International Civil Aviation Organization

Thirty-First Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/31)

Bangkok, Thailand, 29 June – 03 July 2026

Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs

2025 CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT (HOT SPOT N)

(Presented by PARMO)

SUMMARY

This paper presents the 2025 vertical risk assessment for the Central East Pacific (CEP) traffic flow in Pacific airspace. This area was designated as a hot spot (Hot Spot N) at RASMAG/24. The analysis for calendar year 2025 shows a continued trend in the reported LHD Category E for the CEP traffic flow.

1. INTRODUCTION

1.1 The Central East Pacific (CEP) traffic flow contains air traffic between Mainland North America and Hawaii. The RASMAG/24 meeting designated this area as a hot spot (Hot Spot N) due to several reported occurrences and resulting increased risk estimates. The CEP is the busiest traffic flow within Oakland Oceanic Flight Information Region (FIR). This working paper will examine the traffic within the CEP and present the associated risk estimates for calendar year 2025.

2. DISCUSSION

Description of the CEP traffic flow

2.1 The CEP traffic flow contains air traffic operations traveling in the east and west directions between Mainland North America and Hawaii. Amongst the traffic flows observed within the Oakland Oceanic FIR, it is the busiest in terms of traffic volume. The average flight time for an aircraft within the CEP routes is four hours. The CEP has a fixed airway route system consisting of nine airways. The three most northern airways and the most southern airway allow for bi-directional traffic. There are five one-way routes in the center of the route system. **Figure 1** shows the location of the CEP route system structure.

2.2 **Figure 2** provides some related statistics for observed air traffic within the CEP during calendar years 2021 through 2025. The data in **Figure 2** show the traffic levels remain consistent and the proportion of flight operations utilizing data link for communication and surveillance continues to increase. The PARMO monitors the proportion of aircraft filing Required Communication Performance (RCP) 240, Required Surveillance Performance (RSP) 180, and Required Navigation Performance (RNP) 4. Aircraft filing all three indicators are eligible for performance-based reduced horizontal separation standards within Oakland Oceanic FIR. The data in **Figure 2** show the proportion of flight operations eligible for reduced horizontal separation minima has substantially increased based on the observed filed flight plan RNP 4 and PBCS capabilities. In 2019, only thirty one percent of CEP operations were filing RNP 4 and PBCS, and in calendar year 2025 that percentage grew to more than eight percent.

2.3 **Figure 3** shows the observed number of flight operations by month from January 2020 through December 2025. The COVID-19 pandemic and the associated reduction in traffic levels is apparent during calendar year 2020 and in the beginning of calendar year 2021 in **Figure 3**.

