International Civil Aviation Organization

Twenty-Eighth Meeting of the Regional Airspace Safety Monitoring Advisory Group (RASMAG/28)

Bangkok, Thailand, 21 – 24 August 2023

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

2022 CENTRAL EAST PACIFIC TRAFFIC FLOW ASSESSMENT

(Presented by the United States/PARMO)

SUMMARY

This paper presents the 2022 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 2022 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 2022.

2. DISCUSSION

<u>Description of the CEP traffic flow</u>

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

Table 1. CEP Traffic Flow – 2019 through 2022

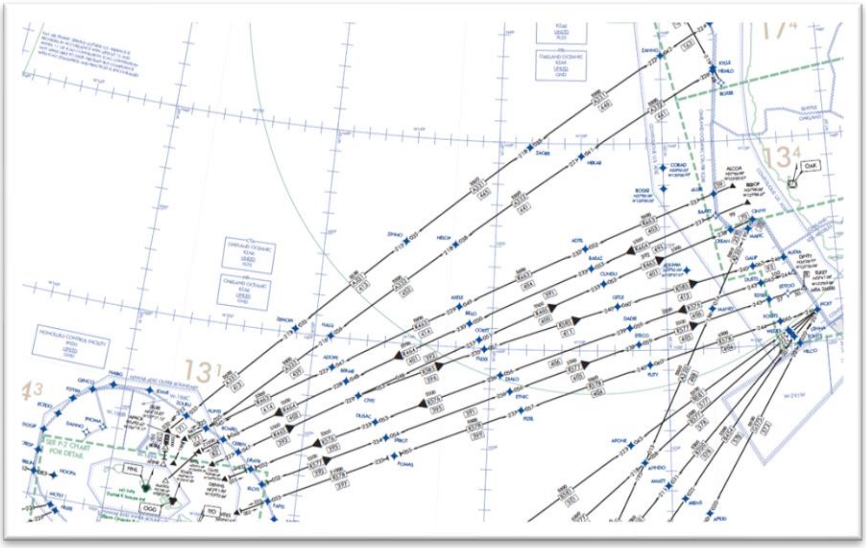

Figure 1. CEP route system

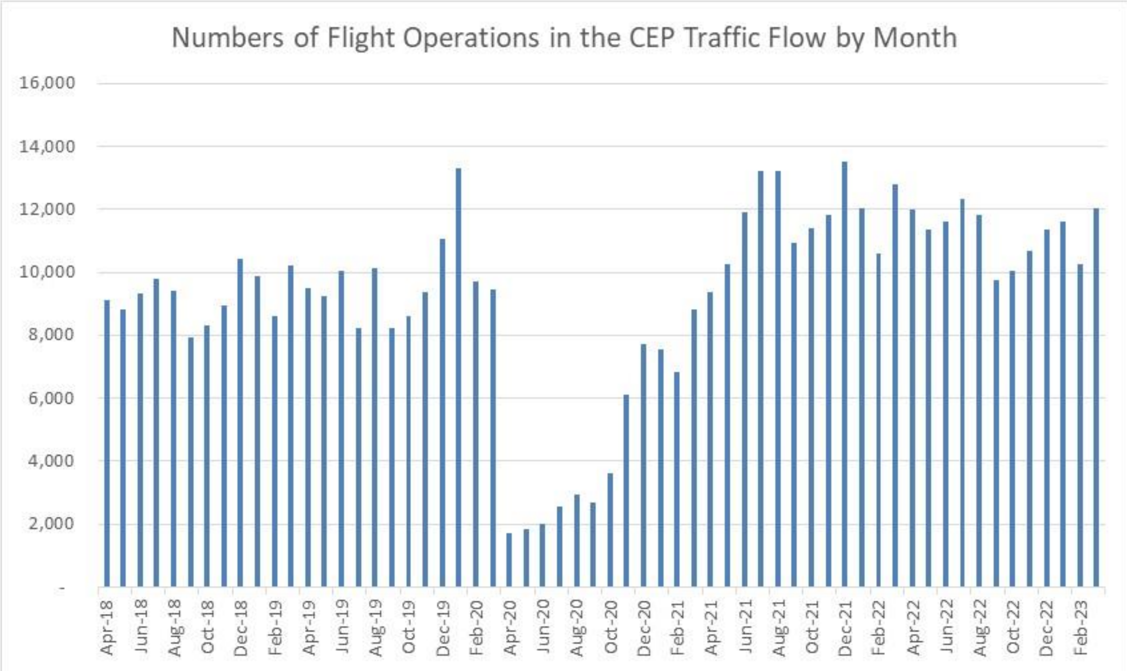

Figure 2. Observed number of flight operations in the CEP by month

Reported Large Height Deviations

2.5 In calendar year 2022, there were 44 reported LHDs that occurred within the CEP traffic flow. This is a slight increase over the 42 reported LHDs in calendar year 2021.

