

Implementation Experience and Plans

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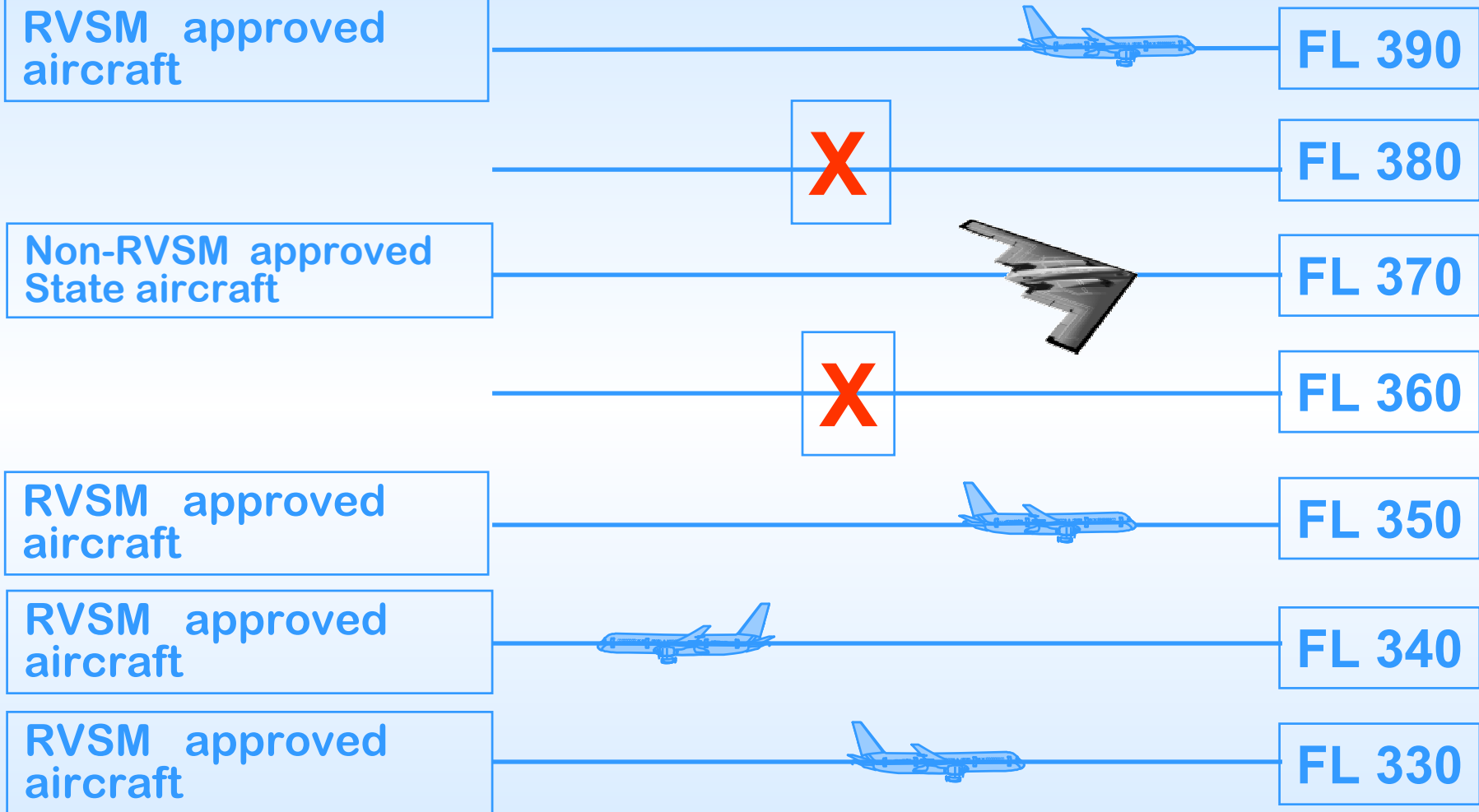
FAA - Air Traffic Services
International Staff

