INTERNATIONAL CIVIL AVIATION ORGANIZATION

EIGHTH MEETING OF CIVIL AVIATION AUTHORITIES OF THE SAM REGION
(RAAC/8)

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Agenda Item 4: Regional Air Navigation Plan – Transition to the CNS/ATM Systems

An Overview of U.S. Domestic RVSM Implementation

(Presented by the United States of America)

SUMMARY

This paper presents an overview of the U.S. Domestic RVSM implementation. The United States, Canada, Mexico and the CAR/SAM Regions are planning to implement RVSM on 20 January 2005.

1.0 INTRODUCTION

1.1 Reduced Vertical Separation Minimum (RVSM) is an ICAO-approved concept that enables the reduction of the vertical separation standard from 2,000 feet to 1,000 feet between FL290 and FL410 (inclusive). RVSM adds six flight levels between FL290 and FL410, thereby increasing airspace throughput and allowing more flexibility for controllers to grant user preferred altitudes.

1.2 RVSM has been implemented in the North Atlantic and Pacific oceanic airspace, and was implemented in domestic European airspace in January 2002. Domestic RVSM (DRVSM) is a high priority for the FAA's Operational Evolution Plan (OEP). DRVSM is paragraph ER-4 in NAS OEP with the Principle Office of Delivery (POD) being the Director of Flight Standards Service AFS-1.

2.0 DISCUSSION

2.1 DRVSM will be implemented from FL290 through FL410 in the airspace of the Continental United States (CONUS), Alaska, the portion of the Gulf of Mexico where the FAA provides air traffic services, the San Juan FIR, and the airspace between Florida and the San Juan FIR.

2.2 The United States, Canada and Mexico are planning a joint implementation of RVSM with a proposed implementation date of January 20, 2005.

Rule Schedule

- May 10, 2002 NPRM publication
- August 8, 2002 Formal comment period closed
- June 2003 Publication of final rule

2.3 When implemented, RVSM approval is required for operation in the designated airspace, with limited exceptions. The Administrator or the appropriate foreign authority must approve operator aircraft to operate in DRVSM airspace. Monitoring of aircraft altimetry, autopilot and altitude alert systems is conducted to confirm that the performance standards are being met.

2.4 In-service aircraft altitude keeping performance is observed to confirm that standards are being met. Ground and airborne monitoring systems are used independently to monitor aircraft performance. RVSM policy and procedures are incorporated into controller, pilot and dispatch programs as well as the revision of Air Traffic systems and programs.

2.5 A safety analysis is performed based on the accepted Collision Risk Modeling (CRM) practices. The Reich CRM for the vertical plane will be used to evaluate and quantify the operational and technical collision risks.

2.6 RVSM adds six flight levels between FL290 and FL410, thereby increasing airspace throughput and allowing more flexibility for controllers to grant user preferred altitudes, mitigate conflict points, reduce the potential for error and reduce vectoring. Fuel savings and operating efficiency benefits for 2005 – 2019 are approximately $5 billion with a 6:1 benefit/cost ratio. The savings in the first year are estimated to be $359 million with an annual increase of 2.0%.

2.7 The following table lists the operator costs for aircraft approval. Major operators started RVSM work in 2002.

	COST (Millions)
Large Transport Aircraft	$206
Small Commercial/GA	$530
Small commercial/GA Downtime if work not accomplished during scheduled Mx	$74
TCAS II, Version 7.0 Upgrade	$46
Monitoring	$4
TOTAL	$860

2.8 Approximately 4,000 aircraft generating 30% of the airspace operations are already RVSM approved. The project requires that 90% of the flights be conducted by RVSM approved aircraft by the January 2005 timeframe. Most new airframes are delivered RVSM ready. In addition, there are aircraft engineering packages as well as non-group/unique airframe processing available for most aircraft. Unapproved aircraft have the option to operate at FL280 and below, which would result in a fuel burn penalty, but relatively short duration flights, or climb through RVSM flight levels to operate at FL 430 and above. Unapproved Lifeguard and DoD aircraft will be accommodated.

2.9 The Air Transport Association reports that airline and air cargo operators maintain consistent support for the January 2005 implementation as does the National Business Aviation Association which advocates that their members should prepare for the implementation. While DoD transport and tanker aircraft are already RVSM compliant, we are working with the Regional Airline Association to clarify individual operator plans.

2.10 The North American Approvals Registry and Monitoring Organization (NAARMO) has been established at the FAA Technical Center. The NAARMO is responsible for conducting the safety assessment and monitoring tasks. The ground based monitoring system, or the Aircraft Geometric Height Measurement Element (AGHME), is currently under development. Deployment to three field sites is expected in 2003. The portable airborne GPS-based monitoring system is already operational.

2.11 The FAA has plans to conduct informational seminars for the operators. The dates are as follows:

- June 2003 Kansas City
- September 9 – 10 2003 Seattle
- 2 in 2004 TBA

Information may also be found on the FAA RVSM Website: www.faa.gov.ats/ato/rvsm1.htm. The RVSM documentation page contains operator and aircraft approval material.

2.12 A Memorandum of Understanding was signed between FAA and DoD in December 2001. The agreement governs the use of DRVSM Airspace by DoD aircraft. The policy states that the FAA will accommodate non-compliant DoD aircraft operation within DRVSM airspace.