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 2022.

2.7 **Figure 3** shows the associated durations with the reported LHDs has decreased 2022 from that reported in 2021. However, the numbers of flight levels crossed without ATC clearance has increased from calendar year 2021 to 2022. 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 16 reported category B LHDs and 28 reported category E LHDs. Eleven of the reported category B LHDs had weather (category I) assigned as a secondary causal code, four of the reported category B LHDs had aircraft contingency (category G) assigned as a secondary causal code.

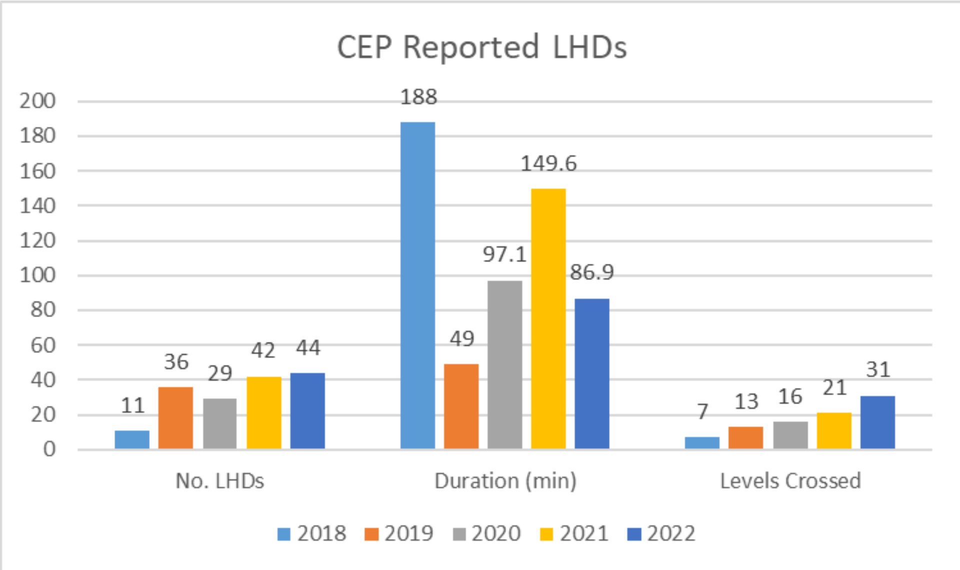

Figure 3. Reported LHDs Comparison Summary

LHD Category Code	LHD Category Description	No of LHD Occurrences	LHD Duration (Min)	No. of Flight Levels Transitioned Without Clearance
B	Flight crew climbing /descending without ATC clearance;	16	1.5	31
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);	28	85.43	0
	Totals	**44**	**86.93**	**31**

Table 2. LHD report by category for CEP Traffic Flow - 2022

2.9 **Table 3** shows the number of reported LHDs and total duration by category in the CEP for calendar year 2022 and 2021. The data show the decrease in the duration associated with category E occurrences for the CEP traffic flow in 2022 compared to 2021. **Figure 4** shows the locations of the reported LHDs within the CEP in 2022. The size of the circles in **Figure 4** indicate the contribution towards the vertical collision risk estimate for calendar year 2022.

	2021		**2022**	
Category	**No. LHD**	**Duration(min)**	**No. LHD**	**Duration (min)**
A	1	0	0	0
B	6	21	16	1.5
E	34	128.6	28	85.43
I	1	0	0	0
Total	**42**	**149.6**	**44**	**86.93**

