International Civil Aviation Organization

Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27)

Video Teleconference, 22 – 25 August 2022

Agenda Item 2: Review Outcomes of Related Meetings

OUTCOMES OF RASMAG-MAWG AND RMACG MEETINGS

(Presented by the Chairperson)

SUMMARY

This paper presents a brief summary from the 9th Meeting of the Monitoring Agencies Working Group (MAWG/9) in February 2022 and the 17th Regional Monitoring Agencies Coordination Group (RMACG/17) virtual discussion Part 1 in April 2022.

1. INTRODUCTION

1.1 The Ninth Meeting of the Regional Airspace Safety Monitoring Advisory Group Monitoring Agencies Working Group (RASMAG/MAWG/9) Virtual Meeting was held in February 2022. Thirty-six (36) participants attended the meetings from AAMA, BOBASMA, China RMA, JASMA, MAAR, PARMO, SEASMA, and ICAO Regional Officers from the Bangkok Office. 10 working papers, 15 information papers, and 3 Flimsies were reviewed.

1.2 The Seventeenth Regional Monitoring Agencies Coordination Group (RMACG/17) Virtual Meeting Part 1 was held in April 2022 via MS Team discussion platform, while the meeting Part 2 in a teleconference format remained to be organized in September 2022. The members representing 13 Regional Monitoring Agencies (RMAs) joined the discussion platform and reviewed 5 working papers, 16 information papers, and 1 Flimsy.

2. DISCUSSION

MAWG/9

FAA's Trial on Using Space-Based ADS-B (SBA) Data for ASE Monitoring

2.1 PARMO informed that the Federal Aviation Administration (FAA) signed a one-year agreement with Aireon in September 2020 to investigate the benefits of Space-Based ADS-B (SBA) data. The trial was extended until January 31, 2022. One of the benefits of SBA data was to provide an ASE monitoring method without ground infrastructure or dedicated airborne equipment. The SBA data gaps were observed in different locations and time zones. These should be considered in planning for the collection and use of SBA data for ASE analysis, and also for quality control prior to publishing official results. One important observation was that the gaps in data were clearly visible at locations and time with busy traffic.

2.2 PARMO would continue to develop an LHD detection tool via inferred flight level deviation trends and/or comparison with selected flight level and an 'Encounter' tool that could identify proximate aircraft to LHD events.

Removing the 1,000 Flight-Hour Requirement from ICAO Annex 6

2.3 China RMA presented the advantages and disadvantages of removing the 1,000 flight-hour requirement from ICAO Annex 6. The proposal was made that rather than removing the 1,000 flight-hour requirement from ICAO Annex 6, using it as a lesser requirement maybe more appropriate.

2.4 China RMA suggested that RMAs should use the two-year requirement priority when it was feasible. Otherwise, it should be decided by RMAs whether the operators can use the 1,000 flight-hour requirement, which is for preventing some operators using it as an excuse to avoid monitoring. When an operator is allowed to use the 1,000 flight-hour requirement, some evidence such as the flight time should be provided to the responsible RMA.

2.5 The meeting noted that some operators from the Asia Pacific regions may have limited height monitoring options. More information gathered from APAC State CAAs would be important for this discussion at the next RMACG meeting.

Treatment of TCAS RA-related LHDs

2.6 MAAR presented the draft proposal to serve as common guidance for APAC RMAs on how to treat TCAS RA-related LHDs. Regarding the current practices that APAC RMAs use to handle TCAS RA -related reports, the different treatments of TCAS RA reports did not have much influence on the high number of Cat J LHDs in Fukuoka FIR as reported by JASMA. A more significant factor seemed to be the volume, density, and complexity of the traffic in the Fukuoka FIR, especially in complex airspace near terminal areas. The analysis showed the drastic reduction of Category J LHD in 2020, when the traffic level decreased due the travel restrictions during the pandemic. In other airspace, the awareness and reporting culture of TCAS RA events to an RMA was another key factor that influenced the frequencies of TCAS RA-related LHDs.

2.7 The meeting agreed to the following proposals as common guidance for APAC RMAs on how to treat TCAS RA-related reports.

a) If there was an operational error leading to the RA that fits the definition of an LHD, then the RMA should treat that error as a separate LHD. The category of this LHD should correspond to the nature of that operational error.

b) For all vertical deviations as a result of the TCAS RA itself that have a magnitude of 300 feet or more,

   i. be recorded as Category K LHDs and treated as operational errors. if the flight crew correctly follow the RA, the deviations should be recorded as Category J LHDs and treated as technical error.

   ii. if the flight crew incorrectly follow the RA, the deviations should

c) For all non-deviations resulting from the flight crew disregarding the TCAS RA, they should be recorded as Category K LHDs and treated as operational errors.

LHD/LLD/LLE Occurrence and Hot Spot Analysis

2.8 The APAC RMAs presented their analysis on LHD/LLE/LLD occurrences and hot spots. The meeting extensively discussed about the reporting criteria, the reporting mechanism, and the benefits from reporting occurrences. The meeting also agreed that the LHD Material Package should be updated as it would help States and ANSPs better understand the LHD definition and criteria.

Management Process of Hot Spots for RASMAG

2.9 MAAR presented a draft process of identifying, monitoring and removing LHD hot spots for APAC RMAs and EMAs to review and adjust before presenting to the RASMAG. Results of the experiment on the proposed hot spot identification process were also discussed.

2.10 The meeting agreed with the Chair's suggestion that the process should be conducted as a trial this year before making a decision by the monitoring agencies and States. All monitoring agencies would try using the approach in their safety reports for the RASMAG/27.