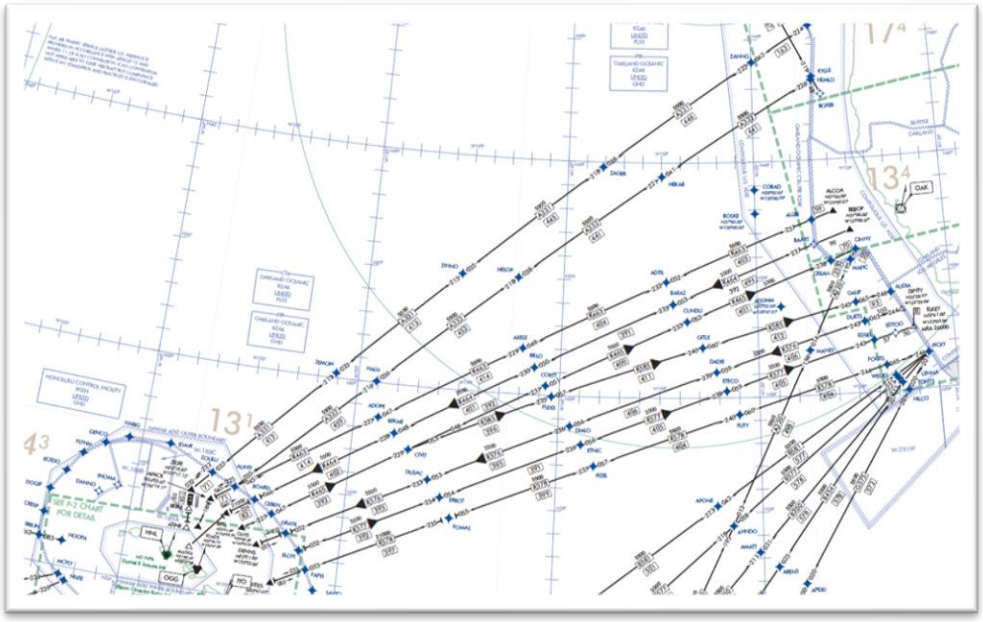

Figure 1. CEP Route System

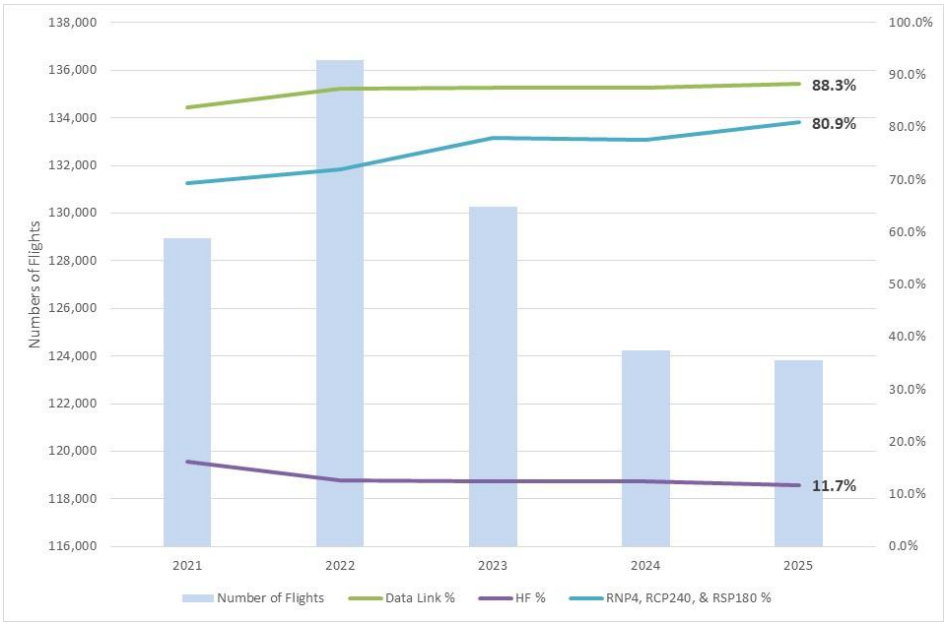

Figure 2. CEP Traffic Flow – 2021 through 2025

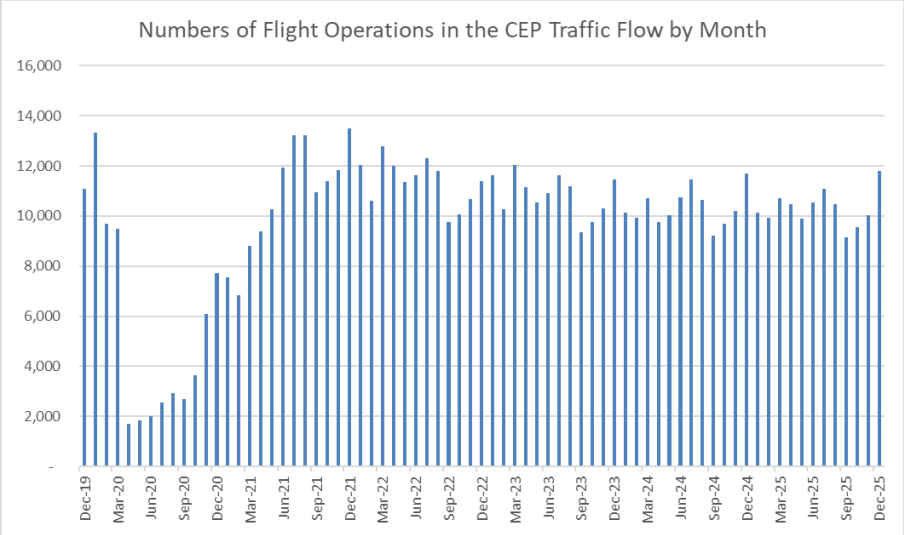

Figure 3. Observed Number of Flight Operations in the CEP by Month

Reported Large Height Deviations

2.4 In calendar year 2025, there were 42 reported LHDs that occurred within the CEP traffic flow. This is a slight increase over the 40 reported LHDs in calendar year 2024.

