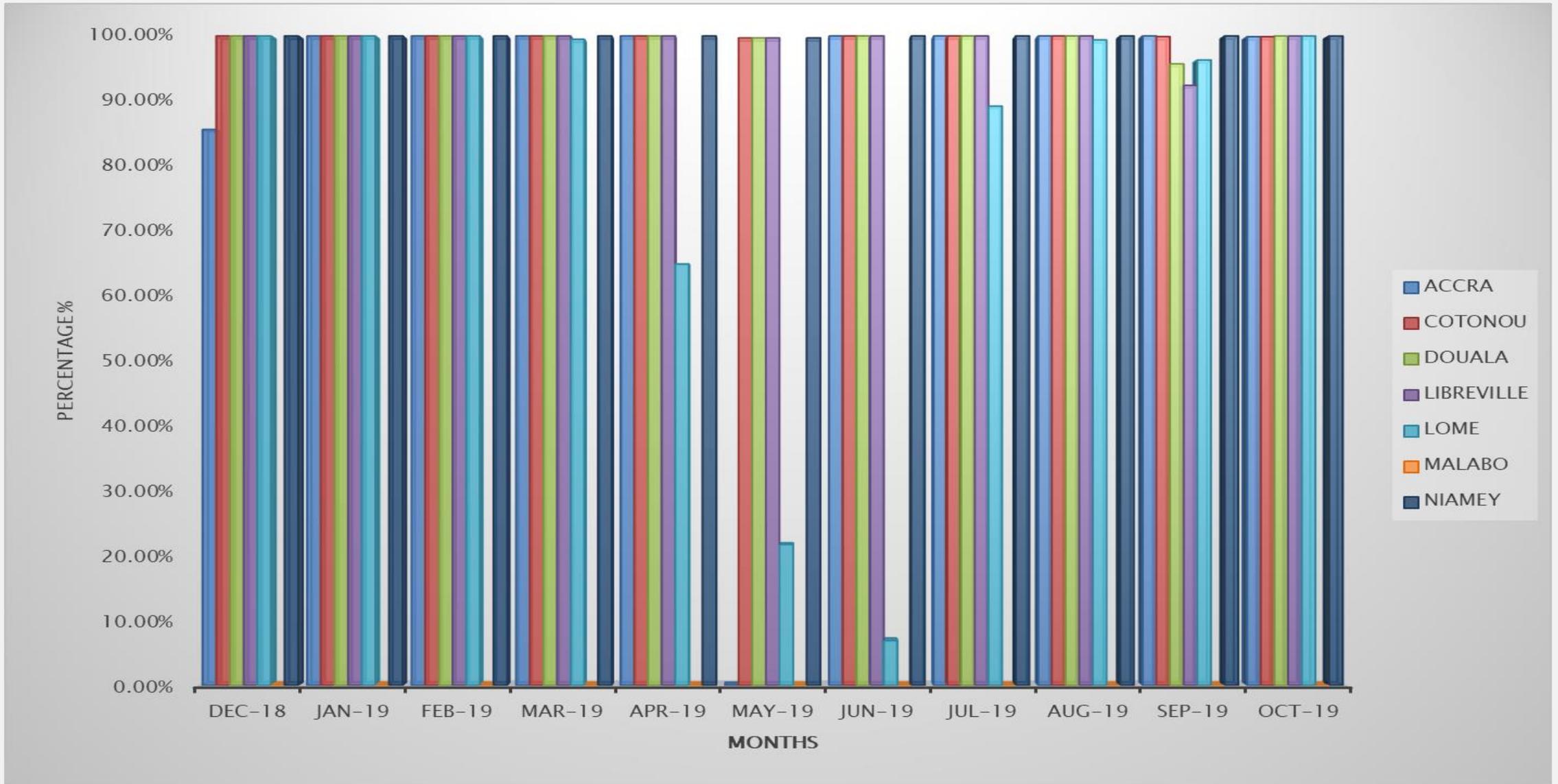
Air traffic services supported are:-

- Aeronautical Fixed Telecommunication Network (AFTN).
- Air Traffic Services/Direct Speech (ATS/DS).

