

Usage of FSS VSATs for safe operation of aircraft in Africa

Abidjan PRIDA 19 -21 March 2024

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Objective

To review the usage of FSS VSATs for safe operation of aircraft in Africa

Communication in Aviation

- Global Aviation system can only operate efficiently through exchange of speech and data.
- Safe, efficient and real time provision of air traffic management (ATM)
- Global, Regional and National networks, main centres and satellite stations as nodes of dedicated Aeronautical Fixed Telecommunications Network (AFTN)
- Mobile Communication- Route , Off-Route, Ground -Air or Air to Air
- Fixed Communication- Ground to ground

Communication in Aviation

- Aeronautical Fixed Telecommunications Network (AFTN) messages: distress ,urgency ,flight safety, meteorological, flight regularity, aeronautical information services (AIS);aeronautical administrative
- Air Traffic Services Direct Speech Network (ATS/DS),
- AFTN to ATS Message Handling System (AMHS), ATS Inter-Facility Data Communications (AIDC), VHF extended coverage links
- Remote control circuits to Navigation aids and Surveillance sensors
- links and integration of surveillance stations.

Very Small Aperture Terminal (VSAT) Implementation

- Very Small Aperture Terminal (VSAT) refers to receive/transmit terminals installed at dispersed sites connecting to a central hub or to other stations via satellite using small diameter antenna dishes (0.6 to 3.8 meter).
- Fixed satellite antennas provide highly reliable communication means for data, voice and fax between almost any number of geographically dispersed sites.
- Earth station - used to receive satellite transmissions mounted on a roof on a wall, or placed on the ground with no terrestrial leg.

VSAT Implementation

- Global and regional fixed networks initially used terrestrial links
- VHF coverage achieved by use of Telecom repeater stations
- Poor connectivity to remote and war torn areas and poor VHF coverage led to high level of unserviceability and poor integrity
- The Limited Africa-Indian Ocean Regional Air Navigation Meeting of 1988 (LIM AFI RAN/1988) recommended use of satellite VSATs in the AFI Region
- VSAT project (AEROSATEL) in early 1990s and extended to AFI Satellite Telecommunications Network (AFISNET) in West Africa and Madagascar.

