International Civil Aviation Organization
Twenty-Fifth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/25)
Video Teleconference, 27 – 30 October 2020

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

CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT

(Presented by United States/PARMO)

SUMMARY

This paper presents the 2019 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 for 2019 show an increase in the number of reported LHDs, but a decrease in their associated durations. In addition, there is a change in the top category for the reported LHD occurrences in 2019 compared to 2018.

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 airspace. This working paper will examine the traffic within the CEP and present the associated risk estimates for calendar year 2019.

2. DISCUSSION

Description of the CEP Traffic Flow

2.1 The CEP traffic flow contains the air traffic traveling in the east and west directions between Mainland North America and Hawaii. Amongst the traffic flows observed within the Oakland Oceanic Control Area (OCA), 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 fix 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 year 2019. The proportion of data link equipped operations within the CEP traffic flow has increased over the years. However, when compared to other traffic flows, the CEP maintains the lowest proportion of data link equipped aircraft within Oakland OCA.

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 OCA.

Table 1. CEP Traffic Flow - 2019

Calendar Year 2019	CEP Traffic Flow
Total flying hours	425,950
Number of Flights	115,543
Proportion Data Link Operations	69.1 %
Proportion HF (only) Operations	30.9 %
Proportion RNP4, RCP240, and RSP180 filing	31.4 %

