

DEPARTMENT OF TRANSPORTATION**Federal Aviation Administration****14 CFR Parts 11 and 91**

[Docket No. FAA-2002-12261; Amendment Nos. 11-49 and 91-276]

RIN 2120-AH68

Reduced Vertical Separation Minimum in Domestic United States Airspace

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule permits the initiation of Reduced Vertical Separation Minimum (RVSM) flights in the airspace over the contiguous 48 States of the United States, the District of Columbia, Alaska, that portion of the Gulf of Mexico where the Federal Aviation Administration (FAA) provides air traffic services, the San Juan Flight Information Region (FIR), and the airspace between Florida and the San Juan FIR. The RVSM program allows the use of 1,000-foot vertical separation at certain altitudes between aircraft that meet stringent altimeter and autopilot performance requirements. This rule also requires any aircraft that is equipped with Traffic Alert and Collision Avoidance System version II (TCAS II) and flown in RVSM airspace to incorporate a version of TCAS II software that is compatible with RVSM operations. The FAA is taking this action to assist aircraft operators to save fuel and time, to enhance air traffic control flexibility, and to enhance airspace capacity.

EFFECTIVE DATE: This final rule is effective November 26, 2003.

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SUPPLEMENTARY INFORMATION:**Availability of Rulemaking Documents**

You can get an electronic copy of this document and of a chart showing the affected airspace through the Internet by taking the following steps:

(1) Go to the search function of the Department of Transportation's electronic Docket Management System (DMS) Web page (<http://dms.dot.gov/search>).

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The Reduced Vertical Separation Minimum (RVSM) Program

The term "flight level" (FL) describes a surface of constant atmospheric pressure related to a reference datum of 29.92 inches of mercury. Flight levels are stated in three digits that represent thousands of feet. Flight levels are separated by specific pressure intervals. Rather than adjusting altimeters for changes in atmospheric pressure, pilots base altitude readings above the transition altitude (18,000 feet in the United States) on this standard reference. Thus FL 290 represents the pressure surface equivalent to 29,000 feet based on the 29.92 inches of mercury datum; FL 310 represents 31,000 feet, and so on.

The RVSM program allows the vertical separation standard that is applied below FL 290 to be applied between FL 290 and FL 410. Below FL 290, air traffic controllers can assign Instrument Flight Rules (IFR) aircraft to flight levels that are separated by 1,000 feet. Above FL 290, however, unless RVSM standards are implemented, the vertical separation minimum is 2,000 feet and IFR aircraft must be assigned to flight levels separated by 2,000 feet.

The 2,000-foot minimum vertical separation restricts the number of flight levels available above FL 290. During peak periods, these flight levels can become congested. When all RVSM flight levels (FL 290-410) are utilized, six additional flight levels are available: FL 300, 320, 340, 360, 380, and 400. Increasing the number of flight levels available in the U.S. domestic airspace is projected to provide enhancements to aircraft operations similar to those gained in the North Atlantic (NAT) and Pacific (PAC) (*i.e.*, mitigation of fuel penalties attributed to the inability to fly optimum altitudes and tracks, and

enhanced controller flexibility for air traffic control).

Summary of the Notice of Proposed Rulemaking (NPRM) Published on May 10, 2002, and the Supplemental Notice of Proposed Rulemaking (SNPRM) Published on February 28, 2003

The NPRM published on May 10, 2002 (67 FR 31920) proposed to implement RVSM from FL 290 through FL 410 over the contiguous U.S. and Alaska, and the portion of the Gulf of Mexico where the FAA provides air traffic services. This reduced vertical separation minimum would only be applied between those aircraft that meet stringent altimeter and autopilot performance requirements. The FAA ("we") proposed the action to assist aircraft operators to save fuel and time, to enhance air traffic control flexibility, and to provide the potential for enhanced airspace capacity. The NPRM outlined the FAA plan during the pre- and post implementation phases to monitor the program to ensure that RVSM safety standards are maintained and that aircraft altitude-keeping performance meets RVSM standards.

We subsequently revised the proposal in an SNPRM published on February 28, 2003 (68 FR 9818). We added a proposal to implement RVSM from FL 290 through FL 410 in Atlantic High Offshore airspace, Gulf of Mexico High Offshore airspace, and in the San Juan Flight Information Region (FIR). This supplement to the NPRM proposed to better define RVSM airspace off the eastern and southern coasts of the United States and harmonize RVSM airspace off the east coast of the U.S. between adjoining airspaces in the domestic U.S., Atlantic High Offshore, and the New York Oceanic FIR. We also proposed to remove the proposal in the NPRM that would have permitted part 91 turbo-propeller aircraft to operate in domestic RVSM airspace with a single RVSM compliant altimeter.

With air traffic levels increasing annually, FAA airspace planners and their international counterparts have established programs to implement RVSM as a primary measure to enhance air traffic management and aircraft operating efficiency. The RVSM program has been implemented in oceanic airspace in the North and South Atlantic, the Pacific, the South China Sea, and in the portion of the West Atlantic Route System (WATRS) that is in the New York Oceanic Flight Information Region. The RVSM program has also been implemented in the continental airspace of Australia and Europe.

Aircraft Operating in U.S. Airspace Already Approved for RVSM

Approximately 38 percent of flights in U.S. airspace are already conducted by aircraft that have been approved for RVSM operations. Approximately 5,400 aircraft of U.S. registry have been FAA-approved for RVSM operations under the existing RVSM regulation. Many U.S. operators have obtained RVSM approval for these aircraft so they can be flown in airspace outside the U.S. where RVSM has been implemented.

Existing and New Regulations: Criteria for Aircraft and Operator Approval

Part 91, Section 91.706 (Operations within airspace designed as Reduced Vertical Separation Minimum Airspace) and part 91, Appendix G (Operations in Reduced Vertical Separation Minimum (RVSM) Airspace) contain the FAA requirements for aircraft and operator approval for RVSM operations outside the U.S. They have been applied to operations outside the U.S. since they were published in April of 1997. The objective of this rulemaking is to add Section 91.180 (Operations Within Reduced Vertical Separation Minimum Airspace in the United States) and amend Part 91 Appendix G Section 8 (Airspace Designation) so that part 91 Appendix G standards can be applied within the domestic U.S. and the other airspaces being added to Appendix G, Section 8.

Domestic RVSM Implementation Plan

We have selected January 20, 2005, as the target date to implement RVSM between FL 290 and FL 410 in the airspace described in this rulemaking. When RVSM is implemented, to fly in RVSM airspace civil operators and aircraft must comply with the RVSM standards of part 91 with only limited exceptions.

In accordance with part 91, Appendix G, Section 5 (Deviation Authority Approval), the FAA may accommodate the following noncompliant operators in RVSM airspace:

- The FAA may accommodate unapproved aircraft conducting air ambulance flights using a Lifeguard call sign as described in the Aeronautical Information Manual.
- In accordance with the FAA/ Department of Defense (DoD) Memorandum of Understanding, the FAA may accommodate unapproved DoD aircraft.
- Unapproved aircraft may be allowed to climb through RVSM flight levels without intermediate level off to operate above RVSM airspace at FL 430 and above, traffic permitting and

- After coordination and consultation provided for in Appendix G, Section 5, the FAA may accommodate flights conducted for aircraft certification and development and customer acceptance purposes.

When such aircraft operate in RVSM airspace, their lack of RVSM approval status will be displayed to FAA controllers and the controllers will apply a 2,000-foot vertical or the appropriate lateral or longitudinal separation standard.

Safety

Since its initial implementation in the North Atlantic in March 1997, RVSM has proven to be safe in both oceanic and continental operations. To date approximately 10 million flights representing 19 million flight hours have been conducted safely in RVSM airspace worldwide.

FAA personnel will apply the experience they have gained in safely implementing RVSM in other areas to the domestic U.S. implementation program. To date, they have served as implementation program managers in three major oceanic areas and have played significant leadership roles in developing and implementing standards and programs under which RVSM could be implemented safely.

In preparation for RVSM implementation in the domestic U.S., FAA Flight Standards and Air Traffic specialists and safety analysts have reviewed the elements contributing to RVSM safety. They concluded that U.S. RVSM operations will meet the level of safety endorsed by the International Civil Aviation Organization and adopted in other regions in the world. In addition, in the period leading up to implementation and during the post-implementation period, they will continue to evaluate the elements of RVSM safety against the accepted level of safety.

Exploration of Tactical RVSM

We explored allowing controllers to apply "tactical RVSM" prior to the target RVSM implementation date. We have decided not to pursue this initiative. It has been found to present unacceptable difficulties related to scheduling and completing document updates and controller and pilot training. Application of tactical RVSM would have allowed controllers to use 1,000-foot vertical separation between FL 290 and FL 410 prior to the target implementation date, at the controller's discretion, if both passing aircraft were RVSM approved.

Specific Airspace Issues

Coordination with Mexico and Canada. We are coordinating RVSM implementation plans with the civil aviation authorities of Canada and Mexico. RVSM was implemented in Northern Canadian Domestic airspace in April 2002, and Canada is planning to implement RVSM in Canadian Southern Domestic airspace at the time that it is implemented in the U.S.

Gulf of Mexico, San Juan FIR and Florida-San Juan FIR Airspace. The airspace in the Gulf of Mexico, the San Juan FIR, and the airspace between the San Juan FIR and Florida have been included in this final rule. Inclusion of this airspace in the final rule allows the FAA to harmonize operations between RVSM airspace in the domestic U.S., RVSM airspace already established in the New York Oceanic FIR and the San Juan FIR.

Hawaiian Airspace. The airspace of the Hawaiian Islands is surrounded by Pacific Oceanic RVSM airspace. RVSM approved aircraft operate to and from Hawaiian airspace, however, there is currently no plan to require RVSM approval for all aircraft to operate within that airspace. Instead, 1,000-foot vertical separation is applied between FL 290 and FL 410 when two passing aircraft are both RVSM approved and 2,000-foot vertical or horizontal separation is applied if either of the passing aircraft is not RVSM approved.

TCAS II Version 7.0 Requirement. A significant majority of the aircraft that operate in the domestic U.S. at and above FL 290 are already required to be equipped with TCAS II, Version 6.04a. Requirements for aircraft TCAS equipage are published in 14 CFR parts 121, 125, 129, and 135. These requirements were revised in a final rule published in April 2003 and are discussed in detail in the TCAS section of the Discussion of Comments. Approximately 85% of domestic operations above FL 290 are conducted by large jet aircraft operating under parts 121, 129, or 135. An FAA Airworthiness Directive published in 1994 mandates TCAS II, Version 6.04a, for all TCAS II installations.

Part 91, Appendix G, section 2, paragraph (g) states that "after March 31, 2002, unless otherwise authorized by the Administrator, 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." This provision was adopted on December 10, 2001 (66 FR 63888). Version 7.0 incorporates Traffic Alert and Resolution Advisory thresholds that mitigate unnecessary

alerts when 1,000-foot vertical separation is applied above FL 290. Version 7.0 generally requires a software modification that is not a major system modification. The cost for this modification has been accounted for in the cost/benefit analysis.

Eligibility of Turbo-propeller Aircraft Operated Under Part 91 and Equipped with a Single RVSM Compliant Altimeter. In the NPRM, we proposed operational and airworthiness criteria for turbo-propeller aircraft operated under part 91 to conduct RVSM operations when equipped with a single RVSM compliant altimeter. In the SNPRM, we proposed withdrawing this option. After considering the SNPRM comments, we have not adopted the provision in this final rule. For the past six years, standards applied worldwide have called for aircraft to be equipped with two RVSM compliant altimeters. We have concluded that different criteria for turbo-propeller aircraft operated under part 91 to conduct RVSM operations should not be adopted. We have determined that adopting this provision would add unnecessary complications to air traffic control in the airspace that borders Canada and Mexico. Those countries have informed us that they will not adopt the provision. We also believe that it is in the best interests of U.S. operators and manufacturers to harmonize with global RVSM standards unless there is adequate justification for a difference. Since the proposal would affect only 0.3 percent of domestic operations, we have concluded that the minor benefit provided is not warranted when considering the major benefits provided by sharing common standards for RVSM operations and air traffic control with neighboring countries and of continued harmonization with global RVSM standards.

Amendment to VFR and IFR Cruising Altitudes At and Above FL 290. This rule revises part 91, Section 91.159 (VFR cruising altitude or flight level) and Section 91.179 (IFR cruising altitude or flight level). The revision to Section 91.159 eliminates reference to VFR flight levels above FL 180. Airspace above FL 180 is established as Positive Control Airspace where aircraft must maintain the altitude or flight level assigned by ATC.

