DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 91

[Docket No. FAA–1999–5925; Amdt. No. 91–261]

RIN 2120–AG82

Reduced Vertical Separation Minimum (RVSM)

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the airspace where Reduced Vertical Separation Minimum (RVSM) may be applied to include Pacific oceanic airspace. RVSM is the reduction of the vertical separation of aircraft from 2,000 feet to 1,000 feet at flight levels (FLs) between FL 290 (29,000 feet) and FL 410 (41,000 feet). RVSM is applied only between aircraft that meet stringent altimeter and autopilot performance requirements. RVSM is currently applied only in North Atlantic (NAT) Minimum Navigation Performance Specifications (MNPS) airspace. The introduction of RVSM in Pacific oceanic airspace will make more fuel and time efficient flight levels and tracks available to operators. RVSM will also enhance airspace capacity in the Pacific. In North Atlantic airspace, RVSM has been shown to maintain in acceptable level of safety since March 1997.

EFFECTIVE DATE: February 24, 2000.

FOR FURTHER INFORMATION CONTACT: Roy Grimes, Flight Technologies and Procedures Division, Flight Standards Service, AFS–400, Federal Aviation Administration, 600 Independence Avenue, SW., Washington, DC 20591, telephone (202) 267–3734.

SUPPLEMENTARY INFORMATION:

Availability of Final Rules

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Background

This final rule is based on Notice of Proposed Rulemaking (NPRM) No. 99–15 published in the **Federal Register** on July 8, 1999 (64 FR 37018) as amended by correction that was published in the **Federal Register** on July 28, 1999 (64 FR 40791). That proposed rule proposed to amend 14 CFR Part 91 Appendix G, Operations within Airspace Designated as Reduced Vertical Separation Minimum (RVSM) Airspace.

A final rule is published in the **Federal Register** at least 30 days before the effective date unless it is determined that good cause exists to provide an effective date that is less than 30 days after publication. This final rule will be effective less than 30 days after publication to meet the implementation date agreed to by the International Civil Aviation Organization (ICAO) Pacific RVSM Implementation Task Force. The Flight Information Regions (FIRs) and aircraft associated with specific oceanic airspace have planned to implement RVSM in the Pacific on the effective date.

Statement of the Problem

Air traffic on Pacific routes between the U.S. and Asia has increased steadily in the past few years and is projected to continue to increase. The North Pacific Track System (NOPAC) is the densest oceanic traffic area in the Pacific. Between 1994 and 1998, the annual traffic count on the NOPAC increased from 42,305 to 60,772 flights which represents an increase of 44 percent. The FAA Aviation Forecast for Fiscal Years 1998–2010 estimates that transpacific passenger traffic will continue to increase at the rate of 6.6 percent per year through 2010. Studies conducted by independent aviation industry analysts forecast the Pacific area to be the fastest growing area for flights to and from the United States.

Unless action is taken, as traffic increases, the opportunity for aircraft to fly at fuel-efficient altitudes and tracks will be significantly diminished. In addition, air traffic service providers may not be able to accommodate greater numbers of aircraft in the airspace without invoking restrictions that can result in traffic delays and fuel penalties.

RVSM alleviates the limitation on air traffic management at high altitudes imposed by the conventional 2,000-foot vertical separation standard. Increasing the number of FLs available in the Pacific region is projected to achieve operator benefits similar to those achieved in the NAT (*i.e.,* mitigation of fuel penalties attributed to the inability to fly optimum altitudes and tracks). In the Pacific, the FAA plans to initially implement RVSM between FL 290 and FL 390 (inclusive). At this time, traffic density above FL 390 does not warrant implementing RVSM at FL 400 and FL 410.

History

The International Civil Aviation Organization (ICAO) Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG) develops and provides oversight for plans and policy related to air navigation in the Pacific and Asia. The APANPIRG established the Asia Pacific RVSM Task Force to develop and implement RVSM policy and programs in the Region. The Task Force is using the policy and criteria developed in other ICAO forums to build the RVSM program for the Pacific. The following paragraphs review the RVSM program development in U.S. and ICAO forums.

Rising traffic volume and fuel costs, which made flight at fuel-efficient altitudes a priority for operators, sparked an interest in the early 1970s in implementing RVSM above FL 290. In April 1973, the Air Transport Association of America (ATA) petitioned the FAA for a rule change to reduce the vertical separation minimum to 1,000 feet for aircraft operating above FL 290. The petition was denied in 1977 in part because (1) aircraft altimeters had not been improved sufficiently, (2) improved maintenance and operational standards had not been developed, and (3) altitude correction was not available in all aircraft. In addition, the cost of modifying nonconforming aircraft was prohibitive. The FAA concluded that granting the ATA petition at that time would have adversely affected safety. Nevertheless, the FAA recognized the potential benefits of RVSM under certain circumstances and continued to review technological developments, committing extensive resources to studying aircraft altitude-keeping performance and necessary criteria for safely reducing vertical separation above FL 290. Data showing that RVSM

implementation is technically and economically feasible has been published in studies conducted cooperatively in international forums, as well as separately by the FAA.

