

## Pilot RVSM Training Guidance Material

Captain Souhail DALLEL  
IFALPA RVP AFI WEST

## RVSM Pilot Procedures

ICAO requires **states** to establish for flight crews specific:

- **Initial** training programs and
- **Recurrent** training programs.

## What is RVSM Airspace?

RVSM airspace is any airspace or route between FL 290 and FL 410 inclusive where aircraft are separated vertically by 300m (1,000 ft).

## RVSM Airspace benefits

The RVSM airspace provides significant benefits in terms of **economy** and en-route **airspace capacity**.

The reduction of standard vertical separation from 2,000 feet/600 meters to 1,000 feet/300 meters between aircraft being flown at FL290 through FL410 adds six new flight levels:

**FL 300, FL 320, FL 340, FL 360, FL 380 & FL 400.**

## RVSM Aircraft Equipments Required

- 2 independent altitude-measurement systems
  - 1 secondary surveillance radar transponder with an altitude-reporting system that can be connected to the altitude-measurement system in use for altitude-keeping
  - An altitude-alerting system; and
  - An automatic altitude-control system
- MASPS requires that the altimetry systems have a maximum error of 80 feet/25 meters and that the automatic altitude control systems be able to hold altitude within 200 ft/60 m.

## Flight Planning

- In the Flight Plan, file letter "**W**" to show RVSM authority, the letter "**Q**" in case of RPL.
- Verify aircraft is RVSM compliant
- Check forecast and reported weather conditions
- Check MEL requirements
- Check RVSM operating limitations, if applicable

## Pre-flight at the Aircraft

- Review maintenance logs and forms to ensure availability/serviceability of RVSM related equipment
- Check MEL required systems operational
- During external inspection, check **Static Ports** and condition of fuselage around pitot static sources.
- Compare Altimeters to known ground elevation (difference not to exceed specified limits **<75 ft**)
- Before Takeoff ensure RVSM equipment operative

## Procedures Prior to RVSM Airspace Entry

The following equipment should be operating normally:

- Two primary altitude measurement systems
- One automatic altitude-control system
- One altitude-alerting device
- Transponder operating

## Procedures Prior to RVSM Airspace Entry

Should any of this equipment fail prior to the aircraft entering RVSM airspace, the pilot should:

- request a new clearance so as to avoid flight in this airspace." or
- follow established contingency procedures

## Enroute Procedures

- In cruise, it is essential that the aircraft be flown at the Cleared Flight Level (CFL)
- Particular care be taken to ensure that ATC clearances are fully understood and complied with
- Except in the event of an emergency, the aircraft should not intentionally depart from CFL without a clearance from ATC

## Enroute Procedures (cont.)

- Comply with RVSM operation limitations, if applicable
- Fly aircraft at Cleared Flight Level
- Use auto altitude capture (A/P), Control altitude transitions, over/undershoot not to exceed 150 ft.
- The vertical rate should be reduced to less than 1500 fpm in the last 1000 ft before reaching the cleared flight level.
- In cruise, fly with automatic altitude control engaged except as required to trim aircraft or to disengage for turbulence
- Altitude alert should be operational

## Enroute Procedures (cont.)

- At approximately one hour intervals, cross check primary and stand-by altimeters
  - Check primary altimeter agreement within 200 ft.
  - At least **initial** cross check should be recorded
- Normally, altimeter controlling Autopilot should provide source for transponder reporting to ATC  
Failure to meet this condition will require that the system be reported as defective and notified to ATC

## Degradation of Aircraft Equipment

- When the pilot of an RVSM approved aircraft confirms that the aircraft's equipment no longer meets the RVSM MASPS, the controller shall:
  - Consider the aircraft as non-RVSM approved and
  - Take action immediately to provide a minimum vertical separation of 2000 ft, or an appropriate horizontal separation minimum, from all other aircraft concerned.