The percentage availability of Lagos and Kano for the months of December 2018 – October 2019 are represented statistically by chart/table in the following slides:-



THE CIRCUIT AVAILABILITY GRAPH FOR AFTN LAGOS



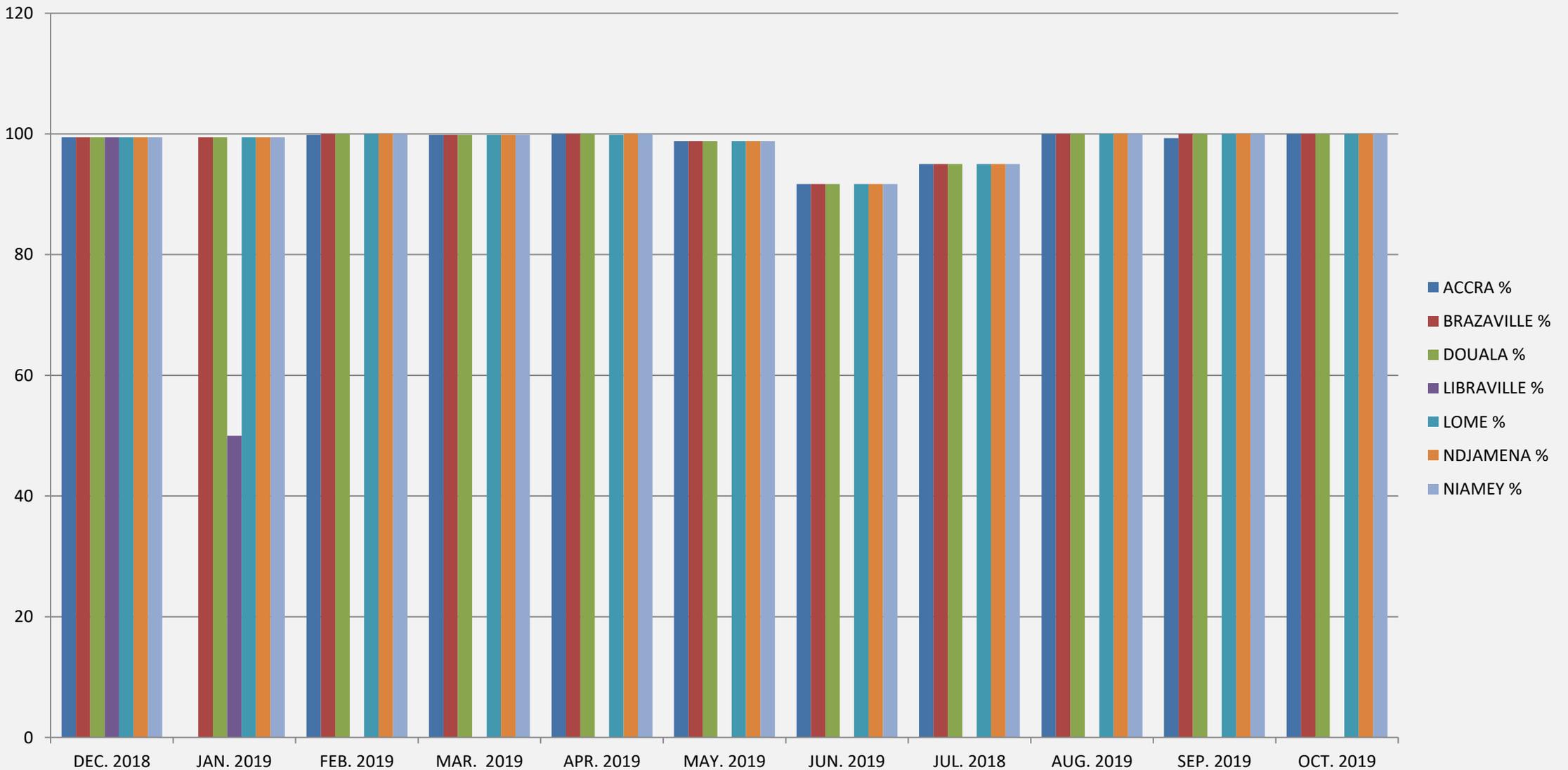


THE PERCENTAGE AVAILABILITY TABLE FOR AFTN LAGOS

| CIRCUIT / MONTH | ACCRA | COTONOU | DOUALA | LIBREVILLE | LOME | MALABO | NIAMEY |
|-----------------|--------|---------|--------|------------|--------|--------|--------|
| DEC 2018 | 85.6% | 100% | 100% | 100% | 100% | 0% | 100% |
| JAN 2019 | 100% | 100% | 100% | 100% | 100% | 0% | 100% |
| FEB 2019 | 100% | 100% | 100% | 100% | 100% | 0% | 100% |
| MAR 2019 | 100% | 100% | 100% | 100% | 99.5% | 0% | 100% |
| APR 2019 | 100% | 100% | 100% | 100% | 64.9% | 0% | 100% |
| MAY 2019 | 99.7% | 99.7% | 99.7% | 99.7% | 21.7% | 0% | 99.7% |
| JUNE 2019 | 100% | 100% | 100% | 100% | 6.9% | 0% | 100% |
| JUL 2019 | 100% | 100% | 100% | 100% | 89.2% | 0% | 100% |
| AUG 2019 | 100% | 100% | 100% | 100% | 99.4% | 0% | 100% |
| SEP 2019 | 100% | 99.9% | 95.7% | 92.4% | 96.3% | 0% | 100% |
| OCT 2019 | 99.88% | 99.88% | 99.99% | 99.99% | 99.99% | 0% | 99.99% |



