

DEADLINE: January 20, 2005



Second Edition

Editor's Notes

The growing demand for air travel has nearly saturated the world's airways, but years of careful scrutiny have resulted in the selection of RVSM to relieve the crowded skies. The success of the initial RVSM regions (oceanic airways between the continents) has paved the way for RVSM expansion into regions governed by Eurocontrol, Nav Canada, the FAA and other national regulatory agencies. RVSM is a reality that is here to stay that will affect the operations of every jet and many turboprops as it continues to move closer to our home airfields.

RVSM will facilitate more on-time departures and arrivals, enhancing the value of airline and business aircraft travel. The airlines have been avid RVSM supporters since its inception because preferred routing, fuel savings and fewer delays will yield greater profits. In fact, the FAA estimates the increased access to fuel-efficient altitudes created with U.S. Domestic RVSM (DRVSM) will deliver \$400 million in fuel savings each year.

The relatively small number of dissimilar airframes has made RVSM certification a manageable task for the airlines. Conversely, the wide array of airframes comprising the business aircraft community has complicated certification. Though many general aviation aircraft have received RVSM certification, an estimated 3,490 aircraft still must be certified before the 2005 mandate. These numbers indicate an overwhelming strain on the FAA and retrofit facilities unless immediate action is taken. If there is not an RVSM solution for your aircraft, we urge you to take action now.

We invite you to call today for advice—without cost or obligation. We understand the RVSM certification process, technology and equipment needs for your unique situation and we can guide you through the RVSM certification process.

STRAIGHT TALK ABOUT

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RVSM: The Facts

- RVSM history.
- Existing RVSM regions.
- Proposed RVSM regions.

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- Airworthiness Certification.
- Required Equipment.
- Aircraft Certification.
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RVSM: The Facts

Existing and Proposed RVSM Regions

Current Regions of Implementation

- NAT (North Atlantic Track System): FL290-410 27Deg North Latitude to the North Pole
- PAC (Pacific): FL290-390 Oakland and Anchorage FIRs
- Australia: FL290-410 BN and ML FIRs north of 45deg South Latitude
- WATRS (Western Atlantic Route System): FL290-410
- Europe: FL290-410
- EUR/SAM Corridor (Southern Atlantic): FL290-410 Canarias, Dakar, Recife and Sal Oceanic FIRs
- Canada: FL290-410 57Deg North Latitude to North Pole
- Asia/Pacific: FL290-410
- South China Sea: FL290-410
- Asia/Europe Routes: FL290-410

Proposed Regions of Implementation

- DRVSM (Domestic United States): FL290-410 Effective January 20, 2005
- Canada: FL290-410 57Deg South Latitude to US Border Effective January 20, 2005
- Caribbean/South America: FL290-410
 Effective January 20, 2005
- Japan/Korea: FL290-410 Pending 2005

Though the airspace surrounding the world's larger airports has long been very crowded, an increase of daily flights between Europe, North America and Asia in the early 1970s was a warning sign that airway traffic would one day bulge at the seams. It was the foresight of these unavoidable bottlenecks that bore the concept that was later dubbed Reduced Vertical Separation Minimum (RVSM).

In 1978, the International Civil Aviation Organization (ICAO) initiated studies to investigate the feasibility of reducing the vertical spacing between aircraft to increase the number of aircraft that could utilize a given airspace while maintaining an acceptable measure of safety. The detailed plan called for the reduction of the vertical space between aircraft from 2,000 feet to 1,000 feet at flight levels above 29,000 feet, adding six more flight levels. Completed in 1988, these studies proved the goal of RVSM was attainable and RVSM was capable of offering increased traffic density, preferred routing and fuel economy. Above all, it offered all these advantages with the highest levels of safety. Implementation of RVSM was initiated with an evaluation phase in the North Atlantic in 1997.

This evaluation phase was followed with full implementation in this region in October 1998. Since then, many other regions around the world have incorporated RVSM as well. The FAA, Eurocontrol, Nav Canada and other regional agencies supported ICAO in its efforts and have since initiated their own vertical separation programs.

The FAA has published its final ruling on the RVSM mandate. It states that the FAA will require all aircraft and flight crews operating in DRVSM airspace to be RVSM compliant as of January 20, 2005.



Highlights of 91-RVSM

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RVSM Approval Requirements

RVSM Equipment Certification:

The following equipment is required for RVSM operations:

- Two independent altimetry systems.
- One autopilot capable of holding altitude within 65 feet.
- An altitude alerting system.
- One Mode C transponder.

