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EUROCONTROL

MILITARY GUIDANCE FOR THE INTRODUCTION OF RVSM IN EUROPE

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MILITARY GUIDANCE FOR INTRODUCTION OF RVSM IN EUROPE

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Abstract

This document has been produced to support the military aviation preparation for the planning, implementation and application of the EUROCONTROL Reduced Vertical Separation Minimum (RVSM) Programme. The guidance material contains general information relating to the European RVSM Programme, operational information for Military Authorities with regard to flight planning, and guidance for the Military Certification/Regulatory Authorities on the RVSM approval process where State exemption has not been sought.

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ABBREVIATIONS

AAD	Assigned Altitude Deviation
ACAS	Airborne Collision Avoidance System
ACH	ATC Flight Plan Change Message (IFPS)
AFIL	Flight Plan Filed in the Air
AIP	Aeronautical Information Publication
AMC	Airspace Management Cell
ANT	Airspace and Navigation Team
APL	ATC Flight Plan Message (IFPS)
ASE	Altimetry System Error
ATM	Air Traffic Management
CDB	Central Data Base
CFL	Cleared Flight Level
CFMU	Central Flow Management Unit
CHG	Modification Message (IFPS)
CMIC	Civil Military Interface Standing Committee
CNS	Communication, Navigation and Surveillance
CVSM	Conventional Vertical Separation Minimum
EANPG	European Air Navigation Planning Group
EATCHIP	European Air Traffic Control Harmonisation and Integration Programme
EATMP	European Air Traffic Management Programme
ECAC	European Civil Aviation Conference
FDPS	Flight Data Processing System
FLAS	Flight Level Allocation Scheme
FMS	Flight Management System
FMP	Flow Management Position (ACC)
FPL	Flight Plan
FUA	Flexible Use of Airspace
GAT	General Air Traffic
GMU	GPS Monitoring Unit
GPS	Global Positioning System
HMU	Height Monitoring Unit
ICAO	International Civil Aviation Organisation
IFPS	Integrated Initial Flight Plan Processing System
IFPZ	IFPS Zone
JAA	Joint Aviation Authorities
MASPS	Minimum Aircraft System Performance Specification
MEL	Minimum Equipment List
MNPS	Minimum Navigation Performance Specification
MTCD	Medium Term Conflict Detection
OAT	Operational Air Traffic
OLDI	On-Line Data Interchange
RA	Resolution Advisory (ACAS)
REJ	Reject Message (IFPS)
RFL	Requested Flight Level
RNAV	Area Navigation
RNP	Required Navigation Performance
RPL	Repetitive Flight Plan
RVSM	Reduced Vertical Separation Minimum of 300 m (1000 ft) between FL 290 and FL 410 inclusive
SARPS	Standards and Recommended Practices
SDB	State Data Base
STCA	Short Term Conflict Alert
TA	Traffic Advisory (ACAS)
TGL	Temporary Guidance Leaflet (JAA)
TLS	Target Level Of Safety
TSA	Temporary Segregated Area
TVE	Total Vertical Error
UIR	Upper Information Region
VFR	Visual Flight Rules
VSM	Vertical Separation Minimum

DEFINITIONS

Altimetry System Error (ASE)

The difference between the pressure altitude displayed to the flight crew when referenced to ISA standard ground pressure setting (1013.2hPa/29.92in.Hg) and the free stream pressure altitude.

Assigned Altitude Deviation (AAD)

The difference between the transmitted Mode C altitude and the assigned altitude/flight level.

Basic RVSM Envelope

The range of Mach numbers and gross weights within the altitude ranges FL 290 to FL 410 (or maximum attainable altitude) where an aircraft can reasonably expect to operate most frequently.

Flight Level Allocation Scheme (FLAS)

The scheme whereby specific flight levels may be assigned to specific route segments within the route network.

General Air Traffic (GAT)

Flights conducted in accordance with the rules and provisions of ICAO.

Height-Keeping Capability

Aircraft height-keeping performance which can be expected under nominal environmental operating conditions with proper aircraft operating practices and maintenance.

Height-Keeping Performance

The observed performance of an aircraft with respect to adherence to a flight level.

Operational Air Traffic (OAT)

Flights which do not comply with the provisions stated for GAT and for which rules and procedures have been specified by appropriate authorities.

Rogue/Aberrant Aircraft

Aircraft which have a TVE of 300 feet or greater or an ASE of 245 feet or greater.

RVSM Approval

The approval that is issued by the appropriate authority of the State in which the Operator is based or of the State in which the aircraft is registered. To obtain such RVSM approval, Operators shall satisfy the said State:

1) that aircraft for which RVSM Approval is sought have the vertical navigation performance capability required for RVSM operations through compliance with the criteria of the RVSM Minimum Aircraft Systems Performance Specification (MASPS);

2) that they have instituted procedures in respect of continued airworthiness (maintenance and repair) practices and programmes;

3) that they have instituted flight crew procedures for operations in the EUR RVSM airspace.

Note: An RVSM approval is not restricted to a specific region. Instead, it is valid globally on the understanding that any operating procedures specific to a given region, in this case the EUR Region, should be stated in the operations manual or appropriate crew guidance.

RVSM Approved Aircraft

Aircraft that have received State approval for RVSM operations within the EUR RVSM Airspace.

RVSM Entry Point

The first reporting point over which an aircraft passes or is expected to pass immediately before, upon, or immediately after initial entry into European RVSM airspace, normally the first reference point for applying a 300 m (1000 ft) vertical separation minimum.

RVSM Exit Point

The last reporting point over which an aircraft passes or is expected to pass immediately before, upon, or immediately after leaving European RVSM airspace, normally the last reference point for applying a 300 m (1000ft) vertical separation minimum.

State Aircraft   For the purposes of European RVSM, only aircraft used in military, customs and police services shall qualify as State aircraft.

Strategic Flight Level   A flight level which is available for flight planning purposes in accordance with the Table of Cruising Levels of ICAO Annex 2, Appendix 3 and the Flight Level Allocation Scheme (FLAS), as specified in the relevant Aeronautical Information Publications (AIPs).

Tactical Flight Level   A flight level which is reserved for tactical use by ATC, and as such, should not be flight-planned.

Target Level of Safety (TLS)   A generic term representing the level of risk which is considered acceptable under particular circumstances.

Total Vertical Error (TVE)   Vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

State Aircraft

EXECUTIVE SUMMARY

INTRODUCTION

To increase airspace capacity and to reduce delays and fuel costs, the Reduced Vertical Separation Minimum (RVSM) Programme will provide an additional six flight levels between FL 290 and FL 410 inclusive on 24 January 2002 in the airspace of 40 European States.

An RVSM Master Plan has been developed and an RVSM Programme Management structure has been introduced to effectively manage the implementation process. The programme involves activities from a wide range of stakeholders including the military authorities and has been organised into three main Sub-Programmes i.e. Airspace User Preparation & Performance Verification, Air Traffic Management Preparation and Safety Assurance.

It is important that communication is established at an early stage between State Military Authorities and their National RVSM Programme Managers responsible for the execution of the applicable National activities within the RVSM Programme Master Plan. Military authorities have been encouraged to nominate National Military contact points (Annex 1 refers) and to provide an indication to them of the number of GAT operations of State aircraft that will regularly operate in EUR RVSM airspace and the RVSM Programme also requires information on the military authorities' plans regarding the RVSM status of their transport type (airlift, tanker, special mission, operational support aircraft etc.) fleets. Accurate information can minimise uncertainty and allay the concerns associated with State aircraft operation upon RVSM implementation.

A questionnaire has been developed by EUROCONTROL to seek information on the RVSM modification programmes of military transport/tanker fleets and on the number of military flights operating as GAT in the EUR airspace. The questionnaire was issued in April 2000 and the first outcome was introduced at the EUR RVSM Military Workshop 6 July 2000.

