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**Agenda Item 5: Airspace Safety Monitoring Activities/Requirements in the Asia/Pacific Region**

**PARMO RVSM TRAFFIC COMPLIANCE MONITORING**

(Presented by PARMO)

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**SUMMARY**

This paper provides an assessment of observed operations without an approval record on file using the Reduced Vertical Separation Minimum (RVSM) airspace overseen by the Pacific Approvals Registry and Monitoring Agency (PARMO) in the Pacific and a portion of Northeast Asia. The assessment process is described and the results for period from September 2022 – June 2023 are presented for the Oakland (ZAK) and Anchorage (ZAN) FIRs. Results for New Zealand (NZZO), Fiji (NADI), Tahiti, and Republic of Korea (Incheon) traffic samples were assessed for December 2022. PARMO approvals records as of June 2023 were used for the assessment.

**1. INTRODUCTION**

1.1. The Pacific Approvals Registry and Monitoring Organization (PARMO), a service provided by the U.S. Federal Aviation Administration's William J. Hughes Technical Center since 2001, serves as the Regional Monitoring Agency (RMA) for the airspace in the Pacific and a portion of Northeast Asia.

1.2. As part of the duties of an RMA, outlined in ICAO Doc 9937 (Reference 1), the PARMO performs regular checks of the operator compliance with State approval requirements within the Pacific and Northeast Asia airspace. The purpose of these checks is to identify non-approved operators and aircraft to ensure the safety of RVSM airspace.

1.3. At RMACG/6, it was decided that all RMAs would conduct a traffic audit for their region of jurisdiction every December. (Reference 2) During RMACG/10, the requirement for a December traffic scrutiny was amended to allow the traffic audit to be performed in any month. (Reference 3).

1.4. Results are presented for the Flight Information Regions (FIRs) under PARMO responsibility: Auckland (New Zealand), Incheon (Republic of Korea), NADI (Fiji), and Tahiti for December 2022 within RVSM.

1.5. As presented in *RASMAG/27 IP30*, in order to address the issue of false identification, quantify the lag from individual States, and identify aircraft that are consistently filing incorrectly, PARMO is conducting more frequent audits within the Anchorage (ZAN) and Oakland (ZAK) portions of the PARMO-delegated airspace.

1.6. PARMO implemented monthly Traffic Sample audits for Anchorage and Oakland FIRs, and this paper describes the process used by PARMO to identify non-approved airframes operating within RVSM airspace, FL290 to FL410, inclusive. The Traffic Sample audits were accomplished through a systematic process of matching air traffic movement data and airframe approval records. The results for September 2022 – June 2023 within RVSM are presented.

## **2. DISCUSSION: OAKLAND AND ANCHORAGE MONTHLY AUDITS**

2.1. Traffic Samples of the Oakland (ZAK) and Anchorage (ZAN) FIRs were collected September 2022 – June 2023, which yielded 207,799 flights within the RVSM airspace.

2.2. The process used to determine non-approved operations, included analysis of the airframe approval records from the RMA KSN, dated October 2022 - July 2023 for this assessment.

2.3. PARMO developed nine steps to categorize the Traffic Sample data into approved or unverified operations:

1. Combined all the Anchorage (ZAN) and Oakland (ZAK) FIRs Flights from Sep 2022 to June 2023 where the Flight Plan contained a ‘/W.’
2. Substituted the Flight ID (ACID) for any Registrations that were blank.
3. Aggregated the Operator and Aircraft Type to list unique Registrations where the aircraft type or operator was absent or slightly different.
4. Compared the Traffic Sample Registrations to the Combined Approvals registrations downloaded from the RMA KSN.
  - a) A residual number of State aircraft registrations, which are not included in the KSN are identified during this process and excluded from the audit results.
5. Summed flights by Registration per month-year and showed if the aircraft had an approval that month.
6. Totaled flights by Registration per month-year
7. Totaled the number of months flown unverified.
8. Calculated total flights by Registration that were unverified.
9. Filtered the results to show unverified operations from September 2022 through February 2023, which repeated over multiple months.
  - a) Steps 1 to 9 were repeated for March 2023 through June 2023.

2.4. If an audit of the December traffic sample was the only audit conducted for the year, then 284 aircraft would have been identified as unverified. Each of those would require additional research to determine the approval status.

2.5. In order to avoid this workload additional audit months were used to see if the aircraft had repeated unapproved operations. For this analysis any aircraft that was unverified for 2 or more months was retained. Any aircraft that was approved at the end of the audit period was removed from unapproved list.

