
NATA Aircraft Maintenance & System Technology Committee Best Practices

RVSM Maintenance

Reduced Vertical Separation Minimum (RVSM) Airspace reduces the vertical separation above flight level (FL) 290 from 2000-ft minimum to 1000-ft minimum, allowing aircraft to fly more optimum profiles safely, gain fuel savings and increase airspace capacity.

Within RVSM airspace, air traffic control separates aircraft by a minimum of 1,000 feet vertically between FL 290 and FL 410 inclusive. RVSM airspace is special qualification airspace; the operator and the aircraft must be approved by the Federal Aviation Administration (FAA) administrator.

History

On January 20, 2005, RVSM was implemented between FL 290 and FL 410 (inclusive) within the airspace of the lower 48 states of the United States, Alaska, Gulf of Mexico, Atlantic High Offshore Airspace (including Houston and Miami Oceanic airspace) and the San Juan FIR. RVSM was implemented on the same date and at the same flight levels in Canadian Southern Domestic and Mexican airspace. It is now implemented in other major airspaces such as Europe, the Pacific Ocean and Australia.

Regulatory Requirement

Title 14 CFR Part 91.180 requires the operator to meet a set of minimum standards listed in appendix G of that part.

Appendix G, defines the two types or categories of aircraft approvals given by the FAA. The first is the RVSM Group Aircraft, which are aircraft within a group of aircraft approved as a group by the administrator. The other is RVSM Nongroup Aircraft, which are aircraft approved for RVSM operations as individual aircraft.

RVSM Group Aircraft:

- Must have been manufactured to the same design, and have been approved under the same type certificate, amended type certificate, or supplemental type certificate.
- The static system of each aircraft must be installed in a manner and position that is the same as those of the other aircraft in the group. The same static source error correction is incorporated in each aircraft of the group.
- The avionics units installed in each aircraft must meet the minimum RVSM equipment requirements of this appendix, meaning they must be:
 - Manufactured to the same manufacturer specification and have the same part number; or

- Of a different manufacturer or part number, if the applicant demonstrates that the equipment provides equivalent system performance.

The Aircraft Manufacturer or Design Organization can advise the owner or operator whether the aircraft is covered by a group approval or is considered as a non-group aircraft per appendix G, as well as provide aircraft RVSM airworthiness approval documents. Examples include:

- For In-service aircraft:
 - Service Bulletin (SB)
 - Aircraft Service Change (ASC)
 - Supplemental Type Certificate (STC)
- For New or In-production aircraft:
 - Airplane Flight Manual statement
 - Type Certificate Data Sheet

Aircraft may be produced RVSM-compliant or brought into compliance through the application of FAA-approved Service Bulletins, Service Letters (SL), or Supplemental Type Certificates that apply to the specific aircraft type or group and, if applicable, the specific aircraft serial number.

Application for RVSM

Both the aircraft and operator must be authorized by the administrator to conduct operations in RVSM airspace. The criteria evaluated to issue this authorization consist of three basic elements:

1. An aircraft must be determined to comply with the requirements of Part 91, appendix G, section 2.
2. The operator's maintenance program must be found to comply with the requirements of Part 91, appendix G, section 3.
3. The operator must be found to have adopted RVSM operating policies and procedures for pilots and, if applicable, dispatchers, that are acceptable to the FAA.

To apply for an RVSM approval, the owner/operator should contact his or her local FAA Flight Standards office for a pre-application meeting and submit an application package that contains:

- Operations Training Programs and Operating Practices and Procedures
- Operations Manuals and Checklists
- Past Performance
- Minimum Equipment List (only if operating under an MEL)
- Maintenance Program
- Plan for participation in Monitoring Programs
- Plan for reporting altitude-keeping errors

A very important part of the application package is the information required per appendix G, in Part 91:

- (1) An identification of the RVSM aircraft group or the nongroup aircraft;
- (2) A definition of the RVSM flight envelopes applicable to the subject aircraft;
- (3) Documentation that establishes compliance with the applicable RVSM aircraft requirements of this section; and

(4) The conformity tests used to ensure that aircraft approved with the data package meet the RVSM aircraft requirements.