Table 3. Reported LHD Occurrences for CEP 2022 vs 2021

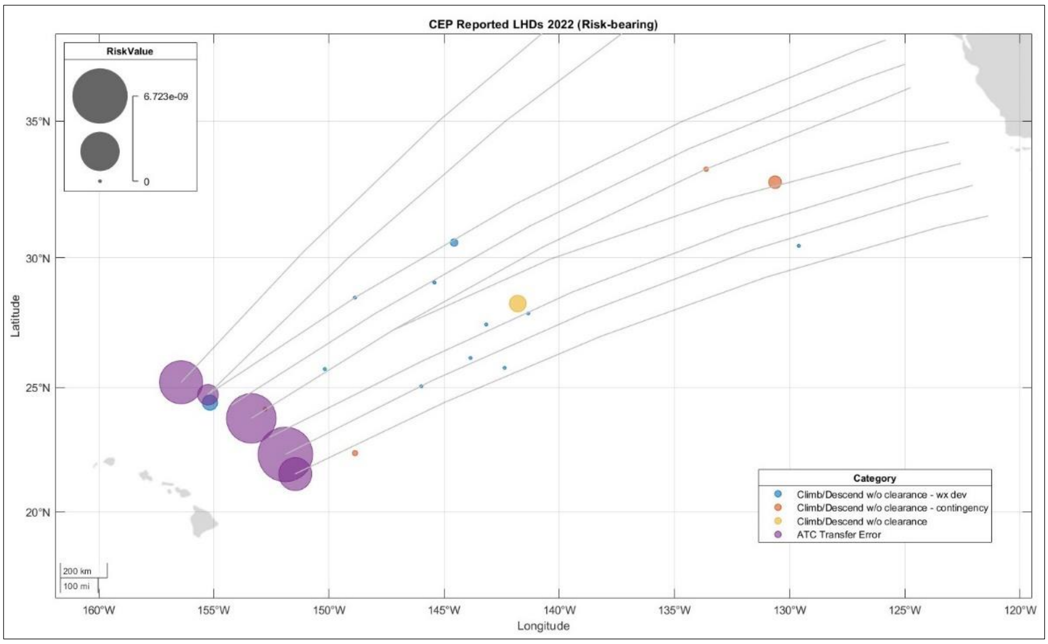

Figure 4. Reported LHDs within the CEP Traffic Flow – 2022

2.10 The trends in reported occurrences for the CEP in 2022 are consistent with that reported in 2021. The most frequently occurring category were errors in ATC-to-ATC transfers. There were 28 category E LHDs reported in the CEP in 2022, all involved transfers between HCF and Oakland center. The longest duration associated with one of these reported occurrences took place in July 2022 and had a duration of 15.70 minutes.

<u>Category E LHD Reports</u>

2.11 The total number of reported LHDs involving errors in transfers between HCF and Oakland center was thirty-three, not all of these occur within the CEP. **Figure 5** 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 Central East Pacific (CEP) traffic are colored in blue. The remaining traffic flows affected by these transfer errors include South Pacific (SOPAC) and OTHER traffic flows. The size of the circle at each boundary point represents the sum of the individual vertical risk estimates from all the reported category E LHDs. The size of the circle at each boundary point represents the sum of the individual vertical risk estimates from all the reported category E LHDs. The vertical risk estimates by traffic flow for the LHDs depicted in Figure 5 are shown in **Table 4.**

