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Online, 9 – 11 November 2020

Agenda Item 2: Review of the Results of Large Height Deviation (LHD)
2.3 Results of the assessment project for safety in RVSM airspace for the CAR and SAM Regions

NEW YORK WEST AIRSPACE HORIZONTAL SAFETY MONITORING REPORT – 2019

(Presented by United States

EXECUTIVE SUMMARY

This Information Paper provides the horizontal safety monitoring report for the continued-safe use of the reduced lateral and longitudinal separation minima in New York West Airspace. The safety assessment is conducted according to the methodology endorsed by the International Civil Aviation Organization (ICAO). This work makes use of reported large lateral deviations (LLDs) and large longitudinal errors (LLEs) and traffic sample data (TSD) for calendar year 2019.

There were twenty-seven reported events for New York West airspace during calendar year 2019. Twenty-two of these events were determined to be risk-bearing LLDs. This report contains a high-level summary of the reported events and evaluates the application of reduced horizontal separation minima.

Strategic Objectives:	• Safety
References:	• Reported Large Lateral Deviations (LLD) & Large Longitudinal Errors (LLE) in 2019 • 2019 Traffic Sample Data (TSD) from FAA Advanced Technologies and Oceanic Procedures (ATOP) oceanic automation system data reduction and archives (DR&A) • ICAO Doc 9689 Manual on Airspace Planning Methodology for the Determination of Separation Minima • ICAO Doc 9869 Performance-based Communication & Surveillance (PBCS) Manual • ICAO Doc 10063 Manual on Monitoring Application of Performance-based Horizontal Separation Minima

1. Introduction

1.1. The North American Approvals Registry and Monitoring Organization (NAARMO), a service provided by the U.S. Federal Aviation Administration at the William J. Hughes Technical Center (WJHTC), fulfills the role of regional monitoring agency (RMA) for the Miami Oceanic, New York West, and San Juan airspace. In addition to the vertical safety monitoring, the NAARMO conducts airspace analyses studies to support the introduction and ongoing use of reduced horizontal separation minima in oceanic airspace.

1.2. In June 2008, a significant restructure of the airways within the New York West airspace was implemented in an effort to increase capacity and efficiency. The fixed route system residing in New York West airspace is referred to as the Western Atlantic Route System (WATRS). With the reorganization of the route system, the 50-NM lateral separation standard was introduced. The WJHTC conducted the safety assessment for the implementation of the 50-NM lateral separation standard in WATRS airspace.

1.3. In December 2013, the 50-NM longitudinal, 30-NM lateral, and 30-NM longitudinal separation minima were introduced in New York West airspace. The reduced horizontal separation minima are available for suitably equipped aircraft pairs. The application of the reduced horizontal separation standards is accomplished ad hoc between pairs of eligible aircraft; this means that the application of the separation minima is not planned prior to oceanic entry. The WJHTC conducted the pre-implementation safety assessment and the post-implementation monitoring activities for these reduced horizontal separation standards in the New York West FIR.

1.4. In March 2018, the Performance-Based Communication and Surveillance (PBCS) requirements and monitoring were implemented in New York West airspace. PBCS involves globally coordinated and accepted specifications for Required Surveillance Performance (RSP) and Required Communication Performance (RCP). Beginning 29 March 2018, the PBCS specifications for RCP 240 and RSP 180 and Required Navigation Performance (RNP) 4 specification are required for the application of reduced horizontal separation minima.

2. Traffic Data

2.1. The flight operations within the New York Oceanic Control Area (OAC) West are comprised of two distinct traffic flows. The two main traffic flows are East-West (North Atlantic (NAT) routes) and North-South (North America (NAM)-Caribbean (CAR) routes).

2.2. The source of traffic data for New York OCA West is the FAA Advanced Technologies and Oceanic Procedures (ATOP) oceanic automation system data reduction and archives (DR&A). These data contain all the reported aircraft positions, as well as the pilot-ATC High Frequency (HF) radio communications and controller pilot data link communications (CPDLC) messages. **Figure 2-1** shows the archived reported positions within New York OCA West for 10 December 2019. Position reports received via Automatic Dependent Surveillance – Contract (ADS-C) are contained in the DR&A archives.

