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Senior Vice-President Foreword

Gilberto Lopez Meyer
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Dear colleagues,

The year 2020 was the most challenging in our industry's history. Owing to border closures and related travel restrictions, as well as fears about catching COVID during air travel, flight operations declined 53% compared to 2019.

During this pandemic crisis, government and industry stakeholders came together to address the need for flexibility and temporary measures that were critical to keeping the industry flying. IATA deployed Safety Risk Assessments and developed extensive Guidance Materials in a number of areas, to support the industry's continued safe operation. Additionally, we raised awareness of emerging safety issues through the publication and dissemination of Operational Safety Notices highlighting potential risk areas such as unstable approaches, contaminated aircraft systems, and fatigue.

Looking at the safety performance in 2020:

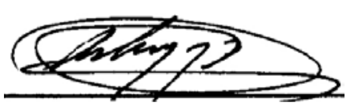
- The number of total accidents and fatal accidents both declined compared to 2019.
- Nevertheless, aviation is so safe that even one accident can skew the accident rate, and this is particularly the case when flight operations are greatly reduced. In 2020, the accident rate increased to 1.71 per million sectors from 1.11 in 2019. The rate for IATA members improved to 0.83 from 0.87.
- The industry's fatality risk increased from 0.09 in 2019 to 0.13 in 2020. This means on average, a person would need to take a flight every day for 461 years to be involved in an accident with at least one fatality, or 20,392 years to face a 100% fatal accident.
- Looking at averages, the data show a continued reduction in accidents, when considering a five-year average rate, from 2.24 (2011-2015) to 1.38 (2016-2020).
- There were zero Loss of Control — In-flight (LOC-I) accidents (and fatalities) for the first time in over 15 years. It, however, remains the highest fatality risk over the last five years, accounting for 698 fatalities. Therefore, focus remains on the fatality risk associated with this accident category.

The IATA Board of Governors has adopted a new safety goal focused on the continual reduction in the all-accident rate, highlighting that safety remains our industry's #1 priority. A new IATA Safety Strategy has been developed to deliver on this goal by continuously improving safety performance through an industry collaborative effort to identify and manage global aviation safety risks.

It is our privilege to offer you this 57th edition of the IATA Safety Report. I encourage you to share the vital information contained in these pages with your colleagues. I would like to thank the Accident Classification Technical Group (ACTG), the Safety, Flight and Ground Operations Advisory Council (SFGOAC), the Safety Group (SG), the Cabin Operations Safety Technical Group (COSTG), and all IATA staff involved for their cooperation and expertise, essential for the creation of this report.

"For effective **Safety Leadership** in aviation, airline executives should set a leadership mindset that enables safety-focused behaviors to embed a positive organizational safety culture. Applied globally, this should be supported by clearly defined safety accountabilities to enable an effective safety culture to exist within each, and every, aviation service provider around the world."

Chairman Foreword



Captain Rubén Morales
Chair, IATA Accident Classification Technical Group

2020 has been an unprecedented year. In economic terms, no industry has been more severely affected by COVID-19 than aviation. International passenger demand in 2020 was 75.6% below 2019 levels. Of course with a drastic reduction in the number of sectors flown, the safety statistics have also been distorted.

When we look at the contributing factors present in 2020 accidents, manual handling is at top of the contributing factors associated with flight crew errors. Other areas of concern are deficient safety management systems, regulatory oversight, and selection systems, all of them latent conditions present in the system before the accident happened. These latent conditions have been present consistently year after year, highlighting the need for improvement in these areas.

IATA has called on governments to work with airlines to maintain safety standards and critical skill levels during the pandemic as well as the safe restart and scale-up of operations during the recovery.

There will be a big challenge ahead to reactivate thousands of grounded aircraft, managing the qualifications and readiness of millions of licensed personnel and dealing with a major drain of experienced workers.

Unfortunately, in 2020, we have again seen a commercial transport aircraft being shot down, this time PS752. The preliminary accident report reveals that an air defense unit misread the heading of the plane, failed to identify it as a passenger aircraft and fired two missiles without authorization. Sadly, all 176 persons on board died. As this accident is considered a deliberate act, it is considered in the aviation security statistics, and therefore is not included in the final figures of this safety report.

It is very important for governments, aircraft operators, air navigation service providers and other airspace users, to work together to share the most up-to-date conflict zone risk-based information available to assure the safety of civilian flights.

On a positive note, in November 2020, the Federal Aviation Administration (FAA) cleared the Boeing 737 MAX to fly for the first time since the plane was involved in two deadly crashes within five months of each other, leading to the grounding of the B737 MAX fleet in March 2019.

I would like to thank the members of Accident Classification Technical Group (ACTG) and IATA staff for producing this report. This year required extra effort, flexibility and innovation to bring the report to you in a timely manner, with the same level of quality, despite the travel restrictions imposed as a consequence of the COVID-19 pandemic.

Safety Report 2020 Executive Summary

In 2020, there were 38 accidents versus 52 in 2019. The number of fatal accidents decreased from eight accidents in 2019 to five in 2020. The number of fatalities declined from 240 in 2019 to 132 in 2020. This includes all deaths from commercial aircraft accidents, but excludes unlawful acts.

The global COVID-19 pandemic has had a severe impact on the aviation industry in 2020, causing a significant drop in the number of commercial flights operated. Just over 22 million flights were operated last year, which is about the same number as were flown in the 1990s. Commercial flights tracked worldwide fell about 53% when compared to 2019 due to travel restrictions imposed by government and health officials to control the spread of COVID-19. As a result, even with the lower number of accidents in 2020 when compared to 2019, the industry witnessed an increase in the global accident rate in 2020, up from 1.11 per million sectors in 2019 to 1.71 in 2020. However, the five-year average rate (2016-2020) was lower than that of the previous five-year period (2011-2015) at 1.38 vs. 2.24 accidents per million sectors. The Jet Hull Loss rate per million sectors was 0.21 in 2020 vs 0.15 in 2019.

The accidents in 2020 with the highest fatalities included an aircraft that crashed into a residential area in May, killing 97 passengers and crew (including one person on the ground), and a runway excursion accident in August, killing 21 passengers and crew. The fatality risk was 0.13 in 2020 compared to 0.09 in 2019.

On 8 January 2020, the world experienced a shocking tragedy with the shooting down of Ukrainian International Airlines Flight 752, minutes after takeoff from Tehran Imam Khomeini International Airport. All 176 people on board perished. Similar to MH17, this is another tragic example of what can go wrong around conflict zones. The incident is considered an unlawful act and is, therefore, included in aviation security statistics and not in this report.

Of the 38 aircraft accidents and 132 fatalities in 2020, International Air Transport Association (IATA) member airlines had two fatal accidents, which accounted for 100 fatalities. In 2020, IATA member airlines continued to trend lower than the industry at 0.83 accidents per million sectors versus 1.71 – a pattern also reflected in the five-year average. The full-year accident rate for IATA Operational Safety Audit (IOSA)-registered carriers in 2020 was lower than the rate for non-IOSA carriers. (1.20 vs 3.29).

Over the last decade, the industry continued its 10-year trend of declining fatal accident rates and fatality risk. In 2011, there were 22 fatal accidents that resulted in 492 fatalities. Over the past five years, there have been an average of eight fatal accidents per year for commercial aircraft (passengers and cargo) resulting in 222 fatalities annually. In 2017, aviation had its safest year on record with only 19 deaths and no fatal passenger jet accidents. IATA continues its focus on supporting aviation stakeholders to continuously reduce industry fatality risk.

The accident categories in 2020 listed in order of the number of fatalities were:

- In-flight Damage (2) with 104 fatalities
- Runway/Taxiway Excursion (2) with 24 fatalities
- Controlled Flight into Terrain (1) with 4 fatalities

The top five accident categories in 2020 listed by the frequency of accidents (including the ones with fatalities) were:

- Runway/Taxiway Excursion (9)
- Hard Landing (7)
- Gear-up Landing/Gear Collapse (6)
- In-flight Damage (5)
- Ground Damage (3)

When considering accidents per region:

- North Asia (NASIA) operators had zero accidents in 2020.
- 29% of the commercial air transport accidents in 2020 involved North American (NAM) operators followed by Asia-Pacific (ASPAC) operators with 18% of total accidents.
- Africa (AFI) had the highest accident rate with 22.27 accidents per million sectors.
- IATA membership and IOSA accreditation for non-IATA members continued a strong correlation with improved safety performance.

Cabin Safety:

- 16 of 24 passenger accidents in 2020 resulted in cabin end state classification. The remaining eight accidents did not have a significant cabin impact.
- The time available for cabin crew to prepare, the level of cabin preparation accomplished, and the method of evacuation or disembarkation was assessed for each accident. Where this was identified, 80% of accidents did not afford any time for cabin crew to consider any additional cabin preparation.
- IATA published guidance documents relating to cabin operations and COVID-19 health precautions throughout the year. These are summarized in this report where risks and mitigations, as identified through IATA, are presented.
- As the year ended, many airlines reported ongoing issues with passenger compliance with wearing masks and face coverings on board. This report includes some observations and recommendations on this issue.

Report Findings and IATA Prevention Strategies:

Accident Classification Technical Group (ACTG) members reviewed each accident that occurred in 2020 and assigned the classifications that are used in this report. The ACTG has identified a few areas of concern that need to be addressed by industry stakeholders and provides guidelines on some specific accident categories, such as Loss of Control — In-flight (LOC-I), Controlled Flight into Terrain (CFIT), Runway Excursion and others, to support this.

Managing Safety in Aviation

IATA SAFETY STRATEGY

The IATA Board of Governors has adopted a new safety goal focused on the continual reduction in the aviation all-accident rate and, through this, highlighting how safety remains our #1 priority.

A new IATA Safety Strategy has been developed around three key pillars to deliver on this goal by continuously improving safety performance through an industry-led collaborative effort to identify and manage global aviation safety risks.

1. **Safety Leadership** – Establishing a leadership mindset among industry executives that enables desired organizational behavior to embed; and, effectively implementing a positive safety culture within every aviation service provider around the world, which is supported by clearly defined safety accountabilities.

2. **Safety Risk** - Utilizing an IATA Global Safety Risk Management Framework to capture, assess, prioritize, and manage identified industry safety risks and develop safety improvement programs to meet the industry's needs.

3. **Safety Connect** – Creating a connected IATA community where IATA safety improvement programs actively engage all IATA members to support them in continuous improvement.

The strategy was developed in consultation with the IATA Safety Group (SG) and IATA Safety, Flight and Ground Operations Advisory Committee (SFGOAC).

With the implementation of this new strategy, IATA will work toward achieving its set goal for 2021 of reducing the five-year rolling average accident rate per million flights compared to 2020.

As the new IATA Safety Strategy evolves and new priorities are identified, we remain focused on continuously driving enhancements through our six-point action plan.

IATA SIX-POINT ACTION PLAN

The activities related to these areas focus on specific organizational and operational safety issues. IATA works closely with industry stakeholders to ensure each of these areas is leveraged to deliver key tangible safety outcomes.

1. Reduce operational risk
2. Support consistent implementation of safety management
3. Identify and address emerging safety issues
4. Support effective recruitment and training
5. Enhance quality and compliance
6. Advocate for improved aviation infrastructure

Each of these six key areas breaks down into several subcategories to address specific aspects of the strategy. Aviation security is also key to maintaining operations resilient to threats. Some of the work carried out by IATA in this area is described below.

CONSIDERATIONS ON 2020 AND THE COVID-19 PANDEMIC

IATA's 76th Annual General Meeting (AGM) unanimously approved a resolution reconfirming the airlines' unwavering commitment to safety and sustainability as we endeavor to reconnect the planet.

The resolution called on governments to:

1. Ensure the industry's viability with continued financial and regulatory support.

2. Aid the industry in reaching its 2050 goal of cutting emissions to half of 2005 levels while exploring pathways to net zero carbon emissions through economic stimulus investments in commercializing Sustainable Aviation Fuel (SAF).