OBJECTIVE AND SCOPE

This guidance document will support the military preparation for the planning, implementation and application of the RVSM Programme. The document seeks to address operational, procedural and technical requirements which have an impact upon military aviation. Additional references (Annex 2) are included where more detailed information on the RVSM programme, and in particular guidance on the approval process, can be obtained.

MILITARY IMPLICATIONS

Due to the physical limitations of certain aircraft, State aircraft are exempted from compliance with the RVSM requirements. However, due to the negative impact of non-compliant aircraft on the controllers' workload and hence on the airspace capacity, military authorities are encouraged to make military aircraft compliant with the RVSM Minimum Aircraft System Performance Specification (MASPS) as far as practicable.

For the certification of civil aircraft the Joint Aviation Authority (JAA) in Temporary Guidance Leaflet (TGL) n°6, Rev. 1 has published detailed procedures. With regard to the certification of military aircraft, military authorities are recommended to use this TGL as guidance material. Special procedures have been developed with respect to ATC handling, RTF procedures and separation criteria; flight planning; civil/military co-ordination including

system requirements; contingency procedures and communication failure procedures. Flight crews, ATC and Air Defence personnel need to have full awareness of the criteria and procedures to operate in EUR RVSM airspace. Adequate training programmes will need to be developed and exercised.

1. INTRODUCTION

1.1 Background

At present, in the ECAC area above Flight Level (FL) 290, a 2000 ft vertical separation minimum is applied. The steady growth in civil aviation has led to capacity shortfalls and increased delays and fuel costs. As one of the possible solutions, the International Civil Aviation Organisation (ICAO) initiated a comprehensive programme of studies to examine the feasibility of reducing the Vertical Separation Minimum above FL 290 from 2000 ft to 1000 ft. The results of these exhaustive studies demonstrated that the reduction of vertical separation was safe, cost beneficial and feasible - without the imposition of unduly demanding technical requirements. After successful implementation in the North Atlantic Region, studies proved the feasibility of the introduction of RVSM in the ECAC airspace. As a result, the ECAC States decided to implement RVSM in the European airspace.

1.2 Benefits of the European RVSM Programme

The European RVSM Programme will provide additional six flight levels in the airspace of the participating RVSM States. The RVSM Programme is one of the most important steps towards increasing en-route capacity to cope with the continuously growing traffic. The additional flight levels and a modified airspace structure should increase ATC capacity by at least 20%, reduce delays and save fuel for both civil and military aircraft operators flying GAT by allowing the use of more optimum flight profiles.

1.3 RVSM Master Plan

From the outset it was clear that, given the complex nature of the European Air Traffic Services (ATS) route structure, its wide variety of aircraft types, high traffic density and the high percentage of aircraft climbing and descending, the continental European airspace would be a more demanding environment than the North Atlantic Region. Another difference was the type and extent of military operations within the airspace of the different States where RVSM would be applied.

Consequently, the introduction of RVSM in Europe appeared much more challenging and EUROCONTROL had to establish a very comprehensive and thorough programme to implement RVSM. The Programme involves activities from a wide range of stakeholders including the military authorities.

The RVSM Master Plan is the framework for the organisation, management and execution of the Programme. It gives a clear and comprehensive picture of the tasks, process, and programme assumptions, schedule and programme management organisation to implement RVSM safely and efficiently. It forms the basis for the necessary commitment by all stakeholders, including military authorities, and it is the baseline for the execution of the programme. The major milestones will be used to assess the progress of all stakeholders.

The Master Plan is supplemented by a Programme Management Plan, which contains the detailed management and control activities required for managing this programme. These documents may be requested from EUROCONTROL, and the Master Plan as well as other

documents such as the ATC Manual for RVSM in Europe and the Military Guidance for the Introduction of RVSM in Europe available on the internet at http://www.eur-rvsm.com .

2. OBJECTIVE AND SCOPE

This guidance document will support the military preparation for the planning, implementation and application of the RVSM Programme. The document seeks to address operational, procedural and technical requirements that have an impact upon military aviation. The principal source document is the ATC Manual for RVSM in Europe (Edition 2.0). Additional references to ICAO, JAA, and EUROCONTROL documentation are included where more detailed information on the RVSM Programme, and in particular guidance on the approval process, can be obtained. The work package for military aviation for RVSM is part of the Work Breakdown Structure (WBS) of the EUR RVSM Programme, extract at Annex 1.
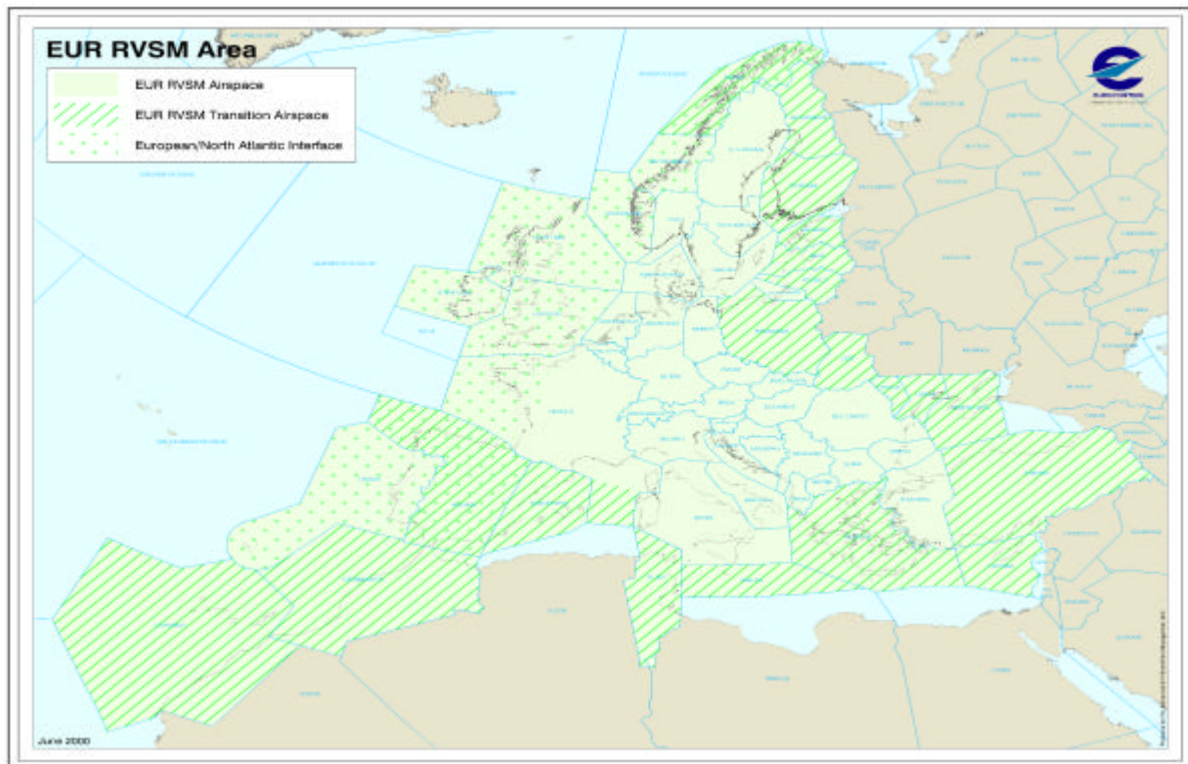
3. APPLICABILITY ASPECTS

3.1 Implementation Date

The RVSM Master Plan date for the implementation of RVSM in the European RVSM Area is 24 January 2002, subject to an overall (e.g. aircraft approval rates, States <ATM> preparedness, safety assurance) assessment to be carried out by Provisional Council / Permanent Commission (PC/CN) and European Air Navigation Planning Group (EANPG) Co-ordinating Group (COG) in July 2001. Some States may wish to apply RVSM in specific areas at any time from March 2001. The early introduction of RVSM by a particular State would be a matter for that State and their actions will not jeopardise the progress and timely completion of the European RVSM Programme. In general terms, the intention is to introduce the tactical use by ATC of 1000 ft vertical separation at and above FL 290.

