International Civil Aviation Organization

Twenty-Ninth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/29)

Bangkok, Thailand, 19 – 22 August 2024

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

2023 CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT

(Presented by the United States/PARMO)

SUMMARY

This paper presents the 2023 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 due to several long duration Large Height Deviations (LHDs) reported in 2018. The analysis for calendar year 2023 show a continued trend in the reported LHD category 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 2023.

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 one 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 **Table 1** provides some related statistics for observed air traffic within the CEP during calendar years 2019 through 2023. The first two rows in Table 1 represent the number of flying hours and the number of flights during the calendar year. The last three rows in Table 1 show the proportion of December traffic for each calendar year observed using data link, using High Frequency (HF) radio, and eligible for reduced horizontal separation standards. This eligibility is determined from the operator filed flight plans.

2.3 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.

2.4 **Figure 2** shows the observed number of flight operations by month from January 2020 through June 2024. 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.

Table 1. CEP Traffic Flow – 2019 through 2023

	2019	2020	2021	2022	2023
Total flying hours	425,950	215,009	461,990	474,687	479,187
Number of Flights	115,543	63,661	128,927	136,431	130,266
Proportion Data Link Operations	69.1 %	81.8%	83.8%	87.3%	87.6%
Proportion HF (only) Operations	30.9 %	18.2%	16.2%	12.7%	12.4%
Proportion RNP4, RCP240, & RSP180 filing	31.4 %	52.2%	69.3%	71.9%	77.9%