2.5 The reported occurrences were reviewed by the scrutiny group for U.S. Pacific Airspace. This scrutiny group consists of operational experts from each air traffic control facility, representatives from FAA Flight Standards and Airspace Safety, and safety analyses experts from the PARMO. The scrutiny group met virtually several times and reviewed all relevant reported occurrences from calendar year 2025.

2.6 **Figure 4** shows the durations associated with the reported LHDs have decreased in 2025 from that reported in 2024. There is an automated script that created Mandatory Occurrence Reports (MORs) for all occurrences involving ATC coordination between Honolulu Control Facility (HCF) and Oakland Center. Figure 4 shows the durations associated with the reported LHDs in 2025 have decreased by 50% from that reported in 2024.

2.7 **Table 1** provides the reported LHD by cause code, duration and flight levels crossed incorrectly for the CEP. The LHD category with the highest duration is category E-RI, errors in ATC-to-ATC transfers with no revision to transfer information. There are three Category A, four Category B, and 37 category E-RI reported LHDs. **Figure 5** shows the trends observed in reported LHD by cause code from 2021 – 2025.

2.8 There were four Category B reported LHDs in calendar year 2025. Three of these Category B LHDs were marked as involving a weather deviation. One of these reports involved ATC querying air crew when able for higher flight level, the inquiry was mistakenly taken as a clearance.

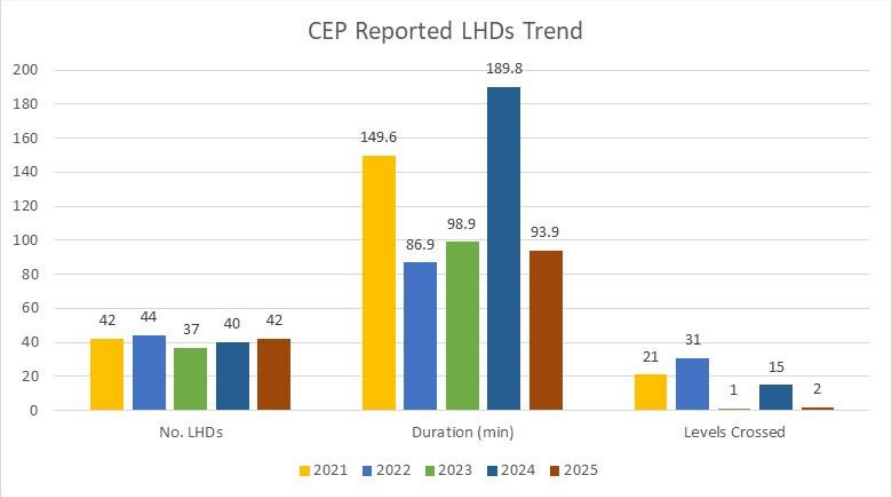

Figure 4. Reported LHDs Comparison Summary

Table 1. LHD Report by Category for CEP Traffic Flow – 2025

LHD Category	LHD Category Description	No. of LHD Occurrences	Duration (Min)	No. of FLs Levels Transitioned Without Clearance
A	Flight crew fails to climb or descend the aircraft as cleared	1	4	0
B	Flight crew climbing /descending without ATC clearance;	4	9	2
E-RI	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of human factors issues, No or Late Revision of Transfer Information	37	80.85	0
	Totals	**42**	**93.85**	**2**

2.9 All 37 reported category E-RI LHDs were errors in coordination from HCF to Oakland Center. There were 80 reported occurrences of this type within the CEP during calendar year 2025, however 43 of these occurrences were mitigated by ATC action and are not considered to be risk-bearing LHDs.