3. Work with airlines to ensure safety standards and critical skills are maintained both during the crisis and in the subsequent restart and scale-up of operations.

The IATA membership also reiterated its commitment to safety. During the crisis, this is evidenced in the comprehensive takeoff guidance published by the International Civil Aviation Organization (ICAO) with the support of IATA and other industry stakeholders. This lays the foundation for the harmonized implementation of a multi-layered approach to keeping travelers and crew safe. While 86% of people currently traveling report that they feel safe with the new measures, there is still work to be done for universal implementation.

The resolution further called on governments to work with airlines to maintain safety standards and critical skill levels during the crisis and in a safe restart and scale-up of operations in the recovery. "We must plan carefully with regulators how to safely ramp up operations in the eventual recovery. Reactivating thousands of grounded aircraft, managing the qualifications and readiness of millions of licensed personnel and dealing with a major drain of experienced workers will be key to a safe restart. From the earliest stages of the crisis, we worked with ICAO and regulators on a framework to do this. And this work continues as the crisis drags on beyond expectations," said Alexandre de Juniac, Director General and CEO of IATA.

IATA Accident Classification Technical Group (ACTG) COVID-19 considerations:

The ACTG, based on the accidents analyzed and classified in 2020 and discussions held by its safety experts, provides the following recommendation for the industry restart in 2021:

Due to the ongoing COVID-19 pandemic and related travel restrictions and lockdowns enforced in most countries, aviation operational professionals worldwide, especially flight crews, have seen a significant change in their roster. Many of them have been grounded, either temporarily or permanently, and most of the airlines still flying have been operating a greatly reduced number of flights. Research has shown that situational awareness, problem-solving and decision-making skills, among other aspects, can deteriorate due to lack of use. It is most important that airlines identify and mitigate this risk by implementing appropriate training and awareness programs for crews returning to work. Fatigue management and operational safety should remain a primary focus, and airlines should continue to encourage operational personnel to provide timely safety reports to ensure no aspect has been overlooked in resuming flight operations.

Flight crew members should not underestimate the consequences of a long period of grounding or limited flying on their abilities. Therefore, they should make sure they are mentally, emotionally and cognitively fit to resume flying, familiar with COVID-19 health and safety arrangements, and fully compliant with recency requirements and any applicable operating limitations. They should also understand there is an increased likelihood of operational challenges, including rapid changes in notices to airmen (NOTAMs), technical issues associated with prolonged grounding of their aircraft, disruption to air traffic control (ATC) and airport services, and changes in flight duty periods.

REDUCE OPERATIONAL RISK

IATA remains focused on its top safety priorities, which include Runway Excursions, Controlled Flight into Terrain (CFIT), Loss of Control–In-flight (LOC-I), Mid-Air Collision, among others, while continuing to promote the implementation of new safety initiatives. Based on analyses of accident data for commercial air transport operations, IATA and the ACTG have developed recommendations to address:

Loss of Control — In-flight

Controlled Flight into Terrain

Runway Excursions

Unstable Approaches

Ground Damage Accidents

Mid-Air Collisions

Human Factors

SUPPORT CONSISTENT IMPLEMENTATION OF SAFETY MANAGEMENT SYSTEMS

The aviation industry has been able to manage the COVID-19 pandemic crisis as well as it has through the Safety Management principles that have been developed and elements of which that have been put in place. Although there are varying stages of understanding and implementation around the world, the use of risk management and safety risk assessments to maintain a focus on safety during such a critical time is a testament to how far we have come. Additionally, the trust and collaborative relationships between regulators and operators that have been established due to the nature of Safety Management programs have certainly helped the aviation industry make timely and effective decisions during this challenging time.

In 2020, IATA focused a lot of attention on a risk management framework, which identified critical risks that emerged as a result of the pandemic. IATA then created timely and relevant guidance material with supporting safety risk assessments for operators and other applicable stakeholders to consider when managing these newly identified or elevated risks. IATA also stressed the importance of operators keeping a safety focus during this time, which is extremely challenging when trying to survive as a business.

As the Safety Management System (SMS) framework and the purpose of each element is well understood, IATA is preparing a multi-year SMS strategy that will not only keep the evolution and continuous improvement of Safety Management moving forward, but also provide the mechanism for operators to engage more directly with each other and other industry stakeholders in influencing the way forward.

IATA Global Safety Risk Management Framework

COVID-19, the upheaval and unprecedented change that it created for the industry cannot be overstated. Managing the change and subsequent risks in a fluid environment can be challenging for even the most mature safety programs. During this time, IATA has developed a COVID-19 Safety Risk Management Framework to capture, analyze and address new or emerging safety risks resulting from multiple alleviations, exemptions and new business models introduced to aviation since the start of the pandemic.

As we look forward to the industry restarting and flourishing, IATA will be leveraging the success of the COVID-19 Risk Framework through a database solution available to all its member airlines to generate a global picture of safety risks where, in collaboration with its stakeholders, IATA may address safety issues on behalf of industry. The IATA Global Safety Risk Management Framework will utilize the successful roll-out of the COVID-19 Safety Risk Management Framework as the ‘proof of concept’ to capture, analyze, prioritize and implement safety improvement programs to address identified aviation safety risks. This will enable prioritization and delivery of aviation safety improvement programs for the benefit of reducing global accidents in aviation.

Safety Information Exchange and Protection

IATA continued to advocate for and focus initiatives on safety data and safety information protections, including the promotion of mechanisms in which safety information could be shared among all stakeholders for the purposes of maintaining or improving safety. IATA continued to work with states and ICAO through the Safety Management Panel to:

1. Promote the importance of voluntary reporting systems, the value they bring to the various Safety Management programs and the criticality of protecting them, their sources and use.

2. Promote the establishment of Collaborative Safety Teams (CSTs) with transparent and controlled governance plans as a way for states to support their State Safety Program (SSP) obligations while ensuring safety information is shared in a way in which the context is properly understood and the Annex 19 protections applied. IATA also monitored and mapped the current global picture of CST developments to identify where future IATA activities should focus and where new opportunities may exist.

Although COVID-19 shifted the priorities for many states and operators, trust and collaboration between the two were never more critical to effectively and rapidly navigate the challenges introduced. This will remain a priority for the Safety Department in 2021.

Safety Culture – A Key Enabler of Safety Management

The COVID-19 pandemic has put enormous pressure on the entire aviation sector, impacting organizations on economic, operational and organizational levels, as well as having a considerable impact on aviation personnel. Multiple changes introduced to aviation in the past months have been and will continue disrupting normal business and safety practices, thus increasing the potential for safety risks. As such, IATA has developed guidance, including safety risk assessments, to ensure the industry keeps a clear focus on safety during the restart of operations, as airlines remain under enormous economic pressure during such trying times.

IATA strongly believes in, and continues to advocate for, the fundamental role of safety culture in an effective SMS, upon which airlines can rely in times of change and crisis. Guided by the IATA Aviation Safety Culture (I-ASC) survey findings, collected since 2016 from over 40 aviation organizations globally, as well as 2020 industry feedback, IATA will focus its 2021 efforts on some of the critical safety culture drivers, such as safety leadership.

Safety leadership is key to ensuring a balance between operational efficiencies and safety is maintained as the industry begins restarting operations. It is equally essential to ensuring that SMS principles are consistently applied during the return to operations to effectively identify and manage safety risks. In addition, collaboration on safety culture continued with airports and ground service providers (GSPs) and will carry on in 2021, further supporting safety improvements and a harmonized approach to safety culture across the industry.

IATA Safety Issue Review Meeting

The IATA Safety Issue Review Meeting (SIRM) is a biannual industry meeting held each year in the spring and fall. Twenty-seven of these meetings have taken place to date, making the SIRM one of IATA Safety's longest running meetings. SIRM's success is predicated on providing an environment where participants feel comfortable in sharing their events, issues and solutions with their fellow safety professionals under the Chatham House Rule.

The SIRM brings together airlines and other industry stakeholders, such as original equipment manufacturers (OEMs) and GSPs. This multi-organizational collaboration has proven to be an effective means to leverage continuous improvement and is an originator to the emerging global information-sharing initiatives that are expected to grow significantly, albeit in a controlled and appropriate manner. The output of the SIRM meetings are bulletins summarizing the topics and issues presented during the meeting in a de-identified format.

Recognizing that the SIRM community would be unable to meet in 2020 due to the pandemic and aiming to stay connected and support the industry, IATA has worked with the IATA Hazard Identification Technical Group (HITG) to develop a Special Edition of the COVID-19 SIRM Bulletin, covering key risk areas identified by our members globally. This Special SIRM Bulletin was produced in October 2020 and compiles industry learnings and recommendations, as well as references to some of the most relevant industry material, including best practices and safety risk assessments completed by IATA to support operations affected by COVID-19. IATA invites the industry to read the Special SIRM Bulletin and consider contributing to future SIRM Bulletins. For further information or questions, contact us at safety@iata.org.

Fatigue Management

The COVID-19 pandemic significantly disrupted the airline business. Airlines around the world had to cancel flights, temporarily suspend operations and/or continue with limited resources. Some states granted operators alleviations to their existing Flight and Duty Time Limitations (FTLs) to help prevent crews from being exposed to an increased risk of infection or subject to invasive testing or quarantine while still maintaining their existing operations.

With crews working reduced hours and extended periods of time off between operational duties, fatigue is not a risk that immediately comes to mind. However, during COVID-19 and in the restart to full operations, many challenges related to fatigue management were introduced, including a shift from where the typical fatigue hazards may be coming from. Recognizing this, the IATA Fatigue Management Technical Group created "Guidance for Managing Crew Fatigue During a Crisis" to assist airlines in recognizing fatigue hazards as well as provide considerations for airlines on how to effectively manage them during and post COVID-19. IATA also hosted one of two webinars in collaboration with ICAO to highlight the issue. Additionally, IATA issued an Operational Notice to raise awareness of the issue and urge all operators to consider the use and effectiveness of their fatigue management strategies within this new environment. IATA Also highlighted this issue, via special briefing material or other effective communication, to all concerned operational personnel. To further support airlines, IATA created an e-learning Fatigue Management Fundamentals course that is available today.

Expanding the understanding of fatigue risk and effective fatigue management techniques will continue to be a focus in 2021.

B737 MAX

On 18 November 2020, the Federal Aviation Administration (FAA) lifted the grounding order and published an Airworthiness Directive (AD) and other supporting documents that specify the design changes, pilot training requirements, and de-preservation maintenance activities operators must complete prior to Boeing's 737 MAX aircraft being certified for service. Design changes include a software update, separation of wires from the cockpit toward the horizontal stabilizer trim motor, an update to the Aircraft Flight Manual (AFM), and testing of the Angle of Attack (AoA) sensor systems. Pilot training of updated procedures will require two hours per crew in a full-flight simulator (FFS).

ANAC (National Civil Aviation Agency of Brazil) lifted its grounding order on 25 November, the second regulator to do so. On 9 December, GOL Airways was the first airline to operate a B737 MAX flight with paying passengers since the aircraft type was grounded. By the end of the year, there were 19 aircraft returned to service and actively operating commercial passenger flights around the globe. By the end of January 2021, both Transport Canada and the European Aviation Safety Agency (EASA) issued their respective ADs and ungrounding orders. Other authorities have gradually been lifting their grounding orders and airspace restrictions since.

For the first half of 2021, the IATA MAX Task Force will monitor the progress of the remaining states in issuing ungrounding orders and opening up their airspace to the MAX, as well as operator activities required to bring the aircraft back into service. Any issues or risks identified with bringing the aircraft back into service, including de-preservation and suggested mitigations, will be communicated to the broader MAX community, as appropriate.

