International Civil Aviation Organization
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Agenda Item 3: Reports from Asia/Pacific RMAs and EMAs

CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT FOR CALENDAR YEAR 2020

(Presented by United States/PARMO)

SUMMARY

This paper presents the 2020 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 results from calendar year 2019 showed a change in the top category for the reported LHD occurrences compared to 2018. The analysis for calendar year 2020 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 usually the busiest traffic flow within Oakland Oceanic Flight Information Region (FIR). The COVID-19 pandemic and associated reduction in air travel affected the observed traffic levels in the CEP and around the world. This working paper will examine the traffic within the CEP and present the associated risk estimates for calendar year 2020.

2. DISCUSSION

2.1 Description of the CEP Traffic Flow

2.2 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 usually the busiest in terms of traffic volume. The COVID-19 pandemic and associated reduction in air travel had an effect on the traffic levels during calendar year 2020. 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.

2.3 **Table 1** provides some related statistics for observed air traffic within the CEP during calendar year 2020 compared to 2019. The first two rows in Table 1 represent the number of flying hours and the number of flights throughout 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.

2.4 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.

2.5 **Figure 3** shows the observed number of flight operations by month from August 2019 through February 2021. The COVID-19 pandemic and the associated reduction in traffic levels is evident in the data provided in Figure 3.

Calendar Year 2019	2019	2020
Total flying hours	425,950	215,009
Number of Flights	115,543	63.661
Proportion Data Link Operations	69.1 %	81.8%
Proportion HF (only) Operations	30.9 %	18.2%
Proportion RNP4, RCP240, and RSP180 filing	31.4 %	52.2%

