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INTERNATIONAL CIVIL AVIATION ORGANIZATION

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ICAO WRC-27 Preparatory Workshop
Radio Altimeters

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Presentation Overview

01 **Radio Altimeters Interference Issue**

02 **New Radio Altimeters Performance Standards**

03 **Regional 5G Implementation Examples**

04 **Summary**

Radio Altimeters

Update on global altimeter issues

- The RA interference problems with adjacent band 5G
- New altimeter standards
- Examples of current national 5G mitigations

Radio Altimeters

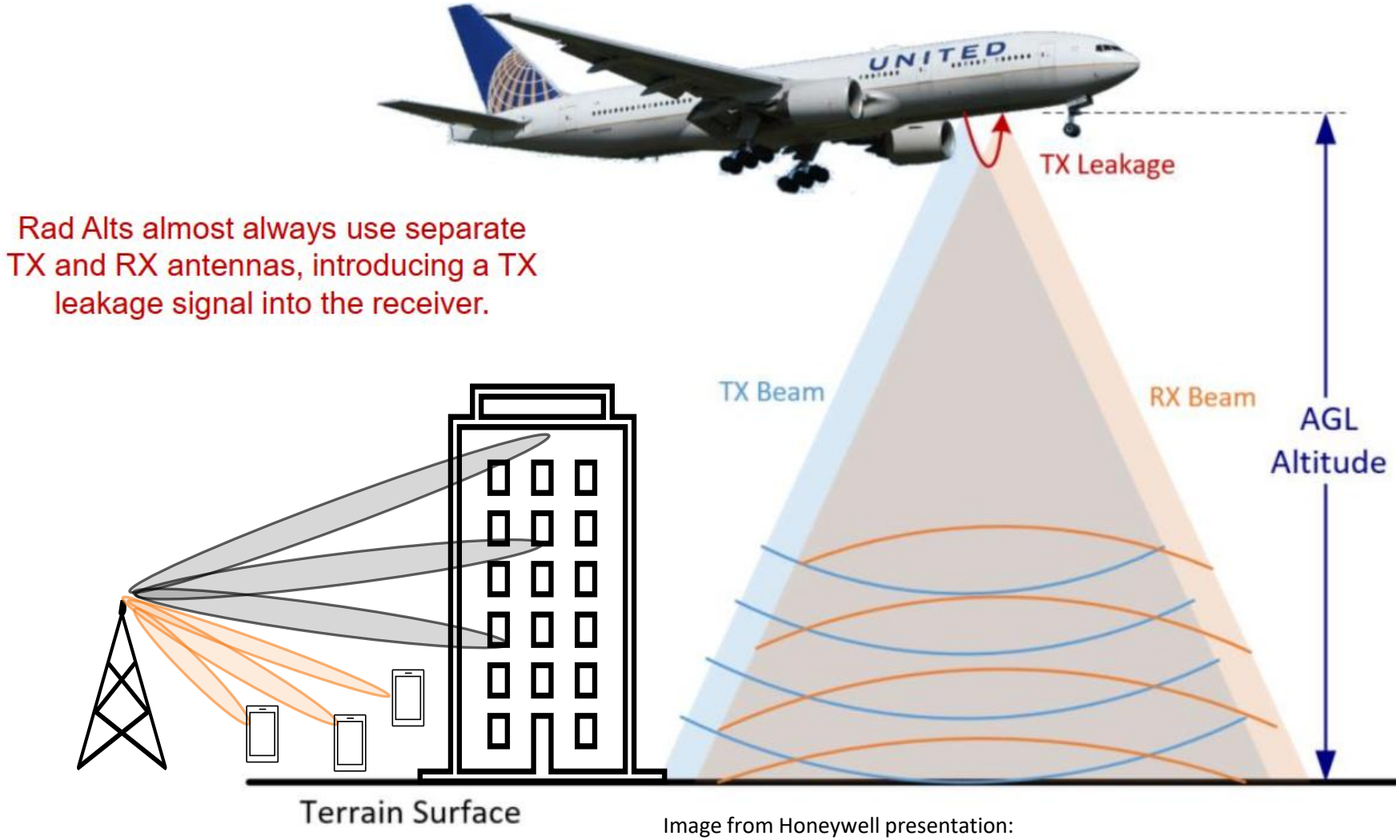
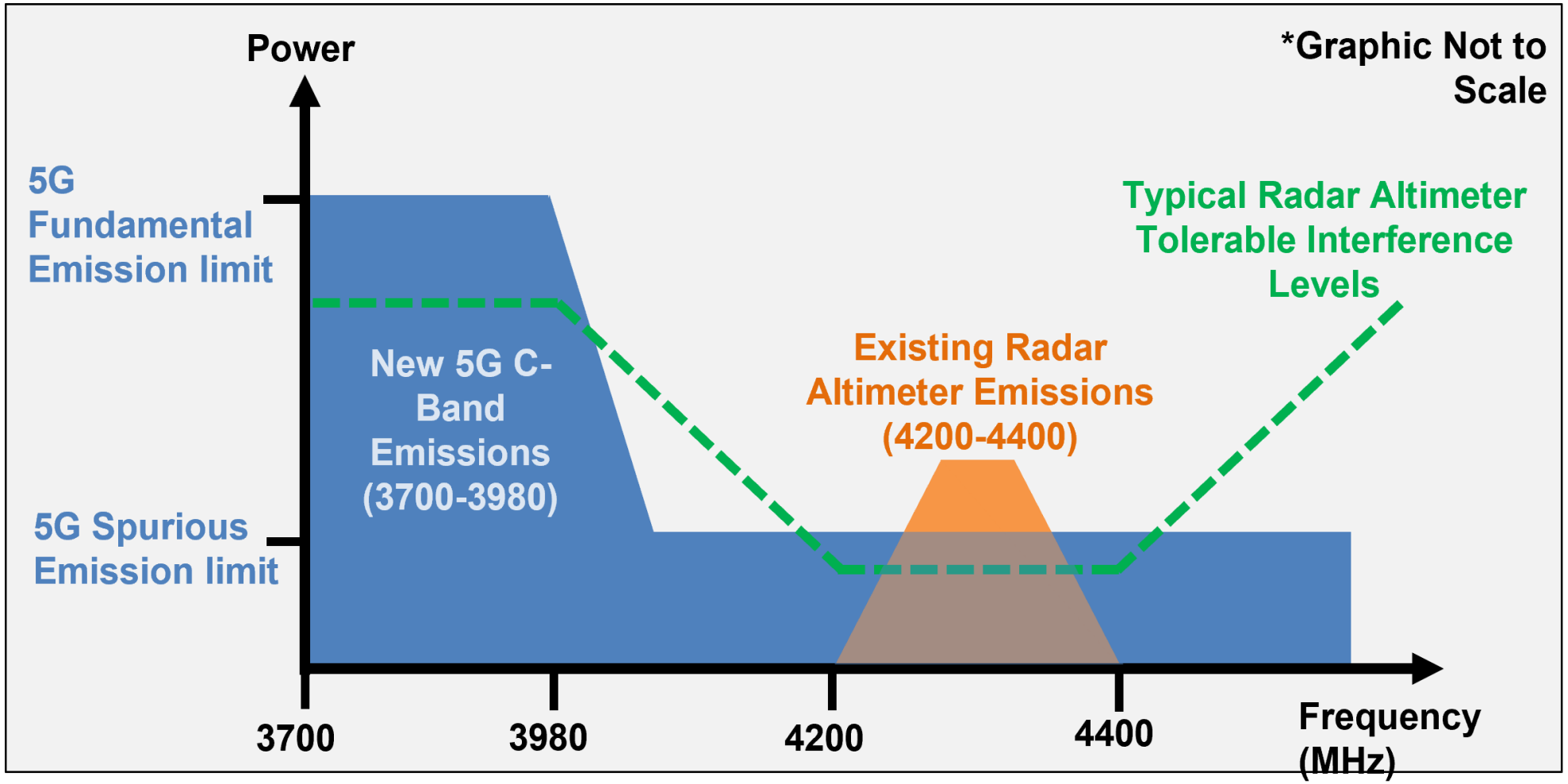


Image from Honeywell presentation:
https://avsi.aero/wp-content/uploads/2021/12/Radio-Altimeter-Overview-of-Design-and-Performance.pdf