2.13 Major Milestones

Milestone	Date
Kick-Off Meeting	Sep-00
User Meetings	Feb-01
User Meetings	May-01
ATC First Simulation	Oct-01
DoD MOU	Dec-01
First DRVSM Seminar	Apr-02
Publish NPRM	May-02
Second ATC Simulation	Jun-02
Second DRVSM Seminar	Sep-02
Mexico Coordination Meeting	Nov-02
Canada Coordination Meeting	Jan-03
Third ATC Simulation	Jun-03
Publish Final Rule	Jun-03
Safety Assessment	Jul-04
Operational Readiness Assessment (Go/Delay)	Sep-04
RVSM Implementation	Jan-05

2.14 The first HITL simulation was completed in October 2001. The purpose of this simulation was to identify the impact of DRVSM on en route controller with respect to workload, complexity and potential for error; to compare the impact of DRVSM in three altitude bands: FL350-FL390, FL330-FL390, FL290-FL410; and to identify ATC procedural implications. The simulation of DRVSM from FL290-FL410 yielded superior results.

2.15 The second HITL simulation was completed on June 2002. The focus of this simulation was on Non-DRVSM approved aircraft transitioning through DRVSM airspace, the outage of DRVSM equipment and tactical use of DRVSM. The results of this simulation indicate that for Non-DRVSM approved aircraft (transitioning, DoD, Lifeguard) there is an increase in workload, complexity and potential for error. The third HITL simulation is scheduled for June 2003. This simulation will focus on assessing and validating proposed DRVSM Procedures as well as the assessment of any remaining areas of concern.

2.16 Certified Professional Controllers participated in an ATC procedures workgroup on March 4-6, 2003 to validate procedures in the Third Simulation. The coordination with industry of proposed new or revised procedures will be through the DCP process. The following items could require new procedures to support DRVSM:

- Routine RVSM procedures to manage RVSM airspace.
- Process to climb/descend non-RVSM aircraft through RVSM airspace.
- Accommodation of DoD, State and Lifeguard aircraft.
- Coordination responsibilities, i.e. point outs between sector strata's.
- Contingency Procedures
    - Suspension of RVSM for turbulence
    - Mountain wave
        - A Mountain Wave Activity Workgroup will be convened to assess the need for procedures.
        - A study is being conducted on Mountain Waves to assess its impact on DRVSM.
    - Wake turbulence
    - Weather deviation procedures
- Air Traffic Flow Management procedural needs.
- System Integration

Develop a seamless integration of DRVSM within the NAS and in coordination with other programs such as URET and airspace redesign.

2.17 It will be necessary to coordinate with Mexico, Canada and adjacent U.S. facilities for ATC issues relevant to DRVM implementation. The U.S. is also participating in the Caribbean and South American efforts for possible inclusion of that airspace in simultaneous RVSM implementation. Meetings are planned between bordering facilities to develop agreements associated with the exchange of traffic under an RVSM environment. There are some international matters of mutual concern. These concerns include the preparedness of Mexico, Canada and the United States for a simultaneous implementation, the procedural development for bordering ATC facilities and the consistency of training for RVSM among the three countries.

2.18 The tactical application of DRVSM has been applied in a few other countries prior to full implementation. The second HITL simulation examines the tactical application. The results, however, have been inconclusive. It appears that under peak traffic conditions it becomes difficult to use DRVSM tactically.

2.19 Deliverables

Headquarters

- International Agreements with Mexico, Canada and Caribbean States
- National Procedures, Order Changes and Briefing Guides
- NAS Automation Changes
- Analysis support with Airspace Redesign for sectorization changes
- AFTM Flow Plans for Initial Operations
    - Non-Approved Aircraft biggest liability
    - Flight Planning compression could overload sectors
- Training Plan templates
- National CADRE training instruction
- Facilitation of local coordination to prepare for implementation (workshops, telecons, templates)
- Labor I&I negotiation
- Funding support for simultaneous national training effort
- ***Any other assistance required to keep the program on track!***

Regional

- Revisions to Virtually all En Route LOAs and SOPs
- Local validation that all NAS automation changes thoroughly tested and properly implemented
- Simultaneous DYSIM Training by CADRE of Instructors for over 9,000 controllers
- Local labor I&I on issues not covered by national agreements
- Local coordination with industry within established forums
- ***Leadership to keep the program on track!!***

2.20 Relevant Websites

DRVSM Website

www.tc.faa.gov/act-500/niaab.drvsm/default.asp

RVSM Website:

www.faa.gov/ats/ato/rvsm1.htm

Airspace Redesign Website:

www.faa.gov/ats/nar/index.html

2.21 Although industry forecasts indicate a potential to loss of $6.5+ billion in revenue in 2003 due to current economic conditions, industry support for DRVSM remains strong. The estimated $800 million in operator upgrade costs along with an estimated FAA Investment of $20 million through FY-2005 are forecasted to yield a return on investment of $359 million in Year 1 and $5 billion over the first 15 years.

3.0 CONCLUSION

3.1 The FAA Flight Standards Office is the Principal Office of Delivery (POD) but much of the responsibility for the critical tasks in the last half of 2004 will be under the FAA's air traffic organization. The FAA is committed to the successful DRVSM implementation in the National Airspace System and will continue to work with bordering facilities to resolve any areas of mutual concern.

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