Performance-Based Communication and Surveillance (PBCS) Oversight

2.11 SEASMA, JASMA, NAARMO/PARMO, and China RMA reported updates of their PBCS monitoring program. The FAA and JCAB have been considering and discussing the implementation of the 23-NM lateral separation minima with the performance requirements of RNP4, RSP180 and RCP240 in the Pacific Ocean airspace of Anchorage and Oakland Oceanic FIR and Fukuoka FIR.

Verification of 'W' for State Aircraft in Asia Pacific Region

2.12 The meeting recalled the discussion at the RASMAG/26 about the verification of 'W' in flight plan for State aircraft. A draft conclusion was proposed to APANPIRG/32 and the final conclusion was adopted as:

Conclusion APANPIRG/32-6: RVSM Approvals Data and Filing of RVSM Indicator in Flight Plans of State Aircraft

States are urged to:

1. Liaise with their State aircraft operators to not file 'W' in item 10 of the ICAO flight plan of aircraft that are not approved for RVSM; and
2. Respond to a survey on RMA and State responsibility on the matter of RVSM approvals of State aircraft.

2.13 With reference to Conclusion APANPIRG/32-6, PARMO sent an email to their delegated States requesting a voluntary list of their State aircraft that regularly have operations in RVSM airspace and are RVSM approved. The purpose of this request is to improve airspace safety by ensuring that only RVSM-approved State aircraft submit flight plans that indicate RVSM capability.

2.14 MAAR proposed a draft questionnaire to gather States' opinion regarding the continuance of 'W' check for State Aircraft in APAC and invited the meeting to review the draft questionnaire. The meeting agreed that the survey would be launched by the ICAO Regional Office to the APAC member States, including those States that already received email from PARMO.

ADS-B Height Monitoring Video

2.15 MAAR developed ADS-B Height Monitoring System (AHMS) video to serve as an educational material for organizations, such as RMAs or ICAO member States. The videos would be reviewed by the MAWG and RMACG before its publication.

RMACG/17 Part 1

RMA Oversight Activities

2.16 All RMAs presented and followed up on results of their oversight activities (as applicable):

a) RVSM approval check - the flight plan audit for aircraft operating in the RVSM airspace without proof of RVSM approval;

b) monitoring burden - the assessment of aircraft operators against the long-term height monitoring requirements; and

c) PBCS approval check - the assessment of aircraft operating with 'P2' and 'RSP180' in their flight plans without proof of PBCS approval/authorization.

RVSM Minimum Monitoring Requirement (MMR)

2.17 The meeting reviewed and adopted the proposed amendments to the MMR for 2022. The changes were Boeing 737-8200, a new variant of the 737 MAX 8, to be added to the MMR, and the Piper PA46-500TP and Piper PA46-600TP to be added to the MMR. The **Attachment** to this paper is the latest version (version 2022) of the MMR.

ASE Performance of Aircraft Groups

2.18 As an annual routine procedure, MAAR presented a high-level summary of each aircraft group performance in terms of average Altimetry System Error (ASE) across different height monitoring systems from 12 RMAs.

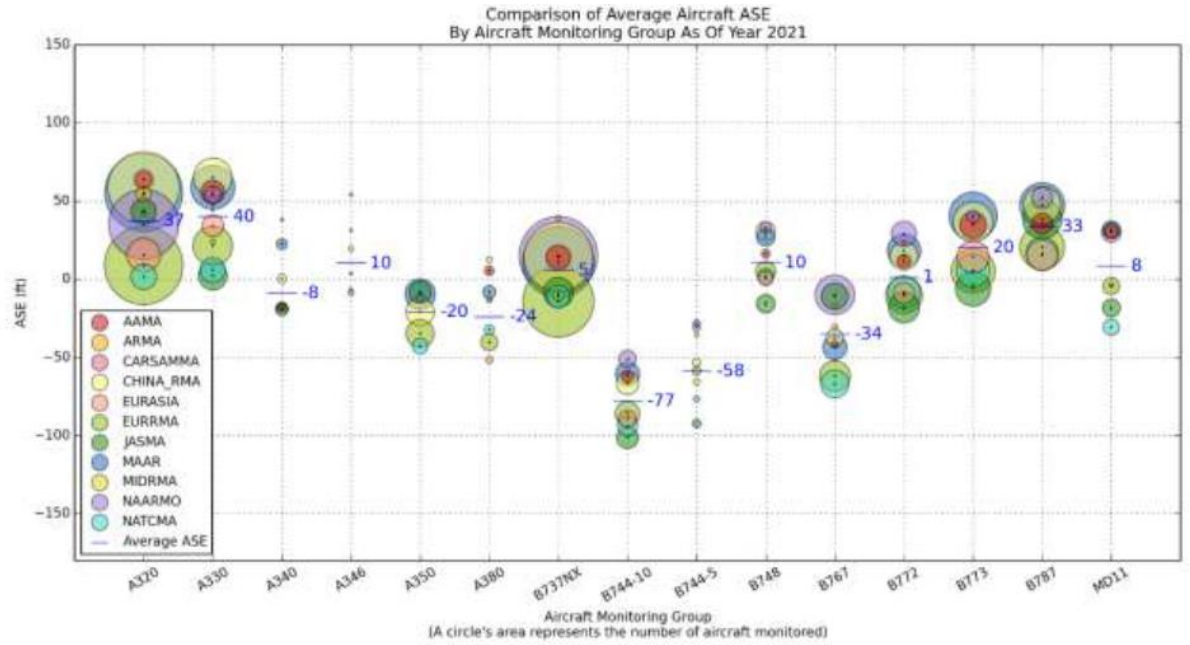

Figure 1: Comparison of aircraft group ASE by aircraft monitoring group as of year 2021 (Airbus, Boeing, and MD11)