3.2 Area of Applicability

RVSM shall be applicable for the conduct of IFR GAT flights in that volume of airspace between FL 290 and FL 410 inclusive in the following Participating States:

Albania	Luxembourg
Austria	Malta
Belgium	Moldova
Bosnia and Herzegovina	Monaco
Bulgaria	Morocco
Croatia	The Netherlands
Cyprus	Norway
Czech Republic	Poland
Denmark	Portugal
Estonia	Romania
Federal Republic of Yugoslavia	Slovak Republic
Finland	Slovenia
France	Spain
Germany	Sweden
Greece	Switzerland
Hungary	The Former Yugoslav Republic of Macedonia
Ireland	Turkey
Italy	Tunisia
Latvia	Ukraine
Lithuania	United Kingdom

Map. January 2001 update of the European RVSM Area

There are provisions for the transition of aircraft to/from the EUR RVSM airspace. These transition tasks associated with the application of 300m (1000 ft) VSM will be carried out in the following FIRs/UIRs:

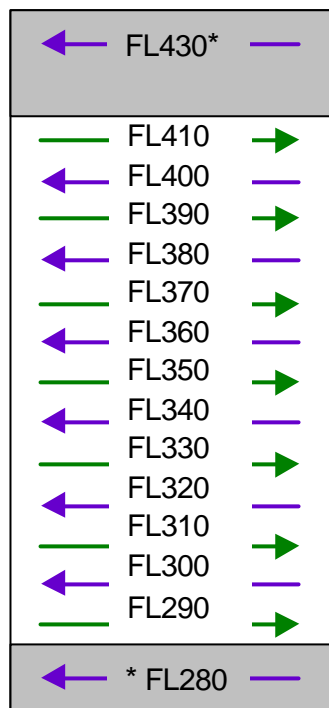|	
Ankara	Turkey
Athinai	Greece
Barcelona	Spain
Bodo	Norway
Canaries	Spain (ICAO AFI Region)
Casablanca	Morocco
Kishinau	Moldova
Lvov	Ukraine
France	France
Madrid	Spain
Malta	Malta
Nicosia	Cyprus
Odesa	Ukraine
Riga	Latvia
Rovaniemi	Finland
Simferopol	Ukraine
Tallinn	Estonia
Tampere	Finland
Tunis	Tunisia
Vilnius	Lithuania
Warszawa	Poland

This volume of airspace will be referred to as the **"EUR RVSM transition airspace"**.

In addition to the European RVSM Transition Airspace, as described above, the State authorities responsible for the following FIRs may establish designated airspace within their FIRs for the purpose of transitioning non-RVSM approved civil aircraft operating to/from the NAT Region:

Bodø (Domestic), Stavanger, Trondheim, Scottish, Shannon, London, Brest, Madrid, and Lisboa

3.3 Cruising Levels

Flight levels within the EUR RVSM airspace will be organised on the basis of their intended use in regards to direction of flight, in accordance with ICAO Annex 2, Appendix 3, Para. a), Table of Cruising Levels. Graphically, such an organisation is described as follows:

←	FL430* ―
―	FL410 →
←	FL400 ―
―	FL390 →
←	FL380 ―
―	FL370 →
←	FL360 ―
―	FL350 →
←	FL340 ―
―	FL330 →
←	FL320 ―
―	FL310 →
←	FL300 ―
―	FL290 →
←	* FL280 ―

* Non-RVSM level
← Tracks 000°-179° (or 090°-269° in the FIRs/UIRs of Italy, France, Portugal and Spain)
→ Tracks 180°-359° (or 270°-089° in the FIRs/UIRs of Italy, France, Portugal and Spain)

It is to be noted from the above that the application of RVSM has the effect of reversing the assignment of FLs 310, 350 and 390 with respect to their use in regards to direction of flight, as compared to airspace where RVSM is not applied. Flight levels 310, 350, and 390 are eastbound cruising levels in an RVSM environment, whereas they are westbound cruising levels in a non-RVSM environment.

3.4 Access to EUR RVSM Airspace

The approved amendment of the ATC Manual for RVSM in Europe (available on www.eur-rvsm.com/) states that except for State aircraft operating as OAT the flights shall be conducted in accordance with the instrument flight rules (even when not operating in instrument meteorological conditions) when operated within or above the EUR RVSM airspace.

Except for State aircraft and for operations within the RVSM transition airspace, only RVSM approved aircraft are permitted to operate in EUR RVSM airspace as IFR GAT. Military aircraft (GAT and OAT) have been exempted from mandatory RVSM approval in the EUR RVSM airspace as due account has been taken of the specific nature of military requirements and operational flexibility. Civil ATS providers understand these requirements and they take into account the exemption status of these aircraft while handling these aircraft without causing undue disruption to their planning and executive tasks.

However, EUROCONTROL has urged States to adapt their State aircraft for RVSM approval, to the extent possible, and especially those aircraft used for GAT operations.

Formation flights, except for State aircraft, are not allowed to operate as GAT within the RVSM airspace. Formation flights of State aircraft, regardless of their individual RVSM approval status are treated as NON-RVSM and are provided with 2000 ft vertical separation when operating as GAT (Annex 3 § 3 refers).

4. AIRBORNE REQUIREMENTS

4.1 Exemption Policy

There is a physical inability (due to limitations in aircraft design) of adapting the large majority of military combat, training etc. aircraft to the defined RVSM MASPS. As a result discussions took place to establish the means by which the requirements of military flight operations, within EUR RVSM airspace, could be met. As an outcome of the discussions, taking into account the national security and defence responsibilities given to Military Authorities, State aircraft are exempted from having to meet RVSM MASPS.

ICAO Doc. 7030/4 clearly stipulates this exemption: "Except for State aircraft, Operators intending to conduct flights within the volume of airspace specified where RVSM is applied shall require RVSM Approval either from the State in which the Operator is based or from the State in which the aircraft is registered".

However, in order to reduce the workload impact on controllers of handling non-RVSM approved State aircraft, national/military authorities are strongly encouraged to make their transport/tanker fleets compliant with RVSM MASPS. This recommendation relates in particular to those State aircraft which operate on a regular basis as GAT in the RVSM airspace.

The amendment to the ATM chapter of the NATO ATM Committee Handbook contains: "National and military authorities are encouraged to make their transport State aircraft fleet compliant with MASPS. However, this retrofit action is technically complex, needs time, and has significant financial consequences".

4.2 RVSM Approval

It should be appreciated that the presence of non-RVSM approved military aircraft operating as GAT could significantly reduce the ATM capacity due to the workload generated and could also penalise other operators whose fleets are MASPS compliant. Military operators are encouraged to make their aircraft RVSM compliant. This is in particular applicable to transport and tanker aircraft with an operational ceiling of FL 280 and above.

To conduct GAT flights with such compliant aircraft they shall obtain RVSM approval. Depending on national legislation, RVSM approval for State aircraft may be obtained from the civil aviation authorities or from the military authorities. Annex 4 provides more detail of the State approval process and minimum equipment fits.

In the first case, the procedure defined by civil authorities in accordance with JAA Temporary Guidance Leaflet n°6 (Rev. 1) has to be applied. Copies can be obtained through the RVSM programme web site (www.eur-rvsm.com).

In the second case, the certification procedure will comply with the requirements of the military certification authorities. TGL n°6 (Rev. 1) may be used as guidance material to define the military specifications and certification procedures.

Aviation authorities will be expected to maintain a State Data Base (SDB) of all approvals which they granted for operations in RVSM airspace. The RVSM programme requests military authorities to provide their intentions as to modification programmes for those aircraft (transport/tanker fleets) regularly operating as GAT. A questionnaire was distributed in Spring 2000 and the initial outcome was presented at the EUR RVSM Military Workshop. Such accurate information allows a proper assessment of the impact of military operations on the GAT structure.

