GTE/18 — IP/05
05/10/18

CAR/SAM Planning and Implementation Regional Group (GREPECAS) Eighteenth Scrutiny Working Group Meeting (GTE/18)
Mexico City, Mexico, 22 – 26 October 2018

Agenda Item 5: **Other Business**

NEW YORK WEST AIRSPACE HORIZONTAL SAFETY MONITORING REPORT

(Presented by United States/
North American Approvals Registry and Monitoring Organization (NAARMO))

EXECUTIVE SUMMARY	
This Information Paper presents the 2017 horizontal safety monitoring report for the New York West airspace. The purpose of this report is to compare actual performance to safety goals related to continued use of reduced horizontal separation minima in New York West Airspace. This report contains a summary of Large Lateral Deviation (LLD) and Large Longitudinal Error (LLE) reports received by the NAARMO for the calendar year 2017. There are 78 reported events accounting for 164 minutes spent at an uncleared / incorrect route during calendar year 2017. This report also contains an estimate of the lateral collision risk. The lateral collision risk estimate for the airspace meets the target level of safety (TLS) value of 5.0×10^{-9} fatal accidents per flight hour.	
Strategic Objectives:	• Safety • Air Navigation Capacity and Efficiency

1. Introduction

1.1 The North American Approvals Registry and Monitoring Organization (NAARMO), a service provided by the Federal Aviation Administration (FAA) Technical Center, fulfils the role of Regional Monitoring Agency (RMA) for the continued-safe use of the Reduced Vertical Separation Minimum (RVSM) in 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 The **attached** report contains a summary of Large Lateral Deviation (LLD) and Large Longitudinal Error (LLE) reports received by the NAARMO for the calendar year 2017. There are twenty-three reported events accounting for 164 minutes spent at an uncleared/incorrect route during calendar year 2017. The attached report also contains an estimate of the lateral collision risk. The lateral collision risk estimate for the airspace meets the target level of safety (TLS) value of 5.0 x 10^{-9} fatal accidents per flight hour.

2. Action

2.1 The Meeting is invited to note and discuss the information in the report.

— — — — — — — — — — —

APPENDIX

NEW YORK WEST AIRSPACE HORIZONTAL SAFETY MONITORING REPORT – 2017

September 2018

Horizontal Safety Monitoring Report for New York West Airspace

(Prepared by North American Approvals Registry and Monitoring Organization (NAARMO))

Summary

This 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 2017.

There were 78 reported events for New York West airspace during calendar year 2017. Twenty-one of these events were determined to be risk-bearing LLDs and two of these events were determined to be risk-bearing LLEs. This report contains a high-level summary of the reported events and evaluates the application of reduced 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. This report contains analyses for operations during calendar year 2017 prior to the implementation of PBCS.

2. Traffic Data

2.1. The flight operations within the New York West Oceanic FIR 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 the New York West FIR 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 the New York West Oceanic FIR during December 2017. The aircraft position data determined by the Bermuda surveillance radar and are not archived. The figure shows only those aircraft positions provided by the pilot/aircraft in oceanic airspace. Position reports received via Automatic Dependent Surveillance – Contract (ADS-C) are contained in the DR&A archives.