THE CIRCUIT AVAILABILITY GRAPH FOR AFTN KANO



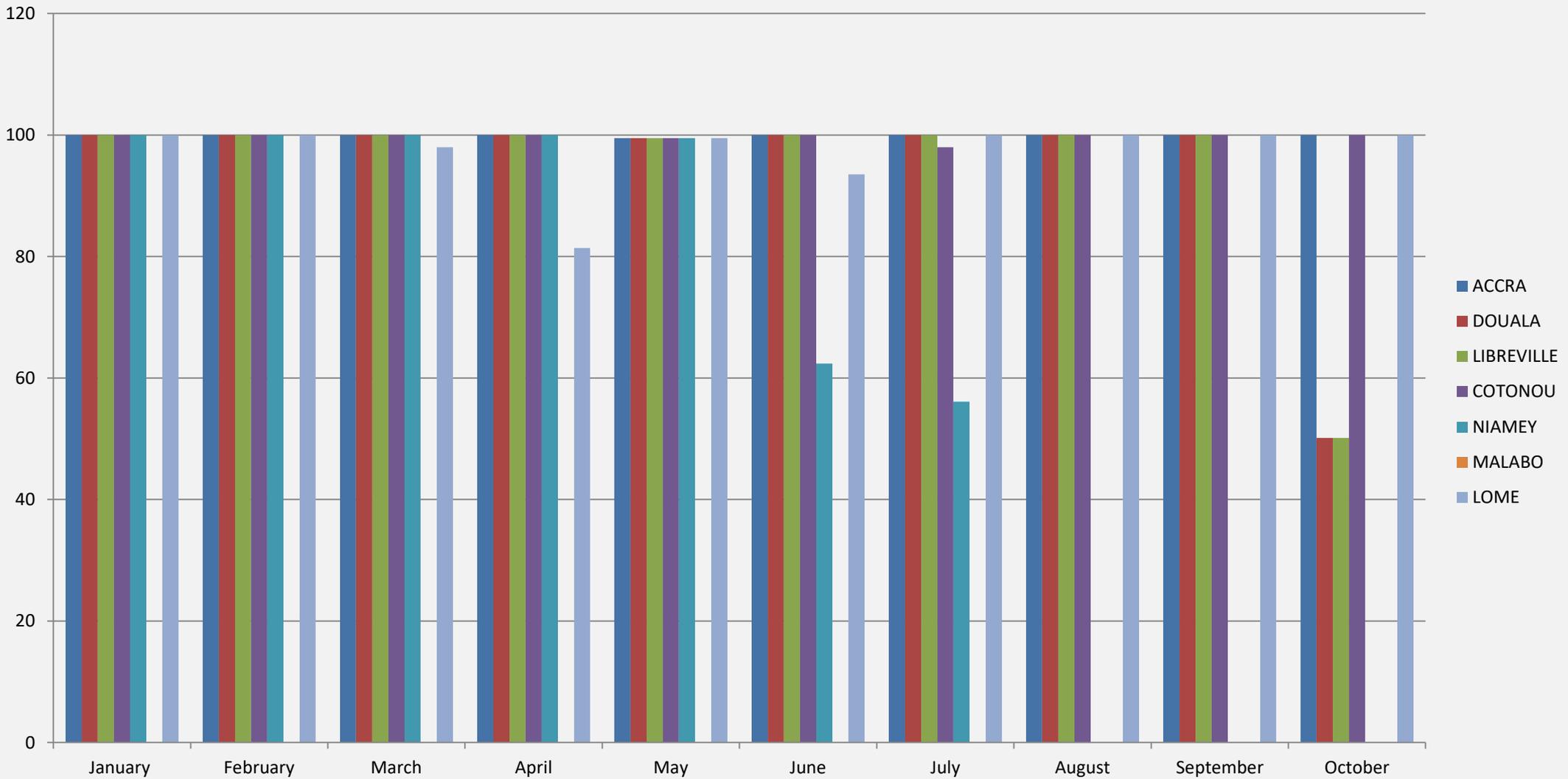


THE PERCENTAGE AVAILABILITY TABLE FOR AFTN KANO

| STATION; | ACCRA | BRAZAVILLE | DOUALA | LIBRAVILLE | LOME | NDJAMENA | NIAMEY |
|-------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | % | % | % | % | % | % | % |
| MONTH | | | | | | | |
| DEC. 2018 | 99.46 |
| JAN. 2019 | 99.46 | 99.46 | 99.46 | 50.00 | 99.46 | 99.46 | 99.46 |
| FEB. 2019 | 99.85 | 100 | 100 | 00.00 | 100 | 100 | 100 |
| MAR. 2019 | 99.86 | 99.86 | 99.86 | 00.00 | 99.86 | 99.86 | 99.86 |
| APRIL 2019 | 100 | 100 | 100 | 00.00 | 99.86 | 100 | 100 |
| MAY 2019 | 98.79 | 98.79 | 98.78 | 00.00 | 98.78 | 98.79 | 98.79 |
| JUNE 2019 | 91.67 | 91.67 | 91.67 | 00.00 | 91.67 | 91.67 | 91.67 |
| JULY2019 | 95.00 | 95.00 | 95.00 | 00.00 | 95.00 | 95.00 | 95.00 |
| AUG. 2019 | 100 | 100 | 100 | 00.00 | 100 | 100 | 100 |
| SEP. 2019 | 99.30 | 100 | 100 | 00.00 | 100 | 100 | 100 |
| OCT. 2019 | 100 | 100 | 100 | 00.00 | 100 | 100 | 100 |