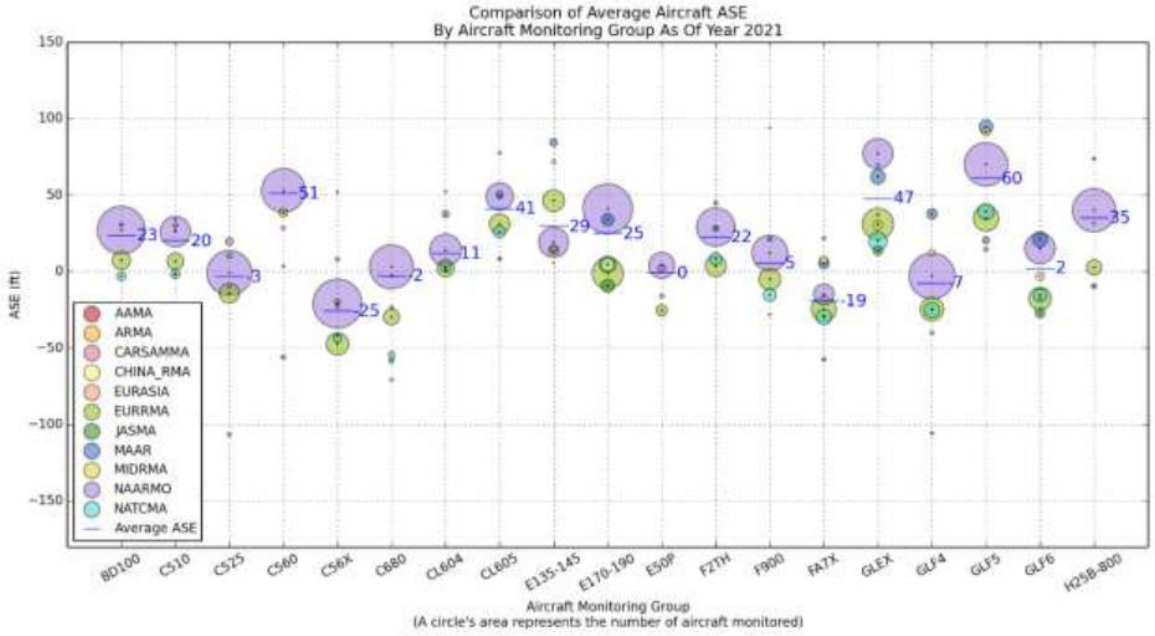

Figure 2: Comparison of aircraft group ASE by aircraft monitoring group as of year 2021 (other major groups)

2.19 As illustrated in **Figure 1** and **Figure 2**, the 2021 global average ASE of each aircraft group did not exceed the MASPS limit of 25 m (80 ft), a criterion specified in the Technical Height-Monitoring Requirements Section of ICAO Doc 9937 Operating Procedures and Practices for RMA.

2.20 NAARMO presented results of the average estimated ASE for aircraft monitoring groups obtained from ADS-B in 2021. The following observations were made.

a) The observed ASE performance of B712 and B727 groups exceed the requirements. The ASE has slightly decreased for both groups from 2020 but will continue to be watched.

b) The B744 group continues to improve due mostly to the retirement of airframes and some to individual airframe maintenance.

c) The B767 group remains steady in its improved state. This is because of newer maintenance procedures taking effect and new aircraft entering service.

d) The observed ASE performance of ASTR, ASTR-SPX, C441, and C500 groups exceed the requirements. NAARMO has been working in conjunction with FAA Flight Standards in regards to the ASTRA and Cessna groups. As of right now, there is an effort to fix each aircraft on an individual basis as needed.

e) The observed ASE performance of FA10, GLF5, H25-700 group exceed the requirements. These groups will continue to be watched.

f) The P180, P180-II and LJ55 group, all having large ASE mean values, exceed the requirements. LJ55 has increased since the previous year. The P180 group has been a topic of discussion in past meetings, and it was decided to handle large ASE on an individual aircraft basis.

PBCS Non-Compliance Reporting

2.21 NAARMO/PARMO shared experience thus far with processing PBCS non-compliance reports. As an RMA, NAARMO and PARMO have implemented responsibilities related to receiving and transmitting reports of aircraft determined to be non-compliant through the PBCS monitoring process. The reporting of non-compliant PBCS aircraft is a component to the PBCS Manual under the ICAO Doc9869 guidance. It was expected that a standardized implementation of non-compliance reporting practices would become universally adopted and consistent reporting among the States and RMAs. It is NAARMO and PARMO's experience that there has been a lack in reports received, some gaps in the data, and delayed receipt of reports.

