RASG-PA

ANNUAL SAFETY REPORT

2020

TENTH EDITION

Regional Aviation Safety Group - Pan America

Information produced with data from 2010 until 2019

Contents

Foreword

The Regional Aviation Safety Group – Pan America (RASG-PA) was established in November 2008 with a vision to remain ahead of any risks to commercial aviation, seeking to achieve the highest level of safety in the Pan American Region, as well as addressing global aviation safety matters from a regional perspective.

RASG-PA membership includes representatives from all States/Territories of the International Civil Aviation Organization (ICAO) North American (NAM), Caribbean (CAR) and South American (SAM) Regions, international organizations and industry. ICAO serves as the group Secretariat, providing administrative, coordination and technical support to the RASG-PA, its working groups, and committees.

The RASG-PA safety management process, as depicted in Figure 1, consists of four recurrent stages. The process begins with the safety data gathering and analysis to produce safety intelligence, allowing for a consolidated vision of the main areas of interest for the development of safety improvement actions, tailored to the realities of the Pan American Region.

Figure 1. RASG-PA Safety Management Process

Previous editions of the Annual Safety Report and other RASG-PA related documentation can be downloaded at: www.icao.int/rasgpa. For additional information contact: rasg-pa@icao.int

Executive Summary

The results of the analysis of regional aviation safety data indicate an alignment with the content of the 2020-2022 GASP edition and pertinent ICAO documentation. When fatal occurrences are classified, four high risk categories (HRCs) were considered the most significant for the Pan American Region operational context, which led the analysis of regional aviation safety data to focus safety enhancement initiatives (SEIs) in the following issues:

- Loss of Control In-flight (LOC-I)
- Runway Excursion (RE)
- Controlled Flight Into Terrain (CFIT)
- Mid-Air Collision (MAC)

According to the statistics contained in this report, the number of accidents in 2019 in the Pan American Region (ICAO NAM, CAR and SAM) for scheduled commercial air transport operations involving aircraft with maximum take-off mass (MTOM) above 5,700 kilograms and the accident rate were higher than in previous years.

The four SEIs continue to show decreasing trends through the latest ten-year period, as it can be seen from the analysis of the reactive data.

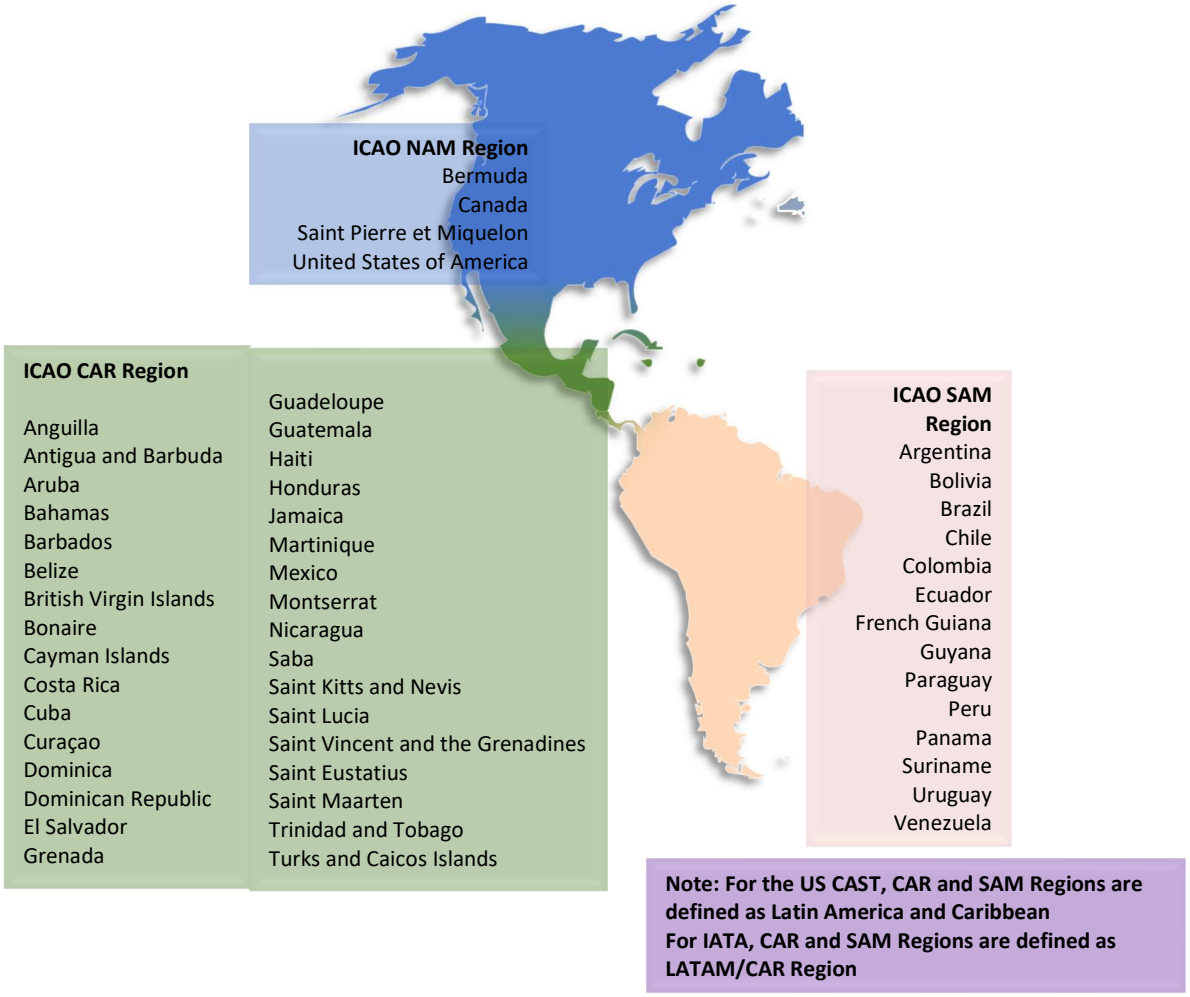
The analysis conducted to determine correlations between the critical elements (CEs) of an effective safety oversight system and areas of the ICAO Universal Safety Oversight Audit Programme - Continuous Monitoring Approach (USOAP-CMA), showed that main findings in the case of NAM Region were related CE 6 (Licencing an Certifications Obligations) in OPS area (Aircraft Operations), specifically regarding the existence of a flight data analysis programme as part of the operator's Safety Management System (SMS). For CAR and SAM Regions, the main findings were also related to CE 6, but specifically in the Aerodrome and Ground Aids (AGA) area, related to aerodrome data, runway safety areas and runway incursion and collision avoidance.

Despite the recent demand retraction for air transport services caused by COVID-19 pandemic, the most recent air traffic projections still attribute remarkable commercial traffic growth for CAR and SAM Regions, which reinforces the necessity to improve ANS and AGA areas, especially in this Regions.

About the report

The principal objective for publishing this report is to highlight its usefulness as a safety intelligence tool, by focusing on the main aviation safety areas of interest in the Pan American Region, incorporating an integrated vision from different stakeholders. The improvements in every new edition of the Annual Safety Report are oriented to facilitate the comprehension of the methodologies, data analysis tools, and other information necessary to implement safety management activities, plans and programs to ensure risk mitigation in the aviation sector.

Figure 2. The Pan American Region (RASG-PA Region)



How this report is structured

The report is structured in two parts:

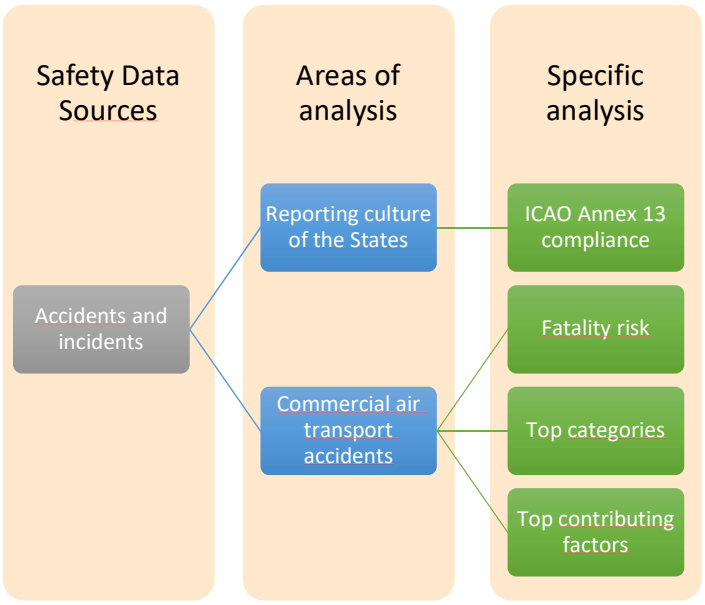
Part One: Safety Information

The first part of the report is oriented to present relevant safety information, according to aviation safety management principles[1], which state that hazards can be identified using two distinct methodologies:

[1] ICAO Annex 19 and Document 9859

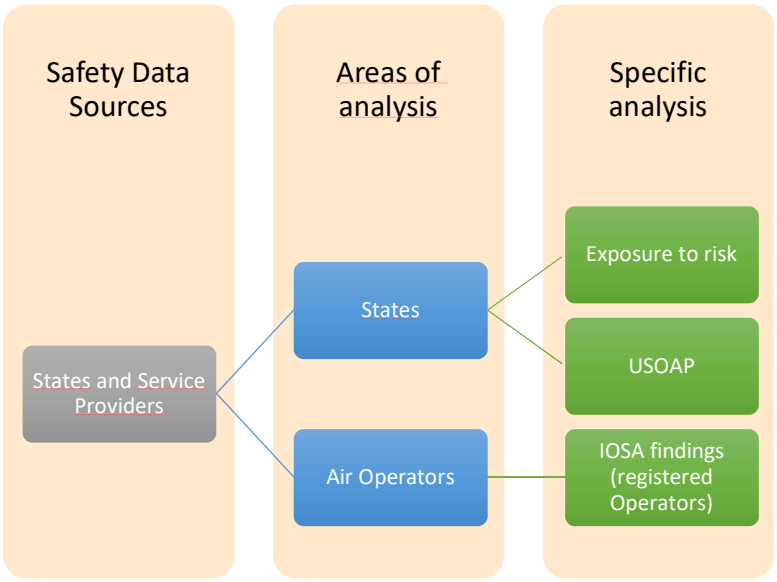
1. **Reactive:** Refers to the analysis of results or past events. Through investigation processes, hazards contributing to accidents or incidents can be identified. In this report, the reactive section presents safety analysis based upon accidents and incidents, as shown in the following figure.

Figure 3. Reactive Safety Data Analysis



2. **Proactive:** Refers to the analysis of existing conditions. Safety assurance processes, such as audits or evaluations, can provide information on hazards in the processes in place. The proactive section of this report includes analysis of audit results for the States (ICAO Standards and Recommended Practices implementation, traffic) and service providers as IOSA (IATA Operational Safety Audits).

Figure 4. Proactive Safety Data Analysis



Part Two: Safety Intelligence

The second part of the report reflects the use of the data analysis results to develop safety intelligence, establishing correlations to facilitate the decision-making process and for the benefit of aviation safety.

Sources of information

Information is only as good as the sources from which it is obtained. To be valid and included in the Annual Safety Report, the information used requires the existence of processes to assure data quality and traceability.

Every stakeholder has a specific approach and uses distinct indicators to measure aviation safety. A goal of the Annual Safety Report is to highlight the main common areas of interest, providing a context in which joint efforts could allow better resources allocation and significant improvement of safety.

Currently, the Annual Safety Report is only possible by the in-kind contribution of the Commercial Aviation Safety Team from United States (US CAST), Boeing, the International Air Transport Association (IATA) and ICAO, who provide the safety information supporting the identification of areas of interest for aviation safety with an integrated view. Other stakeholders are invited to contribute to aviation safety by providing useful information for the Annual Safety Report, or by participating in the RASG-PA, its work groups and committees.

Interacting with the Annual Safety Report

As mentioned previously, the Annual Safety Report is intended to show the behavior of aviation safety at a regional level, with a consolidated perspective amongst the stakeholders.

Users of the Annual Safety Report are invited to apply the proposed methodology; to establish a starting point or a mechanism to improve safety data management by consolidating relevant information from different sources, and by deepening the analysis of the exposed areas, to be more representative of their specific reality and context.

Part One: Safety information

1. Reactive Safety Information

Using the reactive methodology, this section is intended to assist with comprehending the behavior of Safety in the Pan American Region, based upon the analysis of accidents and incidents, according to the data provided by the US CAST, Boeing, IATA and ICAO.

It is important to note that each stakeholder captures a specific portion of data and develops metrics applicable to areas of interest. The Annual Safety Report challenge is to identify and apply the data to allow for a cross-sectional understanding of safety, thus overcoming individual limitations. To develop the metrics in this report, commercial aviation accidents data, gathered and processed by the different stakeholders was considered, according to the following criterions.