The revision to Section 91.179 revises the altitudes or flight levels that are considered to be appropriate for IFR flight in uncontrolled airspace above FL 290 in airspace where RVSM is implemented. In accordance with RVSM regulations, this revision will provide flight levels that are separated by 1,000

feet vertically based on the direction of flight.

Revision to Deviation Authority Requirements. The rule revises part 91 Appendix G, Section 5 (Deviation Authority Approval). The revision deletes the requirement to submit requests 48 hours in advance in order to operate non-compliant aircraft under a deviation. The revision calls for the request to be submitted in a time and manner acceptable to the FAA. This revision allows us to publish in the Aeronautical Information Manual and appropriate FAA orders procedures and processes that are acceptable in different scenarios and circumstances. We intend to grant deviation authority only in limited circumstances because the presence of unapproved aircraft could affect traffic flow and increase controller workload.

Discussion of Comments

We received 79 comments during the NPRM comment period (67 FR 31920, May 10, 2002) and eight comments during the SNPRM comment period (68 FR 9818, February 28, 2003). The FAA response to comments received on both the NPRM and the SNPRM are provided in the discussion of comments below. During the SNPRM comment period, comments were received from Boeing and Viking Transport. Neither of these comments addressed the two specific issues raised in the SNPRM. Both addressed issues only in the underlying NPRM. The issues in these two comments were considered with similar comments received during the original NPRM period.

Some comments supported the proposed domestic RVSM program and implementation date. Included in the organizations that provided comments supporting the proposal or supporting with minor comments were the Air Transport Association (ATA), United Airlines, American Airlines, Federal Express, American Trans Air, The Boeing Company, Cessna Aircraft Company, the Department of Defense, the Air Traffic Control Association (ATCA), and the Port Authority of New York and New Jersey.

Some comments requested major changes in the domestic RVSM implementation program or expressed reservations. Many of these proposed to delay implementing RVSM for a year or more or to implement RVSM in vertical or geographical phases. Organizations making these proposals included the National Business Aviation Association (NBAA), the General Aviation Manufacturers Association (GAMA), the Aircraft Electronics Association (AEA),

and the Aircraft Owners and Pilots Association (AOPA).

Some commenters expressed opposition to implementing RVSM in the United States. These included a number of small operators.

Some commenters provided comments that expressed concerns about safety or what we would require operators to do before they could operate in RVSM airspace. These included organizations such as the Airline Pilots Association (ALPA), the Allied Pilots Association (APA), and the Coalition of Airline Pilots Association (CAPA).

No SNPRM commenters opposed adding Gulf of Mexico and Atlantic High Offshore and San Juan FIR airspace to the list of RVSM airspaces published in part 91, Appendix G, Section 8.

Most SNPRM comments supported the SNPRM proposal to withdraw the proposal made in the NPRM to allow turbo-propeller aircraft operated under part 91 to equip for RVSM operations with a single RVSM compliant altimeter. Two SNPRM comments opposed withdrawal of the NPRM proposal for part 91 turbo-propeller aircraft.

We also received comments from the National Transportation Safety Board (NTSB) and the Regional Airlines Association (RAA), among others.

Air Traffic Services Issues

1. A number of commenters recommended that the FAA should implement RVSM in the National Airspace System (NAS) in vertical phases. For example, one recommendation was to use one of the following two implementation plans:

a. Implement between FL 350–390 in December 2004; then implement in all RVSM flight levels (FL 290–410) in December 2005 or

b. Implement between FL 310–410 in December 2004; then implement between FL 290–410 in 2010

FAA Response: We discussed in the NPRM the option to implement RVSM in phases. The NPRM noted testing and simulation that caused us to decide against implementing RVSM in vertical phases. Extensive simulation testing of various phased implementation possibilities resulted in significantly increased controller workload and an increased level of operational complexity directly related to phase-in scenarios such as those recommended in the comments. These scenarios were shown to increase the potential for error for controllers. The “Final Report for Domestic Reduced Vertical Separation Minimum (DRVSM) Initial Simulation”

is posted on the federal docket. It can be found by searching docket number 12261 at <http://dms.dot.gov>.

2. A commenter recommended that the FAA should implement RVSM between FL 290–370 in December 2004 to allow access to higher flight levels for non-compliant aircraft.

FAA Response: We did not accept this recommendation for two reasons. First, during the simulation testing, an increase of non-compliant aircraft transitioning through RVSM flight levels to fly above RVSM airspace increased complexity of ATC operations and increased the potential for controller error. The proposal to implement between FL 290–410 provides for a limited number of operations at or above FL 430. Second, topping RVSM flight levels at FL 370 would make two flight levels (380 and 400) unavailable at implementation. This loss would diminish benefits in terms of fuel savings and improvements to air traffic controller flexibility to manage aircraft.

3. Some commenters recommended that we should implement RVSM only on designated routes or in certain areas.

FAA Response: We concluded that this proposal is not feasible for the same reasons that a vertical phase-in of RVSM flight levels is not feasible. A plan that would provide multiple areas within domestic U.S. airspace where the vertical separation standards would change between 2,000 feet to 1,000 feet would add an unacceptable amount of complexity to air traffic control and increase controller workload and the potential for controller error.

4. Some commenters, including ALPA and APA, opposed tactical implementation, citing concerns about complexity and safety. They also raised a question about applying the monitoring program before full implementation.

FAA Response: We explored allowing controllers to apply “tactical RVSM” prior to the target RVSM implementation date. We have decided not to pursue this initiative. It has been found to present unacceptable difficulties related to scheduling and completing document updates and controller and pilot training. Application of tactical RVSM would have allowed controllers to use 1,000-foot vertical separation between FL 290 and FL 410 prior to the target implementation date, at the controller’s discretion, if both passing aircraft were RVSM approved.

5. A Congressman asked us to re-evaluate our plan to implement RVSM in all Alaskan airspace. One operator, Security Aviation, made a similar request. More specifically, the

Congressman and Security Aviation requested us to consider implementing in Alaska on only designated routes or areas. The rationale was that RVSM invoked large costs to small Alaskan operators and that operation below FL 290 invoked operational penalties.

FAA response: We believe RVSM implementation in Alaska should proceed on the same date and with the same implementation plan that we are adopting for the lower 48 states and Canadian Southern Domestic airspace. We do not believe RVSM can or should be implemented in Alaskan airspace differently than the surrounding RVSM airspace. RVSM is currently mandated in oceanic airspace to the west and south of Alaska and in Canadian Northern Domestic airspace to the east. In addition, Canadian authorities plan to implement RVSM in Canadian Southern Domestic airspace in January 2005 in conjunction with implementation in the U.S.

In summary, we believe we should implement RVSM in Alaskan airspace in conjunction with the domestic U.S. and Canada for the following reasons:

a. Alaskan RVSM operations cannot be considered in isolation. Alaska is surrounded on three sides by existing RVSM airspace. Operators flying between those airspaces and Alaskan airspace are required to meet RVSM standards. If we do not implement RVSM in Alaska in conjunction with the U.S. lower 48 states and Canada, it will deny benefits to these operators.

b. Implementing a single vertical separation standard in Alaska mitigates problems related to air traffic control complexity and to the potential for controller error both within Alaskan airspace and for operations between Alaska and adjoining RVSM airspace.

c. This rule does not affect operations below FL 290. Operators that now operate below FL 290 can continue to operate as they do currently. Operators that now operate above FL 290 that do not elect to obtain RVSM authority can continue to operate below FL 290. Operation below FL 290 appears feasible since typical leg lengths for flights originating and terminating within Alaska are relatively short duration (1 to 2 hour flights).

6. ATA asked us to implement RVSM in the San Juan FIR and Miami Offshore airspace where the FAA provides air traffic control. The objective would be to align this airspace with RVSM airspace already planned or implemented in adjoining airspace.

FAA Response: We concluded that this proposal had merit and made a proposal in a Supplemental NPRM (SNPRM). The SNPRM proposed to

include Atlantic High Offshore, Gulf of Mexico High Offshore Airspace, and the San Juan FIR airspace as RVSM airspace in part 91, Appendix G, Section 8 (Airspace Designation). A number of SNPRM commenters supported and no SNPRM commenters opposed the proposal. We have adopted the SNPRM proposal in the final rule.

7. APA recommended that we should require RVSM in Hawaiian airspace at and above FL 290.

FAA Response: We do not believe that it is necessary to mandate RVSM in Hawaiian airspace at this time. Hawaiian airspace has operated successfully in its present configuration as transition airspace between adjoining flight information regions where RVSM is mandated since February 2000.

8. One commenter recommended that we should consider Domestic RVSM in the Airspace Re-design program.

FAA Response: We are considering RVSM in the High Altitude Redesign program.

9. GAMA, Bombardier, Raytheon and Cessna recommended that provisions be made in the rule for accommodation of non-compliant aircraft flown for flight testing for certification, new aircraft production and customer acceptance purposes.

They requested rule language as follows:

- Accommodate air ambulance flights using Lifeguard call sign as detailed in AIM.

- Provide for flight in RVSM airspace under special flight permit or standard certificate of airworthiness of non-compliant experimental, new production flight test, new production aircraft flown for customer acceptance purposes

- Provide for experimental and new production aircraft to climb to FL 430 without “traffic permitting” caveat

They also proposed that the FAA designate useable airspace within proximity to aircraft manufacturers.

FAA Response: We believe that the language in part 91, Appendix G, Section 5 (Deviation Authority Approval), will provide for FAA authorization of operation of non-compliant aircraft in RVSM airspace. We recognize that the organizations that made this proposal are seeking assurance that they will be able to fly non-compliant aircraft in RVSM airspace for the purposes of flight-testing for certification and customer acceptance purposes. We recognize that this is an important provision for aircraft manufacturers to conduct their business. We believe that Section 5 enables aircraft manufacturers to work with local ATC Centers to develop

procedures to accommodate their activity.

10. The ALPA and APA request detail on ATC procedures for wake turbulence, mountain wave, and guidance on pilot actions for aircraft contingencies such as aircraft system malfunction.

FAA Response: We have established an RVSM Procedures Work Group to review existing procedures and to develop or revise procedures for ATC in the RVSM environment. We have also established a Mountain Wave Activity (MWA) effort that includes representatives from the Air Route Traffic Control Centers where MWA occurs. We will develop procedures and circulate them for comment. We plan to complete this process in the February 2004 timeframe.

11. A number of commenters raised concerns about the increase of enroute traffic below FL 290 after RVSM is implemented. These concerns relate to the concern that a number of aircraft and operators will not complete RVSM compliance work by the proposed implementation date and will be required to operate below FL 290. The concern is that ATC will not be able to effectively manage this increase of traffic at lower levels.

FAA Response: We have played a significant role in implementing RVSM in four major areas of the world. In each of these implementation programs, we projected the number and percentage of flights that would and would not be conducted by RVSM compliant aircraft on the date and time of initial RVSM implementation. The purpose of this effort was to gain confidence that there would not be a major disruption to air traffic control after RVSM was implemented. In this effort, ATC organizations identified a percentage of flights that they believed could be effectively managed below FL 290.

In the Domestic RVSM planning process, we have made the same effort. We have projected the percentage of flights that will be conducted by RVSM compliant aircraft in January 2005. We project that RVSM compliant aircraft will conduct approximately 90 percent of flights in January 2005. We believe that the approximately 10 percent of flights that may be conducted by non-compliant aircraft can be effectively managed for operations below FL 290.

We have conducted traffic simulations to assess the effect of 5 to 15 percent of flights now operating above FL 290 being required to operate below FL 290 and have found the situation to be manageable. We have the option of changing the vertical limits of air traffic sectors if experience indicates

that it is necessary to enhance air traffic control.

12. Some commenters raised concerns that RVSM would induce a significant traffic increase that would affect controller staffing and workload.

FAA Response: Domestic RVSM implementation should not induce an immediate significant increase in air traffic. Experience in previous RVSM implementation programs has shown this to be the case. In addition, the implementation of RVSM has been shown to decrease controller workload. RVSM adds an additional six flight levels to control air traffic. Simulations have shown that by providing an additional six flight levels where aircraft can be operated, RVSM decreases the need for controller intervention to vector aircraft and to climb or descend aircraft to provide separation.