16 June 2003

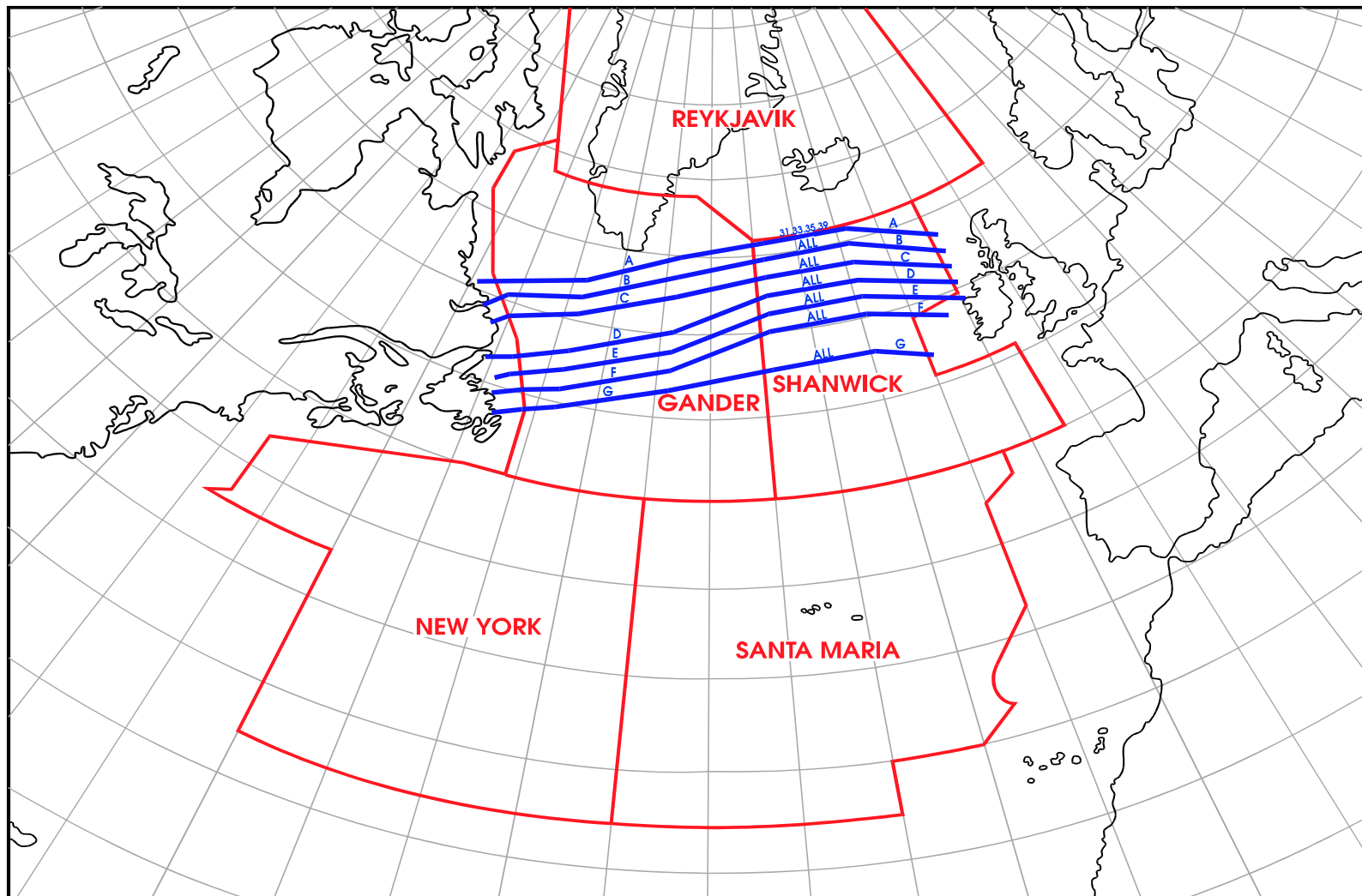
RVSM Airspace

- Aircraft **not** approved for RVSM may **NOT** flight plan at RVSM flight levels unless:
 - Special arrangements made to operate: e.g., state aircraft, humanitarian, delivery, and maintenance flights
 - Special arrangements made for non-approved domestic operations
 - 2000 ft vertical separation applied if both aircraft not RVSM approved