Projections show that by end of 2002 only about 1% of GAT flights in the EUR RVSM airspace will be non-RVSM approved State aircraft flights.

From November 2000 these projections have been validated with regular extraction of CFMU data and the distribution of this traffic has also been assessed.

5. HEIGHT KEEPING

5.1 Objectives

For safety reasons appropriate monitoring to confirm that the height keeping performance requirements are being met has to be executed.

Monitoring is conducted in accordance with the appropriate guidance material issued by ICAO. When notified, Aircraft Operators will be required to co-operate in the monitoring programme.

5.2 Methods of Measuring Aircraft Height Keeping Performance

Once approved, Aircraft Operators are requested to participate in the height keeping performance monitoring programme. The monitoring programme requires the availability of height monitoring systems: ground based Height Monitoring Units (HMUs) and portable on-board GPS Monitoring Units (GMUs).

The Height Monitoring Unit (HMU) is a fixed ground based system which employs a network of a Master and 4 Slave Stations to receive aircraft SSR Mode A/C and Mode S signals to establish the three-dimensional position of the aircraft.

The GPS Monitoring Unit (GMU) is a portable "box" which contains a GPS receiver, a device for recording and storing the GPS three-dimensional position data.

The monitoring system is now fully implemented and each one of the HMU units are recording height keeping performance of aircraft flying within their area of coverage.. The height monitoring system for the EUR RVSM airspace consists of four HMUs: Strumble (United Kingdom), Nattenheim (Germany), Geneva (Switzerland) and Linz (Austria).

Monitoring is normally achieved by aircraft flying in the vicinity of a Height Monitoring Unit (HMU) as height-keeping data is extracted automatically. Additionally, the utilisation of the portable GPS units is possible and foreseen as part of the Monitoring Programme in the EUR region. The NAT has acquired data on military aircraft height-keeping accuracy but access is limited to data base managers of the NAT and EUR region.

State aircraft with approved status may be monitored as they pass adjacent to an HMU as part of the RVSM safety case. Under such circumstances, Military Authorities may be approached to confirm the flight type and/or identity. The percentage of targets may be reduced if it can be demonstrated that a sufficient number of aircraft of the same type has been sampled to satisfy the requirement that the particular aircraft type meets MASPS with a high degree of confidence.

A User Support Cell has been set up at EUROCONTROL Headquarters. It is designed to answer the questions of aircraft operators with regard to technical issues, certification, timescales, supplier availability etc. concerning the implementation of RVSM in Europe in January 2002. The cell is manned during normal business hours (Monday–Friday, Central European Time; tel. ++ 32 2 729 33 95, fax ++ 32 2 729 46 34, e-mail amn.user.support@eurocontrol.be).

6. RVSM PROCEDURES

6.1 General Procedures/ ATC Clearances

The following procedures have a direct link with the compliance or the non-compliance of aircraft to RVSM. The majority of State aircraft will be non-RVSM compliant. Therefore, basic principles and special procedures have been developed. Some basic principles are mentioned below.

- Formation flights, regardless of the RVSM approval status of the individual aircraft involved, will be considered as non-RVSM approved. As such, they must request special handling by ATC. (ICAO Annex 2, Chapter 3, paragraph 3.1.8, provides that aircraft participating in formation flights are permitted to operate within 30 m (100 ft) above or below the flight leader < and a distance not exceeding 0.5 NM (1 km) from the flight leader shall be maintained by each aircraft>. Consequently, formation flights could exceed the total vertical error (TVE) allowed within the EUR RVSM Airspace. Formation flights shall therefore be considered as being non-RVSM approved.). The applicable separation minimum between all formation flights of State aircraft and any other aircraft operating within the EUR RVSM Airspace shall be 2000 ft (600 m).

- ATC will only clear RVSM approved aircraft into the RVSM airspace except for State aircraft and except as provided for in the Transition Procedures.

- The application of 1000 ft or 2000 ft separation by ATC depends on the RVSM status of the aircraft to which separation is provided, the awareness of ATC with respect to the RVSM status of the aircraft concerned and the airspace in which the aircraft are flying.

6.2 RVSM Flight Planning and Co-ordination

The requirement for ATC to accommodate a mix of RVSM approved aircraft and non-RVSM approved State aircraft within the EUR RVSM airspace has significant operational consequences. The requirement to selectively apply two distinct vertical separation minima (VSM) of 1000 ft and 2000 ft within the same volume of airspace increases controller workload considerably.

Therefore, of prime operational importance is the requirement that controllers are continually aware of the RVSM approval status of all aircraft operating within or in close proximity to the RVSM airspace.

Specific ATC and flight planning procedures as well as automated systems adaptations have been mandated to support the requirements mentioned above. Furthermore, intra-centre co-ordination procedures have been developed to ensure that controllers are provided with proper information on the RVSM status of aircraft to be transferred. Further details are in the ATC Manual for RVSM in Europe (Edition 2.0). These procedures are applicable to ATC providers, controllers and aircrew.

Specific guidance on flight planning for Military Operators is included at Annex 3. Operators of military aircraft shall insert "M" in item 8 of the ICAO Flight Plan. (This indication shows to ATC its right to fly in the EUR RVSM Airspace regardless of the RVSM status of the aircraft.) ANT/24 proposed that all European States include the following sentence in their National

Aeronautical Information Publications (AIPs): "In addition to military operations, operators of customs or police shall insert the letter "M" in Item 8 of the ICAO flight plan".

The Initial Integrated Flight Planning System (IFPS) shall designate this information to the flight data processing systems (FDPS) concerned for the purpose of providing ATC with required clear indication that such non-RVSM approved flights, are in fact "State aircraft" and as such are permitted to operate the EUR RVSM airspace.

6.3 Contingency Procedures

Military flight crew when flying as GAT experiencing in-flight contingencies or turbulent atmospheric conditions resulting in degradation of aircraft equipment associated with height keeping are to inform air traffic control as soon as possible. In such cases, 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 air traffic control 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 shall render all possible assistance to a pilot experiencing an in-flight contingency. Subsequent air traffic control actions will be based on the intentions of the pilot, the overall air traffic situation and the real-time dynamics of the contingency.

Detailed procedures are in the amended ATC Manual for RVSM in Europe (Edition 2.0).

6.4 Phraseology

A specific phraseology has been developed to clarify the dialogue of the pilots and the controllers and between ATS units regarding the status of the aircraft. This phraseology is available in the amended ATC Manual for RVSM in Europe and in ad hoc ICAO documents (e.g. Doc. 7030/4) as well as extract at Annex 5.

6.5 Flight Crew Training

Flight crews will need to have an awareness of the criteria for operating in RVSM airspace and be trained accordingly. The items of flight planning and contingency procedures together with the procedures and RTF phraseology should be standardised and incorporated into training programmes and operating practices and procedures.

In order to establish such programmes and procedures, military authorities are invited to use Appendix 4 of TGL n°6, Rev. 1 (Training Programmes and Operating Practices and Procedures), ICAO Guidance Material EUR Doc. 009 and the amended ATC Manual for RVSM in Europe (Edition 2.0) as guidance material.

7. REQUIREMENTS FOR ATS SYSTEMS SUPPORT TO RVSM

In order to accommodate non-RVSM approved military aircraft within European RVSM airspace it is essential that civil and military ATC are systematically aware of the RVSM approval status of all flights operating, not only within the RVSM airspace but also outside and in close proximity to the RVSM airspace.

Also significant is the operational requirement for ATC to be aware whether or not an aircraft is a State aircraft.

It is the responsibility of the ATS providers including the military to ensure that controllers have the necessary system support to enable the safe and timely application of RVSM.