13. One commenter questioned the capability of the Air Traffic Control (ATC) system to accommodate RVSM-induced traffic increases.

FAA Response: First, domestic RVSM should not induce an immediate, significant increase in traffic. ATC systems are adequate to accommodate the projected gradual increase in traffic. Prior to implementation, we will modify ATC systems for operation in an RVSM environment. We are modifying the conflict alert for the application of 1,000-foot vertical separation between FL 290–410. We are modifying controller displays to show the controller when a non-compliant aircraft is in the airspace. We are modifying the flight plan system so that the appropriate information in the equipment block of the operator's flight plan can be displayed to the controller.

14. The NTSB recommended that we should conduct comprehensive controller training that includes simulator training.

FAA Response: We plan to conduct controller training that will include classroom, Computer Based Instruction, and Dynamic Simulation (DYSIM) training.

15. A commenter questioned whether RVSM would enable ATC to more effectively control traffic in weather situations.

FAA Response: It is common in air traffic operations for aircraft to be routed around areas where thunderstorms or severe turbulence is present. The additional six flight levels that RVSM will provide will significantly enhance air traffic control's capability to accomplish this task. The six additional flight levels provide more airspace where aircraft can operate and be separated from other aircraft.

16. One commenter expressed concern that the phrase "Traffic Permitting" attached to the provisions for non-RVSM compliant Lifeguard flights in RVSM airspace and non-compliant aircraft access to FL 430 would limit such flights.

FAA Response: We intend to accommodate Lifeguard flights to the degree possible. "Traffic permitting" simply provides a caveat that the controller may not accommodate such a flight in the event that it cannot be conducted within acceptable safety parameters.

Airworthiness: RVSM Compliance Including Aircraft RVSM Compliance Package Availability

1. A number of commenters raised a concern that aircraft RVSM compliance packages would not be available for all aircraft.

FAA Response: RVSM operations started in the North Atlantic in March 1997. Since that time the FAA and other civil aviation authorities have approved RVSM compliance packages for the large airline and air cargo type aircraft and business aviation type aircraft that conduct the significant majority of operations in domestic airspace. In general, the aircraft manufacturers develop and obtain certification authority approval of compliance packages for aircraft types that they manufacture. Some independent aircraft engineering organization have also developed compliance packages.

We maintain a list of approved RVSM engineering packages on our RVSM documentation Web site. These packages generally take the form of Service Bulletins or Supplemental Type Certificates. The list shows available packages for both large transport aircraft and small commercial and general aviation type aircraft. Using this list of approved packages, we estimate that currently 97.4 percent of all flights are conducted by aircraft with approved RVSM engineering packages. We have observed a significant increase in the availability of RVSM packages in 2002 and anticipates further increase in 2003.

Operators retain the option of having their aircraft approved as a Non-group aircraft. The operator can obtain a Supplemental Type Certificate that applies to a single aircraft or to a small group of aircraft.

Compliance packages are being developed for aircraft that have not previously been available. As an example, non-manufacturer engineering organizations are now developing compliance packages for the Learjet 20 Series. Until recently, there had not been a compliance package projected for

those aircraft. We anticipate that the options for modifying aircraft to RVSM standards will continue to increase as the RVSM implementation date approaches.

2. A commenter was concerned that a large volume of non-group approvals will be required for types of aircraft that are used in general or business aviation. A related concern was that FAA Aircraft Certification Office resources would not be adequate to handle the demand.

FAA Response: We are identifying RVSM focal points for each of the Aircraft Certification Offices (ACO) to facilitate the process for RVSM compliance package approval. We recognize the potential increase in the volume of work required for aircraft used in general aviation or business aviation work and are preparing for it.

Our plan for proceeding with domestic RVSM implementation is based on proceeding with RVSM implementation when a significant majority of the flights are RVSM compliant. Based on experience in previous RVSM implementation programs, we recognize that a percentage of aircraft and operators may not be ready at the time of implementation.

3. A commenter expressed concern that FAA Flight Standards field office resources will be inadequate.

FAA Response: We recognize that Flight Standards (AFS) field offices will be required to assess a large volume of operators seeking RVSM authority. In preparation for RVSM, we are taking the following steps: First, AFS is enhancing and expediting communication between RVSM program leads at FAA Headquarters, in Regional Offices, in Flight Standards District Offices, and in Certificate Management Offices. Headquarters leads are meeting with already designated Regional program leads and RVSM focal points are being designated in each AFS field office. Second, AFS is enhancing existing guidance to make it clearer, more complete, and more user friendly. As an example, AFS is updating the RVSM documentation Web site to more specifically address issues related to operations under part 91. Third, AFS is working with regional offices to identify AFS field offices that may require additional support.

4. A commenter was concerned that there could be a limited availability of parts that would hinder an operators' capability to meet RVSM compliance standards.

FAA Response: In the course of planning the Domestic RVSM program, we raised the question of parts availability with aircraft and avionics

manufacturers. Parts availability was not cited as a problem in these discussions.

5. NATA stated that there is inadequate repair station capacity for the volume of aircraft to be worked on for RVSM compliance and that no formal survey of capacity had been conducted.

FAA Response: We have considered the availability of engineering facilities for small and large aircraft, and small and large operators. Many large operators use company owned and operated engineering facilities. Other operators use independent engineering facilities such as repair stations or aircraft manufacturer service centers. While we did not conduct a formal survey of engineering capacity, we did consult with operators and aircraft manufacturers to project the capability of operators to bring their aircraft into RVSM compliance by January 2005. We found the following:

- Some aircraft manufacturers and repair stations have expanded their engineering facilities to meet the demands of the RVSM program.
- In 2002 and 2003, aircraft manufacturer service center and repair station facilities were underutilized for RVSM work.
- Many operators are completing RVSM engineering during scheduled maintenance to avoid costs associated with removing them from service to complete RVSM work.

Based on consultation with the operator community, we have concluded that:

- A large percentage of aircraft operated by large airplane operators will be RVSM compliant by the January 2005 timeframe.
- If a large number of small aircraft operators plan to complete aircraft engineering work within the 12 month period prior to RVSM implementation, they will risk not having aircraft work completed by January 2005 and may have to operate below FL 290 until they obtain RVSM authority.

We project that RVSM compliant aircraft will conduct approximately 90 percent of flights by January 2005. We believe that it is in the best interest of the majority of operators to implement RVSM as soon as feasible.

6. NPRM proposal to allow turbo-propeller aircraft operated under part 91 to equip with a single RVSM compliant altimeter. Some NPRM commenters, including Cessna, supported the proposal while others, including ALPA and APA, opposed it. The FAA re-considered the NPRM proposal and published an SNPRM in February 2003 with a request for comment by April 14,

2003. The SNPRM proposed to withdraw the provision to allow turbo-propeller aircraft operated under part 91 to conduct RVSM operations using aircraft equipped with a single RVSM compliant altimeter. Most SNPRM comments supported withdrawing the proposal. However, two organizations opposed it. The SNPRM comments are summarized below with our response.

a. Most commenting organizations concurred with the proposal to withdraw the single RVSM-compliant altimeter provision.

FAA Response: In this final rule, we have not adopted the provision to allow turbo-propeller aircraft operated under part 91 to conduct RVSM operations using aircraft equipped with a single RVSM-compliant altimeter. For the past six years, standards applied worldwide have required aircraft to be equipped with two RVSM compliant altimeters. We have concluded that different criteria for turbo-propeller aircraft operated under part 91 to conduct RVSM operations should not be adopted.

b. Two commenters opposed withdrawal of the single RVSM compliant altimeter provision for part 91 turbo-prop aircraft. One commenter stated that operators should retain the ability to determine how their aircraft are equipped. That commenter also stated that standards for RVSM operations in the United States should not be affected by those adopted in other countries including those countries with airspace adjoining the U.S.

FAA Response: First, since March 1997, RVSM operations have been shown to be safe and beneficial in both oceanic and continental airspace. We believe it is critical to RVSM safety that aircraft used in RVSM operations comply with common standards for equipage, system error and performance. We have published those standards in part 91 Appendix G. Aircraft that have not complied with Appendix G have shown altitude-keeping errors that are incompatible with RVSM safety. Second, when new standards are adopted for operations such as RVSM, we believe that we must, to the extent possible, attempt to adopt standards that are common to neighboring countries and other countries worldwide. We have determined that adopting the single RVSM compliant altimeter provision would add unnecessary complications to air traffic control in the airspace that borders Canada and Mexico. Those countries have informed us that they will not adopt the provision. We also believe that it is in the best interests of U.S. operators and

manufacturers to harmonize with global RVSM standards unless there is adequate justification for a difference in our regulations. Common country, region and global standards enable operators to fly across boundaries without incurring operational limitations or penalties. Common standards also enable aircraft manufacturers to sell products to operators in other countries and regions without requiring special aircraft system modifications. We have concluded that, since the proposal would affect only 0.3 percent of domestic operations, the minor benefit provided does not justify a difference from international standards when considering the major benefits provided by sharing common standards for RVSM operations and air traffic control with neighboring countries and of continued harmonization with global RVSM standards.

c. One commenter believed that if we did not retain the single RVSM compliant altimeter provision then we should raise the floor of RVSM airspace to flight level 300 so that turbo-propeller aircraft could operate at flight level 290.

FAA Response: To allow non-RVSM aircraft to operate at FL 290 would require us to raise the floor of RVSM airspace to FL 310, not FL 300. Above FL 290, 2,000-foot vertical separation is required between aircraft unless the aircraft are RVSM compliant. If we were to allow non-RVSM aircraft to operate at FL 290, FL 300 could not be used since it does not provide 2,000-foot vertical separation when non-RVSM aircraft are involved. The loss of one of the six new flight levels provided by RVSM would limit RVSM benefits for the significant percentage of the operator community that is preparing for RVSM implementation.

7. ATA asked for a single source of material for RVSM programs.

FAA Response: We established an RVSM Documentation Web page to provide ready access to RVSM regulations and to RVSM guidance. Official documents related to RVSM are available from that Web page at http://www.faa.gov/ats/ato/rvsm_documentation.htm. In addition, these documents can be obtained from FAA Flight Standards District Offices and Certificate Management Offices.

Benefits

1. A number of commenters expressed concern that RVSM will not alleviate delay or holding problems in the terminal area and will, in fact, exacerbate the situation by increasing arriving and departing traffic.

FAA Response: First, the implementation of RVSM will not automatically lead to a significant traffic increase in the short to mid term in either the enroute or the terminal area. The near doubling of flight levels will not lead to a near doubling of the number of airframes that operate in the national airspace system (NAS). Air traffic at FAA air route traffic control centers is projected to increase at an average annual rate of 2.0 percent. RVSM will enhance air traffic's capability to manage this increase efficiently. Second, the enhancements to enroute operations stand on their own merit. They are estimated to account for approximately \$800,000 annual savings as a result of reduced ground delays. Also, we do not believe that we should make no effort to enhance enroute operating efficiency until additional enhancements to terminal area operations are made. Third, domestic RVSM is a project in the NAS Operational Evolution Plan (OEP). It is in the En Route Congestion section of the OEP. The NAS OEP also contains projects that address Arrival/Departure Rate problems including runway capacity and terminal area problems. The domestic RVSM project should not be considered in isolation, but as an element of OEP projects that are addressing: Arrival/Departure Rate, En Route Congestion, Airport Weather Conditions, and En Route Severe Weather.

2. One commenter stated that fuel savings is not an adequate justification for Domestic RVSM implementation.

FAA Response: The Regulatory Impact Analysis cites both quantitative and qualitative benefits to domestic RVSM implementation. Fuel savings due to enhanced access to more fuel-efficient flight levels is quantified. We forecast 5.3 billion dollars in fuel savings from January 2005 through January 2016. The analysis also cites qualitative benefits to air traffic control. These benefits include increased controller flexibility, enhanced sector throughput allowing more aircraft to operate on time and fuel efficient routes, reduced controller workload allowing them to control traffic more efficiently, enhanced flexibility to allow aircraft to cross intersecting routes, mitigation of traffic congestion at conflict points, and potential for enhanced overall enroute airspace capacity in the long term.

3. One commenter stated that domestic RVSM benefits will not be significant to small operators.

FAA Response: We recognize that the aircraft utilization rate for small operators is significantly lower than that for larger operators and therefore small

operators accrue RVSM benefits at a lower rate. We believe that RVSM provides significant enhancements to daily operations in the National Airspace System (NAS) and provides benefits to the operators that conduct the significant majority or approximately 90 percent of operations in the NAS. We are considering the overall benefit to the majority of operators as well as the overall enhancement to NAS operations.