The IATA Operational Safety Audit (IOSA) has adapted audit procedures to ensure IOSA auditors verify B737 MAX operators implement applicable ADs as well as crew training and other operational requirements. Additionally, IOSA-registered operators are requested to submit an "Operator Questionnaire" every 60 days, which contains information related to the B737 MAX return to service. The questionnaires can be requested by partner airlines and regulators, and are made available upon authorization by the airline.

IDENTIFY AND ADDRESS EMERGING/ EVOLVING SAFETY ISSUES

Since SMS relies on data to identify emerging risks, IATA is putting additional effort to improve not only industry access to safety information, but also its capability for automation for more efficient safety analyses. This section provides key highlights and developments for emerging/evolving operational risks that have recently generated remarkable activity and media attention.

Cargo and Mail Safety and Lithium Batteries

Throughout 2020, the Cargo Department addressed dangerous goods and other issues that emerged as a result of the COVID-19 pandemic. These included the development of guidance on the:

a) Transport of specimens of SARS-CoV-2.

b) Carriage of alcohol-based sanitizers. Subsequent changes were adopted to the 2021-2022 edition of the ICAO Technical Instructions through an addendum permitting operators to carry on board an aircraft alcohol-based hand sanitizers and cleaning products for use by passengers and crew.

c) Transport of human remains where the cause of death was COVID-19 in coordination with the Centers for Disease Control and Prevention (CDC), ICAO and the World Health Organization (WHO).

d) Loading of cargo and mail in the passenger cabin in conjunction with Ground Operations and Safety and Flight Operations (SFO).

e) Transport of vaccines, including the use of dry ice as a refrigerant and safety guidance on the handling of temperature-controlled containers (TCC).

f) Mail safety guidelines, including a position paper endorsed by the Universal Postal Union (UPU) containing:

- Need for collaboration
- Training requirements
- Safe and secure supply chain
- Regulated Agent program
- Recommendations on screening
- Safe operations
- Civil aviation authorities' role and control
- Reference to Annex 6, Chapter 15

g) Improved standards related to unit load device (ULD) serviceability requirements for ramp and ground operations, such that the ULD's condition should be continuously monitored and verified throughout the ULD operational cycle.

h) Draft is available for carriage checklist for the acceptance of the turbine engine on engine stand (to be completed in 2021).

The SAE Aerospace G-27 Committee, which was established at the request of ICAO, continues its work throughout 2020 to develop a performance standard that can be used to test packages containing lithium batteries. The objective of the standard is to qualify packaging for lithium batteries that, in the event of a thermal runaway of a lithium cell within the package, there would be no hazardous effects outside the package.

Due to the travel restrictions associated with the COVID-19 pandemic, the work of the G-27 Committee was conducted remotely. IATA Cargo is represented on the committee by two voting members. The completion of the standard to a point at which it can be submitted for a vote of the G-27 Committee is not expected before the end of 2021. If the committee votes to adopt the standard, it will then be submitted to SAE for final approval. Once SAE publishes the final standard, it will then be considered by the applicable ICAO bodies, likely the Dangerous Goods Panel, Flight Operations Panel and Airworthiness Panel, to determine if the standard is suitable for adoption into the ICAO Technical Instructions.

The reporting and alert system for incidents involving undeclared and mis-declared dangerous goods in cargo that was implemented by IATA Cargo in October 2019 now has 39 subscribing airlines. In 2020, 14 reports of incidents involving undeclared and mis-declared dangerous goods in cargo were received and alerts issued to the subscribing airlines. The alerts enabled the subscribing airlines to take appropriate action in accordance with their safety risk assessment.

IATA Cargo continues to promote outreach to industry on cargo and mail safety, dangerous goods and the need for compliance with the IATA Dangerous Goods Regulations (DGR) or other standards. However, due to the pandemic in 2020, there were just three one-day dangerous goods workshops conducted in Africa in January. The annual two-day lithium battery workshop that had been scheduled for Manchester in October 2020 was instead conducted as a two-hour webinar. Other mail and cargo safety seminars will resume as soon as the situation permits.

SUPPORT EFFECTIVE TRAINING

IATA Training and Licensing leads and participates in the development of new training standards and publishes, with the support of the Pilot Training Task Force, guidance materials and best practices to support operators and training organizations implement these new standards. Additionally, IATA offers consultancy services to provide practical support for the implementation of the standards related to competency-based training and assessment (CBTA) programs, including evidence-based training (EBT). Contact us for more information.

IATA is committed to the Total Systems Approach (TSA), which stands for the application of CBTA principles across all aviation disciplines in general, and particularly to a pilot's entire career. Hence, the defined competencies for pilots and instructors/evaluators should be consistently applied throughout pilot aptitude testing, initial (ab initio) training, type rating training and testing, command upgrade, recurrent training (including EBT), as well as instructor and examiner selection and training.

IATA also produces guidance materials to address specific areas of pilot training, such as upset prevention and recovery training (UPRT) and flight crew monitoring: IATA Guidance Material and Best Practices for the Implementation of UPRT, 2nd Edition; Guidance Material for Improving Flight Crew Monitoring, 1st Edition.

COVID-19 Guidance and Best Practices

To support the industry through the COVID-19 crisis, IATA has been advocating to states for operator training and pilot license validity extensions as well as pilot recent experience flexibilities; and proposing alternative solutions to the traditional licensing and operational requirements when training capacity and operational experience are limited.

IATA has been proposing CBTA solutions, adapted to the status of pilot populations in regard to ICAO's training and operational standards, to operators and training organizations to manage the end of the alleviations period while ensuring a safe and efficient restart of operations. In support of this, the following guidance materials and papers were published in 2020, all of which are available for free download here:

- Guidance for Post-COVID Restart of Operations: CBTA Training Solutions
- Managing Pilot Training and Licensing Extensions: Second option for National Aviation Authorities to grant alleviations to avoid the increase in volume of training ("Stacking effect")
- Virtual Classroom Instruction: Ensuring the quality of training when classroom instruction is delivered via virtual classroom
- ATO-AOC Partnership, including Instructor Provisioning, - COVID-19 Return to Operations

Competency-based Training and Assessment Provisions

IATA participated in the revision of the provisions of Annex 1 - Personnel Licensing, the Procedures for Air Navigation Services - Training (PANS-TRG Doc 9868) and Annex 6 Part 1, as well as the consequential amendments of related guidance materials, including the Manual of Evidence-based Training (Doc 9995) and the Manual on Upset Prevention and Recovery Training (Doc 10011).

These amendments promote the expansion of a harmonized pilot competency set and clarify the role of the competencies in the Threat and Error Management (TEM) model. The competencies of the approved adapted competency model provide individual and team countermeasures to threats, errors and undesired aircraft states. Consequently, IATA Training and Licensing is represented and actively involved in the work of the recently reactivated ICAO Personnel Training and Licensing Panel (PTLP), with the goal to develop, maintain and address the evolving needs of provisions and guidance material for personnel licensing, approved training organizations and simulation training devices in the context of the global expansion of CBTA.

Competency-based Training and Assessment for Instructors and Evaluators

Given the essential contribution of instructors and evaluators (IEs) to flight safety, IATA considers it important to enhance the level of competency of IEs globally. To support this competency enhancement, IATA published the Guidance Material for Instructor and Evaluator Training, 1st Edition. The guide introduces and defines a set of IE competencies to be applied from the selection process across all types of IE training, from licensing to operator training, by both operators and training organizations. The IATA IE competency set has been endorsed by ICAO and EASA.

Evidence-based Training

Evidence-based Training (EBT) was the first recurrent training program to apply the principles of CBTA for safe, effective and efficient airline operations, while addressing relevant threats. The aim of an EBT program is to identify, develop and evaluate the key competencies required by pilots to operate safely, effectively and efficiently in a commercial air transport environment by managing the most relevant threats and errors based on evidence collected in operations and training.

IATA is currently reviewing the EBT Data Report, 1st Edition, which constitutes the foundation of the EBT Curriculum endorsed by ICAO in Doc 9995. The publication of an amendment to the EBT Data Report is expected in Q2 2021.

Competency-based Training and Assessment for Technicians

IATA is also part of the ICAO Competency-based Training and Assessment Task Force (CBTA-TF) for Maintenance, which is tasked with developing an ICAO framework for technician training. IATA has supported the revision of the provisions of the Procedures for Air Navigation Services - Training (PANS-TRG Doc 9868) Part III Training and Assessment for Aircraft Maintenance Personnel.

The aim of a CBTA program for technicians is to identify, develop and evaluate the competencies required by commercial aircraft maintenance personnel to operate safely, effectively and efficiently. CBTA in maintenance is geared toward individual student performance. The specification of the competency to be achieved, the evaluation of the student's entry level, the selection of the appropriate training method and training aids, and the assessment of a student's performance are the key factors to the success of such a program.

Ground Operations Safety

Mission and Strategy

The IATA Ground Operations mission and vision is to improve safety and operational efficiency while fostering a sustainable environment. Its strategy is to focus on the reduction of personal injuries, the cost of ground damage, delays and turnarounds, as well as $C0_2$ emissions and noise via global standardization and implementation of innovative solutions.

Priorities in 2020

With the COVID-19 pandemic resulting in a crisis for the entire aviation industry, the IATA Ground Operations priorities have focused on supporting our members in dealing with operational challenges arising from the global reduction of traffic as well as the effective and safe return to service, including onboarding of ground staff.

IATA Ground Operations has developed extensive guidance material and solutions to address these priorities:

IATA position on ground operations

The current crisis offers a unique opportunity for the industry to adopt common ground handling standards, enabling standardization, simplification and a high level of safety to be achieved alongside the opportunity to reduce costs and improve efficiency. IATA, with its key stakeholders, strongly recommends the industry take this opportunity:

- To adopt the IATA Ground Operations Manual (IGOM) standards in lieu of operator-specific requirements.
- For operators to provide GSPs with clear instructions whenever there is a variation from the IGOM standards.
- To adopt Airport Handling Manual (AHM) Chapter 11 training recommendations.
- For GSPs to utilize IATA Safety Audit for Ground Operations (ISAGO) to support a reduction in station audits.

Ground handling during COVID-19

Developed in response to various operational challenges arising from the pandemic, such as new health measures, reduction of operations, and long-term storage of ULDs, ground support equipment (GSE) and aircraft.

Transport of cargo and mail in passenger cabin

Developed in response to industry demand for transport of cargo in the passenger cabin, providing simple, common and consistent considerations and procedures that are applicable globally.

Aircraft cleaning and disinfection during and post pandemic

Based on IATA passenger survey results, enhanced aircraft cleaning and disinfection are one of the key factors helping restore passenger confidence to fly. The guidance for aircraft cleaning and disinfection has been developed with all key stakeholders and published in IGOM, Ed.10.

IATA has cooperated with Radio Technical Commission for Aeronautics (RTCA) and European Organization for Civil Aviation Electronics (EUROCAE) to develop a global guidance based on IATA procedures. IATA also lobbies with various authorities to harmonize regulatory requirements globally.

Ground handling return to service

In cooperation with industry experts, guidance for ground handling return to service has been developed. This guidance has been enhanced and included in the AHM, Ed. 41, Chapter 6 as a new section "AHM 640 - Pandemic Management". This section provides guidance for management during a pandemic regarding ceasing, reducing and restarting operations. It includes tools such as checklists and a risk assessment matrix, helping members to assess and manage pandemic situations and effectively restart their operations. With respect to GSE long-term storage and return to service, this material is published in AHM 918.

Onboarding of Ground Staff

As an adjunct to the existing AHM 1110, IATA has developed a new section, AHM 1111, which provides guidelines on how to manage training programs under pandemic situations. In addition to general principles, it also covers how to conduct training when:

- Facilities and/or trainers are not available
- On-the-job training is not possible
- There is a reduced number of employees

The purpose of this guidance is to ensure safe air transport, as well as the safety of employees, equipment and aircraft under pandemic situations without lowering any safety standards.

Ground Support Equipment

The e-learning GSE Return to Service course has been developed and is available to support an effective restart.