The owner/operator also has to ensure that the aircraft meets the equipage requirements noted in appendix G, which include:

1. Altitude-keeping equipment. The aircraft must be equipped with two operational independent altitude measurement systems.
2. The aircraft must be equipped with at least one automatic altitude control system that controls the aircraft altitude within the tolerance specified in appendix G.
3. The aircraft must be equipped with an altitude alert system that signals an alert when the altitude displayed to the flight crew deviates from the selected altitude by more than:
 - ± 300 feet for aircraft for which application for type certification was made on or before April 9, 1997; or
 - ± 200 feet for aircraft for which application for type certification is made after April 9, 1997.
4. Altimetry system error containment. For group aircraft appendix G divides aircraft into two certification timelines, aircraft for which application for type certification was made on or before April 9, 1997, and those for which type certification was made after April 9, 1997. The error containment limitations for each of those timelines varies. Again, this is an area an owner must study and ensure that the equipment installed can meet these requirements.

For the nongroup aircraft, the error containment is much more simplified and also described in the appendix.

Appendix G also requires that the Traffic Alert and Collision Avoidance System (TCAS) be compatible with RVSM Operations. Unless otherwise authorized by the FAA, if an aircraft that is equipped with TCAS II is operated in RVSM airspace it must be a TCAS II that meets TSO C-119b (Version 7.0), or a later version.

The RVSM Maintenance Program

The RVSM maintenance program must outline procedures to maintain aircraft in accordance with the requirements of Part 91, appendix G.

The approved RVSM maintenance program does not need to include elements that are not related to RVSM maintenance. Inspection programs such as an Approved Aircraft Inspection Program or manufacturer's recommended inspection program do not satisfy the RVSM requirements unless they contain procedures to maintain RVSM aircraft.

The applicant will need to make sure the RVSM maintenance program addresses the following:

- Identification of components considered RVSM critical and identification of structural areas noted as RVSM-critical areas.
- The name or title of the responsible person who will ensure that the aircraft is maintained in accordance with the approved program.

- The method the operator will use to ensure that all personnel performing maintenance on the RVSM system are properly trained, qualified, and knowledgeable of that specific system.
- The method the operator will use to notify the crew if the aircraft has been restricted from RVSM but is airworthy for an intended flight.
- The use of calibrated and appropriate test equipment and a quality assurance program for ensuring continuing accuracy and reliability of test equipment, especially when outsourced.
- The method the operator will use to verify that components and parts are eligible for installation in the RVSM system, as well as to prevent ineligible components or parts from being installed.
- The method the operator will use to return an aircraft to service after maintenance has been performed on an RVSM component/system or after the aircraft was determined to be non-compliant.
- Maintenance, and inspection procedures with acceptable maintenance practices for ensuring continued compliance with the RVSM aircraft requirements, including periodic inspections, functional flight tests, etc.
- The maintenance requirements listed in Instructions for Continued Airworthiness associated with any RVSM-associated component or modification.
- The method the operator will use to ensure conformance to the RVSM maintenance standard. Operators using the services of FAA 14 CFR Part 145 certificated repair stations must include provisions to ensure that the requirements of their RVSM programs are being met.

IMPORTANT: Simple changes to your aircraft can render your RVSM maintenance program unapproved, as well as your ability to fly in RVSM airspace. Even a simple thing like a registration number change will invalidate your RVSM maintenance program and your LOA, because the registration number is displayed on your LOA and, in some instances, on your program.

Approval Requirements

Either the principal avionics inspector or principal maintenance inspector will make the determination of an aircraft's compliance and evaluate the operator's maintenance program for approval. The determination that an aircraft is RVSM-compliant may be accomplished entirely through the examination of documents and/or data. Physical inspection of an airframe may not be required if the submitted documentation is sufficient.

The regulation you operate under determines the specific RVSM approval whether you are issued a Letter of Authorization under Part 91, Management Specifications under Part 91K, or Operation Specifications under Part 135 or Part 121.

For Part 91, aircraft approved for RVSM can be used in RVSM operations worldwide. This includes RVSM operation in continental areas such as Europe and the United States. Aircraft equipage and altitude-keeping performance requirements were developed using the highest density traffic counts in the world so that aircraft could receive one-time approval for worldwide operations.