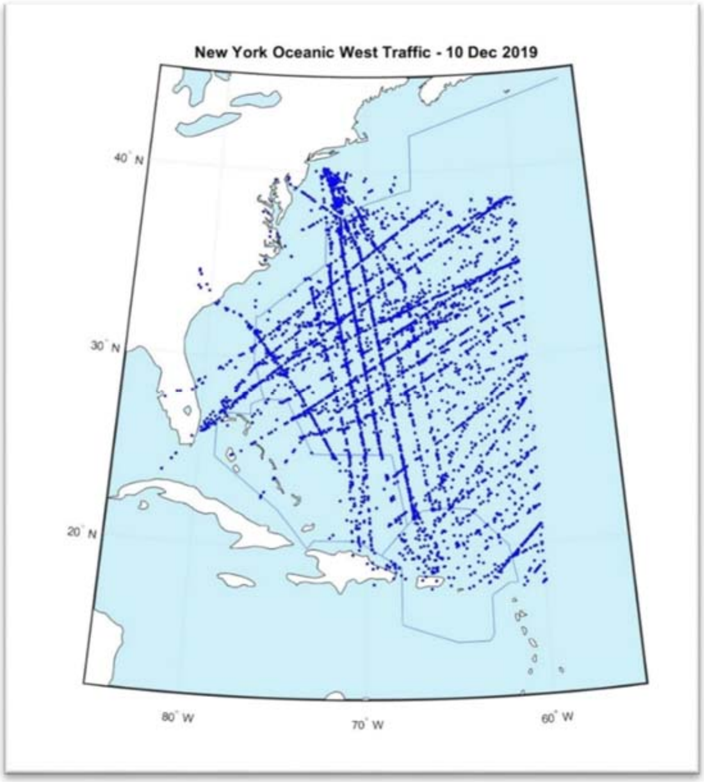

Figure 2-1. Aircraft/Pilot Reported Positions within New York OCA West – 10 December 2019

2.3. **Figure 2-2** shows the number of flights by day in New York OCA West for December 2019. The vertical blue bars show the number of flight operations per day observed in the data sample. The average number of flight operations per day observed in the data is 652 flights per day. This represents a slight increase in the number of flight operations per day; in December 2018, this analysis showed 593 flight operations per day.

2.4. **Appendix A** contains the most current data link performance analysis summary conducted for New York OCA West.

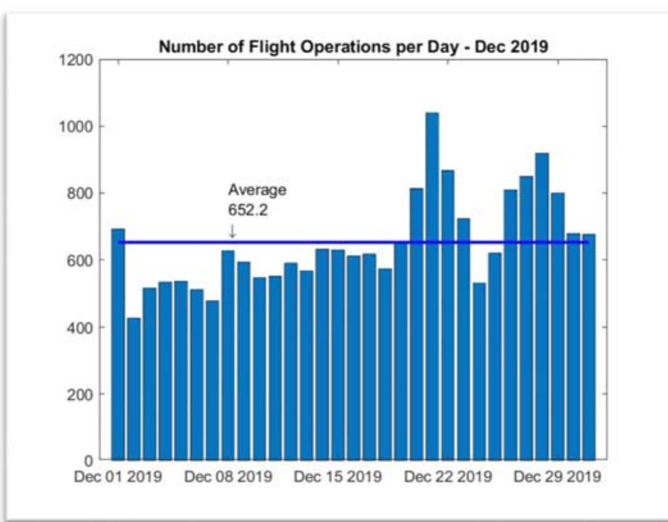

Figure 2-2. Number of Flight Operations Observed by Day – New York OCA West Dec 2019

3. Event Scrutiny Methodology

3.1. The lateral CRM methodology is analogous to, and aligns with, the vertical operational risk model, in that it explicitly accounts for the risk due to the number of tracks or routes crossed without clearance, and the risk due to time spent on the incorrect track or route. To employ this methodology, it is necessary to assess the number of tracks or routes crossed without clearance and the time spent on the incorrect track or route for each reported LLD.

3.2. Due to the variety of possible lateral separation standards available to aircraft operations in New York OCA West, the magnitude of the deviation along with the aircraft capabilities are used to determine the number of tracks crossed and time spent on the incorrect track.

3.3. In 2019, the possible lateral separation standards varied depending on the filed performance-based navigation (PBN), performance-based communication (PBC), and performance-based surveillance (PBS) status of the aircraft. **Table 3-1** summarizes the possible reduced horizontal separation standards available for aircraft operations within New York OCA West in 2019.

Table 3-1. Horizontal Separation Standards Available in New York OCA West – 2019

Lateral/ Longitudinal	Separation Standard	Minimum PBN	Minimum PBC	Minimum PBS
Lateral	50 NM	RNP 10	-	-
Lateral	30 NM[1]	RNP 4	RCP 240	RSP 180
Longitudinal	10 minutes	-	-	-
Longitudinal	50 NM	RNP 10	RCP 240	RSP 180
Longitudinal	30 NM	RNP 4	RCP 240	RSP 180

3.4. During the scrutiny of each reported event, the filed communication, navigation, and surveillance (CNS) capabilities of the aircraft involved are recorded. This information is used to assess the associated risk impact for each LLD and LLE. For LLD events, the deviation magnitude from the cleared route is examined to determine whether a track crossed should be counted. **Table 3-2** shows the lateral buffers used for LLD events to determine the number of tracks crossed. The number of tracks crossed, N_T, is determined from the deviation magnitude and the associated lateral buffer for the aircraft operation. The lateral buffer applies to the eligibility of the aircraft based on the filed flight plan not the separation standard applied at the time of the event.

3.5. The lateral buffers for the New York OCA West shown in **Table 3-2** are calculated in the following manner:

3.5.1. In preparation for the 23NM lateral separation minimum, the lateral buffer for aircraft operations eligible for 23NM lateral separation standard is 15NM = 23NM – 4NM [for RNP4] – 4NM [2 × SLOP to account for opposite direction traffic].