Enhanced GSE can be a positive contributor to improved safety – for staff, passengers and aircraft. A recent study conducted by IATA indicates that if 9% of ground operations were performed by enhanced GSE, a reduction of over 13% of instances of damage and 20% of total ground damage cost can be expected. GSE fitted with proximity sensing and warning systems are already well established – major manufacturers report that at least 80% of the units they now sell are equipped with these systems – and the trend is increasing. IATA is working on a model for refining and defining the tangible benefits of using enhanced GSE.

IATA Ground Operation Manual Variation Portal

IATA is launching the IGOM Variation Portal to facilitate aircraft ground handling and ease the industry restart process. Some of the features are:

- A digital gap analysis tool: airlines can enter their own variations from IGOM, making these visible to the end-user and thus easier to implement.
- A fully traceable notifications and acknowledgement function to simplify communications between ground handers and airlines.
- Customized dashboards to help keep track of stations and generate reports for management review.

Digital Load Control

Engineering the process for setting and effectively maintaining aircraft data for the weight and balance functions. A new digital schema has been created in cooperation with aircraft manufacturers and users to mitigate load control errors generated by incoherent datasets that are manually loaded into Departure Control Systems (DCSs).

ENHANCE QUALITY AND COMPLIANCE

Regulations must evolve as the industry grows and technologies change. The IATA audit programs aim to increase global safety performance and reduce the number of redundant auditing activities in the industry.

IATA Operational Safety Audit

As at 31 December 2020, there were 438 airlines on the IOSA registry despite the aviation industry having difficult times under COVID-19. In 2020, IOSA introduced the IOSA Support Program to offer a safety focused, attainable, flexible and effective approach in light of the COVID-19 crisis. The Support Program includes a series of relief measures for IOSA-registered operators and IOSA auditors to manage the impact of COVID-19, while maintaining critical safety assurance.

IOSA Standards Manual

- IOSA Standards Manual (ISM), Ed. 14 has been deferred and the new effective date is anticipated for September 2021.
- A temporary revision to ISM, Ed. 13 has been issued to extend the Active Implementation and Parallel Conformity Option dates therein.
- Another temporary revision to ISM, Ed. 13 has been issued to allow operators to satisfy the specification of ORG 3.4.6 by using alternative internal oversight methods for obtaining sufficient evidence to effectively assess ongoing conformity with IOSA standards.

Extenuating Circumstances Claim for Audit Conduct

- Until 31 July 2020, operators unable to undergo or complete a registration renewal audit prior to their expiry date were given the opportunity to submit a claim of Extenuating Circumstances for Audit Conduct. A validated claim granted them an additional 180 calendar days following the current expiry date.
- Following 31 July 2020, this option has remained available for operators that ceased operations due to COVID-19.

Remote Audit Option

- In July 2020, a reduced scope remote IOSA Audit option has been introduced. The full scope on-site audit option remains available.
- All IOSA Support Program rules and options are available in the IOSA Program Manual (IPM) Temporary Appendix and

IOSA Auditor Handbook (IAH) Temporary Audit Procedures at www.iata.org/iosa.

Other Relief Measures and Guidance

- Four editions of IOSA Guidance for Safety Monitoring under COVID-19 have been issued.
- Risk assessments for the IATA standards and recommended practice (ISARP) compliance tool have been introduced for operators.
- IOSA auditor qualification and currency requirements were revised.

The IOSA program continued to be acknowledged by numerous regulators and is utilized to complement their oversight activities, especially during the COVID-19 crisis. Regulators and organizations, including, but not limited to, the Netherlands Civil Aviation Authority (ILT) and the Civil Aviation Authority of Singapore (CAAS) signed a Memorandum of Understanding (MoU) with IATA on the use of the IOSA program.

Among others, IATA is working on the following changes to the IOSA program in the coming years:

- Development of an integrated risk framework to introduce a risk-based audit approach.
- Digital transformation to enable risk-based auditing and to connect operators, regulators, GSPs and other stakeholders through a platform approach.

IATA Standard Safety Assessment Program

As at 31 December 2020, there are nine airlines on the IATA Standard Safety Assessment (ISSA) registry and one airline is at the final stage of its registration process. Airlines that were in the pipeline in 2020 had to postpone their ISSA assessments due to the COVID-19 crisis.

In 2020, in alignment with the IOSA program, ISSA introduced the ISSA Support Program. This program introduced relief measures for ISSA-registered operators and the operators interested in joining the ISSA program.

Considering all the risks and taking appropriate mitigative actions, ISSA remote assessment was launched on 27 August 2020. Meanwhile, on-site ISSA assessment remains available for operators. All ISSA Support Program rules and options are available in the ISSA Program Manual (ISPM) Temporary Appendix and IAH Temporary Audit Procedures at www.iata.org/issa.

The African Civil Aviation Commission (AFCAC) has entrusted IATA to provide technical assistance and support to operators in Single African Air Transport Market (SAATM) states to achieve ISSA certification, in collaboration with the African Airlines Association (AFRAA), with this activity being financed by resources from the African Development Bank's grant to AFCAC.

Overall, the project will look for eligible airlines to undergo preparation for ISSA, performing for each operator an ISSA gap analysis, followed by necessary corrective actions to address any deficiencies, resulting in readiness for the operators to go through the assessment process after the project is finished. Support for ISSA is expected to be provided to a maximum of 10 operators. This demonstrates the growing interest of operators in the ISSA program globally.

IATA Safety Audit for Ground Operations

ISAGO is a standardized and structured audit program of GSPs operating at airports. The audits assess a GSP's conformance with standards developed by global industry experts for the management, oversight, and implementation of ground operations. The standards aim to improve flight safety and reduce ramp accidents and incidents through full implementation of safety management and standardization of procedures on the same level as required of airlines, airports and other aviation operations. The audits are conducted by IATA selected, trained and qualified auditors who are members of the IATA Charter of Professional Auditors (CoPA). IATA manages CoPA and continuously evaluates the performance of the auditors.

ISAGO is continually enhanced and aligned with industry best practices and applicable regulatory provisions to ensure its overall consistency and relevance. IATA is committed to establishing ISAGO as an accepted alternative means of compliance for airline regulatory oversight of ground operations. ISAGO is currently the only global program that is aligned with ICAO Doc 10121, Manual on Ground Handling, and requires a GSP to implement an SMS equal to that required by regulators of aircraft and airport operators.

ISAGO benefits to the GSP, airline and airport operator include safer ground operations, fewer accidents and injuries - which leads to a reduction in operational costs and improved procedures - and an enhanced understanding of the high-risk areas in ground operations.

ISAGO is conducted on a two-year cycle at both headquarters and station levels of a ground handling company. ISAGO is applicable to independent ground handlers as well as airline-owned subsidiaries or airline-embedded GSPs, regardless of size. The scope of the audit is tailored to the range of activities conducted by the GSP. Any GSP is welcome to apply for the ISAGO registration audit.

In just over a decade, ISAGO has grown and now reaches every region of the world. As at 31 December 2020, over 220 GSPs are ISAGO-registered. ISAGO audits have been conducted on the services provided at over 300 stations at over 200 airports worldwide.

More than 500 ISAGO audit reports are available in the ISAGO Registry platform, accessible to airlines through the ISAGO membership program. Airlines may use these ISAGO reports in lieu of and to satisfy their oversight obligations of outsourced ground handling operations and provide input to their SMS.

IATA Fuel Quality Pool

The IATA Fuel Quality Pool (IFQP) is a group of more than 180 airlines that work together to assess the implementation of safety and quality standards and procedures at aviation fuel facilities. The IFQP does not set standards, but ensures fuel quality policies and standards are followed, and major fuel safety items are addressed, such as compliance with the use of differential pressure-limiting devices on all monitor-equipped vehicles.

IFQP-qualified inspectors perform inspections against industry regulations at airports worldwide and the reports are shared among IFQP members. By providing comprehensive training of inspectors and development of standardized inspection procedures according to airline and regulatory requirements, the IFQP enhances safety and improves quality control standards of fuel facilities at the airport.

De/Anti-icing Quality Control Pool

The IATA De/Anti-icing Quality Control Pool (DAQCP) is a group of more than 120 airlines that audit de/anti-icing providers and share the inspection reports and workload at various locations worldwide. The pool's main goal is to ensure de/anti-icing safety guidelines, quality control recommendations, standards and procedures are followed at airports worldwide. The inspection checklist is based on the Global De-icing Standard published by SAE.

IATA Drinking Water Quality Pool

The IATA Drinking Water Quality Pool (IDQP) was created by a number of airlines to safeguard the health of passengers and crew on board aircraft by using the highest standards to ensure water quality. By sharing inspection reports, airlines avoid multiple audits of the same provider at the same location, thereby enjoying substantial financial savings from reductions of airport inspection workloads and associated costs.

ADVOCATE FOR IMPROVED AVIATION INFRASTRUCTURE

Air Navigation Service Providers (ANSPs) are a critical component in the aviation supply chain. They provide safe, efficient and cost-effective Air Traffic Management (ATM) and air navigation infrastructure to airline operators. Throughout 2020 and entering into 2021, there were several critical ATM and air navigation infrastructure areas identified as needing improvement. IATA has been working with member airlines, key partners such as ICAO, the Civil Air Navigation Services Organization (CANSO), state regulators and ANSPs, to ensure ATM operations and infrastructures would maintain the required level of safety and efficiency, while maintaining a positive cost-benefit business case and supporting the reduction of CO_2 emissions.

COVID-19 Impacts on ATM

The operational and financial impact of COVID-19 on the aviation industry is unprecedented. Operational working environments continue to change along several vectors. In addition to uncertainty related to flight schedules, new regulations for short and long-term parked aircraft, biosafety measures, increased aircraft maintenance and flight planning challenges, airlines are required to keep track of the many new restrictions and changes in government protocols issued in response to health risks.

In response to these challenges, IATA initiated the following:

1. Information/Data Availability

IATA developed an information sharing dashboard to provide operators with a single location where they could find aviation operational information related to COVID-19 published by states. The automated dashboard displays NOTAM information on airspace and airports, by both ICAO regions and state Flight Information Region (FIRs). In addition, IATA created the COVID OPS tool to assist operators by allowing operators to ask specific questions related to COVID restrictions. The questions are distributed to an appropriate IATA subject matter expert (SME), located in the appropriate region, to provide a timely response. Once the question is answered, it is archived for future reference. Moving forward, both the dashboard and COVID OPS tool will be incorporated into the revamped IATA Tactical Operations Portal (ITOP), which is monitored and supported by IATA Liaison Desk personnel.

2. Analysis of COVID Risks

COVID-19 led to a different risk landscape which can, by extension, introduce new operational challenges and safety hazards. In addition, the pandemic has revealed gaps that need to be addressed across the aviation supply chain to increase efficiency and decision-making.

To better understand the risks that were caused or amplified by COVID-19, IATA conducted a Safety Risk Assessment (SRA) with industry partners. The SRA focused on the following:

1. Human factors for dispatchers and Air Traffic Control Officers (ATCOs) related to the social stress and anxiety and job insecurity that COVID has caused.

2. Maintaining competency and training for dispatchers and ATCOs. During the pandemic, the lack of facility accessibility and the limitations associated with virtual/remote training has had a major impact on recurrent and on-the-job training (OJT).

3. How to ensure a positive aviation and safety culture during a pandemic when many priorities are shifted.

4. The interface between ATCOs and pilots given the changing traffic levels and long periods of limited operations.

5. The impacts of COVID-19 on airport operations, specifically due to long-term parked aircraft, nonstandard aircraft ground movement, new biosafety measures, and risks of increases in wildlife due to low traffic.

The SRAs and educational webinars that followed were used to develop bulletins that are available on the IATA website.