- Number of Reports Expected:
  - When reports are not received it is unclear whether no monitoring is occurring or if all monitoring shows compliant performance.
  - It may be useful for ANSPs to provide RMAs with confirmation there were no non-compliance reports for the expected period.
- Timeliness of data received:
  - Data compilation, analysis, problem investigation is a large workload for ANSPs and is typically not completed until two to three weeks into the month following the end of the three-month analysis period.
  - Reports that must go through another RMA first take longer to arrive to NAARMO (e.g. NAT ANSPs report to NAT CMA and then NAT CMA has to organize and redistribute to create reports to NAARMO and other RMAs).
  - This means reports come in at staggered times and it is difficult to know how long to wait for all possible incoming reports to then go through the work of creating the outgoing reports. In most cases, this means NAARMO has to complete the process twice for a given monitoring period.
  - Because of this, monthly reports still have a lag time between ANSP and operator. Reports will not likely arrive at operator until up to two months after the end of the previous monitoring period.
- PBCS contacts at State/Civil Aviation Authority (CAA) level are not always known.
  - The RMA contacts at the State/CAA level are typically centered around RVSM and in most cases there are different points of contact for PBCS. In some cases, there may be no dedicated, informed PBCS contact to receive and action the non-compliance reports.
  - If the reports do not make it to the State/CAA, they will not make it to the operator. NAARMO and PARMO are seeing some repeat offenders in the monthly reports that make it appear the reports are not making it to the operators. This means these aircraft are continuing to have RCP240/RSP180 indicators in their flight plans indicating State-authorized eligibility for performance-based operations, while being observed with performance below the requirements.
  - If this issue is encountered and unable to be resolved with the known State contacts, the RMA may need to alert their respective Planning and Implementation Regional Group (PIRGs) to ensure that the associated risks are known and resolved.

- State involvement in PBCS implementation and participation are not always known.
  - It has been observed that in some cases, while RMAs continue to take the necessary measures to promote and harmonize policies and procedures in airspace that PBCS are applied, State participation is absent and it is not known whether these States are or continue to monitor. Additionally, some States that were initially or at some point participating in non-compliant reporting and monitoring have not done so for an extended period.

- The overall PBCS non-compliance reporting process is very much manual.
  - This includes the receipt, organization and redistribution of the incoming reports, and the emails to the various downstream entities.

- Tracking of non-compliant aircraft
  - Implementation of a successful system involving non-compliance monitoring and reporting is promising and has proven to have impactful results, but continues to be a work in progress and has seen delays in communication among and across different entities.
  - The expectations for actions or corrective actions and the responsibilities to whom the required procedures pertain to at times are complex, making the potential increase in workload for tracking of non-compliant aircraft without knowledge of whom the responsible party or parties may be, unrequited.

2.22 NAT CMA also shared their experience with processing PBCS non-compliance reports that there had been irregular intervals between reports received from NAT ATSPs and occasionally no reports received. All NAT ATSPs have small teams working on the PBCS reports and the NAT CMA recognizes the challenges faced by them and are grateful for their continued efforts. Current challenges faced include resource, reorganization, sickness and local holidays all affecting the monthly output schedule. The NAT CMA will continue to monitor the situation and use the best option identified at the time of receiving reports and is open to ongoing dialogue and improvement activities with other RMAs and ATSPs to deliver a more efficient transfer of data.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper;

b) review the proposals on how to treat TCAS RA-related reports (paragraph 2.7) and adopt as common guidance for APAC RMAs;

c) adopt the MMR version 2022 for applicability in the Asia Pacific region (Attachment);

d) consider communications with designated RMAs regardless of observed PBCS non-compliant aircraft status (paragraph 2.21 - 2.22); and

e) discuss any relevant matters as appropriate.

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RVSM MONITORING GROUPS AND MINIMUM MONITORING REQUIREMENTS

AS OF: 29 April 2022

Version: 2022.0

1. UPDATE OF MONITORING REQUIREMENTS TABLE AND WEBSITE. As significant data is obtained, monitoring requirements for specific aircraft types may change. When Table 1 below, is updated, a letter will be distributed by the Regional Monitoring Agencies (RMAs) to the States concerned. The updated table will be posted on the RMA website being maintained by the International Civil Aviation Organization (ICAO). The secure website address is: http://portal.icao.int

2. INITIAL MONITORING. All operators that operate or intend to operate in airspace where RVSM is applied are required to participate in the RVSM monitoring program. Table 1 establishes requirements for initial monitoring associated with the RVSM approval process. In their application to the appropriate State authority for RVSM approval, operators must show a plan for meeting the applicable initial monitoring requirements.

3. AIRCRAFT STATUS FOR MONITORING. Aircraft engineering work that is required for the aircraft to receive RVSM airworthiness approval must be completed prior to the aircraft being monitored. Any exception to this rule will be coordinated with the State authority.

4. APPLICABILITY OF MONITORING FROM OTHER REGIONS. Monitoring data obtained in conjunction with RVSM monitoring programs from other regions can be used to meet regional monitoring requirements. The RMAs, which are responsible for administering the monitoring program, have access to monitoring data from other regions and will coordinate with States and operators to inform them on the status of individual operator monitoring requirements.

5. MONITORING PRIOR TO THE ISSUE OF RVSM OPERATIONAL APPROVAL IS NOT A REQUIREMENT. Operators should submit monitoring plans to the responsible civil aviation authority and the RMA that show how they intend to meet the requirements specified in Table1. Monitoring will be carried out in accordance with this table.

6. AIRCRAFT GROUPS NOT LISTED IN TABLE 1. Contact the RMA for clarification if an aircraft group is not listed in Table 1 or for clarification of other monitoring related issues. An aircraft group not listed in Table 1 will probably be subject to Category 2 monitoring requirements.

7. TABLE OF MONITORING GROUPS. Table 2 shows the aircraft types and series that are grouped together for operator monitoring purposes.

8. TABLE OF NON-GROUP AIRCRAFT: Table 3 shows the aircraft types and series that are Non-Group aircraft (i.e., Not certified under group approval requirements) for monitoring purposes.