2.6. At the Eighteenth Regional Monitoring Agency Coordination Group (RMACG/18), data using the method described above was presented. The September 2022 to February 2023 audit of Oakland and Anchorage airspace yielded a total of 19 non-approved aircraft from 6 states with a total of 271 non-approved operations. A breakdown of the manual review of the 19 previously non-approved aircraft is shown in Table 1.

RMA	Traffic Samples From ZAK/ZAN	Approved/Exported/Canceled	Typos/Misfile	Query	Unapproved
AAMA	Australia	1			
MAAR	India	2			
NAARMO	Canada	1			
	Mexico				2
	United States	11			1
NATCMA	United Kingdom (Bermuda)	1			
<b>Total</b>		<b>16</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Table 1:** Breakdown of Results from the Oakland and Anchorage Traffic Samples from Sep 2022 to Feb 2023, Reevaluated using June 2023 Approvals.

2.7. Rather than doing the manual analysis, Table 2 shows that auditing for a longer time yields a better result. Using the extended audit process, 13 registrations were automatically cleared in the month indicated leaving a total of 6 aircraft from 2 states needing further review, of which 3 remained non-approved.

Anchorage and Oakland Traffic Samples Sep 2022 to Feb 2023						
RMA	State	Registrations	Non-approved Months Count	Non-approved Operations	Month Cleared using CA	Comments
AAMA	Australia	VH8MJ	3	9	JUN	
MAAR	India	VTAEF	3	40	APR	
		VTAEG	2	16	APR	
NAARMO	Canada	CGBSW	3	14	APR	
	Mexico	XAARR	2	2		Unapproved - not seen since JAN
		XAFPS	2	2		Unapproved - not seen since JAN
NAARMO	United States	N154MH	3	7	APR	
		N159WW	3			
	N2AC	2	7	APR		
	N401VE	2	2	APR		
	N465AN	2	4	APR		
	N49RF	2	8	MAR		
	N572DZ	2	36		Approved	
	N601GD	3	35	MAY		
	N618GD	2	2		Approved - Reg Number Change	
	N799JR	3	5		Approved - Reg Number Change	
	N8778Q	2	2		Unapproved - not seen since DEC	
	N888YG	5	74	MAY		
	NATCMA	United Kingdom (Bermuda)	VPBEL	2	4	JUN
			2	2	MAR	

**Table 2** Analysis of the 19 previously non-approved registration from the Oakland and Anchorage Traffic Samples from Sep 2022 to Feb 2023, after monthly evaluation

2.8. In PARMO’s experience, displaying the approvals as each month passed (as shown in Appendix A) gave more insight as to the flow of the aircraft’s approval status from non-approved or approved. Based on the monthly review PARMO found the average number of months aircraft remained in an unverified status was 3.2 months.

2.9. Continuing the monthly audit process, with the introduction of more Traffic Samples by June 2023, the audit accumulated 16 registrations with repeat appearances from 5 states with a total of 322 unverified operations. These were again manually analyzed, and the results are summarized in Table 3.

RMA	Traffic Samples From ZAK/ZAN	Approved/Exported/Canceled	Typos/Misfile	Query	Unapproved
CARSAMMA	United Kingdom (Cayman Islands)				1
JAPANRMA	Japan	1			
NAARMO	Canada				1
NAARMO	United States	11			1
PARMO	Republic of Korea	1			
<b>Total</b>		<b>13</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Table 3:** Breakdown of results from the Oakland and Anchorage Traffic Samples from March 2023 to June 2023 approvals

2.10. Instead of performing the manual process, if PARMO continues the extended audit, these aircraft would have been automatically cleared. The 16 non-approved aircraft from Table 3 above are shown in Table 4, which includes the month when the approval data was received, and approval status could be verified. Based on the monthly review PARMO found the average number of months aircraft remained in an unverified status was 2.8 months.

RMA	State	Registrations	Non-approved Months Count	Non-approved Operations Count	Month Cleared	Comments
CARSAMMA	United Kingdom (Cayman Islands)	VPCBN	2	4		Unapproved
JAPANRMA	Japan	JA850J	4	104	JUL	
NAARMO	Canada	CGPFT	4	14		Unapproved
NAARMO	United States	N17550	2	5	JUL	
NAARMO	United States	N416WWM	2	3		Unapproved
NAARMO	United States	N422DZ	2	4	JUL	
NAARMO	United States	N523DE	2	15	JUL	
NAARMO	United States	N6389	2	2		Exported
NAARMO	United States	N782AM	3	16	JUL	
NAARMO	United States	N783AM	3	34	JUL	
NAARMO	United States	N806HK	3	18	JUL	
NAARMO	United States	N964AM	3	22	JUL	
NAARMO	United States	N965AM	4	20	JUL	
NAARMO	United States	N966AM	3	19	JUL	
NAARMO	United States	N967AM	3	26	JUL	
PARMO	Republic of Korea	HL8389	2	16	JUL	

**Table 4:** Analysis of the 16 newly identified non-approved registrations after monthly evaluation.

2.11. Continued monthly audits will serve as a method to identify lags, and successive audits will separate true repeat offenders from aircraft incorrectly identified as unapproved due to lag.