3.5.2. For aircraft operations eligible for 50NM lateral separation standard, the lateral buffer is 36NM = 50NM – 10NM [for RNP10] – 4NM [2 × SLOP to account for opposite direction traffic].

[1] The 23NM lateral separation minimum replaced the 30MM lateral separation minimum. The US FAA is planning to implement the 23NM lateral separation minimum in the near future.

Table 3-2. Lateral Buffer for LLD Events

Separation Standard for which the aircraft operation is eligible	Lateral Buffer (NM)
23NM	15
50NM	36

3.6. The methodology to determine the number of tracks/routes crossed and time spent on the incorrect track/route is similar to the methodology used to determine the number of flight levels crossed and time spent on incorrect flight level for the estimate of vertical risk. For example, a reported occurrence indicates an aircraft, which is eligible for the 23NM lateral separation minima, deviated 35NM. This case would result in time spent on the incorrect route and zero tracks crossed. This time would begin when the aircraft is estimated to have reached the 15NM lateral deviation buffer, and ends when the deviation amount reaches its maximum or the end of the event.

4. Reported Large Lateral Deviations (LLD) and Large Longitudinal Errors (LLE)

4.1. The NAARMO utilizes the FAA's Comprehensive Electronic Data Analysis and Reporting (CEDAR) database, which is a collection of safety-related events reported from various internal FAA sources. There were twenty-seven reported events for New York OCA West during calendar year 2019. After scrutiny group review, twenty-two of these events were determined to be risk-bearing LLDs.

- There was one reported LLE during calendar year 2019.
- There were three reports of prevented LLDs, in these cases a deviation was prevented by ATC action.
- There were four reported occurrences classified as mitigated and non-risk bearing because the expected contingency/weather procedures were correctly followed. One reported LLD occurrence was considered to be non-risk bearing due to available radar surveillance during the radar to non-radar transition.
- Lateral deviations were minimized due to ATC intervention in three reported LLDs.

4.2. **Table 4-1** contains a summary of all the risk-bearing LLDs/LLEs by month. The third column of Table 4-1 shows the number of tracks crossed without clearance. The fourth column of Table 4-1 contains the sum of the at-risk time for reported LLD/LLE occurrences.

Table 4-1. Risk-bearing LLDs and LLEs

Date	LLD/LLE Count	LLD Tracks Crossed	LLD/LLE Duration (min)
Jan 2019	0	0	0
Feb 2019	2	0	18
Mar 2019	3	0	0
Apr 2019	1	0	0
May 2019	0	0	0
Jun 2019	2	0	4
Jul 2019	2	0	0
Aug 2019	1	0	0
Sep 2019	3	0	0
Oct 2019	2	0	6

Date	LLD/LLE Count	LLD Tracks Crossed	LLD/LLE Duration (min)
Nov 2019	4	1	2
Dec 2019	2	0	16
TOTAL	**22**	**1**	**46**

4.3. The scrutiny review determined a general cause for each of the 22 risk-bearing LLDs and LLEs. **Table 4-2** summarizes the reported occurrences by primary cause category.

Table 4-2. Risk-bearing LLDs/LLEs by Cause Category

Category Code	Category Description	Number of Occurrence Reports	LLD / LLE Duration (min)	Number Tracks Crossed
A	Flight crew deviate without ATC Clearance	10	13	1
B	Flight crew incorrect operation or interpretation of airborne equipment (e.g., flight plan followed rather than ATC clearance, original clearance followed instead of re-clearance etc.)	1	0	0
D	ATC system loop error	2	21	0
E	Coordination errors in the ATC-unit-to-ATC-unit transfer of control responsibility	3	8	0
G	Turbulence or other weather related cause	0	0	0
I	Other	6	4	0
	TOTAL	**22**	**46**	**1**

4.4. There were ten risk-bearing occurrences involving flight crews deviating without ATC clearance, category A. Nine of the category A events involve air crews deviating around severe weather. A secondary category code, category G, was assigned to these LLDs. **Figure 4-1** shows the locations of the nine reported LLDs classified as category A/G. Two of the reported category A/G LLDs occurred over the same location, GRAMN. There was one reported LLD with a thirteen minute duration and another with one track crossed without clearance.