Costs Including Downtime Issues

1. A number of commenters stated that they believed the average cost to modify aircraft to comply with RVSM standards will be in the \$200,000–\$300,000 range.

FAA Response: In the Regulatory Impact Analysis we have estimated the costs to modify individual aircraft types for RVSM compliance. The range of modification costs for individual airframes varies from less than \$100 for some aircraft types up to \$175,000 to \$235,000 for a small number of older aircraft types.

2. Comments were made that the costs of operation below FL 290 should be considered in the Benefit/Cost analysis. Also, comments were made that raised issues related to range limitation and fuel burn costs below FL 290.

We have examined operations below FL 290. We anticipate that approximately 10 percent of daily flights in the NAS that are currently operated above FL 290 may operate below FL 290 in the initial period of domestic RVSM implementation. We have examined the time of flight in NAS operations and the affect of operating below FL 290 on aircraft range and fuel burn and have posted the study entitled "An Examination of Range and Fuel-Burn Penalties Associated With Operating Business Jet Type Aircraft Beneath Proposed Domestic Reduced Vertical Separation Minimum (DRVSM) Airspace" in the public docket. You can find the public docket on the Internet at <http://dms.dot.gov>. Search for docket number 12261. For this analysis, we first examined five older small commercial/ general aviation aircraft types with high modification costs under the assumption that some operators may elect to operate these aircraft types below FL 290 rather than incur RVSM modification costs. We next examined all business jet aircraft types operated under 14 CFR part 135. We reached the following conclusions in the study:

- We estimate the average annual cost of operation below FL 290 per airframe to be \$1,147.

- The average fuel penalty for business jet aircraft operated under part 135 is 7.15 percent.

- Eight percent of operations flown prior to DRVSM above FL 290 could no longer be flown without a fuel stop due to range penalties associated with operating below FL 290.

Other factors that the FAA considered were:

- Average flight time at enroute cruise was 1.9 hours for aircraft used in commercial operations and 1.4 hours for aircraft used in general aviation operations.

- Time at enroute cruise was 2 hours or less for 82 percent of general aviation flights.

3. Some commenters stated that after comparing RVSM aircraft modification costs to the residual value of the aircraft, they could not justify modifying certain aircraft types.

FAA Response: Operators have two basic options. They can upgrade their aircraft to comply with RVSM standards or they can operate their aircraft below FL 290 or, if capable, above FL 410. We recognize that in some cases operators may decide for economic reasons not to pursue RVSM compliance.

4. Some commenters stated that DRVSM will significantly impact the part 135 on-demand charter industry.

FAA Response: We support DRVSM implementation because it provides significant benefits to NAS operations and to the operators that conduct the significant majority of flights in NAS airspace. We recognize that some operators will have to make economic decisions on whether to retain an aircraft and operate it below FL 290 or to modify it to RVSM standards so that it can operate above FL 290. Based on our analysis of operations below FL 290, it appears that operation below FL 290 is a viable option for some operators if they choose not to modify their aircraft.

5. One commenter stated that if it did not modify its aircraft for RVSM there would be a significant negative impact on the residual value of the aircraft.

FAA Response: RVSM is a worldwide program. RVSM has already been implemented in the North and West Atlantic, Pacific and Western Pacific, Europe, Australia, and Northern Canada. In addition, there are implementation groups established for the Middle East, the Caribbean, and South America. We believe that the aviation community must recognize the global nature of RVSM and plan accordingly. The residual value of aircraft is not a primary consideration in this rulemaking.

6. One commenter proposed that the costs to small operators should be

subsidized either by the Airport and Airways Trust fund or by the airlines.

FAA Response: A proposal to subsidize small operators by either the airlines or by the Airport and Airways Trust Fund was not proposed in the NPRM and is beyond the scope of this rulemaking.

7. Some commenters stated that the Regulatory Impact Analysis needs to be updated and the modification costs for small aircraft should be re-estimated and should include the out of service cost during the period the aircraft are undergoing modification.

FAA Response: The Regulatory Impact Analysis that is summarized in this document and published in full in the DOT Docket includes updated costs and benefit estimates. We have estimated the number of aircraft that may be out of service for RVSM modification. We have also estimated costs related to the loss of revenue when certain aircraft are out of service undergoing RVSM modification. Many operators have scheduled RVSM compliance work to be completed during scheduled aircraft inspections to avoid the cost of additional out of service time for RVSM modification.

8. RAA stated that it did not believe that RAA operators were considered in the NPRM Regulatory Impact Analysis.

FAA Response: RAA operator costs were considered in the Regulatory Impact Analysis that was included with the NPRM in the DOT Docket and are considered in the Regulatory Impact Analysis included with this final rule.

9. One commenter stated that operators were unable to accurately assess the costs related to monitoring of aircraft altitude keeping.

FAA Response: We assessed operator costs associated with monitoring in the Regulatory Impact Analysis published in conjunction with the NPRM and the final rule. In that assessment, the FAA estimated that operator costs associated with monitoring of the DRVSM fleet would be approximately \$4.3 million. For this assessment, we projected that the GPS-based Monitoring System (GMS) would monitor a portion of the RVSM fleet and the ground based Aircraft Geometric Height Monitoring Element would monitor those not monitored by the GMS. The \$4.3 million in monitoring costs are not significant when compared to estimated fleet upgrade costs of \$735 million. Operators have two options for obtaining information on monitoring systems and procedures. They can obtain information by accessing the FAA RVSM Web site at <http://www.faa.gov/ats/ato/rvsm1.htm>. They can obtain the same information by contacting one of

the Flight Standards District Offices in their area.

Implementation Program: Necessity To Implement, Implementation Scenarios, Planned Implementation Date

1. A number of aviation organizations and some individuals provided comments supporting the implementation plan and schedule published in the NPRM. These commenters opposed proposals to vertically phase-in RVSM flight levels. Commenters cited significant public benefit and benefit to the national interest. They cited proven benefits in areas outside the United States, including reduced operating costs (time, fuel efficiency) and enhanced air traffic control.

FAA Response: We acknowledge these comments and have considered them in our evaluation of the DRVSM implementation plan.

2. The ATA proposed that the FAA should change the target implementation date to a more suitable Aeronautical Information Regulation and Control (AIRAC) date of January 20, 2005. The ATA's rationale for this proposal is that the AIRAC date in December 2004 is December 23. Since this date is just before a major holiday, ATA proposed that the FAA should target January 20, 2005 as the date to implement DRVSM.

FAA Response: We understand the benefits of this proposal and will use January 20, 2005 for planning purposes. The AIRAC dates are agreed dates when changes to aeronautical information are made for flight planning and also for aircraft navigation databases. We agree that January 20, 2005 is a more practical date to implement DRVSM.

3. Federal Express proposed that the implementation date for DRVSM be harmonized with the Enhanced Ground Proximity Warning System (EGPWS) on March 31, 2005 so that aircraft modification schedules for the two programs could be coordinated.

FAA Response: We have projected that RVSM compliant aircraft will conduct ninety percent of flights by January of 2005. We believe this is an appropriate time to implement DRVSM.

4. RAA asserts that 85% of regional jets will be required to be RVSM compliant on the DRVSM implementation date.

FAA Response: We are tracking RVSM compliance of operators and aircraft types. Since regional jets are a significant fleet in domestic operations, we are closely tracking the status of the regional jet fleet. As stated previously, we believe that we should implement DRVSM when approximately 90 percent

of flights are RVSM compliant and we must consider benefits to overall NAS operations.

5. A number of commenters proposed that the FAA should delay implementing DRVSM. Dates proposed included: Late 2005, 2006, and 2010. The rationale for the proposed delays included request for more time for operators to complete aircraft compliance work, suggestion that RVSM should be delayed until airport capacity projects were completed, limitations to repair station capacity, and concern for operator log jam in the final year.

FAA Response: We have chosen a target implementation date on which we project approximately 90 percent of flights in the NAS to be conducted by RVSM compliant aircraft. For each year of delay, we estimate that approximately \$394 million dollars in fuel savings will be lost. In addition, air traffic control enhancements such as enhanced controller flexibility and decreased workload, mitigation of traffic congestion at conflict points, and increased sector throughput will also be delayed. We believe that those operators that do not obtain RVSM authority by the implementation date can operate viably below FL 290 until they obtain RVSM authority.

Also, based on past experience, we believe that a delay in the target implementation date will only result in many operators delaying their own plans to obtain RVSM authority.

For these reasons, we believe that January 20, 2005, should remain the target date for Domestic RVSM implementation.

6. A number of commenters stated that many operators would not start work to obtain RVSM authority until the final rule is published. Since we intend to publish the final rule in June 2003, those operators will only have 18 months to complete the work.

FAA Response: We cannot compel compliance with any rulemaking action until the final rule takes effect; however, there is no prohibition in an operator taking action based on an NPRM. Many operators, including operators that conduct a major percentage of NAS operations, already have significant parts of their fleets RVSM compliant or have begun work to obtain RVSM compliance. In operator surveys conducted during development of the NPRM many operators indicated the intention of having their fleets RVSM ready by late 2004. Many major operators have expressed support for the implementation date stated in the NPRM. Delaying DRVSM implementation would deny benefits to

operators that have aggressively pursued RVSM programs.

7. Some operators opposed DRVSM implementation due to costs and a perception of limited benefits.

FAA Response: We have shown quantified benefits for fuel savings and qualitative benefits for ATC enhancements. The benefit/cost ratio for the period 2002 to 2016 is approximately 6 to 1. RVSM has provided significant benefits in other major world airspaces. We believe that DRVSM is justified.

8. Comments were made questioning the need for aircraft to complete the RVSM compliance process. The commenters proposed that non-compliant aircraft should be allowed to operate at RVSM flight levels.

FAA Response: The FAA and other civil aviation authorities conducted studies of aircraft altitude-keeping performance in preparation for developing regulations and standards for RVSM operation. These studies showed that altitude-keeping at RVSM flight levels was not standardized. The tolerance for errors greater than 300 feet in RVSM airspace is very small. The studies showed that the aircraft population exhibited large errors at an unacceptable rate.

The aircraft RVSM compliance standards published in part 91 Appendix G were established to ensure safety in RVSM operations.

Maintenance

1. Some commenters believe there should be separate rulemaking for RVSM Maintenance program requirements. AEA recommended that we should remove RVSM maintenance requirements from part 91, Appendix G and related FAA RVSM guidance material and publish them in regulations with more general applicability. The rationale was that RVSM operations would become standard operation rather than a special operation.

FAA response: Since initial RVSM implementation in the North Atlantic five years ago, basic standards for maintenance programs have been provided in part 91, Appendix G. In addition, specific provisions for aircraft RVSM systems have been published in the RVSM compliance packages approved by certification authorities for individual aircraft types or groups.

First, RVSM requirements apply to operations between FL 290–410, inclusive. They do not apply to aircraft operating below FL 290. Second, we acknowledge that RVSM may become the standard worldwide in the future for operations between FL 290–410 and in

the future it may be appropriate to consider placing RVSM maintenance requirements in other regulations. At this time, however, RVSM maintenance program requirements are published in Appendix G.

2. AEA states that there is a lack of direction and standardization from FAA Headquarters for maintenance programs.

FAA Response: We have chosen not to arbitrarily limit the ways an operator or the industry may meet RVSM requirements. Since different equipment solutions, based on different error budgets and component tolerances are being used by applicants, maintenance programs will vary.

A single maintenance requirement has been placed on aircraft obtaining RVSM authorization. The requirement is to maintain the aircraft within the specifications of Appendix G. The elements of the maintenance programs are developed during certification of an aircraft's altitude keeping performance. We have chosen not to limit an operator or the industry to a single method of compliance, therefore, elements of the maintenance program will vary.

3. NATA questioned the assertion that RVSM maintenance costs are not significant.

FAA Response: There are two major elements in maintenance programs related to RVSM required aircraft systems. The first is requirements established by aircraft and avionics manufacturers for the basic certification of the aircraft. The second is maintenance requirements approved by certification authorities in the RVSM compliance package for individual aircraft types.

Since March 1997, we have granted RVSM authority to hundreds of operators and approximately 5,400 aircraft including approximately 3,700 general aviation aircraft. Operators have not cited maintenance costs as a major factor in the initial five years of RVSM operations. We anticipate that maintenance costs will lower as service center availability and experience expands.