## In-Flight Contingency Procedures

- An in-flight contingency affecting flight in the RVSM Airspace pertains to unforeseen circumstances which directly impact on the ability of one or more aircraft to operate in accordance with the vertical navigation performance requirements of the RVSM Airspace.
- The pilot shall inform ATC as soon as possible of any circumstances where the vertical navigation performance requirements for the RVSM Airspace cannot be maintained.

## In-Flight Contingency Procedures (cont.)

### ATC to be notified for:

- failure of automatic altitude control system
  - loss of primary altimetry system
  - loss of engine thrust requiring descent
  - loss of any equipment affecting height keeping
  - encounter with greater than moderate turbulence
- If unable to notify ATC, follow established contingency procedures

## In-Flight Contingency Procedures (cont.)

- The pilot shall obtain a revised air traffic control clearance prior to initiating any deviation from the cleared route and/or flight level, whenever possible. Where a revised ATC clearance could not be obtained prior to such a deviation, the pilot shall obtain a revised clearance as soon as possible thereafter.
- Air traffic control actions will be based on the intentions of the pilot, the overall air traffic situation, and the real-time dynamics.

## In-Flight Contingency Procedures (cont.)

- Suspension of RVSM refers to a discontinuance of the use of a vertical separation minimum of 1 000 ft between RVSM approved aircraft operating within the RVSM Airspace.
- A vertical separation minimum of 2 000 ft shall be applied between all aircraft operating within the portion of the RVSM Airspace where RVSM has been suspended, regardless of the RVSM approval status of the aircraft.

## Flight Crew Training

- Knowledge and understanding of ATC phraseology
- Crew X-check to ensure compliance with ATC clearance
- Contingency procedures (including use of stand-by altimeter)
- Problems of visual perception (other aircraft at 1000ft)
- Airframe operating limitations for RVSM ops.

## Regional Procedures

RVSM approval is Globally applicable.

**However:**

- From Region to Region there may be different procedures! (e.g. contingency procedures)
- Responsibility of Pilot in Command to be aware of Regional differences.

## State Aircraft operating within RVSM Airspace

All State aircraft operating in RVSM Airspace will be considered as non-RVSM MASPS compliant and therefore non-RVSM approved. Therefore, the VSM required between State and other traffic shall be 2,000 ft.

State aircraft, i.e. military aircraft, might be exempted from RVSM requirements and where applicable, the indication that a non-RVSM approved aircraft is a State aircraft should be displayed.

## State Aircraft operating within RVSM Airspace

FL 350



FL 340

X

FL 330



Non-RVSM  
approved  
State Aircraft

FL 320

X

FL 310



## Scenarios addressed in RVSM AIRSPACE

## RVSM Aircraft System Malfunction Enroute

**Scenario:**

Loss of Automatic Altitude Control, Altitude Alerter or All Primary Altimeters

**Pilot will:**

- Contact ATC and state **"Unable RVSM Due Equipment"**
- Request clearance out of RVSM airspace unless operational situation dictates otherwise

## RVSM Aircraft System Failure Enroute

**Scenario:**

One Primary Altimeter Remains Operational

**Pilot will:**

- Cross check stand-by altimeter
- Notify ATC of operation with single primary altimeter
- If unable to confirm primary altimeter accuracy, follow actions for failure of **all** primary altimeters

## RVSM Aircraft System Failure Enroute

### Scenario:

#### Transponder Failure

### Pilot will:

- Contact ATC and request authority to continue to operate at cleared FL
- Comply with revised clearance, if issued

### Controller will:

- Consider request to continue at cleared FL
- Issue revised clearance, if necessary.

## RVSM Severe Turbulence Encounter

### Pilot will:

- Contact ATC and state "Unable RVSM Due Turbulence"
- If not issued by controller, request vector clear of traffic
- Request FL change or re-route, if so desired

### Controller will:

- ATC is required to establish either:
  - an appropriate horizontal separation minimum, or
  - an increased vertical separation minimum of 2000 ft.