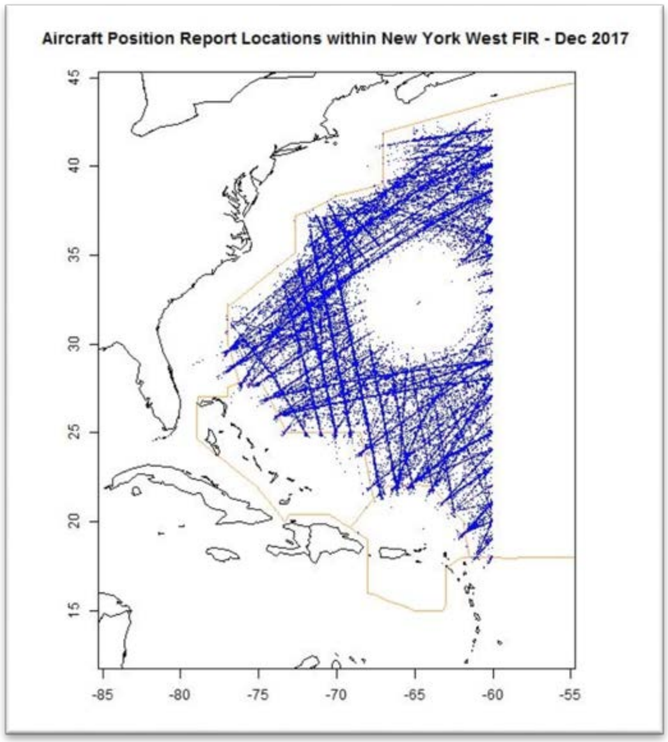


Figure 2-1. Aircraft/Pilot Reported Positions within New York West Airspace – December 2017

2.3. **Figure 2-2** shows the number of flights by day in the New York West FIR for December 2017. 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 553 flights per day.

2.4. **Appendix A** contains the most current data link performance analysis summary conducted for the New York FIR. These data include the New York West and New York East FIRs for the period January – June 2018. The PBCS requirements were implemented on 29 March 2018.

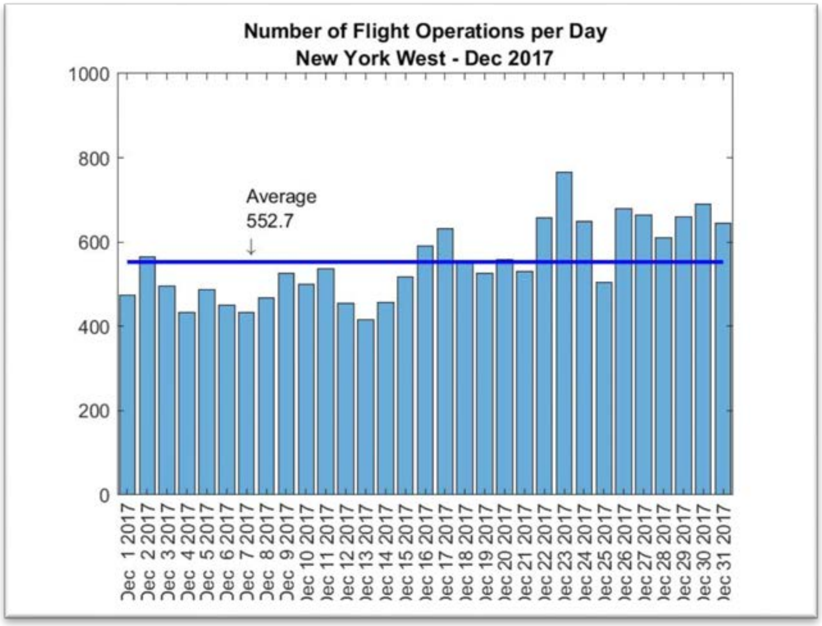


Figure 2-2. Number of Flight Operations Observed by Day – New York West FIR December 2017

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 West airspace, 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 2017, the possible lateral separation standards varied depending on the filed RNP status and the surveillance/communication capabilities of the aircraft. **Table 3-1** summarizes the possible reduced horizontal separation standards available for aircraft operations within the New York FIR in 2017. Due to the implementation of the PBCS requirements in March 2018, the requirements for these separation standards will include specific data link communication and surveillance performance requirements.