The different civil requirements detailed in section 8 of the ATC Manual for RVSM in Europe (Edition 2.0) should be regarded as guidance by military authorities in the following domains:

- Radar display systems;
- Flight data processing systems (FDPS);
- Flight strips (paper or electronic);
- Safety nets (STCA, MTCD);
- On – Line Data Interchange (OLDI) messages.

For military authorities it is of utmost importance to assess the efficiency of level 3 co-ordination. If necessary, they may need to implement system supported co-ordination to improve it. The "Guidance Document for the Concept of the Flexible Use of Airspace (FUA)" allows for a maximum joint use of airspace by appropriate civil/military procedures as well as system-supported co-ordination at a tactical ASM level. Details of the functional specifications for system support to civil/military co-ordination are further elaborated in EATMP (EATCHIP) deliverables "Functional Support for System Support to Airspace Data Distribution and Civil/Military Co-ordination". These procedures and specifications are considered sufficient for the implementation of RVSM.

8. VERTICAL SPACING FROM TSAS, PROHIBITED, RESTRICTED AND DANGER AREAS

Special procedures have been developed with respect to activities within airspace restrictions and/or reservations. Since the behaviour of aircraft in such areas is unpredictable and the military aircraft operating in such areas are most likely non-RVSM approved, all flights in these areas are considered as being **non**-RVSM approved. Consequently, the standard minimum vertical separation applied between air traffic within restricted airspace and air traffic outside this airspace is 2000 ft.

The minimum vertical spacing required between the vertical limits of the activities contained within such airspace restrictions and/or reservations and non-participating aircraft operating within the RVSM airspace is:

- 2 000 ft, above the upper limit of such activities, for upper limits of FL 290 or above, and
- 2 000 ft, below the lower limit of such activities, for lower limits of FL 300 or above.

Therefore, the application of RVSM will continue to require that the same minimum vertical spacing be applied between activities occurring within airspace restrictions and/or reservations and non-participating aircraft, as were being applied prior to RVSM implementation.

States will, as stipulated in the ASM Handbook, promulgate the first usable flight levels above/below airspace restrictions and/or reservations, in the definition of the associated ATS routes. Depending on the methodology used to delineate and promulgate such airspace restrictions and/or reservations, the first usable flight levels will be situated either 1 000 ft or 2 000 ft above/below the *published* vertical limits of the airspace restrictions and/or reservations. Nevertheless, operation by non-participating aircraft at such first usable flight levels, defined as a function of one of the two delineation methodologies, will guarantee the application of the required minimum 2000 ft vertical spacing from the activities occurring within airspace restrictions and/or reservations.

However, in an airspace environment where the responsible ATS units are fully aware as to the RVSM approval status of all traffic involved, reduced vertical separation of 1 000 ft may be applied between RVSM approved aircraft.

9. COMMUNICATIONS FAILURE IN FLIGHT

The approved amendment to ICAO Doc. 7030/4 specifies that "ATC shall provide a minimum vertical separation of 2000 ft (600 m) between an aircraft experiencing a communications failure in flight and any other aircraft, where both aircraft are operating within RVSM airspace".

In December 2000, the European Air Navigation Planning Group (EANPG) endorsed a *proposal for amendment of the ICAO Regional Supplementary Procedures for Europe pertaining to air-ground communication failure procedures*. The proposed procedures are intended for application throughout the European Region, including the airspace between FL 290 and FL 410 inclusive. This proposal is subject to the ICAO procedure for the amendment of ICAO Doc. 7030/4.

Within RVSM airspace there are thirteen cruising levels which may be assigned by ATC, as compared to seven within non-RVSM airspace between flight levels 290 and FL 410 inclusive. Flight levels 310, 350, and 390 are "eastbound" cruising levels within RVSM airspace, whereas they are "westbound" cruising levels within non-RVSM airspace. This is an important consideration, particularly where non-RVSM airspace is located adjacent to, and east of, RVSM Airspace.

The route structure adaptation will be necessary in the transition airspace to avoid aircraft to fly opposite directions at the same flight level.

There is a requirement to establish RVSM entry/exit points designated as **compulsory reporting points** *at or near the boundaries between the EUR RVSM Airspace and adjacent non-RVSM airspace and compulsory reporting points at or near the boundaries between the EUR RVSM Airspace and the RVSM Transition Airspace for all ATS routes which cross such boundaries. The designation of these points as compulsory reporting points could enhance ATC's ability* **to detect air-ground communication failures**.

Relating to the establishment of compulsory reporting points, the proposed amendment to Doc. 7030 pertaining to air ground communication failure procedures, and specifically the proposed " **period of 7 minutes**" *should be taken into account.*

Detailed explanation can be found in section 7 of the amended ATC Manual for RVSM in Europe (Edition 2.0).

10. ACAS/RVSM DEPENDENCY

The implementation of RVSM is being undertaken with due regard for the operational performance of ACAS II. As indicated in the EUR ACAS Provisions, the mandatory use of ACAS II in Europe precedes the implementation of RVSM in Europe. It is considered important that TCAS II, Version 7 should be in widespread use before the EUR RVSM system is implemented. Analysis of TCAS II, Version 6.04A (or earlier) performance has revealed that, in an RVSM environment, it would generate a high number of nuisance Traffic Advisories (TAs) and Resolution Advisories (RAs).

One of the findings of the study has been conducted on the ACAS/RVSM interaction is that a high proportion of the nuisance RAs are caused by level-off encounters which will also be valid of V7.0 within RVSM airspace. Guidance has already been provided by many states to encourage pilots to reduce their aircraft vertical rate when approaching the cleared flight level while another aircraft is at an adjacent flight level. There is work in progress to provide revised guidance within ICAO Doc 8168 PANS OPS and ICAO Annex 6 to aircrews on climb rates as they approach level-off. This also includes military pilots operating within the GAT structure.

Pilots and controllers should be aware that a small population of aircraft will continue to operate within the European RVSM Airspace while operating either TCAS II, Version 6.04A (or earlier), or no ACAS, by virtue of the fact that they are not included in the criteria for mandatory carriage and operation, i.e. *civil, fixed-wing turbine aircraft of more than 15000 kg or maximum passenger load of more than 30*.   Safety studies initiated by EUROCONTROL are currently underway to define the operational impact such aircraft will have on the EUR RVSM Airspace.

It was recognised by the RVSM Programme that there is a need to increase the awareness of controllers and pilots as to the likely increase in alerts within RVSM airspace, regardless of the ACAS version logic fitted. One of the prime causes for nuisance alerts is the high vertical speeds as aircraft approach level-off which triggers alerts at adjacent flight levels.

- ATC training for RVSM should include a good understanding of the interaction and differing performance behaviour of TCAS versions V7.0 and V6.04a within the RVSM and CVSM environments.

- Pilot training for RVSM Approvals should include guidance on level-off procedures with specific regard to high vertical speed in an RVSM environment.

Considering the target date of 1 January 2005 concerning the equipment of some transport military aircraft with ACAS II and considering that only ACAS II equipment will fulfil RVSM requirements, Military Authorities which intend to equip aircraft with collision avoidance systems are recommended to purchase TCAS II, Version 7 when available. Version 6.04A of TCAS II is not ICAO ACAS SARPs compliant.

11. MILITARY CONSIDERATIONS

11.1 Introduction of RVSM and Military Operations

The introduction of RVSM on 24 January 2002 will affect the military community as an airspace user, ATS provider and as a regulator.

11.1.1 Airspace Users

Military aviation operates a wide range of aircraft types either:

- as GAT and being equipped to civil standards in the same way as civil GAT flights (in particular, transport aircraft operations may in general be considered as similar to those of commercial airlines);
- as GAT, but not being equipped to civil standards (in particular, fighters and training aircraft) because of the limited space available or technical impossibility of fitting the equipment to enable them to conform fully to civil standards;
- as OAT flights, equipped or not to civil standards, or
- exclusively in segregated airspace to perform in particular Air Defence and Air Combat manoeuvres, equipped or not to civil standards.