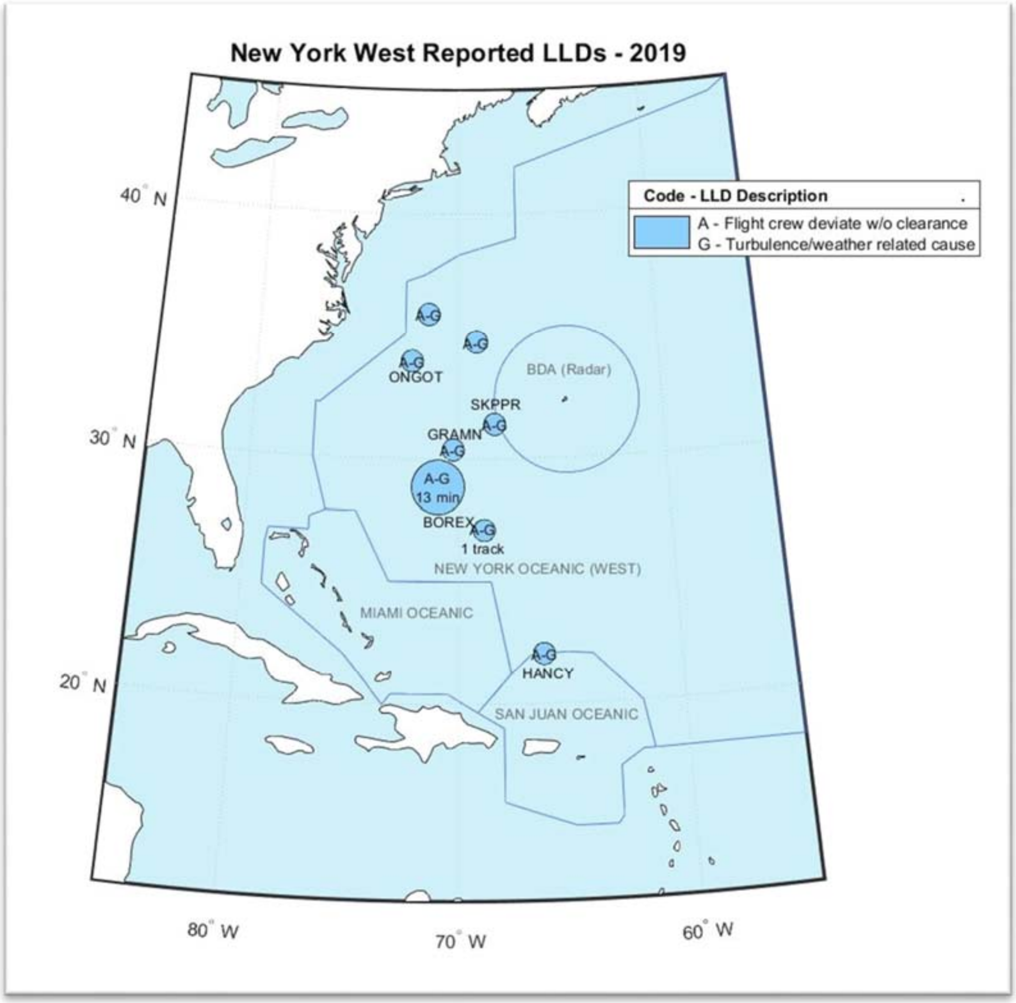

Figure 4-1. Category A/G LLD locations

4.5. There are six reported occurrences classified as Other, category I. In all these cases there were discrepancies between the ATC expected route and the route being flown by the air crew. The Filed Flight Plan (FPL) Monitoring Ad hoc Group, which reports to the AIDC/FPL Task Force in the CAR/SAM Region, is investigating these issues. In previous years, the NAARMO analysis classified these types of occurrences as category B or E. However, the 2019 scrutiny review was more informed with the progress of the Filed FPL Monitoring Ad hoc Group. To better observe trends in the various probable causes, a secondary category was created and assigned to each of these occurrences. Currently there are three possible causes for these occurrences.

- Reroute entered into the ATC system by a central Traffic Flow Management Departure unit, which modifies the routing of an original filed ICAO FPL, with or without coordination with the AOC dispatch. No assurance the amended routing is provided to the aircraft by the airport ATC clearance delivery.
- Multiple flight plans in the ATC system
- Operator dispatch/flight planner incorrectly issue amendment or change to existing flight plan.

4.6. **Figure 4-2** shows the probable causes assigned to each of the six category I occurrences by the scrutiny review group.

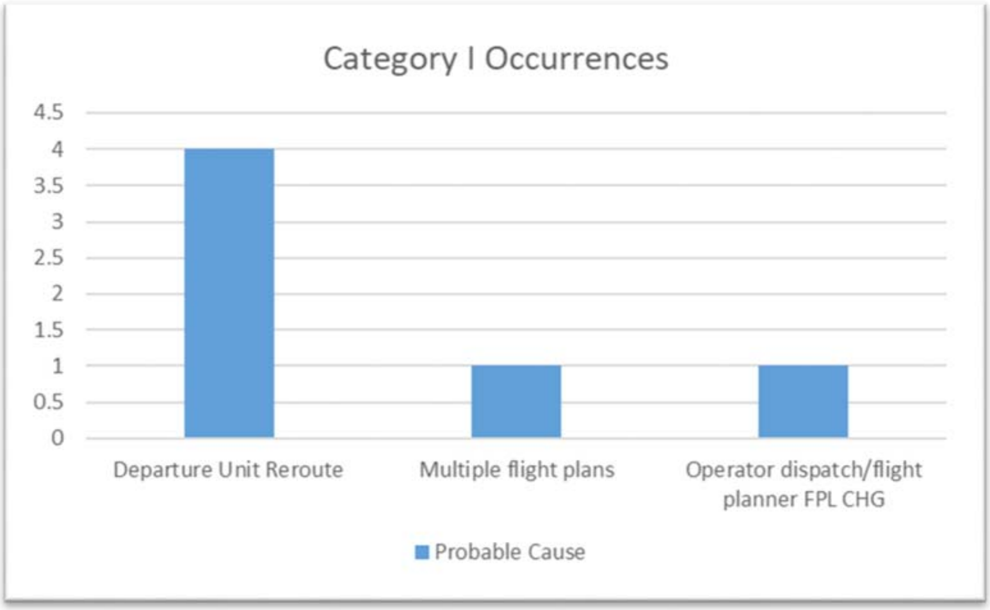

Figure 4-2. Category I Occurrences

4.7. There are two reported category D LLDs with a total duration of twenty-one minutes. One of these reports had a duration of eighteen minutes and was caused by the adjacent ATC sector not issuing a reroute. The other reported category D occurrence had a duration of three minutes. This occurrence involved ATC failure to deliver a clearance to the aircrew. ATC training in progress was also a factor during this occurrence.

