RASG - APAC

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SAFETY ADVISORY

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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).**

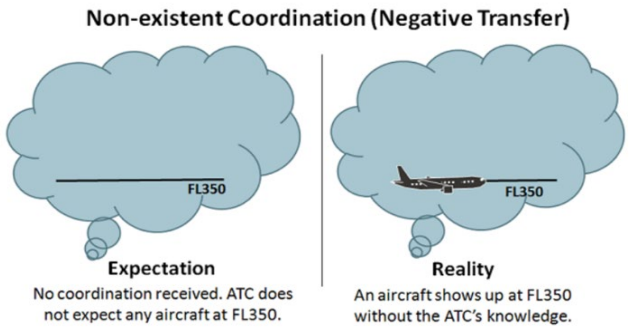

Figure 1: Category E LHD due to non-existent coordination.

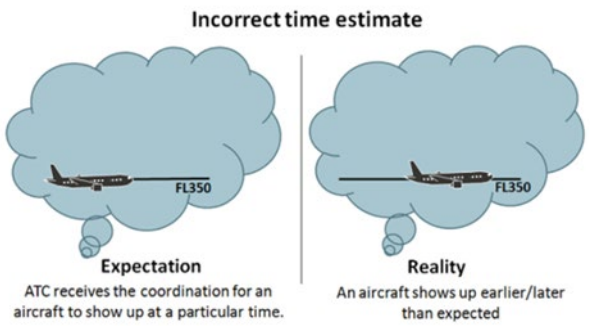

Figure 2: Category E LHD due to an incorrect time estimate versus the actual boundary time.

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.

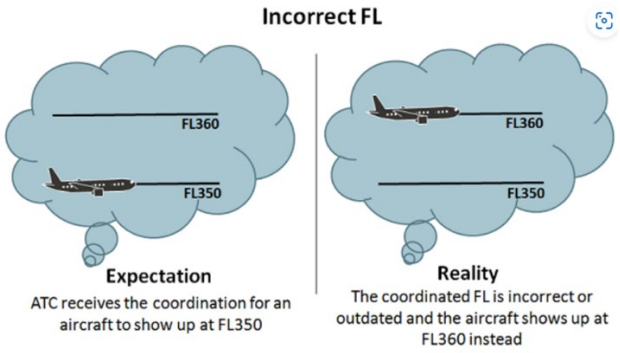

Figure 3: Category E LHD due to incorrect altitude coordination by ATC.

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.

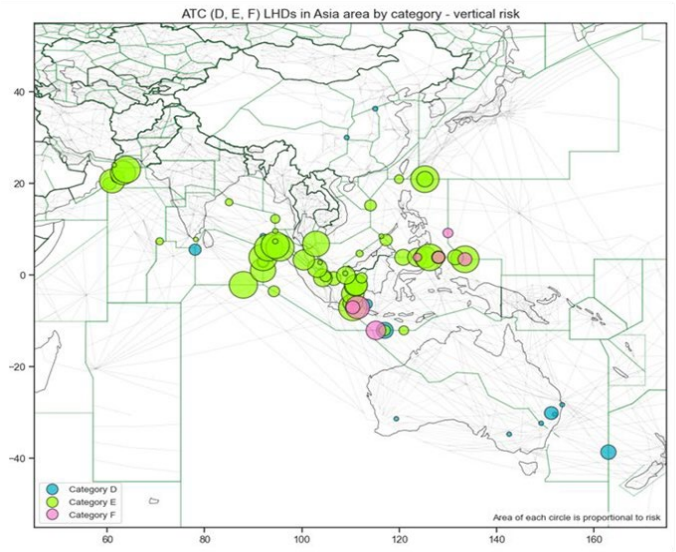

Figure 4: Category E LHDs (green) in Asia Pacific for 2023. The larger the circle, the more LHDs occurred and for a longer duration.

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).