- ICAO data on accidents, serious incidents and incidents occurred during scheduled commercial air transport operations, involving aircraft with maximum takeoff mass above 5,700 kg, classified by State of Occurrence. The analyzed time frame was 2010-2019.
- Accidents occurred from 2010 to 2019 resulting in hull losses and/or onboard fatalities involving western built aircraft during part 121 or equivalent operations (greater than 9 seats or greater than 7,500 pounds of cargo capacity), classified by the State of Operator, provided by the US CAST.
- IOSA results and accidents involving fixed-wing aircraft over 5,700 kg with jet or turboprop propulsion engaged in commercial operations, in the time period 2015-2019, provided by IATA.

1.1 Pan American accident statistics and rates

According to ICAO data (ADREP), 52 accidents during regular commercial air transport operations, involving aircraft above 5,700 kilograms occurred in Pan America, 1 of those accidents resulted in fatalities.

The distribution of 2019 global accidents, fatal accidents and fatalities by RASGs (Regional Aviation Safety Groups) is shown in table 1. Also, Table 2 shows the specific values for the Pan American Region.

Table 1. Accident Statistics and Accident Rates – 2019

RASG	Estimated Departures (in millions)	Number of accidents	Accident rate (per million departures)	Fatal accidents	Fatalities	Share of Traffic	Share of Accidents
AFI	1 130 861	10	8.8	2	183	2.9%	8.7%
APAC	12 663 222	18	1.4	Nil	Nil	32.6%	15.7%
EUR	9 826 990	29	3.0	3	55	25.3%	25.2%
MID	1 311 340	2	1.5	Nil	Nil	3.4%	1.7%
PA	13 856 870	52	3.8	1	1	35.7%	45.2%
International waters	n/a	4	n/a	Nil	Nil	n/a	3.5%
WORLD	38 789 283	115	3.0	6	239	100%	100%

Table 2. Scheduled Commercial Air Transport Accidents occurred in Pan America (2010-2019)

Year	Total Accidents	Fatal accidents[2]	Total fatalities
2010-2019 avg.	41.4	2.2	30.2
2019	52	1	1
2018	45	3	114

In 2019 the number of total accidents was higher than the 10-year average. However, the total fatalities occurred during 2019 was lower than the 10-year average.

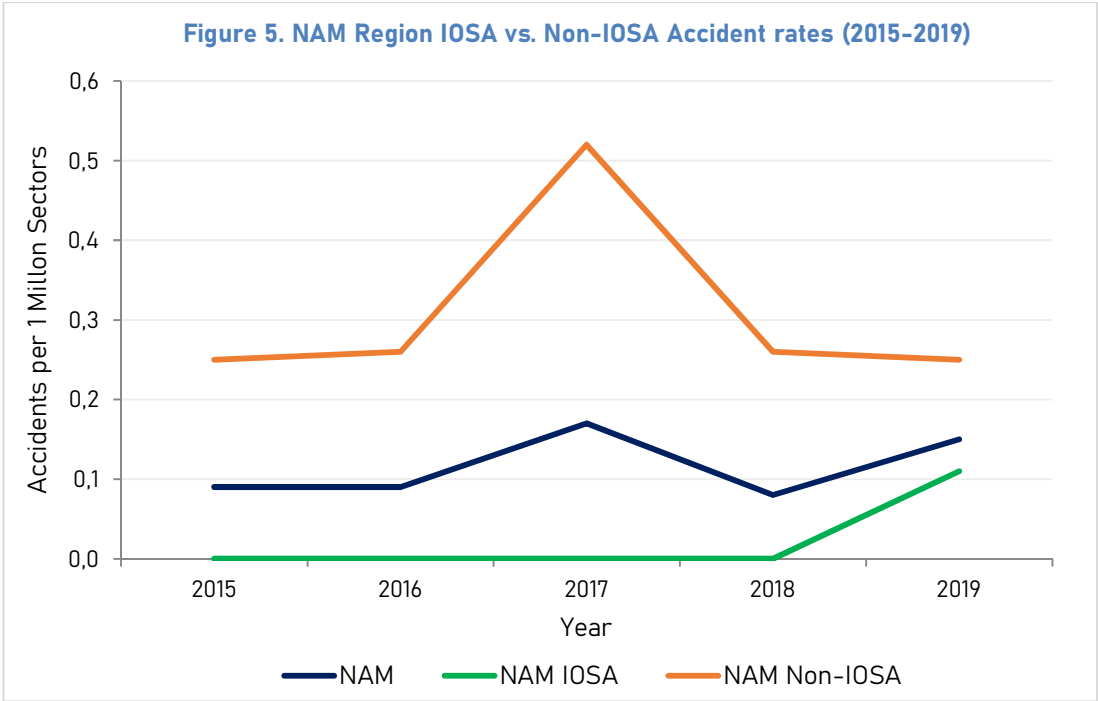
During 2010-2019 period a total of 22 fatal accidents occurred, where 5 occurred in the CAR region, 8 in the SAM region and 9 in the NAM region. For that period of time, according to the information provided by ICAO iSTARS system, the scheduled traffic by region (in millions of departures) was: 10.344 M for the CAR region, 18.931 M for SAM region and 102.094 M for NAM region.

1.2 NAM Region Analysis

1.2.1 IATA Operational Safety Audit (IOSA) summary

The comparison of the number of recorded accidents per million sectors flown for IOSA registered airlines versus non-IOSA registered airlines in the NAM Region, indicated significantly lower rates for IOSA registered operators, as shown in the following figure:

Figure 5. NAM Region IOSA vs. Non-IOSA Accident rates (2015-2019)



[2] An accident where at least one passenger or crewmember is killed or later dies (within 30 days following the accident date)

1.2.2 Contributing Factors to 2015-2019 Accidents

Using a classification model based on the Threat and Error Management (TEM) framework, IATA identified contributing factors to NAM 2015-2019 accidents, as follows.

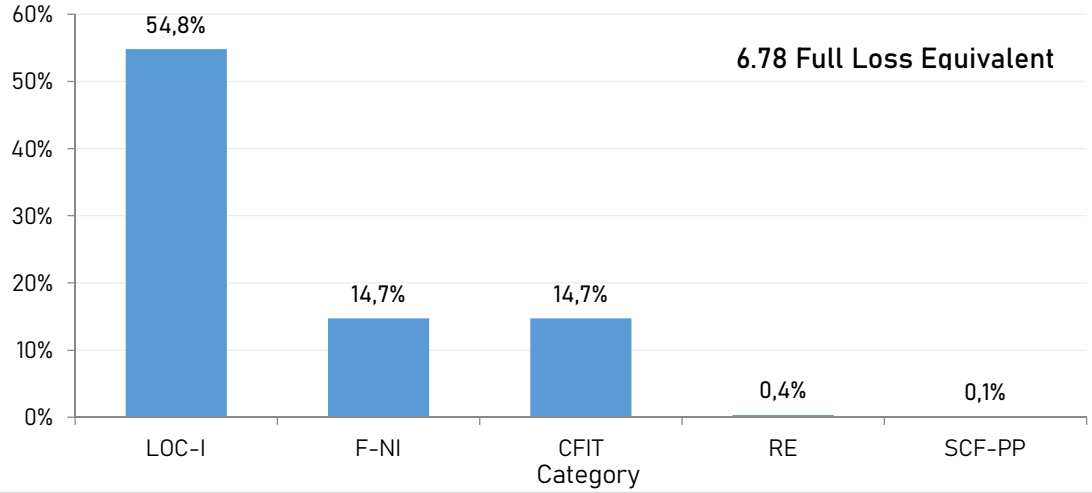
Table 3. Top Contributing Factors to NAM accidents (2015-2019)

Latent conditions	Safety Management (20%) Flight Operations (17%) Regulatory Oversight (17%) Maintenance Operations (11%) Flight Ops: SOPs & Checking (11%) Maintenance Ops: SOPs & Checking (11%)
Threats (Environmental)	Meteorology (41%) Wind/Wind shear/Gusty wind (28%) Poor visibility/IMC (15%) Thunderstorms (9%)
Threats (Airline)	Aircraft malfunction (31%) Gear/Tyre (17%) Maintenance events (13%) Ground Events (9%)
Flight Crew Errors	Manual Handling / Flight Controls (30%) SOP Adherence / SOP Cross-verification (20%) Pilot-to-Pilot Communication (7%)
Undesired Aircraft States	Vertical / Lateral / Speed Deviation (20%) Long/floated/bounced/firm/off-center/crabbed land (17%) Unstable Approach (13%) Abrupt Aircraft Control (11%) Continued landing after Unstable Approach (11%)
Countermeasures	Monitor/Cross-check (15%) Overall Crew Performance (15%) Captain should show leadership (13%) Leadership (13%)

1.2.3 Fatality risk

The US CAST utilizes a model to determine fatality risk associated to accidents. For this analysis, accidents are classified in categories, based on specific characteristics of each occurrence, consistent with ADREP Taxonomy. According to the information obtained from ICAO-ADREP system, the distribution of fatality risk in 2010-2019 accidents affecting Operators located on the NAM regions presented in the following chart.

Figure 6. NAM Region Fatality Risk distribution by CICTT (2010-2019)



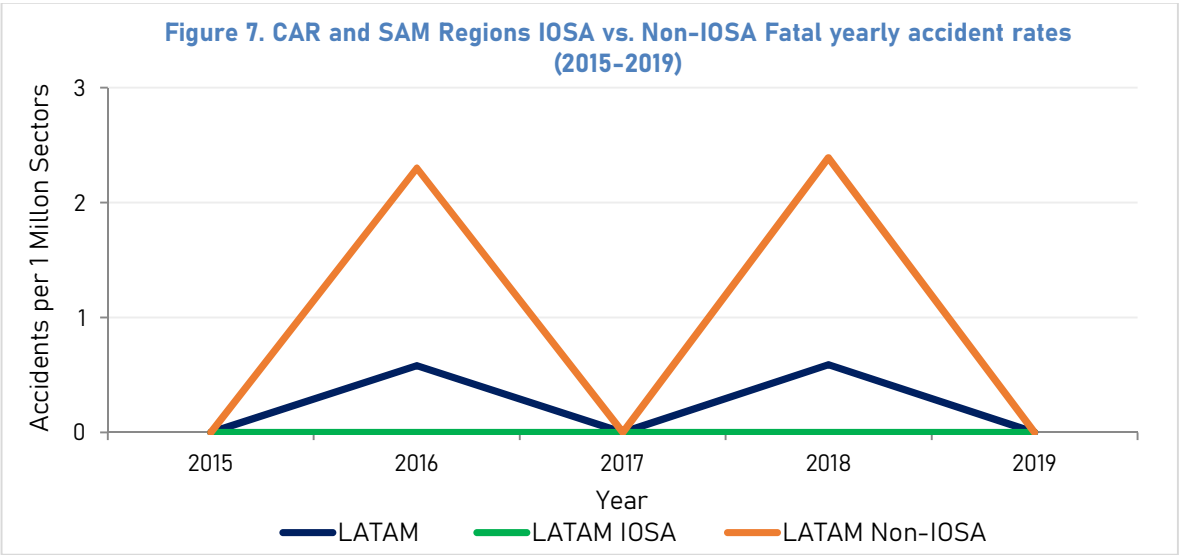
1.3 CAR and SAM Regions Analysis

Because of the ways of gathering and processing data made by the different stakeholders, in many cases it is not possible to separate CAR and SAM Regions data.

1.3.1 IATA Operational Safety Audit (IOSA) summary

The comparison of the number of recorded accidents per million sectors flown for IOSA registered airlines versus non-IOSA registered airlines in the Latin American and Caribbean IATA Regions (LATAM/CAR), indicated lower rates for IOSA registered operators, as shown in the following figure:

Figure 7. CAR and SAM Regions IOSA vs. Non-IOSA Fatal yearly accident rates (2015-2019)



1.3.2 Contributing Factors to 2014-2018 Accidents

IATA identified the top contributing factors to CAR and SAM Regions 2015-2019 accidents, as follows.

Table 4. Top Contributing Factors to CAR and SAM accidents (2015-2019)

Latent conditions	Regulatory Oversight and Safety Management (38%) Flight Operations (31%) Selection Systems (24%) Dispatch (21%) Flight Ops: SOPs and Checking (21%)
Threats (Environmental)	Meteorology (21%) Airport Facilities (14%) Thunderstorms (10%) Poor visibility/IMC (10%) Contaminated runway / Taxiway – poor braking action (7%)
Threats (Airline)	Aircraft Malfunction (41%) Maintenance events (24%) Gear/Tire (21%) Dispatch/Paperwork (17%) Operational pressure (14%)
Flight Crew Errors	SOP Adherence / SOP Cross-verification (24%) Manual Handling / Flight Controls (21%) Callouts (10%)
Undesired Aircraft States	Unnecessary Weather Penetration (14%) Operation Outside Aircraft Limitations (14%) Abrupt Aircraft Control (10%) Long/floated/bounced/firm/off-center/crabbed land (10%) Weight & Balance (10%)
Countermeasures	Monitor / Cross-check (21%) In-flight decision-making / contingency management (21%) Overall Crew Performance (17%)

1.3.3 Fatality risk

According to the information provided by The US CAST, the distribution of fatality risk for the accidents occurred within the 2010-2019 period affecting Operators with domicile in the CAR and SAM Regions, is shown in the following figures[3].