Rocket Launches and Commercial Space Operations

IATA is concerned by the lack of progress on the development of regulatory provisions for commercial space activities. It has been suggested by some in the industry that these operations should be kept free of provisions that may constrain innovation. However, given that these activities may include low orbit operations and recoverable vehicles that will transit through civil operational airspace, the goal should be to develop provisions and best practices that will permit the integration of these operations into current operations, thereby ensuring the continued safe operation of all stakeholders. The manner in which these operations may be integrated could be similar to the Unmanned Traffic Management (UTM) concept being developed to integrate unmanned aircraft.

Unauthorized Use of Unmanned Aircraft

IATA has been working with industry partners to develop guidance material that will assist states, airports and ANSPs in developing local procedures that will help them better address events of unauthorized use of unmanned aircraft. The guidance material focuses on a collaborative risk assessment approach when making decisions about airport operations. The guidance is planned to be issued during the first half of 2021.

Global Navigation Satellite Systems Interference

Since the last IATA Safety Report, IATA continues receiving concerning reports on harmful interference to Global Navigation Satellite Systems (GNSS). GNSS is a cornerstone of daily flight and ATM operations, and it provides fundamental position and timing information to aircraft safety systems (e.g., Ground Proximity Warning System—GPWS), air traffic services satellite communications, aircraft navigation (Global Positioning System—GPS and Performance-based Navigation—PBN) and Automatic Dependent Surveillance-Broadcast (ADS-B) applications. Effective protections of GNSS signals and robust and timely mitigations of harmful interference to GNSS are, therefore, necessary.

IATA, in cooperation with the International Federation of Air Traffic Controllers' Association (IFATCA) and the International Federation of Air Line Pilots' Associations (IFALPA), has raised awareness and recommendations on this safety-critical issue to the 40th ICAO Assembly. Resulting from the strong support by the Assembly and an urgent request by the ICAO Council, in August 2020, ICAO issued a State Letter emphasizing the need for:

- Reinforcing communications, navigation and surveillance (CNS) systems resilience to interference.
- Preventing use of illegal interfering devices.
- Increasing collaboration with radio regulatory and enforcement authorities.
- Reinforcing civil-military coordination to address interference risks associated with GNSS testing and conflict zones.
- Increasing coordination between aviation and radio-regulatory authority and military.
- Retaining essential conventional navigation infrastructure for contingency support in case of GNSS outages.
- Developing mitigation techniques for loss of services.

Additionally, the issue of harmful interference to GNSS has been brought to the attention of and for actions by the International Telecommunication Union (ITU), the United Nations Specialized Agency for information and communication technologies and the global authority on radio spectrum protections.

Protection of Aircraft Radar Altimeters from Interference

Radar altimeters (RAs), operating at 4.2-4.4 GHz, are the only sensors on board a civil aircraft that provide a direct measurement of the clearance height of the aircraft over the terrain or other obstacles (i.e., the Above Ground Level - AGL - information). The RA systems' input is required and used by many aircraft systems when AGL is below 2,500 ft. The RAs also play a crucial role in providing situational awareness to the flight crew. The measurements from the RAs are also used by Automatic Flight Guidance and Control Systems (AFGCS) during instrument approaches, and to control cockpit displays of crew information from critical systems, such as Predictive Wind Shear (PWS), the Engine-Indicating and Crew-Alerting System (EICAS), and Electronic Centralized Aircraft Monitoring (ECAM) systems. Any failures or interruptions of these RAs can lead to incidents with catastrophic outcomes, potentially resulting in multiple fatalities.

RAs are installed in all types of aircraft, including commercial transport aircraft; business, regional, general aviation airplanes; and both transport and general aviation helicopters. Noting the safety-critical roles of aircraft RAs in protecting the safety of flights and the traveling public, it is necessary that governments robustly protect the integrity of RAs in service. It is the responsibility and in the best interest of governments to ensure any deployments of 5G technologies do not cause interference to the incumbent RAs and to consult with aviation agencies and authorities, incorporating aviation recommendations and fully addressing aviation safety concerns.

SECURITY

The partnership between governments and the aviation industry is the foundation upon which a safe, secure and accessible air transport network is built. Aviation security policy must learn from evolving threats. IATA supports global standards, but an outcome-based risk-mitigation approach is essential, as every location has a unique mix of challenges and controls must be applied proportionately where the risk is greatest.

Aviation Cyber Security

To address cyber threats and ensure the civil aviation industry is resilient to cyber-attacks, in 2019 the ICAO Aviation Cyber Security Strategy was endorsed. Following the outcomes of the ICAO 40th Assembly, the need for taking further action to counter cyber threats by states and industry was emphasized. Therefore, IATA worked with ICAO and published an Aviation Cyber Security Action Plan, supporting the process of strategy adoption. IATA strongly supports the ICAO position as the most appropriate way to drive coherent global dialogue and action on aviation cyber security (ACyS). IATA is closely collaborating with the ICAO Secretariat Study Group on Cybersecurity (SSGC) and Trust Framework Study Group (TFSG) to contribute to the development of the action plan.

In addition, IATA is developing relevant industry guidance documentation for airlines with respect to new cyber provisions for the IOSA Standards Manual (ISM, Ed. 14). This enables the coordination and calibration, through advocacy, standards and services, to the most appropriate level of holistic cyber protection for the industry.

Conflict Zones

Safety and security risks associated with conflict zones continue to be major concerns for aircraft operators. The downing of a Ukraine International Airlines flight on departure from Teheran in January 2020 underscored the imperative that airlines require access to relevant and corroborated information from governments to be able to perform accurate risk assessments. IATA has worked toward moderating the most appropriate changes to ICAO Annex 6, 15 and 17, specifically consistent with the outcomes of the Dutch Safety Board investigation into MH17. Accordingly, IATA's own IOSA program standards and recommended practices continue to evolve. Concurrently, IATA and its members support the evolving changes to Annex 6, 15 and 17 in terms of enhanced risk assessment requirements for operators when hostile conflict is occurring and/or likely to occur.

IATA released an open source security incident database that provides member airlines with a tool that collates a range of publicly available information and establishes a baseline that will help airlines carry out the required safety and security risk assessments.

IATA Meteorological Project

IATA's Meteorological (Met) Project seeks to achieve two objectives:

- Develop a global, real-time, objective aircraft-sensed turbulence data sharing platform for airline operational use to mitigate the impact of turbulence.
- Improve weather forecasts by expanding the existing World Meteorological Organization (WMO) Aircraft-based Meteorological Data Relay (AMDAR) program to airlines from data sparse areas through the WMO IATA Collaborative AMDAR Program (WICAP).

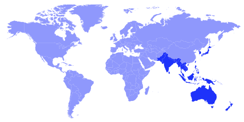
IATA has developed a turbulence sharing platform, IATA Turbulence Aware (ITA), to consolidate, standardize and enable access to worldwide real-time objective turbulence data collected from multiple airlines around the globe. The primary purpose of the ITA system, which became operational on 1 January 2020, is to provide airline pilots, dispatchers and operations center personnel with real-time, very detailed turbulence awareness. The platform supports a global industry shift toward data-driven turbulence mitigation. The ITA platform provides an open solution to industry that will enable any operator to share their data within a global turbulence repository; the aim being that carriers will have access to each other's real-time turbulence data so that greater situational awareness, both pre-flight and in-flight, can be achieved.

Turbulence data within the platform is integrated into third-party vendor weather, flight planning, trajectory and alerting tools for operational use by airlines in the program. IATA also provides a Turbulence Aware Viewer tool, which may be used by dispatchers and in flight by pilots. The tool provides a visualization of real-time turbulence data over the previous four hours along with a long-term accessible archive. Post-flight analytics and manual historical data extraction are all possible via the viewer tool for analysis of turbulence, wind, temperature and in-flight turbulence safety events.

The overall benefits of IATA's Met Project are to improve airline safety performance by decreasing turbulence-related injuries, optimize fuel burn and gain additional operational efficiencies through more accurate flight planning based on improved forecast and real-time turbulence, wind and temperature data.

REGIONAL INSIGHT

Asia-Pacific Region (ASPAC)



SFO ASPAC Safety Strategy

Developed in conjunction with the Asia-Pacific/North Asia Regional Coordination Group (RCG), Safety and Flight Operations Asia Pacific (SFO ASPAC) utilizes a risk-based, data-driven safety strategy with reactive, proactive and ultimately predictive capabilities that focuses on the top regional fatal accident risks:

- Approach and Landing Accidents Reduction (ALAR)
- Loss of Control — In-flight (LOC-I)
- Controlled Flight into Terrain (CFIT)

We are also focused on the emerging Mid-Air Collision (MAC) risk using Traffic Collision Avoidance System Resolution Advisory (TCAS RA) information from Flight Data eXchange (FDX) and other sources like ICAO's Large Height Deviation (LHD) reports.

SFO ASPAC uses Global Aviation Data Management (GADM) as a foundational tool for safety analysis, decision-making, and performance monitoring when working with ICAO, individual states, airline members and other system stakeholders. GADM enables data-driven risk identification and performance monitoring.

SFO ASPAC liaises and collaborates with key partners like the Association of Asia Pacific Airlines (AAPA) and the US Commercial Aviation Safety Team (CAST) on selected safety initiatives.

During 2020, SFO ASPAC supported several COVID-19-related safety initiatives in the region, primarily through ICAO, and globally through SFO headquarters in Montreal.

Reactive: with ICAO at Asia-Pacific Regional Aviation Safety Team

The annual IATA Safety Report is one of the sources of information used to produce the annual Asia-Pacific Safety Report, which is, in turn, used to focus regional initiatives on the top risks. The Asia-Pacific Regional Aviation Safety Team (APRAST) continues to develop Safety Enhancement Initiatives (SEIs) pertinent to the top three risk areas and encourage their implementation. SFO ASPAC supports the periodic review of SEIs conducted by APRAST to ensure currency/relevancy is maintained.

Proactive: Asia-Pacific Information Sharing Demonstration Project

The Asia-Pacific Information Sharing Demonstration Project is an APRAST initiative with a governance board co-chaired by CAA Singapore and IATA. After earlier finalizing a MAC risk analysis, the project is currently conducting Go-Around risk analysis for airports in the five member states: Singapore, Japan, People's Republic of China, Indonesia and the Philippines. Several regional airlines also participate.

Predictive: Global Safety Predictive Analytics Research Center (SPARC) in Singapore

In 2015, IATA and CAAS jointly initiated a feasibility study for the application of predictive analytics on aircraft data. The technical feasibility of the project was validated during 2016 and 2017. During 2018, three runway-related machine learning algorithms were developed. In 2020, IATA signed a Collaborative Arrangement (CA) with CAAS and the FAA with the objective of further enhancing the SPARC model's predictive data analytics capabilities.

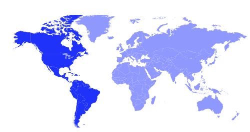
The algorithms enable the model to learn from egregious approaches the key feature(s) that would influence the risk of a runway excursion for landing aircraft. In each case, the analysis from applying the algorithms has identified primary causal features of an event and associated confidence levels in the model's prediction of their ongoing effect. While the predictive results varied depending on the prediction point, the predictive confidence exceeded 90% in some cases. It is expected that, as the algorithms are trained using larger volumes of data, their predictive power will improve.

Enhance Quality and Compliance

SFO ASPAC continues to promote the use of IOSA and ISAGO with airlines and GSPs in ASPAC. There were 71 airlines from the region on the IOSA registry at year end.

States throughout the region are also regularly encouraged to consider entering into formal agreements to utilize IATA's audit programs to complement their safety oversight activities. During 2020, SFO ASPAC organized virtual collaborative sessions with the current regulator signatories of IOSA utilization agreements to provide them with a COVID-19-related program update.

Pan-America Region



Reduction of fatality risk in the Pan-American Region and continued improvement of safety performance in the North Atlantic and South Atlantic regions remain very high priorities in addressing the region's challenges. The COVID-19 pandemic introduced a unique situation despite improvements in the risk profile of the region, whereby the risk footprint remains an area of heighten vigilance.