2.10 **Figure 6** shows the proportion of the Vertical Collision Risk Estime (CRE) by LHD Category for the CEP traffic flow. The data show 72 percent of the Vertical CRE is related to the Category E occurrences and 20 percent of the Vertical CRE is related to the Category B occurrences.

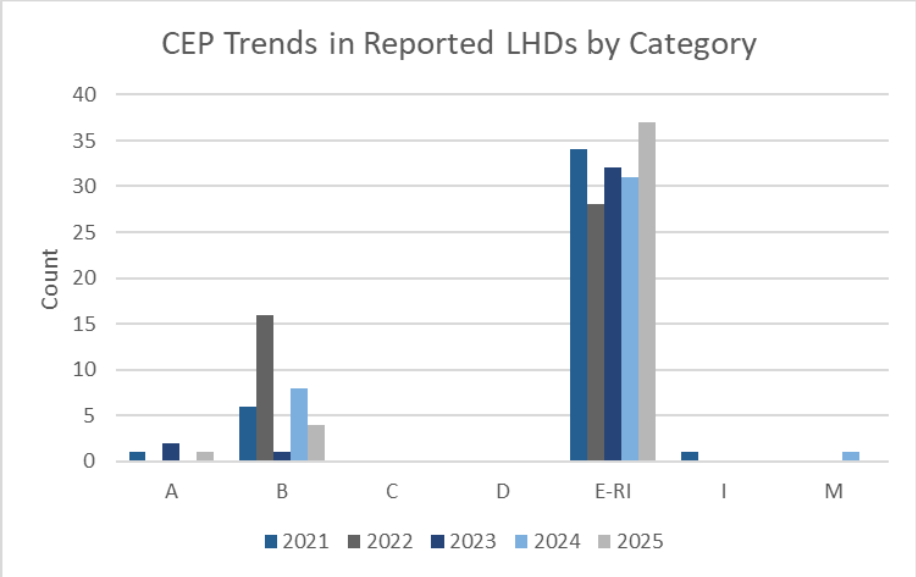

Figure 5. Observed Trends in Reported LHDs by Cause Code – 2021 through 2025

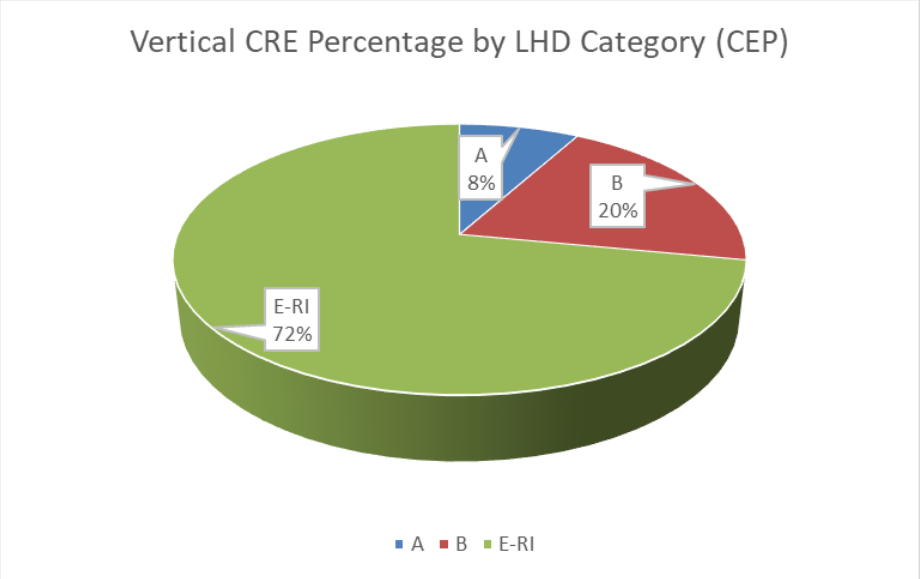

Figure 6. Percentage of Vertical CRE by LHD Category for the CEP Traffic Flow – 2025

2.11 **Figure 7** shows the locations of the reported LHDs within the CEP in 2025. The size of the circles in **Figure 7** indicates the contribution towards the vertical collision risk estimate for calendar year 2025. The vertical collision risk estimates provided in **Figure 7** considers whether the airway is unidirectional or bi-directional.