Figure 8 - CAR Region fatality risk distribution by CICTT (2010-2019)

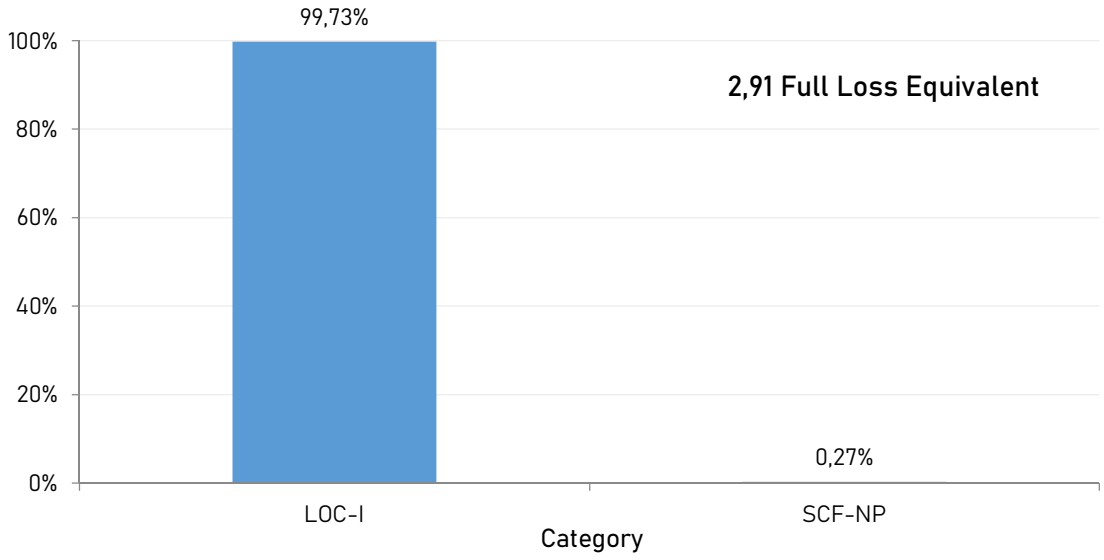
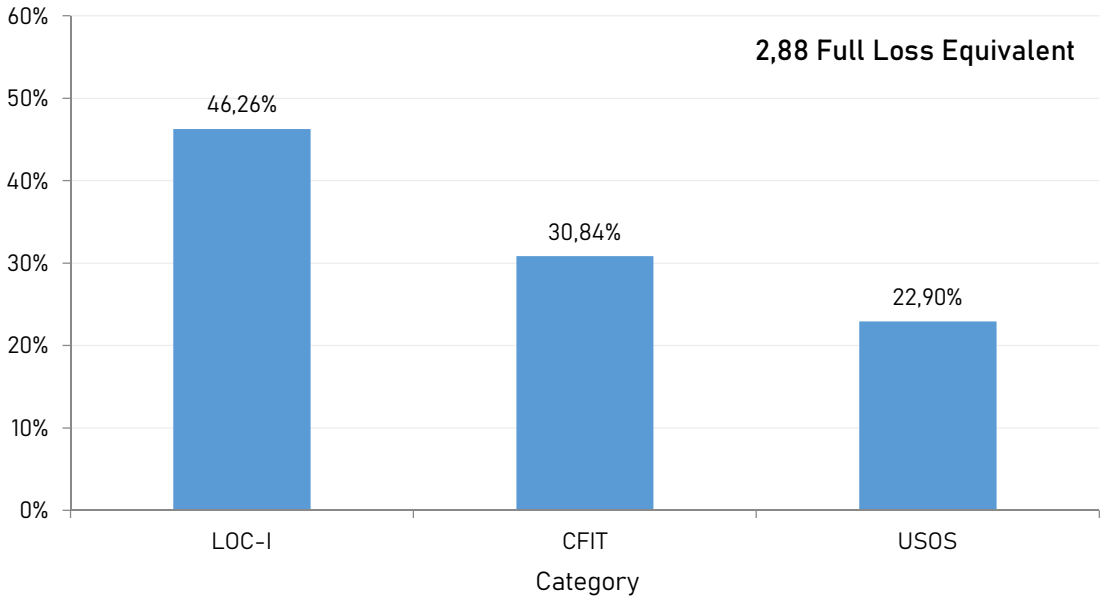


Figure 9. SAM Region fatality risk. Part 121 equivalent (2010-2019)



[3] See List of Acronyms on page 32 of this report

1.3.4 Accident data in the SAM Region

The States of the SAM Region implemented the AIG Regional Coordination Mechanism (ARCM), in order to enhance regional accident and incident investigation and the related data. At the time of this version of the Annual Safety Report, European Coordination Centre for Accident and Incident Reporting Systems (ECCAIRS) has been implemented in the States of the SAM Region, and standardization and quality processes are under development.

1.3.5 AIG mechanisms in the CAR region

The States of the CAR region continue to seek regional collaboration to improve their level of compliance with accident and incident investigations (AIG), although it was previously commented that the RAIO was part of this approach, the creation of cooperation mechanisms may for now be the way to later form a RAIO.

In Central America, the Central American Regional Aviation Accident Investigation Group (GRIAA) a regional collaboration group among the six Central American States (Guatemala, Belize, El Salvador, Guatemala, Costa Rica and Nicaragua) had been established. Under the support of the Caribbean Aviation safety and Security Oversight System (CASSOS) a similar approach for the Caribbean (RAIO-C) to be implemented by CASSOS member States is being discussed.

Together with these, Regional collaboration agreements among AIG entities had been established for the exchange of resources, best practices and training matters: GRIAA – Transportation Safety Board from Canada (TSB), CASSOS – TSB, GRIAA – ARCM, Aviation Accident Investigation Commission from Dominican Republic (CIAA) – Mexico AIG – GRIAA.

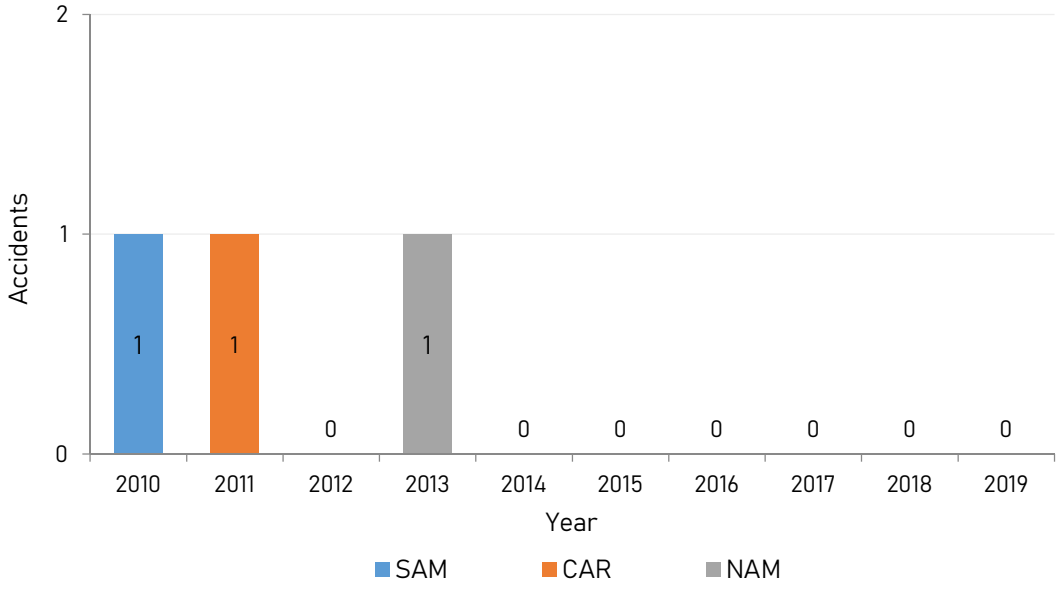
1.4 Specific analysis

After the determination of the most significant fatal accident categories for the Pan American Region was made, based on a fatality risk distribution by category of occurrence, the results were considerably aligned with the content of 2020-2022 GASP edition, from which four out of five high risk categories (HRCs) were considered the most significant for the Pan American Region operational context CFIT, LOC-I, MAC and RE. Then, a more in-depth analysis was performed to determine the behavior and recurrent aspects of each category to be considered in the safety decision making process. Some other occurrence categories, such as TURB, ARC or GCOL, among others, were not included in this report, but had influence in the total amount of occurrences in Pan American Region, even though no fatal occurrence was classified in the latter group of categories in the last ten-year period. Thus, as it can be seen in Appendix A, there is a slight increasing trend in the total number of accidents, although accidents among the HRCs categories present a decreasing trend in Pan American Region, as described in sections 1.4.1 to 1.4.4.

1.4.1 Specific analysis of Controlled Flight Into Terrain

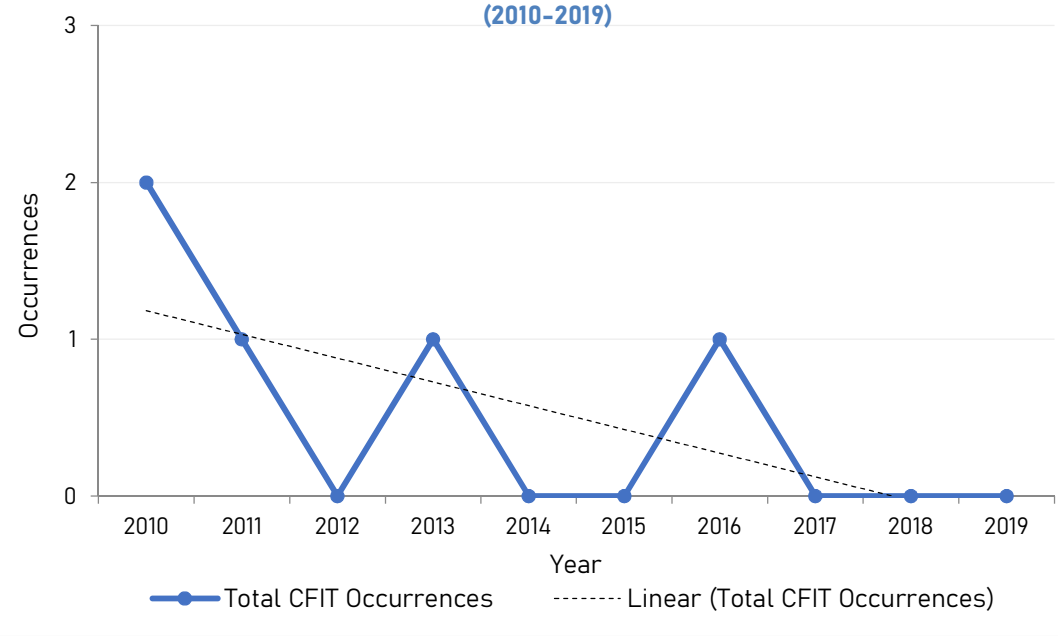
Accidents recorded by the ICAO Accident/Incident Data Reporting (ADREP) show a decreasing trend in the Pan American Region, as presented in the following chart.

Figure 10. CFIT Accidents distribution per year by Region (2010-2019)



Accident, serious incident and incident data provided by ICAO, showed an average of 0.5 total occurrences in the Pan American Region within the latest 10-year moving average (2010-2019), with a decreasing trend. The specific numbers of CFIT occurrences per year are presented in the following figure.