9. TRAILING CONE DATA. Altimetry System Error estimations developed using Trailing Cone data collected during RVSM certification flights can be used to fulfill monitoring requirements. It must be documented, however, that aircraft RVSM systems were in the approved RVSM configuration for the flight.

10. MONITORING OF AIRFRAMES THAT ARE RVSM COMPLIANT ON DELIVERY. If an operator adds new RVSM compliant airframes of a type for which it already has RVSM operational approval and has completed monitoring requirements for the type in accordance with the attached table, the new airframes are not required to be monitored. If an operator adds new RVSM compliant airframes of an aircraft type for which it has NOT previously received RVSM operational approval, then the operator should complete monitoring in accordance with the attached table.

11. FOLLOW-ON MONITORING. Monitoring is an on-going program that will continue after the RVSM approval process. Long term minimum monitoring requirements are established in the Annex 6 to the Convention on International Civil Aviation. On a regional basis, a programme shall be instituted for monitoring the height-keeping performance of aircraft operating in RVSM airspace in order to ensure that continued application of this vertical separation minimum meets regional safety objectives.

Table 1: MONITORING REQUIREMENTS TABLE (Civilian)

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE

MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT

CATEGORY		GROUP DESCRIPTOR	MINIMUM MONITORING REQUIREMENTS
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	A124, A30B, A306, A310-GE, A310-PW, A318, A320, A330, A340, A345, A346, A380, A3ST, AVRO, B712, B727, B737C, B737CL, B737NX, B747CL, B74S, B744-5, B744-10, B748, B752, B753, B764, B767, B772, B773, B787, BD100, BE40, C25A, C25B, C510, C525, C560, C56X, C650, C680, C750, CARJ, CL600, CL604, CL605, CRJ7, CRJ9, DC10, E135-145, E170-190, E50P, E55P, F100, F900, FA7X, GALX, GLEX, GL5T, GLF4, GLF5, H25B-800, J328, LJ40, LJ45, LJ60, MD10, MD11, MD80, MD90, PC12, PRM1, T154	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A148, A158, A20N, A337, A339, A350, A35K, AC90, AC95, AJ27, AN72, ASTR, ASTR-SPX, B701, B703, B731, B732, B37M, B38M, B39M, B744-LCF, B779, B78X, BCS1, BE20, BE30, C25C, C441, C500, C550-B, C550-II, C550-SII, C700, CRJ10, D328, DC85, DC86-87, DC91, DC93, DC94, DC95, EPIC, E120, E45X, EA50, E545-550, E290, E295, F2TH, F70, FA10, FA20, FA50, G150, G280, GL7T, GLF2, GLF2B, GLF3, GLF6, GLF7, H25B-700, H25B-750, H25C, HA4T, HDJT, IL62, IL76, IL86, IL96, L101, L29B-2, L29B-731, LJ23, LJ24, LJ25, LJ28, LJ31, LJ35-36, LJ55, MC21, MU30, PA46, P180, P180-II, PAY4, PC24, SB20, SBR1, SBR2, SF50, SU95, T134, T204, T334, TBM, WW24, YK42	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring, (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.
3	NON-GROUP	Aircraft types for which no generic compliance method exists: A225, AN12, AN26, B190, B462, B463, B74S-SOFIA, BA11, BE9L, FA6X, GSPN, H25A, L29A, PAY3, R721, R722, SJ30, STAR	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1,000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.

Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A124	A124	AN-124 RUSLAN	
A148	A148	AN-148	
A158	A158	AN-158	
A30B	A30B	A300	
A306	A306	A300	
A310-GE	A310	A310	Series: 200, 200F, 300, 300F
A310-PW	A310	A310	Series: 220, 220F, 320, 320F
A318	A318	A318	
A320	A319 A320 A321	A319 A320 A321	
A20N	A19N A20N A21N A21N A21N	A319neo A320neo A321neo A321LR A321XLR	
A330	A332 A333	A330 A330	
A337	A337	AIRBUS BELUGA XL (A330-743L)	
A339	A339 A338	A330-900neo A330-800neo	
A340	A342 A343	A340 A340	
A345	A345	A340	
A346	A346	A340	
A350	A359	A350-900 A350-900 ULR	
A35K	A35K	A350-1000	
A380	A388	A380	
A3ST	A3ST	A300	600R ST BELUGA
AC90	AC90	COMMANDER 690 COMMANDER 840 COMMANDER 900	
AC95	AC95	AERO COMMANDER 695	
AN72	AN72 AN74	ANTONOV AN-72 ANTONOV AN-74	
ASTR	ASTR	1125 ASTRA	S/n 1-78, except 73
ASTR-SPX	ASTR	1125 ASTR SPX, G100	S/n 73, 79-145 S/n > 145
AVRO	RJ1H RJ70 RJ85	RJ100 Avroliner RJ70 Avroliner RJ85 Avroliner	
B37M	B37M	Boeing 737 MAX 7	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
B38M	B38M B38M	Boeing 737 MAX 8 Boeing 737 MAX 8200	
B39M	B39M	Boeing 737 MAX 9	
B701	B701	B707	
B703	B703	B707	Series 320, 320B, 320C
B712	B712	B717	
B727	B721 B722	B727 B727	
B731	B731	B737	
B732	B732	B737	
B737CL	B733 B734 B735	B737-300 B737-400 B737-500	
B737NX	B736 B737 B738 B739 B739	B737-600 B737-700 B737-800 B737-900 B737-900ER	 B737-700 including the BBJ B737-800 including the BBJ2
B737C	B737	B737-700	Series: 700C
B747CL	B741 B742 B743	B747-100 B747-200 B747-300	
B74S	B74S B74R	B747SP B747SR	
B744-5	B744 B74D	B747-400	5 inch Probes up to s/n 25350
B744-10	B744 B74D	B747-400	10 inch Probes from s/n 25351
B744-LCF	BLCF	B747-400	
B748	B748	B747-8	
B752	B752	B757-200	
B753	B753	B757-300	
B767	B762 B763	B767-200 B767-300	
B764	B764	B767-400	
B772	B772 B772 B77L B77L	B777-200 B777-200ER B777-F B777-200LR	
B773	B773 B77W	B777-300 B777-300ER	
B779	B779	B777-9	
B787	B788 B789	B787-8 B787-9	
B78X	B78X	B787-10	
B8200	B38M	B737-8200 B737-MAX8-200 B737-MAX200	Not including the standard B737-MAX8 which is in the B38M Monitoring Group above