Because of the high standard of performance and equipment required for RVSM, the FAA advocated initial introduction of RVSM in oceanic airspace where special navigation performance standards were already required. Special navigation areas require high levels of long-range navigation precision due to the separation standard applied. RVSM implementation in such airspace requires an increased level of precision demanded of operators, aircraft, and vertical navigation systems.

On March 27, 1997, RVSM was implemented in one such special navigation area of operation established in the ICAO NAT Region, the NAT MNPS. In designated NAT MNPS airspace, tracks are spaced 60 nautical miles (NM) apart. Between FLs 310 and 390 (inclusive), aircraft are separated vertically by 1000 feet. All aircraft operating in this airspace must be appropriately equipped and capable of meeting required lateral navigation performance standards of part 91, section 91.705 and vertical navigation performance standards of part 91, section 91.706. Operators must follow procedures that ensure the navigation standards are met. Flight crews must also be trained on RVSM policy and procedures. Each operator, aircraft, and navigation system combination must receive and maintain authorization to operate in the NAT MNPS. The North Atlantic Systems Planning Group (NATSPG) Central Monitoring Agency monitors NAT aircraft fleet performance to ensure that a safe operating environment is maintained.

FAA data indicate that the altitude-keeping performance of most aircraft flying in oceanic airspace can meet the standards for RVSM operations. The FAA and ICAO research to determine the feasibility of implementing RVSM included the following four efforts:

1. FAA Vertical Studies Program. This program began in mid-1981, with the objectives of collecting and analyzing data on aircraft performance in maintaining assigned altitude, developing program requirements to reduce vertical separation, and providing technical and operational representation on the various working groups studying the issue outside the FAA.

2. RTCA Special Committee (SC)–150. RTCA, Inc., (formerly Radio Technical Commission for Aeronautics) is an industry organization in Washington, DC, that addresses aviation technical requirements and concepts and produces recommended standards. When the FAA hosted a public meeting in early 1982 on vertical separation, it was recommended that RTCA be the forum for development of minimum system performance standards for RVSM. RTCA SC–150 was formed in March 1982 to develop minimum system performance requirements, identify required improvements to aircraft equipment and changes to operational procedures, and assess the impact of the requirements on the aviation community. SC–150 served as the focal point for the study and development of RVSM criteria and programs in the United States from 1982 to 1987, including analysis of the results of the FAA Vertical Studies Program.

3. ICAO Review of the General Concept of Separation Panel (RGCSP). In 1987, the FAA concentrated its resources for the development of RVSM programs in the ICAO RGCSP. The U.S. delegation to the ICAO RGCSP used the material developed by SC–150 as the foundation for U.S. positions and plans on RVSM criteria and programs. The panel's major conclusions were:

- RVSM is technically feasible without imposing unreasonably demanding technical requirements on the equipment.
- RVSM provides significant benefits in terms of economy and en route airspace capacity.
- Implementation of RVSM on either a regional or global basis requires sound operational judgment supported by an assessment of system performance based on: aircraft altitude-keeping capability, operational considerations, system performance monitoring, and risk assessment.

4. NATSPG and the NATSPG Vertical Separation Implementation Group (VSIG).

The NATSPG Task Force was established in 1988 to identify the requirements to be met by the future NAT Region air traffic services system; to design the framework for the NAT airspace system concept; and to prepare a general plan for the phased introduction of the elements of the concept. The objective of this effort was to permit significant increases in airspace capacity and improvements in flight economy. At the meeting of the NATSPG in June 1991, all of the NAT air traffic service provider States, as well as the International Air Transport Association (IATA) and International Federation of Airline Pilots Association (IFALPA), endorsed the Future NAT Air Traffic Services System Concept Description developed by the NATSPG Task Force. With regard to the implementation of RVSM, the Concept Description concludes that priority must be given to implementation of this measure as it is believed to be achievable within the early part of the concept time frame. The NATSPG's initial goal was to implement RVSM between 1996 and 1997. To meet this goal, the NATSPG established the VSIG in June 1991 to take the necessary actions to implement RVSM in the NAT. These actions included:

- Developing programs and documents to approve aircraft and operators for conducting flight in the RVSM environment and to address all issues related to aircraft airworthiness, maintenance, and operations. The group has produced guidance material for aircraft and operator approval that ICAO has distributed to civil aviation authorities and NAT users. Also, ICAO has planned that the guidance material be incorporated in the approval process established by the States.
- Developing the system for monitoring aircraft altitude-keeping performance. This system is used to observe aircraft performance in the vertical plane to determine that the approval process is uniformly effective and that the RVSM airspace system is safe.
- Evaluating and developing ATC procedures for RVSM, conducting simulation studies to assess the effect of RVSM on ATC, and developing documents to address ATC issues.

The ICAO Limited NAT Regional Air Navigation Meeting held in Portugal in November 1992 endorsed the NATSPG RVSM implementation program. At that meeting, it was concluded that RVSM implementation should be pursued. The FAA concurred with the conclusions of the NATSPG on RVSM implementation.

