



International Civil Aviation Organization

ICAO Twenty-Seventh Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/27)

Video Teleconference, 22 – 25 August 2022

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

CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT FOR CALENDAR YEAR 2021

(Presented by the United States/PARMO)

SUMMARY

This paper presents the 2021 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 a number of long duration Large Height Deviations (LHDs) reported in 2018. The analysis for calendar year 2021 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 a number of 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 2021.

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. **Figures 1 and 2** show 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 2021. 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 3** shows the observed number of flight operations by month from August 2019 through May 2022. 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.

	2019	2020	2021
Total flying hours	425,950	215,009	461,990
Number of Flights	115,543	63,661	128,927
Proportion Data Link Operations	69.1 %	81.8%	83.8%
Proportion HF (only) Operations	30.9 %	18.2%	16.2%
Proportion RNP4, RCP240, & RSP180 filing	31.4 %	52.2%	69.3%

Table 1. CEP Traffic Flow – 2019 through 2021

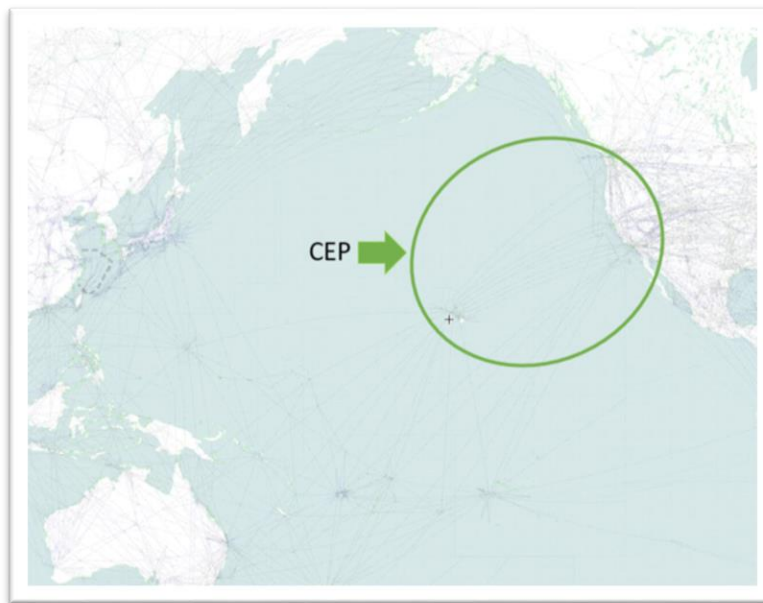


Figure 1. CEP location within Pacific Airspace

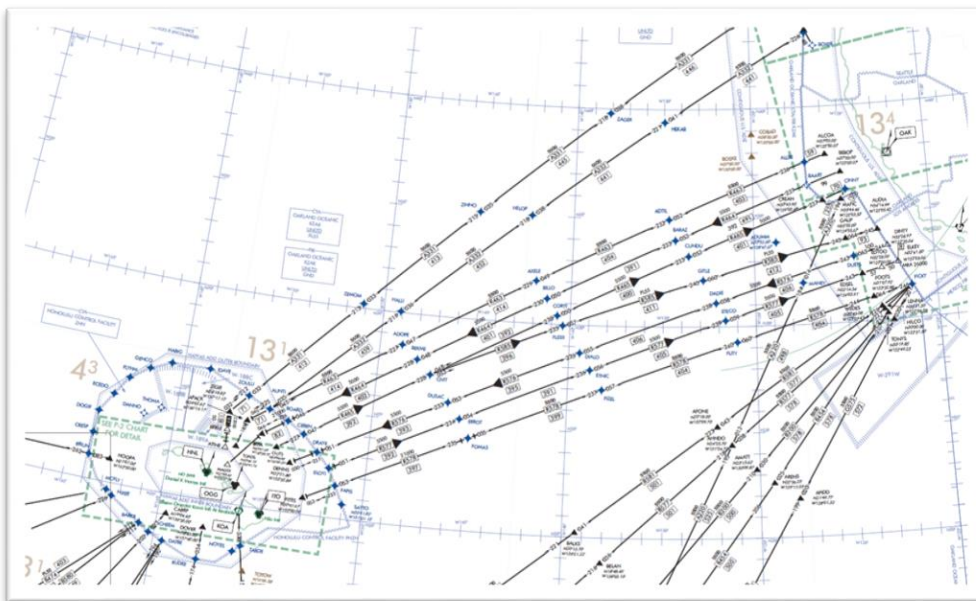


Figure 2. CEP route system

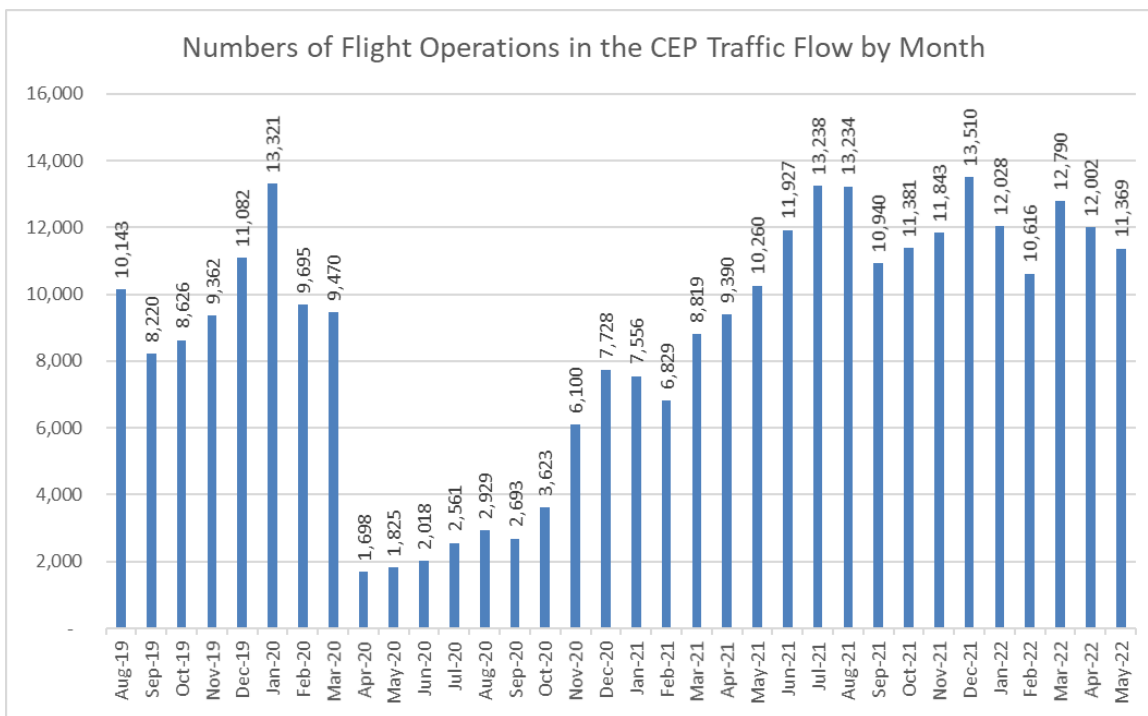


Figure 3. Observed number of flight operations in the CEP by month

Reported large height deviations (LHDs)