Figure 11. CFIT Total Occurrences Distribution per Year - Pan America (2010-2019)



Contributing factors determined by IATA for Pan America CFIT accidents 2015-2019, were:

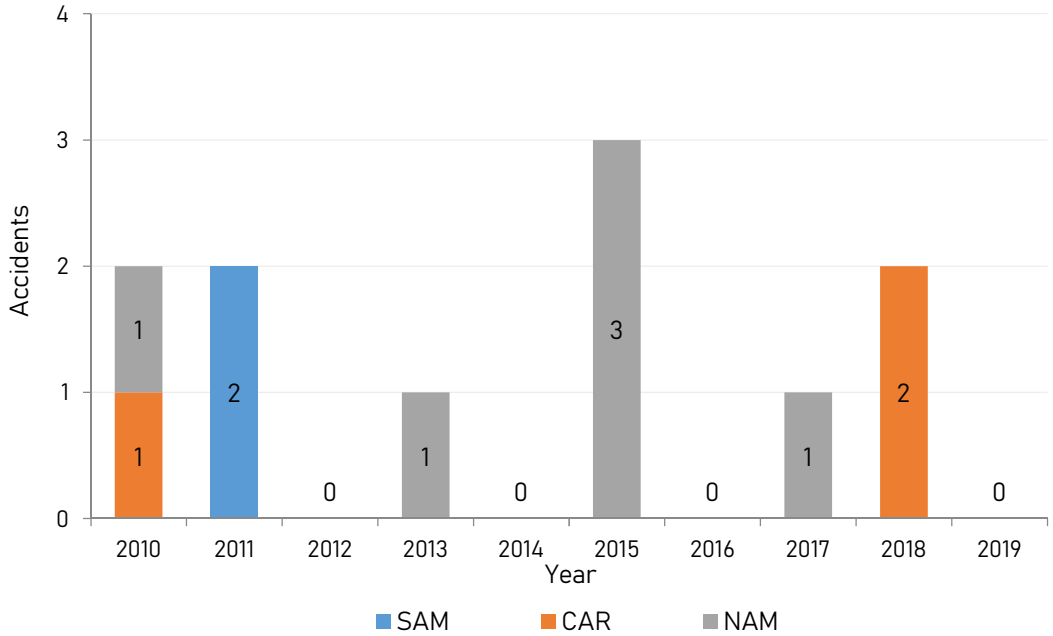
Table 5. Contributing Factors to CFIT (2015-2019)

Latent conditions	Regulatory Oversight (100%) Flight Operations (75%) Flight Ops: SOPs & Checking (75%) Safety Management (75%)
Threats (Environmental)	Meteorology (75%) Lack of visual reference (75%) Poor visibility / IMC (75%) Nav Aids (50%) Ground-based Nav Aid malfunction or not available (50%)
Threats (Airline)	Operational Pressure (50%) Fatigue (50%) Airport Facilities (25%)
Flight Crew Errors	SOP Adherence / SOP Cross-verification (100%) Callouts (50%)
Undesired Aircraft States	Unnecessary Weather Penetration (50%) Vertical / Lateral / Speed Deviation (50%) Abrupt Aircraft Control (25%)
Countermeasures	Overall Crew Performance (75%) Monitor / Cross-check (75%)

1.4.2 Specific analysis of Loss of Control In-flight

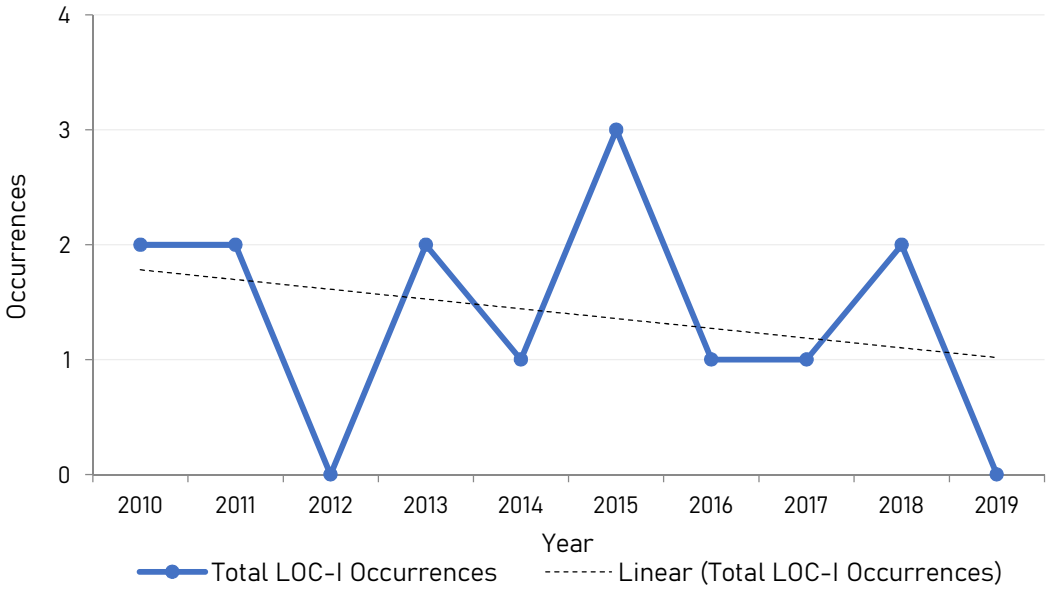
Accidents recorded by the ICAO-ADREP show a decreasing trend through the latest ten-year period, as presented in the following figure.

Figure 12. LOC-I Accidents per year by Region (2010-2019)



According to ICAO accident, serious incident and incident data, LOC-I total occurrences showed an average of 1.4 per year, with a decreasing trend in the period 2010-2019. The distribution of LOC-I occurrences per year is shown in the following figure.

Figure 13. LOC-I Total Occurrences Distribution per Year - Pan America (2010-2019)



Contributing factors determined for Pan America Loss of Control In-flight 2015-2019 accidents by IATA were:

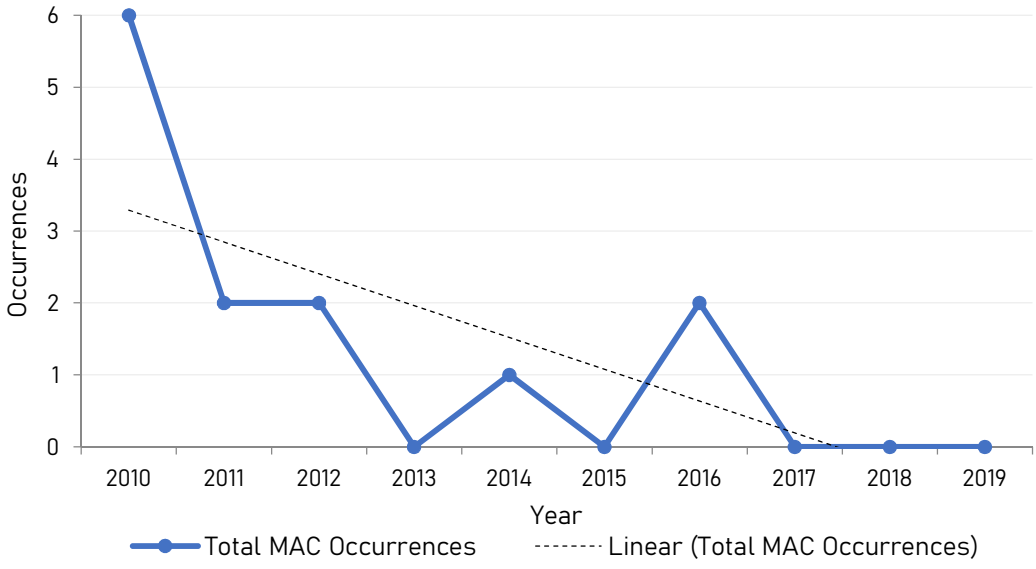
Table 6. Contributing Factors to LOC-I (2015-2019)

Latent conditions	Flight Operations (55%) Safety Management (50%) Regulatory Oversight (40%) Flight Ops: SOPs & Checking (40%) Flight Ops: Training Systems (40%)
Threats (Environmental)	Meteorology (45%) Poor visibility / IMC (20%) Icing Conditions (15%) Wind/ Wind shear/ Gusty wind (15%)
Threats (Airline)	Aircraft Malfunction (35%) Contained Engine Failure / Powerplant Malfunction (20%)
Flight Crew Errors	Manual Handling / Flight Controls (50%) SOP Adherence / SOP Cross-verification (50%)
Undesired Aircraft States	Operation Outside Aircraft Limitations (40%) Vertical / Lateral / Speed Deviation (35%) Abrupt Aircraft Control (30%)
Countermeasures	Overall Crew Performance (50%) Monitor / Cross-check (50%)

1.4.3 Specific analysis of Mid Air Collision

Accident, serious incident and incident data provided by ICAO, showed 13 MAC occurrences in total, for the time frame from 2010 to 2019, in the Pan American Region, with a decreasing trend, as presented in the following figure.

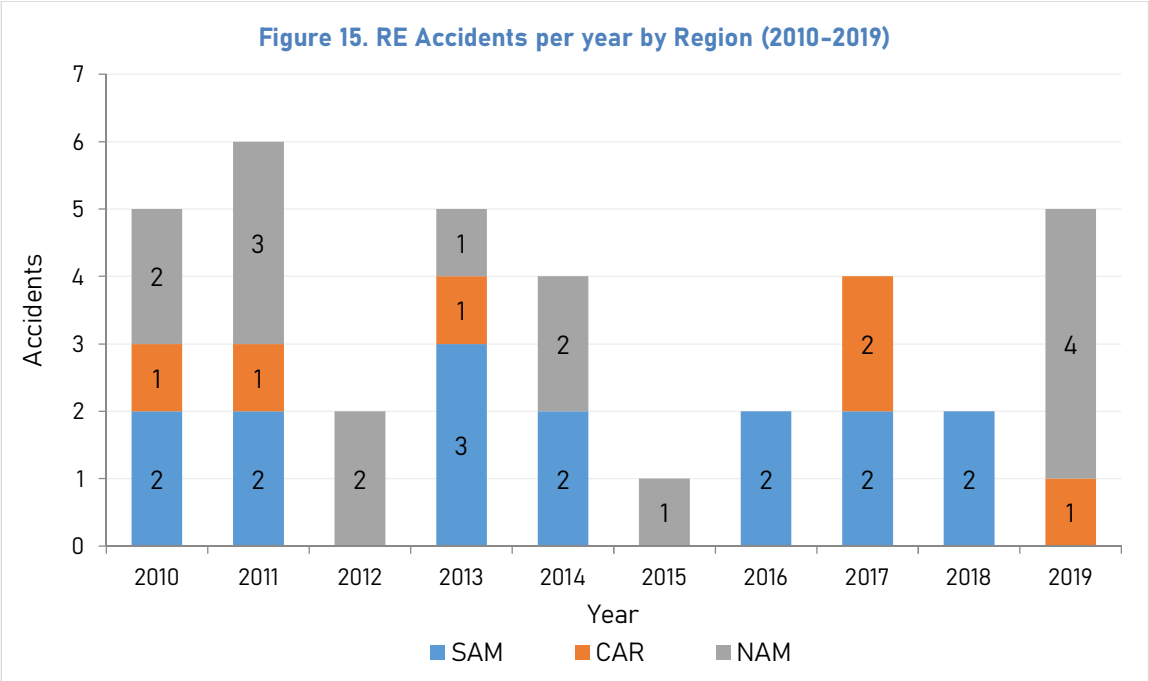
Figure 14. MAC Total Occurrences Distribution per Year – Pan America (2010-2019)



1.4.4 Specific analysis of Runway Excursion

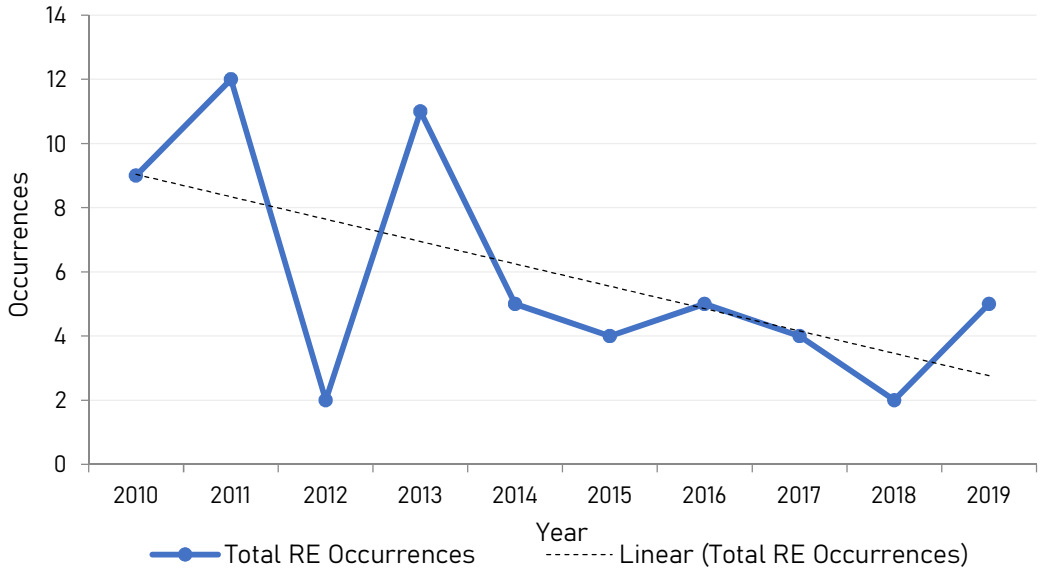
Accidents recorded by the ICAO-ADREP for the 2010-2019 period show a decreasing trend, as presented in the following figure.

Figure 15. RE Accidents per year by Region (2010-2019)



Accident, serious incident and incident data provided by ICAO, showed 59 runway excursions (an average of 5.9 per year) in the last 10-year moving period (2010-2019) with a decreasing trend. The number of REs per year is depicted in the following figure.