Separation Applied Between Non-RVSM and RVSM Aircraft Within RVSM Airspace



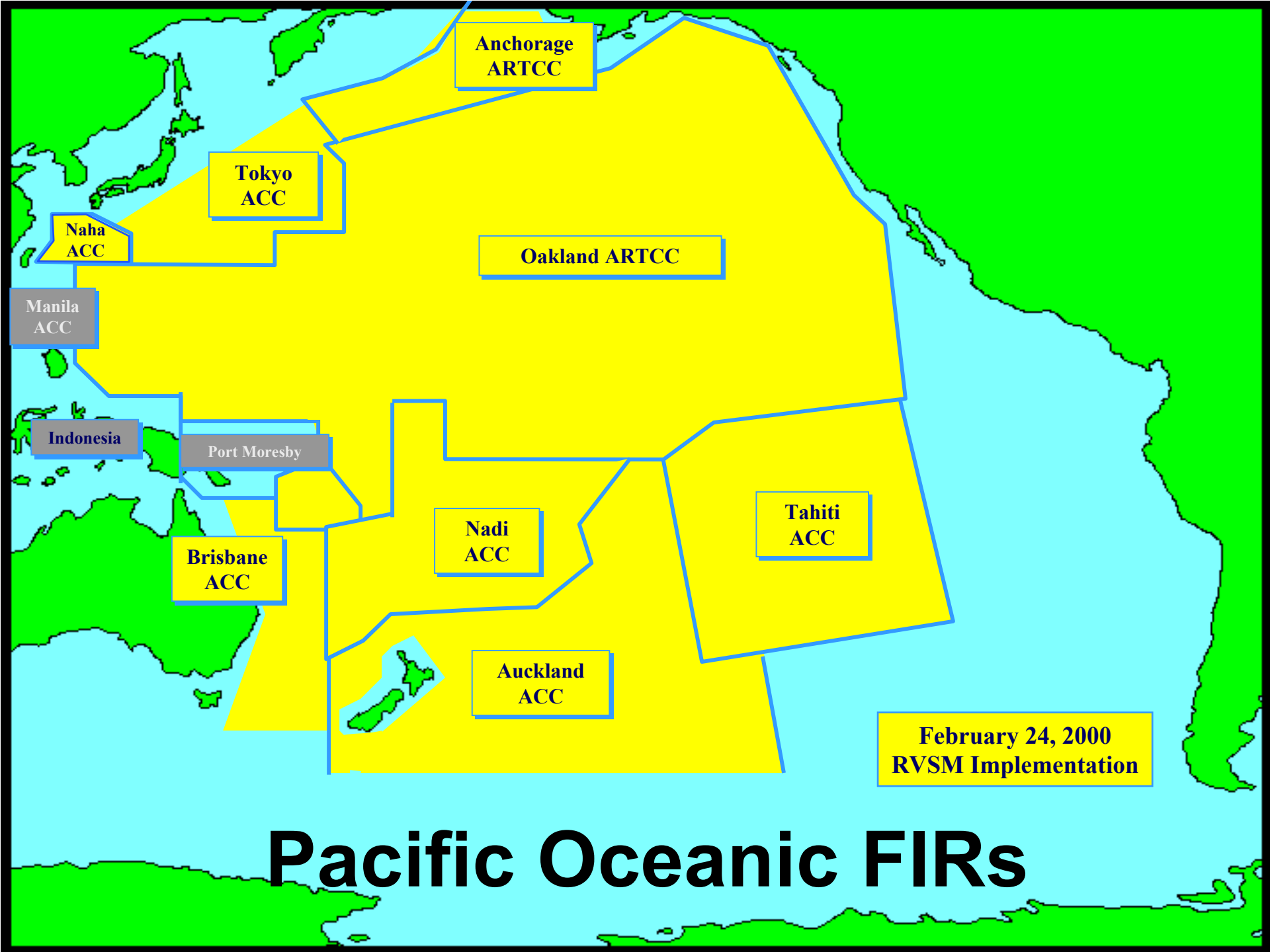
North Atlantic Region - Oceanic FIRs



NAT / WATRS AIRSPACE - SEPARATION MINIMA



- NAT RVSM Implemented FL 330-370 in March 1997
- Expanded to FL 310-390 in October 1998
- Expanded to FL 290-410 in January 2002
- WATRS RVSM “Transition” Implemented in September 2000
- Implemented FL 310-390 in November 2001
- Expanded to FL 290-410 in January 2002



Anchorage
ARTCC

Tokyo
ACC

Naha
ACC

Manila
ACC

Indonesia

Port Moresby

Brisbane
ACC

Nadi
ACC

Auckland
ACC

Oakland ARTCC

Tahiti
ACC

February 24, 2000
RVSM Implementation

Pacific Oceanic FIRs

Pacific FIRs FL 290-390 as of 24 Feb 2000

FIR	Comment
Anchorage Oceanic	Exclusionary
Auckland Oceanic	Exclusionary
Brisbane	Oceanic east of Australia 24 Feb 2000. Remainder of FIR March 2001
Nadi	Exclusionary
Naha	Oceanic (non-exclusive RVSM airspace)
Oakland Oceanic	Exclusionary
Port Moresby	Exclusionary
Tahiti	Exclusionary
Tokyo	Oceanic: exclusionary except certain route segments

* FL 410 is available for non-RVSM approved flights / Tactical Use FL 400-410

RVSM Background

North Atlantic Development Programs

THE NORTH ATLANTIC SYSTEMS PLANNING GROUP (NAT SPG)

MEMBERS

- Canada
- Denmark
- France
- Iceland
- Ireland
- Norway
- Portugal
- United Kingdom
- United States

OBSERVERS

- Russian Federation
- Spain
- IACA
- IAOPA
- IATA
- IBAC