To maintain heighten vigilance of the region's risk footprint, the Americas Regional Coordinating Groups (RCG's) of IATA focuses on a data-driven approach to enable the strategic and tactical implementation of initiatives. Collaboration with states and industry stakeholders remains key toward the level of vigilance needed for safety improvement opportunities.

North Atlantic and North America (NAT/NAM)

The safety performance of the North Atlantic (NAT) High-Level Airspace (HLA), as measured and monitored by the NAT Systems Planning Group (SPG) for 2019, showed that over 58% of the key performance indicators (KPIs) were met. The vertical collision risk estimate for 2019 was estimated to be 52.6 x 10-9 fatal accidents per flight hour (fapfh). However, with Strategic Lateral Offset Procedure (SLOP), the risk reduced to 12.0 x 10-9 fapfh, which highlights the importance of SLOP in minimizing the risk of collision in the airspace. Application of SLOP by operators continues to show majority utilization of the centerline options, whereas the benefit of the procedure is derived more from the even distribution of all three options (centerline, 1 Nautical Mile (NM) or 2NM right of centerline) by operators. The lateral collision risk for 2019 was estimated to be 13.6 x 10-9 fapfh. The vertical and lateral collision risk estimates were lower in 2019 compared to 2018.

In the North American (NAM) region, proactive management of risk through identification and control of existing and emerging safety issues continues in collaboration with several stakeholders such as the US CAST to reduce risk system-wide with a data-driven approach. Mitigation of identified risks, such as takeoff misconfiguration, has enabled development of CAST Safety Enhancements (SEs) 227, 228 and 229 and a host of other SEs for the associated risk, which are published and being monitored for overall system improvements.

Latin America and Caribbean (LATAM/CAR)

Latin American and Caribbean (LATAM/CAR) efforts continue to focus on the top four areas of risk: CFIT, MAC, LOC–I and Runway Excursion, led by the Regional Aviation Safety Group – Pan America (RASG-PA). Dependence on the GADM program remained a critical aspect in monitoring the region's safety performance in coordination with Collaborative Safety Teams (CSTs) and being able to drive the IATA RCG objectives towards implementation of the safety priorities. While the RASG-PA continues to focus on its work from a regional perspective, the work of CSTs, in countries such as Brazil and Mexico amongst others in the region, remains an instrumental part of keeping heightened vigilance in the region's risk footprint and addressing risks with a tailored approach utilizing various data sources with GADM being a part of the data pool that is driven by airline data.

Americas Insight Analysis

Fatality risk in the Pan-America Region showed a decreasing trend across the five-year period analyzed (2015-2019). However, the three-year moving average of the highest-risk accident category for the region showed LOC-I slightly above the world average, while CFIT and Runway/Taxiway Excursion were below the world three-year moving average. Overall, MAC serious incident data showed a downward trend.

It is important to highlight that incident data for some countries in the region continue to show opportunities for safety improvements. Eight states/territories in the Pan-America Region are below the 60% level of Effective Implementation (EI) for the ICAO Standards and Recommended Practices according to the ICAO Universal Safety Oversight Audit Program (USOAP) Continuous Monitoring Approach (CMA). Accordingly, ICAO USOAP Critical Elements (CEs) showing the lowest percentage of effective implementation in the region remain CE7 - Surveillance obligations and CE8 - Resolution of safety concerns.

Auditing standards remain a vital part of an airline's operational safety and efficiency process to ensure the transport of passengers and goods safely. The region's partnership with the Latin American and Caribbean Air Transport Association (ALTA) and Air Transport Association of Canada (ATAC) enabled outreach and awareness to operators regarding the ISSA program for operators seeking to join the program. The region's operators continue to see nonconformity with SMS practices as required by IOSA dealing with the management of safety risk associated with aircraft operations.

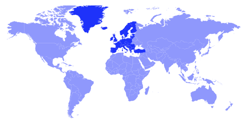
The technical risk estimates for 2020 satisfy the goal of not exceeding the target level of safety (TLS) in Reduced Vertical Separation Minimum (RVSM) airspace for the Caribbean and South America region. It is important to highlight that, while the overall technical risk estimate for 2020 did satisfy the TLS goal, there were a few FIRs that did not attain the goal. Additionally, in RVSM airspace, lack of coordination between facilities remains a major contributing factor to the events recorded.

In the North Atlantic (NAT), recent initiatives such as the Organized Track System (OTS) trial continue to gain momentum with operators toward elimination of OTS in NAT and attaining the region's long-term objectives.

As a result of the global pandemic, safety and operational challenges emerged, such as FAA Airspace ATC Zero Events, which resulted in airspace closures, often on short notice, creating challenges by increasing workload complexity for flight crews and airline operations centers (AOCs). Implications of these airspace closures included lengthy reroutes, increased fuel burn and en route flight diversions due to insufficient fuel remaining. In December 2020, the FAA reported 62 facility closures for COVID mitigation with an average closure time of 1.5 hours for each event. Moreover, multiple facility closures occurred on several occasions, further heightening workload complexities while reducing opportunities to complete flights to intended destinations. Moreover, operational safety events resulting from noncompliance on the use of face masks, communication challenges, fatigue, and lack of recent flight experience have been noted in the region. The associated guidance has been published and made available by states and industry organizations.

The Pan-America Region is collaborating with South Atlantic (SAT) industry stakeholders in continuing efforts to improve the safety and efficiency of the SAT area. As part of the improved coordination needed for the SAT, a joint task force (Atlantic Coordination Group) was formed to support improvements concerning interoperability and safety oversight, including enhancement of efficiency in the Europe/South America airspace corridor.

Europe Region (EUR)



Managing the COVID-19 Crisis

The European Region (EUR) was strongly impacted by the COVID-19 crisis in 2020; therefore, our highest priority was to ensure cooperation and coordination with the regional organizations to work together toward a faster and smoother recovery from the crisis. Europe was the first region to restart operations with a full complement of public health safety documents for a safe journey in the COVID-19 context. IATA has signed a cooperation agreement with EASA for the implementation of the COVID-19 Aviation Health Safety Protocol to strengthen efforts to ensure a consistent and safe travel experience for passengers during the COVID-19 pandemic. As a result of the coordinated efforts, alleviations requested for airlines were largely accepted by EASA and EUR states in the first weeks of the crisis to allow for a continuation of safe operations. Through very close cooperation with EASA and national regulators, various safety issues and conditions were highlighted so the airlines' views and concerns were considered (e.g., exemptions of crew members from quarantine requirements, allowing crew members to travel to simulator sessions, wearing of face masks on the flight deck).

IATA has been recognized as a reliable and trustworthy partner in the European aviation environment, participating in all COVID-19 consultation processes (very often with tight deadlines) aimed at generating guidance materials for the industry to be able to continue operations and recover. Due to the pandemic and as a result of IATA advocacy activities, European regulators decided to postpone most of the regulatory activities that were running or planned as the need to first contain the crisis was obvious. Most of the rulemaking tasks that were postponed will need to be reevaluated, given the new realities and challenges of air transport. Nevertheless, safety risk management remained a priority and, among other initiatives, IATA contributed to the work on safety promotion of the EASA Commercial Air Transport – Collaborative Analysis Group (CAT.CAG), notably in highlighting the issues relating to unstable approaches.

IATA Safety Programs

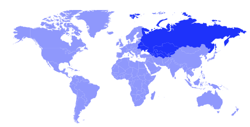
Although the top industry concern in 2020 was the survival of the industry, safety has always remained one of our highest priorities. One of the important tasks for IATA Europe was to ensure continuous support, within the IOSA Support Program, for airlines whose IOSA registration was or could have been affected by the pandemic. There were 164 airlines from the region on the IOSA registry at year end.

States throughout the region are regularly encouraged to consider entering into formal agreements to utilize IATA's audit programs to complement their safety oversight activities. In October 2020, IATA signed an MoU with ILT on the use of IOSA for safety oversight. During 2020, SFO EUR organized virtual collaborative sessions with current regulator signatories of IOSA utilization agreements to provide them with a COVID-19-related program update.

During the period of reduced operations, when airlines have less safety data from their own operations, and with increased COVID-19-induced safety risks (i.e., decrease in aviation personnel currency, higher level of stress and workload), safety information sharing has never been more important. IATA EUR worked with the regional-based carriers to expand membership in IATA GADM programs. On 5 March 2020, we hosted a GADM workshop in IATA's Madrid office to brief the airlines on the peculiarities of the new Incident Data Exchange (IDX) program and recent updates to the FDX program. By the end of 2020, GADM membership grew by 27 in IDX and 12 in FDX.

IATA EUR has contributed to the second revision of the European Action Plan for the Prevention of Runway Excursions. The new revision has become a global document titled Global Action Plan for the Prevention of Runway Excursions. IATA has been recognized as a validating organization for its contents.

Commonwealth of Independent States (CIS)

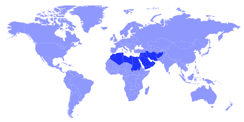


Enhancement of Safety Awareness in CIS

One of the major projects that IATA is contributing to in the Commonwealth of Independent States (CIS) region is the ICAO/Interstate Aviation Committee Technical Project No. RER/01/901 named "Development of Operational Safety and Continuing Airworthiness for Contracting States of the International Agreement" that has been active for 20 years. This is an important project for all regional stakeholders; it helps to enhance safety awareness and allows sharing of industry best practices on area-specific safety issues with regulators, airlines, airports and other organizations within the Russian-speaking states.

Due to the pandemic, the initial event schedule had to be revised on a case-by-case basis. Some of the workshops had to be postponed to 2021 while the ones on the most essential topics were conducted in the form of webinars, which, in the end, allowed us to ensure a wider international participation and more international speakers. IATA contributed to the webinars on Safety Data Processing and State Safety Risk Management (21-22 October) and Competency-based Training and Assessment/Evidence-based Training (12, 19 and 26 November). To meet the immediate needs of the industry, two additional webinars were held to tackle the challenges of the industry restart and recovery during the pandemic (8 July and 5 November), where IATA shared information on the COVID-19-related safety risks and pertinent guidance material.

Middle East and North Africa Region (MENA)



The aviation industry had one of its worst years in 2020 due to COVID-19; carriers from Middle East and North Africa (MENA), which is part of Africa and Middle East (AME), have been challenged by the importance of connecting traffic over Gulf hubs and elsewhere, since long-haul air travel markets have been slowest to reopen. As a result, COVID-19 caused major disruption of flight operations in MENA.

The focus for 2021 is to support the aviation industry with the restart and to achieve a continuous reduction in operational safety risks. The safety risks identified based on the analysis of available safety data in Edition 9 of Middle East (MID) Safety Report include:

1. Loss of Control — In-flight (LOC-I)
2. Runway Excursion and Abnormal Runway Contact (ARC) during landing
3. Controlled Flight into Terrain (CFIT)
4. Mid-Air Collision (MAC)
5. Runway Incursion

In addition, emerging safety risks were identified as:

- Global Navigation Satellite System (GNSS) outage
- State Safety Oversight capabilities
- Safety Management
- COVID-19 pandemic outbreak

IATA MENA continues to work closely with all concerned stakeholders (states, ICAO and ITU) on measures to ensure effective reporting of GNSS interferences and developing mitigation measures to reduce the effects of the interference. The majority of GPS outages were closely linked with political conflict in the region. The most affected geographical area was Eastern Mediterranean, Baghdad and Ankara FIRs.