Table 3-1. Horizontal Separation Standards Available in New York West FIR – 2017

Lateral/ Longitudinal	Separation Standard	Minimum RNP	Minimum Communication Capabilities	Minimum Surveillance Capabilities
Lateral	50 NM	10	HF	HF
Lateral	30 NM	4	CPDLC	ADS-C
Longitudinal	10 minutes	-	HF	HF
Longitudinal	50 NM	10	CPDLC	ADS-C
Longitudinal	30 NM	4	CPDLC	ADS-C

3.4. During the scrutiny of each reported event, the 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 current methodology applied to LLD events for the determination of tracks or routes crossed. The number of tracks or routes crossed, N_T, is determined by the magnitude of the deviation. For example, if the event report indicated the aircraft crossed through two adjacent tracks from the cleared/expected track then the value of N_T would be two. The last column of Table 3-2 provides an indication whether a duration is needed for the event. This duration represents the time spent on an uncleared or unprotected route.

Table 3-2. Current Methodology for LLD Events

Communication & Surveillance Capabilities[1]	Deviation Magnitude (NM)	Track Crossed	Duration Spent on Incorrect Route?
HF	< 25 NM	0	No
HF	≥ 25 NM & < 45 NM	1	No
HF	≥ 45 NM	N_T	Yes
CPDLC & ADS-C	< 15 NM	0	No
CPDLC & ADS-C	≥ 15 NM & < 25 NM	1	No
CPDLC & ADS-C	≥ 30 NM	N_T	Yes

4. Reported Large Lateral Deviations and Large Longitudinal Errors

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 78 reported events for New York West airspace during calendar year 2017. After scrutiny group review, 21 of these events were determined to be risk-bearing LLDs and two of these events were determined to be risk-bearing LLEs. **Table 4-1** contains a summary of all the risk-bearing LLDs and 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

[1] The observed communication and surveillance capabilities for aircraft using satellite data link was used to determine eligibility for a specific separation standard. FANS-1/A aircraft are assumed to be RNP 4 capable.

for reported LLD events. The last column of Table 4-1 shows the LLE event duration in minutes.

Table 4-1. Risk-bearing LLDs and LLEs

Date	LLD/LLE Count	LLD Tracks Crossed	LLD Duration Spent on Incorrect Route (min)	LLE Duration (min)
Jan 2017	2	1	40	-
Feb 2017	2	1	40	-
Mar 2017	3	1	0	-
Apr 2017	1	0	0	-
May 2017	2	1	1	-
Jun 2017	2	1	0	1
Jul 2017	4	1	0	-
Aug 2017	4	1	45	3
Sep 2017	1	1	22	-
Oct 2017	1	0	1	-
Nov 2017	0	-	-	-
Dec 2017	1	2	15	-
TOTAL	**23**	**10**	**164**	**4**

4.2. The scrutiny review determined a general cause for each of the 23 risk-bearing LLDs and LLEs. **Table 4-2** summarizes the reported LLDs and LLEs by general cause category.

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

LLD /LLE Category Code	LLD/LLE Category Description	Number of LLD/ LLE	Duration (min)	LLD Number Tracks Crossed
A	Flight crew deviate without ATC Clearance	14	20	7
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.)	3	27	2
D	ATC system loop error (e.g., ATC issues incorrect clearance, Flight crew misunderstands clearance message etc.)	4	120	1
F	Navigation errors, including incorrect position estimate or equipment failure of which notification was not received by ATC or notified too late for action	1	1	0
I	Other	1	0	0
	TOTAL	**23**	**168**	**10**

4.3. The risk-bearing events involving flight crews deviating without ATC clearance, category A, account for more than half of the risk-bearing events in 2017. Ten of the category A events involve pilots deviating around severe weather. In these ten cases, there was not enough evidence to suggest that the published procedures for weather deviation were followed by the flight crews, therefore these events were determined to be risk-bearing.

4.4. The risk-bearing events classified as ATC system loop error, category D, contributed more than half of the duration spent on uncleared route in 2017. There were four risk-bearing events in category D accounting for 120 minutes spent on the incorrect route and four routes crossed. Three of these events were the result of an incorrect route amendment computer entry made by the transferring ATC facility, which caused the profiled route for the aircraft to reverse course and double back on itself. All of the aircraft involved were communicating with ATC via HF radio only and were not FANS 1/A equipped. As a result, data link communications and ADS-C periodic reports between compulsory reporting points were not available for these flights, which lengthened the time it took ATC to discover the route discrepancies. In each event, the error was identified when the aircraft did not report over an expected compulsory reporting point. The estimated time the aircraft operated within oceanic airspace without ATC protection was 40 minutes in each case.