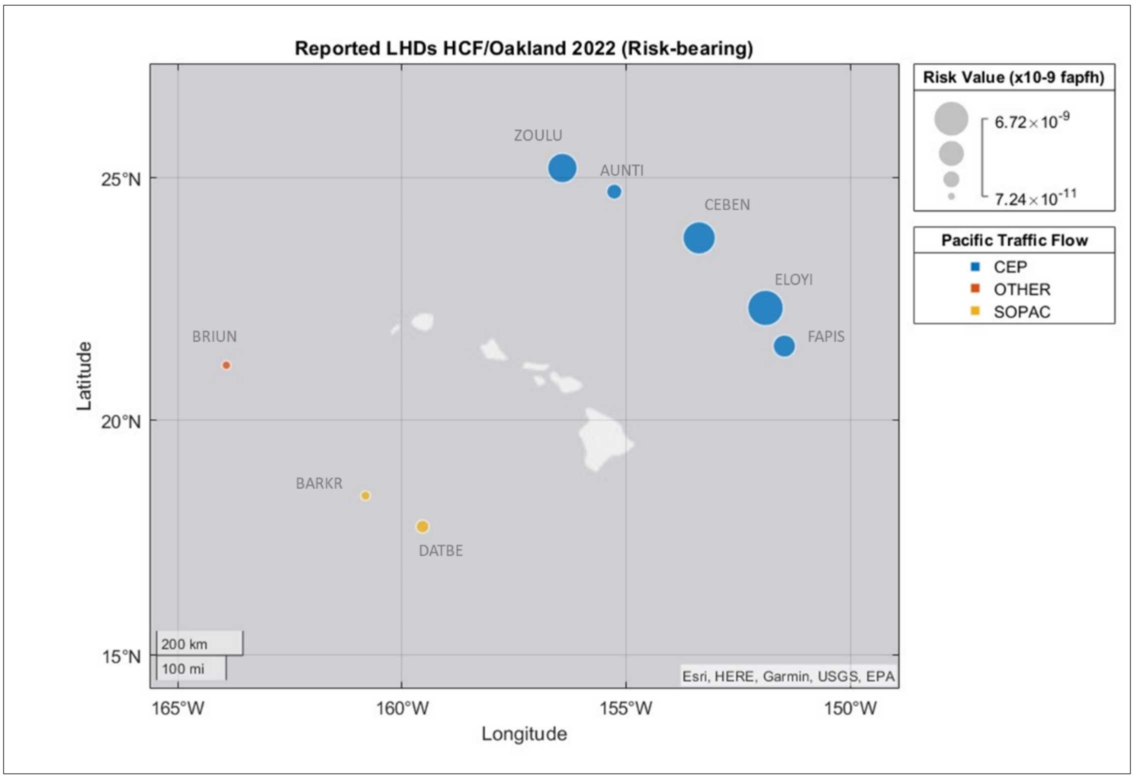

Figure 5. Reported LHDs transfer occurrences HCF – Oakland OCA (2022)

Traffic Flow	LHD Count	LHD Duration Sum (min)	Sum Vertical Risk Estimate (× 10^{-9} fapfh)
CEP	30	87.68	20.18
OTHER	1	4.150	0.07
SOPAC	2	3.72	0.73

Table 4. Vertical Risk Estimates by Traffic Flow - HCF/Oakland Category E LHD Reports 2022

2.12 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.

2.13 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.

2.14 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:

2.15 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.

2.16 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.

2.17 All 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 January 2022 through March 2022. During the outage periods, there are fewer reported occurrences due to the limited investigation and validation of such occurrences.

Category B LHD Reports involving Weather and Aircraft Contingency

2.18 The next trend observed from reported occurrences within the CEP traffic flow are deviations around adverse meteorological conditions and due to aircraft contingency events. This trend influences both the horizontal and vertical safety analyses. The reported occurrences involving deviations around adverse meteorological conditions or deviations due to aircraft contingencies that were not in accordance with published procedures are included in **Table 3** and **Figure 4**.

2.19 In response to these observed trends, Oakland ARTCC provided operators with information on weather deviation and contingency procedures at a recent Oceanic Work Group (OWG) meeting. The presentation provided suggestions for aircraft operators to use in flight crew training. The most important part of the procedure is for the air crew is to contact ATC via CPDLC or voice, suggested phraseology is to indicate "WEATHER DEVIATION REQUIRED". This provides ATC with the priority needed to ensure the safety of the requesting aircraft and other operations in the vicinity. If ATC is not able to issue a clearance to deviate for adverse weather, the air crew should advise ATC of intentions and execute the published procedure. Oakland ARTCC explained that a preliminary pilot deviation (PD) would be filed, however, the subsequent investigation would determine whether the published procedure was followed correctly. There would be no punitive outcome for air crews using the published procedure to avoid adverse meteorological conditions. Appendix A contains some of the material presented to operators at the OWG meeting. Many of the airline operators in attendance indicated the training material for pilots would be adjusted based on this information.

Vertical Risk Estimate

2.20 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**.**

2.21 The overall vertical risk for the CEP in 2022 is 21.2 × 10^{-9} fapfh, a value that exceeds the target level of safety (TLS). This value represents a slight decrease from that reported in 2021. **Figure 6** shows the five-year (rolling 12-month) trend for the CEP vertical collision risk estimates.