THE PERCENTAGE AVAILABILITY GRAPH FOR ATS/DS LAGOS



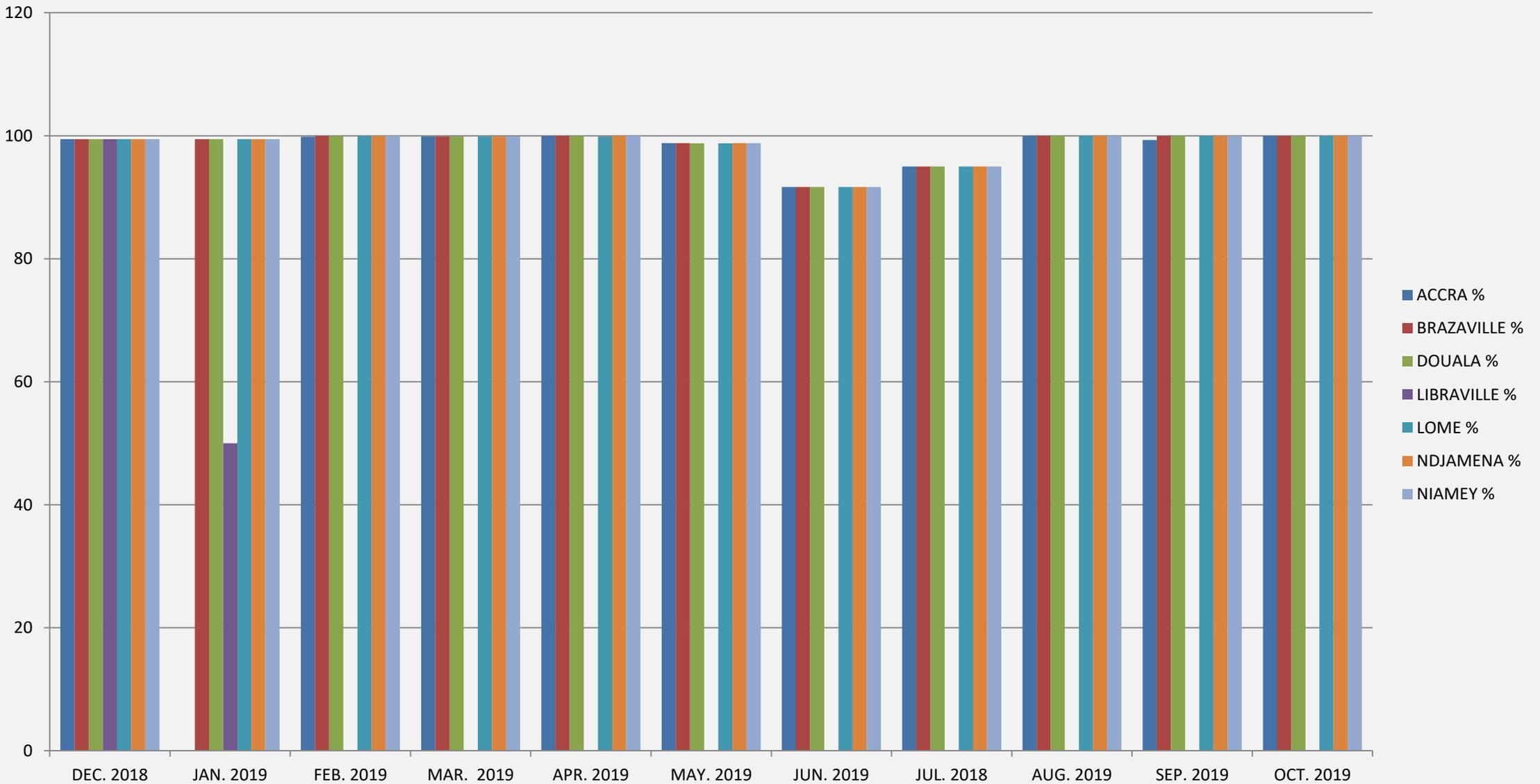


THE PERCENTAGE CIRCUIT AVAILABILITY TABLE FOR ATS/DS LAGOS

| MONTH | ACCRA | DOUALA | LIBREVILLE | COTONOU | NIAMEY | MALABO | LOME |
|-----------|-------|--------|------------|---------|--------|--------|-------|
| January | 100 | 100 | 100 | 100 | 100 | 0 | 100 |
| February | 100 | 100 | 100 | 100 | 100 | 0 | 100 |
| March | 100 | 100 | 100 | 100 | 100 | 0 | 98 |
| April | 100 | 100 | 100 | 100 | 100 | 0 | 81.4 |
| May | 99.5 | 99.5 | 99.5 | 99.5 | 99.5 | 0 | 99.5 |
| June | 100 | 100 | 100 | 100 | 62.37 | 0 | 93.52 |
| July | 100 | 100 | 100 | 98 | 56.1 | 0 | 100 |
| August | 100 | 100 | 100 | 100 | 0 | 0 | 100 |
| September | 100 | 100 | 100 | 100 | 0 | 0 | 100 |
| October | 100 | 50.13 | 50.13 | 100 | 0 | 0 | 100 |



THE PERCENTAGE AVAILABILITY GRAPH FOR ATS/DS KANO