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
BCS1	BCS1	BOMBARDIER CS100	
	BCS1	AIRBUS A220-100	
	BCS3	BOMBARDIER CS300	
	BCS3	AIRBUS A220-300	
BD100	CL30	CHALLENGER 300	
	CL35	CHALLENGER 350	Begins at s/n 20501
BE20	BE20	200 KINGAIR	
BE30	BE30	B300 SUPER KINGAIR	
	B350	B300 SUPER KINGAIR 350	
BE40	BE40	BEECHJET 400	
		BEECHJET 400A	
		BEECHJET 400XP	
		HAWKER 400XP	
C441	C441	CONQUEST II	
C500	C500	500 CITATION	
	C500	500 CITATION I	
	C501	501 CITATION I SINGLE PILOT	
C510	C510	MUSTANG	
C525	C525	525 CITATIONJET	
		525 CITATIONJET 1	
		525 CITATIONJET PLUS	
	C25M	C525-M2	S/n 800 and on
C25A	C25A	525A CITATIONJET II	
C25B	C25B	CITATIONJET III	
		525B CITATIONJET III	
C25C	C25C	525C CITATIONJET IV	
C550-B	C55B	550 CITATION BRAVO	S/n 550-0801 and on
C550-II	C550	550 CITATION II	S/n 550-0001 to 550-0800
	C551	551 CITATION II SINGLE PILOT	
C550-SII	C550	S550 CITATION SUPER II	S/n starts with “S”
C560	C560	560 CITATION V	
		560 CITATION V ULTRA	
		560 CITATION V ENCORE	
		560 CITATION V ENCORE PLUS	
C56X	C56X	560 CITATION EXCEL	
		560 CITATION XLS	
		560 CITATION XLS PLUS	
C650	C650	650 CITATION III	
		650 CITATION VI	
		650 CITATION VII	
C680	C680	680 CITATION SOVEREIGN	
	C68A	680-A LATITUDE	“A” in s/n
C700	C700	700 CITATION LONGITUDE	
C750	C750	750 CITATION X	
CARJ	CRJ1	CRJ-100	
	CRJ2	CRJ-200	
	CRJ2	CRJ-440	
	CRJ2	CHALLENGER 800	
	CRJ2	CHALLENGER 850	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
CRJ7	CRJ7 CRJ7	CRJ-700 CRJ-550	
CRJ9	CRJ9 CRJ9	CRJ-705 CRJ-900	
CRJ10	CRJX	CRJ-1000	
CL600	CL60	CL-600 CL-601	S/n < 5000
CL604	CL60	CL-604 CL-601-3A CL-601-3R	S/n 5000-5700 S/n 5001-5134 S/n 5135-5300
CL605	CL60 CL60	CL-605 CL-650	S/n > 5700
DC10	DC10	DC-10	
D328	D328	328 TURBOPROP	
DC85	DC85	DC-8	
DC86-87	DC86 DC87	DC-8 DC-8	
DC91	DC91	DC-9	
DC93	DC93	DC-9	
DC94	DC94	DC-9	
DC95	DC95	DC-9	
EPIC	EPIC	Epic E1000	
E120	E120	EMB-120 Brasilia	
E135-145	E135 E145 E35L	EMB-135 EMB-145 EMB-135BJ Legacy 600/650	
E45X	E45X	EMB-145 XR	
E170-190	E170 E170 E75S E75L E190 E190	E170 E175 E170-200 short wing E175 long wing E190 E195	
E290	E290	E190-E2	
E295	E295 E295	E195-E2 E190-400	
E50P	E50P	PHENOM 100	
E545-550	E545 E545 E550 E550	EMB-545 LEGACY 450 EMB-545 PRAETOR 500 EMB-550 LEGACY 500 EMB-550 PRAETOR 600	
E55P	E55P	PHENOM 300	
EA50	EA50	ECLIPSE	
F100	F100	FOKKER 100	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
F2TH	F2TH	FALCON 2000 FALCON 2000-EX FALCON 2000LX FALCON 2000-LXS FALCON 2000-S	
F70	F70	FOKKER 70	
F900	F900	FALCON 900 FALCON 900DX FALCON 900EX FALCON 900LX	
FA10	FA10	FALCON 10	
FA20	FA20	FALCON 20 FALCON 200	
FA50	FA50	FALCON 50 FALCON 50EX	
FA7X	FA7X FA8X	FALCON 7X FALCON 8X	
G150	G150	G150	
G280	G250 G280	G250 G280	
GALX	GALX	1126 GALAXY G200	
GLEX	GLEX	GLOBAL EXPRESS CLASSIC GLEX GLOBAL XRS GLOBAL 6000 GLOBAL 6500	EXPRESS S/n > 9158 S/n > 9431, and 9313 and 9381 S/n > 60001
GL5T	GL5T	GLOBAL 5000 GLOBAL 5000-GVFD GLOBAL 5500	 S/n > 9434, and 9386 and 9401 S/n > 60001
GL7T	GL7T	GLOBAL 7500	
GLF2	GLF2	GULFSTREAM II (G-1159)	
GLF2B	GLF2	GULFSTREAM IIB (G-1159B)	
GLF3	GLF3	GULFSTREAM III (G-1159A)	
GLF4	GLF4	GULFSTREAM IV (G-1159C) G300 G350 G400 G450	
GLF5	GLF5	GULFSTREAM V (G-1159D) G500 G550	
GLF6	GLF6	G650	
GLF7	GA5C GA6C	G500 GVII G600 GVII	
H25B-700	H25B	BAE 125 / HS125	Series: 700A, 700B
H25B-750	H25B	HAWKER 750	