Military Operations

1. The Department of Defense (DoD) said that it is necessary for the FAA to accommodate the operation of DoD aircraft that could not meet RVSM standards in order to assist the DoD accomplish its operational mission.

FAA Response: The DoD has elected, to the extent possible, to modify its aircraft to meet RVSM standards so that they can operate safely without special accommodation in RVSM airspace. Most large DoD transport and tanker aircraft are already RVSM compliant. The

percentage of flights in the NAS by DoD fighter and bomber aircraft that are unable to meet RVSM standards is projected to be less than 1 percent.

The FAA recognizes the critical nature of the DoD mission to national defense, recognizes that some DoD aircraft types are unable to meet RVSM standards, and plans to accommodate non-compliant DoD aircraft by applying 2,000 foot vertical separation or the appropriate horizontal separation standard to those aircraft. The FAA and DoD already have agreed procedures to coordinate the operation of DoD aircraft on special operations such as formation flights and have developed similar agreements in a joint FAA/DoD Memorandum of Understanding for RVSM operations.

2. ALPA stated that the rule language should be amended to state that non-compliant military aircraft would be provided increased separation.

FAA Response: Part 91, Appendix G, Section 5 provides the basic standards for operation of non-compliant aircraft in RVSM airspace. Section 5 permits deviations for a specific flight if air traffic control determines that the aircraft may be provided “* * * appropriate separation * * *”. Controller handbooks define appropriate separation in these circumstances as 2,000 feet vertical separations or the applicable horizontal separation standard.

3. ALPA proposed that the word “civil” be removed from the proposed Section 91.180 to ensure the compliance of military aircraft with RVSM standards.

FAA Response: The FAA and DoD have entered into a Memorandum of Understanding that details DoD obligations in RVSM operations in the NAS. The military has used the standards of part 91, Appendix G to approve its aircraft for RVSM operations since the 1997 implementation of RVSM. The FAA/DoD MOU provides adequate assurance that this will continue to be the case.

Miscellaneous

1. One commenter proposed that vertical separation could be provided by GPS.

FAA Response: The geometric height above the earth provided by GPS is not compatible with the pressure flight level displays provided by pressure altimeters. The geometric height of pressure levels is not constant, but varies during the flight. Since aircraft altitude-keeping and performance are based on pressure levels world-wide, an evolution to altitude-keeping and

vertical separation based on GPS is not possible at this time.

Monitoring

1. ALPA raised concerns related to the adequacy of monitoring resources and requested more information on the location and schedule for ground-based Aircraft Geometric Height Measurement Element (AGHME) units.

FAA Response: We are planning for AGHME units to be deployed in September of 2003. The FAA Technical Center is conducting studies to establish the most effective location for the units and the number of units necessary to provide adequate coverage. We will inform the aviation community as these studies progress.

We now have 40 portable GPS-based Monitoring Units (GMU) available to conduct monitoring and will acquire 40 enhanced GMUs starting in 2003.

2. ALPA raised concerns that certain operator’s may not participate in the monitoring program.

FAA Response: Each operator is required to participate in the monitoring program as a condition for obtaining RVSM authority. Since 1997, operators have recognized the importance of monitoring programs and have participated in the programs.

3. One commenter questioned the need for independent monitoring considering RVSM airworthiness standards.

FAA Response: The monitoring programs are designed to give authorities an independent assessment of aircraft altitude-keeping performance in a given airspace. The monitoring program has identified aircraft types and individual aircraft that were not performing to RVSM standards. Based on monitoring information, in a small number of cases, the FAA and other authorities have found it necessary to remove RVSM authority for an aircraft type, to revise the aircraft RVSM compliance package, or to require aircraft inspection and maintenance. We believe that monitoring is a valuable tool to confirm that RVSM operations are conducted to standards.

Operational Issues

1. A commenter suggested that there is a need for a separate Letter of Authorization (LOA) for domestic-only operators.

FAA Response: We believe that the current LOA format can be used to grant multiple authorities for operation in special areas of operation, including the domestic United States. We do not believe it is necessary to develop a separate LOA for domestic RVSM only. In addition, we have published

expanded guidance to explain the use of the LOA.

2. A commenter questioned the practice of engaging the autopilot during RVSM operations.

FAA Response: Since 1997, it has been standard practice to engage the autopilot during RVSM operations unless the pilot deems it necessary to do otherwise. Performance standards are established for autopilot systems used in RVSM operations. The purpose of these standards is to ensure acceptable altitude-keeping in RVSM airspace.

3. Several commenters expressed the concern that the FAA should take steps to enhance field inspector training and better standardize processes

FAA Response: We believe that an effort is necessary to enhance training, guidance, and standardization for Flight Standards District Offices (FSDOs). We are dedicating resources to accomplish this task.

4. NBAA proposed that operators be granted provisional authority to conduct RVSM operations for 90 days while FSDOs complete the evaluation of the operator’s application.

FAA Response: We do not agree with this proposal. We believe that each operator’s application must be thoroughly evaluated to ensure aircraft compliance and program compliance before the operator conducts RVSM operations.

5. One commenter suggested that the process for an operator acquiring a previously RVSM approved aircraft to obtain LOA should be simplified.

FAA Response: We will examine this situation and clarify and simplify the authorization process in this situation.

6. A commenter questioned the necessity to re-issue an LOA to part 91 operators every two years. The rationale was that RVSM would become the standard for daily operations after DRVSM implementation.

FAA Response: We believe that this requirement should be reviewed as part of a post implementation review. We will coordinate with industry to address this issue in the year following DRVSM implementation.

Safety Issues—General

1. Several commenters expressed the concern that the FAA must perform an adequate safety analysis before DRVSM implementation.

FAA Response: The ICAO Review of the General Concept of Separation Panel (RGCSP), which included FAA representatives, conducted a safety analysis on U.S. domestic operations in the course of developing the worldwide requirements for aircraft altitude-keeping performance. The RGCSP

determined that the busiest enroute airspace in the U.S. and the world was that between Albuquerque and Los Angeles. Operations in this high traffic density airspace were analyzed using Collision Risk Modeling. This analysis provided the basis for aircraft altimeter accuracy and autopilot performance requirements that are published in part 91, Appendix G, and in the ICAO RVSM Manual.

The Separation Standards Group (ACB-310) at the FAA William J. Hughes Technical Center provides safety analysis capabilities for FAA programs reducing the separation between aircraft. ACB-310 personnel have participated in or lead the Safety and Monitoring (SAM) Groups in all of the RVSM implementation programs in oceanic airspace except the South Atlantic. The SAM groups have been responsible for completing safety analysis in each individual area of operation. ACB-310, in coordination with FAA Flight Standards and Air Traffic will be responsible, prior to DRVSM implementation, for updating the safety analysis for DRVSM airspace.

2. A commenter expressed the concern that the Target Level of Safety (TLS) should be stringent enough to protect NAS safety.

FAA Response: We have adopted the TLS endorsed by ICAO and used to assess RVSM implementation safety worldwide.

3. APA expressed the concern that increased or better navigation accuracy in the vertical and horizontal planes increases risk when pilot or controller errors occur.

FAA Response: The Collision Risk Model (CRM) accounts for aircraft navigation accuracy. Navigation accuracy is one of the major elements considered in the CRM to assess airspace system safety.

4. A number of commenters expressed a concern that RVSM may have been a factor in the July 2002 mid-air collision in Europe.

FAA Response: The German Federal Bureau of Aircraft Accidents Investigation is conducting the investigation into the July 2002 mid-air collision in Europe. The investigation is still underway, however, neither the RVSM program nor the 1,000-foot vertical separation standard appear to have been a factor. The aircraft were correctly established at their assigned altitude of FL 360 and were separated horizontally. When their paths converged, the controller attempted to issue a clearance for one of the aircraft to descend so that the aircraft would be separated vertically. When that aircraft descended, it did so in conflict with its

TCAS Resolution Advisory (RA) to climb and descended into another aircraft. The second aircraft was following its TCAS RA to descend. It appears that this scenario could have occurred as it did under the conventional vertical separation rules that were applied prior to European RVSM implementation in January 2002. RVSM does not appear to have been a factor and RVSM operations have continued in European airspace.

5. AOPA proposed that non-compliant aircraft should be allowed to climb to and above FL 290 if required to avoid weather.

FAA Response: We are making provision for non-compliant aircraft to climb through RVSM airspace without intermediate level off to operate above RVSM airspace. The AOPA proposal would allow non-compliant aircraft to climb into RVSM airspace on a regular basis and operate there for a sustained period of time. We oppose this proposal because we have found in simulations that increasing the number of non-compliant aircraft in RVSM airspace significantly increases controller workload, complicates air traffic control, and increases the potential for controller and pilot error.

When warranted by the circumstances, the pilot retains the option under existing regulations to take the action necessary to protect the safety of the aircraft.

6. An individual proposed that aircraft should fly random vertical paths rather than standard flight levels.

FAA Response: Air Traffic Control, air traffic conflict alert systems, vertical separation standards, pilot and controller procedures, and aircraft operations are based worldwide on aircraft accurately maintaining cleared flight level and track. The DRVSM project is intended to introduce a new vertical separation standard into the existing operational environment. It is not within the scope of the DRVSM project to implement random vertical paths into NAS operations.

7. One commenter raised a concern about non-compliant aircraft operating without authorization at RVSM flight levels.

FAA Response: RVSM programs provide protection against aircraft operating at RVSM flight levels without authorization in several ways. First, FAA regulations require aircraft and operators to have FAA authorization before flying in RVSM airspace. Second, part 91, Appendix G, Section 4 requires operators to correctly annotate the flight plan filed with ATC with the RVSM status of their aircraft. Third, the operator's RVSM status is displayed to

the controller so that the correct vertical separation will be applied. Fourth, the Separation Standards Group (ACB-310) at the FAA Technical Center tracks both individual airframes and operators on an RVSM Approvals Database and periodically compares the database to airframes observed operating in RVSM airspace to identify unauthorized aircraft. Fifth, the FAA investigates any operators found operating in RVSM airspace without authority.

8. The NTSB recommended that the FAA should track wake turbulence events in the post implementation period.

FAA Response: Wake turbulence may occur when one aircraft is trailing another by 10–12 miles on the same track and is 1,000 feet below another. It may also occur if two aircraft pass each other in opposite directions on the same track separated by 1,000 feet. The occurrence of wake turbulence is dependant on wind direction and atmospheric conditions at the time that the aircraft pass.

Since the initial RVSM implementation in 1997, wake turbulence has generally been found to be moderate or less in magnitude and has affected crew and passenger comfort rather than safety. Pilots are able to avoid wake turbulence in airspace such as the U.S. where direct pilot-controller communications are available by requesting a flight level change, a minor track offset, or a track change.

Wake turbulence has not been a factor in the past year of RVSM operations in Europe.

Before we implement RVSM in domestic airspace we will apply experience that we have gained since 1997 to develop and publish pilot guidance on wake turbulence. In addition, we will conduct a post implementation problem detection/resolution effort that includes wake turbulence.

9. The NTSB recommended that the FAA should conduct adequate training so that operators, pilots, and controllers clearly understand aircraft requirements and status including enroute aircraft system failures.

FAA Response: The FAA Flight Standards Service is coordinating with the FAA Air Traffic organization to develop appropriate guidance for the Aeronautical Information Manual and other FAA documents posted on the FAA RVSM Web site and available in Flight Standards field offices. We will emphasize these areas of concern.

10. One commenter questioned the pilot actions in the event of autopilot failure enroute.

FAA Response: The FAA and other Air Traffic Service Providers provide guidance on recommended pilot actions in events such as aircraft system malfunctions, medical emergencies, and weather encounters. These recommendations are referred to as contingency procedures. In an environment such as the domestic U.S. where direct pilot-communications and radar surveillance is available, ATC assistance is readily available in contingency events such as autopilot failures.

Small Entity Analysis

1. Part 91 and 135 small businesses were not identified in the NPRM Small Entity Analysis. NATA questioned the finding of insignificant impact on small entities and questioned its treatment of part 91 and part 135 businesses.

FAA Response: We have updated the Regulatory Impact Analysis (RIA) published with this final rule. The Small Entity analysis was updated for the RIA.

TCAS

1. A number of commenters asserted that TCAS installation should be a requirement for operation in RVSM airspace.

FAA Response: The FAA does not concur with this assertion for the reasons discussed below.