## RVSM Mountain Wave Activity (MWA)

### Pilot actions:

- Contact ATC and report experiencing MWA
- If controller calls traffic at adjacent FL, pilot may request vector to avoid merging targets
- Request FL change or re-route, if so desired

### Controller actions:

- Advise pilot of traffic at adjacent FL's
- If pilot requests, vector aircraft to avoid merging targets
- Issue FL change or re-route, traffic permitting

## RVSM Wake Turbulence

- In RVSM airspace, wake turbulence generally found to be moderate or less
- Wind direction determines probability of encounter
- Minor adjustment to track can mitigate encounter

### Pilot should:

- Contact ATC and request vector, FL change or lateral offset (if capable)

### Controller should:

- Issue vector, FL change or lateral offset; traffic permitting

## COMMUNICATION FAILURE

The ICAO Procedures specify that the applicable vertical separation minimum between an aircraft experiencing a communication failure in flight and any other aircraft, where both aircraft are operating within the RVSM Airspace, shall be 2 000 ft, unless an appropriate horizontal separation minimum exists.

## Non-RVSM Aircraft

- Non-RVSM Aircraft Climbing/Descending Through RVSM FL's To/From FL 430 and above:
  - Will be handled on a workload permitting basis
  - Aircraft must be capable of continuous climb at a normal rate to a FL above RVSM airspace

## Post flight

Annotate maintenance documents

- Report altitude maintaining capability, transponder failures, altitude indications difference **>200 ft**
- File the " ALTITUDE DIVIATION REPORT FORM" for any altitude deviation **> 300 ft**
- File the « wake turbulence encounter report »

## TCAS II Version 7.0 Operating Characteristics

- Traffic Alert threshold 850 ft.
- Preventive RA threshold 700 ft.
- Corrective RA threshold 600 ft.

### Operating Recommendation

Operate TCAS in TA/RA mode during RVSM operations including transition areas

## TCAS II Version 7.0 Operator Procedures

Operators should specify procedures by which an aeroplane climbing or descending to an assigned altitude or flight level, especially with an autopilot engaged, may do so at rate less than 1500 ft/min throughout the last 300 m (1000 ft) of climb or descent to the assigned level when the pilot is made aware of another aircraft at an adjacent altitude or flight level by an airborne traffic display.

*–Note.- These procedures are intended to avoid unnecessary airborne collision avoidance system (ACAS II) resolution advisories in aircraft at adjacent levels.*

## TCAS RA

### Follow TCAS regardless of ATC clearance

- Advise ATC :
  - « FLT Number TCAS CLIMB or DESCENT »
  - When clear of conflict, Resume cruise FL
- REPORT an AIRPROX to ATC
- File an AIRPROX

### Pilot-Controller Communication Phraseology RVSM Operation

Circumstance	Phraseology
Air traffic control (ATC) query about RVSM status of flight	"Confirm RVSM approved."
Pilot indication that flight is RVSM approved.	"Affirm RVSM."
Pilot indication that flight is not RVSM approved.	"Negative RVSM."
Pilot of state aircraft (e.g., military) indication that flight is not RVSM approved	"Negative RVSM, state aircraft."
ATC denial of clearance into RVSM airspace	"Unable clearance into RVSM airspace. Maintain (descend to or climb to) FL....."

### Pilot-Controller Communication Phraseology RVSM Operation

Circumstance	Phraseology
Pilot report of weather affecting ability to maintain RVSM height-keeping requirements. (e.g., severe turbulence)	"Unable RVSM due turbulence."
Pilot report of equipment degraded below RVSM requirements	"Unable RVSM due equipment."
ATC request for report when flight is able to resume RVSM operations.	"Report able to resume RVSM."
Pilot report of ability to resume RVSM operations after weather and/or equipment contingency	"Ready to resume RVSM."

**THANK YOU**