Reference Material

The FAA and other organizations developing RVSM requirements have produced a number of studies and reports. The FAA used the following documents in the development of this amendment:

- Summary Report of United States Studies on 1,000-Foot Vertical Separation Above Flight Level 290 (FAA, July 1988).
- Initial Report on Minimum System Performance Standards for 1,000-Foot Vertical Separation Above Flight Level 290 (RTCA SC–150, November 1984); the report provides information on the methodology for evaluating safety, factors influencing vertical separation, and strawman system performance standards.
- Minimum System Performance Standards for 1,000-Foot Vertical Separation Above Flight Level 290 (Draft 7, RTCA, August 1990); the FAA concurred with the material developed by RTCA SC–150.

• The Report of RGCSP/6 (ICAO, Montreal, 28 November–15 December 1988) published in two volumes. Volume 1 summarizes the major conclusions reached by the panel and the individual States. Volume 2 presents the complete RVSM study reports of the individual States:

• European Studies of Vertical Separation Above FL 290—Summary Report (prepared by the EUROCONTROL Vertical Studies Subgroup).

• Summary Report of United States Studies on 1,000-Foot Vertical Separation Above Flight Level 290 (prepared by the FAA Technical Center and ARINC Research Corporation).

• The Japanese Study on Vertical Separation.

• The Report of the Canadian Mode C Data Collection.

• The Results of Studies on the Reduction of Vertical Separation Intervals for USSR Aircraft at Altitudes Above 8,100 m (prepared by the USSR).

• Report of RGCSP/7 (Montreal, 30 October–20 November 1990) containing a draft Manual on Implementation of a 300 M (1,000 Ft) Vertical Separation Minimum (VSM) Between FL 290 and 410 Inclusive, approved by the ICAO Air Navigation Commission in February 1991 and published as ICAO Document 9574.

• 14 CFR Part 91 Section 91.706—Operations Within Airspace Designed As Reduced Vertical Separation Minimum Airspace

• 14 CFR Part 91 Appendix G—Operations in Reduced Vertical Separation Minimum (RVSM) Airspace.

• Flight Standards Handbook Bulletin for Air Transportation (HBAT) and General Aviation (HBGA) ''Approval of Aircraft and Operators for Flight in Airspace Above Flight Level 290 Where a 1,000 Foot Vertical Separation Minimum is Applied'' (HBAT 99–11A and HBGA 99–17A).

• Interim Guidance Material 91–RVSM, ''Approval of Aircraft and Operators for Flight in Airspace Above FL 290 Where a 1,000 Foot Vertical Separation is Applied'', Change 1 (June 30, 1999). The interim guidance continues to provide recommended procedural steps for obtaining FAA approval.

• AC No. 91–70, ''Oceanic Operations'' (September 6, 1994).

• NATSPG Airspace Monitoring Sub-group Vertical Monitoring Report. (Issued quarterly)

Related Activity

Project increases in Pacific oceanic air traffic and the successful implementation of RVSM operations in the NAT support the implementation of RVSM in the Pacific. Pacific operators and Air Traffic Service (ATS) providers have requested that RVSM be pursued aggressively.

The ICAO Asia Pacific RVSM Implementation Task Force is the international body that is developing Pacific RVSM implementation plans. The Task Force is chaired by an FAA representative from the Air Traffic International Staff and supported by an ICAO representative from the Asia/Pacific Regional Office. The Task Force has three standing sub-groups: The Air Traffic Operations Group, the Aircraft Operations and Airworthiness Group and the Safety and Monitoring Group. The working groups are chaired by FAA air traffic and flight standards specialists. The Task Force includes representatives from Asia and Pacific civil aviation authorities, operators and the pilot and air traffic controller associations. The Task Force meets at approximately quarterly intervals to develop policy and procedure documents and to progress implementation tasks.

Discussion of Comments

The FAA received comments on the proposed rule from the following 6 organizations:

(1) The Air Traffic Control Association (ATCA)

(2) United Airlines (UAL)

(3) The Department of Defense (DOD)

(4) The National Business Aviation Association, Inc. (NBAA)

(5) The Hagadone Corporation

(6) The Independent Pilots Association (IPA)

Detailed Discussion of Comments and Disposition

ATCA Comments. ATCA states that it concurs with the proposed rule to implement RVSM in Pacific oceanic airspace. ATCA also states that RVSM will improve Air Traffic Management (ATM) and accommodate traffic growth in the Pacific.

UAL Comments. United Airlines (UAL) commented that it has no technical objections to this NPRM. UAL already has approval to operate four major aircraft types in RVSM airspace and anticipates no difficulties in obtaining RVSM approval for three other aircraft types prior to the February 24, 2000 implementation date. UAL supports the initial requirement for operators to monitor the altitude-keeping performance of two aircraft per fleet type, however it objects to the potential for a long term monitoring requirement.

FAA Response. Since the initial implementation of RVSM in March 1997, operator monitoring requirements have been systematically reduced as aircraft altitude-keeping performance data has been accumulated. FAA specialists are currently working with the airlines on the ICAO Asia Pacific RVSM Implementation Task Force to develop a post-implementation aircraft monitoring program that will accumulate enough data and information to show that RVSM operations remain safe. UAL is represented on that group and the FAA will continue to seek UAL's input and consider its arguments.