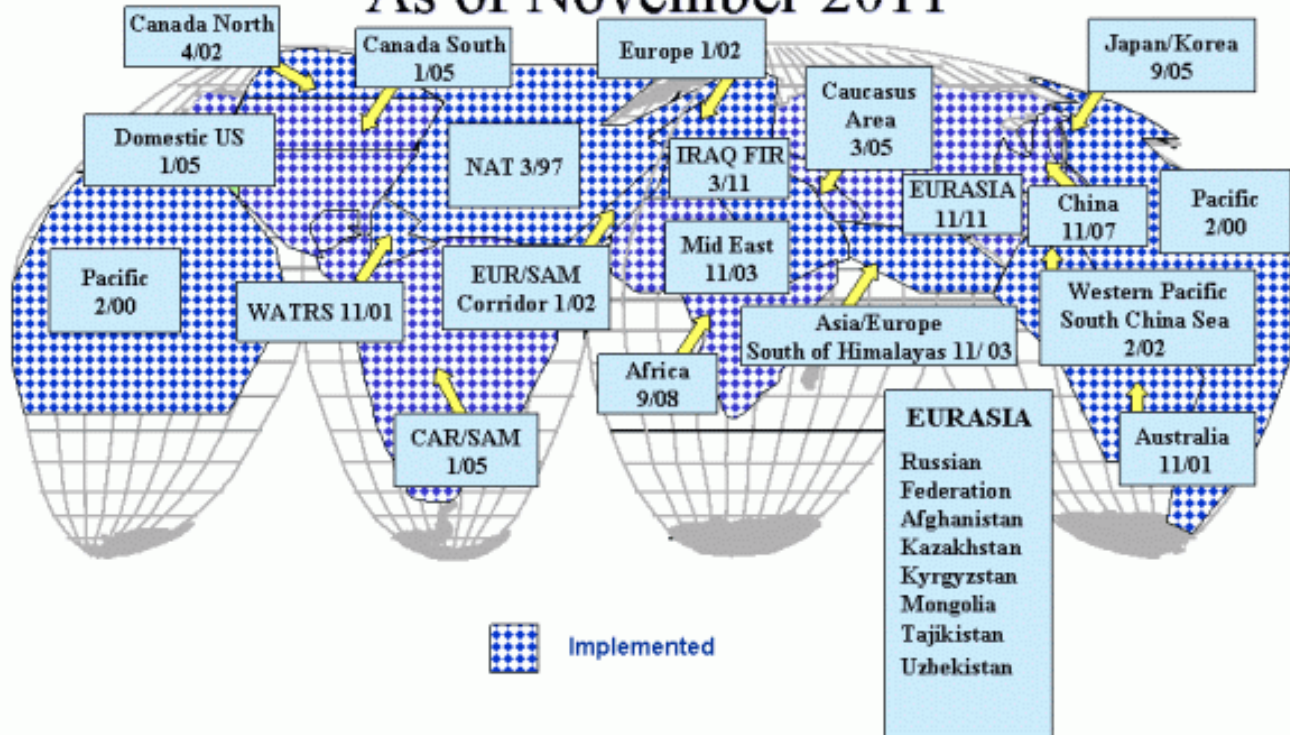
The caveat is that the operator is responsible to operate according to any special procedures or

requirements in the applicable airspace. For example, China adopted RVSM but instituted a Metric flight level system. The metric flight levels are slightly different than the U.S. Flight Levels. They are available online, but the operator is responsible to know about them and operate accordingly (one point to take from this: the FL290 to FL 410 for RVSM airspace is good for U.S. operations, but there are some areas of the world for which the boundaries of RVSM airspace may vary).

Another example is TCAS II. It is not required for RVSM operations in the United States; however, Part 91 appendix G, section 2, paragraph (g) is the only regulatory language that relates TCAS to RVSM operations. It states that "...if you operate an aircraft that is equipped with TCAS II in RVSM airspace, it must be a TCAS II that meets TSO C-119b (Version 7.0), or a later version, unless otherwise authorized by the Administrator."

However, some areas of the world have required TCAS II outside of RVSM regulations. India and Europe are two that come to mind. Europe has put a size restriction to the requirement (only aircraft over a certain size are required to have TCASII), but India requires all jets to be equipped with TCAS II.

RVSM Worldwide - Implemented As of November 2011



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