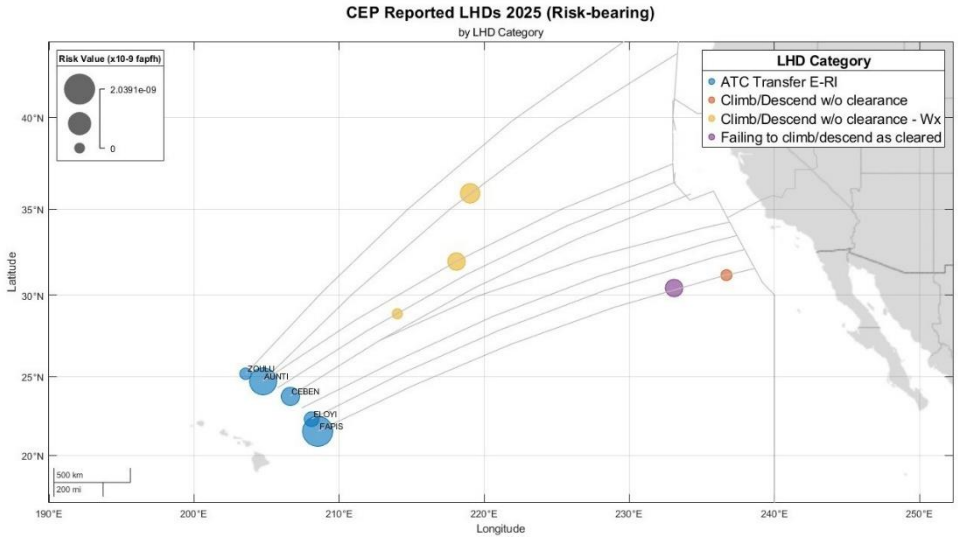

Figure 7. Reported LHDs within the CEP Traffic Flow – 2025

2.12 The trends in reported occurrences for the CEP in 2025 are consistent with that reported in 2024. The most frequently occurring category was errors in ATC-to-ATC transfers. There were 37 category E-RI LHDs reported in the CEP in 2025, all involved transfers between HCF and Oakland center. The longest duration associated with one of these reported occurrences took place in December 2025 and had a duration of seven minutes.

Category E LHD Reports

2.13 The total number of reported LHDs involving errors in transfers between HCF and Oakland center was forty-seven, not all of these occur within the CEP. **Figure 8** provides the general locations for all the category E LHD reports between HCF and Oakland center. The different colors indicate which traffic flow was affected by the reported occurrence, determined by the city pair. The reported LHD with locations to the east of Hawaii affect the Central East Pacific (CEP) traffic are colored in blue. The remaining traffic flows affected by these transfer errors include South Pacific (SOPAC), Japan-Hawaii, and OTHER traffic flows. The size of the circle at each boundary point represents the vertical collision risk estimate from all the reported Category E LHDs at that location. The vertical risk estimates by traffic flow for the LHDs depicted in **Figure 8** are shown in **Table 2.**