2.12. Factors contributing to lag as encountered by PARMO include but are not limited to:

- state notification of approval to the RMA
- updates to the approvals database
- mistakes and typographical errors in the original traffic data
- code-sharing and lease arrangements between airlines.
- For US registered aircraft lags in the FAA Registry and LOA issuance related to registration number changes and registrant changes (improved from 6 months to 6 weeks)

### 3. DECEMBER TRAFFIC AUDITS

3.1. Traffic Sample Data (TSD) for December 2022 for Pacific and Northeast Asia airspace was received from each of the Flight Information Regions (FIRs) under PARMO responsibility: Auckland (New Zealand), Incheon (Republic of Korea), Nadi (Fiji), and Tahiti which yielded 34,578 flights within the RVSM airspace.

3.2. The registration numbers and operator-aircraft combinations from the December 2022 traffic samples were cross-examined against the combined approval records as of March 2023. Any aircraft identified without an RVSM approval was placed on the audit list for further examination and verification. The analysis yielded 30 aircraft from 12 states confirmed with non-approved operations.

3.3. As no new Traffic Samples were expected from Auckland (New Zealand), Incheon (Republic of Korea), Nadi (Fiji), and Tahiti, a reevaluation of the December 2022 traffic samples was performed. The 30 previously identified non-approved registrations were evaluated against the combined approval records published June 2023.

3.4. As shown in Table 4, out of the 30 identified with non-approved operations: 24 registrations were found to be Approved, Ferried, Canceled or Exported while 3 were found to be misfiles or typographical errors, 1 needed follow up to help determine its outcome with 2 aircraft remaining non-approved.

RMA	December 2023 - Auckland (New Zealand), Incheon (Republic of Korea), Nadi (Fiji), and Tahiti Traffic Samples	Approved/Exported/Canceled	Typos/Misfile	Query	Unapproved
AAMA	Australia	5	2		
CARSAMMA	United Kingdom (Cayman Islands)	1			
CHINA RMA	China (PRC)	3			
EurAsia RMA	Russian Federation			1	
JASMA	Japan	1			
MAAR	India	1			
	Mongolia	1			
	Vietnam	2			
NAARMO	Canada		1		
	United States	7			1
PARMO	New Zealand				1
	Republic of Korea	3			
<b>Total</b>		<b>24</b>	<b>3</b>	<b>1</b>	<b>2</b>

**Table 5:** Reevaluation of December 2022 PARMO FIRs Traffic Samples using June 2023 combined approval records.

#### 4. CONCLUSION

4.1. In review of the September 2022 through June 2023 monthly assessment of operations without an RVSM approval record on file, PARMO established that more frequent examination of traffic data reduces reporting errors. The burden on the analysts was subsequently reduced, an analyst does not have to pursue aircraft that have taken self-corrective action, been the result of a mistake made during flight plan filing, or delayed registration number change reporting or lag in the issuance of specific RVSM Authorizations.

4.2. Monthly traffic audit data has shown overall workload can be reduced. When several months of information are used to determine if aircraft are potentially unapproved, there are fewer resulting cases to consider and the likelihood that they are actually unapproved is higher. Using an audit repeat period based on the average lag would be optimal to the reporting and pursuit of unapproved aircraft operations in RVSM.

4.3. The meeting is invited to:

- a) note and review the contents of the PARMO traffic scrutiny work presented in this paper and
- b) provide any relevant updates on the records contained within the results and
- c) consider the benefits of more frequent audits.

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## References

1. *Doc 9937 - Operating Procedures and Practices for Regional Monitoring Agencies in Relation to the Use of a 300 m (1000 ft) Vertical Separation Minimum Between FL 290 and FL 410 Inclusive*, International Civil Aviation Organization, First Edition - 2010.

2. *Summary of Discussions (RMACG/6)*, Cornwall, Canada, 6-10 June 2011: Task #10 “All RMAs conduct traffic scrutiny survey during the same time frame [December] in order to understand the magnitude of the situation.”