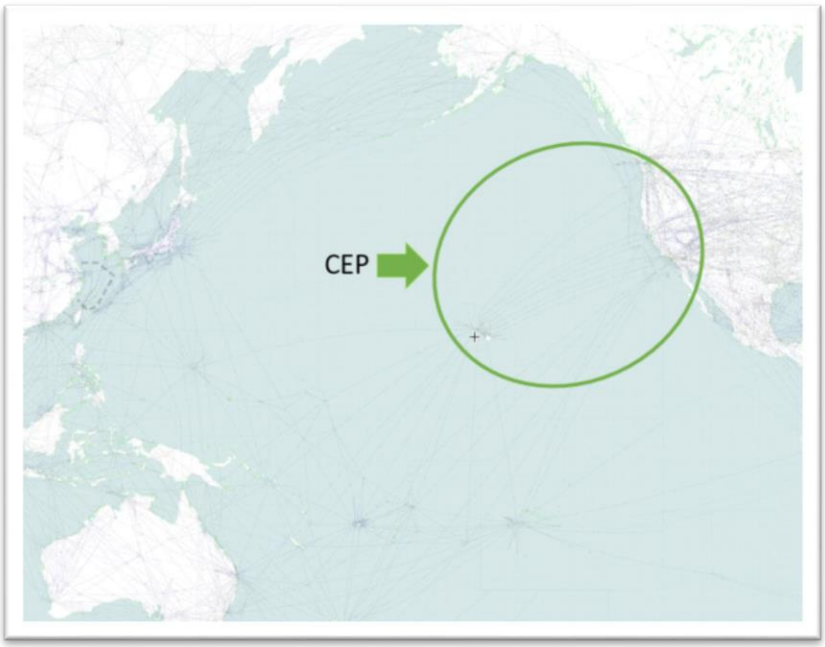

Figure 1. CEP location within Pacific Airspace

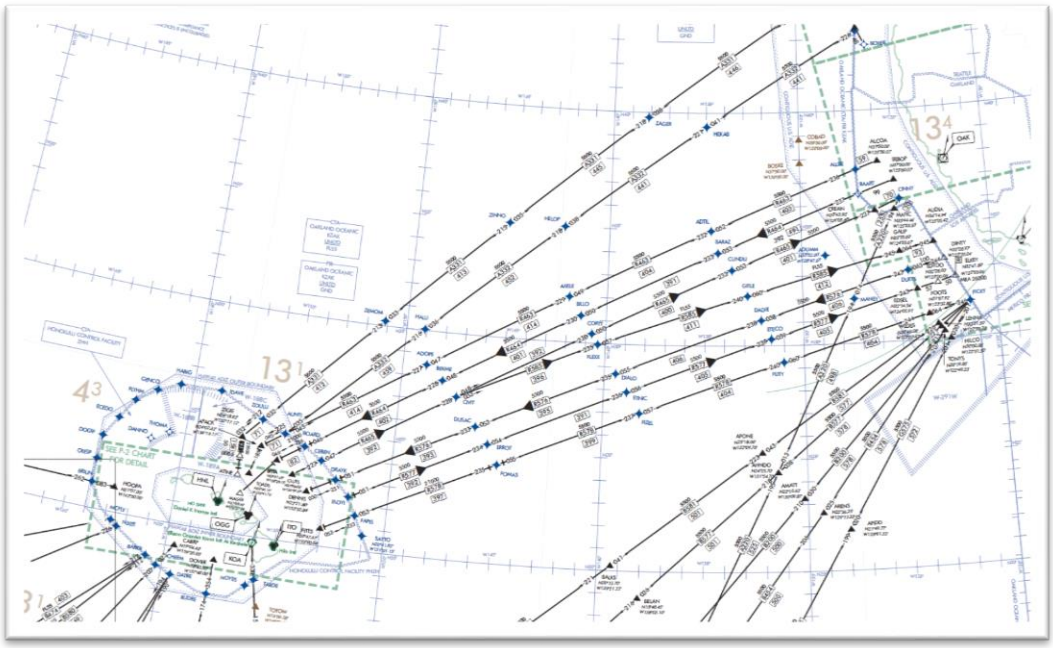

Figure 2. CEP route system

Reported large height deviations (LHDs)

2.4 For calendar year 2019, there were thirty-six reported LHDs for the CEP. This is an increase over the eleven LHDs reported in 2018. The increase in the number of reported LHDs in 2019 was primarily due to increased reported errors in ATC-to-ATC transfers between Honolulu Control Facility (HCF) and Oakland OCA. The HCF-Oakland OCA transfer LHD reports are described later in this working paper.

2.5 **Figure 3** shows the associated durations with the reported LHDs has decreased in 2019 from that reported in 2018. This decrease is due to zero long duration LHDs in 2019 for the CEP traffic flow. A long duration LHD is an LHD with a duration of twenty minutes or more. The longest duration LHD reported for in 2019 for the CEP was seventeen minutes. In 2018, there were three long duration LHD reports in the CEP traffic flow, each one with duration greater than twenty minutes.

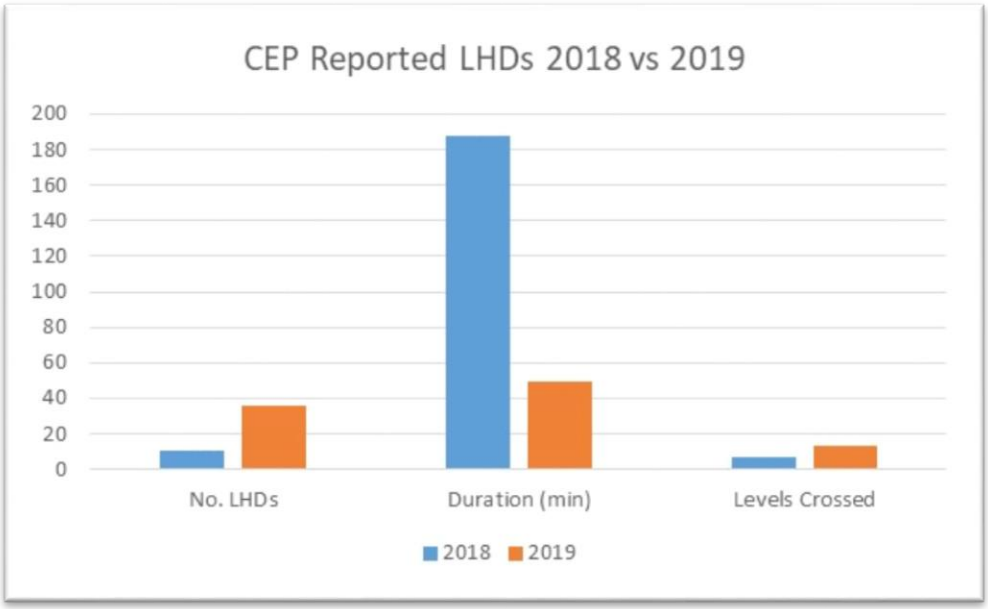

Figure 3. Reported LHDs Comparison 2018 vs 2019

2.6 **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. In 2018, there were zero category E reported LHDs for the CEP traffic flow. The 2018 categories with the largest duration were category D, ATC loop error with 81 minutes, and category B, air crew climb/descend without clearance, with 76 minutes.

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

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;	2	3	1
B	Flight crew climbing /descending without ATC clearance;	2	9	2
C	Incorrect operation or interpretation of airborne equipment (e.g. incorrect operation of fully functional FMS, incorrect transcription of ATC	0	0	0

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
	clearance or re-clearance, flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.)			
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);	30	33	0
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	2	4	10
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	**36**	**49**	**13**

2.7 **Table 3** shows the number of reported LHDs and total duration by category in the CEP for 2019 vs 2018. The data show a change in the types of reports received for the CEP traffic flow in 2019 compared to 2018. There were zero category D LHDs reported in 2019.