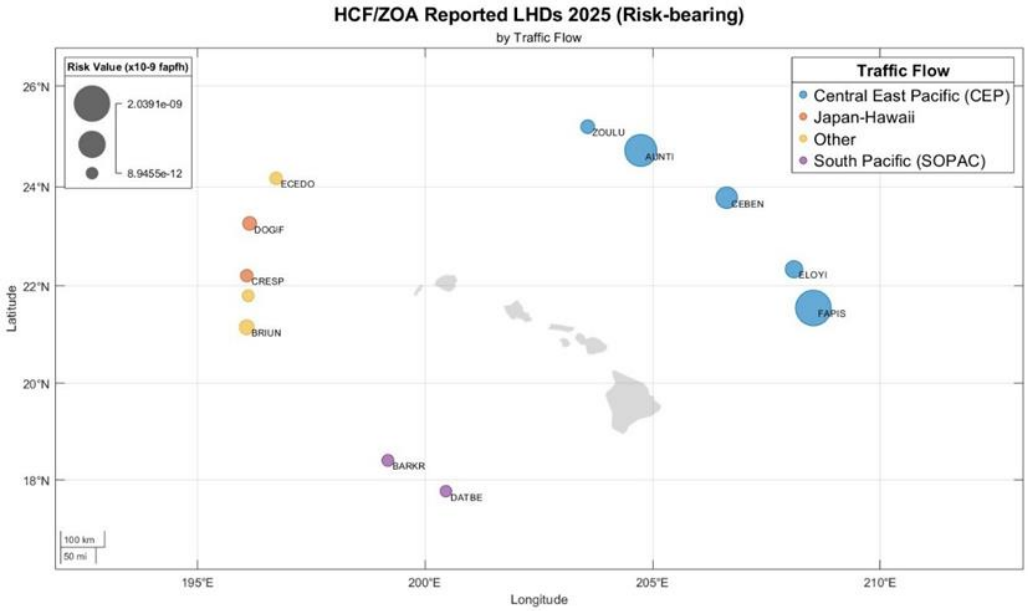

Figure 8. Reported LHDs Transfer Occurrences HCF – Oakland (2025)

Table 2. Vertical Risk Estimates by Traffic Flow – HCF/Oakland Category E-RI LHD Reports 2025

Traffic Flow	LHD Count	LHD Duration Sum (min)	Sum Vertical Risk Estimate (× 10^{-9} fapfh)
CEP	37	80.8	4.62
Japan-Hawaii	2	5.12	0.14
OTHER	5	10.33	0.23
SOPAC	3	0.63	0.04

2.14 The scrutiny review group informed PARMO these occurrences affect the user preferred routes (UPRs) crossing fixed airways within Oakland Oceanic FIR. These events occur frequently and have been tracked as both LLEs and LHDs for several years.

2.15 In 2021, a task force was established to further investigate these occurrences and determine remedial actions. The task force determined that the HCF does not have the functionality to update the aircraft profile and transfer the updated information to the next facility. The current automation system at the HCF includes the Surveillance Data Processing (SDP) Microprocessor En Route Automated Radar Tracking System (Micro-EARTS) and the Offshore Flight Data Processing System (OFDPS). The FAA's offshore modernization plan had been delayed for many years due to higher priorities. Currently, the HCF is testing the En Route Automation Modernization (ERAM) system, with implementation planned during calendar year 2027. Prior to the introduction of ERAM at the HCF, both facilities have implemented mitigation strategies:

a) a procedure that requires the controller to determine the remaining travel time to the boundary fix is in use by the HCF. During this procedure, ATC computes an estimated time of arrival (ETA) for the boundary fix and manually transfers the ETA to the next facility. It is noted that this is a manual procedure and is a short-term solution;

b) an Enhanced Trial Probe (ETP) for out of conformance reports was introduced in the oceanic automation system at Oakland ARTCC. This trial probe provides an alert to Oakland ATC for any potential conflicts that might affect an incoming aircraft from another facility in which the transfer information was incorrect. The ETP produces a visual on-screen alert for ATC, it does not create a protected aircraft profile. ATC action is required for the aircraft profile to be corrected; this action can be initiated based on the results of the ETP. The ETP information is a snapshot based on the information received at a specific time, the ETP does not update the system; and

c) Oakland ARTCC has implemented routine training for the oceanic controllers. This training instructs the controllers on how to update an aircraft's profile/fix times using the coordination window within the ATC automation system. All the reported occurrences of this type were validated by Oakland ARTCC using the radar information or ADS-C position information from the aircraft.

2.16 The Mandatory Occurrence Reports (MORs) and available archive data were examined for all reported occurrences involving HCF and Oakland center. The MOR contains results from a script that captures coordinated transfer information and the actual boundary crossing position report. The script also captures the time stamp for the update to the aircraft profile in the ATC automation system. If the aircraft profile was updated prior to the boundary crossing, the occurrence is considered a reported prevention and has zero duration. These prevented occurrences are marked as non-risk bearing LHDs and are not included in the analysis contained in this report. If the aircraft profile was updated after the boundary crossing, the occurrence has a non-zero duration, unprotected time within Oakland Oceanic FIR, and is a risk-bearing LHD.