DOD Comments. DOD concurs, in principal, with the NPRM. It requests, however, that the FAA acknowledge and specific wording agreed to in recent meetings on the procedure for handling aircraft that are not RVSM compliant.

FAA Response. The FAA is adopting the wording on this issue that DOD cited in its comment. The FAA and the other Pacific Air Traffic Service Providers are adopting the following policy: ''Aircraft that are not RVSM compliant (*e.g.,* State aircraft, ferry and maintenance flights) will only be cleared to operate between FL 290 and 390 (inclusive) after coordination with the first and notification given to subsequent oceanic centers. Notification constitutes approval.''

NBAA Comments. First, the NBAA states that RVSM is currently implemented only between FLs 310–390 (inclusive) in the North Atlantic (NAT) and in portions of Canadian airspace. (Note: Canada only applies RVSM in designated transition airspace where aircraft transition between conventional and reduced vertical separation). NBAA requests that Pacific RVSM altitudes be made consistent with RVSM altitudes in the NAT and Canada. Second, NBAA states that general aviation aircraft manufacturers will not be able to publish approved RVSM Service Bulletins (SBs) for certain aircraft types by the February 24, 2000 implementation date. NBAA states that efforts must be made to accommodate such aircraft on a case by case basis for a designated period of time to allow manufacturers enough time to publish SBs.

FAA Response. (1) Consistency of RVSM Implementation. 14 CFR 91, Appendix G, Section 1 defines RVSM airspace as airspace between FL 290–FL 410 (inclusive) where 1,000-foot vertical separation is applied. Air Traffic Service Providers (ATSP) have elected to implement RVSM in phases. In October 1998, the NAT ATSP implemented RVSM between FL 310–FL 390 (inclusive). The planned initial implementation of Pacific RVSM will be FL 290–FL 390 (inclusive). The Pacific ATSP have published these FLs in NOTAMS and Aeronautical Information Publications. The FAA has provided adequate information to the operators and does not consider the applying RVSM to different FL stratum in the NAT and Pacific as a significant safety or training issue.

(2) Accommodation of Unapproved Aircraft in Pacific RVSM Airspace.

NBAA states that aircraft manufacturer engineering packages may not be available for the February 24, 2000 implementation for 1,000 business jet airframes. The FAA has the following comments:

(a) Prior Notification. The FAA believes it has given the operator community adequate time to prepare for Pacific RVSM implementation and has made extensive efforts to keep it informed on the progress of implementation plans. In January 1998, the ICAO Pacific RVSM Implementation Task Force identified February 2000 as the target date for Pacific RVSM implementation. Since that time, FAA representatives have briefed the target Pacific implementation date at user forums such as the NBAA International Operations Conference and the Pacific Oceanic Working Group. In February 1999, the FAA published an International NOTAM announcing the RVSM implementation target date of February 2000 for Oakland and Anchorage Oceanic airspace. Also, RVSM has been implemented for the past two and a half years in North Atlantic airspace. It was implemented there between FL 330–FL 370 (inclusive) in March 1997 and expanded to FL 310–FL 390 (inclusive) in October 1998. The operators and aircraft manufacturers have been well informed of the planned expansion of RVSM to other airspace.

(b) Non-group Approval Option. Operators have the option of having their aircraft approved as a non-group aircraft if an aircraft manufacturer does not develop a group approval process. Although this is a more expensive process, certain operators have used it successfully to gain RVSM approval for their aircraft. This option is available to the business aviation community.

(c) Number of Airframes Affected. NBAA states that 1,000 business jet airframes could be non-compliant on the 24 February 2000 Pacific RVSM implementation date. The FAA estimate is that 700 airframes could be affected, but this figure represents all airframes in the fleet. Not all of these airframes actually conduct operations in Pacific oceanic airspace.

(d) Percentage of Flights Affected. The majority of operators that will be prepared for RVSM implementation should not be denied the benefits of RVSM because a small percentage of operators are not yet prepared. One percent (1.0%) of flights in Pacific oceanic airspace are conducted by business aviation. Airworthiness documents (*e.g.,* Aircraft Service Changes, Service Bulletins) that detail the requirements for RVSM aircraft approval are available for the majority of aircraft types including the major business jet types. The percentage of flights conducted by aircraft for which RVSM airworthiness documents are not forecast to be available by February 2000 is 0.16 per cent. This situation will not affect 99.84 percent of flights.

(e) Accommodation of Unapproved Aircraft: Effect on Controller Workload. RVSM has been implemented as exclusionary airspace. That is, aircraft operating in RVSM designated areas at designated FLs are normally required to be RVSM approved. The flight of unapproved aircraft is only allowed on an infrequent basis, if the operator coordinates the operation with ATC prior to the flight and ATC can accommodate them in accordance with CFR Part 91, Appendix G, Section 5. By standardizing RVSM approval in a given airspace, air traffic controllers can apply one aircraft separation standard to the vast majority of aircraft operating in that airspace.

Note: Pacific ATSP have made provisions for infrequent flight of non-compliant aircraft such as State aircraft and maintenance and humanitarian flights.