Military aviation will be impacted technically and operationally with RVSM introduction. RVSM will permit the handling of more aircraft in the upper airspace and this will result in additional workload on military ATC/AD to accommodate OAT requirements to cross ATS routes. Training of pilots and military controllers must take place to prepare these operational personnel for the new environment.

The retrofit of the military transport fleets has financial consequences as well as a technical and certification impact. When non-RVSM compliant State aircraft operate as GAT in RVSM airspace the complexity of the provision of a higher vertical separation minima can lead to operational disadvantages such as non-optimum routes and flight profiles and additional fuel consumption.

11.1.2 Provision of Military OAT Services and OAT/GAT Separation

Today, where the military ATS unit is responsible for the provision of OAT/GAT separation, the military OAT controller is still required to apply a minimum of 2000 ft between a State aircraft crossing an ATS route and any aircraft operating as GAT along this ATS route.

With the implementation of RVSM, for all cases where an aircraft operating within the EUR RVSM airspace is non-RVSM approved, it shall be provided with a minimum vertical separation of 2000 ft. Within the EUR RVSM airspace, a reduced vertical separation minimum of 1000 ft may only be applied where both the civil and military ATC units (all controllers) are fully aware the RVSM approval status of all traffic (aircraft) involved and all aircraft shall be RVSM approved.

However, with the addition of six extra flight levels, the traffic patterns and the increase in traffic, which RVSM could eventually generate, will affect the workload of the military controller in separating traffic in the vertical plane. The application of adequate real-time civil/military facilities and procedures as described in the FUA Concept reference documents would allow the safe and shared use of airspace between OAT and GAT without putting extra co-ordination workload on the military controller.

11.1.3 Military Regulations

According to their national legislation, some States have entrusted military authorities to establish regulations related to the provision of air traffic services to military flights operating as OAT and/or to the certification of military aircraft equipment.

With the implementation of RVSM and the subsequent suppression of assigned ICAO cruising flight levels, current OAT procedures, in particular those prescribing the use of flight levels for OAT operations, will need to be amended or modified.

Procedures for the approval/certification process of State (military) aircraft as RVSM compliant has to be elaborated if the appropriate national/military authority decides to do its own certification. In doing so, the requirements stated in Doc. 7030/4 and TGL n°6, Rev. 1 should be taken into account as guidance material.

11.2 Actions to be Taken by the Military

Within the RVSM Programme, a series of military related activities are foreseen, as of all stakeholders, the RVSM Programme needs commitments of the military authorities. A brief detail of the tasks to be achieved and their associated timescales are at Annex 1. In the context of RVSM, the military community has to be seen as acting as airspace user and ATS provider, including Air Defence, as well as being the regulating and certifying authority.

11.2.1 Airspace Users

In their capacity of airspace user, military authorities should:

- assess the impact of RVSM on their operations;
- modify transport aircraft where applicable;
- conduct flight crew training and amend operating practices and procedures where appropriate. Refs: Appendix 4 of TGL n° 6, Rev. 1 (Training Programmes and Operating Practices and Procedures) and ICAO Guidance Material EUR Doc. 009;
- provide flight planning guidance for operations in RVSM airspace.

11.2.2 As ATS Provider

In their capacity as ATS provider, military authorities are responsible for the safe handling of military aircraft flying in or across RVSM airspace and subsequently should:

- modify, where appropriate, their ATS Systems to cope with the new RVSM environment;
- complete/amend Letters of Agreement with civil ATS units;
- conduct training for ATC/AD controllers.

11.1.3 As Regulator

In their capacity as regulator, military authorities responsible for the safe operation of military aircraft and, in close co-operation with civil authorities within the National RVSM programme organisation, should:

- implement National Legislation/Regulation related to the provision of air traffic services in the RVSM environment;
- prepare airspace for the introduction of RVSM;
- launch a National RVSM awareness programme including military aspects;
- provide approval/certification criteria for military transport aircraft;
- approve suitably modified aircraft;
- seek to make their transport fleet compliant with MASPS where they regularly operate as GAT.

11.2.4 As Certification Authority

As certification authority, military authorities should:

- assess the possibilities of the military (transport) aircraft modification;
- assess the technical feasibility of modification;
- determine certification criteria;
- modify (transport) aircraft where applicable;
- monitor equipage rate;
- approve suitable modified aircraft.

ANNEX 1   MILITARY WORK PACKAGE

The Work Package for Military Aviation Preparation for RVSM is part of the Work Breakdown Structure (WBS) of the EUR RVSM Programme. It contains the detailed tasks to be achieved and the corresponding time schedules to meet the implementation of RVSM on 24 January 2002. The WBS (with start and finish dates) can be used a checklist for Military Authorities.

	Start	Finish
Military Aviation Preparation for RVSM	**03/09/98**	**23/01/02**
Co-ordination with Military aviation on RVSM preparation		
Initial Co-ordination with ECAC Military Community - CMIC involvement	17/02/99	01/06/99
Initial Co-ordination with non ECAC Military Community - Int'l events/NATO	19/03/99	14/09/99
Ongoing Co-ordination with ECAC Military Aviation	26/04/99	23/01/02
Ongoing Co-ordination with non ECAC Military Aviation	15/09/99	23/01/02
Impact of RVSM on Military	**01/12/98**	**22/01/02**
Conduct Impact Assessment on military aircraft	01/12/98	30/04/99
Conduct Reassessment of RVSM Impact on Military Aircraft	01/05/00	05/05/00
Conduct Reassessment of RVSM Impact on Military Aircraft	01/05/01	07/05/01
National Level 1 Assessment of RVSM Impact	03/05/99	15/09/99
Military Participation in Nat RVSM Prog Management Team	02/06/99	22/01/02
Conduct Reassessment of NLR Study	03/05/99	31/12/99
Military Operation Procedures Assessment	**16/09/99**	**28/09/01**
Conduct Assessment of Military Operational Procedures	16/09/99	30/08/00
Adapt Military Operational Procedures	09/12/99	30/08/00
Complete Letters of Agreement	03/01/00	28/09/01
Review flight planning aspects for GAT and OAT flights	01/05/00	29/12/00
Update related documents	01/05/00	29/12/00
Military ATS/Air Defence Modifications	**16/09/99**	**22/08/01**
Assess technical and software modifications if required	16/09/99	27/12/00
Modify ATS/AD systems if required	28/12/00	22/08/01
Military Aircraft Modifications	**23/03/99**	**28/09/01**
Produce Guidance Documentation & relevant information	23/03/99	20/12/99
Assess technical feasibility/financial aspects of Mil aircraft modifications	03/05/99	10/03/00
Determine Certification Criteria	03/05/99	10/03/00
Modify transport aircraft where applicable	13/03/00	27/08/01
Monitor equipage rate	13/03/00	27/08/01
Approve Suitably Modified Aircraft	11/09/00	28/09/01
Agree on National Airspace Modification Structure Level 1	**03/09/98**	**02/01/01**
Military RVSM Awareness	**01/06/99**	**24/12/01**
Military input to RVSM Awareness Programme	01/06/99	24/12/01
Crew and ATC personnel training	**31/08/00**	**30/11/01**
Establish Training Requirements	31/08/00	24/01/01
Perform crew training	25/01/01	08/10/01
Perform ATC and Air Defence training	19/04/01	30/11/01