Figure 16. RE Total Occurrences Distribution per Year - Pan America (2010-2019)



Contributing factors for Pan America Runway Excursions 2015-2019 determined by IATA are shown in the following table:

Table 7. Contributing factors to RE (2015-2019)

Latent conditions	Safety Management (41%) Regulatory Oversight (40%) Flight Operations (22%)
Threats (Environmental)	Meteorology (56%) Airport Facilities (49%) Wind / Wind shear / Gusty wind (35%) Contaminated runway/Taxiway – poor braking action (33%)
Threats (Airline)	Aircraft Malfunction (17%) Operational Pressure (13%) Inad overrun area/trench/ditch/prox of structures (11%) Fatigue (8%)
Flight Crew Errors	Manual Handling / Flight Controls (48%) SOP Adherence / SOP Cross-verification (37%) Callouts (17%)
Undesired Aircraft States	Long / floated/ bounced / firm / off-center / crabbed landing (40%) Unstable Approach (22%) Unnecessary Weather Penetration (21%) Continued Landing after Unstable Approach (21%) Vertical/Lateral/Speed Deviation (21%)
Countermeasures	Overall Crew Performance (37%) Taxiway/Runway Management (27%) Monitor / Cross check (22%)

2. Proactive Safety Information

This section is intended to apply the proactive methodology to show the risk exposure level in aviation, based upon the results of safety oversight and management processes.

At the level of the States, ICAO USOAP-CMA results were used to establish the current context for safety.

At the level of the operator, IOSA results were used by IATA to identify latent conditions that eventually could affect safety.

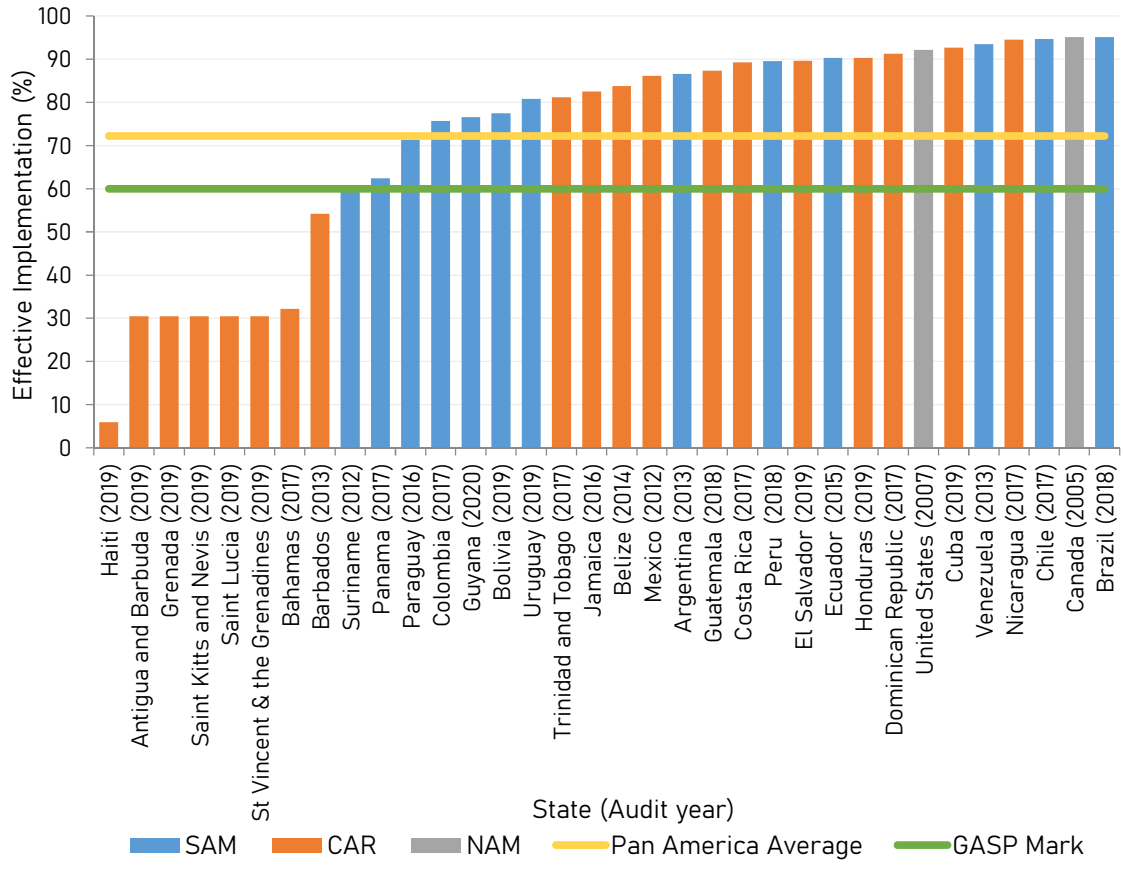
2.1 Proactive information at the level of the States

2.1.1 ICAO Universal Safety Oversight Audit Programme - Continuous Monitoring Approach (USOAP-CMA)

It is essential to ICAO that States establish, maintain and improve the eight critical elements of an effective safety oversight system, as well as the eight technical areas.

The following figure shows detailed distribution of the percentage of Effective Implementation (EI) by State in the Pan American Region, based upon the latest USOAP audit or Coordinated Validation Mission (ICVM).

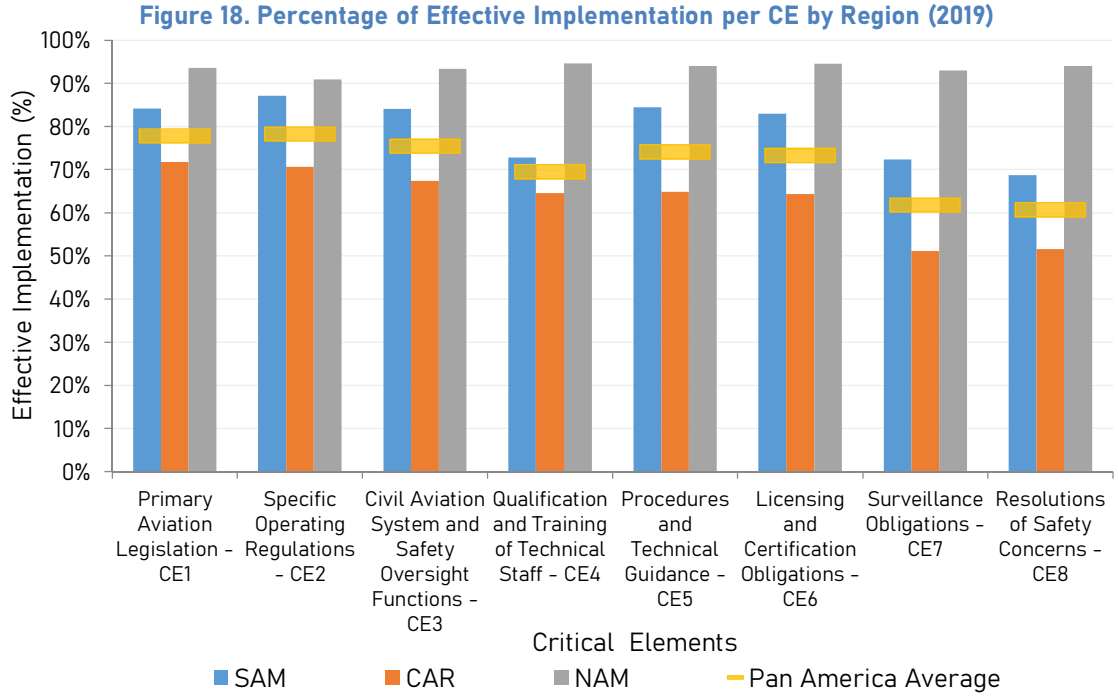
Figure 17. Percentage of Effective Implementation per State by Region



According to the previous chart, the average effective implementation in the Pan American Region is 72.19% as of December 2019. That value is above the world average of 68.56%. The average EI was 63.85% for CAR region states, 81.08% for SAM and 93.64% for NAM states. Also, it was verified that 76.4% of the States in the RASG-PA region have achieved the target of 60% EI, as suggested by the Global Aviation Safety Plan (GASP). According to ICAO GASP, States should target their efforts to increase and maintain effective implementation above 60%.

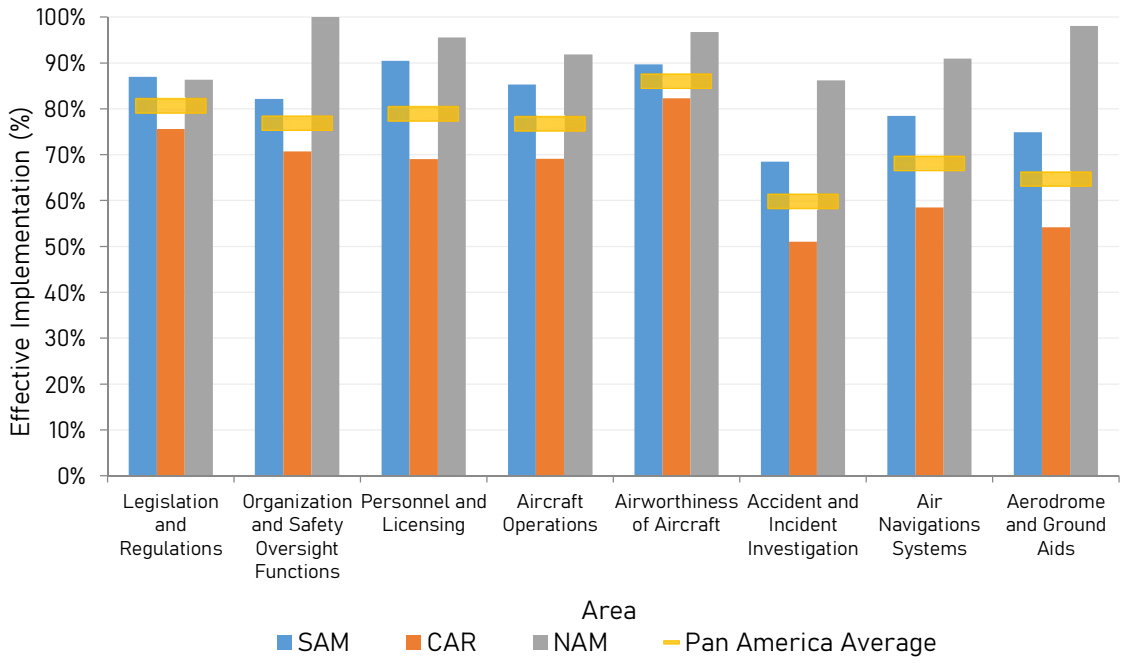
According to ICAO USOAP and ICVM information, the CEs showing the lowest percentage of effective implementation in the Pan American Region still remains **CE7: Surveillance obligations** and **CE8: Resolution of Safety Concerns**. This and other facts are shown in the following figure:

Figure 18. Percentage of Effective Implementation per CE by Region (2019)



Regarding the eight technical areas, AIG, AGA and ANS continue to be the areas that show the lowest levels of effective implementation, especially in the CAR Region, as presented in the following figure:

Figure 19. Percentage of Effective Implementation per Area by Region (2019)



To determine the correlation of areas and critical elements, an analysis of the allocation of findings was conducted, using the integrated Safety Trend Analysis and Reporting System (iSTARS). The following tables show the average findings per area and critical element for each Region.

Table 8. NAM Region USOAP CMA average finding per Area vs. CE (2019)

CE \ A	LEG	ORG	AIG	PEL	OPS	AIR	ANS	AGA
CE1	1		1		1			
CE2	2		1	2	2	2	2	2
CE3			3		1		2	
CE4			1		1	1	2	
CE5			5		1	2	2	
CE6				1	6	1	4	2
CE7				1		2	4	
CE8			3				1	

In the case of the NAM Region, the highest numbers were in OPS/CE6, specifically regarding the existence of a flight data analysis programme as part of the operator's Safety Management System (SMS).

Table 9. CAR Region USOAP CMA average finding per area vs. CE (2019)

CE \ A	LEG	ORG	AIG	PEL	OPS	AIR	ANS	AGA
CE1	2		4		1		1	
CE2	2		4	3	4	4	3	9
CE3		2	6	2	2	1	11	2
CE4			3	3	2	1	14	3
CE5	1		24	2	5	5	3	7
CE6				9	19	5	20	25
CE7				4	4	2	14	13
CE8			8	3	2	2	4	5

In the case of CAR Region, main findings regarding AGA/CE6 were related to the systems in place in the States to ensure certain aspects of aerodromes certifications such as documentation clearance, compliance with the regulations by the aerodrome operator, especially with regard to aerodrome data, determination and reporting of pavement bearing strengths, emergency plans and provision of power supplies.

