

# Satellite backup for Civil Aviation usage

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**INTELSAT**

*Envision. Connect. Transform.*

# Agenda

- Context
- Challenges
- Satellite outages
- Service Outage, November 2013
- Backup options
- Discussion

# Context – Capacity usage

- 4 satellites are used to meet civil aviation coverage requirement and connectivity: IS-901, 10-02, 14 and 904
- Capacity Distribution
  - Transponder Lease services
    - Intelsat 1002
    - Intelsat 14
    - Intelsat 904
  - Carrier Based Services
    - Intelsat 1002
    - Intelsat 901
- Civil aviation networks:
  - AFISNET, CAFSAT, NAFISAT, SADC

# Challenges

- Coverage:
  - Ubiquitous coverage required
  - New routes opening up
- Interconnectivity:
  - Connect and deploy overlay networks of dispersed groupings
- Interoperability:
  - Operate and connect dissimilarly networks and equipment
- Performance:
  - Availability, Continuity, Integrity, Quality of Service

# Satellite outages

- **Satellites are highly reliable:**
  - Built-in redundancy
  - No single point of failure
  - Serving key business, government, military and safety services
  - Also used as backup to terrestrial services
- **Most service outages are not attributable to the spacecraft**
  - Installation and Maintenance skills
  - Ground equipment
  - Environment

# Satellite outage - ctd

- Service interruption causes:
  - Radio Frequency Interference:
    - Proper VSAT installation and maintenance are required
  - Ground equipment failure:
    - On-site spare equipment and preventive maintenance are required
  - Sun interference:
    - Depends on location, satellite EIRP and antenna size, Predictable (cf. MyIntelsat)
  - Bad weather conditions:
    - Considered in link design (power margins)
  - Spacecraft failure:
    - Very rare. IS-1002 based on the highly reliable E3000 platform.

# Service Outage, November 2013

- On 11/13/2013, ASECNA and Roberts FIR reported an outage on their IS-1002 service
- Investigation showed that:
  - Outage was caused by offending carriers in the transponder
  - A customer was performing SSPA maintenance without Intelsat assistance
  - Intelsat worked with the customer to correct power levels
  - Total outage time was 1 hour 30 minutes
- Conclusion:
  - Involve Intelsat RF Operations Center to mitigate RF interference
  - Raise awareness of maintenance teams on interference issues
  - No space segment failure involved

# Backup options

- The design of a satellite backup option must consider:
  - The type of outages that one wants to mitigate
  - The risks associated with service interruption
  - The costs of the backup system: investment and operations
- Backup possibilities:
  - In-orbit spare satellite:
    - Very expensive solution to cover against a very low probability of failure
  - Backup station pointing towards another satellite:
    - Simple solution, duplication costs, but also opens load balancing possibilities
  - Terrestrial systems:
    - Overall reliability and costs need to be assessed



# Discussion

- What services require a back up?
  - AFTN, ATS/DS, Corporate networks?
- What are the risks identified with service interruption?
  - Safety of life?
  - Flights grounded?
  - Financial penalties?
- What are the current procedures when service is interrupted?
- What is the willingness to pay for a backup system?