2.17 An additional step was added to the LHD analysis in calendar year 2025. For aircraft using ADS-C, the analysis identified whether a manual request for aircraft position report via ADS-C prior to the aircraft reaching the HCF/Oakland boundary is observed. This manual request for aircraft position information shows positive ATC action for these occurrences. The ETP alerts can provide ATC with information on potential conflicts using the manually requested position information from the aircraft. If a manual request for ADS-C position was observed earlier than the profile update time, the time stamp from the manual request for aircraft position was used to determine the LHD duration.

2.18 **Figure 9** shows the current observed trends, many of the occurrences are mitigated prior to the time the aircraft reaches the oceanic entry point.

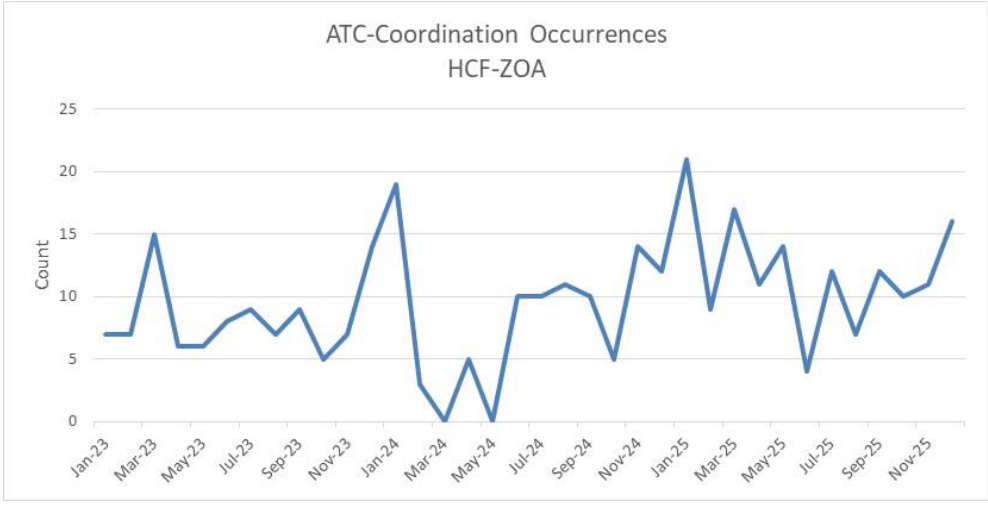

Figure 9. Observed Trends in ATC-Coordination Occurrences, HCF-ZOA

Vertical Risk Estimate

2.19 The methodology used to estimate vertical risk in Pacific airspace considers the location of the reported LHDs. The vertical risk estimates for each traffic flow are calculated and then weighted by the observed flying hours within each flow. Therefore, the individual vertical risk for the CEP traffic flow is available through the vertical risk calculations for Pacific airspace**.**

2.20 The overall vertical risk for the CEP in 2025 is 6.4×10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This value represents a 57% decrease from that reported in 2024 [15.1×10^{-9} fapfh]. **Figure 10** shows the two-year (rolling 12-month) trend for the CEP vertical collision risk estimates. The data show a positive decreasing trend in vertical collision risk estimates. This is attributed to the corrective actions employed at the ATC units to mitigate the E-RI LHD occurrences.

