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Aerospace Management Systems Division



Reduced Vertical Separation Minimum (RVSM) Post-Certification Verification



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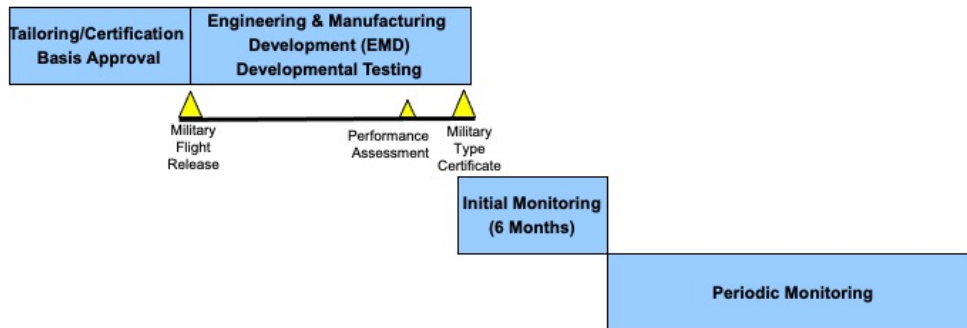
Topics



- RVSM Cert/Life-Cycle Process
- Compliance Phases
- Why RVSM Periodic Monitoring?
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- Periodic Monitoring Process
- ADS-B Monitoring
- RVSM Monitoring References
- Summary



RVSM Cert/Life-Cycle Process



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Compliance Phases



- **EMD V&V**

- Includes Analysis, SIL/Ground/Flight Testing
- Flight testing can be done in Restricted airspace or FAA pre-coordinated block of airspace

- **Initial Monitoring**

- First stage of Periodic Monitoring
- Provides initial post-certification confidence of RVSM performance using a percentage of fielded aircraft to represent fleet
- Required within 6 months following platform airworthiness certification

- **Periodic Monitoring**

- Verifies certified aircraft RVSM performance is maintained during operations for life of platform
- Tied to Continual Airworthiness

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RVSM Minimum Monitoring Requirements tables can be found at:

https://www.faa.gov/air_traffic/separation_standards/rvsm/documents/APP-B_MMR_as_of_7-21-2017.pdf



Why RVSM Periodic Monitoring?



- **Program to monitor or verify aircraft height-keeping performance**

- Over time RVSM primary performance parameters degrade
 - Barometric system accuracy
 - Autopilot hold
 - Alerting pilot when either of above fails
- Monitoring validates primary performance parameters of RVSM-certified aircraft
 - Consists of a specific process for life of aircraft following certification
 - Includes specific maintenance activity
- Monitoring requirement exists worldwide for access to RVSM airspace

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Why RVSM Periodic Monitoring?



- RVSM Degradation Causes
 - Aircraft performance degrades over operational time from
 - Pitot tube and static port degradation
 - Imperfections in aircraft skin (skin waviness)
 - Barometric component drift over time

- Can result in Altimetry System Error (ASE) to fall outside of allowable values
 - Monitoring verifies if ASE is within allowable values
 - Action must be taken by operator if these limits are exceeded



Periodic Monitoring Requirements



- **RVSM Height Monitoring Plan**
 - Required to demonstrate aircraft's ability to maintain ASE requirements of part 91, Appendix G
 - Documents process needed to verify ASE performance
 - Required when applying for RVSM certification
 - Elements of monitoring plan include:
 - Number and identification of aircraft to be monitored in each monitoring group;
 - Expected time frame for completion of monitoring requirements; and
 - Expected method for monitoring



Periodic Monitoring Requirements



▪ Monitoring Implementation

- Operators must conduct initial monitoring within six months of RVSM authorization receipt
- Operators must **conduct monitoring every two years** or within intervals of 1,000 flight hours per aircraft, whichever period is longer
- Operators not required to complete monitoring prior to being granted operational approval
- Evidence of previous successful monitoring of aircraft transfers to new owner and may be used to meet monitoring requirements
- When calculating 1,000 hour minimum recurring monitoring requirement:
 - Duration should be from last valid monitoring date on record
 - Flight Log book data should be sufficient