1,000-foot separation. First, we believe it is important to note that 1,000 ft vertical separation has been applied up to flight level 290 on a global basis, including the U.S., for about 40 years. The 1,000-foot vertical separation below FL 290 is based on basic certification standards for aircraft altimeters, autopilots, and pilot and controller procedures. The current requirements for TCAS equipage are not based on this separation standard.

TCAS and Transponder Equipage Requirements. TCAS equipage is required by parts 121, 125, 129, and 135. Equipage requirements are not related to a specific separation standard or operational procedure. Part 91 § 91.215 requires transponder equipage for operation in Class A airspace. Class A airspace is between FL 180–600 in the U.S.

We estimate that in domestic U.S. operations approximately 90% of flights are currently equipped with TCAS. In addition, all aircraft must be equipped with transponders to operate in U.S. Class A airspace. Aircraft that are transponder equipped, though not TCAS equipped, are still displayed to TCAS equipped aircraft and produce TA's and RA's when within the parameters.

Revision to FAA TCAS Equipage Rules. The FAA published a Final Rule in April 2003 that will, in the January 2005 timeframe, increase the number, percentage and categories of aircraft operating in U.S. domestic airspace that are equipped with TCAS. This is so because in the revised regulations TCAS equipage requirements for turbine-powered airplanes are no longer based on passenger seat configuration. A major provision of the revised part 121 § 121.256, part 125 § 125.224, and part 129 § 129.18 is that, effective January 1, 2005, turbine-powered airplanes of more than 33,000 pounds maximum certified takeoff weight must be operated with one of the following:

- TCAS II that meets TSO C-119b (version 7.0) or a later version
- TCAS II that meets TSO C-119a (version 6.04A Enhanced)
- A collision avoidance system equivalent to TSO C-119b (version 7.0) or later version capable of coordinating with units that meet TSO C-119a (version 6.04A Enhanced)

In addition, these sections contain requirements for new TCAS II installations made after April 30, 2003; requirements for replacement of TCAS II (version 6.04A Enhanced) installations that cannot be adequately repaired with TCAS II (version 7.0) installations; provisions, effective January 1, 2005, for the operation of airplanes with a passenger seat configuration of 10–30 seats and provisions for piston-powered airplanes of more than 33,000 pounds maximum certificated takeoff weight.

Part 91 Aircraft TCAS Equipage. Many business aviation operators equip their aircraft with TCAS voluntarily, as a safety measure.

Other factors. Other factors related to the discussion of TCAS as it relates to RVSM are:

a. *Safety Analysis.* The safety analysis conducted prior to RVSM implementation does not consider the effect of TCAS on risk bearing events such as altitude busts, controller errors, etc. Instead, risk is estimated based on aircraft altitude-keeping errors (technical errors) and operational or human errors. This estimated risk is compared to the agreed Target Level of Safety. The intent is to identify errors and mitigate their occurrence. Nowhere in the safety analysis or in operational evaluation is it assumed that an error event is not significant because risk is mitigated by TCAS when the event occurs.

b. *RVSM Experience.* Since March 1997, in RVSM operations worldwide, approximately 14 million RVSM flight

hours have been accumulated and 6 million RVSM flights have been conducted safely. The criteria for altimeter accuracy, autopilot performance, and altitude alerts, plus the RVSM policies and procedures have been effective since their publication in guidance form in 1994 and in part 91, appendix G in April 1997.

c. *ICAO Aircraft Equipage Standards.* The ICAO RVSM aircraft equipage standards applied worldwide, including Europe, do not include a requirement for TCAS.

d. *TCAS Events.* The events in enroute airspace where TCAS has provided a safety net have not been related to the separation standard applied. Instead, events in enroute airspace where aircraft have come into proximity, generally have related to human error. Such events have occurred in airspace where 2,000-foot vertical separation is applied and in some cases where 60 nm lateral separation was applied.

e. *TCAS II Version 7.0.* In December 2001, we published a revision to Part 91, Appendix G to require that Version 7.0 be incorporated into TCAS II if TCAS is installed on the aircraft and the aircraft is used in RVSM operations. RVSM operations will require Version 7.0 in domestic U.S. operations.

2. One commenter stated the belief that TCAS was a requirement for RVSM in other areas of the world.

FAA Response: Neither FAA regulations nor ICAO standards and policies require TCAS installation in order to conduct RVSM operations. ICAO Annex 6 (Operation of Aircraft), Part 1 (International Commercial Air Transport Aeroplanes) contains the ICAO standard for TCAS II, Version 7.0 installation on an aircraft. ICAO standards call for TCAS II, Version 7.0 installation on aircraft with a take-off gross weight exceeding 33,000 pounds or with a passenger carrying capacity of more than 30.

ICAO Annex 6, Part II (International General Aviation Aeroplanes) calls for aircraft to be equipped with a pressure altitude reporting transponder, but does not call for TCAS installation. TCAS installation policies for individual ICAO regions are published in ICAO Regional Supplementary Procedures (Doc 7030). ICAO Doc 7030 TCAS and transponder installation policies reflect ICAO Annex 6, Parts I and II.

3. Some comments proposed that an operating TCAS should be a requirement for entry into RVSM airspace and also for continued operation in the event of TCAS failure enroute.

FAA Response: TCAS installation and operation is not a requirement for the application of enroute separation standards including 1,000-foot vertical separation below FL 290. Master Minimum Equipment List policy allows for TCAS to be inoperative for up to 3 days. The aircraft equipage requirements for RVSM have provided safe RVSM operations since 1997.

4. ALPA asked us to analyze the incremental safety benefit of requiring TCAS on all aircraft.

FAA Response: The safety analysis performed prior to RVSM implementation considers the frequency of aircraft altitude-keeping errors and of human errors. The risk of error events is not considered to be mitigated by TCAS.

We have estimated that there will be a high probability of TCAS equipage in encounters between aircraft. We have estimated that in 81 percent of encounters between pairs of aircraft both aircraft will be TCAS equipped and in 99 percent of such encounters at least one aircraft will be TCAS equipped.

5. CAPA suggested that encounters between aircraft where one is TCAS equipped and the other is not are similar to the European mid-air collision event that occurred in July of 2002.

FAA Response: First, we do not believe that the potential event described is specific to a single separation standard, including 1,000-foot separation above FL 290. Second, 1,000-foot vertical separation is applied without requirements for TCAS below FL 290. Third, the mid-air event in Europe occurred despite the fact that both aircraft were TCAS equipped. In NAS airspace, approximately 90 percent of aircraft are estimated to be TCAS equipped.

6. AEA asked for confirmation of TCAS I acceptability for operations in RVSM airspace.

FAA Response: The only RVSM requirement related to TCAS installation is that if the aircraft is equipped with TCAS II and used in RVSM operations then TCAS II, Version 7.0 must be incorporated. There is no prohibition in RVSM requirements against TCAS I.

7. AEA asked if Mode S waivers would remain in effect.

FAA Response: All TCAS installations require a TCAS-compatible Mode S transponder. This is to allow for coordination during events where more than one aircraft is TCAS equipped. This is true for Version 7 and all previous versions. TCAS Version 7 and all earlier versions are capable of tracking other aircraft that are equipped

with either a Mode A/C or Mode S transponder. TCAS will provide TA and RA protection against aircraft equipped with either type of transponder.

We have not issued any waivers to the requirement for a Mode S transponder on a TCAS-equipped aircraft. This would have resulted in TCAS being inoperative at all times.

The requirement for Version 7 instead of earlier versions of the TCAS logic should have no affect on waivers issued to Mode S requirements for aircraft that are not TCAS equipped.

Regulatory Impact Analysis Summary

Executive Order 12866 directs federal agencies to promulgate new regulations or modify existing regulations after consideration of the expected benefits to society and the expected costs. Each federal agency shall assess both the costs and the benefits of proposed regulations while recognizing that some costs and benefits are difficult to quantify. A proposed rule is promulgated only upon a reasoned determination that the benefits of the proposed rule justify its costs.

The order also requires federal agencies to assess whether a proposed rule is considered a "significant regulatory action". The Regulatory Flexibility Act of 1980 requires agencies to analyze the economic impact of regulatory changes on small entities. The Office of Management and Budget directs agencies to assess the effect of regulatory changes on international trade. Finally, Public Law 104-4 requires federal agencies to assess the impact of any federal mandates on state, local, tribal governments, and the private sector.

In conducting these analyses, we have determined that this rule: (1) Generates benefits that justify its costs for the significant majority of U.S. operators and is "a significant regulatory action" as defined in the Executive Order; (2) is significant as defined in Department of Transportation's Regulatory Policies and Procedures; (3) has a significant impact on a substantial number of small entities, but provides benefits that justify a final rule; and (4) does not constitute a barrier to international trade. These analyses, available in the docket, are summarized below.

This rule expands Reduced Vertical Separation Minimum (RVSM) operations to aircraft operating between FL 290-410 (inclusive) in the airspace of the 48 contiguous States of the U.S., the District of Columbia, Alaska, that portion of the Gulf of Mexico where we provide air traffic services, the San Juan FIR and the airspace between Florida and the San Juan FIR. Some of the

benefits of this rulemaking are: (1) An increase in the number of available flight levels; (2) enhanced airspace capacity; (3) permits operators to operate more fuel/time efficient routes and altitudes; and (4) enhanced air traffic controller flexibility by increasing the number of available flight levels, while maintaining an equivalent level of safety.

We estimate that this rule will cost U.S. operators \$869.2 million for the fifteen-year period 2002-2016 or \$764.9 million, discounted. For the purposes of this cost analysis, we assumed that operators would choose to upgrade almost all of their aircraft to meet RVSM standards. Operators of non-RVSM approved aircraft would, however, retain the option of flying above or below RVSM airspace. Benefits would begin accruing on January 20, 2005. Estimated quantifiable benefits, based on fuel savings for the U.S. aircraft fleet over the years 2005 to 2016, would be \$5.3 billion or discounted at \$3.0 billion.

In addition to fuel savings, many non-quantifiable or value-added benefits will result from the implementation of RVSM in domestic U.S. airspace. Input from air traffic managers, controllers, and operators has identified numerous additional benefits.

Through implementation of RVSM in the NAT and PAC regions, operators and controllers have realized some additional benefits as identified by air traffic managers and controllers are:

- Enhanced capacity
- Reduced airspace complexity
- Decreased operational errors in these regions
- Reduction of user-requested off course climbs for altitude changes
- Improved flexibility for peak traffic demands
- Reduction of the effect of traffic converging at critical points
- Increased number of options in deviating aircraft during periods of adverse weather

The benefits outlined above for RVSM in the NAT and PAC regions are anticipated in domestic U.S. airspace. There should be expected efficiencies through reduced airspace complexity, increased flight levels, and fewer altitude changes with crossing traffic.

Operators can also expect enhanced operating efficiency and the potential for decreased departure delays due to improved airspace efficiency. Specific benefits cited by aircraft operators are:

- Decreased flight delays
- Improved access to desired flight levels

- Reduced average flight times
- Increased likelihood of receiving a clearance for weather deviations
- Seamless, transparent, and harmonious operations between adjoining RVSM airspaces
- Consistent procedural environment throughout the entire flight
- Reduced impact of adverse weather by permitting aircraft deviations to other airways without any efficiency loss.

Implementation of RVSM in U.S. domestic airspace should increase user satisfaction. The benefits described in this section are compelling in number and operational impact. These benefits are also important in that they are enjoyed both by air traffic and aircraft operators.

Analysis of Alternatives

This rule is a "significant regulatory action" as defined by Executive Order (E.O.) 12866 (Regulatory Planning and Review) because this rule will impose costs exceeding \$100 million annually. The E.O. requires that agencies promulgating economically significant rules provide an assessment of feasible alternatives to their respective rulemaking actions. In addition, the E.O. requires that an explanation of why the final rule, which is significant, is preferable to the identified potential alternatives. We identified and considered three alternatives to the final rule.

Alternative One—The Status Quo

This alternative would maintain the 2,000-foot separation above FL 290 and would avoid the equipment and testing requirements of this rule, which impose a cost of \$869.2 million (\$764.9 million, discounted) from 2002 to 2016 on the aviation industry and the FAA. But maintaining the status quo also means that aviation industry would not receive any of the cost-savings afforded by DRVSM. As mentioned earlier, the cost-savings afforded by this rule are estimated to be \$5.3 billion (\$3.0 billion, discounted) in fuel savings over the same period. Since the foregone cost-savings of the alternative greatly exceed the avoided costs, we reject this alternative in favor of the final rule.