Table 1: CEP Traffic Flow – 2019 vs 2020

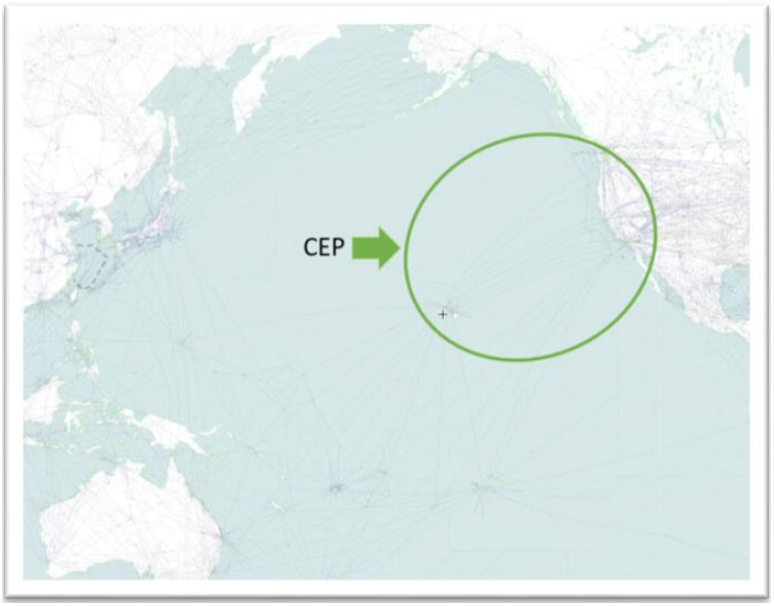

Figure 1. CEP location within Pacific Airspace

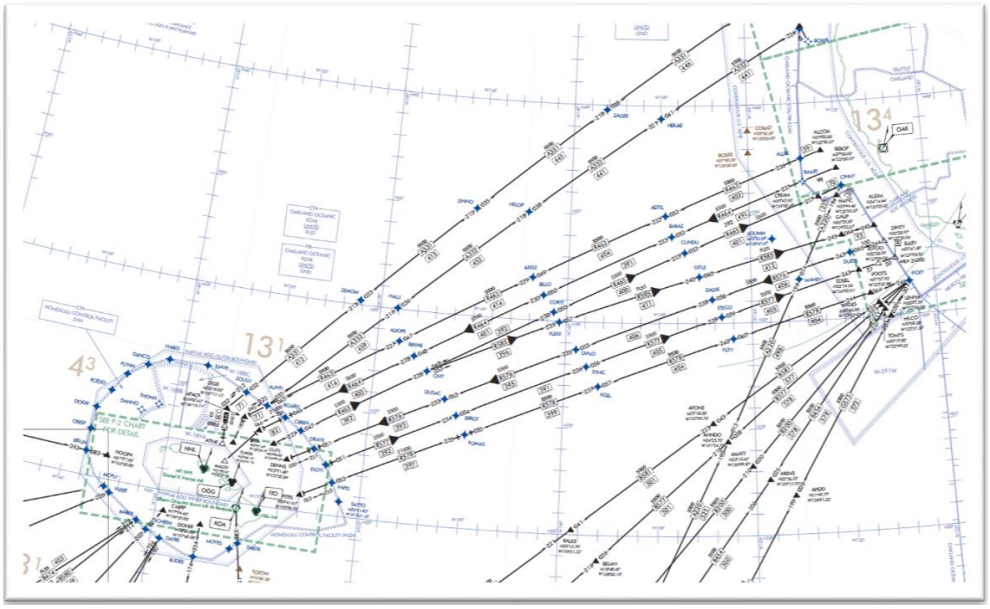

Figure 2. CEP route system

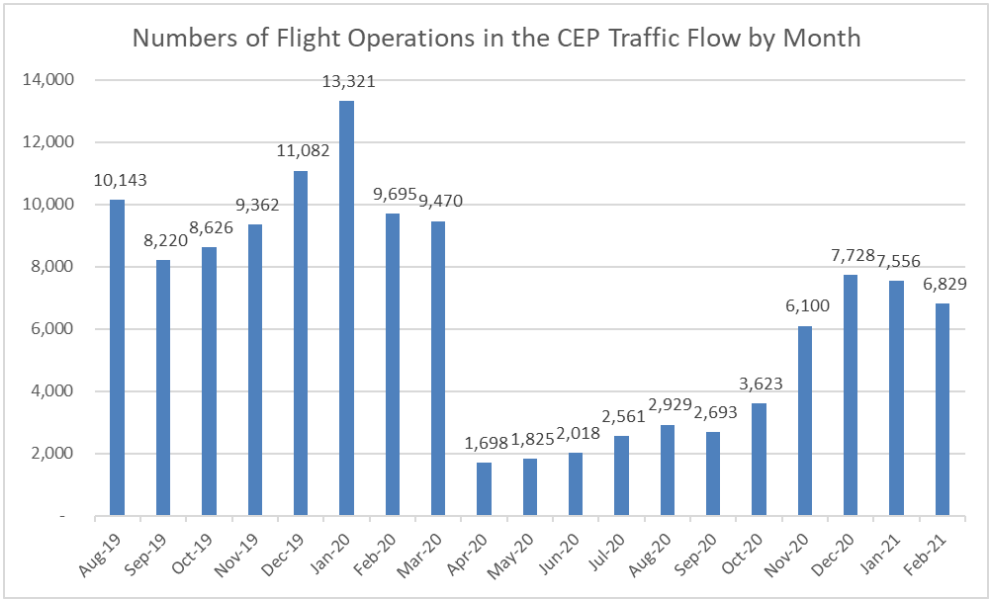

Figure 3. Observed number of flight operations in the CEP by month

Reported large height deviations (LHDs)

2.6 For calendar year 2020, there were twenty-nine reported LHDs for the CEP. This is a decrease over the thirty-six LHDs reported in 2019. The decrease in the number of reported LHDs in 2020 was likely due to the COVID-19 pandemic and the resources required to investigate the specific types of occurrences.

2.7 The reported occurrences from the Oakland and Anchorage FIRs were reviewed by the scrutiny group for the Anchorage and Oakland Oceanic FIR. 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 2020.

2.8 **Figure 4** shows the associated durations with the reported LHDs has increased in 2020 from that reported in 2019. The increase is due to more accurate accounting of the unprotected time associated with the reported occurrences involving ATC coordination between Honolulu Control Facility (HCF) and Oakland center.