ANNEX 2   REFERENCES

Document Name	Reference	Version
Report of the Special European Regional Air Navigation Meeting 09/94	ICAO Doc. 9639 SP EUR (1994)	N/A
Procedures for Air Navigation Services Rules of the Air and Air Traffic Services	ICAO Doc. 4444	
ICAO Manual on RVSM	ICAO Doc. 9574	1.0
JAA Temporary Guidance Leaflet n° 6 (Guidance material on the approval of aircraft and operators for flight in airspace above flight level 290 where a 300m (1.000 ft) vertical separation minimum is applied)	TGL 6 Revision 1	01/10/99
ATC Manual for Reduced Vertical Separation Minimum (RVSM) in Europe	Approved by ANT/18, 02/99; ANT/24,01/01 EUROCONTROL, ASM.ET.1.ST13.5000	2.0 Amend. 1, 01/01
ICAO Guidance Material on the Implementation of a 300m (1000 ft) Vertical Separation Minimum in the European RVSM Airspace	Endorsed by EANPG/40, 01/99 EUR Doc. 009	
Proposal for Amendment of the ICAO Supplementary Procedures (Doc. 7030/4) – European Region/RVSM area of applicability and method of application (technical requirements)	Endorsed by EANPG/40, 01/99 Approved by ICAO 10/12/99	
Proposal for Amendment of the ICAO Supplementary Procedures (Doc. 7030/4) – European Region – operational requirements	Endorsed by EANPG/41 29/11-02/12/99 Modified and approved by ICAO Amendment 200 12/12/00	
RVSM Master Plan of European Vertical Separation Minimum Programme	EUROCONTROL PC Approved (23/04/99). Permanent Commission Decision n° 78	3.5
Planning and Management of European ATM Programmes	PC/99/4/5	
Table of Cruising Levels	ICAO Annex 2 Appendix 3 § a	

Document Name	Reference	Version
Guidance Document for the Concept of the Flexible Use of Airspace	ASM. ET1.ST08-5000 Guid – 01-00 Edition 15/02/96	AL 3 11/98
On-Line Data Interchange (OLDI)	DPS.ET1. ST06 – STD – 01 –00 Edition 2.2	09/88
National Aeronautical Information Circulars (AICs) and/or Aeronautical Information Publications (AIPs)	RVSM AIC/1, AIC/2, AIC/3	

ANNEX 3   RVSM FLIGHT PLANNING REQUIREMENTS

1.   Introduction

Doc. 7030/4 states that flights are to be conducted in accordance with the instrument flight rules (even when not operating in instrument meteorological conditions) when operated within or above the EUR RVSM airspace. A flight plan will have to be submitted prior to operating in RVSM airspace to the air traffic services reporting office, either ad hoc or as repetitive flight plan (RPL).

2.   Flight Planning Requirements

RVSM compliance of the aircraft will have to be indicated with the letter "W" in Item 10 of the flight plan as well as "M" for military aircraft in Item 8 and all operators of non-RVSM approved State aircraft shall insert "STS/NONRVSM" in item 18 of the flight plan.

For Repetitive Flight Plans (RPLs) (not common but might be used by military), there will be a further obligation for all operators filing RPLs to include in Item Q of the RPL all equipment and capability information in conformity with Item 10 of the ICAO Flight Plan.

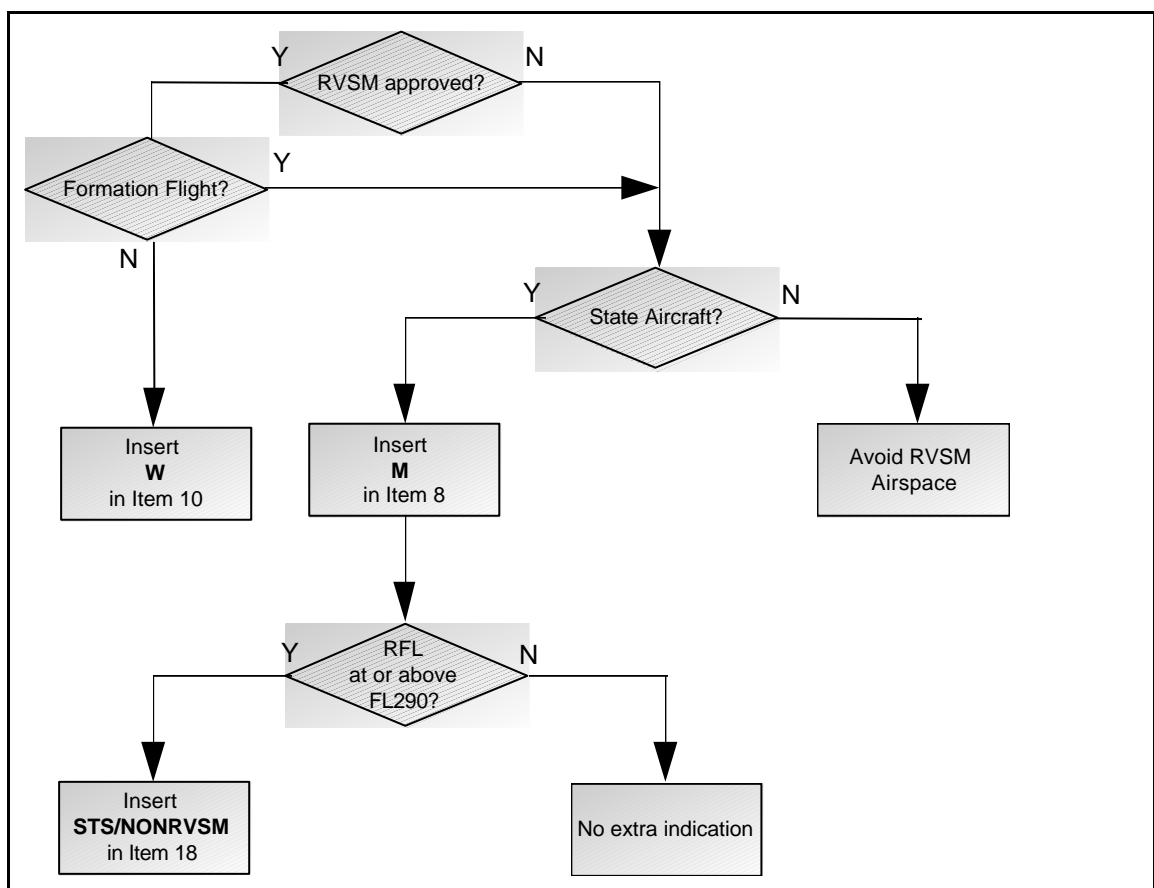### 3.   List of Flight Planning Requirements Relating to Military Operators

- The flight plan submitted for a flight intending to operate across the lateral limits of the RVSM airspace shall include in **Item 15** of the ICAO flight plan:

    - the **entry point** at the lateral limits of the RVSM airspace and the specific requested flight level (RFL) for that portion of the route commencing immediately after the entry point;
    - the **exit point** at the lateral limits of the RVSM airspace and the specific requested flight level (RFL) for that portion of the route commencing immediately after the exit point.

- All operators of **RVSM approved aircraft** shall insert the letter **"W" in Item 10** of the ICAO flight plan **regardless of the requested flight level**.

- All operators of **non-RVSM approved State aircraft** with a requested flight level of FL 290 or above shall insert the phrase **"STS/NONRVSM" in Item 18** of the ICAO Flight Plan.

- In addition to Operators of **military** aircraft, Operators of **customs** or **police** aircraft shall insert the letter **"M" in Item 8** of the ICAO flight plan if non-RVSM approved and intending to operate within the RVSM airspace.

- All operators filing **Repetitive Flight Plans** (RPL) shall include **in Item Q** of the RPL all equipment and capability information **in conformity with Item 10** of the ICAO Flight Plan. As a consequence, operators of RVSM approved aircraft shall also include the letter **"W" in Item Q** of the RPL **regardless of the requested flight level**.

- If a **change of aircraft** operated in accordance with a repetitive flight plan results in a modification of the RVSM approval status as stated in Item Q, a **modification message (CHG**) shall be submitted by the operator.

- Operators **of State aircraft**, not RVSM approved, filing **RPL**s including a RFL of FL 290 or above, shall include **"STS/NONRVSM" in Item Q.**

4. Formation Flights

- Regardless of the RVSM approval status of the individual aircraft concerned, the letter **"W"** shall **never** be inserted **in Item 10** of flight plans related to **formation flights of State aircraft**;

- Operators of **formation flights** involving **State aircraft** intending to operate **as GAT** in RVSM airspace shall include **"STS/NONRVSM" in Item 18** of the ICAO Flight Plan.