Alternative Two—Implement Domestic RVSM Without the Equipment and Testing Requirements

This alternative would allow RVSM between FL 290 and FL 410 without requiring aircraft system engineering to 14 CFR part 91, appendix G. This alternative would allow the aviation industry to receive the estimated \$5.3 billion (\$3.0 billion, discounted) in fuel

savings while the aviation industry and the FAA avoid RVSM costs of \$869.2 million (\$764.9 million, discounted). Unfortunately, this is not a viable alternative due to safety considerations.

Studies by the FAA and European civil aviation authorities have shown that many aircraft that have not been calibrated to RVSM standards exhibit altitude-keeping errors that exceed the standards established for RVSM safety. In these studies, non-RVSM calibrated aircraft were observed with errors of up to 700 feet. Under RVSM aircraft are allowed to operate with only 1,000 feet vertical separation. If non-RVSM calibrated aircraft were allowed to operate with only 1,000 feet vertical separation, there could be a 400-foot altitude overlap in altitude-keeping errors for two non-RVSM calibrated aircraft operating in close proximity to each other. Thus, there is an increased risk of midair collisions if non-RVSM calibrated aircraft are allowed to operate under RVSM. Since there are some aviation safety concerns with this alternative, this alternative is also rejected in favor of the final rule.

Alternative Three—Delay Implementation of the RVSM by Seven or Eight Years

This alternative would delay implementation of the rule by seven or eight years. This would allow the costs to be spread over a longer period of time so that costs in any one-year would be below \$100 million. This would make the rule no longer economically significant under E.O. 12866. The cost of this alternative would still be the same as the cost of the final rule, although the discounted costs would be lower than the discounted costs of the final rule. However, if implementation of the rule were delayed by seven or eight years, the estimated cost-savings would be reduced by \$2.0 billion or \$2.4 billion, respectively (\$1.5 billion, discounted or \$1.8 billion, discounted, respectively). This is a considerable amount of cost-savings to forego in order for the FAA to avoid issuing an economically significant rule. For this reason, this alternative is rejected in favor of the final rule.

Regulatory Flexibility Analysis

The Regulatory Flexibility Act of 1980 establishes as a principle of regulatory issuance that agencies shall endeavor, consistent with the objective of the rule and applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulation. To achieve that principle, the Act requires agencies to solicit and

consider flexible regulatory proposals and to explain the rationale for their actions. The Act covers a wide-range of small entities including small businesses, not-for-profit organizations, and small governmental jurisdictions.

Agencies must perform a review to determine whether a proposed or final rule will have a significant economic impact on a substantial number of small entities. If the determination is that it will, the agency must prepare a regulatory flexibility analysis (RFA) as described in the Act.

However, if an agency determines that a proposed or final rule is not expected to have a significant economic impact on a substantial number of small entities, section 605(b) of the 1980 Act provides that the head of the agency may so certify and an RFA is not required. The certification must include a statement providing the factual basis for this determination, and the reasoning should be clear.

Findings of the Regulatory Flexibility Analysis

Operators of large transport aircraft meeting the Small Business Administration (SBA) small entity criteria were identified in the 6-day traffic sample of ETMS data and appear in Table 2 of the Regulatory Impact Analysis. Revenue information for the small entity operators was obtained from the *Air Carrier Financial Statistics Quarterly*, *Dun and Bradstreet Million Dollar Directory*, *J&P Airline Fleets International*, and the *Department of Transportation Bureau of Transportation Statistics Office of Airline Information Web Site*.

Operators of small commercial or general aviation aircraft are typically operated under either 14 CFR part 91 or 14 CFR part 135. This study focuses on part 135 operators. Since they utilize their aircraft as their primary means of revenue generation through offering non-scheduled charter flights, they are more prone to being impacted by this rule. The FAA estimates that 380 operators with less than 1,500 employees operate 2,780 turbojet aircraft on part 135 generating \$7.0 billion in charter revenue per annum. As of December 2002, 422 of these aircraft are RVSM approved leaving 2,358 non-approved aircraft. The FAA estimates the cost to upgrade the non-approved airframes is \$211.4 million. In addition, the FAA estimates that these operators will incur approximately \$74.1 million, or \$195,000 per operator, in lost revenue associated with the downtime necessary to upgrade these airframes for RVSM operations. Based on these estimates, the FAA has

determined that this group of approximately 380 operators is significantly impacted by this rule.

The following reviews some of the factors associated with the costs of upgrading part 135 aircraft that the FAA considered in the Regulatory Flexibility Analysis (RFA):

- Table 1 of the Regulatory Impact Analysis (RIA) provides projected costs associated with upgrading individual aircraft types. The FAA recognizes that the costs may change. In some cases, the FAA has seen costs decrease as more upgrade options become available. The FAA also recognizes, however, that in the period before the RVSM implementation date competition for upgrade facilities may lead to an increase in costs. Therefore, the FAA concludes that this cost may vary and can only be estimated.

- For the purposes of estimating costs associated with upgrading part 135 aircraft to RVSM standards, the FAA used the conservative assumption in RIA Tables 2 and 3 that all operators will incur upgrade costs during the 15-year cost analysis period, 2002–2016. The FAA recognizes that some operators of high upgrade cost aircraft may elect to fly below flight level 290 for an indefinite period of time. The FAA conducted a study entitled “An Examination of Range and Fuel-Burn Penalties Associated with Operating Business Jet Type Aircraft Beneath Proposed U.S. Domestic Reduced Vertical Separation Minimum (DRVSM) Airspace”. The study is available in the rulemaking docket. The study provides costs for flight operation below 290 for such aircraft. The FAA concluded that the costs associated with flight below flight level 290 are less than that for upgrade. The FAA, therefore, believed that assuming all aircraft would incur upgrade costs was a conservative approach.

- RIA Table 5 provides an estimate of revenue lost to part 135 operators when their aircraft are in service centers undergoing RVSM upgrade. For the purpose of developing this table, the FAA assumed an average aircraft downtime of two weeks. The FAA recognizes that actual downtime can vary in individual situations, however, we believe two weeks to be a reasonable assumption for average downtime. These costs can be mitigated if upgrades occur during other scheduled maintenance.

- In the RFA Affordability Analysis, the FAA recognizes that the 380 part 135 operators will fund upgrade costs from company sources, lenders or through the issuance of equity capital.

- Although in January 2005 approximately 90 per cent of flights in domestic U.S. RVSM airspace are projected to be conducted by RVSM-compliant aircraft, approximately 10 percent of flights that now operate above FL 290 are projected to operate below that level. The FAA recognizes that some operators may not complete RVSM engineering work and FAA Flight Standards office processing by the RVSM implementation date. Such operators retain the option to fly below FL 290 until they receive RVSM authority. FAA flight simulations have shown that the approximate 10 percent increase in traffic below FL 290 can be accommodated without degrading safety.

- The FAA examined the fuel consumption penalties and range limitations associated with flight below FL 290. The study entitled “An Examination of Range and Fuel-Burn Penalties Associated with Operating Business Jet Type Aircraft Beneath Proposed U.S. Domestic Reduced Vertical Separation Minimum (DRVSM) Initial Simulation” is available for review in the docket. Using data from the FAA Enhanced Traffic Management System, the study examined the actual leg lengths and city-pairs that part 135 aircraft fly. The study concluded that part 135 aircraft would incur a fuel consumption penalty of approximately 7.15 percent. The penalty imposes an average annual cost of \$1,147 per airframe or \$3.1 million for the part 135 aircraft population that has not already been upgraded. In addition the study concluded that approximately 92 percent of flights would not require a fuel stop when flown beneath FL 290. The study can be found in the public docket at <http://dms.dot.gov> and searching docket number 12261.

- In the past 7 years of RVSM operations, maintenance costs have not been a significant factor in comparison to initial aircraft approval costs. RVSM required systems are already standard for most aircraft and maintenance is already a requirement for them. The FAA recognizes that RVSM requires additional maintenance measures for some aircraft. However, they have not been factored here because they have not been factors in previous RVSM implementations.

- In the “Costs” section of the “Discussion of Comments”, the FAA states that the residual value of aircraft was not a primary consideration in this rulemaking. The FAA believes that compliance with RVSM standards will actually increase the residual value of some aircraft. The FAA recognizes that aircraft that are not upgraded will

decrease in residual value, however, RVSM is a global program that has been implemented in a large portion of global airspace and operators must plan accordingly.

The analysis of the operators of large transport aircraft shows that of the 22 potential small entity operators identified in the traffic sample, none were determined to have upgrade costs resulting in their being significantly impacted by this rule. However, 380 Part 135 operators are significantly impacted by this rule. Therefore, the FAA has determined that this rule will impact a substantial number of small entities.

Regulatory Flexibility Analysis

Under section 603(b) of the RFA (as amended), each regulatory flexibility analysis is required to address the following points: (1) Reasons why the FAA is considering the rule, (2) the objectives and legal basis for the rule, (3) the kind and number of small entities to which the rule would apply, (4) the projected reporting, record-keeping, and other compliance requirements of the rule, and (5) all Federal rules that may duplicate, overlap, or conflict with the rule.

Reasons Why the FAA Is Implementing This Rule

This rulemaking action will increase the number of available flight levels, enhance airspace capacity, and permit operators to fly more fuel and time efficient tracks and altitudes. The rule will also enhance air traffic controller flexibility by increasing the number of available flight levels, while maintaining an equivalent level of safety.

The Objectives and Legal Basis for the Rule

The objective of this rule is to enhance operational efficiency and air traffic flexibility. Specifically, this rule aims to create flexibility and resultant benefits for operators and air traffic providers. The legal basis for this rule is found in 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, and articles 12 and 29 of the Convention on International Civil Aviation (61 stat. 1180).

The Kind and Number of Small Entities to Which the Rule Will Apply

This rule applies to 70 scheduled airlines operating large transport aircraft under Part 121 of which 22 are small

operators with 1,500 or fewer employees. In addition, this rule also applies to 380 operators operating under Part 135 with all considered to be small entities. The FAA estimates that 1,900 corporations also operate non-approved turbojet aircraft under Part 91 that will be upgraded for this rule. These aircraft are primarily used for private non-revenue transportation and were considered in the Benefit/Cost analysis.

The Projected Reporting, Recordkeeping, and Other Compliance Requirements of the Rule

Information collection requirements in the final rule have been previously approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) and have been assigned OMB Control Number: 2120-0679.

The following paperwork costs would be imposed on aircraft operators:

Section 14 CFR part 91, Section 91.180 would require aircraft operators seeking operational approval to conduct RVSM operations within the 48 contiguous States of the United States (U.S.), Alaska, the portion of the Gulf of Mexico where the FAA provides air traffic services, the Miami-San Juan corridor and the San Juan flight information region (FIR), to submit their application to their CHDO. This submission by the estimated 2,275 respondents would require each organization to spend 30 hours on the paperwork at a cost of approximately \$950 for each operator.

All Federal Rules That May Duplicate, Overlap, or Conflict With the Rule

We are unaware of any Federal rules that duplicate, overlap, or conflict with the rule.

Other Considerations:

Affordability Analysis¹

For the purpose of this analysis, the degree to which small entities can afford the cost of compliance is based on the availability of financial resources. Initial

¹ Small entity operators have the following options. They may elect to:

- Modify their aircraft to RVSM standards,
- Operate at and below FL 280 for a period of time until they either modify their aircraft or purchase RVSM compliant aircraft,
- Operate at and below FL 280 indefinitely.

In past RVSM implementation programs, some operators have modified their aircraft despite the costs involved. They have taken this decision because they do not wish to operate with a restriction. Instead, they wish to have access to all flight levels up to FL 410 in order to retain all available options to avoid weather, to be accommodated in prevailing traffic flows and to operate at the most fuel efficient FL's and on preferred routes.

upgrade costs can be funded from company funds, lenders, or through the issuance of equity capital. These compliance costs can be accommodated by accepting reduced profits, increasing ticket prices or charter rates, or through other cost-savings measures to offset costs.

The cost of compliance for the 380 impacted small entity operators is \$211.4 million, or \$556,000.00 per small entity for upgrade costs and \$74.1 million in downtime costs. Small entity operators are expected to enjoy smaller benefits than large transport operators due to their disproportionate cost-benefit ratio of upgrade costs to forecasted benefits. FAA analysis has determined that the average operator will realize a 1.86% fuel saving. However, part 135 operators electing not to upgrade or delay their aircraft upgrade plans would incur on average a 7.15 percent fuel penalty from conducting operations beneath FL290. Although we recognize these upgrade costs have a significant impact on these operators, the operational penalties associated with not upgrading or delaying aircraft upgrade plans do not prevent the operators from continuing to operate.