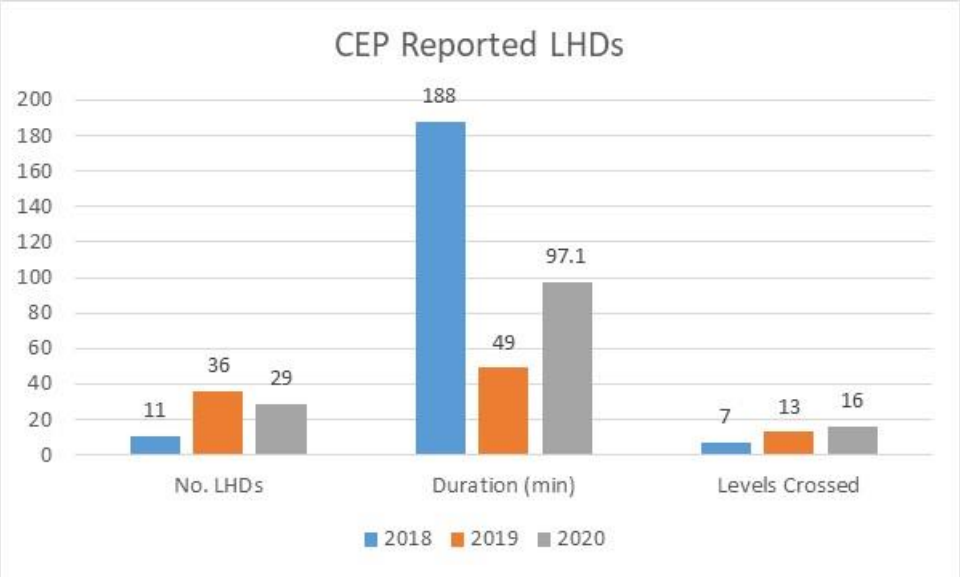

Figure 4. Reported LHDs Comparison Summary

2.9 **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. The two LHD category M reports involved aircraft returning to departure airport without ATC clearance.

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	1	0
B	Flight crew climbing /descending without ATC clearance;	5	18	15
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 coordination, incorrect time estimate/actual, flight level, ATS route etc not in accordance with agreed parameters);	21	68.1	1

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
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	0	0	0
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	2	10	0
	Totals	**29**	**97.1**	**16**

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 2020 vs 2019. The data show the increase in the duration associated with category E occurrences for the CEP traffic flow in 2020 compared to 2019. **Figure 5** shows the locations of the reported LHDs within the CEP in 2020.

	2019		2020	
Category	**No. LHD**	**Duration(min)**	**No. LHD**	**Duration (min)**
A	2	3	1	1
B	2	9	5	18
E	30	33	21	68.1
I	2	4	0	0
M	0	0	2	10
Total	**36**	**49**	**29**	**97.1**