4.5. The source of the three category D events was an error made in the flight data input/output (FDIO) amendment. The main corrective action taken has been to provide FDIO retraining to the ATC unit involved. These events took place in January, February and August 2017. During the scrutiny review, the operational experts noted that it had been more than 12 months since the last of these events occurred without another incident, which was taken as an indication of corrective-action success. Another mitigation planned is a change to the ATOP automation system that will alert ATC when an aircraft route appears to double back on itself.

4.6. **Figure 4-1** shows the locations of the risk-bearing LLDs and LLEs in 2017. Three of the category D events, with the largest combined duration on uncleared route, are located at the same boundary point in the airspace. These category D events are marked with a larger icon than the other events. The category A events that involve air crews deviating from cleared route due to severe weather occur throughout the airspace in no apparent pattern.

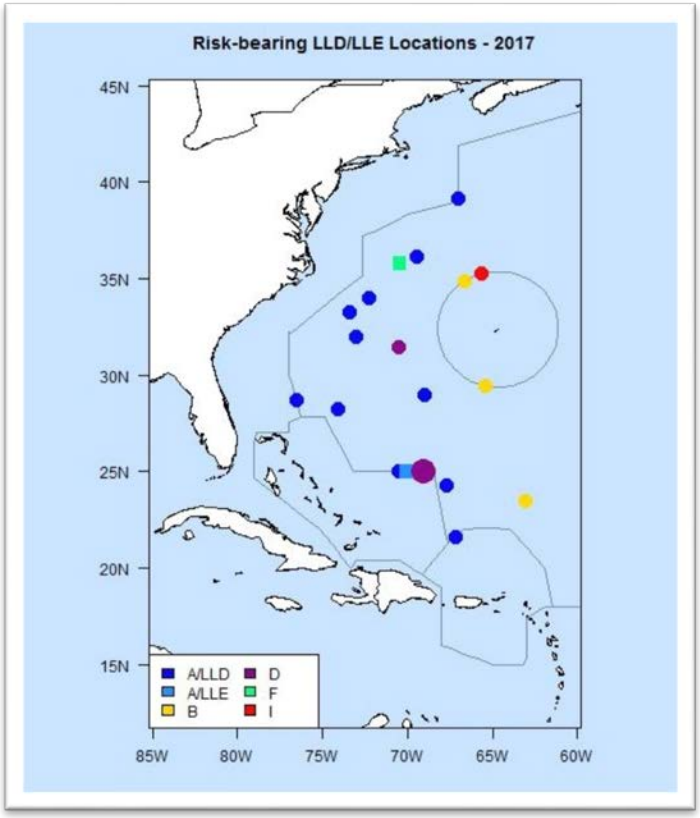


Figure 4-1. Risk-bearing LLDs and LLEs Location

4.7. The standard lateral separation in New York West airspace is 50NM; aircraft indicating RNP 10 in the filed flight plan are eligible for this separation. 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. Aircraft operations utilizing data link communications are eligible for reduced horizontal separation standards. The expectation is that the error rate and deviation magnitudes for data link capable aircraft will be smaller compared to non-data link operations due to more frequent position reporting. **Table 4-3** provides a comparison of the reported risk-bearing LLDs considered in 2017.