Table 10. SAM Region USOAP CMA average finding per area vs. CE (2019)

CE \ A	LEG	ORG	AIG	PEL	OPS	AIR	ANS	AGA
CE1	1		4					
CE2	2		3	1	2	3	1	3
CE3		2	3		1	1	4	1
CE4			3	1	1	2	10	2
CE5			13		2	2	1	2
CE6				3	9	3	9	15
CE7				2	2	1	7	9
CE8			4	1	1	1	4	3

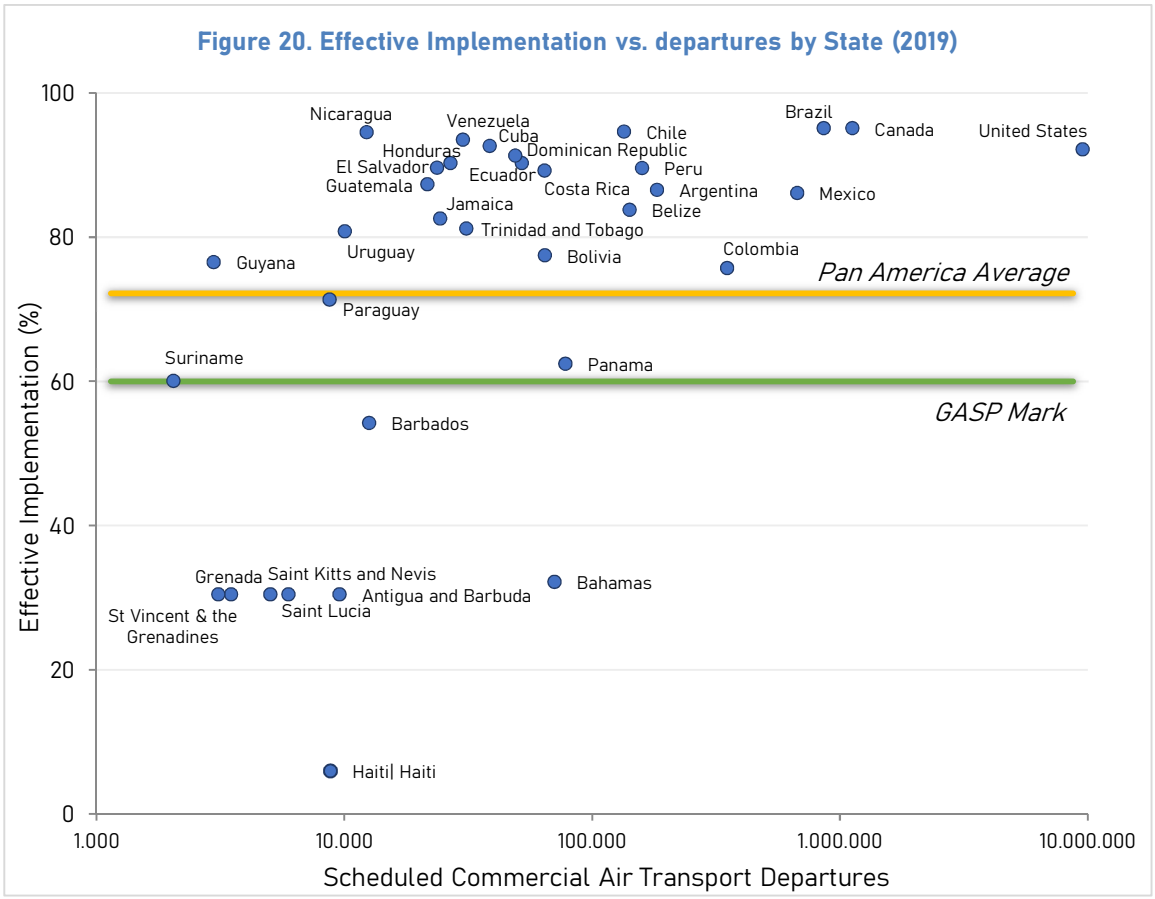
In the case of SAM Region, the highest numbers were reached in AGA/CE6, mainly on the assurance of aerodrome operators employing competent personnel for critical activities, a quality system to ensure data compliance, integrity, accuracy and protection, safety of the runway surrounding areas and integration of lighting, marking and signals as part of the aerodrome's runway incursion and collision avoidance strategy.

According to the ICAO Global Air Transport Outlook to 2030, forecasts for total Latin America and Caribbean passenger traffic call for an annual growth rate of 5.9% to 2030. By 2030, Latin America and Caribbean operations are expected to account for 74% of the total passenger traffic from, to and within the regions. However, this thorough analysis was issued before the COVID-19 pandemic, which will certainly impact its accuracy on a short-term period, while due update in long-term analysis from ICAO and other organizations is still pending and will need to assess the full impact of the pandemic in order to be properly updated.

Even with all the uncertainties regarding the future traffic growth, the RASG-PA highly recommends that the CAR and SAM Regions continuously monitor and improve the implementation of the ICAO Standards and Recommended Practices (SARPs), especially in CE7 and CE8, and also in the areas of ANS, AGA and AIG.

Figure 20 shows a comparison between EI and traffic volume (departures) by Pan American States in 2019, based upon ICAO iSTARS (State Traffic) data, which could be an indicator for risk exposure to States.

Figure 20. Effective Implementation vs. departures by State (2019)



2.2 Information at the level of the Air Operators

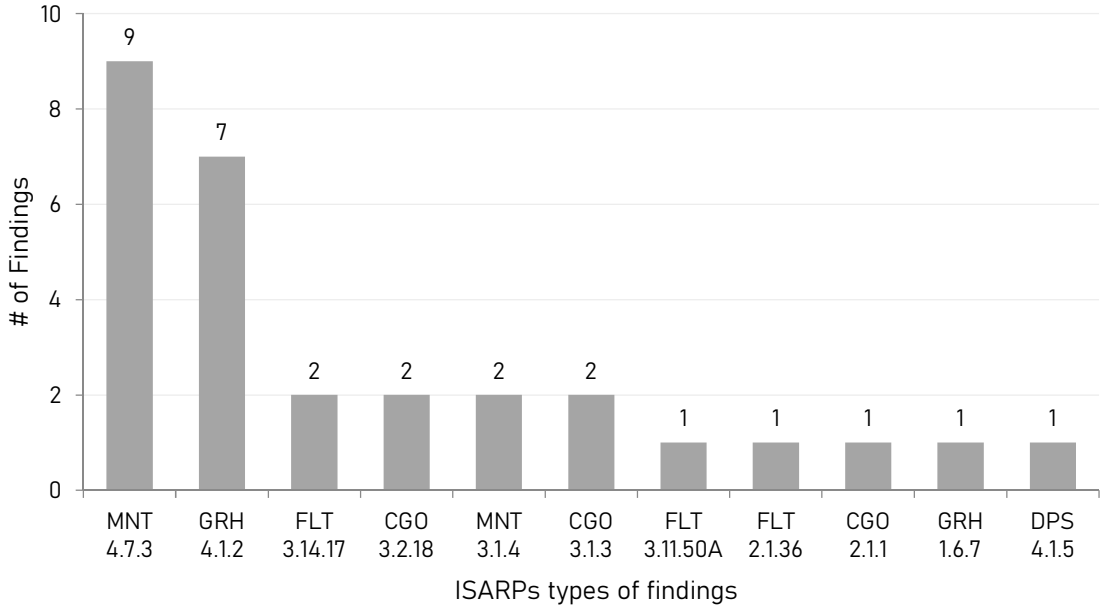
2.2.1 IOSA main findings

IATA prepared a review of the IOSA Standards and Recommended Practices (ISARPs), related to LOC-I, CFIT, and RE including the top findings in the NAM and the LATAM/CAR region. References for each of the findings in the eight (8) disciplines Organization (ORG), Flight Operations (FLT), Dispatch (DSP), Cabin (CAB), Maintenance (MNT), Cargo (CGO), Ground Operations (GRH) and Security (SEC) can be found in the IOSA Standards Manual (ISM) documentation through

https://www.iata.org/en/iata-repository/publications/iosa-audit-documentation/iosa-standards-manual-ism-ed-132/

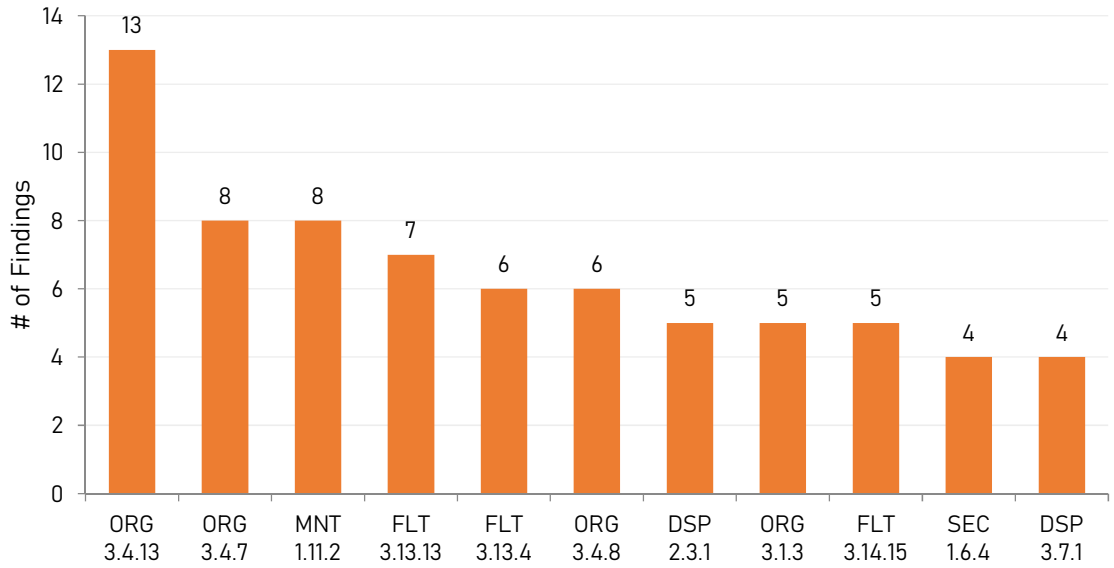
In the NAM region, the top three (3) findings for the period under review (2017-2019) were related to process for verifying acceptable maintenance organization ESD program (ISARPs MNT 4.7.3); establishment of ground-aircraft communication link during aircraft fueling operations (ISARPs GRH 4.1.2); in-flight fuel management in situation of fuel emergency (ISARPs FLT 3.14.17); process to ensure a dangerous goods report is made to the appropriate authority (ISARPs CGO 3.2.18); processes to ensure applicable aircraft maintenance records (ISARPs MNT 3.1.4) and process for ensuring accuracy of scales used to weigh cargo shipments (ISARPs CGO 3.1.3)

Figure 21. IOSA Top Findings in the NAM Region (2017-2019)



In the LATAM/CAR region, the top three (3) findings for the period under review (2017-2019) were related to training and qualification program that ensures auditors who conduct auditing under the quality assurance program (ISARPs ORG 3.4.13); process for the production of a Conformance Report (CR) related to the audit of all ISARPs as is specified in ORG 3.4.6. (ISARPs ORG 3.4.7); agreement with an external maintenance organization that performs maintenance functions for the Operator that specifies measurable maintenance safety and quality standards (ISARPs MNT 1.11.2); flight crew procedures relating transport of passengers and/or supernumeraries (without cabin crew) ensuring they are seated with their seat belts fastened (ISARPs FLT 3.13.13). The figure below shows the findings:

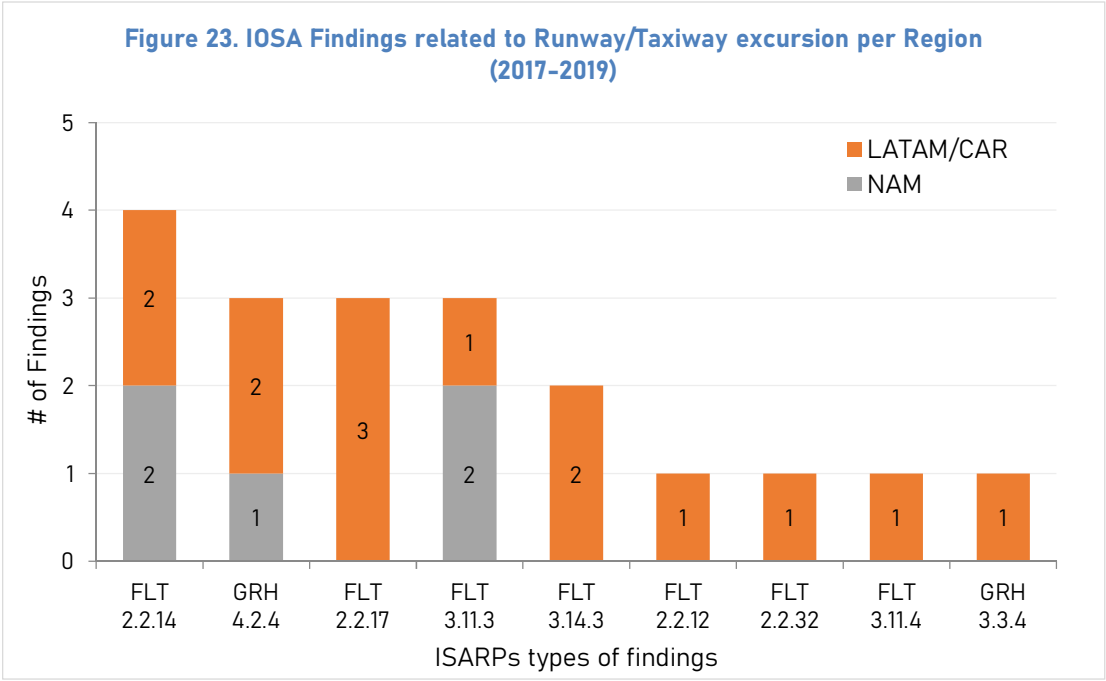
Figure 22. IOSA Top Findings in the LATAM/CAR Region (2017-2019)



To assist operators in better understanding the latent conditions related to the high-risk accident categories on RE, LOC-I and CFIT, the top findings for the Pan American region are shown in the accompanying figures.

