International Civil Aviation Organization

Thirty-Sixth Meeting of the Asia/Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG/36)

Bangkok, Thailand, 24 to 26 November 2025

Agenda Item 6: Any Other Business

COLLABORATION BETWEEN RASMAG AND SEI WG

(Presented by Chairperson of RASMAG on behalf of RASMAG and SEI WG)

SUMMARY

This paper provides the outcome of collaboration between Regional Airspace Safety Monitoring Advisory Group (RASMAG) and the Asia Pacific's Regional Aviation Safety Team's (APRAST) Safety Enhancement Initiatives Working Group (SEI WG) on High-Risk Category (HRC) Mid-Air Collisions (MAC).

Strategic Objectives:

A: ***Safety*** *– Enhance global civil aviation safety*

B: ***Air Navigation Capacity and Efficiency*** *— Increase the capacity and improve the efficiency of the global aviation system*

1. INTRODUCTION

1.1 During the Twelfth PIRG & RASG Regional Coordination Meeting held on 27 November 2024, in the ICAO APAC Office, in a hybrid format (face-to-face and video teleconference), the topic of overlapping issues/initiatives that required to be coordinated between APANPIRG and RASG APAC Sub-Groups was discussed under Agenda Item 2.

1.2 One specific topic identified was the data sharing between RASMAG and SEI WG on High-Risk Category (HRC) Mid-Air Collisions (MAC).

2. DISCUSSION

2.1 After deliberation and discussion at the PIRG & RASG Regional Coordination Meeting, it was agreed that respective Chairpersons of APANPIRG and RASG-APAC Sub-groups would coordinate and work collaboratively on common safety issues and deliver the activities. For the safety issues concerning Large Height Deviation (LHD) and APAC regional hot spots, RASMAG and the SEI WG were assigned to conduct an information exchange of relevant data and identified mitigation actions.

2.2 Since 2015, RASMAG meetings have tracked Large Height Deviation (LHD) hot spots, and in 2024, a formalised process for managing these hot spots was established, requiring proof of mitigation or prevention measures and demonstrated effectiveness through reduced occurrences and operational risk. In collaboration with RASMAG, the SEI WG exchanged LHD hotspot data and jointly identified mitigation strategies, recognising Category E LHDs (coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility because of human factors issues) as precursors to Mid-Air Collisions (MAC), identified as a Global High-Risk Category in the ICAO Global Aviation Safety Plan (GASP). Risk could increase at Flight Information Region (FIR) boundaries in Reduced Vertical Separation Minima (RVSM) airspace where coordination gaps compromise aircraft separation.

2.3 Similar to the RASMAG, the APRAST recently has been tracking various data sources that can provide insight into the MAC risk within the region. Collaborative efforts have been established between IATA and the U.S. Commercial Aviation Safety Team to securely share aggregated Traffic Collison Avoidance System Resolution Advisory (TCAS RA) hotspot information. TCAS RAs could provide a risk picture below RVSM airspace which would provide a holistic view once integrated with other data sources such as those tracked by RASMAG.

2.4 This collaboration built on RASMAG's formalised hotspot management process and laid the foundation for joint safety outputs, including targeted advisories and mitigation tools, to reduce LHD occurrence and operational risk at identified hotspots. The outcome of this collaboration was the development and publication of the RASG-APAC Safety Advisory (RSA) titled: *Elevated Mid-Air Collision (MAC) risk in Reduced Vertical Separation Minima (RVSM) Airspace*, as provided in **Attachment A**. This RSA was intended for Civil Aviation Authorities (CAAs) responsible for State Safety Oversight of Air Navigation Services, and Air Navigation Service Providers (ANSPs).

2.5 A multi-pronged approach was planned for the distribution of RSAs, and this RSA was distributed to the Regional Monitoring Agencies (RMAs) in APAC. The RMAs are subsequently encouraged to distribute widely to their respective States CAAs and ANSPs.

Potential Future Collaborations

2.6 **Information Distribution Network:** RMAs maintain a Point of Contact (POC) database that's relatively up to date, which covers all State CAAs (the unit responsible for RVSM approvals) and ANSPs (ACCs). This network could be used to disseminate future safety-related information, such as RSAs, to widen the target audience. It was recently used to distribute the RASG-APAC Safety Advisory (RSA), supplementing the existing channel.

2.7 **Safety Tools/Guidelines:** RASMAG had developed some analysis tools/guidelines to assist States/Administrations to mitigate LHDs (https://www.aerothai.co.th/maar/safetylhd.php). This may be revived, refined and published under RASG-APAC MAC's Safety Tools section.

2.8 **RASMAG Safety Bulletins & RASG-APAC Safety Advisory (RSA):** RASMAG also produces Safety Bulletins (the third issue currently being refined and expected to be published by the end of 2025). Moving forward, there is potential to consolidate these efforts, and RASMAG may consider the use of the RSA mechanism instead of the current Safety Bulletin.