4.8. Two of the three category E reported LLDs were caused by errors in automated coordination. In these cases, the aircraft traveled from oceanic airspace into radar coverage airspace, and then returned to oceanic airspace. The re-entry into oceanic airspace was not coordinated properly in these occurrences. The total time spent at unprotected flight levels was five minutes. The last occurrence of this problem was in November 2019. The software fix for this problem has now been implemented, there have been no repeat occurrences reported to date.

4.9. **Figure 4-3** in next page shows the locations of the risk-bearing LLDs/LLEs in 2019. The size of the circle is determined by the relative ratio of the associated duration at that location.

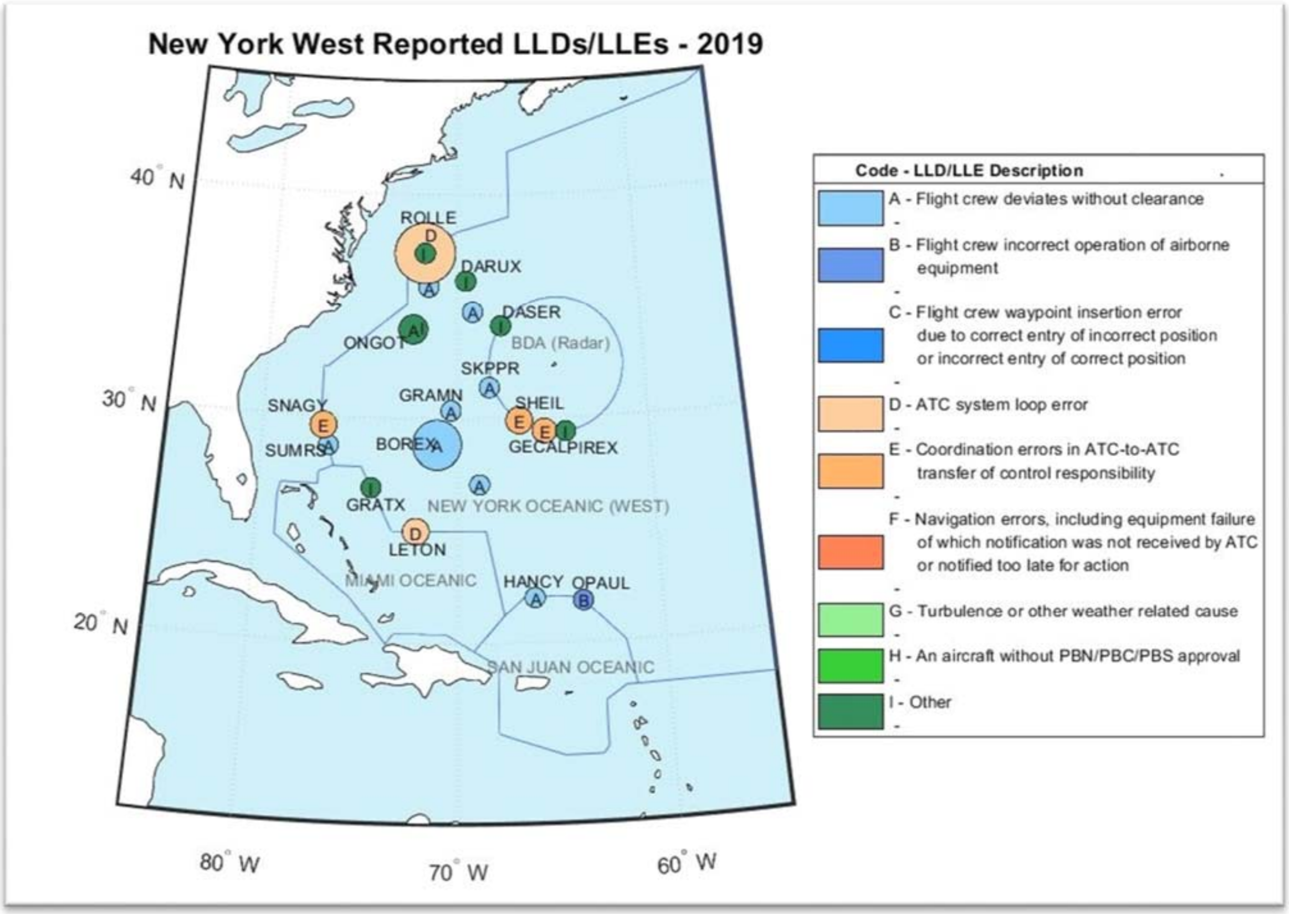

Figure 4-3. Locations of Risk-bearing LLDs/LLEs

4.10. The standard lateral separation in New York OCA West is 50NM; aircraft indicating RNP 10 in the filed flight plan are eligible for this separation, there is no PBCS requirement for the 50NM lateral separation standard.