2.8 The number of reported category A and B events did not change much from 2018 to 2019. However, there is a noticeable difference in the durations associated with the category A and B events. One of the four category A and B reports involved an aircraft using HF radio as the primary means of communication, the other three reports involved data link equipped aircraft. In one of the category A and B events, the pilot climbed above RVSM flight levels, therefore only the flight levels crossed incorrectly within the RVSM flight level band contribute towards vertical risk. **Figure 4** shows the locations of the reported LHDs within the CEP in 2019.

Table 3. Reported LHD Occurrences for CEP 2018 vs 2019

	2018		2019	
Category	**No. LHD**	**Duration(min)**	**No. LHD**	**Duration (min)**
A	3	14	2	3
B	3	76	2	9
C	1	17	0	0
D	4	81	0	0
E	0	0	30	33
G	0	0	0	0
I	0	0	2	4
Total	**11**	**188**	**36**	**49**

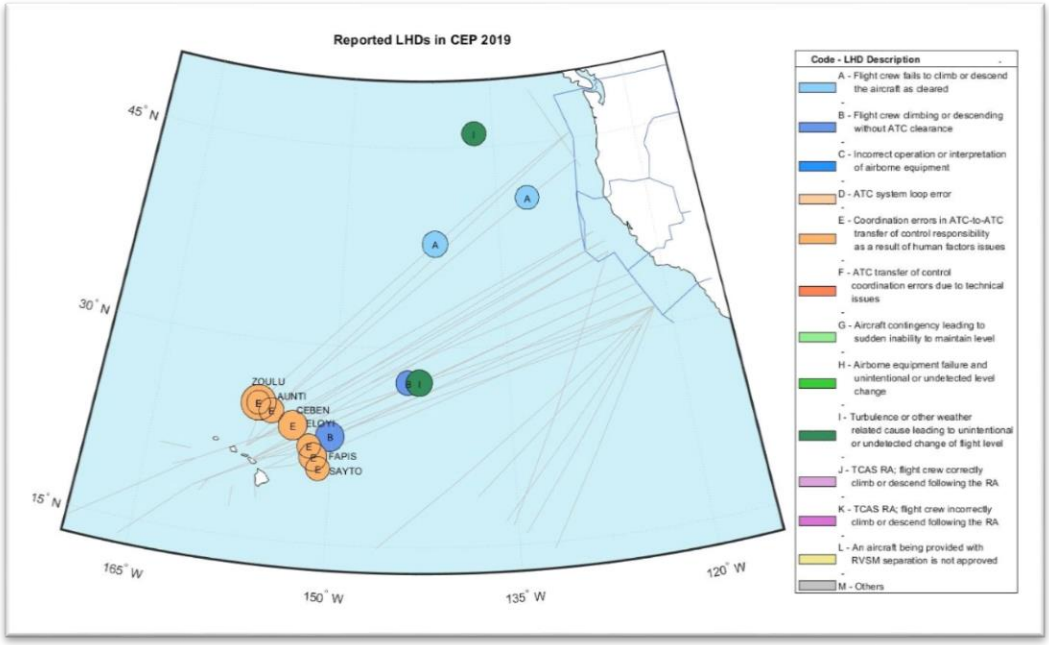

Figure 4. Reported LHDs within the CEP Traffic Flow - 2019

2.9 It is difficult after only one year to determine the effectiveness of the actions taken as a result of the reported occurrences in 2018. But, the causes of the occurrences that provided the largest durations in the CEP did not repeat in 2019. In review, the actions taken as a reaction to the large duration occurrences in 2018 include:

2.9.1 The largest reported occurrence in 2018 involved a U.S. registered general aviation operation using HF communications. The pilot mistakenly assumed “cleared as filed” applied to the indicated flight level change with the cleared routing. The regulatory organization within the U.S. FAA contacted the operator in regards to the occurrence.

2.9.2 The second largest duration reported for the CEP in 2018 occurred due to an incorrect altitude clearance relayed by the third-party HF radio operator. The bounds for the block altitude clearance delivered to the aircrew did not match those expected by ATC. ATC later identified the error during a routine HF radio position report. The third-party HF radio operator was notified of this occurrence and has conducted the necessary retraining.

2.10 The reported occurrences for the CEP in 2019 have a different theme. The most frequently occurring category were errors in ATC-to-ATC transfers. There were thirty category E LHDs reported in the CEP in 2019, all of which occurred for aircraft transfers between HCF and Oakland OCA. There was a seventeen-minute duration category E LHD reported in January 2019. The remaining twenty-nine category E LHDs occurred between September and November 2019.

