Altimetry System Error (ASE)
Workshop 17-19 October 2017

RVSM and Monitoring
2020 and Beyond – US Perspective
Key Acronyms and Abbreviations

- RVSM - Reduced Vertical Separation Minimum
- ICAO – International Civil Aviation Organization
- RMA – ICAO RVSM Regional Monitoring Agency
- AGHME – Aircraft Geometric Height Measure Element (US and Canadian ground-based monitoring)
- ADS-B – Automatic Dependent Surveillance - Broadcast
- GPS – Global Positioning System
- GMS – GPS-based Monitoring System
- GMU – GPS-based Monitoring Unit
- EGMU/E²GMU – Enhanced GPS-based Monitoring Unit
Overview

- RVSM Monitoring – Current
- RVSM Monitoring – Future
- International RMA Support – Current
- International RMA Support – Future
- AGHME
- ADS-B Height Monitoring Considerations
- ADS-B Height Monitoring Ground Stations
- GMS Considerations
- ASE Processing
RVSM Monitoring - Current State

- **GMS**
  - FAA Global Leadership
    - Maintenance
    - Training
    - Hardware/software tech refresh/development
  - Resource Intensive
  - Sponsored by FAA Tech Center

- **AGHME**
  - GMS ASE engine
  - Automated
  - Sponsored by FAA Tech Center

- **ADS-B Height Monitoring**
  - GMS ASE engine
  - Solution development continues
  - Not currently available to operators
RVSM Monitoring – Future State

- **GMS**
  - FAA Global Leadership
    - Tech Refresh/Development
  - Increased Automation and Outsourcing
  - Additional sponsors within FAA?

- **AGHME**
  - GMS ASE engine
  - Additional Automation
  - Remain cost-effective once ADS-B is primary method?
  - Additional sponsors within FAA?

- **ADS-B Height Monitoring**
  - Automated processing
  - Solution development complete
  - Sponsors within FAA?
International RMA Support - Current

● GMS Hardware
  ○ FAA Global Leadership
    ■ GMU Tech Refresh/Development
    ■ Loan/Provide
  ○ Sponsor: support from FAA Tech Center

● GMS Software/Data
  ○ Commercial GPS correction software
  ○ ASE Calculation
  ○ Meteorological Data
  ○ Sponsor: support from FAA Tech Center

● ADS-B Height Monitoring
  ○ Australia/AAMA, Japan/JASMA, Asia/MAAR, RMA China, EURASIA RMA
International RMA Support - Future

- **GMS Sustainability/Commercial**
  - GMU Tech Refresh/Development
  - Provide ASE
  - Sponsor?

- **Commercial GMS Software/Data?**
  - GPS correction software
  - ASE Calculation
  - Meteorological Data

- **Hardware and software training support?**

- **ADS-B Height Monitoring?**
  - Quality Assurance
  - Sampling

- **Performance-Based Communication and Surveillance (PBCS) Monitoring?**
AGHME

- Technical refresh to extend service life to sustain operations of U.S. AGHMEs beyond 2020
- Cost-effective once ADS-B becomes primary means of RVSM monitoring?
- Continued maintenance for in-service AGHMEs
- Installation of Florida AGHME
- Atlantic City AGHME site to remain operational beyond 2020
- Continued maintenance of Canadian AGHME sites
  - Ottawa, Ontario
  - Lethbridge, Alberta
- ASE processing
ADS-B Height Monitoring Considerations

- Forthcoming RVSM ADS-B Out rulemaking will require continual monitoring via ADS-B Out.
- Ownership, funding and level of effort for continual monitoring via ADS-B Out and related analysis of aircraft performance possible?
- GMS ASE engine re-engineering.
- GMS ASE engine adapted to meet ADS-B height monitoring needs.
- Quality assurance, sampling, storage and automation requirements for continual monitoring via ADS-B.
- Personnel resources to support ADS-B height monitoring data analysis.
ADS-B Height Monitoring Ground Stations

- ADS-B data collection optimized for RVSM height-monitoring
- International and domestic interest in validated ADS-B height monitoring system.
- Potential users:
  - Africa/AFIRMA
  - Middle East/MIDRMA
  - Caribbean & South America/CARSAMMA
  - Other RMAs desiring expanding ADS-B monitoring coverage
  - Aircraft manufacturers, FBOs, aircraft maintenance and management organizations.
- ASE calculation needed
Anticipated user benefits:
- Low cost system with increased coverage for enhanced monitoring capability
- More timely identification of aberrant and non-compliant airframes.
- Operators equipped with ADS-B Out and compliant with Part 91 Appendix G in US will not have to prepare and submit authorization package under US FAA rule change.

Possible cost model - operators would pay nominal cost when ASE result needed for compliance.
GMS Considerations

- Sustain current GMS assets
  - GMU
  - EGMU
  - \( E^2 \)GMU
- Development of next-generation \( E^3 \)GMU adding ADS-B Out reception to airborne platform.
- Continued expansion of \( E^2 \)GMU assets to RMAs, aircraft manufacturers, fixed base operators and aircraft management organizations.
- Support for RMAs requiring GMS support.
- Upgraded ASE calculation software.
ASE Processing

- Upgrade ASE software
  - Modern or multiple platform
  - Modern language
  - Enhanced automation
  - Enhanced user interface
  - Enhanced documentation
Summary

- What are the considerations for maintaining and upgrading the current monitoring systems?
- What impact does height monitoring from ADS-B data have on:
  - Current monitoring systems
  - US RMA operations
  - International RMA operations
  - RMA-RMA support relationships

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