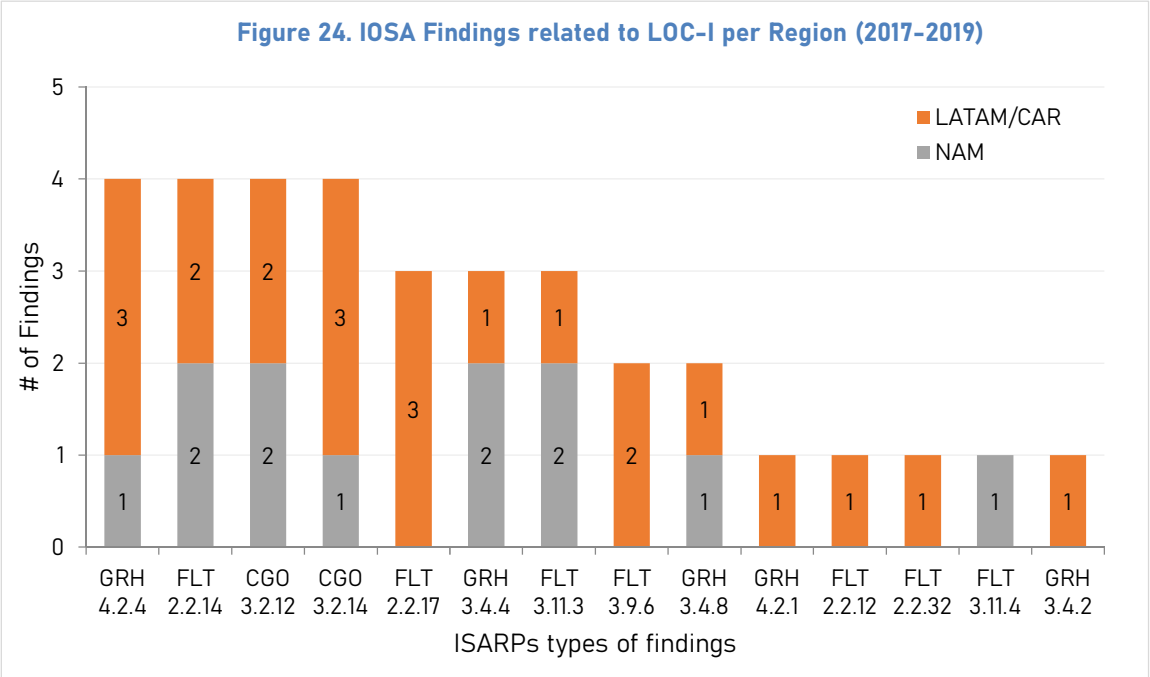
Figure 23 presents the top findings associated with RE for the period under review (2017-2019). ISARP FLT 2.2.14 was the top factor, which addresses complete training in procedures for aircraft upset recovery during initial ground training and, subsequently, during recurrent training.

Figure 23. IOSA Findings related to Runway/Taxiway excursion per Region (2017-2019)



The top findings associated with LOC-I can be seen in the Figure 24 below. ISARPs FLT 2.2.14, which addresses complete training in procedures for aircraft upset recovery during initial ground training and, subsequently, during recurrent training, still remains for period under review (2017-2019) as one of the most frequent LOC-I findings.

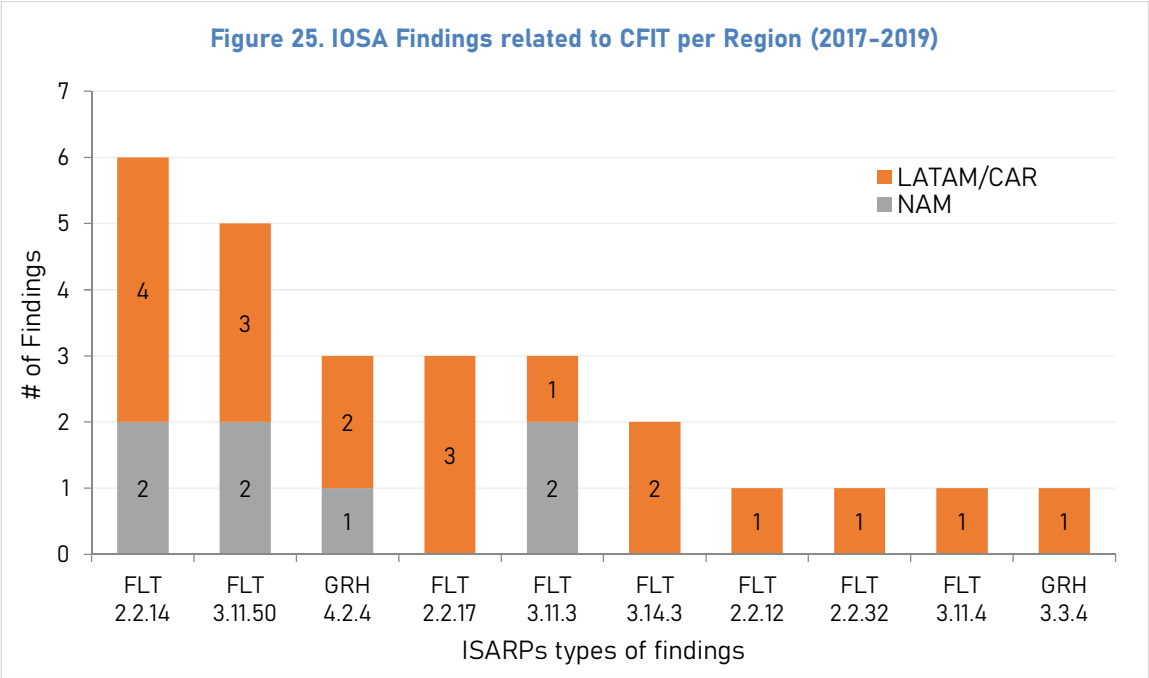
Figure 24. IOSA Findings related to LOC-I per Region (2017-2019)



Also ISARPs GRH 4.2.4, which addresses de-/Anti-icing Program; ISARPs CGO 3.2.12, related to the transportation of dangerous goods (damaged or leaking) and ISARPs CGO 3.2.14, related to the procedures that ensure that information on dangerous goods to be loaded on a flight is communicated to the appropriate person responsible for load control, highlight as the most detected ones.

The top finding associated with CFIT for the period under review (2017-2019) was related to ISARPs FLT 2.2.14, which addresses complete training in procedures for aircraft upset recovery during initial ground training and subsequently during recurrent training. For this period ISARPs FLT 2.2.14 replaced ISARPs FLT 3.11.50 related aircraft operation at low heights AGL, to restrict rates of descent for the purposes of reducing terrain closure rate and increasing recognition/response time in the event of an unintentional conflict with terrain, as the most frequent finding related CFIT occurrences. The figure below shows the findings:

Figure 25. IOSA Findings related to CFIT per Region (2017-2019)



Part Two: Safety Intelligence

This part of the report is intended to present correlations and conclusions based on the information contained in the first part.

To be consistent with the structure of the first part of the report, conclusions are described according to the safety analysis methodologies, and correlations are the result of the cross-sectional analysis, thus increasing the frame of reference for safety decision making process.

1. Conclusions based on reactive information

- Accidents in the Pan American Region showed an increasing trend across the ten-year period analyzed (2010-2019), as it can be inferred from the data presented in Appendix A. In 2019 the accident rate in the Region was higher than the world average.
- The analyzed reactive data also highlighted that Loss of Control In-flight (LOC-I), Runway Excursion (RE) and Controlled Flight into Terrain (CFIT) continue to be the top categories of interest in the Pan American Region. All high risk categories showed decreasing trends across the period.
- With regard to the Mid-Air Collision (MAC) category, serious incidents and incident data showed a downward trend.
- High risk categories (HRC) evaluated in this report have been decreasing over the years, however, this is not the case with categories such as TURB, GCOL and ARC that have not been studied in detail but are occurring more frequently in PA region. These categories are influencing the accident trend in the region, so it is recommended that RASG-PA evaluate these categories in order to add them as new indicators. Particularly to TURB occurrences, the PA-RAST added severe weather as an additional risk category and is in the early stages of developing a safety enhancement team to address the risk. This information could be reflected in the 2021 report once all proper information is gathered and the risks involved are duly assessed.
- Management decisions, Safety management, and Regulatory oversight were identified as the top latent conditions for 2015-2019 accidents in the both North America and Latin America & Caribbean regions.

2. Conclusions based on proactive information

- Since the last edition of this report, the level of effective implementation (EI) of the critical elements (CEs) below 60% keeps at 8 States in the Pan American Region according to the ICAO Universal Safety Oversight Audit Programme - Continuous Monitoring Approach (USOAP-CMA). Also, the regional effective implementation average improved in more than 6% since 2010.

- USOAP findings on Licensing and Certification obligations (CE 6) in the operations area (OPS) was the most common in NAM Region, related to the existence of a flight data analysis as part of SMS operators. In the case of CAR and SAM Regions, main findings were also related to CE 6, but specifically in the Aerodrome and Ground Aids (AGA) area, related to aerodrome data, runway safety areas and runway incursion and collision avoidance.
- Furthermore, due to the forecasted increase in regional traffic, risk exposure of the States in the CAR and SAM Regions could be affected due to low EI in Air Navigation Systems (ANS) including Aerodromes and Ground Aids (AGA) areas.

3. Safety Intelligence correlations

- Accidents and their precursors, presented in the first part of the report, provide a perspective of the entire aviation system about safety. To manage safety in an efficient manner, it is important to maintain reliability in safety information and intelligence, which is only achievable by developing and improving safety data gathering, validation, exchange and analysis processes.
- Even though different stakeholders maintain their own initiatives for safety data collection and analysis, the development of safety reports could allow the aviation community to obtain a harmonized view of the aviation system. Stakeholders are encouraged to use ADREP, US CAST, ISARPs and other standardized taxonomies, which could facilitate addressing a shared comprehension of conditions and situations related to safety.
- Technological improvement in the aviation system requires fast and complete data exchange. In the age of intelligence, data availability is key to be up to date. Applied to safety, decision making based on information supported by data should allow proper and timely response to key issues. Stakeholders are invited to use the areas showed in this Annual Safety Report to develop more in-depth analysis oriented to support the establishment of indicators, acceptable levels of safety and safety targets.
- The number of fatal accidents occurred in 2010-2019 period per million scheduled departures (according to iSTARS) in such period of time for each PA region and the average EI of the region can be related. For the CAR region there was 0.483 fatal accidents per 1M of scheduled departures, while the SAM region registered 0.423 fatal accidents per 1M of scheduled departures and the NAM region 0.088 fatal accidents per 1M of scheduled departures. Taking into account the proactive information contained in this report, it is observed that the highest rate of fatal accidents corresponds to the regions with the lowest average EI value, as well as the lowest fatal accident rate is related to higher average EI values.