4.11. The standard longitudinal separation is 10 minutes. The airspace is not exclusive with regard to airspace user satisfaction of horizontal-plane navigation standards as a requirement for airspace use and does allow for non-RNP 10 operations.

4.12. Eligible flight operations for the 23NM lateral separation standard must file RCP240, RSP180 and RNP4 in their flight plan. The proportion of RCP240, RSP180 and RNP4 operations in New York OCA West observed in December 2019 is 30 percent.

5. Lateral Collision Risk Estimation

5.1. This section of the paper provides the parameter estimates used in the ICAO lateral risk model. The collision risk methodology consists of a mathematical model to estimate risk for comparison to the safety criterion, the target level of safety (TLS). The section also provides information on the sources of data used to estimate risk model parameters. Based on the December 2019 traffic data, the NAARMO estimates approximately 277,504 annual flying hours for New York OCA West.

5.2. Aircraft Types Observed in New York OCA West

5.2.1 **Figure 5-1** provides the top 25 aircraft types observed in the December 2019 traffic data by flying hours. The aircraft types in Figure 5-1 account for more than 93 percent of total flying hours observed the airspace. The flying hours associated with the Airbus A320 family; including A319, A320, and A321, account for the most observed aircraft in the traffic sample at 21 percent. The Boeing 737 NGX; including the B737, B738, and B739 accounts for 14 percent of all flying hours observed in the traffic data.

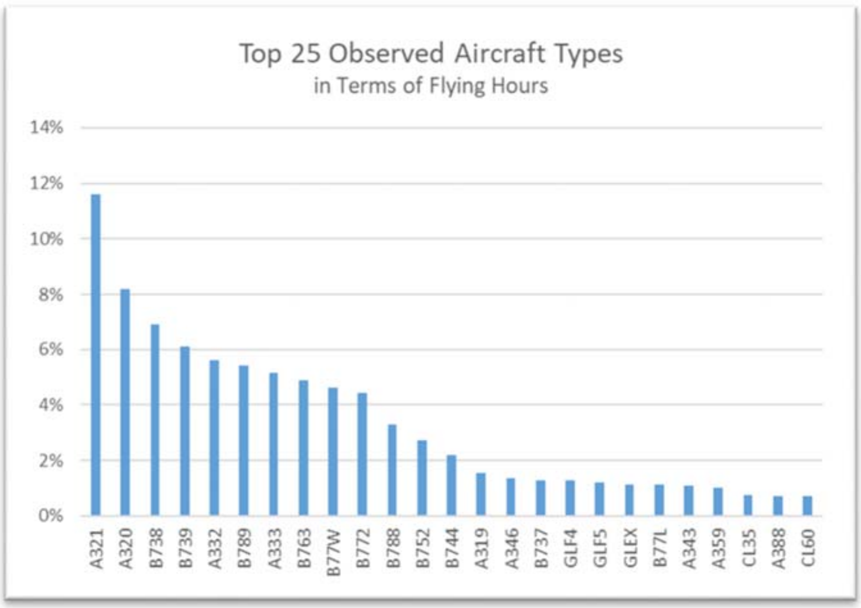

Figure 5-1. Observed Aircraft Types in Terms of Flying Hours in New York OCA West

5.3. Aircraft Size

5.3.1 The collision risk model parameters related to the aircraft size are: length, wingspan, and height. These parameters are estimated directly from the ATOP DR&A December 2019 data and related aircraft specifications. The weighted dimensions are calculated using the actual dimensions of the aircraft type multiplied by the proportion of total flying time observed for the type in the traffic sample. The resulting CRM parameters for the aircraft length, wingspan, and height are presented in **Table 5-1.**

Table 5-1. CRM Parameter Estimates for Aircraft Size

Airspace	Length λ_x (NM)	Wingspan λ_y (NM)	Height λ_z (NM)
New York OCA West	0.0271 *165 ft*	0.0247 *150 ft*	0.0077 *47 ft*

5.4. Same-Direction and Opposite-Direction Lateral Occupancy

5.4.1 The traffic data are used to estimate the number of lateral aircraft pairs. A lateral aircraft pair is observed when two aircraft, operating on the same flight level and on laterally separated routes, have reported positions within 15 minutes. **Table 5-2** shows the same and opposite-direction lateral occupancy estimates for New York OCA West. Because most of the aircraft operations occur on fixed routes with a flight level allocation scheme (FLAS) in place, there were very few observed opposite-direction lateral aircraft pairs in the traffic data. The lateral separation used to determine the lateral occupancy values is 50NM.

Table 5-2. Same and Opposite direction lateral occupancy values

Airspace	Same Direction Lateral Occupancy Value	Opposite Direction Lateral Occupancy Value
New York OCA West	0.0706	0.0007

5.5. *Probability of Vertical Overlap*

5.5.1. The probability of vertical overlap accounts for contributions to vertical error arising from the effects of turbulence, loss of altitude hold and crew response to airborne collision avoidance system alerts as well as from errors in aircraft altimetry and altitude-keeping system performance.