Table 4-3. LLDs Comparison by Communication/Surveillance Capabilities - 2017

Aircraft Comm / Surveillance Capability	LLD Count	LLD Magnitude Mean (NM)	Max LLD Magnitude (NM)	Standard Deviation of LLD Magnitude (NM)
HF	15	47.13	147	45.44
Data Link (CPDLC, ADS-C)	6	22.00	44	16.41

4.8. The current proportion of data link equipped operations in New York West airspace is approximately 60 percent, this includes aircraft operations on both the east-west NAT routes and north-south NAM-CAR routes. The majority of the data link equipped aircraft operations are observed on the east-west NAT routes. Therefore, whether the observed LLD rate is in fact lower for aircraft operations utilizing data link for communications compared to HF aircraft is unclear. However, the statistics provided in Table 4-3 do show that the reported 2017 LLD magnitudes are lower for aircraft operations utilizing data link for communications and surveillance in New York West airspace. Furthermore, the maximum LLD magnitude, LLD magnitude average and standard deviation are lower for data link operations.

4.9. Appendix B provides a high-level summary of the risk-bearing LLD events for 2017.

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 2017 traffic data, the NAARMO estimates approximately 251,575 annual flying hours for 2017 in New York West.

5.2. *Aircraft Types Observed in the New York West FIR*

5.2.1. **Figure 5-1** provides the top 25 aircraft types observed in the December 2017 traffic data by flying hours. The aircraft types in Figure 5-1 account for more than 95 percent of total flying hours observed the airspace. The flying hours associated with the Boeing 737 NGX; including the B737, B738, and B739 is 23 percent of all flying hours observed in the traffic data. The Airbus A320 family; including A319, A320, and A321, accounts for the second most-observed aircraft in the traffic sample at 19 percent.

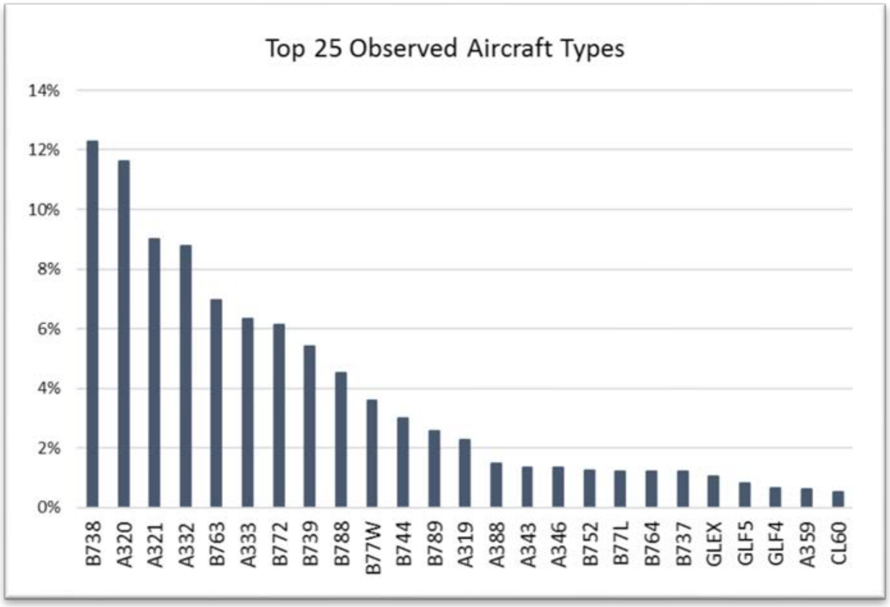


Figure 5-1. Observed Aircraft Types in Terms of Flying Hours in New York West Airspace

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 2017 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 (NM) λ_x	Wingspan (NM) λ_y	Height (NM) λ_z
New York West	0.0278	0.0259	0.0080

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 the New York West airspace. Because most of the aircraft operations occur on fixed routes with a flight level allocation scheme (FLAS) in place, there were no 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	Opposite Direction Lateral Occupancy

	Value	Value
New York West	0.0710	0.00

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. Currently, the U.S. Aircraft Geometric Height Measurement Element (AGHME) and the GPS Monitoring Unit (GMU) systems provide the NAARMO with estimates of aircraft altimetry system error (ASE), an important contributor to the estimated probability of vertical overlap. 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 lateral risk is 0.42.