List of Scheduled Commercial Accidents in 2019 Pan-America

Local Date	Modelo	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-01-03	Embraer ERJ190-100	United States	PA		CABIN
2019-01-08	Airbus A320-200	United States	PA		RAMP
2019-01-23	de Havilland DHC8-100	Canada	PA		RE
2019-01-28	Boeing 727-200	United States	PA		ARC
2019-02-03	Boeing 787-8	United States	PA		CABIN
2019-02-13	Embraer ERJ170	United States	PA		TURB
2019-02-17	Boeing 737-800	United States	PA		TURB
2019-02-27	Boeing B777-200	United States	PA		TURB
2019-03-03	Airbus A320-200	Brazil	PA		USOS
2019-03-04	Embraer EMB145	United States	PA		USOS
2019-03-07	Boeing 737-300	Bolivia	PA		SCF-NP
2019-03-10	Boeing 737-800 & Boeing 757-300	United States	PA		GCOL
2019-03-10	Bombardier CL600 2C10 & Bombardier CL600 2D24	United States	PA		RAMP
2019-03-27	Boeing 737-700	United States	PA		BIRD
2019-04-04	Boeing MD88	United States	PA		GCOL
2019-04-08	BAe Jetstream 4100	Dominican Republic	PA		ARC
2019-04-10	Airbus A321-200	United States	PA		ARC
2019-04-11	Boeing 737-900	United States	PA		CABIN
2019-05-03	Boeing DC-3	Canada	PA		SCF-PP
2019-05-10	de Havilland DHC8-300	Canada	PA		GCOL
2019-05-25	Boeing 737-800	United States	PA		TURB
2019-05-28	Airbus A320-200	United States	PA		CABIN
2019-06-09	Boeing 737-900	United States	PA		ARC
2019-06-15	ATR 42-300	Brazil	PA		ARC, EVAC
2019-06-15	Boeing 757-200	United States	PA		ARC, RE
2019-06-17	Boeing 737-800	United States	PA		RAMP
2019-07-17	Bombardier CL 600 2B19	United States	PA		GCOL
2019-07-19	de Havilland DHC8-400	Canada	PA		ARC
2019-07-22	Boeing 767-300	United States	PA		TURB
2019-07-23	Boeing 757-300	United States	PA		RAMP
2019-07-31	Bombardier CL600 2D24	United States	PA		RAMP

List of Scheduled Commercial Accidents in 2019 Pan-America (continued)

Local Date	Modelo	State of Occurrence	RASG Region	Fatalities	Occurrence Category
2019-08-02	Boeing 787-8 & Airbus A340-300	Canada	PA		GCOL
2019-08-03	Boeing 737-300	Bolivia	PA		SCF-NP, ADRM
2019-08-06	Boeing 737-900ER & Airbus A320-200	United States	PA		GCOL, ADRM
2019-08-08	Airbus A320-200	United States	PA		TURB, CABIN
2019-08-08	Airbus A321-200	United States	PA		ARC, WSTRW
2019-08-26	Boeing MD88	United States	PA		TURB
2019-08-27	Airbus A320-200	United States	PA		TURB
2019-09-06	Airbus A319-100	United States	PA		TURB
2019-09-07	ATR 72-200	Colombia	PA		ARC
2019-10-12	Embraer EMB110	Bahamas	PA		SCF-NP, ARC, RE
2019-10-17	Saab 2000	United States	PA	1	RE
2019-10-29	De Havilland DHC8-400	United States	PA		BIRD
2019-11-11	Embraer EMB145	United States	PA		RE
2019-11-23	Boeing 737-400	Colombia	PA		SCF-NP, ARC
2019-12-14	Bombardier CL600 2D24	United States	PA		CABIN
2019-12-15	Embraer EMB145	United States	PA		TURB
2019-12-16	Embraer EMB135	United States	PA		TURB
2019-12-18	Embraer ERJ190	United States	PA		TURB
2019-12-19	Boeing 737-900	United States	PA		AMAN
2019-12-21	Boeing 737-700	United States	PA		BIRD
2019-12-22	Boeing 737-800	United States	PA		SCF-NP, ARC

Source of data: API ICAO – Accidents – Accessed 2020-10-07

Note: API ICAO databases are constantly being updated. Therefore, there might be some minor changes in information between RASG-PA Annual Safety Report 2020 and other publications provided by ICAO.

List of Acronyms

ADREP	Accident/Incident Data Reporting System (ICAO)
ADRM	Aerodrome
ARC	Abnormal Runway Contact
AFI	Africa (IATA Region) and Regional Aviation Safety Group-Africa-Indian Ocean (RASG-AFI)
AGL	Above Ground Level
AIG	Accident and Incident investigations
AIS	Aeronautical Information Service
AMAN	Abrupt manoeuvre
APAC	Regional Aviation Safety Group - Asia and Pacific Regions (RASG-APAC)
ARC	Abnormal runway contact
ARCM	AIG Regional Cooperation Mechanism
ASPAC	Asia/Pacific (IATA Region)
ASRT	Annual Safety Report Team
ATM	Air Traffic Management, Communications, Surveillance
ATS	Air Traffic Services
BIRD	Birdstrike
CAB	Cabin (IOSA)
CABIN	Cabin safety events
CAR	Caribbean (ICAO Region)
CARSAMMA	Caribbean and South America Regional Monitoring Agency
CEs	Critical Elements (ICAO)
CFIT	Controlled flight into terrain
CGO	Cargo Operations (IOSA)
CIS	Commonwealth of Independent States (IATA Region)
CMA	Continuous monitoring approach
CR	Conformance Report (IOSA)
CRM	Collision Risk Methodology
DGAC	Directorate General of Civil Aviation
DIPs	Detailed Implementation Plans
DSP	Dispatch (IOSA)
ECCAIRS	European Coordination Centre for Accident and Incident Reporting Systems
E-GPWS	Enhanced Ground Proximity Warning System
EI	Effective Implementation of ICAO SARPs
ESD	Electrostatic Sensitive Devices
EUR	Europe (ICAO and IATA Region) and Regional Aviation Safety Group - Europe (RASG-EUR)
EVAC	Evacuation
FDA	Flight Data Analysis
FDM	Flight Data Monitoring
FIR	Flight Information Region
FLT	Flight Operations (IOSA)
F-NI	Fire/smoke (none-impact).
FOQA	Flight Operations Quality Assurance
F-POST	Fire/Smoke (post-impact)
FUEL	Fuel related
GASP	ICAO Global Aviation Safety Plan
GCOL	Ground collision
GPWS	Ground Proximity Warning System
GRH	Ground Handling Operations (IOSA)
GSI	Global Safety Initiative
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICE	Icing
ICVM	ICAO Coordinated Validation Missions
IDISR	Data Exchange Program of Ramp Safety Inspections
IMC	Instrument meteorological conditions
IOSA	IATA Operational Safety Audit
ISARPs	IOSA Safety and Recommended Practices
ISTARS	ICAO Integrated Safety Trend Analysis and Reporting System
LALT	Low altitude operations
LAR	Latin American Aeronautical Regulation
LATAM/CAR	Latin America and Caribbean (IATA Regions)
LHDs	Large Height Deviations
LOC-G	Loss of control - ground
LOC-I	Loss of control - inflight
MAC	AIRPROX/TCAS alert/loss of separation/near miss collisions/mid-air collisions
MID	Regional Aviation Safety Group - Middle East (RASG-MID)
MNT	Aircraft Engineering and Maintenance (IOSA)
MENA	Middle East and North Africa (IATA Region)
MOU	Memorandum of Understanding
MTOM	Maximum Take-off Mass
NAM	North America (ICAO and IATA Region)
NASIA	North Asia (IATA Region)
OTHR	Other
ORG	Organization and Management System (ORG)
PA-RAST	Pan America – Regional Aviation Safety Team
RA	Resolution Advisory

RAIO	Regional Accident and Incident Investigation Organization
RAMP	Ground handling operations
RASG-PA	Regional Aviation Safety Group – Pan America
RASGs	Regional Aviation Safety Groups
RE	Runway excursion (departure or landing)
RI	Runway Incursion
RI-A	Runway Incursion – Animal
RI-VAP	Runway Incursion – vehicle, aircraft or person
RMA	Regional Monitoring Agency (CARSAMMA)
RVSM	Reduced Vertical Separation Minima or Minimum
SAM	South America (ICAO Region)
SARPS	Standards and Recommended Practices (ICAO)
SEC	Security Management (IOSA)
SEIs	Safety Enhancement Initiatives
SCF-NP	System/component failure or malfunction (non-powerplant)
SCF-PP	Powerplant failure or malfunction
SEC	Security-related
SIMS	ICAO Safety Information Monitoring System
SMRT	Safety Monitoring and Report Team (RASG-PA)
SMS	Safety Management System
SOP	Standard Operating Procedure
SRVSOP	Regional Safety Oversight Cooperation System
TCAS	Traffic Collision and Avoidance System
TCAS RA	Traffic Collision and Avoidance System-Resolution Advisory
TEM	Threat and Error Management
TLS	Target Level of Safety (RVSM)
TURB	Turbulence encounter
UNK	Unknown or Undetermined
US CAST	Commercial Aviation Safety Team (United States)
USOAP	Universal Safety Oversight Audit Programme
USOS	Undershoot/Overshoot
WSTRW	Wind shear or thunderstorm

Appendix A

Complementary Reactive Information

Figure A-1. Accidents per Year - Pan America (2010-2019)

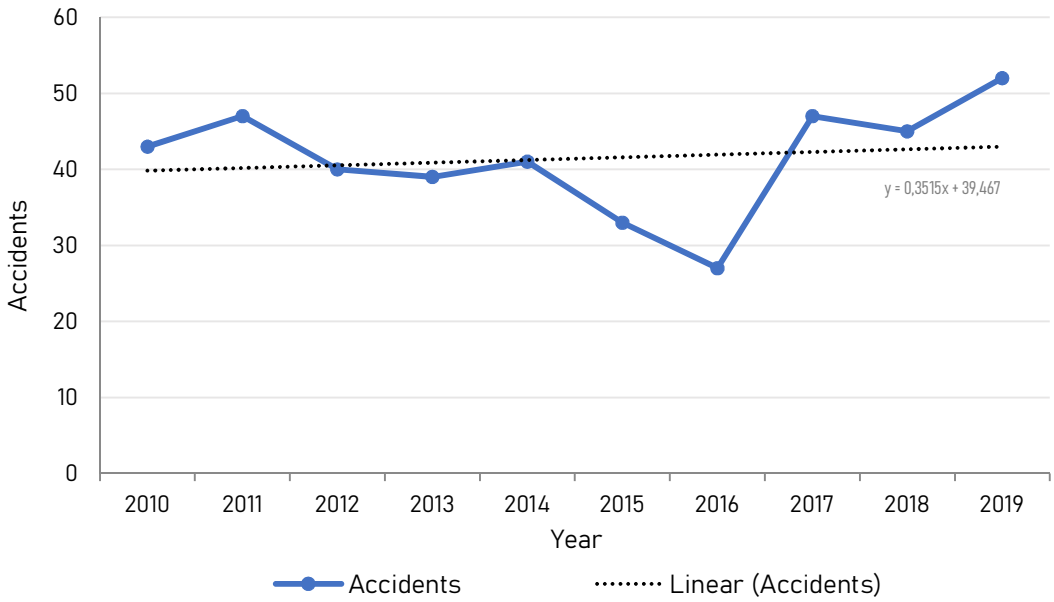
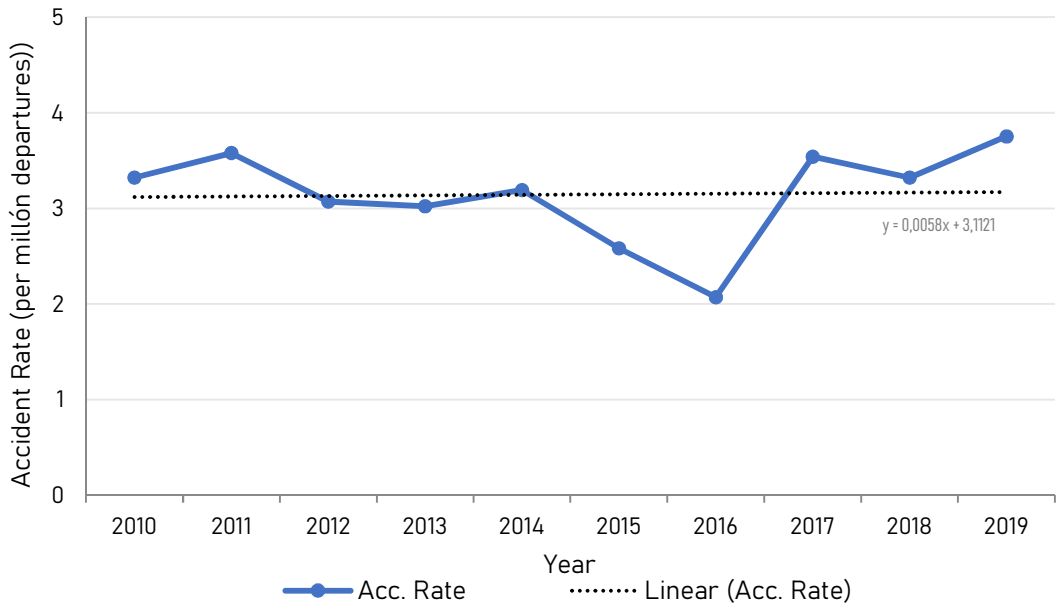


Figure A-2. Accidents Rate per Year - Pan America (2010-2019)



Credits

RASG-PA thanks the members of the RASG-PA Safety Monitoring and Report Team (SMRT) that contributed to the elaboration of this RASG-PA Annual Safety Report.


RASG-PA
International Civil Aviation Organization (ICAO) + States + International Organizations + Industry