2.9 **Safety Enhancement Initiatives (SEI)**: The upcoming Asia Pacific Regional Aviation Safety Plan (AP-RASP) 2026–2028 would adopt the MAC as a Regional High-Risk Category (R-HRC) for the APAC region. Large Height Deviations (LHDs) - particularly Categories E (coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility because of human factors issues) and J (TCAS resolution advisory and flight crew correctly following the resolution advisory) - were recognized as a direct precursor event to the MAC. Asia Pacific Regional Aviation Safety Team (APRAST) would propose two actions to mitigate the MAC Risk:

a) In coordination with the appropriate APANPIRG contributing bodies to identify geographic areas of concern and analyse the underlying factors specific to the APAC region using 2025–2026 LHD hotspot data.

b) Based on the analysis in 2.9a) and in accordance with the RASG Procedural Handbook, develop focused regional SEIs and/or RASG-APAC Safety Advisories (as appropriate) and prioritise the SEIs accordingly.

3. ACTION BY THE MEETING

3.1 The Meeting is invited to:

a) note the RASG-APAC Safety Advisory No. 25-001, June 2025 (**Attachment A**);

b) note the current and potential collaborations between PIRG and RASG; and

c) discuss any relevant matters as appropriate.

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RASG - APAC

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SAFETY ADVISORY

June 2025 No. 25-001

Elevated Mid-Air Collision (MAC) risk in Reduced Vertical Separation Minima (RVSM) Airspace

Subject: Risk of Mid-Air Collision at Flight Information Region (FIR) airspace boundaries within RVSM airspace due to ATC Unit to ATC Unit coordination errors.

Intended Audience: Civil Aviation Authorities responsible for State Safety Oversight of Air Navigation Services, and Air Navigation Service Providers (ANSPs)

Background: Any reduction in separation minima requires a safety monitoring mechanism as a part of its implementation. Therefore, States are required to establish safety monitoring arrangements for their Reduced Vertical Separation Minima (RVSM) airspace. An annual assessment of Mid-Air Collision risk in such airspace is one of these existing monitoring arrangements. Airspace occurrence reports from applicable States are crucial to this process as they are a key measure of MAC risk in RVSM airspace. An airspace occurrence report that contributes to vertical MAC risk is called a Large Height Deviation, or LHD.

By definition, a LHD is a vertical deviation from an ATC assigned or coordinated altitude that results in an error of 300 ft or more. The deviation may be the result of human error, equipment malfunction or environmental factors. However, LHDs are not just altitude deviations. Essentially, a LHD happens when an aircraft occupies a space unexpected by ATC, leading the trajectory anticipated by ATC to no longer correspond to the actual trajectory. Not knowing that the space is occupied, ATC may clear another aircraft to that location, which increases the risk of a mid-air collision. Therefore, LHDs could be all instances where an aircraft occupies a point in space unknown by ATC as the result of an operational error or condition affecting the flight.

Regional Monitoring Agencies (RMAs), established by each ICAO region's Planning and Implementation Group, use LHDs to calculate airspace collision risk and identify airspace Hot Spots. States involved in the identified Hot Spots are expected to coordinate measures for minimizing the causal factors of the LHDs.

Category E LHDs are defined as coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility because of human factors issues **(e.g., late, or non-existent coordination, incorrect time estimate/actual, flight level, ATS route etc. not in accordance with agreed parameters).**

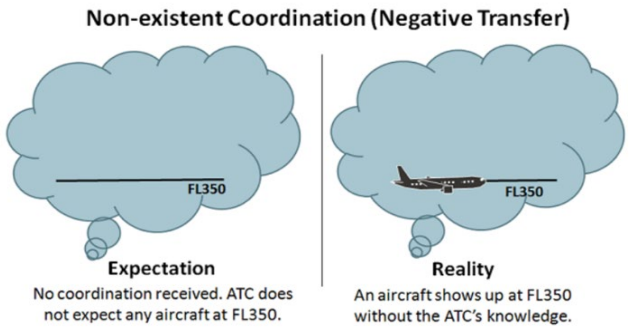

Figure 1: Category E LHD due to non-existent coordination.

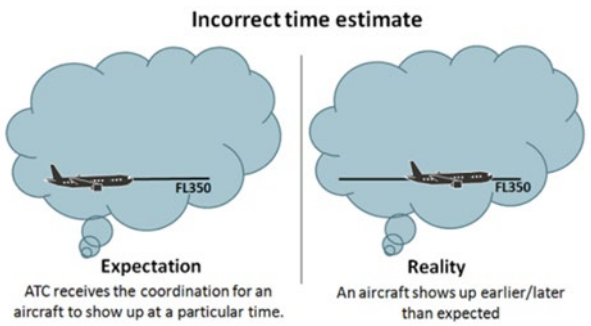

Figure 2: Category E LHD due to an incorrect time estimate versus the actual boundary time.

An LHD occurs when an air traffic controller expects an aircraft to be at one location, but the aircraft is at another location. This significantly increases the risk of mid-air collision.