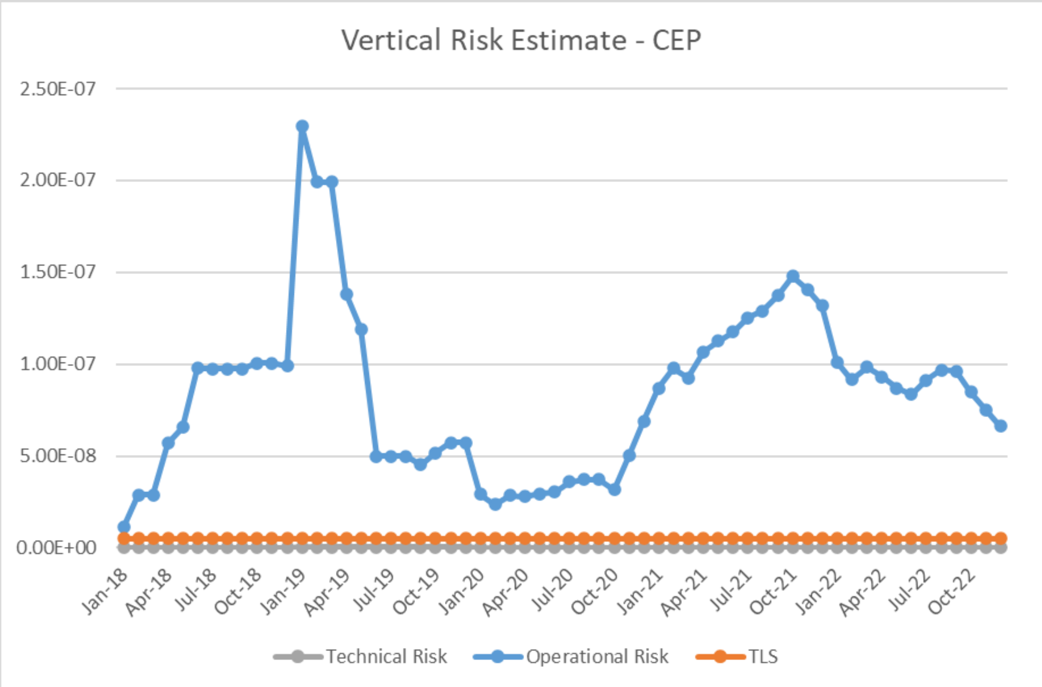

Figure 6. CEP vertical collision risk estimates by calendar year (rolling 12-month)

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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Appendix A
Information Regarding the Proper Execution of the Weather Deviation Procedure in Oceanic Airspace

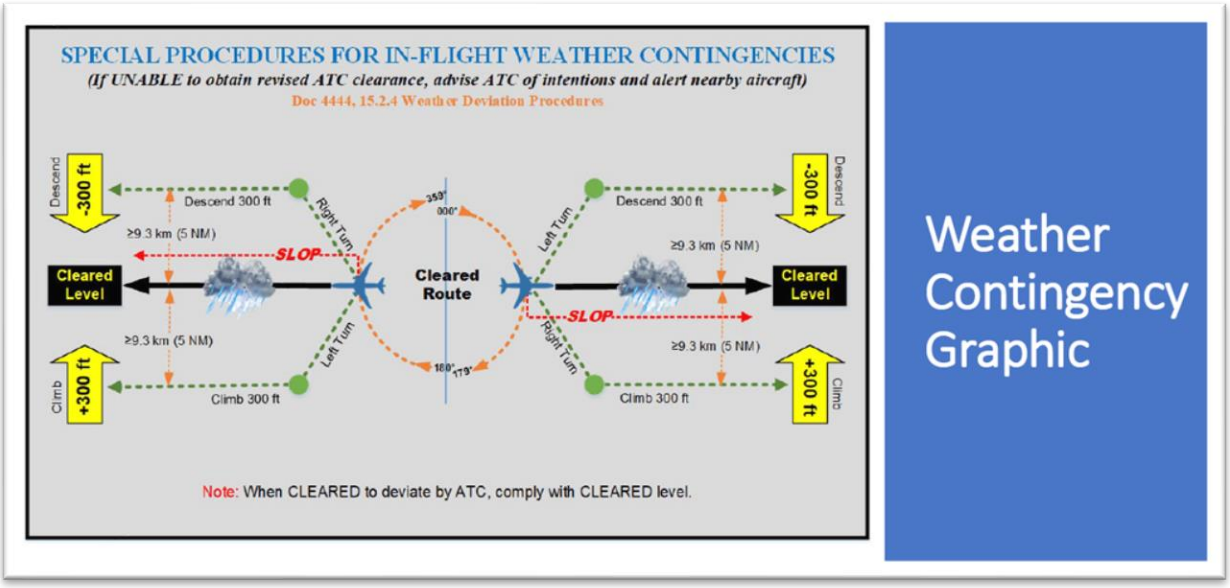
FAA AIP ENR 7.3 Special Procedures for In-Flight Contingencies in Oceanic Airspace