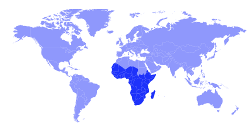
The COVID-19 pandemic was addressed in a proactive manner as an emerging safety risk in the MID 9th Annual Safety Report and will be included in 2021 priorities. IATA MENA is contributing to:

- ICAO MID Regional Recovery Planning Task Force (RPTF), leading Workstream 4 (WS 4) Air Navigation Services and Air Traffic Management, and providing material input into WS 1 (Public Health Requirements), WS 2 (Operational Safety Measures) as well as WS 3 (Airport and Passenger Facilitation).
- Crisis management on operational, crew licensing, airworthiness, auditing and safety-related industry issues (liaising with regional ICAO toward defined COVID-19 Contingency Related Difference (CCRD) and ICAO Council Aviation Recovery Task Force (CART) criteria for support) promoting a staggered approach to renewal processes for the restart.
- Supported eligible member airlines in MENA to file for extensions to their IOSA registration due to extenuating circumstances (EC). A total of 14 airlines benefited from EC and received registration extensions.
- Worked with the regional carriers to expand membership in IATA Global Aviation programs. As a result, membership grew by nine additional airlines.

The IOSA program continues to be acknowledged by numerous MENA region regulators and is utilized to complement their oversight activities. United Arab Emirates General Civil Aviation Authority (UAE GCAA) signed a safety MoU with IOSA recognizing the program as an acceptable means to complement their oversight obligations.

Implementation of the SSP is one of the main challenges faced by states in the MID Region. Improvements of SSP implementation is addressed as a top priority through SEIs.

Africa and Indian Ocean Region (AFI)



AFI, as part of AME, also experienced major disruptions due to the COVID-19 pandemic. Despite the disruptions, IATA continued to make substantial contributions to the 6th Edition of the African Regional Aviation Safety Group (RASG-AFI) Annual Safety Report, which was issued in July 2020. The report tracks Abuja Safety Targets and general safety risks in the following areas:

1. Runway-related accidents
2. Controlled Flight into Terrain (CFIT)
3. Loss of Control–In-Flight (LOC-I)
4. Fatigue Risk Management Systems (FRMS) implementation by airlines
5. Achieve and maintain zero fatalities in aircraft accidents
6. Progressively reduce rate of air proximity (AIRPROX)
7. Raise awareness and encourage data sharing of incidents and safety concerns via a singular platform

Edition 6 of the RASG-AFI Annual Safety Report had the following general recommendations:

- Establishment of effective Runway Safety Teams.
- Active participation of states in Global Aviation Safety.
- Resolution of the only remaining Significant Safety Concern (SSC) in one state (Eritrea) to be prioritized by all stakeholders.

IATA continues to work closely with all key stakeholders to improve safety in the region. IATA and African Airlines Association (AFRAA) joined forces with the African Civil Aviation Commission (AFCAC) on a three-year safety project. The objective of the project is to provide technical support to the African air operators of states party to the Single Africa Air Transport Market

(SAATM) to ensure they achieve and maintain global aviation safety standards. This will be done through a process of identifying and assessing eligible airlines, conducting gap analyses, and recommending corrective actions for each participating carrier to prepare them for IOSA or ISSA evaluation.

The IOSA and ISAGO programs continue to be acknowledged by numerous AFI region regulators and is utilized to complement their oversight activities. Nigeria Civil Aviation Authority (CAA) signed a safety MoU with IOSA and ISAGO in February 2020 recognizing the programs as acceptable means to complement their oversight obligations.

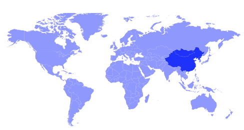
IATA AFI also contributed to the following in 2020:

- Worked with AFI regional carriers to expand membership in IATA Global Aviation programs. As a result, membership grew by five additional airlines.

- Convened the 17th AFI Incident Analysis Group (AIAG/17) meeting. Despite COVID-19 travel restrictions, the meeting was attended by 65 participants. The AIAG/17 meeting analyzed 71 Undesired Condition Reports (UCRs) and found that 79% of the UCRs analyzed were confirmed to be Loss of Separation (LoS) events. The goal of the group is to reduce the number of AIRPROXs in the airspace.

Implementation of an SSP is one of the main challenges faced by states in AFI Region. Only one country has thus far reached Level 4 in SSP implementation.

North Asia Region (NASIA)



SFO NASIA continues to implement a risk-based, data-driven safety strategy to promote the overall safety performance of the region. As such, SFO NASIA pays attention to the demand from member airlines and the cooperation with the regional CAAs. To face the challenges brought on by COVID-19, SFO NASIA keeps close cooperation with member airlines, ICAO and all regional stakeholders in the domains of audit programs, safety information sharing, GADM, COVID-19 Safety Risk Management Framework, etc. The followings are achievements highlighted in 2020.

Enhancing safety information sharing

SFO NASIA enhanced safety information sharing (i.e., operation notices, SIRM Bulletins, operational-related guidance) within the region and received positive feedback.

Promoting GADM

GADM made significant progress in 2020; seven airlines in the region joined the program, including from the Chinese mainland, Hong Kong SAR and Chinese Taipei. Through IATA advocacy, the concept of safety information exchange has been gradually accepted.

Enhancing the service of IATA China ATFM Liaison Desk

SFO NASIA expanded its service to all airlines to promote safety performance, including:

- Coordinating with authorities regarding crew restriction issues and providing support for urgent requests.

- Assisting airlines to coordinate with Air Traffic Management Bureau (ATMB), CAAC to exchange ATC safety-related information during daily operation.

- Supporting cargo operations for airlines newly operating in the region regarding flight permits to ensure the supply chain and transportation of medical supplies.

Promoting IOSA and ISAGO

In September and October 2020, three sessions of IOSA Training Workshop for CAAC were delivered, which were attended by cabin safety inspectors, principal operations inspectors (POI) and CCAR-129 inspectors from CAAC headquarters and regional administrations.

In November 2020, two sessions of CAAC Weight and Balance Workshop were delivered, which were attended by CAAC headquarters, GSPs and member airlines.

Promoting Flight Operation Safety

To promote the development of EBT in the global aviation industry, in November 2020, two sessions of CAAC CBTA (EBT) webinars were delivered, which were attended by CAAC headquarters, EASA, OEMs and member airlines.

SFO NASIA cooperated with related organizations (airlines, OEMs and MROs) in the domain of maintenance to create and promote awareness of parked aircraft return to service (RTS) and shared experience and best practices with regional stakeholders in a timely manner.

SFO NASIA also monitored CCRD alleviations in the region on a regular basis and updated the policies from CAAs, especially regarding personnel licenses, medical certificates and MRO certification.

Promoting Cabin Safety

In August 2020, SFO NASIA and Civil Aviation University of China (CAUC) jointly held an online workshop entitled Cabin Safety and Operations During and Post Pandemic, which was attended by IATA headquarters, CAAC headquarters and airlines in the region.

Promoting Metric System Change

Participated in the research arranged by CAAC of metric system changing and assisted in completing the preliminary study report of phase 2019-2020, which has been submitted to State Air Traffic Control Commission Office (SATCCo) for review.

Promoting WGS-84 Compliance

The Provisions on the Scope of State Secrets in the Management of Surveying and Mapping Geographic Information was jointly issued by the Ministry of Natural Resources of the People's Republic of China and the National Administration of State Secrets Protection, effective from 1 July 2020, which has improved the accuracy of the names and coordinates of key military and national security facilities.

Promoting IATA Turbulence Aware

IATA Turbulence Aware (ITA) has made positive progress in 2020, when five airlines in the region signed the trial contract.

1

IATA 2020 Safety Report

Safety is aviation's highest priority. More than 75 years ago, the global airline industry came together in Havana, Cuba, to create the International Air Transport Association (IATA). As part of IATA's mission to represent, lead and serve its members, the association partners with aviation stakeholders to collect, analyze and share safety information. It also advocates for global safety standards and best practices that are firmly founded on industry experience and expertise. A vital tool in this effort is IATA's annual Safety Report, which is now in its 57^{th} year of publication. It is the definitive yearbook to track commercial aviation's safety performance, challenges and opportunities.

The IATA Safety Report has been IATA's flagship safety document since 1964. The document provides the industry with critical information, derived from the analysis of aviation accidents, to understand safety risks and propose mitigations. The 2020 Safety Report was produced at the beginning of 2021 and presents trends and statistics based on knowledge of the industry at that time.

The IATA Safety Report is a valuable tool as aviation works tirelessly to improve its already superb safety record. This report is made available to the industry for free distribution.

Image courtesy of Airbus

SAFETY REPORT METHODS AND ASSUMPTIONS

The IATA Safety Report is produced each year and is designed to present the best-known information at the time of publication. Due to the nature of accident analysis, certain caveats apply to the results of this report. First, the accidents analyzed and the categories and contributing factors assigned to those accidents are based on the best available information at the time of classification. Second, the sectors used to create the accident rates are the most up-to-date available from OAG at the time of production. Third, results of analysis from 2016–2020 reports are used as benchmarks for comparison; however, historical numbers presented in this 2020 report may not exactly match earlier editions due to data updates during the intervening period.

ACCIDENT CLASSIFICATION TECHNICAL GROUP

The Accident Classification Technical Group (ACTG) was created to analyze accidents, identify contributing factors, determine trends and areas of concern relating to operational safety, and develop prevention strategies. The results of the work of the ACTG are incorporated in this annual IATA Safety Report. It should be noted that many accident investigations are not complete at the time the ACTG meets to classify the year's events and additional facts may be uncovered during an investigation that could affect the currently assigned classifications.

The ACTG is composed of safety experts from IATA, member airlines, original equipment manufacturers (OEMs), professional associations and federations as well as other industry stakeholders. The group is instrumental in the analysis process and produces a safety report based on the subjective classification of accidents. The data analyzed and presented in this report is extracted from a variety of sources. Once assembled, the members of the ACTG validate each accident report using their expertise to develop an accurate assessment of the events.

2020 ACTG members:

Capt. Ruben Morales
(Chair)
HONG KONG EXPRESS

Capt. Takahisa Otsuka
(Vice-Chair)
JAPAN AIRLINES

Dr. Dieter Reisinger
AUSTRIAN AIRLINES

Mr. Marcel Comeau
AIR CANADA

Mr. Xavier Barriola
AIRBUS

Capt. Jeff Mee
ALPA

Ms. Tatyana Morozova
AIR ASTANA

Mr. Nicolas Bornand
AIR FRANCE

Ms. Alice Calmels
ATR

Capt. Jorge Robles
AVIANCA CARGO - TAMPA

Capt. Ivan Carvalho
AZUL BRAZILIAN AIRLINES

Capt. Sam Goodwill
THE BOEING COMPANY

Mr. Eric East
THE BOEING COMPANY

Mr. David Monteith
DE HAVILLAND

Mr. Luis Savio dos Santos
EMBRAER

Ms. Huanmei Yang
ICAO

Capt. Arnaud Du Bédat
IFALPA

Mr. Martin Plumleigh
JEPPESEN

Capt. Peter Krupa
LUFTHANSA

Capt. Andreas Poehlitz
LUFTHANSA

Mr. David Fisher
MITSUBISHI HEAVY INDUSTRIES
REGIONAL JET (MHIRJ)

Capt. HockKeat Ho
SINGAPORE AIRLINES

Capt. Antonio Jose dos Santos Gomes
TAP AIR PORTUGAL

Capt. Suha Senol
TURKISH AIRLINES

Capt. B. Pete Kaumanns
VEREINIGUNG COCKPIT

Mr. Greg Brock
WORLD METEOROLOGICAL
ORGANIZATION

Capt. Mark Searle
IATA

Mr. Gabriel Acosta
IATA

Mr. Andrea Mulone
IATA

Ms. Hanada Said
IATA

Ms. Anna Bernhardt
IATA

2

Decade in Review

AIRCRAFT ACCIDENTS AND FATALITIES

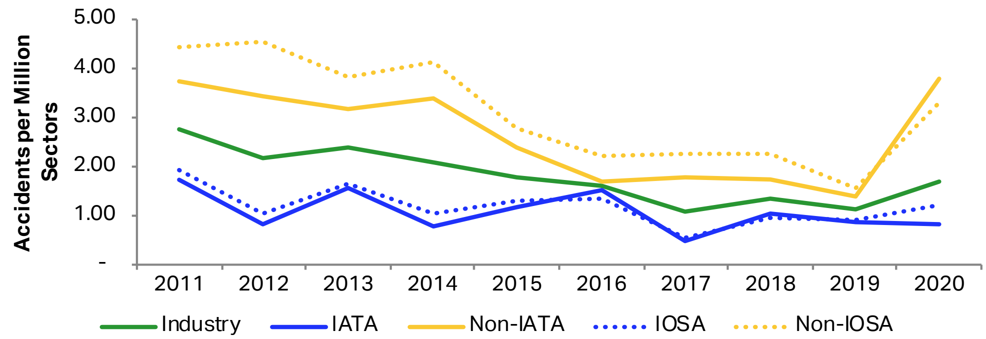
This section presents yearly accident rates for the past 10 years for each of the following accident metrics: all accidents, fatality risk, fatal accidents and hull losses, as well as general statistics on the number of fatalities and accident costs.