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
H25B-800	H25B	BAE 125 / HS125	Series: 800A, 800B
		HAWKER 800XP HAWKER 800XPI HAWKER 800 HAWKER 850XP HAWKER 900XP HAWKER 950XP	
H25C	H25C	HAWKER 1000	
HA4T	HA4T	HAWKER 4000	
HDJT	HDJT	HONDAJET HA-420	
IL62	IL62	ILYUSHIN-62	
IL76	IL76	ILYUSHIN-76	
IL86	IL86	ILYUSHIN-86	
IL96	IL96	ILYUSHIN-96	
J328	J328	328JET	
L101	L101	L-1011 TRISTAR	
L29B-2	L29B	L-1329 JETSTAR II	
L29B-731	L29B	L-1329 JETSTAR 731	
LJ23	LJ23	LEARJET 23	
LJ24	LJ24	LEARJET 24	
LJ25	LJ25	LEARJET 25	
LJ28	LJ28	LEARJET 28 LEARJET 29	
LJ31	LJ31	LEARJET 31	
LJ35-36	LJ35	LEARJET 35, 35A LEARJET 36, 36A	
LJ40	LJ40 LJ70	LEARJET 40 LEARJET 70	Begins at s/n 2001 Begins at s/n 2134
LJ45	LJ45 LJ75	LEARJET 45 LEARJET 75	 Begins at s/n 456
LJ55	LJ55	LEARJET 55	
LJ60	LJ60	LEARJET 60	
MC21	MC21	IRKUT MC21-300	
MD10	MD10	MD-10	
MD11	MD11	MD-11	
MD80	MD81 MD82 MD83 MD87 MD88	MD-80 MD-80 MD-80 MD-80 MD-80	
MD90	MD90	MD-90	
MU30	MU30	MU-300 DIAMOND	1A
PA46	PA46	PA46-500TP PA46-600TP	
P180	P180	P-180 AVANTI	S/n < 1105 but not 1002
P180-II	P180 P180	P-180 AVANTI II P-180 AVANTI EVO	S/n > 1104 and also 1002

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
PAY4	PAY4	PA-42 Cheyenne 400	Series: 1000 CHEYENNE
PC12	PC12	Pilatus PC-12	
PC24	PC24	Pilatus PC-24	
PRM1	PRM1	PREMIER 1	
SB20	SB20	SAAB 2000	
SBR1	SBR1	SABRELINER 40 SABRELINER 60 SABRELINER 65	
SBR2	SBR2	SABRELINER 80	
SF50	SF50	CIRRUS SF50	RVSM-capable s/n 8, 89, and 94 or above
SU95	SU95	SUKHOI SUPERJET 100-95	
T134	T134	TU-134	
T154	T154	TU-154	
T204	T204	TU-204 TU-214 TU-224 TU-234	
T334	T334	TU-334	
TBM	TBM7 TBM8 TBM9	TBM-700 TBM-850 TBM-900	TBM8 with winglets, begins at s/n 1000
WW24	WW24	1124 WESTWIND	
YK42	YK42	Yakovlev YAK-42 Yakovlev YAK-40	

Table 3: Non-GROUP AIRCRAFT (i.e., Not certified under group approval requirements) (Civilian)

Non-Group Descriptor	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A225	A225	ANTONOV AN-225	Non-Group
AN12	AN12	ANTONOV AN-12	Non-Group
AN26	AN26	ANTONOV AN-26	Non-Group
B190	B190	BEECH 1900	Non-Group
B462	B462	BAe-146-200	Non-Group
B463	B463	BAe-146-300	Non-Group
B74S-SOFIA	B74S	NASA B74SP with Sofia telescope	Non-Group: N747NA (s/n 21441)
BA11	BA11	BAC-111	Non-Group
BE9L	BE9L	Beechcraft King Air C90GT Beechcraft King Air C90GTI King Air Model 90 except F90 and F90-1	Non-Group
FA6X	FA6X	Falcon 6X	Non-Group
GSPN	GSPN	GROB G-180 SPn Utility Jet	Non-Group
H25A	H25A	HS125-400, -600	Non-Group
L29A	L29A	L-1329 JETSTAR 6/8	Non-Group
PAY3	PAY3	PIPER Cheyenne 3	Non-Group

Non-Group Descriptor	A/C ICAO	Manufacturer Type	Additional Defining Criteria
R721	R721	B-727-100: Re-engined	Non-Group
R722	R722	B-727-200: Re-engined	Non-Group
SJ30	SJ30	SWEARINGEN SJ-30	Non-Group
STAR	STAR	BEECH 2000 STARSHIP	Non-Group