Table 3. Reported LHD Occurrences for CEP 2019 vs 2020

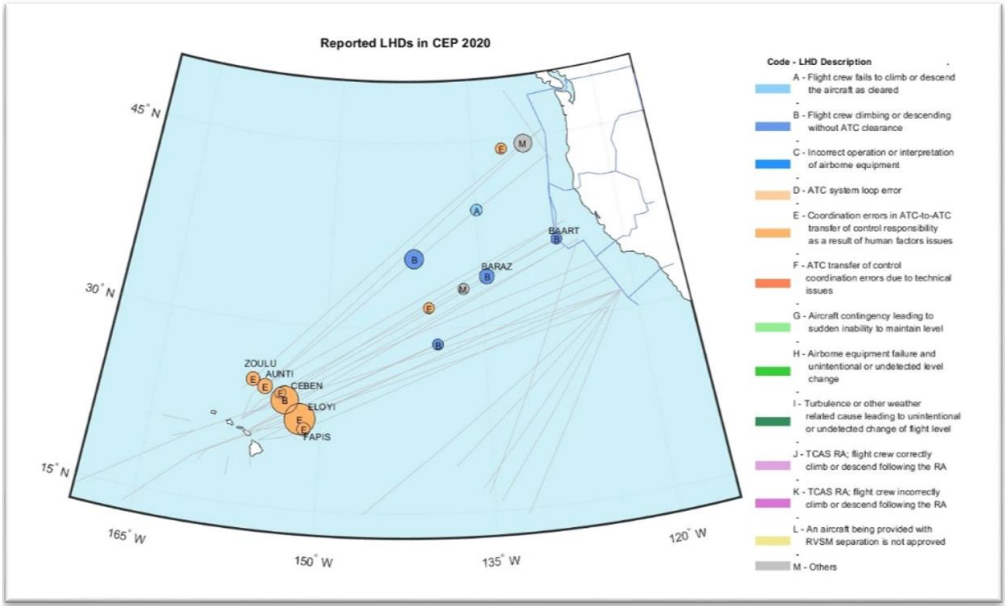

Figure 5. Reported LHDs within the CEP Traffic Flow - 2020

2.11 The trend in reported occurrences for the CEP in 2020 are consistent with that reported in 2019. The most frequently occurring category were errors in ATC-to-ATC transfers. There were twenty-one category E LHDs reported in the CEP in 2020, all but two involved transfers between HCF and Oakland center. There was an eighteen-minute duration category E LHD reported in the CEP during December 2020.

2.12 The total number of category E LHDs associated with errors in transfers between HCF and Oakland center is twenty-two, 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.

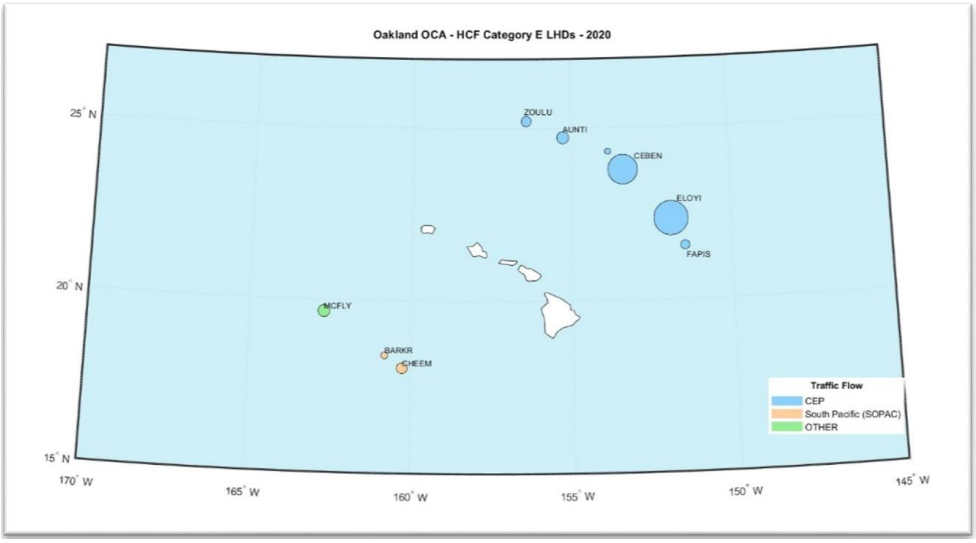

Figure 6. Reported transfer occurrences HCF – Oakland OCA [2020]

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. The resources needed for this activity were made available sporadically during calendar year 2020 due to the COVID-19 pandemic and associated staffing challenges at the ARTCCs.

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 has been established to further investigate these occurrences and determine remedial actions. After being delayed due to the COVID-19 pandemic, 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 is to implement the En Route Automation Modernization (ERAM) system at the HCF by the end of calendar year 2025. Prior to that time, the task force developed the following mitigation strategies:

2.15.1 A procedure that requires the controller to determine the remaining travel time to the boundary fix was approved for the HCF. During this procedure, ATC will compute an estimated time of arrival (ETA) for the boundary fix and manually transfer 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 The task force will examine the resulting occurrence data once this short-term solution is in place. If the data show that the short-term solution is not sufficient, there is another procedure that could be implemented for the short-term. This other procedure involves the controller obtaining the ETA for the boundary fix from the air crew and then transferring that time to the receiving facility. This procedure is in use in other oceanic airspace where the United States provides air traffic services.

2.15.3 Another interim step considered by the task force is to develop Performance Based Navigation (PBN) route structures for HCF. Due to the timeline and funding required for the development of PBN routes, this activity may not be complete prior to the implementation of ERAM in calendar year 2025. However, the task force considered the associated benefits with PBN routes and suggested this this development activity may happen in parallel.

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 17.35×10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This value represents a decrease from that reported in 2019 and 2018 for the CEP. The vertical collision risk estimate for 2019 was 59.9×10^{-9} fapfh, and the vertical collision risk estimate for 2018 was 99.1×10^{-9} fapfh.

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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