If, on a *regular* basis, controllers are required to apply 1,000-foot vertical separation to certain aircraft and 2,000-foot vertical separation to others, the operation of the airspace becomes more complex and there is a negative effect on air traffic management and on controller workload. Additionally, service to RVSM-approved aircraft would be significantly diminished if unapproved aircraft were accommodated in RVSM airspace on other than rare occasions, such as those stated above. It should be noted that the application of RVSM in the North Atlantic is also exclusionary and the same provisions for limited accommodation of unapproved aircraft are applied.

(f) Concluding Comment. For the reasons cited above, the FAA has determined that in RVSM airspace it will accommodate only the infrequent flight of unapproved aircraft for maintenance, humanitarian and State aircraft flights.

The Hagadone Corporation Comments. The Hagadone Corporation states that the FAA has not approved an aircraft modification kit to enable Gulfstream II (GII) aircraft to comply with the requirements for RVSM. The Hagadone Corporation requests one of three options for RVSM implementation on the Hawaii routes. One option would be to limit the upper RVSM altitude to FL 370 on all or some of the routes from the West Coast of the U.S. to Hawaii. The second option would be to delay the implementation on these routes. The third option would be that Oakland Oceanic, with prior notice, would provide 2,000-foot separation for non-RVSM aircraft for these routes.

FAA Response. First, Hagadone states that the FAA has not approved an RVSM aircraft modification kit for the GII aircraft. The FAA has approved aircraft engineering packages for aircraft for which it has received adequate justifying data. The FAA has approved Aircraft Service Change (ASC) 499 (effective September 27, 1999) for a group of 20 GII aircraft equipped with the Honeywell SPZ–800 autopilot. Also, ASC 498 that addresses a group of 184 GII aircraft equipped with the Honeywell SP–50 autopilot is expected to be released in the 1st quarter of 2000. In addition, ASC 505 that addresses a group of 11 GIIB aircraft equipped with the Honeywell SPZ–800 autopilot and ASC 504 that addresses a group of 31 GIIB equipped with the Honeywell SP–50 autopilot is expected to be released in the 2nd quarter of 2000.

Second, Hagadone suggests three options for RVSM implementation on the Hawaii routes.

Option 1: Limit the ceiling of RVSM airspace to FL 370. This option has not been accepted. The planned ceiling is FL 390. The small percentage of flights affected (0.16%) does not warrant limiting the RVSM ceiling for the large majority of aircraft that will be compliant.

Option 2: Delay RVSM implementation on the West Coast to Hawaii routes. This option has not been accepted. The vast majority of operators and aircraft will be ready for RVSM on 24 February 2000. These operators should not be denied the benefits of RVSM because a small minority will not be ready.

Option 3: Following prior notification from the operator, Oakland Oceanic to provide conventional 2,000-foot vertical separation to non-compliant aircraft. This option has not been accepted. As noted in the response to the NBAA comments, this option affects airspace complexity and controller workload and negatively impacts service to approved users.

IPA Comments. IPA believes that Traffic Alert and Collision Avoidance System (TCAS) must be required equipment for the introduction of RVSM into Pacific oceanic airspace.

Note: RVSM has been implemented since March 1997 in North Atlantic oceanic airspace. IPA does *not* recommend that Section 91.706 and Appendix G be revised to require aircraft operating in NAT RVSM airspace to equip with TCAS.

IPA believes that the introduction of RVSM into Pacific oceanic airspace will increase the probability of accidents occurring and that TCAS will provide a safety net.

FAA Response. (1) Part 91 Aircraft Equipage Requirements for RVSM Approval. Part 91 Section 91.706 and Appendix G do not require TCAS equipage for aircraft approval for RVSM operations. 1,000-foot vertical separation has been applied up to flight level 290 since the early 1960s without special aircraft equipage or performance requirements. RVSM programs enable the use of 1,000-foot vertical separation between FL 290–410 (inclusive). Section 91.706 and Appendix G require that for an aircraft to be approved for RVSM operations, the aircraft altimetry systems, automatic altitude-keeping devices and altitude alerters must meet stringent performance requirements and also be equipped with a transponder. Aircraft equipage and performance requirements were developed in the ICAO Review of the General Concept of Separation Panel (RGCSP) and published in ICAO Document 9574 in 1992. Section 91.706 and Appendix G reflect the ICAO requirements.

(2) North Atlantic RVSM Experience. RVSM has been applied successfully since March 1997 in North Atlantic oceanic airspace. NAT airspace has the highest traffic density of any oceanic airspace in the world. Between 900 to 1100 flights are conducted each day in the RVSM airspace of the North Atlantic. By contrast, the busiest route system in the Pacific is the North Pacific Route System (NOPAC) where approximately 175 flights are conducted each day. In addition, approximately 440 flights operate per day in the entire Pacific.

(3) Applicability of IPA Comments to TCAS Rulemaking. The FAA believes that the IPA comments relate more specifically to the benefits of TCAS as a safety net in general operations and are more applicable to the rulemaking related specifically to TCAS equipage requirements. The FAA does not believe that the IPA recommendation for TCAS equipage related specifically to the expansion of 1,000-foot vertical separation above FL 290. IPA cited several incidents where TCAS could have or did contribute to the prevention of an accident. None of these incidents occurred in airspace where RVSM is applied and many of them occurred below FL 290.