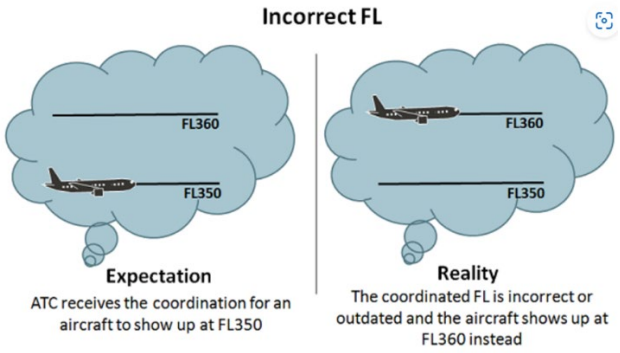

Figure 3: Category E LHD due to incorrect altitude coordination by ATC.

Category E LHDs are a direct result of the way in which an ANSP coordinates an aircraft transfer across airspace boundaries, mainly in oceanic airspace. These coordination errors result in the aircraft being unprotected by ATC in all domains because ATC either does not know an aircraft is in its airspace, or believes the aircraft occupies a point in space and time that it does not occupy.

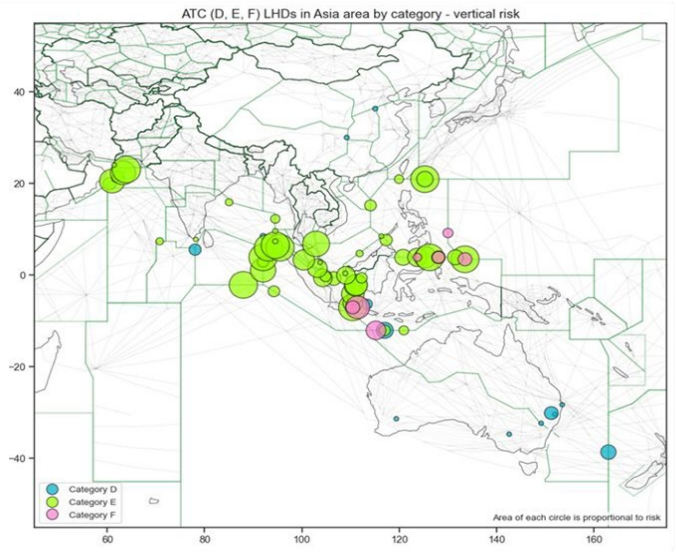

Figure 4: Category E LHDs (green) in Asia Pacific for 2023. The larger the circle, the more LHDs occurred and for a longer duration.

Recommendations: To mitigate the risk of MAC resulting from Category E Large Height Deviations, the RASG-APAC recommends the following:

To Civil Aviation Authorities responsible for State Safety Oversight of Air Navigation Services:

- Conduct a safety oversight inspection, audit or assessment to ensure that the ANSP(s) providing services in your State, in both sovereign and delegated airspaces, have established procedures for safely and effectively transferring aircraft across Flight Information Region airspace boundaries.
- Ensure that these procedures have adequate redundancies and are captured in an inter- or intra- facility agreement document.
- If the ANSP does not have such procedures, direct the development of procedures to ensure a safe and effective way of transferring control responsibility of cross-border flights between ATC Units or service providers.
- If the ANSP does have established procedures, assess the effectiveness of,

and the ANSP's compliance with, these procedures.
- If the oversight activity results in a lack of effectiveness of the aircraft transfer procedures, or ANSP non-compliance with the procedures, mandate the development of a Corrective Action Plan to mitigate this mid-air collision risk.
- Leverage ICAO data provided by the Regional Monitoring Agencies to provide further clarity of this MAC risk.
- Conduct regular meetings with neighboring or regional ANS Oversight Organizations to discuss cross airspace boundary safety issues, systemic issues of non-compliance, lessons learned, and best practices.
- Ensure the ANSP is sharing LHD occurrence data with the relevant RMA.

To Air Navigation Service Providers:

- Conduct an internal safety assurance review to confirm that your organization has established procedures for effectively transferring aircraft across Flight Information Region airspace boundaries. If so, determine if your organization is compliant with those procedures.
- Ensure that these procedures have adequate redundancies and are captured in an inter- or intra- facility agreement document.
- If the safety assurance review reveals a systemic issue of non-compliance with transfer of control responsibility procedures, create a Corrective Action Plan to mitigate this mid-air collision risk.
- Ensure that air traffic controllers are aware of the importance of conducting an accurate and timely transfer of aircraft when transitioning across airspace boundaries, and the elevated risk of mid-air collision if the transfer is not conducted correctly.
- Manage the performance of ATC units or air traffic controllers that are not implementing transfer of control procedures correctly.

Together, State Safety Oversight Authorities and ANSPs can eliminate Category E LHDs in RVSM Airspace.

- Conduct regular meetings with neighboring ANSPs or ATC Units to discuss cross airspace boundary safety issues, lessons learned, and best practices.
- Share LHD occurrence data with the relevant RMA.

Additional Resource(s):

- RASMAG Safety Bulletin, Issue 1: July 2019;
- Monitoring Agency for Asia Region (MAAR), Large Height Deviation (LHD), LHD Analysis and Mitigation;
- Guidance Material for the Continued Safety Monitoring of the Asia-Pacific RVSM Airspace (Version 3.0 August 2024).