2.5 For calendar year 2021, there were forty-two reported LHDs for the CEP. This is an increase over the twenty-nine LHDs reported in 2020.

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 2021.

2.7 **Figure 4** shows the associated durations with the reported LHDs has increased in 2021 from that reported in 2020. This increase coincides with the increase in the number of reported occurrences in 2021. Starting with the reported occurrences received in calendar year 2020, there is accurate accounting of the unprotected time 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 is one reported category A LHD and six reported category B LHDs. Two of the reported category B LHDs had weather (category I) assigned as a secondary causal code, one of the reported category B LHDs had contingency (category H) assigned as a secondary causal code.

2.9 There is one reported LHD with weather/turbulence as the primary causal factor, category I, this contributes towards the estimate of technical vertical risk. All of the other reported LHDs for the CEP traffic flow contribute towards the estimate of vertical operational risk.

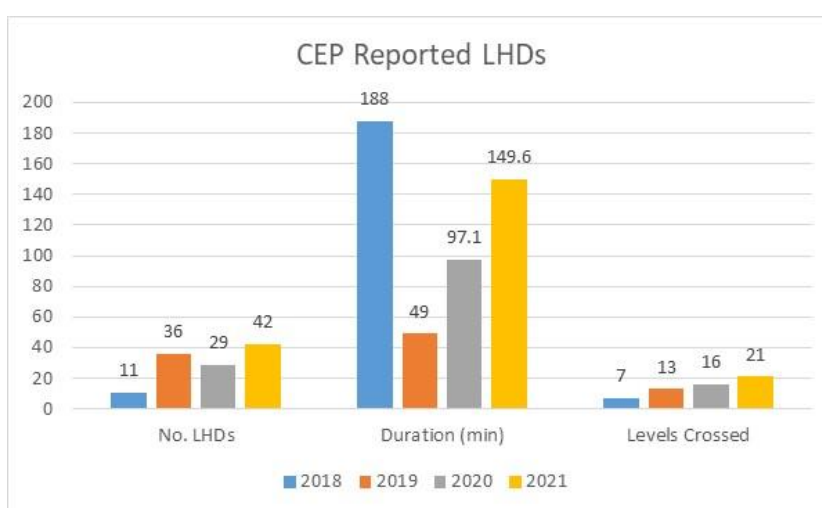


Figure 4. Reported LHDs Comparison Summary

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
A	Flight crew failing to climb/descend the aircraft as cleared;	1	0	1
B	Flight crew climbing /descending without ATC clearance;	6	21	18
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.)	0	0	0
D	ATC system loop error; (e.g. ATC issues incorrect clearance or flight crew misunderstands clearance message);	0	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	34	128.6	0