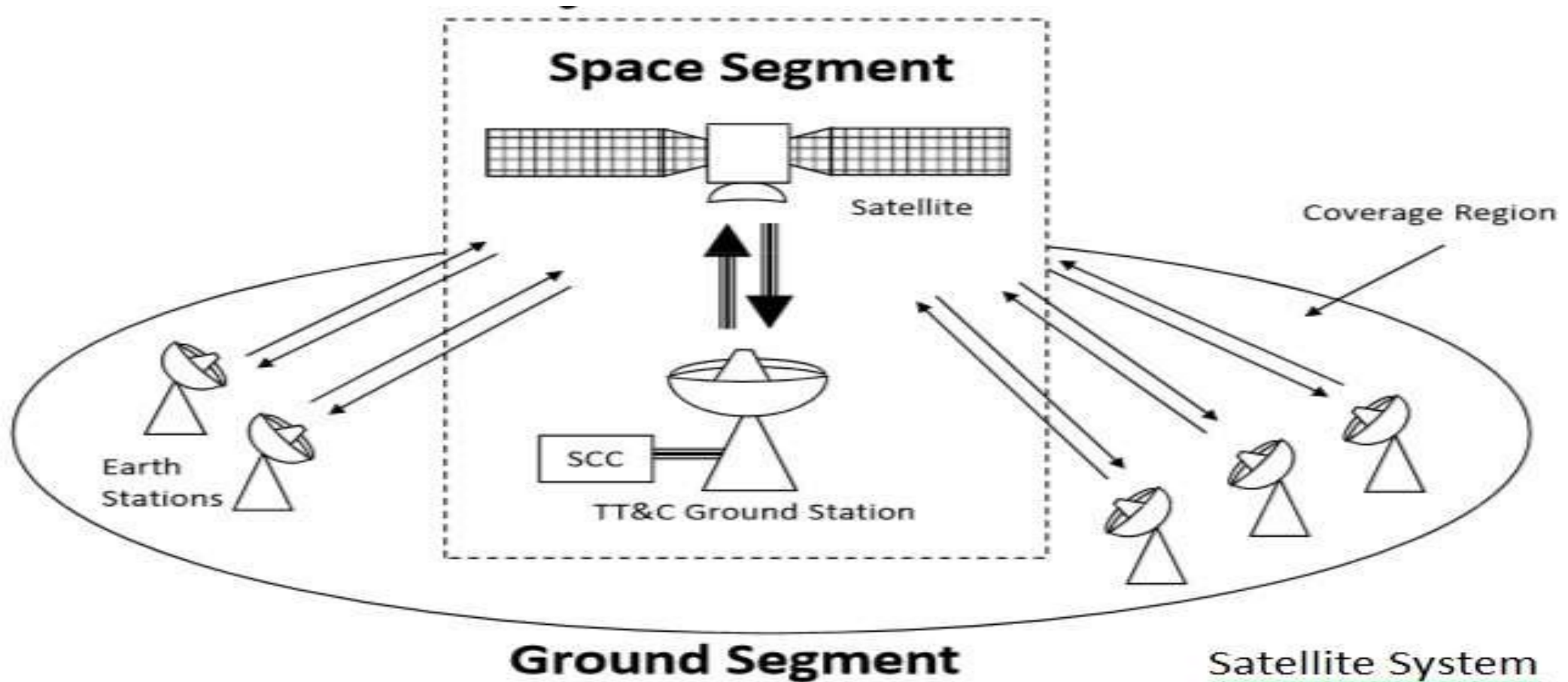
VSAT Implementation

- Early 2000s : South African Development Community (SADC VSAT/1).
- New generation: (SADC VSAT/2) launched in 2008 with the inauguration of a new VSAT network for North-Eastern African States (NAFISAT).
- Central Atlantic FIRs Satellite Telecommunications Network (CAFSAT), to cater for requirements between South Atlantic area control centres.
- Resulted in great improvement in quality and reduction of deficiencies with availabilities better than 99%, higher integrity and safety
- Brazaville circuit to Kenya example of success after nil connection for many years.

VSAT Implementation

- Networks developed by different grouping of States at different times characterized conceptual and technical varieties.
- Coordination and consideration to standardizing and integrating existing VSAT networks, spear-headed by ICAO Regional offices.
- Integrated regional/interregional digital communication networks, centralized operational control and Internet Protocol (IP) recommended to enable Interconnectivity, Operational and technical inter-operability
- Administrative arrangements: Supervisory committee, cost recovery mechanism, technical arrangements (personnel, maintenance), and network management (monitoring and control) introduced.
- Domestic networks also set up to meet State requirements e.g Kenya

VSAT typical satellite: space segment, ground segment and TT&C (Tracking Telemetry & command station / satellite control center)



VSAT components

- Outdoor unit, Indoor unit, space component and control centre
- Space Segment: satellite in space two way communication one frequency pair operates as an active repeater in space.
- A star topology, using a central uplink site, such as a network operation center (NOC), to transport data back and forth to each VSAT
- A mesh topology, where each VSAT relays data via satellite to another terminal by acting as a hub with no centralized uplink site .
- Combination of both star and mesh topologies in Africa.
- The networks have been regularly upgraded to take advantage of technological advances while ensuring inter- operability

ICAO INVOLVEMENT

- ICAO initially recommended VSAT option in LIMA meeting
- It offered a secretariat and coordination between the Network Provider and the States to ensure take off and sustenance
- A cost recovery method via IATA has been established for operation and upgrades to eliminate direct state financing difficulties.
- NAFISAT, SADC and AFISNET have been interconnected
- Where no Institutional framework existed, ICAO assisted States to form one eg NAFISAT.
- ICAO vision: ultimately have one network dedicated to Aeronautical communication after an inter operable network in is achieved.

Challenges

- Maintenance capabilities, modernization of network components, ownership and funding arrangements and associated cost recovery mechanisms.
- Network provider needed for multi State networks with no institutional arrangement and inadequate funding.
- Many different ways of VSAT network implementation and VSAT vendors use of proprietary signal protocols leads to diversity.
- Inter connectivity between nodes belonging to different VSAT networks difficult, costly, and sub-optimum in performance.
- Cooperation of Airlines through IATA in directly funding infrastructure, while still paying Air Navigation Charges.

Conclusions

- Networks based on VSAT technology offer the best means of providing Aeronautical Fixed Services (AFS) connectivity .
- Relaying air/ground communications between ATS centres and remote ground stations and Mobile services extended range.
- Installation easier and faster as infrastructure required minimum
- VSATs in Africa operate in C-band, FSS and often Mobile systems, which are Primary and with higher pfd's interfere requiring distance or Frequency separation
- Regulating protection of Aeronautical VSATs is a continuous process and ITU through various WRCs since 2007 has introduced protection.

References

- AFI ANP ICAO Doc 7474
- Radio Regulations
- ICAO GANP Doc 9750
- ICAO LIMA and APIRG reports

THANKS

3/20/24

VSAT USAGE PRIDA SW

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A group of business professionals in a line, holding hands, symbolizing teamwork and success. The image is partially obscured by a large, light-colored, wavy graphic element that flows across the bottom right of the slide.