Disproportionality Analysis²

On average, the 380 small entities will be disadvantaged relative to operators of large transport aircraft due to disproportionate cost impacts. Operators of large transport aircraft enjoy greater revenues than the small entities and typically operate larger fleets. Due to their fleet sizes, large transport aircraft operators enjoy more flexibility to rotate their fleet through the RVSM approval process without a disruption in service while many of the small entities operate only one aircraft. Further, operators of large transport aircraft enjoy having their own maintenance facilities.

² The FAA examined alternatives for operators that do not elect to modify their aircraft to RVSM standards and reached the conclusions discussed below:

Allowing Un-approved Aircraft to Operate Unconditionally in RVSM Airspace. The FAA concluded that it would not be feasible or safe to allow large numbers of un-approved aircraft to operate in RVSM airspace with RVSM approved aircraft. A mix of approved and un-approved aircraft increases ATC complexity, controller work load and the potential for error.

Delaying DRVSM Implementation. It is in the best interest of the majority of the operators and to the overall enhancement of NAS operations to proceed with DRVSM implementation in January 2005. Each year that implementation is delayed will result in the loss of \$394 million dollars in operator benefits and delay enhancements to NAS operations.

Competitiveness Analysis

The 380 small-entity operators do not compete with large transport operators but could experience significant costs through upgrading their aircraft for RVSM operations. However, FAA analysis has shown that aircraft operated under part 135 experience on average a 7.15% reduction in fuel efficiency if they were operated beneath the RVSM stratum. Further, FAA RVSM readiness projections for the January 2005 DRVSM implementation timeframe indicate that the aircraft generating approximately 90% of the operations in the NAS will be approved for RVSM operations. The estimated annual increase in fuel-burn for the projected 10% of non-approved NAS traffic would result in \$103.7 million in total fuel penalties for these operators based on \$18.2 billion in annual fuel consumption for all operations.

Description of Alternatives

We have considered a number of alternatives to the rule. We find that this rule achieves the desired airspace enhancements and delivers the maximum benefits to operators and air traffic providers while maintaining system safety.

The following alternatives to the rule have been considered:

- Status Quo
- Not enforce the rule for small entities
- Delay the rule
- Phased RVSM implementation

Alternative One—Status Quo

This alternative would maintain the current 2,000-foot vertical separation minimum above FL290 thereby avoiding the \$869.2 million (\$764.9 million, discounted) in costs between 2002 and 2004 for the aviation industry and the FAA. However, maintaining the status quo does not provide the desired airspace enhancements for operators and air traffic providers. As noted earlier, the cost savings and NAS operational enhancements are estimated to be \$5.3 billion (\$3.0 billion, discounted) over the 15-year period. Under this alternative, the foregone cost-savings would be more than seven times the cost of this rule. Therefore, we reject this alternative in favor of the rule.

Alternative Two—Not Enforce the Rule for Small Entities

This alternative would permit small operators to operate in RVSM airspace without upgrading their aircraft for such operations. Under this scenario, small operators would avoid \$285.5 million (\$211.4 million in upgrade costs and

\$74.1 in downtime costs) or \$751,316.00 per operator. However, this would compromise safety as it would result in some 2,400 non-approved aircraft operating in the RVSM stratum. Therefore, the FAA rejects this alternative in favor of the rule.

Alternative Three—Phased Implementation of RVSM

This alternative would involve the implementation of RVSM for a smaller altitude band such as FL330–370 with eventual expansion to the full RVSM envelope of FL290–410. Although this alternative would create some flexibility for small operators to continue operating near their desired flight levels and delaying their implementation plans, airspace complexity would be increased. The simulations conducted at the FAA Technical Center showed that when RVSM was applied in any altitude band other than FL 290–410, system safety and airspace management were negatively impacted. Controller workload, potential for controller error and operational complexity all increased. Therefore, we reject this alternative in favor of the rule. The “Final Report for Domestic Reduced Vertical Separation Minimum (DRVSM) Initial Simulation” is in the docket and can be accessed at <http://dms.dot.gov> and searching for docket number 12261.

Alternative Four—The Final Rule

This alternative represents the Final Rule. Under this alternative, airspace users and air traffic providers will receive \$5.3 billion (\$3.0 billion, discounted) in cost-savings for the years 2005 to 2016. These benefits will be realized through the investment of \$869.2 million (\$764.9 million discounted) in costs associated with this rule. We estimate that the costs for 380 small entities would be \$211.4 million, or \$556,000.00 on average. This alternative is preferred, as we believe it provides the best balance of costs and benefits for airspace users and air traffic providers without a reduction in aviation safety.

International Trade Impact Statement

The Trade Agreement Act of 1979 prohibits Federal agencies from engaging in any standards or related activities that create unnecessary obstacles to the foreign commerce of the United States. Legitimate domestic objectives, such as safety, are not considered unnecessary obstacles. The statute also requires consideration of international standards and where appropriate, that they be the basis for U.S. standards. We have assessed the potential effect of this rulemaking and

have determined that it will impose the same costs on domestic and international entities and thus it has a neutral trade impact.

Federalism

We have analyzed this final rule under the principles and criteria of Executive Order 13132, Federalism. We have determined that this action will not have a substantial direct effect on the States, or the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government. Therefore, we determined that this final rule does not have federalism implications.

Paperwork Reduction Act of 1995

Information collection requirements in the final rule have been previously approved by the Office of Management and Budget (OMB) under the provisions of the Paperwork Reduction Act of 1995 (44 U.S.C. 3507(d)) and have been assigned OMB control number 2120–0679. This final rule adds the OMB control number to the table of OMB control numbers in 14 CFR 11.201(b).

Unfunded Mandates Reform Act of 1995 Assessment

The Unfunded Mandates Reform Act of 1995 (the Act), enacted as Public Law 104–4 on March 22, 1995, is intended, among other things, to curb the practice of imposing unfunded Federal mandates on State, local, and tribal governments.

Title II of the Act requires each Federal agency to prepare a written statement assessing the effects of any Federal mandate in a proposed or final agency rule that may result in a \$100 million or more expenditure (adjusted annually for inflation) in any one year by State, local, and tribal governments in the aggregate, or by the private sector; such as a mandate is deemed to be a “significant regulatory action.”

This rule does not contain such a mandate. Therefore, the requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

International Civil Aviation Organization and Joint Aviation Regulations

In keeping with U.S. obligations under the Convention on ICAO, it is FAA policy to comply with ICAO Standards and Recommended Practices (SARP) to maximum extent practicable. The operator and aircraft approval process was developed jointly by the FAA and the JAA under the auspices of NATSPG. We have determined that this amendment does not present any difference.

Environmental Analysis

FAA Order 1050.1D defines FAA actions that may be categorically excluded from preparation of a National Environmental Policy Act (NEPA) environmental assessment or environmental impact statement. In accordance with FAA Order 1050.1D, appendix 4, paragraph 4(j), regulations, standards, and exemptions (excluding those, which if implemented may cause a significant impact on the human environment) qualify for a categorical exclusion. We believe that this rule qualifies for a categorical exclusion because no significant impacts to the environment are expected to result from its finalization or implementation.

Energy Impact

We have assessed the energy impact of this rule in accordance with the Energy Policy and Conservation Act (EPCA) and Pub. L. 94–163, as amended (42 U.S.C. 6362). We have determined that this rule is not a major regulatory action under the provisions of the EPCA.

Executive Order 13211—Energy Supply, Distribution, or Use

Executive Order 13211 requires agencies to submit a Statement of Energy Effects to the Administrator of the Office of Information and Regulatory Affairs (OIRA), Office of Management and Budget, for matters identified as significant energy actions. A significant energy action is an action that (1) is significant under Executive Order 12866 and is likely to have a significant adverse effect on the supply, distribution, or use of energy or (2) is designated by the administrator of the Administrator of OIRA as a significant energy action. We are not required to submit a Statement of Energy Effects for this proposed rule because we do not expect this rule to have a significant adverse effect on the supply, distribution, or use of energy and the Administrator of OIRA has not identified it as a significant energy action.

List of Subjects

14 CFR Part 11

Administrative practice and procedure, Reporting and recordkeeping requirements.

14 CFR Part 91

Air-traffic control, Aircraft, Airmen, Airports, Aviation safety, Reporting and recordkeeping requirements.

The Amendment

■ For the reasons discussed in the preamble, the Federal Aviation Administration amends parts 11 and 91 of Title 14 of the Code of Federal Regulations (14 CFR parts 11 and 91) as follows:

PART 11—GENERAL RULEMAKING PROCEDURES

■ 1. The authority citation for part 11 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40101, 40103, 40105, 40109, 40113, 44110, 44502, 44701–44702, 44711, and 46102.

Subpart B—Paperwork Reduction Act Control Numbers

■ 2. Amend the table in § 11.201(b) by revising the entry for part 91 to read as follows:

§ 11.201 Office of Management and Budget (OMB) control numbers assigned under the Paperwork Reduction Act.

14 CFR part or section identified and described	Current OMB control No.
Part 91	2120–0005, 2120–0026, 2120–0027, 2120–0573, 2120–0606, 2120–0620, 2120–0631, 2120–0651, 2120–0679

PART 91—GENERAL OPERATING AND FLIGHT RULES

■ 3. The authority citation for part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 1155, 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46504, 46506–46507, 47122, 47508, 47528–47531, articles 12 and

29 of the Convention on International Civil Aviation (61 stat. 1180).

Subpart B—Flight Rules

■ 4. Amend §91.159 by revising paragraph (b) to read as follows and by removing paragraph (c):

§ 91.159 VFR cruising altitude or flight level.

(b) When operating above 18,000 feet MSL, maintain the altitude or flight level assigned by ATC.

■ 5. Amend §91.179 by revising paragraph (b)(3) introductory text and adding a new paragraph (b)(4) to read as follows:

§ 91.179 IFR cruising altitude or flight level.

(3) When operating at flight level 290 and above in non-RVSM airspace, and—

(4) When operating at flight level 290 and above in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace and—

(i) On a magnetic course of zero degrees through 179 degrees, any odd flight level, at 2,000-foot intervals beginning at and including flight level 290 (such as flight level 290, 310, 330, 350, 370, 390, 410); or

(ii) On a magnetic course of 180 degrees through 359 degrees, any even flight level, at 2000-foot intervals beginning at and including flight level 300 (such as 300, 320, 340, 360, 380, 400).

■ 6. Add § 91.180 to subpart B to read as follows:

§ 91.180 Operations within airspace designated as Reduced Vertical Separation Minimum airspace.

(a) Except as provided in paragraph (b) of this section, no person may operate a civil aircraft in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace unless:

(1) The operator and the operator's aircraft comply with the minimum

standards of appendix G of this part; and

(2) The operator is authorized by the Administrator or the country of registry to conduct such operations.

(b) The Administrator may authorize a deviation from the requirements of this section.

■ 7. In Appendix G, amend section 5 by revising the introductory text; redesignating paragraph (2) as paragraph (a) and by revising newly redesignated (a); and amend section 8 by adding new paragraphs (d), (e), and (f) to read as follows:

Appendix G to Part 91—Operations in Reduced Vertical Separation Minimum (RVSM) Airspace

Section 5. Deviation Authority Approval

The Administrator may authorize an aircraft operator to deviate from the requirements of § 91.180 or § 91.706 for a specific flight in RVSM airspace if that operator has not been approved in accordance with Section 3 of this appendix if:

(a) The operator submits a request in a time and manner acceptable to the Administrator; and

Section 8. Airspace Designation

(d) *RVSM in the United States.* RVSM may be applied in the airspace of the 48 contiguous states, District of Columbia, and Alaska, including that airspace overlying the waters within 12 nautical miles of the coast.

(e) *RVSM in the Gulf of Mexico.* RVSM may be applied in the Gulf of Mexico in the following areas: Gulf of Mexico High Offshore Airspace, Houston Oceanic ICAO FIR and Miami Oceanic ICAO FIR.

(f) *RVSM in Atlantic High Offshore Airspace and the San Juan FIR.* RVSM may be applied in Atlantic High Offshore Airspace and in the San Juan ICAO FIR.

Issued in Washington, DC, on October 22, 2003.

Marion Blakey,
Administrator.

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