The RVSM altimetry equipment installation may be approved by TC (Type Certificate), OEM (Original Equipment Manufacturer) Service Bulletin, or STC (Supplemental Type Certificate).

RVSM Operational Certification:

Operational approval for RVSM includes instructions for continued airworthiness, MEL requirements and an RVSM Flight Manual Supplement. Operational approval can be achieved by two means.

Group Certification: These aircraft are part of a fleet like type and model with identical altimetry equipment, autopilots and flight characteristics. Grouped aircraft can be approved by TC, SB or STC utilizing data compiled from a representative number of like aircraft.

Non-Grouped Certification: These aircraft have unique flight characteristics, airframe configuration or equipment that does not conform to a group or fleet such as:

- Unique altimetry equipment.
- Autopilot systems inconsistent with the group or fleet.

Straight Talk About RVSM

- Unique pitot/static system configuration.
- Airframe modifications (winglets, radomes, etc).

Non-grouped aircraft must be approved individually by STC and will have a (unique/aircraft specific) SSEC (Static System Error Correction) and continued airworthiness requirements.

Operator Approval: The second part of operational certification requires the operator seeking FAA approval to provide the appropriate FAA FSDO (Flight Standards District Office) with the following:

- Formal letter of application. (90-120 days prior to anticipated approval date.)
- A meeting date following application submittal.
- Airworthiness documents showing the aircraft has been approved for RVSM operations.
- Description of aircraft equipment.
- RVSM operations training program.
 - Part 135 operators must submit training records and operating practices/procedures.
 - Part 91 operators must submit training records or demonstrate knowledge of RVSM operating practices/procedures.
- · Operations manuals and checklists.
- MEL of items pertinent to RVSM operations.
- Approved maintenance program.

• Plan for monitoring program participation (the operator may elect to complete the required test flight utilizing a GMU or HMU).

Height Monitoring: Following certification, all operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring program to assure the aircraft meets the minimum RVSM height criteria. To participate, aircraft must fly over an HMU or use a GMU.

Height Monitoring Unit (HMU): These units are located in Gander, Newfoundland, Strumble, Scotland. There are also three locations in Europe, and the FAA's future plans include three HMUs in the U.S. The operator must notify the appropriate HMU facility prior to its flight over the site.

GPS Monitoring Unit (GMU): In the U.S. this is the most common method. A GMU is comprised of GPS receiver, two GPS antennas (suction-cupped to interior cabin windows) and a laptop computer. During the GMU flight (typically 90 minutes), the computer records the GPS data as the aircraft operates at various altitudes and speeds between FL290 and FL410.

Following the flight, the GMU flight data, Mode C data from ATC and atmospheric barometric data from the National Oceanic & Atmosphere Association (NOAA) is sent to the FAA data center for evaluation. The FSDO will issue the RVSM Letter of Authorization (LOA) only after it has received successful GMU flight results.

Online Resources

- FAA RVSM web site: www.faa.gov/ats/ato/rvsm_documentation.htm

- Eurocontrol RVSM web site: www.eur-rvsm.com

- Training syllabus for using TCAS in RVSM airspace: www.faa.gov/ats/ato/150_docs/tcas_5.doc

- ACAS II requirement for European airspace: www.faa.gov/ats/ato/150_docs/euroacas.doc

- RVSM Ops Manual Providers www.aviationmanuals.com www.dandaviation.com www.guardianjet.com www.gln-compliance.com www.avsourcemanuals.com





Questions and Answers



Am I required to have ACAS/TCAS for RVSM operations?

Not in the NAT and PAC oceanic areas. However, Eurocontrol has mandated the use of ACAS II in European airspace for all aircraft over 15,000 kg (33,000 lbs) and in 2005, aircraft 12,500 lbs and over will be required to have ACAS II. Operation in RVSM airspace (excluding Europe) does not include a TCAS requirement. It does, however, require MOPS 7 software for TCAS II-equipped aircraft.

For clarification, Eurocontrol has defined Aircraft Collision Avoidance System (ACAS) as "TCAS with Minimum Operational Performance Specifications (MOPS) 7 software."

In plain English, ACAS is TCAS with the new 7.0 software upgrade. Version 7.0 replaces 6.4 to offer these benefits:

- Fewer needless TCAS alerts.
- Reduced Traffic Advisory (TA) and Resolution Advisory (RA) thresholds.
- Permitting Climb or Descend RAs to weaken in slow closure rate encounters.

Can I use my TCAS system in RVSM air-space?