(4) Current Projects Related to TCAS Equipage Requirements. There are efforts under way in the United States to revise the existing regulations related to TCAS equipage. Also, ICAO has now published Standards and Recommended Practices (SARPS) addressing TCAS equipage. The status of these efforts is as follows:

(a) Revision of Regulations Related to TCAS Equipage. In response to the IPA petition for rulemaking, the FAA is developing an NPRM. The FAA believes that the IPA comments are more applicable to this effort than to RVSM rulemaking.

(b) ICAO Annex 6 (Operation of Aircraft): Part I (International Commercial Air Transport Aeroplanes) and Part II (International General Aviation Aeroplanes). ICAO has published standards intended to expand equipage with collision avoidance systems and transponders. In November 1998, Annex 6 Part 1 was amended to state that by January 1, 2003, aircraft in excess of 15,000 kg (33,000 pounds) takeoff weight or authorized to carry more than 30 passengers shall be equipped with an airborne collision avoidance system (ACAS II) and by January 1, 2005, aircraft in excess of 5,700 kg (12,500 pounds) take off weight or authorized to carry more than 19 passengers shall be equipped with ACAS II. In addition, Annex 6 Part II paragraph 6.13 now states that by January 1, 2003, unless exempted by appropriate authorities, all aeroplanes shall be equipped with a pressure-altitude reporting transponder that operates in accordance with Annex 10, Volume IV. A note also states that this provision is intended to support the effectiveness of ACAS.

Summary of Specific IPA Issues

(1) Non-concur Due to Unacceptable Risk. IPA states that it has no objection, in principal, to the concept of reducing vertical separation if safety is not compromised. IPA, however, opposes this rule because the FAA does not mandate that all transport category aircraft operating in RVSM airspace must be equipped with an operational Traffic Alert and Collision Avoidance System (TCAS). Without a TCAS requirement, IPA believes that RVSM poses unacceptable risks to safety.

(2) Applicability of Collision Risk Modeling to Operational Safety. IPA questions the FAA statement that ''all factors have been assessed'' in developing the safety goals for RVSM. They question the FAA statement that the Target Level of Safety of 5 accidents in 1 billion flight hours leads to a theoretical calendar year interval between accidents in RVSM airspace of 322 years.

(3) Need for Safety Net. IPA argues that RVSM will lead to higher density traffic in airspace where it is applied and that will increase the risk of collision. IPA believes that TCAS is required to provide a safety net.

(4) Pilot Error; Mis-setting Altimeters. IPA states that mis-set altimeters in an RVSM environment will pose a threat to safety. They are particularly concerned about aircraft operating to and from Russian and Chinese airspace where metric altitudes are used and operating from Alaska and Canada where extremely low altimeter settings can be encountered.

(5) Review of TCAS Saves. IPA cites a number of incidents or accidents both below and above FL 290 where TCAS could have or did contribute to the prevention of a collision.

FAA Response to IPA Issues

(1) Unacceptable Risk Posed by RVSM Implementation Without TCAS. RVSM has been applied successfully in the NAT for 2.5 years. 1,000-foot vertical separation has been applied below FL 290 in both oceanic and continental airspace for approximately 35 years. TCAS has not been specifically required for the application of 1,000 foot-vertical separation in these environments. Instead, TCAS equipage is required by operational rules in part 121, 125, 129, and 135.

Although TCAS is not specifically required for RVSM aircraft approval, a large percent of oceanic operations are already conducted by aircraft that are TCAS equipped. Because 14 CFR parts 121, 125, 129, and 135 require TCAS equipage of airplanes with passenger seat configurations of up to 30 seats, approximately 90 percent of flights in Pacific Oceanic airspace are conducted by TCAS equipped aircraft.

The United States was the first State to require TCAS equipage. The FAA recognizes the benefits to operational safety provided by TCAS, however it does not believe that the requirement for TCAS equipage is related to the RVSM standard. TCAS equipage requirements are, therefore, published in separate regulations.

The primary threat to safety in the vertical plane both prior to and after RVSM implementation has been from human errors such as the pilot failing to level at the assigned FL. (These are referred to hereafter as operational errors). These types of errors can occur in airspace where 2,000-foot vertical separation is applied as well as those where a 1,000-foot vertical separation is applied. Recognizing the TCAS safety benefit when such errors occur, as noted previously, ICAO has already published SARPs to expand TCAS equipage and the FAA published rules requiring TCAS equipage. Also, as noted, the FAA

is developing an NPRM in response to the IPA petition for additional rulemaking related to TCAS equipage requirements.

Operational errors are also being addressed by RVSM implementation groups. Airspace monitoring organizations have been established in both the North Atlantic and the Pacific. (in the Pacific, the organization is the Asia/Pacific Approvals Registry and Monitoring Organization (APARMO). One of the stated responsibilities of the monitoring organizations is to track operational errors, analyze their effect on risk in the airspace and to administer the effort to ensure operator compliance with RVSM requirements. The APARMO will track civil aviation authority investigation of operational errors and coordinate measures to mitigate the occurrence.