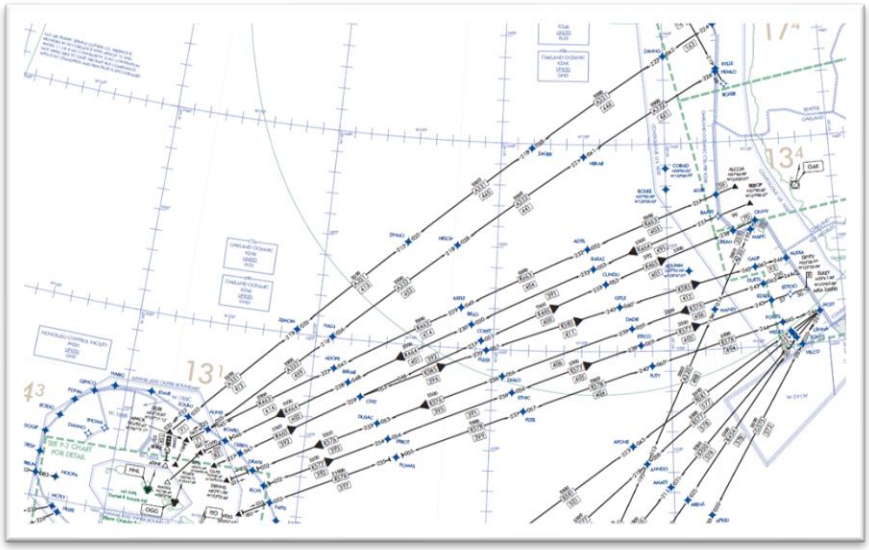

Figure 1. CEP route system

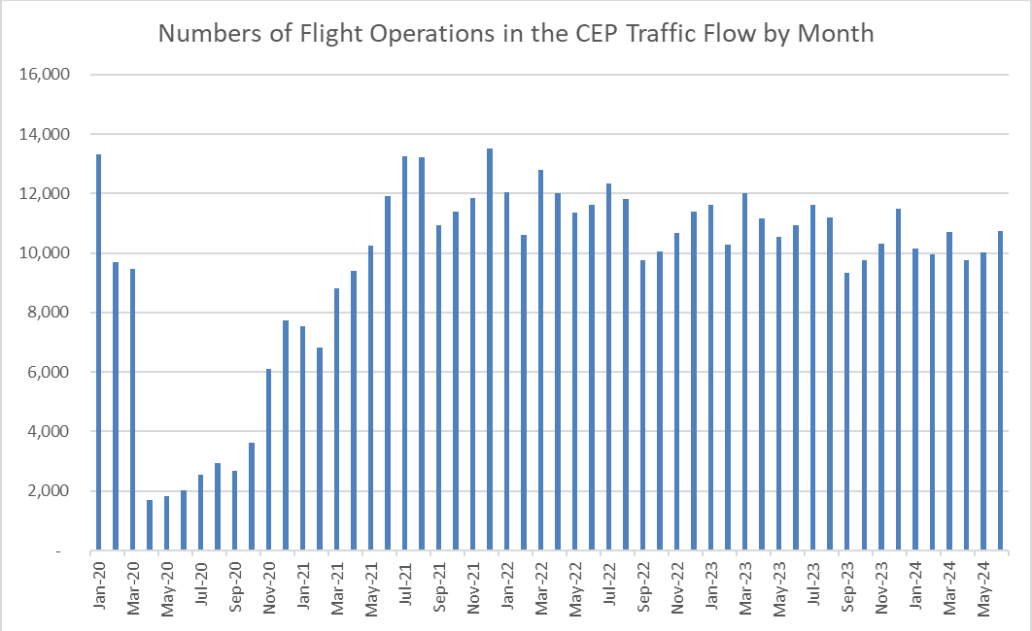

Figure 2. Observed number of flight operations in the CEP by month

Reported Large Height Deviations

2.5 In calendar year 2023, there were 37 reported LHDs that occurred within the CEP traffic flow. This is a slight decrease over the 44 reported LHDs in calendar year 2022.

2.6 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 2023.

2.7 **Figure 3** shows the associated durations with the reported LHDs has increased in 2023 from that reported in 2022. However, the numbers of flight levels crossed without ATC clearance has decreased from calendar year 2022 to 2023. Starting with the reported occurrences received in calendar year 2020, there is accurate accounting of the durations associated with the reported occurrences involving ATC coordination between Honolulu Control Facility (HCF) and Oakland center.

2.8 **Table 2** 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, errors in ATC-to-ATC transfers. There are two category A, one category B, and 32 category E reported LHDs.

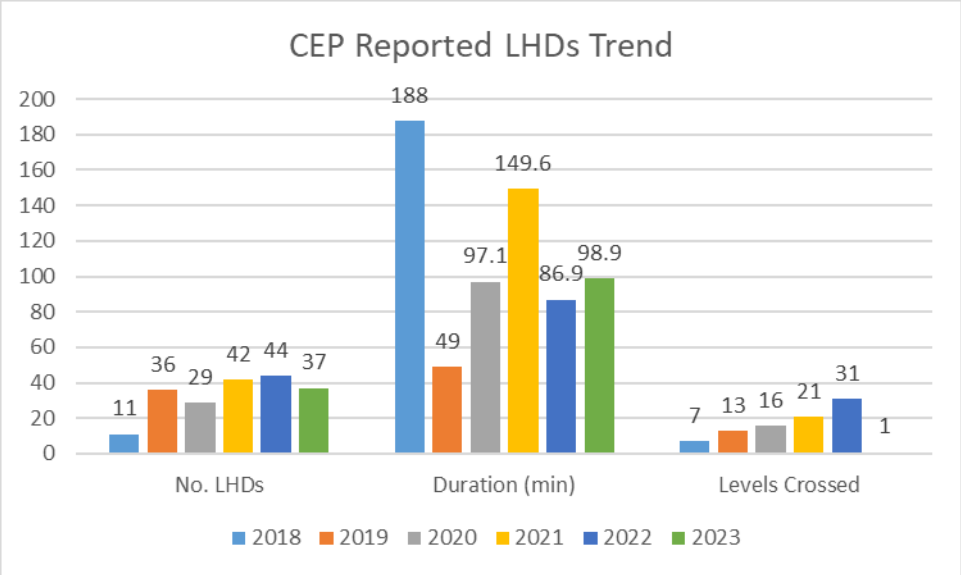

Figure 3. Reported LHDs Comparison Summary

Table 2. LHD report by category for CEP Traffic Flow - 2023

LHD Category	LHD Category Description	No of LHD Occurrences	Duration (Min)	No. of FLs Levels Transitioned Without Clearance
A	Flight crew failing to climb/descend as cleared	2	0	1
B	Flight crew climbing /descending without ATC clearance;	1	0	0
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility as a result 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);	34	98.9	0
	Totals	**37**	**98.9**	**1**

2.9 For the 2023 analysis, a more precise calculation was made for the vertical collision risk estimate. The risk calculation now considers whether the airway associated with the boundary fix for each reported occurrence is a one-way route or bidirectional route. Previous reports for this area applied the same expected traffic density for all occurrences. Figure 1 shows there are one-way routes and bidirectional routes in the CEP. **Table 3** lists the routes, corresponding HCF/Oakland boundary fix, and whether the route is one-way or bidirectional. The calculations for reported occurrences on a one-way route assume no opposite direction traffic, e.g. zero value for opposite direction vertical occupancy. This calculation reflects the operational situation for these one-way routes. This adjustment affects the estimated risk for occurrences reported at boundary fixes CEBEN and ELOYI. For reference, the 2022 CEP risk estimates were recalculated in this manner and compared to the data from 2023, a comparison is provided in **Figure 4**. The adjusted calculation has a greater effect on the vertical collision risk estimate for calendar year 2022 due to the larger proportion of occurrences reported for the one-way routes. In calendar year 2023, all the longer duration occurrences affected the bi-directional routes.