Table 1: MONITORING REQUIREMENTS TABLE (Military)

MONITORING IS REQUIRED IN ACCORDANCE WITH THIS TABLE

MONITORING PRIOR TO THE ISSUE OF RVSM APPROVAL IS **NOT** A REQUIREMENT

CATEGORY		GROUP DESCRIPTOR	MINIMUM MONITORING REQUIREMENTS
1	GROUP APPROVED: DATA INDICATES COMPLIANCE WITH THE RVSM MASPS	C17, C130, KC135	Operators of aircraft types contained in this category shall have a minimum of 2 airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring. Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each group in the fleet. In the event that an operator has a single airframe from a Group, then that aircraft shall be monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring.
2	GROUP APPROVED: INSUFFICIENT DATA ON APPROVED AIRCRAFT	Other group aircraft other than those listed above including: A178, A400, C5, C550-552, E3, F18, KC2, KC46, KC39, P1, P8	Operators of aircraft types contained in this category shall have a minimum of 60% of airframes monitored every 2 years or 1,000 flight hours, whichever is longer calculated from the date of the last successful height monitoring, (the number of airframes to be monitored shall be rounded up to the nearest whole integer). Operators with fleets consisting of aircraft from more than one Monitoring Group shall meet this requirement for each Group in the fleet.
3	NON-GROUP	**Aircraft types for which no generic compliance method exists:** GLF5-AEW, GLEX-ASTOR **Aircraft types for which the compliance method is not known:** A30B-M, A310-M, A332-M, ASTR-M, B737-AWACS, C12, C21, C32, C35, C37, C40, C550-B-M, C9, CL60-M, E135-M, E4, E6, E8, E530, FA10-M, FA20-M, FA50-M, GLF3-M, GLF4-M, IL76-M, KC10, KC-390, KC46, P180-M, R135, VC25	Operators of aircraft types contained in this category shall have 100% of airframes monitored every 2 years or 1,000 flight hours., whichever is longer calculated from the date of the last successful height monitoring.

Table 2: MONITORING GROUPS FOR AIRCRAFT CERTIFIED UNDER GROUP APPROVAL REQUIREMENTS (Military)

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
A178	A178	Antonov A178	
A30B-M	A30B	A300	B2-100 (Zero-G)
A310-M	A310	A310	MRT, MRTT
A332-M	A332	KC30-A KC45-A Voyager KC2, KC3	MRTT
A400	A400	A400M	
ASTR-M	ASTR	1125 ASTRA	NAV&COM
C12	BE20	C-12	
C130	C130	C-130 Hercules	Series: H only
	C30J	C-130J Hercules	
C17	C17	C-17 Globemaster III	
C21	LJ35	C-21	
C32	B752	C-32	Series: A, B
C40	B737	C-40 Clipper	
C5	C5	C5 Galaxy	
C550-552	C550	552 CITATION II (USN)	
C550-B-M	C550	550 CITATION BRAVO	
C550-M	C550	550 CITATION II	
C35	C560	560 CITATION V UC-35	
C37	GLF5	C-37 TP102D	Series: A, B Series: C
CL60-M	CL60	CL604	MPA
E135-M	E135	EMB-135	MRT
E3	E3TF E3CF	E-3 Sentry	
E4	B742	E-4	
E6	E6	E-6 Mercury	
B737-AWACS	E7A	B737	B737 AEW&C
E8	B703	E-8 J-Stars	
E530	E530	TEXTRON AIRLAND SCORPION	
FA10-M	FA10	FALCON 10	MRT
FA20-M	FA20	FALCON 20	EW/ELINT, MRT, EXP
FA50-M	FA50	FALCON 50	MPA/SAR
F18H	F18H	McDonnell-Douglas F/A 18 F/A-18 Hornet	
GLF3-M	GLF3	C-20	Series: A, B, C, D, E
GLF4-M	GLF4	C-20 S102B	Series: F, G, H

Monitoring Group	A/C ICAO	Manufacturer Type	Additional Defining Criteria
		TP102	
IL76-M	IL76	IL-76	MRT, T
KC2	KC2	KAWASAKI KC2 C-2 RC-2 XC-2	
KC10	DC10	KC-10 Extender KDC-10 DC-10	
KC46	KC46	Boeing KC46 Boeing KC-46 Pegasus Boeing KC46A or B767-2C	
KC135	B703 K35E K35R	KC-135 Stratotanker KC-135 Stratotanker C-135 Stratotanker	
KC39	KC39	Embraer KC390	
P1	P1	Kawasaki P-1	
P180-M	P180	P-180 AVANTI	
P8	P8	B738-ERX	BOEING P8 POSEIDON
R135	R135	RC-135	
VC25	B742	VC-25	

Abbreviations:

EW/ELINT	Electronic Warfare/Electronic Intelligence
EXP	Experimental
MPA	Maritime Patrol Aircraft
MRT	Multi Role Transporter
MRTT	Multi Role Transporter and Tanker
SAR	Search and Rescue
T	Transporter

Table 3: Non-GROUP AIRCRAFT (i.e., Not certified under group approval requirements) (Military)

Non-Group Descriptor	A/C ICAO	Manufacturer Type	Additional Defining Criteria
GLEX-ASTOR	GLEX	Raytheon Sentinel aka RAF's ASTOR (Airborne Stand-Off Radar)	Non-Group
GLF5-AEW	GLF5	GULFSTREAM G550	Non-Group : AEW

Abbreviations:

AEW	Airborne Early Warning