Radio Altimeters

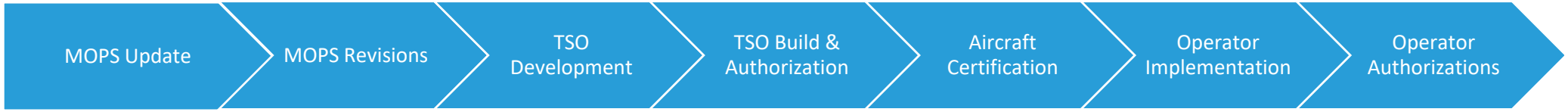
Interference concerns



Radio Altimeters

New Altimeter Standards

- New altimeter standards being developed by RTCA/EUROCAE
  - FAA and EASA requesting new altimeter performance and updates from previous 1980 standard
- New MOPS expected March 2027
  - New standard includes both LRU and antenna performance
  - MOPS progress updates anticipated Q4 2026
- Certification and manufacturing of new altimeters will begin once MOPS complete
  - Mass deployment not anticipated until 2030s at the earliest
  - Regular standards process normally takes 10+ years from beginning to end



National Example – USA 2020 5G Proceeding

3700 – 3980 MHz

- United States implemented 5G in 3.7-3.98 GHz range in 2020
  - Decision required extensive follow-up work from both industry and FAA to mitigate potential interference
- 5G limitations agreed until Jan 2028
  - 5G antenna elevation limited above horizon
  - Spurious emissions to -48 dBm/MHz conducted in 4.2-4.4 GHz
  - Coordination with FAA for 5G towers near airports
- Many US aircraft required additional filtering to meet performance
  - ‘Group 4’ performance

National Example – USA 2026 5G FCC/FAA Rulemaking

3980-4200 MHz

- Joint FCC/FAA national process released July 2026
  - 5G allocated up to 4140 MHz (160 MHz of new 5G spectrum)
    - Leaves existing SATCOM remaining in 4160-4200 MHz
  - Combined with aircraft retrofit with 5G mitigations
    - Also updates previous 5G rules in 3700-3980 MHz from 2020 to align
- 5G Auction starts April 2027 for switch on Dec 2030
  - All US Part 121/129 must be retrofitted by Dec 30, 2030
  - All other Part 91/135 must be retrofitted by Oct 31, 2034
    - FAA will issue advisories for affected aircraft
- Rebate for aircraft retrofits being implemented
  - Estimated rebate cost of approx. $5 bn USD for all aircraft

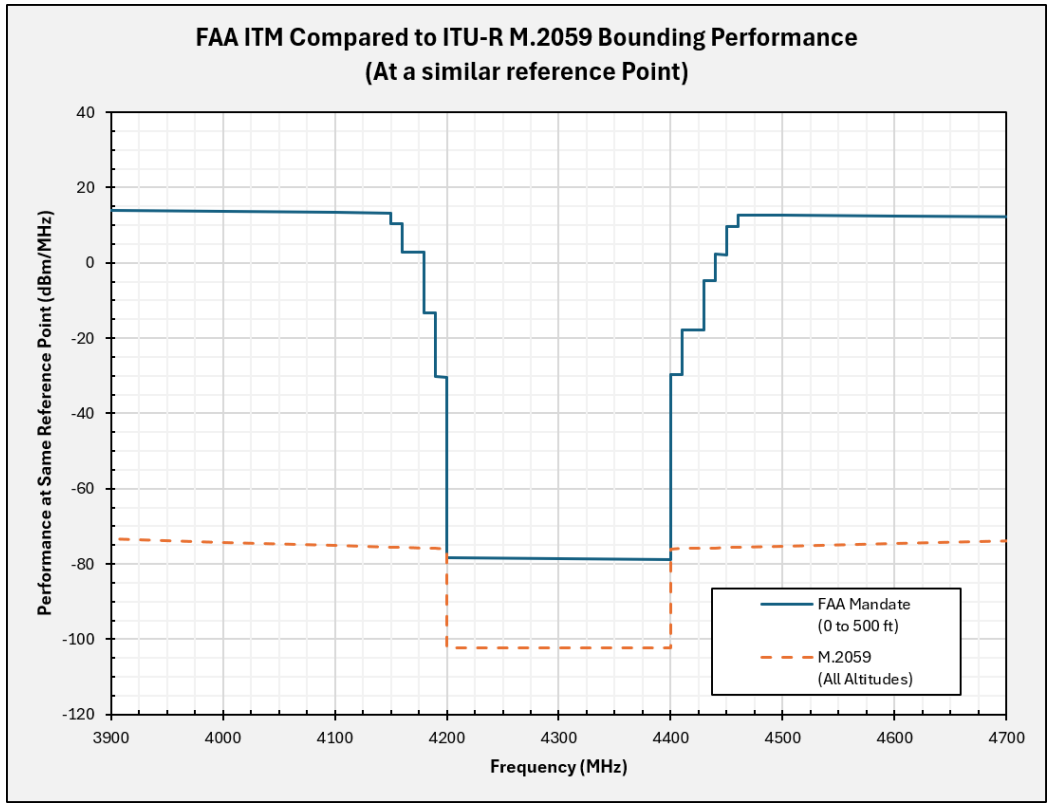
National Example – USA 2026 5G FCC/FAA Rulemaking (cont)