The safety of RVSM is based on standardized aircraft equipage and performance and pilot and controller procedures related to altitude keeping. Monitoring of the altitude-keeping performance of RVSM approved aircraft in the NAT has shown that aircraft maintain FL better than that required for airspace system safety. The ICAO Altimetry System Error (ASE) requirements are for mean ASE not to exceed 80 feet and the mean plus 3 standard deviations of ASE not to exceed 245 feet. The mean ASE observed in the NAT aircraft population is −4 feet and the mean plus 3 standard deviations observed is 150 feet.

(2) Applicability of Collision Risk Modeling (CRM) to Operational Safety. CRM is an ICAO recognized tool that is used to analyze traffic density, aircraft altitude-keeping and human errors. It is used to establish aircraft performance requirements as well as to establish limits on the frequency of large errors. It provides a statistical probability of an accident occurring. The Target Level of Safety (TLS) established for RVSM is a theoretical 2.5 equipment related fatal accidents in a billion flight hours. The NAT Central Monitoring Agency (CMA) and the Asia/Pacific Approvals Registration and Monitoring Organization (APARMO) are tasked with collecting and investigating all errors beyond established limits in RVSM airspace. Both aircraft and human errors observed and reported are evaluated against this TLS.

Both ICAO and the FAA consider CRM to be only a tool to be used to evaluate safety and not a substitute for operational and engineering judgment. Because of this, the NAT CMA and APARMO investigate altitude-keeping errors that exceed established values individually to determine their cause and recommend measures to mitigate future errors. The FAA and the other civil aviation authorities have established operational procedures and policy to mitigate the occurrence of errors that can threaten safety.

(3) Need for a Safety Net Due to Increases in Traffic Density. As noted previously, a large percentage of U.S. aircraft are already required to be TCAS equipped by the existing regulations and ICAO has published SARPs that are intended to standardize and increase the effectiveness of TCAS operation in international airspace.

(4) Pilot Error: Mis-Setting Altimeters. Setting of altimeters to 29.92 when passing the transition altitude and re-checking for proper setting when reaching the initial cleared FL is identified as a special emphasis item for pilot training for RVSM operations. The FAA will re-emphasize the importance of properly following altimeter setting procedures for operations in all RVSM airspace. The FAA will emphasize this to FAA Flight Standards Offices as well in the ICAO Pacific RVSM Implementation Task Force that is providing guidance to the international community on RVSM policy and procedures. In regard to low altimeter settings, aircraft have operated for the past 2.5 years from Canada where low altimeter settings are encountered into NAT RVSM airspace.

(5) Review of TCAS Saves. The FAA recognizes the safety net that TCAS provides. The FAA agrees that TCAS plays a major role in limiting the probability of collision in the incidents cited in Attachment A of the IPA comments. However, none of these incidents occurred in RVSM airspace and most of them occurred below FL 290. The FAA believes this supports its position that TCAS equipage should be related to the existing operational regulations requiring TCAS and not to the regulations governing RVSM operations.

After considering the comments submitted in response to the final rule, the FAA determined that no further rulemaking is necessary.

Paperwork Reduction Act

The reporting and recordkeeping requirements associated with this rule remain the same as under current rules and have previously been 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 2120–0026. There are no new requirements for information collection associated with this amendment.

International Compatibility

In keeping with U.S. obligations under the Convention on International Civil Aviation, it is FAA policy to comply with International Civil Aviation Organization (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. The FAA has determined that this amendment does not present any differences.

Regulatory Evaluation Summary

Changes to Federal regulations must undergo several economic analyses. First, Executive Order 12866 directs that each Federal agency shall propose or adopt a regulation only upon a reasoned determination that the benefits of the intended regulation justify its costs. Second, the Regulatory Flexibility Act of 1980 requires agencies to analyze the economic effect of regulatory changes on small entities. Third, OMB directs agencies to assess the effect of regulatory changes on international trade. And fourth, the Unfunded Mandates Reform Act of 1995 (Pub. L. 104–4) requires agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by private sector, or $100 million or more annually (adjusted for inflation).

In conducting these analyses, the FAA has determined that this rule is not ''a significant regulatory action'' under section 3(f) of Executive Order 12866 and, therefore, is not subject to review by the Office of Management and Budget. The rule is not considered significant under the regulatory policies and procedures of the Department of Transportation (44 FR 11034, February 26, 1979). This rule will not have a significant economic impact on a substantial number of small entities and will not constitute a barrier to international trade.

This final rule amends 14 CFR 91, Appendix G. Section 8 (Airspace Designation) by adding the appropriate Pacific oceanic Flight Information Regions (FIRs) where RVSM would be implemented. The benefits of this amendment are that, for Pacific oceanic operations, it will (1) increase the number of available flight levels, (2) enhance airspace capacity, (3) permit operators to operate more fuel/time efficient tracks and altitudes, and (4) enhance air traffic controller flexibility

by increasing the number of available flight levels, while maintaining an equivalent level of safety.

The FAA estimates that this final rule will cost U.S. operators $21.7 million for the ten-year period 2000–2009 or $19.5 million, discounted. Estimated benefits, based on fuel savings for the commercial airplane fleet over the years 2000–2009, would be $120 million, or $83.8 million, discounted. Therefore, based on a quantitative and qualitative evaluation of this action, the proposed rule would be cost-beneficial.