5.6. Time Spent on Uncleared/Incorrect Route

5.6.1. The proportion of flying time spent on uncleared/incorrect routes is determined as the ratio of the amount of time spent on uncleared/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 2017 contain 164 minutes of flying time spent on uncleared/incorrect routes.

5.6.2. Tables 4-1 and 4-2 provide the duration on incorrect/uncleared routes. The proportion of flying time spent on incorrect/uncleared 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 West airspace obtained from the ATOP DR&A data are 251,575 hours. The resulting ratios of time spent on incorrect/uncleared routes is 1.09 x 10^{-5} for New York West airspace.

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 uncleared/incurred route and another for the number of uncleared/incorrect routes crossed. The $P_y(S_y)$ value for time spent on uncleared/incorrect routes is given by:

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

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

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

The number of routes uncleared/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 uncleared/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
$P_y(50)$) for time spent on uncleared / 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 uncleared/incorrect route.	1.1 x 10^{-6}	Estimated from traffic data, and risk-bearing LLDs (164 minutes spent on uncleared/incorrect route
$P_y(50)$) for uncleared / incorrect routes crossed	Probability that two aircraft assigned to laterally adjacent tracks lose all planned lateral separation and are in lateral overlap due uncleared / incorrect routes crossed.	2.6 x 10^{-8}	Estimated from traffic data, and risk-bearing LLDs (10 uncleared/ incorrect routes crossed)
$P_y(30)$) for time spent on uncleared / 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 uncleared/incorrect route.	3.1 x 10^{-7}	Estimated from traffic data, and risk-bearing LLDs (28 minutes prorated to 47 minutes spent on uncleared/incorrect route
$P_y(30)$) for uncleared / incorrect routes crossed	Probability that two aircraft assigned to laterally adjacent tracks lose all planned lateral separation and are in lateral overlap due uncleared / incorrect routes crossed.	1.8 x 10^{-8}	Estimated from traffic data, and risk-bearing LLDs (4 prorated to 7 uncleared/ 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

Term	Definition	Estimate	Source
			airspace
λ_x	Average aircraft length.	0.0278 NM	Estimated from New York West traffic data
λ_y	Average aircraft wingspan.	0.0259 NM	Estimated from New York West traffic data
λ_z	Average aircraft height with undercarriage retracted.	0.0080 NM	Estimated from New York West traffic data
$E_y(same)$	Same-direction lateral occupancy for a pair of aircraft on same flight level on adjacent routes.	0.0710	Estimated from New York West traffic data
$E_y(opp)$	Opposite-direction lateral occupancy for a pair of aircraft on same flight level on adjacent routes.	0.0	Estimated from New York West 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 uncleared/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	251,575	Estimated from FAA ATOP DR&A for New York West airspace

6. Results and Conclusions

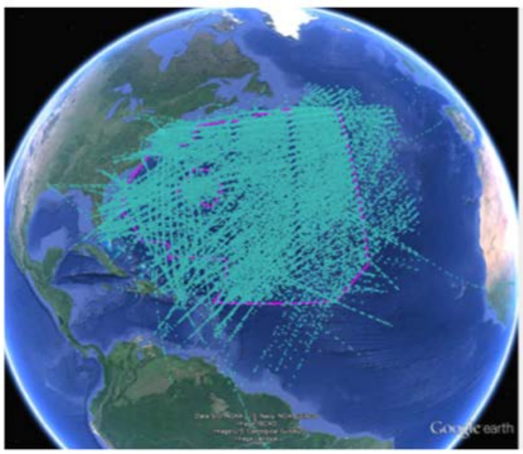
6.1.1. The risk-bearing LLDs within New York West airspace are applied to the estimated flying hours and lateral occupancy values for New York West airspace. There were 10 uncleared/incorrect routes crossed and 164 minutes spent on an uncleared/incorrect route. The estimated lateral risk for the application of the 50NM lateral separation minimum in New York West airspace is 3.51×10^{-9} fatal accidents per flight hour (fapfh). This estimate meets the overall safety goal of 5.0×10^{-9} fapfh.