- IFALPA
- IFATCA
- INMARSAT

Secretariat ICAO (Paris)

OPS/AIR Sub-Group

- Developed the global guidance for RVSM approval of aircraft and operators
- Development process consisted of extensive coordination and harmonization
 - JAA
 - FAA
 - Other CAAs
- Material was completed in early 1994
- Widespread dissemination of material

ATC Sub-Group

- ATC Simulations for RVSM/non-RVSM transition areas were performed to facilitate operational implementation
- Simulations were performed by
 - Canada
 - United Kingdom
 - United States
 - France
 - Ireland
- ATC procedural development was effective due to simulation results

Airspace Monitoring Sub-Group

- Technical Development of components of the NAT hybrid monitoring systems
 - Height Monitoring System (HMU)
 - GPS-based Monitoring System (GMU)
- System Verification Criteria Development
- Monitoring Methodology Development
- Implementation Decision Making based on Monitoring results as well as other factors
- Group has now been absorbed into NAT CMA /RSSIG/MIG Sub Groups

Math Sub-Group

- Safety aspects of implementation
- Analytical support to assist in implementation decision-making
- Cost/Benefit analyses
- Collision Risk Analysis

Asia/Pacific RVSM Task Force

- Chairperson: FAA Air Traffic Services International Staff
- Secretariat: ICAO Bangkok
 - ATC Operations Work Group
 - Operations/Airworthiness Work Group
 - Safety and Airspace Monitoring Work Group