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Periodic Monitoring Process



- Impact to MAJCOMs
 - **Operator (MAJCOM) should provide plan for participation in RVSM monitoring program**
 - Normally entails “check” of portion of operator’s aircraft by an independent height-monitoring system
 - Height-keeping errors fall into two broad categories:
 - Errors caused by malfunction of aircraft equipment
 - Operational errors
 - **Operators who consistently commit errors of either variety may be required to forfeit authority for RVSM operations**
 - If problem is specific to one aircraft type, RVSM authority may be removed for the operator for that specific type

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Periodic Monitoring Process



- **Monitoring Equipment**
 - **AGHME (Aircraft Geometric Height Measurement Element)**
 - **Fly-Over facility**
 - Does not require aircraft to be instrumented
 - FAA published reports are annotated by the unique Mode S 24-Bit address
 - **AGHME constellations located at six sites in North America:**
 - Atlantic City, New Jersey
 - Phoenix, Arizona
 - Ottawa, Ontario
 - Lethbridge, Alberta
 - Portland, Oregon
 - Wichita, Kansas

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Reference for AGHME sites in North America: :

https://www.faa.gov/air_traffic/separation_standards/aghme/locations/



ADS-B Monitoring



- Amends 14 CFR part 91, Appendix G; adds new section 9 (*Aircraft Equipped with ADS-B Out*)
 - Enables determining aircraft compliance on an ongoing basis
 - Aircraft equipped with qualified ADS-B OUT systems will be height-monitored during normal operations at RVSM altitudes when sufficient ADS-B data is available to the FAA to determine RVSM performance
 - Aircraft's altitude-keeping performance must have been monitored and found to be RVSM within previous 24 months
 - The aircraft must continue to meet the altitude-keeping performance specified in part 91 Appendix G, section 9

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Reference for 14 CFR part 91, Appendix G, section 9:

https://gov.ecfr.io/cgi-bin/text-idx?gp=&SID=19b122d1544ac370a5bd6d76bb3eaf1&mc=true&tpl=/ecfrbrowse/Titl e14/14tab_02.tpl



ADS-B Monitoring



- Advantages of ADS-B Monitoring
 - FAA recognizes elimination of burden and expense of current RVSM application process for operators of aircraft equipped with qualified ADS-B Out systems
 - Meets altitude keeping equipment performance requirements
 - Eliminates operator's need for separate RVSM monitoring program and authorizations
 - Safer RVSM operations through recurring monitoring



RVSM Monitoring References



- RVSM Height Monitoring Guide for U.S. Operators (dated 25 May 2016)
 - Appendix A Short Guide to Monitoring
 - Appendix B RVSM Minimum Monitoring [Tables] Chart
 - Appendix C FAA approved GPS-based Unit (GMU) RVSM Monitoring Providers
 - Appendix D Ground-based monitoring using the North American AGHME System
 - Appendix E Ground-based monitoring outside North America
 - Appendix F Frequently asked RVSM Monitoring questions (FAQs)
 - Appendix G Points of Contact for RVSM Height Monitoring

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RVSM Height Monitoring Guide for U.S. Operators (dated 25 May 2016)

https://www.faa.gov/air_traffic/separation_standards/rvsm/documents/FINAL_Monitor_Proc_US_Opr_5-25-2016.pdf



Summary



- **RVSM compliance**
 - Required for access to airspace needed to accomplish mission
- **Monitoring required**
 - RVSM certification can be revoked without it
 - Monitoring identifies ASE violations needing correction
- **Monitoring methods**
 - AGHME Fly-Over
 - ADS-B
- **Verification maintenance mandatory**
 - Perform skin waviness maintenance to correct ASE violations
 - Ensure Baro system accuracy
- **Work with operational command for testing**
 - Prevents expensive over-testing

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