2.10 **Figure 5** shows the locations of the reported LHDs within the CEP in 2023. The size of the circles in Figure 5 indicate the contribution towards the vertical collision risk estimate for calendar year 2023. The vertical collision risk estimates provided in Figure 5 take into account whether the route is unidirectional or bi-directional.

Table 3. CEP Routes, HCF/ZOA Boundary Fix, Route Direction

Route	Boundary Fix	Route direction
R577	ELOYI	One-way, EAST
R576	DRAYK	One-way, WEST
R465	CEBEN	One-way, EAST
R464	BOARD	One-way, WEST
R578	FAPIS	Bi-directional
R463	AUNTI	Bi-directional
A331	ZOULU	Bi-directional
A450	BRIUN	Bi-directional
R584	MCFLY	Bi-directional
B326	NIXEE	Bi-directional
B580/B474	BARKR	Bi-directional
A579	CHEEM	Bi-directional
G347/G457	DATBE	Bi-directional
B596	RUDEE	Bi-directional
B595	TARDE	Bi-directional

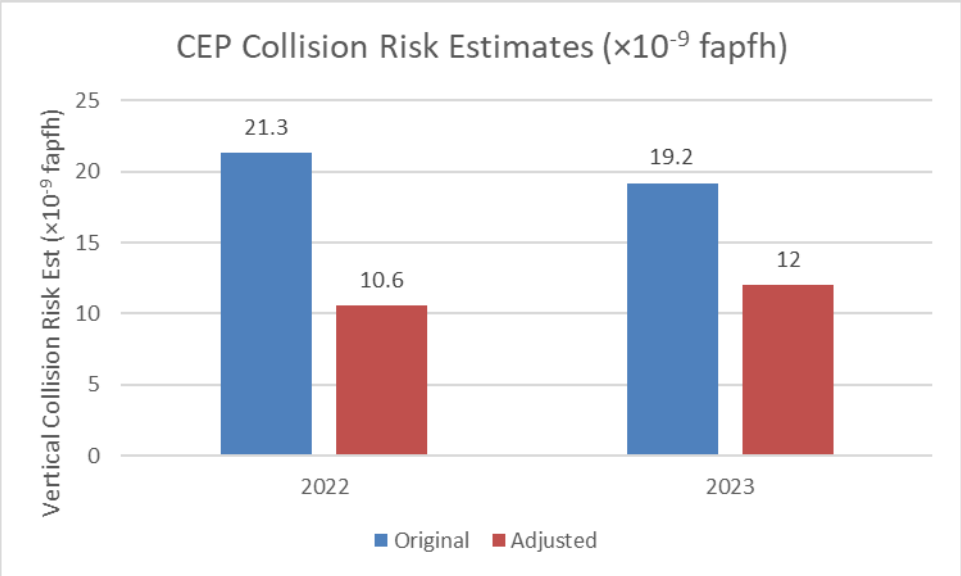

Figure 4. Modification to Risk Estimates Based on Affected Route in CEP

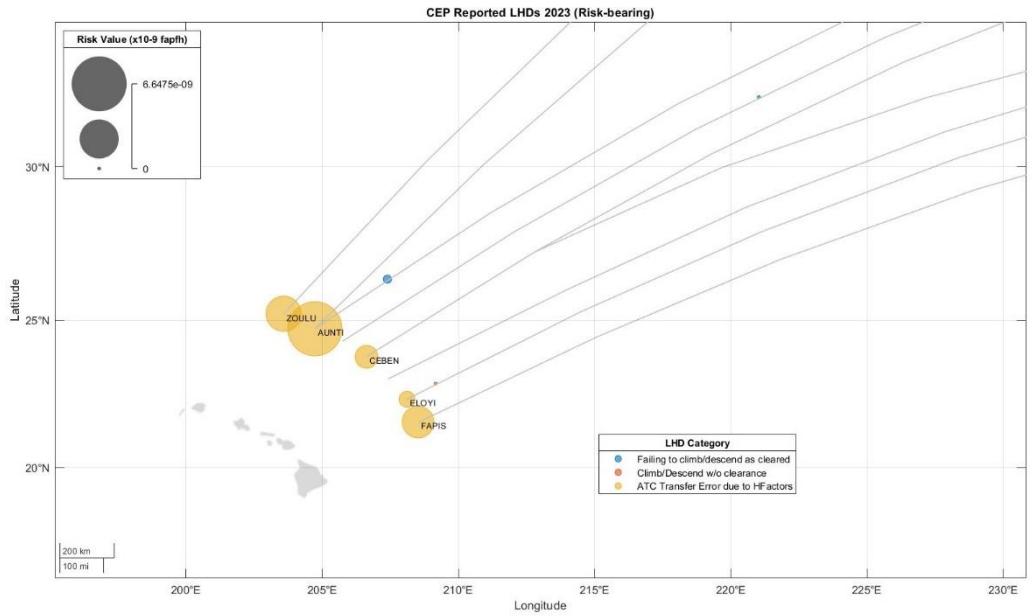

Figure 5. Reported LHDs within the CEP Traffic Flow – 2023