5.5.2. Estimates of aircraft altimetry system error (ASE) are obtained from aircraft height monitoring processes developed by NAARMO. These processes require several data sets, including meteorological and aircraft geometric height data. Aircraft geometric data is obtained from either the U.S. Aircraft Geometric Height Measurement Element (AGHME), Automatic Dependent Surveillance – Broadcast (ADS-B) data, or the GPS Monitoring Unit (GMU) system. Control of aircraft ASE is one of the principal objectives of the State RVSM approval process, which must be held by operators in airspace where the RVSM is applied.

5.5.3. The NAARMO estimate for the probability of vertical overlap for aircraft pairs operating on the same flight level, $P_z(0)$,used in the estimation of vertical operational risk is 0.42.

5.6. Time Spent on Unexpected/Incorrect Route

5.6.1. The proportion of flying time spent on unexpected/incorrect routes is determined as the ratio of the amount of time spent on unexpected/incorrect routes to the total amount of flying time in the airspace during the period when the incorrect route events occurred. The risk-bearing LLDs for calendar year 2019 contain 43 minutes of flying time spent on unexpected/incorrect routes. This is an increase in the number of minutes spent on unexpected/incorrect routes compared to that reported for calendar year 2018. In calendar year 2018, there were 12.8 minutes of flying time spent on unexpected routes.

5.6.2. **Tables 4-1 and 4-2** provide the duration on unexpected/incorrect routes. The proportion of flying time spent on unexpected/incorrect routes is estimated using the values in Table 4-1 and dividing by the estimated flying hours. The estimated annual flying hours for New York OCA West obtained from the ATOP DR&A data are 277,504 hours. The resulting ratio of time spent on unexpected/incorrect routes is 2.6×10^{-6} for New York OCA West.

5.7. Probability of Lateral Overlap

5.7.1. The probability of lateral overlap accounts for contributions to lateral error arising from navigation system performance. The probability that two aircraft operating on the same route and flight level are in lateral overlap, $P_y(0)$, is 0.1. This value is currently used in lateral risk estimates in the Asia and

Pacific Region. This value is expected to increase with the use of Global Navigation Satellite System (GNSS) in aircraft navigation systems.

5.7.2. The probability that two aircraft operating on adjacent routes and the same flight level are in overlap, $P_y(S_y)$, is determined from the value of $P_y(0)$ and the risk-bearing LLDs. The lateral separation standard is represented by the term S_y. There are two estimates of $P_y(S_y)$, one for the time spent on unexpected/incorrect route and another for the number of unexpected/incorrect routes crossed. The $P_y(S_y)$ value for time spent on unexpected/incorrect routes is shown below.

$$P_y(S_y) = \frac{T_r}{F(NY)} \times P_y(0)$$

5.7.3. The total time spent on unexpected/incorrect routes during a calendar year is represented by the term T_r. The estimated annual flying hours for New York OCA West is given by $F(NY)$. The $P_y(S_y)$ value for the number of unexpected/incorrect routes crossed is shown below.

$$P_y(S_y) = \frac{N_r}{F(NY)} \times \frac{2\lambda_y}{\overline{|\dot{y}_r|}}$$

5.7.4. The number of routes unexpected/incorrect routes crossed is represented by the term N_r. The term $\overline{|\dot{y}_r|}$ represents the lateral closer rate of aircraft crossing through an unexpected/incorrect route.

5.8. Collision Risk Model Parameters

5.8.1. The individual parameters of the models, their definitions, estimates, and sources are given in **Table 5-3.**

Table 5-3. Lateral Collision Risk Model Parameter Estimates

Term	Definition	Estimate	Source
$P_z(0)$	Probability that two aircraft operating on the same flight level are in vertical overlap	0.42	Value used in the vertical risk estimates for Pacific airspace
$P_y(Sy)$ *for time spent on unexpected / incorrect route*	Probability that two aircraft assigned to laterally adjacent tracks lose all planned lateral separation and are in lateral overlap due to time spent on unexpected/incorrect route.	2.6×10^{-7}	Estimated from traffic data, and risk-bearing LLDs (43 minutes spent on unexpected/incorrect route
$P_y(Sy)$ *for unexpected / incorrect routes crossed*	Probability that two aircraft assigned to laterally adjacent tracks lose all planned lateral separation and are in lateral overlap due unexpected / incorrect routes crossed.	2.2×10^{-9}	Estimated from traffic data, and risk-bearing LLDs (one unexpected/ incorrect routes crossed)
$P_y(0)$	Probability that two aircraft on the same track are in lateral overlap	0.1	Value used in the vertical risk estimates for Pacific airspace
λ_x	Average aircraft length.	0.0271 NM	Estimated from New York West OCA traffic data
λ_y	Average aircraft wingspan.	0.0247 NM	Estimated from New York West OCA raffic data
λ_z	Average aircraft height with undercarriage retracted.	0.0077 NM	Estimated from New York West OCA traffic data