2.11 The total number of category E LHDs associated with errors in transfers between HCF and Oakland OCA is sixty-two, not all of these occur within the CEP. **Figure 5** provides the general locations for all of the category E LHD reports. 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 Japan – Hawaii, South Pacific (SOPAC), and Other traffic flows.

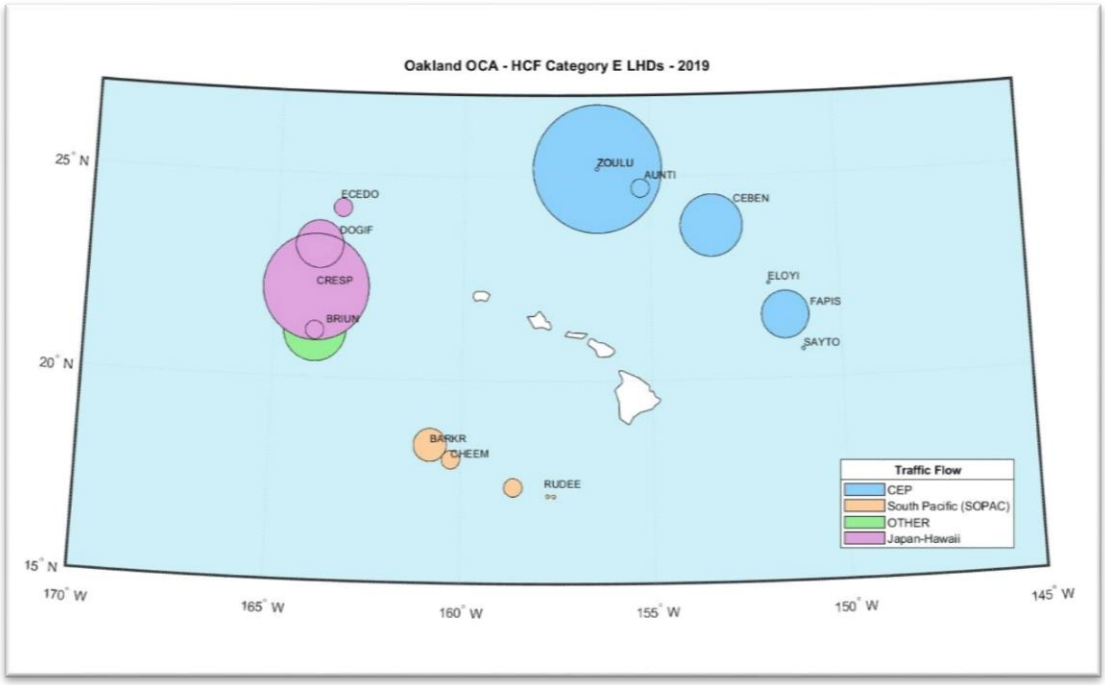

Figure 5. Reported transfer occurrences HCF – Oakland OCA (2019)

2.12 The scrutiny review group informed PARMO these occurrences affect the user preferred routes (UPRs) crossing fixed airways within Oakland airspace. 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 during the September to November 2019 period, which helps to explain the inconsistent reporting for these occurrences. During this period, there were pauses in reporting occurrences as real-time improvements were made to both the process for examining the occurrences and the actual ATC-to-ATC transfer procedure itself. The current status of this work is ongoing; a task force has been established that includes personnel from both facilities.

2.13 The available system data were examined for each of the sixty-one reported occurrences. The subject matter experts from Oakland center and PARMO agreed to the following scheme to determine each associated LHD duration:

2.13.1 If there were no observed updates to related messages in the archived sector queue data prior to the aircraft entry into Oakland oceanic airspace, an acceptable time of two minutes was assigned to the reported LHD. The lack of amended sector queue messages indicates the receiving ATC did not recognize the transfer error prior to aircraft entering Oakland oceanic airspace.

2.13.2 If there were amendments made to related messages in the archived sector queue data prior to the aircraft entry into Oakland oceanic airspace, a zero duration was assigned to the reported LHD. These updated messages in the sector queue data represent the recognition of the discrepancy by ATC prior to the actual boundary crossing time.

2.13.3 After examining the recorded system messages and applying the above scheme, there were thirty-three reported LHDs with zero duration, and twenty-eight reported LHDs each with 2 minutes duration (e.g. 28 reported LHDs with 2 minutes duration (a total of 56 minutes)).

2.14 Vertical Risk Estimate

2.15 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.

2.16 The overall vertical risk for the CEP in 2019 is 59.9×10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This is a decrease from the December 2018 calculated vertical risk for the CEP of 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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