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SAFE SKIES.
SUSTAINABLE FUTURE.

Session 7: Key Takeaways, Recommendations and Path Forward

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V2: Includes updates from panel discussion / moderator notes

List of Topics for Review / Discussion / Agreement

Radio Regulatory Topics

Flight Deck Matters

ATC Operations

Service Provision Aspects

Short Term C-PNT

Long Term C-PNT

Radio Regulatory Topics

Objective: Limit RFI Occurrence as much as possible

Implement ITU WRC23 Resolution 676

- Aviation needs to be represented in ITU, for example to help any future update of Res 676 to succeed
- Continue to promote / improve coordination with military / security actors
  - Including testing & Counter UAS
- Use ITU RR15 Escalation Procedure for RFI over international water or cross-border cases
  - Capabilities to detect, RF measure, geolocation of source
  - Guidance on link between operator reports / ANSP confirmation / spectrum regulator engagement: Coordination and reporting is necessary and should be as simple as possible
- Improve enforcement of jammers & educate about their illegality (careful not to advertise vulnerability)
  - Market enforcement (websites)
  - Make ownership illegal to facilitate confiscation

02

Flight Deck Matters

Objective: Support Air Crews in Operational Risk Reduction and Management

“Supplemental Ops Procedures” Flight Phase

- Make near real time “GNSS RFI Weather” available on EFB or other means (ATIS, …)
  - ADS-B based monitoring: common guidance / standard to enable near-global coverage?
  - Encourage information sharing by operators (similar to turbulence awareness)
  - Fuel and alternate planning?
  - Dispatch decisions depending on equipage?
  - Clarify & facilitate RFI Reporting (EFB function?)
  - Space weather advisories: ensure crew knows what to do with information
- Evaluate need for harmonization of procedures and phraseology
  - Especially for most significant risks where common response helps to provide ATC support
  - For example, “emergency climb” due to TAWS alert
- Use of Conventional NAV and INS / IRS
  - Ensure Full INS / IRS Alignment
  - Position cross checking / VOR Radial “Airspace Barrier”
  - Ability to fly conventional procedures (training)

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ATC Operations

Objective: Ensure effective support to flight crews while maintaining safety

- Develop OPS Integration of GNSS RFI Situational Awareness Maps
  - ATC has the big picture but passing on reports is on time permitting basis
  - Coordination SMC (Systems Monitoring and Control) and ATCO (Planning and Executive)
  - Ensure readiness to provide radar vectors (verify circumstances when ATC may refuse giving vectors), other navigational assistance, or clock checks
  - Asking pilots to switch to visual nav: may be against operator company policy and may lead to crew declaring emergency
  - Ensure suitable staffing / sector workload planning / monitoring of compliance with clearance
  - Ensure and simplify reporting
- ATCO Training and Awareness
  - Response to abnormal situations / clearance deviations
  - Identify critical areas for TAWS climb and deconfliction advisories
  - Phraseology for RT advisories?

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Service Provision Aspects

Objective: Ensure suitable CNS capabilities are available as required

- Safety cooperation with local operators
  - RFI/Spoofing Warnings via NOTAM, AIP, ATIS – need clear process and know when it is over (testing)
  - Improve impact radius description and terminology (NOTAM etc). How significant does an event need to be that it requires notification?
- Facilitate Pilot Positional Awareness
  - VOR/DME Minimum Operational Network
  - For cross-checking and reversion by operators without DME/DME RNAV
- Provide Resilient Operational Network
  - DME/DME RNAV (where possible) to maintain PBN operations
  - Ensure independence of CNS (Radar, MLAT, Time)
- Provide GNSS Jamming and Spoofing Monitoring
  - Using ADS-B Out (including Space Based) or WAM, also detect time spoof on SATCOM
  - Potentially complemented by ground networks (esp. to protect INS alignment) & Flight inspection capabilities, coop with radio monitoring agencies
- Clarify RFI Report Handling
  - AIS / PIREP, ATCO Report, Follow-Up (Spectrum Regulator), define concrete actions
- Ensure ATSEP Awareness and Training

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Short Term C-PNT Development

Objective: Increase capabilities to maintain PBN and efficient operations with current technology and “small” evolutions

- DME Technology Refresh to enable RNP 0.3
  - Standards update to give credit to current performance
  - Improve DME Network Planning and Coverage Optimization
  - Resolve interoperability issues (DME tuning / selection). Make sure DME NAV works!
- Implement Robust Clocks & better define time keeping performance requirements
  - Augment GNSS Time with TCXO Oscillators or other alternate time & time distribution sources
  - T-RAIM?
- Improve GNSS Robustness
  - Fast deployable MMR and other upgrades
- Avoid cross-contamination of sensors
- Implement Spoofing Monitors in Surveillance Trackers
  - ADS-B to SSR / WAM Comparison

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Long Term C-PNT Development

Objective: Achieve Robust PNT with new technology upgrades

- Analyze “Cyber Risks” of ALL CNS and safety net systems and develop mitigations in line with security risk assessment
  - Clarify definition of “Integrated CNS”: Beat common mode weaknesses with common mode strengths (smart integration while maintaining independence) of ground / air / space systems
- Standardize & implement GNSS Resilience
  - Authentication, Improved Antennas (CRPA), RFI Detection and Downlink
- Improve L-Band Spectrum Utilization with new C-PNT Technologies
  - eDME using Legacy Compatible Transition
  - Other candidates (including other spectrum bands)
- Agree Balanced CNS Evolution Roadmap (Ground / Air / Space Capabilities)
  - Considering spectrum efficiency as a necessary driver

“Parking Lot”

To note any topic not captured / arising in discussion

TBC during Session

Thank You

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