Yes! However, additional training and proficiency in TCAS operation must be demonstrated prior to obtaining RVSM operational approval. This is because the 1,200 foot vertical detection range of the original TCAS was designed for the 2,000 foot vertical separation standard. For a training syllabus, visit: www.faa.gov/ats/ato/150_docs/tcas_5.doc. In addition, aircraft with TCAS II systems must have 7.0 software (ACAS) for RVSM operations.

How do I know if RVSM certification is available for my aircraft?

Start by calling your aircraft OEM or a service provider such as Duncan Aviation. They will should know the current and future RVSM certification status of your aircraft model. Another source is: www.faa.gov/ats/ato/150_docs/GA-RVSM-0201.doc. Also, the appropriate SB regarding RVSM for your aircraft will verify if the altimetry equipment currently installed in your aircraft is adequate for RVSM approval.

What if my aircraft is not included in any group solution?

Your aircraft will have to be individually approved (see page 8). RVSM-compliant altimetry equipment must be installed by an existing or new STC. Then the aircraft, with the RVSM-compliant equipment installed, must undergo a trailing cone test flight to verify the existing SSEC (Static System Error Correction) or determine new correction. A second STC (operational) must be developed that incorporates the new SSEC, maintenance procedures for continued airworthiness, MEL requirements and operational procedures. Some facilities capable of performing flight tests and developing an operational STC include:

AeroMech, Inc: Aerodata Systems: Flight Test Associates: Kohlman Systems: www.aeromechinc.com www.aerodatasys.com www.flttest.com www.kohlmansystems.com

Following FAA acceptance of the operational STC, the operator must follow the operator approval steps outlined on page 9 of this book.



What does "SSE" and "SSEC" mean?

Static System Error (SSE) is the difference between the altitude indicated by the aircraft altimetry (ports, probes, plumbing, etc.) and actual altitude. Static System Error Correction (SSEC) is the correction applied to new or existing altimeters that enables them to measure altitudes to RVSM standards (+/- 20 feet). We have found that very few existing altimetry systems meet RVSM tolerances. This is due to the lack of technology available when they were built.

Determining SSEC for RVSM certification is a complex and expensive process. It typically involves extensive flight testing using a trailing cone or specially calibrated chase aircraft. The data gathered by these means is compared with cockpit data to determine the SSEC.

What happens if my aircraft does not meet the "Group Criteria?"

If the existing aircraft systems, airframe structure and/or flight test data of your aircraft do not meet the acceptable group parameters, group approval may not be possible. If possible, you may opt to correct the limiting condition(s). Another option is to continue certification efforts under an individual, non-grouped approval. Each aircraft that is approved individually (non-grouped) requires a unique operational STC and, depending on the existing equipment, may also need a separate equipment STC.

Am I required to obtain a new LOA (Letter of Authorization) before I fly into a new RVSM region?

No! However, the operator must address the subjects that are unique in the new RVSM area of operations. (See IG 91RVSM, Paragraph 11.)

I've heard paint can be an issue for initial and ongoing RVSM certification, what's the deal?

The new SSEC that is programmed into RVSM-compliant altimeters is calculated to correct errors in the entire static system. Part of this error comes from inconsistent airflow over and around the aircraft static ports. This is caused by chips in the paint, paint stripe ridges, irregular or damaged static ports, dents and bulges in the skin and even the thickness and smoothness of new paint. For this reason, it is critical to choose a service center that truly understands the relationship between paint and RVSM and which practices will ensure your aircraft will meet RVSM operational criteria now and in the future.

NOTES



Key Terms



Key Terms

ACAS-Airborne Collision Avoidance System ACO-Aircraft Certification Office **ASC-Aircraft Service Change ASE-Altimetry System Error** DRVSM-Domestic RVSM - United States airspace FSDO-Flight Standards District Office GMU-GPS Monitoring Unit HMU-Height Monitoring Unit ICAO- International Civil Aviation Organization LOA-Letter of Authorization MEL-Minimum Equipment List **MNPS-Minimum Navigation Performance Specification MOPS-Minimum Operation Performance Standards** NAT-North Atlantic Tracks NPRM-Notice of Proposed Rule Making **OEM-Original Equipment Manufacturer** PAC-Pacific Ocean airspace **RNP-Required Navigation Performance RVSM-Reduced Vertical Separation Minimum** SB-Service Bulletin SSEC-Static Source Error Correction STC-Supplemental Type Certificate **TC-Type** Certificate WATRS-Western Atlantic Route System

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IAH — Houston, TX	ISP — Long Island, NY	MDW — Chicago, IL
MMU — Morristown, NJ	PWK — Palwaukee, IL	SDL — Scottsdale, AZ
STP — St. Paul, MN		