Term	Definition	Estimate	Source
$E_y(same)$	Same-direction lateral occupancy for a pair of aircraft on same flight level on adjacent routes.	0.0706	Estimated from New York West OCA traffic data
$E_y(opp)$	Opposite-direction lateral occupancy for a pair of aircraft on same flight level on adjacent routes.	0.0007	Estimated from New York West OCA traffic data
$\overline{\lvert \Delta V \rvert}$	Average absolute relative along-track speed between aircraft on same-direction routes.	13 knots	Value used in the North Atlantic, Pacific, and US Domestic airspace lateral risk estimates
$\overline{\lvert V \rvert}$	Average absolute aircraft ground speed.	480 knots	Value used in the North Atlantic, Pacific, and US Domestic airspace lateral risk estimates
$\overline{\lvert \dot{y} \rvert}$	Average absolute relative cross-track speed for an aircraft pair assigned to adjacent routes as the y lose all planned lateral separation, S_y.	5 knots	Value used in the North Atlantic, Pacific, and US Domestic airspace lateral risk estimates
$\overline{\lvert \dot{y}_r \rvert}$	Average lateral closure rate of aircraft crossing through an unexpected/incorrect route	80 knots	Value used in the NAT lateral risk estimates
$\overline{\lvert \dot{z} \rvert}$	Average absolute relative vertical speed of an aircraft pair assigned to the same flight level which are in vertical overlap	1.5 knots	Value used in the North Atlantic, Pacific, and US Domestic airspace lateral risk estimates
F(NY)	Estimated flying hours within New York West FIR	277,504	Estimated from FAA ATOP DR&A for New York West OCA

6. Results and Conclusions

6.1. The reported risk-bearing LLDs within New York OCA West are applied to the estimated flying hours and lateral occupancy values for New York OCA West. There was one unexpected/incorrect routes crossed and 43 minutes spent on an unexpected/incorrect route. The lateral risk estimate is **1.1×10^{-9} fatal accidents per flight hour (fapfh)**. This estimate meets the overall safety goal of 5.0×10^{-9} fapfh.

6.2. NAARMO is developing a process to examine the application of reduced longitudinal separation using the archived ATOP DR&A data. This work is being accomplish along with the development of longitudinal monitoring through the ICAO Separation and Airspace Safety Panel (SASP). The COVID-19 situation has affected the progress of this work. The NAARMO expects to provide information on this method to the next GTE meeting.

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APPENDIX

Data Link Performance Summary
New York FIR OCA
July – December 2019

A.1. The use of data link in the airspace is summarized in **Figure A-1**. The percentage of aircraft operations using Future Air Navigation System (FANS)-1/A data link is 35 percent. The percentage of aircraft operations filing RNP4, RCP240 and RSP180 is 30 percent.

Flow	Av flights per day	% FANS datalink	% RNP4	% RCP240/ RSP180
OCA-West	**288**	**35%**	**35%**	**30%**
OCA-East	**375**	**95%**	**95%**	**80%**
Combined ZNY	***690***	***68%***	***67%***	***65%***

Figure A-1. Data Link Usage Observed in the New York FIRs – January through June 2019

A.2. The data link performance observed by media type is provided in **Figure A-2**. The RSP 180 and RCP 240 criteria are used to determine whether the requirements are met for the airspace. These data show the aggregate performance using all the appropriate data link transactions collected during the period. There were 79,278 flight operations using data link during the period. The criteria are found in ICAO Doc 9869, *Performance-based Communication and Surveillance (PBCS) Manual*, *Second Edition*, *2017*. The green colors indicate the specified performance criteria have been met. The red colors indicate the specified performance criteria have not been met. In the table, “ASP” stands for “Actual Surveillance Performance”, “ACP” refers to “Actual Communication Performance”, and “ACTP” refers to “Actual Communication Technical Performance”.

Media Type	ADS-C			CPDLC				
	Count of ADS-C Downlink Messages	ASP 95%	ASP 99.9%	Count of CPDLC Transactions	ACTP 95%	ACTP 99.9%	ACP 95%	ACP 99.9%
Performance Criteria		**RSP 180**			**RCP 240**			
Aggregate	2,573,051	98.2%	99.3%	158,883	99.1%	99.4%	99.1%	99.4%
SAT	1,910,705	97.9%	99.2%	121,784	99.0%	99.4%	99.1%	99.4%
VHF	658,684	99.2%	99.7%	31,340	99.8%	99.9%	99.5%	99.7%
HF	3,609	69.4%	82.4%	26	57.7%	69.2%	61.5%	65.4%
SAT-VHF				3,415	96.1%	97.5%	96.2%	97.0%
VHF-SAT				1,895	96.9%	98.7%	97.4%	98.2%
SAT-HF				133	84.2%	87.2%	88.7%	88.7%
HF-SAT				252	98.0%	99.6%	98.4%	99.2%
VHF-HF				5	100.0%	100.0%	100.0%	100.0%
HF-VHF				33	69.7%	78.8%	90.9%	90.9%

Figure A-2. Aggregate Data Link Performance Observed in New York FIR – July – December 2019

— END —