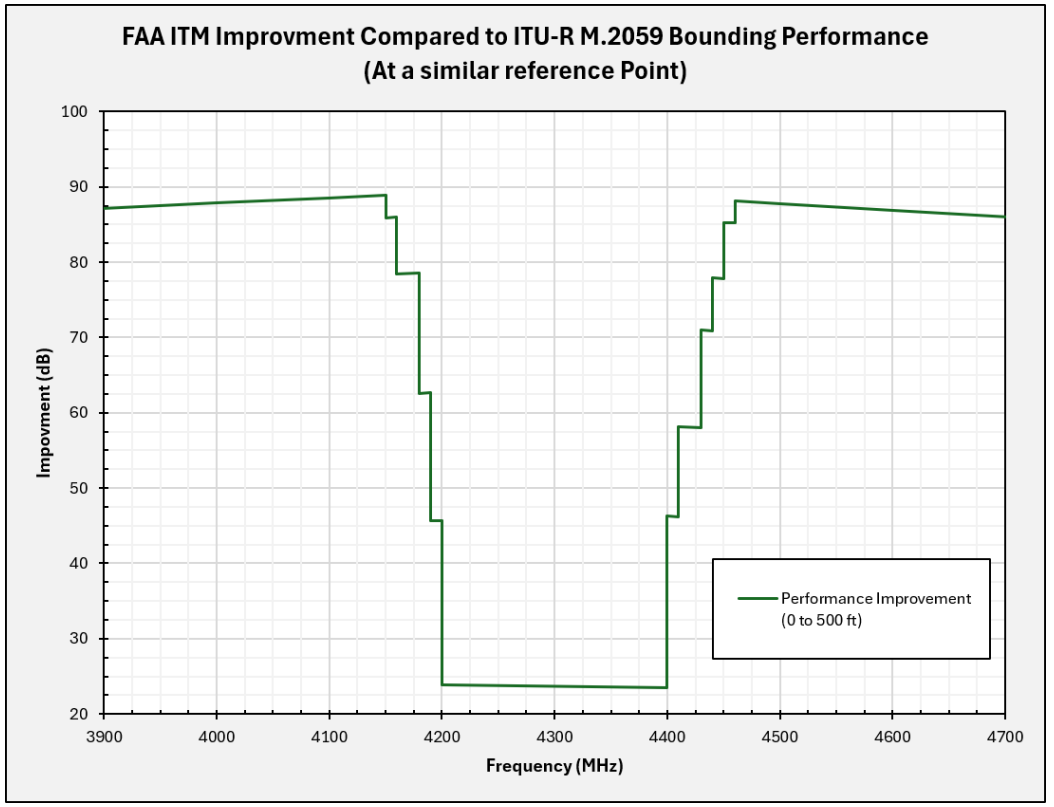
3980-4200 MHz

- 5G mitigations put in place
  - Limit of 65 dBm/MHz EIRP for fundamental power across all polarizations
  - Spurious limit in 4200-4400 MHz in either:
    - -28.4 dBm/MHz EIRP
    - -46 dBm/MHz conducted
  - 5G towers limited to max height of 450 ft
- Factors built into rulemaking
  - Minimum of 35ft separation between aircraft and 5G tower
  - 6 dB safety margin
  - ~5 dB signal aggregation factor
  - Free Space Path Loss propagation
  - 45 Deg cross pole of 5G antennas provides 3dB of credit for RA antenna

National Example – USA 2026 5G FCC/FAA Rulemaking

Comparison of RA performance before and after rulemaking





Note: The FAA ITM performance depicted above assumed 11.5 dBi of antenna gain and 3 dB of cable loss at all frequencies. These assumptions were made to compare the RA receiver unit specification in ITU-R Recommendation M.2059 to the recently mandated FAA System Level ITM specified as a PFD at the receive antenna face.

