

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.