3. *Summary of Discussion (RMA CG/10)*, Bangkok, Thailand, 18 - 22 May 2015: Paragraph 3.2.33 “The meeting discussed the need of the fixed month for scrutiny activities as decided at the RMACG/6 meeting and agreed that with the maturity of most of the monitoring programs, and with most of the RMAs performing monthly verification of the approval status, it is not necessary to fix a month for data collection, but it is of crucial importance the exchange of data between the RMAs to guarantee that all have the same correct information on approval status.”

Appendix A

The snapshot below depicts the September 2022 to February 2023 Audit of Oakland and Anchorage airspace which yielded 19 non-approved aircraft from 6 states with a total of 271 non-approved operations.

The table shows the flow of approvals as each month passed and gives more insight to the approval status of the aircraft listed and when it was included in the ICAO RMA combined approvals file.

REG	ACT	START_DATE	END_DATE	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	APPRVD_JUL	CURR_US_APPRVD	UNAPPROVED_OTIS	CNT_MONTHS_REPEAT
VH8MJ	IGA(GLEX); UNK(GLEX)	11/23/2022	06/08/2023	n/a	n/a	N	N	n/a	N	n/a	N	N	VH8MJ Y	Y	Y	9	5
VTAEF	AIC(B77L)	12/15/2022	06/29/2023	n/a	n/a	n/a	N	N	N	N	VTAEF Y	VTAEF Y	VTAEF Y	Y	Y	40	4
VTAEG	AIC(B77L)	01/15/2023	06/30/2023	n/a	n/a	n/a	n/a	N	N	N	VTAEG Y	VTAEG Y	VTAEG Y	Y	Y	16	3
CGBSW	UNK(ASTR); UNK(unk)	10/09/2022	06/26/2023	n/a	N	n/a	n/a	N	N	N	CGBSW n/a	CGBSW n/a	CGBSW Y	Y	Y	14	4
XAARR	IGA(GLF4); UNK(GLF4)	12/28/2022	01/05/2023	n/a	n/a	n/a	N	N	n/a	n/a	n/a	n/a	n/a	N	N	2	2
XAFPS	IGA(GLF5); UNK(GLF5)	12/27/2022	01/02/2023	n/a	n/a	n/a	N	N	n/a	n/a	n/a	n/a	n/a	N	N	2	2
N154MH	MVJ(GLF5); MVJ(unk)	11/14/2022	06/30/2023	n/a	n/a	N	N	n/a	N	N	n/a	N154MH n/a	N154MH Y	Y	Y	7	4
N159WW	IGA(GLF5)	12/28/2022	03/27/2023	n/a	n/a	n/a	N	N	N	N	N159WW n/a	N159WW n/a	N159WW n/a	Y	Y	7	4
N2AC	IGA(GLEX)	01/30/2023	02/06/2023	n/a	n/a	n/a	n/a	N	N	n/a	N2AC n/a	N2AC n/a	N2AC n/a	Y	Y	2	2
N401VE	TWY(GLEX)	11/12/2022	06/28/2023	n/a	n/a	N	N	n/a	n/a	n/a	N401VE n/a	N401VE Y	N401VE Y	Y	Y	4	2
N465AN	AAL(A321)	01/25/2023	06/29/2023	n/a	n/a	n/a	n/a	N	N	N465AN Y	N465AN Y	N465AN Y	N465AN Y	Y	Y	8	2
N49RF	IGA(GLF4); MIL(GLF4); UNK(GLF4)	12/07/2022	01/31/2023	n/a	n/a	n/a	N	N	n/a	n/a	n/a	n/a	n/a	N	Y-State	36	2
N572DZ	DAL(A359)	11/10/2022	04/10/2023	n/a	n/a	N	n/a	N	N	N	N	N	N572DZ n/a	Y	Y	35	5
N601GD	JAS(GLF6)	01/11/2023	02/18/2023	n/a	n/a	n/a	n/a	N	N	n/a	n/a	n/a	n/a	N	Y-Reg number changed	2	2
N618GD	IGA(GLF6)	12/27/2022	02/08/2023	n/a	n/a	n/a	N	N	N	n/a	n/a	n/a	n/a	N	Y-Reg number changed	5	3
N799JR	MIL(GLEX); UNK(GLEX)	09/29/2022	12/19/2022	N	n/a	n/a	N	n/a	n/a	n/a	n/a	n/a	n/a	N	N	2	2
N8778Q	SWA(B38M)	09/09/2022	06/30/2023	N	N	N	n/a	N	N	N	N	N8778Q Y	N8778Q Y	Y	Y	74	7
N888YG	IGA(GLF4)	01/21/2023	04/01/2023	n/a	n/a	n/a	n/a	N	N	N	N	n/a	n/a	N	Y	4	4
VPBEL	IGA(B737); IGA(unk); UNK(B737)	10/14/2022	11/11/2022	n/a	N	N	n/a	n/a	n/a	VPBEL n/a	VPBEL n/a	VPBEL n/a	VPBEL n/a	Y	Y	2	2
			Cnt Flew and Unapproved	2	3	6	10	14	13	8	4	1	0	7	3	271	3.21
			Number unapproved since Feb 2023 paper					19	17	9	8	7					Avg Number of Months

Legend

Light grey: the registration did not appear in the traffic sample.