Final Regulatory Flexibility Determination

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 of applicable statutes, to fit regulatory and informational requirements to the scale of the business, organizations, and governmental jurisdictions subject to regulations.'' 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 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.

A review of the Pacific traffic data shows that no small entities operate in Pacific oceanic airspace where this rule applies. The FAA has also examined the impact of this rulemaking on small commercial operators of business jet aircraft and found that such operators are all computer or air taxi operators that do not operate in Pacific oceanic airspace. This information was obtained from the FAA database of U.S. registered aircraft and operators.

The FAA has determined that there are reasonable and adequate means to accommodate the transition to RVSM requirements, particularly for general aviation operators (many of whom are small). As of May 1999, 50% of the U.S registered GA airframes that are capable of conducting oceanic operations were approved for RVSM. Operators of such aircraft have already obtained approved in order to operate in the NAT.

The FAA conducted the required review of this final rule and determined that it will not have a significant economic impact on a substantial number of small entities. Accordingly, pursuant to the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Federal Aviation Administration certifies that this final rule will not have a significant impact on a substantial number of small entities.

International Trade Impact Statement

The provisions of this rule would have little or no impact on trade for U.S. firms doing business in foreign countries and foreign firms doing business in the United States.

Executive Order 13132, Federalism

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

Unfunded Mandates Reform Act of 1995 Assessment

Title II of the Unfunded Mandates Reform Act of 1995 (the Act), codified as 2 U.S.C. 1501, 1571, requires each Federal agency, to the extent permitted by law, to prepare a written assessment of the effects of any Federal mandate in a proposed or final agency rule that may result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of $100 million or more (adjusted annually for inflation) in any one year. Section 204(a) of the Act, 2 U.S.C. 1534(a), requires the Federal agency to develop an effective process to permit timely input by elected officers (or their designees) of State, local, and tribal governments on a proposed ''significant intergovernmental mandate.'' A ''significant intergovernmental mandate'' under the Act is any provision in a Federal agency regulation that would impose an enforceable duty upon state, local, and tribal governments, in the aggregate, of $100 million (adjusted annually for inflation) in any one year. Section 203 of the Act, 2 U.S.C. 1533, which supplements section 204(a), provides that before establishing any regulatory requirements that might significantly or uniquely affect small governments, the agency shall have developed a plan that, among other things, provides for notice to potentially affected small governments, if any, and for a meaningful and timely opportunity to provide input in the development of regulatory proposals.

This rule does not contain a Federal intergovernmental and private sector mandate that exceeds $100 million a year, therefore, the requirements of Title II of the Unfunded Mandates Reform Act of 1995 do not apply.

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), this rule qualifies for a categorical exclusion.

Energy Impact

The energy impact of the notice has been assessed in accordance with the Energy Policy and Conservation Act (EPCA) and Pub. L. 94–163, as amended (42 U.S.C. 6362) and FAA Order 1053.1. It has been determined that the final rule is not a major regulatory action under the provisions of the EPCA.

List of Subjects in 14 CFR Part 91

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

The Amendment

In consideration of the foregoing, the Federal Aviation Administration amends part 91 of Title 14 Code of Federal Regulations as follows:

PART 91—GENERAL OPERATING AND FLIGHT RULES

1. The authority citation for Part 91 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40103, 40113, 40120, 44101, 44111, 44701, 44709, 44711, 44712, 44715, 44716, 44717, 44722, 46306, 46315, 46316, 46502, 46504, 46506–46507, 47122, 47508, 47528–47531.

2. Appendix G is amended by revising Section 8 to read as follows:

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

* * * * *

Section 8. Airspace Designation

(a) RVSM in the North Atlantic.

(1) RVSM may be applied in the NAT in the following ICAO Flight Information Regions (FIRs): New York Oceanic, Gander Oceanic, Sondrestrom FIR, Reykjavik Oceanic, Shanwick Oceanic, and Santa Maria Oceanic.

(2) RVSM may be effective in the Minimum Navigation Performance Specification (MNPS) airspace within the NAT. The MNPS airspace within the NAT is defined by the volume of airspace between FL 285 and FL 420 (inclusive) extending between latitude 27 degrees north and the North Pole, bounded in the east by the eastern boundaries of control areas Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik Oceanic and in the west by the western boundaries of control areas Reykjavik Oceanic, Gander Oceanic, and New York Oceanic, excluding the areas west of 60 degrees west and south of 38 degrees 30 minutes north.

(b) RVSM in the Pacific.

(1) RVSM may be applied in the Pacific in the following ICAO Flight Information Regions (FIRs): Anchorage Arctic, Anchorage Continental, Anchorage Oceanic, Auckland Oceanic, Brisbane, Edmonton, Honiara, Los Angeles, Melbourne, Nadi, Naha, Nauru, New Zealand, Oakland, Oakland Oceanic, Port Moresby, Seattle, Tahiti, Tokyo, Ujung Pandang and Vancouver.

Issued in Washington, DC, on February 1, 2000.

Jane F. Garvey,

Administrator.

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