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
	coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters);			
F	Coordination errors in the ATC-to-ATC transfer of control responsibility as a result of equipment outage or technical issues;	0	0	0
G	Aircraft contingency event leading to sudden inability to maintain assigned flight level (e.g. pressurization failure, engine failure);	0	0	0
H	Airborne equipment failure leading to unintentional or undetected change of flight level (e.g. altimetry errors)	0	0	0
I	Turbulence or other weather related causes	1	0	2
J	TCAS resolution advisory; flight crew correctly following the resolution advisory	0	0	0
K	TCAS resolution advisory; flight crew incorrectly following the resolution advisory	0	0	0
L	An aircraft being provided with RVSM separation is not RVSM approved (e.g. flight plan indicating RVSM approval but aircraft not approved, ATC misinterpretation of flight plan);	0	0	0
M	Other	0	0	0
	Totals	42	149.6	21

Table 2. LHD report by category for CEP Traffic Flow - 2019

2.10 **Table 3** shows the number of reported LHDs and total duration by category in the CEP for 2021 vs 2020. The data show the increase in the duration associated with category E occurrences for the CEP traffic flow in 2021 compared to 2020. **Figure 5** shows the locations of the reported LHDs within the CEP in 2021.

Category	2020		2021	
	No. LHD	Duration(min)	No. LHD	Duration (min)
A	1	1	1	0
B	5	18	6	21
E	21	68.1	34	128.6
I	0	0	1	0
M	2	10	0	0
Total	29	97.1	42	149.6

Table 3. Reported LHD Occurrences for CEP 2020 vs 2021

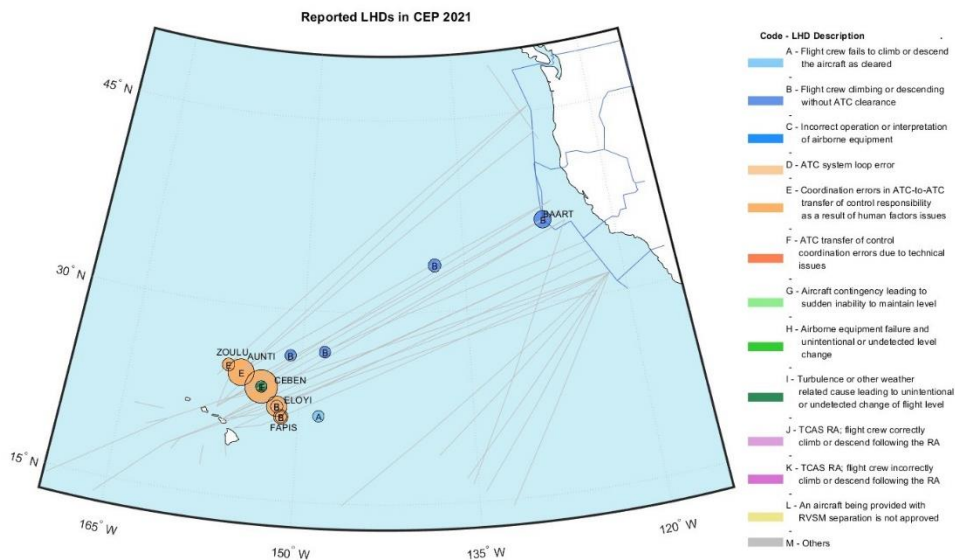


Figure 5. Reported LHDs within the CEP Traffic Flow – 2021

2.11 The trends in reported occurrences for the CEP in 2021 are consistent with that reported in 2020. The most frequently occurring category were errors in ATC-to-ATC transfers. There were thirty-four category E LHDs reported in the CEP in 2021, all involved transfers between HCF and Oakland center. The longest duration associated with one of these reported occurrences took place in November 2021 and had a duration of twenty-three minutes.

2.12 The total number of reported LHDs involving errors in transfers between HCF and Oakland center was forty-one, not all of these occur within the CEP. **Figure 6** provides the general locations for all of 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 CEP traffic are colored in blue. The other traffic flows affected by these transfer errors include South Pacific (SOPAC), and Other traffic flows.