Red: the registration appeared in the traffic sample and no approval found in combined approval file.

Dark green: the registration appeared in the traffic sample and approval was found in combined approval file.

Light green: registration did not appear in the traffic sample and approval was found in combined approval file.

Appendix B

The snapshot below depicts the September 2022 to June 2023 Audit of Oakland and Anchorage airspace which yielded 16 non-approved aircraft.

The table shows the flow of approvals as each month passed and gives more insight to the approval status of the aircraft listed and when it was included in the ICAO RMA combined approvals file.

RMA	COUNTRY	REG	START_DATE	END_DATE	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	CURR_APPRVD	CNT_MONTHS_REPEAT	UNAPPROVED_QTS	COMMENTS	
CARSAMMA	United Kingdom	VPCBN	11/21/2022	06/01/2023	VPCBN n/a	VPCBN n/a	VPCBN Y	VPCBN n/a	VPCBN Y	VPCBN Y	VPCBN Y	VPCBN Y	N	N	N	2	4	Unapproved	
JAPANRMA	Japan	JAB50J	03/18/2023	06/18/2023	n/a	n/a	n/a	n/a	n/a	n/a	N	N	N	N	Y	4	104		
NAARMO	Canada	CGPFT	03/30/2023	06/02/2023	n/a	n/a	n/a	n/a	n/a	n/a	N	N	N	N	N	4	14	Unapproved	
NAARMO	United States	N17550	04/26/2023	06/30/2023	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N	n/a	N	Y	2	5		
NAARMO	United States	N416WM	04/15/2023	06/24/2023	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N	n/a	N	N	2	3	Unapproved	
NAARMO	United States	N4220Z	05/12/2023	06/17/2023	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N	N	Y	2	4		
NAARMO	United States	NS23DE	05/26/2023	06/30/2023	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N	N	Y	2	15		
NAARMO	United States	N6389	11/06/2022	06/21/2023	n/a	n/a	N	n/a	n/a	n/a	n/a	n/a	n/a	N	Y	2	2	Exported	
NAARMO	United States	N782AM	04/12/2023	06/20/2023	N782AM n/a	N782AM n/a	N782AM n/a	n/a	N782AM n/a	n/a	n/a	N	N	N	Y	3	16		
NAARMO	United States	N783AM	04/01/2023	06/25/2023	N783AM n/a	N783AM n/a	N783AM n/a	n/a	N783AM n/a	n/a	n/a	N	N	N	Y	3	34		
NAARMO	United States	N806HK	02/09/2023	06/04/2023	n/a	n/a	n/a	n/a	n/a	N	n/a	n/a	N	N	Y	3	18		
NAARMO	United States	N964AM	04/17/2023	06/21/2023	N964AM n/a	N964AM n/a	N964AM n/a	n/a	N964AM n/a	n/a	n/a	N	N	N	Y	3	22		
NAARMO	United States	N965AM	03/30/2023	06/29/2023	N965AM n/a	N965AM n/a	N965AM n/a	n/a	N965AM n/a	n/a	N	N	N	N	Y	4	20		
NAARMO	United States	N966AM	04/07/2023	06/30/2023	N966AM n/a	N966AM n/a	N966AM n/a	n/a	N966AM n/a	n/a	n/a	N	N	N	Y	3	19		
NAARMO	United States	N967AM	04/03/2023	06/30/2023	N967AM n/a	N967AM n/a	N967AM n/a	n/a	N967AM n/a	n/a	n/a	N	N	N	Y	3	26		
PARMO	Republic of Korea	HL8389	05/28/2023	06/29/2023	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	N	N	Y	2	16		
					Cnt Flew and Unapproved			1			1	3	7	4	16				
					Accumulation of registrations			1			1	2	5	12	16				
																	Avg Number of Months	2.75	322

Legend

- Light grey: the registration did not appear in the traffic sample.
- Red: the registration appeared in the traffic sample and no approval found in combined approval file.
- Dark green: the registration appeared in the traffic sample and approval was found in combined approval file.
- Light green: registration did not appear in the traffic sample and approval was found in combined approval file.