Keys to Successful Implementation

- Early formal agreement on implementation date
- Program Publicity
- Implementation Optimization/Flexibility

Publicity Process

- RVSM Seminars
- Extensive coordination with operators at all appropriate forums
- Extensive ICAO SAM & NACC support
- RVSM Web Site maintained on behalf of FAA and CAR/SAM RVSM Task Force
 - <http://www2.faa.gov/ats/ato/car-sam.htm>

NAT RVSM Benefits in 1st Year of Operation

- 2 Major airline studies reported \$4-6 million in cost savings for the first year of implementation (March 27, 1997 - March 27, 1998)
- Major airlines reported cost recovery within 10 months of implementation
- Enhanced flexibility for Air Traffic Management
- Number of OTS tracks reduced
- Increased availability of random tracks

PAC RVSM Benefits in 1st Year of Operation

- Operators achieving cruise fuel burn improvements between 0.5% and 1.0%
- Reduction of crossing traffic complexity
- Reduction in ATC coordination
 - Decreased workload
 - Reduction in delays

EUR RVSM Benefits in 1st Year of Operation

- Capacity of en route Air Traffic Control Centers increased by 14%
- Traffic level decrease of ~ 2%
- En route delays decreased by 40%
- 1-2% reduction in carbon dioxide and nitrous oxide emissions
- An estimated fuel burn savings of 290,000 tons

Operational Issues: NAT, PAC & EUR

- NAT
 - TCAS: Nuisance Traffic Alerts
 - Wake Turbulence: 2 nm offset procedure published
 - Exclusion of Unapproved Operators
- PAC
 - Reports on Large Height Deviations to APARMO
 - Impact of Mountain Wave Activity on Height-Keeping Performance
- EUR
 - Access to RVSM Airspace
 - RVSM Phraseology (most widespread problem is failure of non-approved a/c to state “negative RVSM” on first contact)
 - Flight Planning (in-flight changes of RVSM approval status)

NAARMO Database of Airframe/Operator Approvals

■ US database: FAA Technical Center

– As of April 2003

- 4250 aircraft approved
- 1701 large transport aircraft
- 37 operators
- 2549 small commercial/general aviation

CAR/SAM RVSM Readiness

As of April 2003

Category	Fleet	Airworthiness Approved	To Approve
Commercial	1265	94	1171
IGA	1122	121	1001
Total	2387	215	2172

* U.S. aircraft operating in the CAR/SAM are not reflected in this table as they will upgrade for DRVSM

December 1997 Event

- Crew accepted clearance to FL 360
- Remained at FL 350, reported FL 360
- Crew referred to FL 360 set on altitude alerter
- Estimated risk including event approximate to the TLS
- Operational judgement:
 - Not an RVSM induced event
 - RVSM mitigates risk by adding FLs

July 2002 Midair Collision over Germany



- Problem in conflicting TCAS and radar controller orders, not RVSM related
- Both a/c received TCAS warning at 21:34:42 UTC
- Tupolev TU154 followed ACC Zurich's instructions to descend when TCAS ordered climb
- Boeing B752 followed TCAS order to descend
- Collision occurred at ~ FL 350 at 21:35:32 UTC
- Both aircraft were RVSM compliant and had recently undergone a height keeping performance check

Implementation Dates

- | | |
|---|----------|
| ■ NAT | Mar 1997 |
| ■ PAC | Feb 2000 |
| ■ Tactical application in UK, Ireland, Germany, and Austria | Apr 2001 |
| ■ Australia | Nov 2001 |
| ■ Europe | Jan 2002 |
| ■ Western Pacific/South China Sea | Feb 2002 |
| ■ Northern Canada | Apr 2002 |
| ■ Mid East Region | Nov 2003 |
| ■ Domestic U.S./Southern Canada | Jan 2005 |
| ■ CAR/SAM | Jan 2005 |