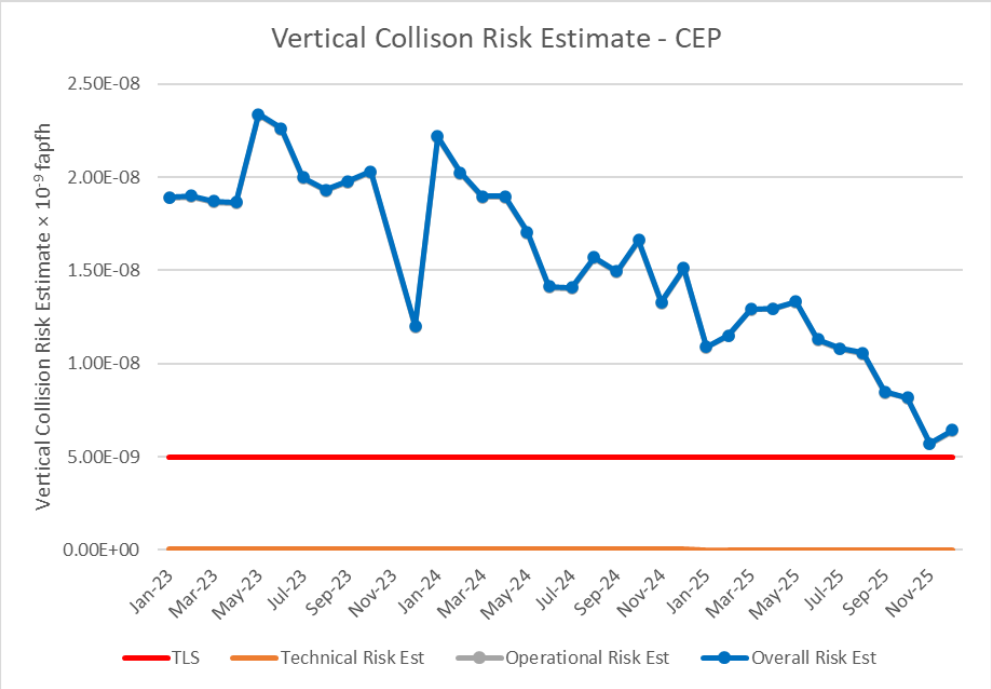

Figure 10. CEP Vertical Collision Risk Estimates by Calendar Year (Rolling 12-month)

Hot Spot Identification Process

2.21 This section updates the Hot Spot Identification criteria for Hot Spot N. This process was proposed at Ninth Meeting of the RASMAG Monitoring Agencies Working Group (RASMAG/MAWG/9) in February 2022. **Table 3** provides the results of the Hot Spot identification process applied to the CEP Traffic Flow, Hot Spot N.

Table 3. Hot Spot N Results

	2018	2019	2020	2021	2022	2023	2024	2025
Number of LHDs in Hot Spot N	11	36	29	42	44	37	40	42
Number of Clusters (n) in Region	4	3	3	3	3	3	3	3
Hot Spot N Operational Risk ($\times 10^{-9}$ fapfh)	23.7	16.4	17.3	23.7	21.2	12.0	15.1	6.4

	2018	2019	2020	2021	2022	2023	2024	2025
Criteria: Number of Occurrences in Region/(n+1)	6.4	20.75	12.85	16.25	17.5	9.25	10	10.5
Criteria: Region Risk Estimate ($\times 10^{-9}$ fapfh)/(n+1)	5.28	7.85	5.5	7.05	8.15	3	3.8	1.6
Criteria: TLS >= 5 $\times 10^{-9}$ fapfh	5	5	5	5	5	5	5	5
Result and Action by RASMAG Meeting	Continue Monitoring (RASMAG/ 24)	Continue Monitoring (RASMAG/ 25)	Continue Monitoring (RASMAG/ 26)	Continue Monitoring (RASMAG/ 27)	Continue Monitoring (RASMAG/ 28)	Continue Monitoring (RASMAG/ 29)	Continue Monitoring (RASMAG/ 30)	

2.22 For RASMAG to remove an LHD hot spot, proof of mitigation measures should be presented, and the implementation results should reflect the effectiveness of risk controls in terms of reduction in the number of occurrences and operational risk of the hot spot.

2.23 The data show that the corrective actions employed to mitigate the E-RI LHD occurrences have been effective. The implementation of ERAM at HCF should reduce these occurrences as the ERAM system is capable of directly interfacing with the ATOP system.

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

a) note the information contained in this paper; and

b) review the hot spot criteria for this area; and

c) discuss any relevant matters as appropriate.

— END —