THE PERCENTAGE AVAILABILITY TABLE FOR ATS/DS KANO

| STATION; | ACCRA | BRAZAVILLE | DOUALA | LIBRAVILLE | LOME | NDJAMENA | NIAMEY |
|-----------|-------|------------|--------|------------|-------|----------|--------|
| | % | % | % | % | % | % | % |
| DEC. 2018 | 99.46 | 99.46 | 99.46 | 99.46 | 99.46 | 99.46 | 99.46 |
| JAN. 2019 | 99.46 | 99.46 | 99.46 | 50 | 99.46 | 99.46 | 99.46 |
| FEB. 2019 | 99.85 | 100 | 100 | 0 | 100 | 100 | 100 |
| MAR. 2019 | 99.86 | 99.86 | 99.86 | 0 | 99.86 | 99.86 | 99.86 |
| APR. 2019 | 100 | 100 | 100 | 0 | 99.86 | 100 | 100 |
| MAY. 2019 | 98.79 | 98.79 | 98.78 | 0 | 98.78 | 98.79 | 98.79 |
| JUN. 2019 | 91.67 | 91.67 | 91.67 | 0 | 91.67 | 91.67 | 91.67 |
| JUL. 2018 | 95 | 95 | 95 | 0 | 95 | 95 | 95 |
| AUG. 2019 | 100 | 100 | 100 | 0 | 100 | 100 | 100 |
| SEP. 2019 | 99.3 | 100 | 100 | 0 | 100 | 100 | 100 |
| OCT. 2019 | 100 | 100 | 100 | 0 | 100 | 100 | 100 |



Thank You