2.11 The trends in reported occurrences for the CEP in 2023 are consistent with that reported in 2022. The most frequently occurring category were errors in ATC-to-ATC transfers. There were 32 category E LHDs reported in the CEP in 2023, all involved transfers between HCF and Oakland center. The longest duration associated with one of these reported occurrences took place in June 2023 and had a duration of 24 minutes.

Category E LHD Reports

2.12 The total number of reported LHDs involving errors in transfers between HCF and Oakland center was forty, not all of these occur within the CEP. **Figure 6** 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) and Japan-Hawaii 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 6 are shown in **Table 4.**

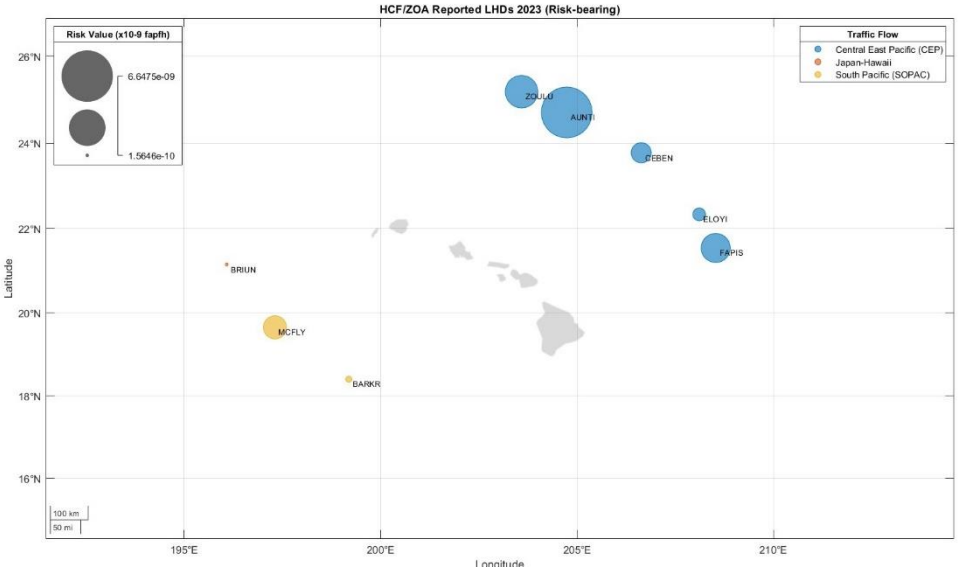

Figure 5. Reported LHDs transfer occurrences HCF – Oakland OCA (2023)

Table 4. Vertical Risk Estimates by Traffic Flow - HCF/Oakland Category E LHD Reports 2023

Traffic Flow	LHD Count	LHD Duration Sum (min)	Sum Vertical Risk Estimate ($\times 10^{-9}$ fapfh)
CEP	34	98.9	12.0
Japan-Hawaii	3	8.8	0.16
SOPAC	3	7.0	1.9

2.13 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 require significant resources at the ATC facility to investigate underlying causes.