5. Overview of RVSM Flight Planning Requirements

ANNEX 4   AIRWORTHINESS AND STATE APPROVAL OF AIRCRAFT

The following can be used as guidelines for the airworthiness and approval process for State aircraft that regularly operate as GAT.

1.   TGL 6 Revision 1

Though State aircraft are exempted from compliance with RVSM requirements, Military Authorities are encouraged to make military aircraft compliant with RVSM MASPS as far as practicable. JAA Temporary Guidance Leaflet (TGL) n° 6 Rev. 1 is the authoritative document of the ECAC Member States on all issues relating to the European MASPS and on the approval of aircraft and operators for flight in designated RVSM airspace. It can be used as guidance to define the military specifications by the military certification/regulatory authorities.

TGL n° 6 provides detailed guidance on:

- The process for the approval of Aircraft and Operators for RVSM operations;
- RVSM performance requirements;
- Aircraft System requirements;
- Airworthiness Approval;
- Continued Airworthiness(Maintenance Requirements);
- Operational Approval (ATC and Flight Crew) aspects.

2.   Minimum Equipment Fit

- Two independent altitude measurement systems;
- One 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;
- An automatic altitude control system.

3.   State Approval of Aircraft for RVSM Operations

It should be noted that RVSM approval is not restricted to a specific region. Instead, it is valid globally on the understanding that any operating procedure specific to a given region, in this case the EUR region, should be stated in the operations manual or appropriate crew guidance.

4.   State Approval Process

With effect from the agreed date of implementation of RVSM in European airspace, Operators intending to conduct flights within the notified RVSM airspace shall require RVSM Approval either from the State in which the aircraft is registered or from the State in which the Operator is based. Whilst the primary responsibility for gaining the necessary approval must rest with the aircraft operator, State aviation authorities will be expected to initiate such procedures as necessary to publicise the requirement for, and the means of obtaining, such approvals. In addition, State aviation authorities should maintain regular checks and records of the approvals which they have granted and ensure that the relevant data is passed to the designated central database.

5.   RVSM Approvals

RVSM approval will encompass most of the following elements; further detailed guidance is available in TGL 6 Rev. 1. For RVSM airspace for which an operational approval is prescribed airworthiness approval alone does not authorise flight in that airspace.

- *Airworthiness Requirements (including continuous airworthiness)*

   TGL 6 Rev. 1 provides guidance for the approval of newly built aircraft and for aircraft which are already in service. Aircraft may be granted airworthiness approval against these requirements, or those of equivalent State documentation.

   State Airworthiness authorities should also confirm that aircraft altimetry and height keeping equipment would be maintained in accordance with approved procedures.

- *Operational Requirements*

   To meet the operational requirements of RVSM approval the operator will need to satisfy the appropriate authority that they have instituted flight crew procedures for operations in European RVSM airspace:

   - Description of Aircraft Equipment - appropriate to RVSM operations;
   - Training Programmes and Operating Practices and Procedures. Military Authorities should be assured that the operating practices, procedures and training items related to RVSM operations are incorporated in initial, and where appropriate, recurrent training programmes.
   - Operations Manuals and Checklists. The appropriate manuals and checklists should be revised to include information/guidance on standard operating procedures for RVSM operations.
   - Maintenance. When application is made for operational approval, the operator should establish a maintenance programme acceptable to the responsible authority.
   - The RVSM Performance Verification/Monitoring Programmes. This programme is available for Military Authorities to include a check on a sample of their fleet, where appropriate, by an independent height monitoring system. Approved State aircraft flying through the Height Monitoring Units will have their height keeping performance assessed.

6.   Suspension or Revocation of Approval for RVSM Operations

The incidence of height keeping errors that can be tolerated in an RVSM environment is small. Thus Operators will be expected to take immediate action to rectify the conditions which cause an error. The operator should report an occurrence involving poor height keeping to the responsible authority within 72 hours. The report should include an initial analysis of causal factors and measures taken to prevent any reoccurrence.

7.   Occurrences that should be reported and investigated are height keeping errors which display

- Total Vertical Error (TVE) equal to or greater than 300 ft (90m);
- Altimetry System Error (ASE) equal to or greater than 245 ft (75m);
- Assigned Altitude Deviation (AAD) equal to or greater than 300 ft (90m).

8.   Provision for the Monitoring of Aircraft

A programme to monitor or verify aircraft height-keeping performance is considered a necessary element of European RVSM implementation. Verification and monitoring programmes have the basic objective of observing and evaluating the height-keeping performance of MASPS equipped aircraft to:

- confirm the efficacy of the RVSM MASPS;
- monitor the effectiveness of the approval process;
- confirm that required safety levels will be achieved when RVSM is implemented.

9.   Database of State Approvals

State aviation authorities will be expected to maintain a State Database (SDB) of all approvals which they have granted for operations in RVSM airspace.

ANNEX 5   PHRASEOLOGY RELATED TO EUR RVSM OPERATIONS

1.   Controller/pilot RTF phraseology

Phrase	Meaning
(callsign) CONFIRM RVSM APPROVED	For a controller to ascertain the RVSM approval status of an aircraft.
NEGATIVE RVSM * status	For a pilot to report non-RVSM approval status: i) on the initial call on any frequency within the EUR RVSM airspace (controllers shall provide a read back with this same phrase); and ii) in all requests for flight level changes pertaining to flight levels within the EUR RVSM airspace; and iii) in all read backs to flight level clearances pertaining to flight levels within the EUR RVSM airspace. Additionally, except for State aircraft, pilots shall include this RTF phrase to read back flight level clearances involving the vertical transit through FL 290 or FL 410.
AFFIRM RVSM *	For a pilot to report RVSM approval status.
NEGATIVE RVSM STATE AIRCRAFT *	For a pilot of a non-RVSM approved State aircraft to report non-RVSM approval status, in response to the RTF phrase (callsign) CONFIRM RVSM APPROVED.
(callsign) UNABLE CLEARANCE INTO RVSM AIRSPACE, MAINTAIN [or DESCEND TO, or CLIMB TO] FLIGHT LEVEL (number)	Denial of air traffic control clearance into the EUR RVSM airspace.
UNABLE RVSM DUE TURBULENCE *	For a pilot to report when severe turbulence affects the aircraft's capability to maintain the height-keeping requirements for RVSM.
UNABLE RVSM DUE EQUIPMENT *	For a pilot to report that the aircraft's equipment has degraded below the MASPS required for flight within the EUR RVSM airspace. This phrase is to be used to convey both the initial indication of the non-MASPS compliance, and henceforth, on initial contact on all frequencies within the lateral limits of the EUR RVSM airspace until such time as the problem ceases to exist, or the aircraft has exited RVSM airspace.
READY TO RESUME RVSM *	For a pilot to report the ability to resume operation within the EUR RVSM airspace after an equipment or weather-related contingency.
REPORT ABLE TO RESUME RVSM	For a controller to confirm that an aircraft has regained its RVSM approval status, or to confirm that the pilot is ready to resume RVSM operations.

(indicates a pilot transmission)*

2. Phraseology between ATS units

Phrase	Meaning
NEGATIVE RVSM *or* NEGATIVE RVSM STATE AIRCRAFT [*as applicable*]	To verbally supplement an automated estimate message exchange that does not automatically transfer Item 18 information. Also used to verbally supplement estimate messages of non-RVSM approved aircraft.
UNABLE RVSM DUE TURBULENCE [*or* EQUIPMENT, *as applicable*]	To communicate the cause of a contingency relating to an aircraft that is unable to conduct RVSM operations due to severe turbulence or other severe weather-related phenomenon [or equipment failure, as applicable].