4. Weather Deviation Procedures
4.1 General.
NOTE−
The following procedures are intended for deviations around adverse meteorological conditions.
4.1.1 When weather deviation is required, the pilot should **contact ATC via CPDLC or voice**. A rapid response may be obtained by either
4.1.1.1 Stating, "WEATHER DEVIATION REQUIRED" to indicate that priority is desired on the frequency and for ATC response; or
4.1.1.2 Requesting a weather deviation using a CPDLC lateral downlink message.
4.1.2 When necessary, the pilot should initiate the communications using the urgency call "PAN PAN" (preferably spoken three times) or by using a CPDLC urgency downlink message.
4.1.3 The pilot shall inform ATC when a weather deviation is no longer required, or when a weather deviation has been completed and the aircraft has returned to its cleared route.
4.2 Actions to be Taken When Controller−Pilot Communications Are Established:
4.2.1 The pilot should notify ATC and request clearance to deviate from track or route, advising when possible the extent of the deviation requested.
The flight crew will use whatever means are appropriate (i.e., CPDLC and/or voice) to communicate during a weather deviation.
NOTE−
Pilots are advised to contact ATC as soon as possible with requests for clearance in order to provide time for the request to be assessed and acted upon.
4.2.2 ATC should take one of the following actions:
4.2.2.1 When appropriate separation can be applied, issue clearance to deviate from track; or
4.2.2.2 If there is conflicting traffic and ATC is unable to establish appropriate separation, ATC should:
a) Advise the pilot of inability to issue clearance for the requested deviation;
b) Advise the pilot of conflicting traffic; and
c) Request the pilot's intentions.
4.2.3 The pilot should take one of the following actions:
4.2.3.1 Comply with the ATC clearance issued; or
4.2.3.2 Advise ATC of intentions and execute the procedures provided in paragraph 4.3.
4.3.1 If the aircraft is required to deviate from track or route to avoid adverse meteorological conditions, and prior clearance cannot be obtained, an ATC clearance shall be obtained at the earliest possible time. Until an ATC clearance is received, the pilot shall take the following actions:
4.3.1.1 If possible, deviate away from an organized track or route system;
4.3.1.2 Establish communications with and alert nearby aircraft by broadcasting at suitable intervals:
aircraft identification, flight level, position (including ATS route designator or the track code) and intentions, on the frequency in use and on 121.5 MHz (or as a backup, on the inter−pilot air−to−air frequency 123.45 MHz);
4.3.1.3 Watch for conflicting traffic both visually and by reference to ACAS, if equipped;
4.3.1.4 Turn on all aircraft exterior lights (commensurate with appropriate operating limitations);
4.3.1.5 For deviations less than 9.3 km (5.0 NM) from the originally cleared track or route, remain at a level assigned by ATC;
4.3.1.6 For deviations greater than or equal to 9.3 km (5.0 NM) from the originally cleared track or route, when the aircraft is approximately 9.3 km (5.0 NM) from track, initiate a level change in accordance with TBL ENR 7.3−1.
4.3.1.7 If the pilot receives clearance to deviate from the cleared track or route for a specified distance and subsequently requests but is denied clearance to deviate beyond that distance, the pilot should apply an altitude offset in accordance with TBL ENR 7.3−1 immediately;
4.3.1.8 When returning to track or route, the aircraft should be at the previously assigned flight level prior to a point 9.3 km (5.0 NM) from the route centerline.
4.3.2 If contact was not established prior to deviating, continue to attempt to contact ATC to obtain a clearance. If contact was established, continue to keep ATC advised of intentions and obtain essential traffic information.

Offset and Altitude Table

TBL ENR 7.3−1
Altitude Offset When Denied Clearance to Deviate 9.3 km (5.0 NM) or More

Originally Cleared Track or Route Center Line	Deviations ≥ 9.3 km (5 NM)	Level Change
EAST (000° − 179° magnetic)	LEFT	DESCEND 90 m (300 ft)
	RIGHT	CLIMB 90 m (300 ft)
WEST (180° − 359° magnetic)	LEFT	CLIMB 90 m (300 ft)
	RIGHT	DESCEND 90 m (300 ft)



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