Regional Example - Europe

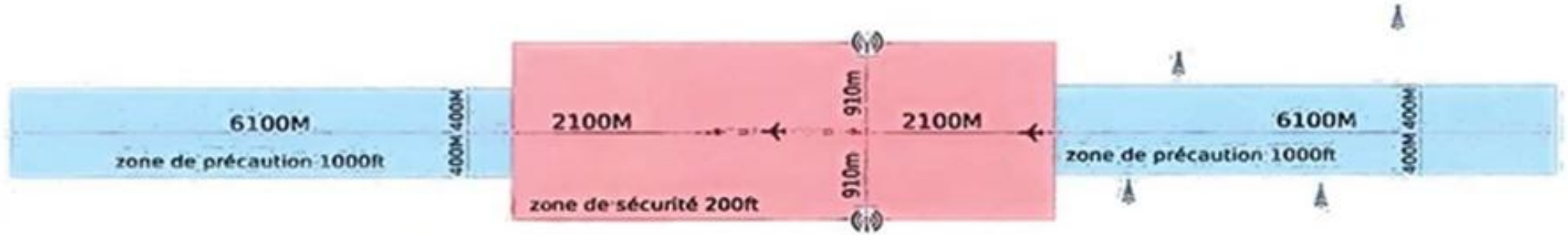
Current Situation

- Europe operating similar, but not identical, 5G bands to the US
  - EASA does not believe there is an immediate safety issue and is monitoring for any RA interference reports
  - DG MOVE/CONNECT have published roadmap proposal for altimeter retrofits in 2030s with EASA responsible for aviation protections
- ECC Report 362 published in 2025
  - Assessed 3.4-3.8 and 3.8-4.2 GHz mobile systems against radio altimeter
  - Aviation interests filed comments questioning the conclusions in the published report
    - Not representative of all current altimeters
    - Not worst-case aircraft operational scenarios

Regional Example - Europe

France 5G Mitigations Example

- Provisional precautionary measures relating to the geographical location of some 5G antennas in the vicinity of airports with IFR procedures in mainland France have been implemented.
  - Mitigation measures are still in place around Airports where ILS CAT III are implemented



Other National Examples

RA Protections Implemented in multiple other Nations

- Other administrations have implemented national mitigations to protect radio altimeters from adjacent 5G signals
    - Examples include Australia, Japan, Saudi Arabia, etc.
- Many national mitigations based on creating separation distances between airport/heliport facilities and 5G cell towers
    - Exact values have varied depending on data provided
- FSMP CG has been capturing the status of national mitigations*: https://www.icao.int/safety/FSMP/MeetingDocs/FSMP%20WG18/IP%20-%20Copy/FSMP-WG18-IP09R1_CG-RA%20Report%20Feb%202024%20v1.2.docx
    - No globally agreed mitigation methodology to assess and mitigate potential interference

Radio Altimeters

Ongoing Actions

- Aviation industry needs to engage with national spectrum regulators
  - Participate in national spectrum regulator process to educate and inform on aviation specific requirements
  - Ensure accurate aviation information available to help inform national positions and mitigations
  - Data is critical to support positions
- Increase aviation attendance at the ITU-R WP 5B and WP 5D meetings
  - Allow greater ‘in-room experience’ from aviation and additional voices to support ICAO position on WRC-27 Agenda Item 1.7
  - Both aviation regulators and industry
- Please contact ICAO Secretariat if there are any questions or national updates
  - Can provide additional resources and help document ongoing national efforts
  - National updates to CG summary paper are welcome

Summary

- New Radio altimeter standards are going to take time to be implemented
  - Near-term studies of 5G/6G needs to assess current altimeter equipment
- Aviation industry needs to engage with spectrum regulators to provide aviation specific expertise and guidance
  - Both at domestic and international processes
  - Promote correct usage of altimeter performance, ICAO operational scenarios, and protection of WAIC
- Please contact ICAO Secretariat for questions and provide updates to FSMP
  - Can provide additional resources and contacts for questions

Thank You

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