6.1.2. The risk-bearing LLDs within New York West airspace from aircraft operations eligible for the 30NM lateral separation standard are prorated for all operations and applied to the estimated flying hours and lateral occupancy values. There were four uncleared/incorrect routes crossed and 28 minutes spent on an uncleared/incorrect route involving operations eligible for the reduced lateral separation standard. The proportion of eligible aircraft operations is 60 percent. The estimated lateral risk for the application of the 30NM lateral separation minimum in New York West airspace is 1.14×10^{-9} fatal accidents per flight hour (fapfh). This estimate meets the overall safety goal of 5.0×10^{-9} fapfh.

6.1.3. 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 NAARMO expects to provide information on this method to the next GTE meeting.

Appendix A
Data Link Performance Summary
New York FIRs
January – June 2018

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 66 percent. The percentage of aircraft operations filing Required Navigation Performance (RNP) 4 is 63 percent. Most of the observed FANS-1/A operations are traveling in the east-west directions through both the New York West and New York East FIRs.



	Jan-Jul 2018
Av flights/day	671
% flights using FANS data link	66%
% RNP4	63%
Individual airframes using FANS data link	3,833

Figure A-1. Data Link Usage Observed in the New York FIRs – January through June 2018

A.2. The data link performance observed by media type is provided in **Figure A-2**. The Required Surveillance Performance (RSP) 180 and Required Communication Performance (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 75,999 flight operations using data link during the period. The criteria are found in ICAO Doc 0869, *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", "ACTP" refers to "Actual Communication Technical Performance", and "PORT" refers to "Pilot Operational Response Time".

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%	PORT 95%
Performance Criteria		RSP 180			RCP 240				
Aggregate	2,363,958	98.28%	99.34%	60,592	99.17%	99.41%	99.47%	99.57%	97.62%
SAT	1,806,032	98.08%	99.32%	54,809	99.24%	99.50%	99.53%	99.63%	97.69%
VHF	551,522	99.33%	99.67%	5,181	99.58%	99.81%	99.71%	99.86%	97.45%
HF	6,369	61.69%	76.34%	6					
SAT-VHF				218	94.50%	97.25%	97.71%	98.62%	92.20%
VHF-SAT				242	92.98%	90.08%	95.04%	94.21%	91.74%
SAT-HF				106	72.64%	66.98%	76.42%	74.53%	96.23%
HF-SAT				23					
VHF-HF				6					
HF-VHF				1					

Figure A-2. Aggregate Data Link Performance Observed in New York FIR – January through June 2018

Appendix B
Large Lateral Deviation Summary
2017

B.1. Table B-1 provides a high-level summary of the 21 risk-bearing LHDs for calendar year 2017. The table shows the aircraft communication capability which was used to determine the eligibility for reduced lateral separation standards in 2017.

Table B-1. Risk-beaing LLDs for calendar year 2017

Aircraft Communication Capability	LLD Category Code	Deviation Magnitude (NM)	Time spent on Uncleared / Incorrect Route (min)	Uncleared / Incorrect Routes Crossed
ADS-C	A	15	0	1
ADS-C	A	8	1	0
ADS-C	A	5	0	0
ADS-C	A	20	0	1
ADS-C	B	44	22	1
ADS-C	B	40	5	1
HF	A	40	0	1
HF	A	40	0	0
HF	A	10	0	0
HF	A	10	0	0
HF	A	15	0	0
HF	A	40	0	1
HF	A	35	0	1
HF	A	147	15	2
HF	B	2	0	0
HF	D	105	40	0
HF	D	105	40	0
HF	D	105	40	0
HF	D	25	0	1
HF	I	20	0	0
HF	A	8	1	0
		TOTAL	**164**	**10**

— END —