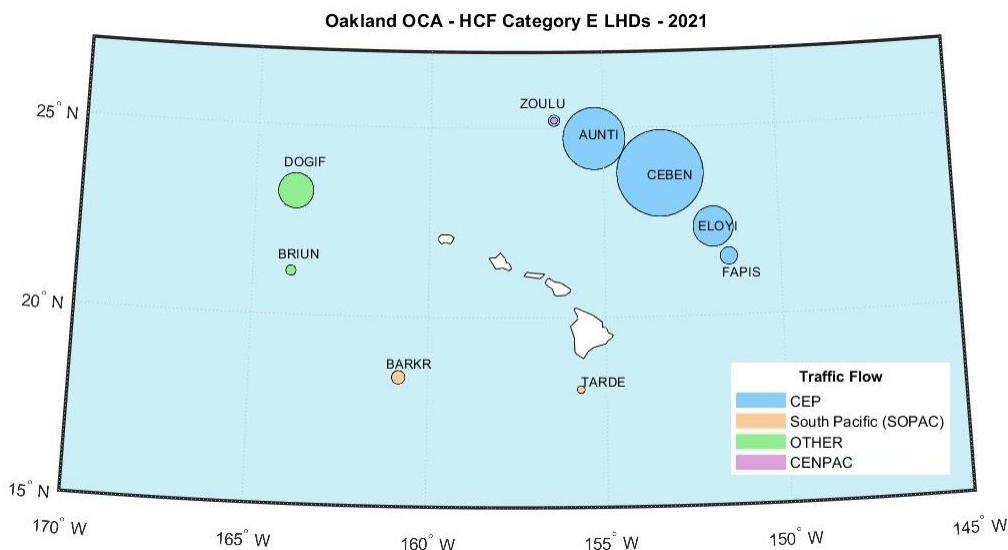


Figure 5. Reported transfer occurrences HCF – Oakland OCA [2021]

2.13 The scrutiny review group informed PARMO these occurrences affect the user preferred routes (UPRs) crossing fixed airways within Oakland Oceanic FIR. These type of 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 of 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 still on track for implementation by the end of 2025. Prior to that time, both facilities have implemented mitigation strategies:

2.15.1 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 considered to be a short-term solution.

2.15.2 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.

2.15.3 All of the reported occurrences of this type were validated by Oakland center using the radar information or ADS-C position information from the aircraft. There were extended periods in which the radar used for this validation was out of service, specifically from November 2021 through March 2022. During the outage periods, there are fewer reported occurrences due to the limited investigation and validation of such occurrences.

Vertical Risk Estimate

2.16 The methodology used to estimate vertical risk in Pacific airspace takes into account 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.

2.17 The overall vertical risk for the CEP in 2020 is 23.7×10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This value represents an increase from that reported in 2019. **Figure 6** shows the four-year trend for the CEP vertical collision risk estimates.

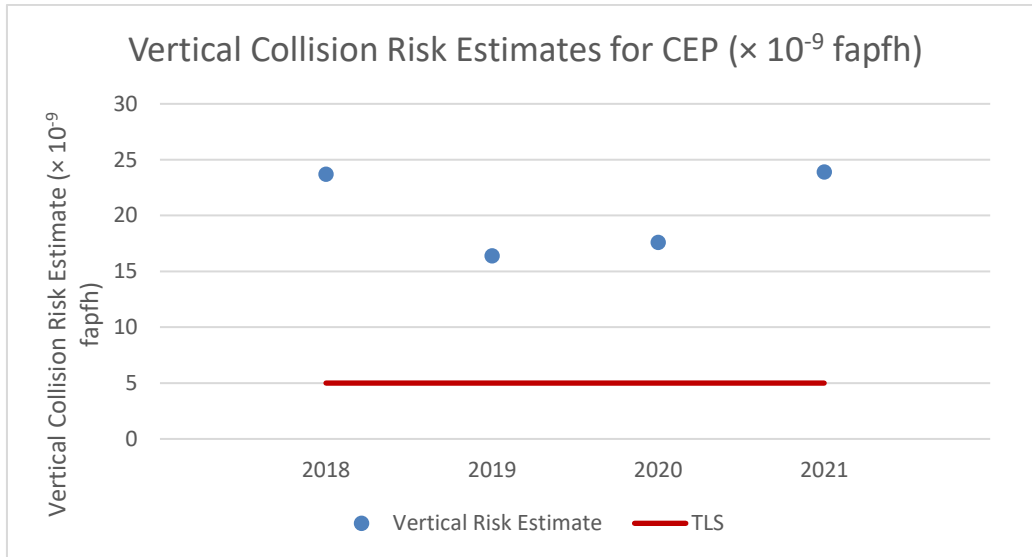


Figure 6. CEP vertical collision risk estimates by calendar year

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.

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