2.14 The available system data were examined for all the LHD category E occurrences involving HCF and Oakland center. The operational experts from Oakland center determined whether there was any unprotected time within Oakland Oceanic FIR for each occurrence. First, the actual boundary crossing time was noted. Next, the time stamp for an update to the aircraft profile in the Oakland automation system was noted. If the aircraft profile was updated prior to the boundary crossing, the occurrence is considered a reported prevention and has zero duration. If the aircraft profile was updated after the boundary crossing, the occurrence has a non-zero duration and unprotected time within Oakland Oceanic FIR.

2.15 A task force was established to further investigate these occurrences and determine remedial actions, the task force met at the HCF early in 2021. The task force reviewed the current systems and procedures at the HCF. It was 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 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. The current plan to implement the En Route Automation Modernization (ERAM) system at the HCF is planned for implementation by the end of 2025. Prior to that time, both facilities have implemented mitigation strategies:

2.16 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 a short-term solution.

2.17 Oakland center has implemented refresher 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 center using the radar information or ADS-C position information from the aircraft.

2.18 Furthermore, the FAA's Air Traffic Safety Oversight Service is providing oversight of the development and implementation of additional mitigations aimed at reducing the vertical risk estimate in the CEP prior to ERAM implementation. This is an ongoing effort that may see a reduction in the number of Category E LHDs reported during the third quarter of calendar year 2024.

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 2023 is 12.0×10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This value represents a decrease from that reported in 2022. **Figure 6** shows the five-year (rolling 12-month) trend for the CEP vertical collision risk estimates.

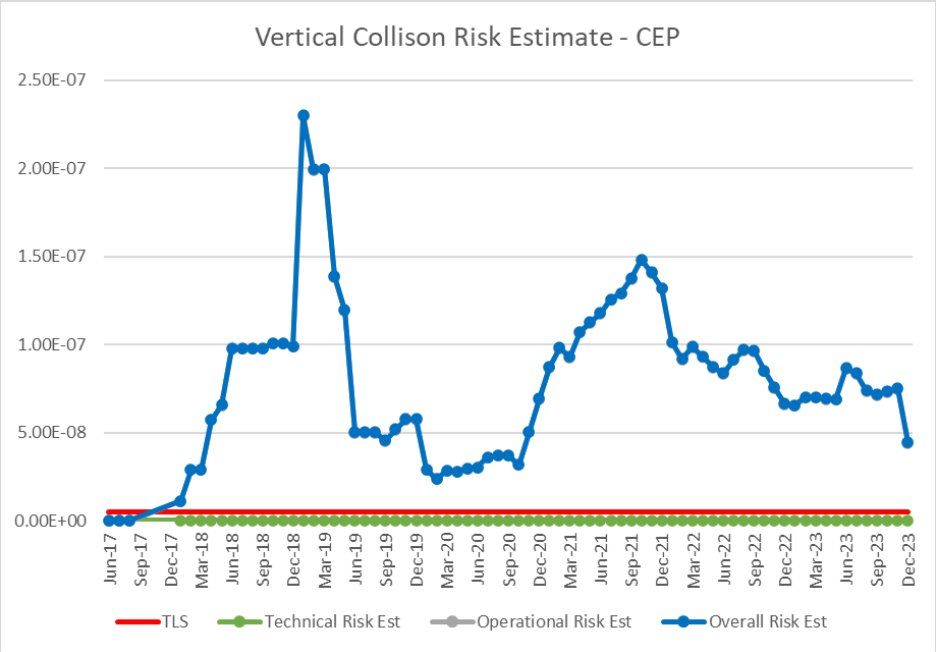

Figure 6. CEP vertical collision risk estimates by calendar year (rolling 12-month)

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 5** provides the results of the Hot Spot identification process applied to the CEP Traffic Flow, Hot Spot N.

Table 5: Hot Spot N Results

	2018	**2019**	**2020**	**2021**	**2022**	**2023**
Number of LHDs in Hot Spot N	11	36	29	42	44	37
Number of Clusters (n) in Region	4	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
Criteria: Number of Occurrences in Region/(n+1)	6.4	20.75	12.85	16.25	17.5	9.25
Criteria: Region Risk Estimate ($\times 10^{-9}$ fapfh)/(n+1)	5.28	7.85	5.5	7.05	8.15	3
Criteria: TLS >= 5 $\times 10^{-9}$ fapfh	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)

2.22 The results shown in Table 5 confirm the decision to continue monitoring the data collected for Hot Spot N. PARMO will provide an update for Hot Spot N to RASMAG/30 in 2025.

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.

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