Image courtesy of Embraer

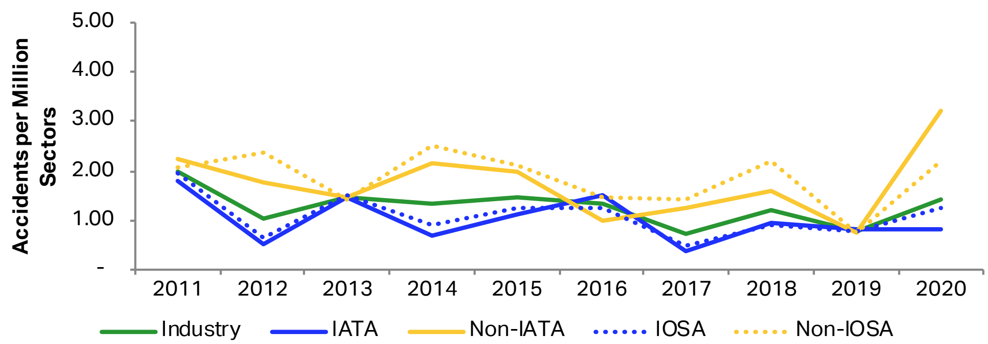
ALL ACCIDENTS

'All Accidents' is the most inclusive rate, including all accident types and all severities in terms of loss of life and damage to aircraft.

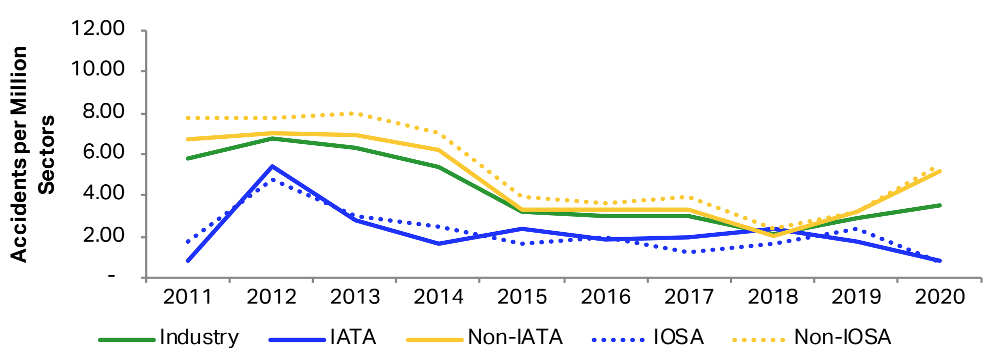
Jet & Turboprop Aircraft



Jet Aircraft



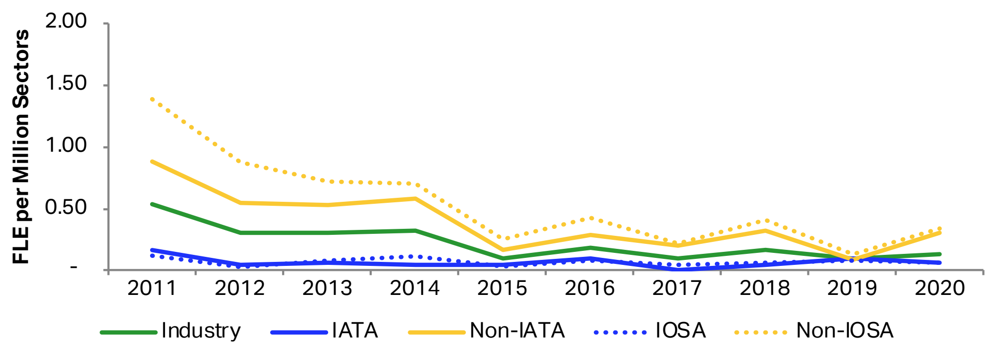
Turboprop Aircraft



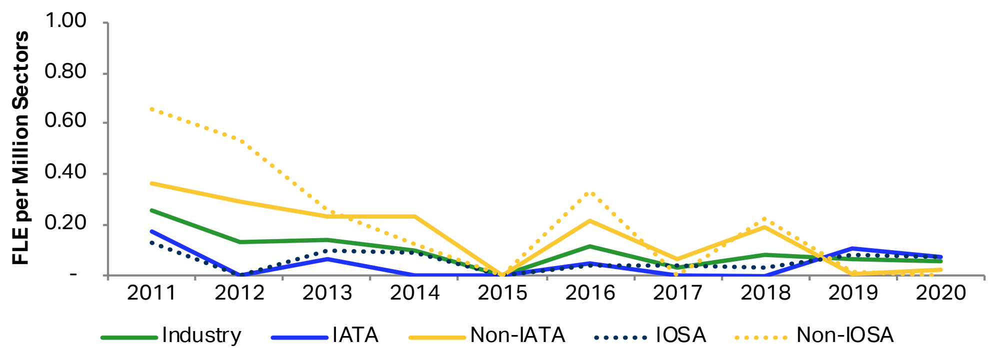
FATALITY RISK

Fatality Risk: Full-Loss Equivalents (FLE) per million sectors. For a definition of 'full-loss equivalent', see Annex 1.

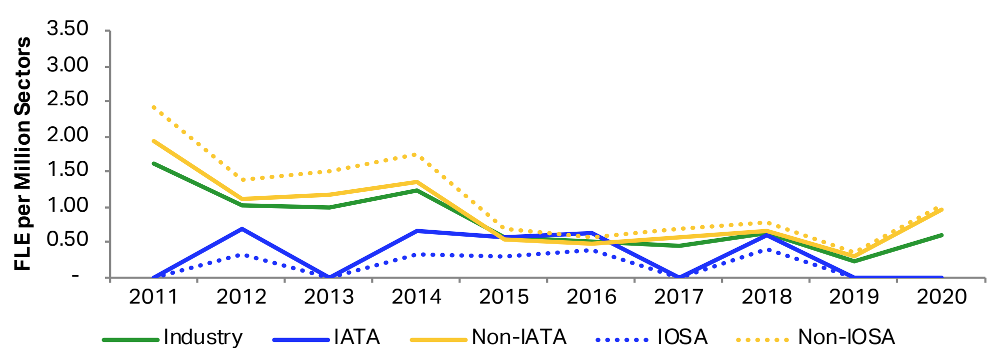
Jet & Turboprop Aircraft



Jet Aircraft



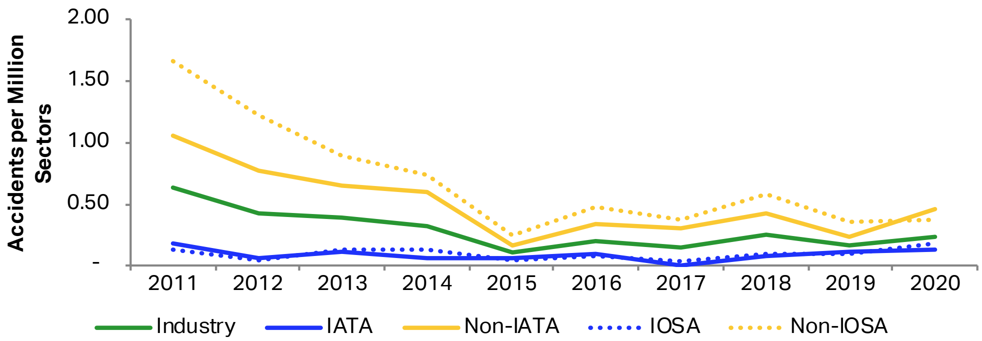
Turboprop Aircraft



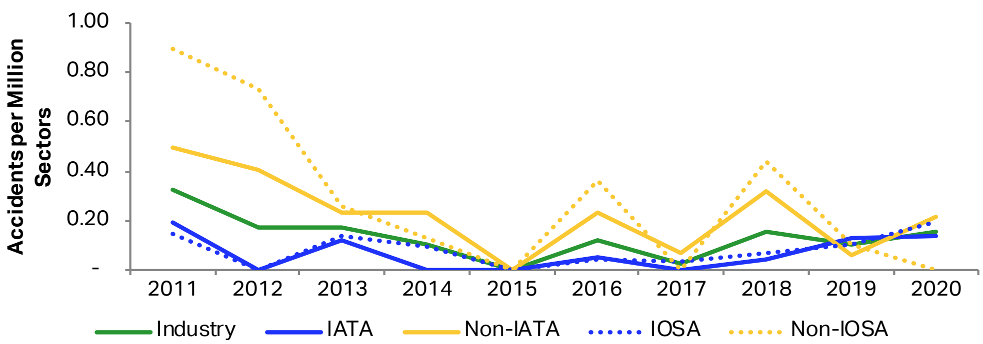
FATAL ACCIDENTS

Fatal Accidents are those where at least one person on board the aircraft perished as a result.

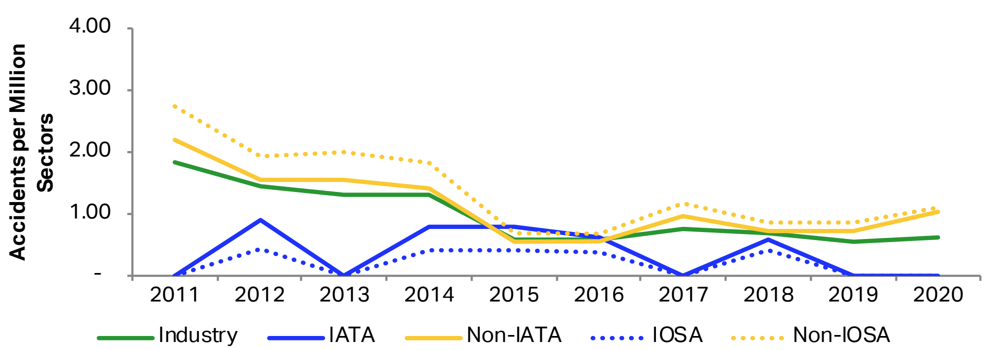
Jet & Turboprop Aircraft



Jet Aircraft



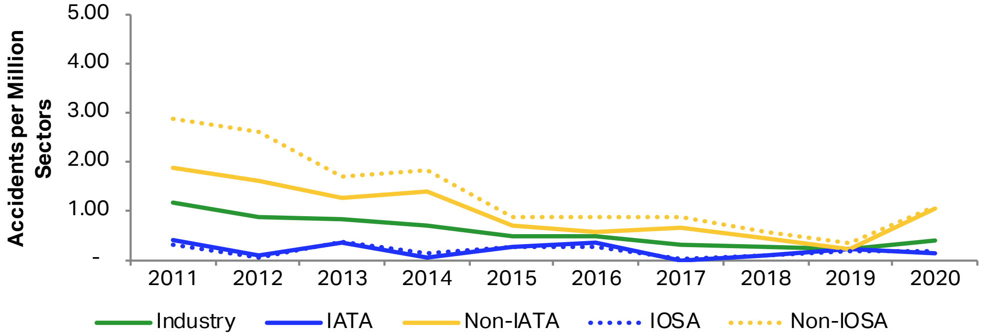
Turboprop Aircraft



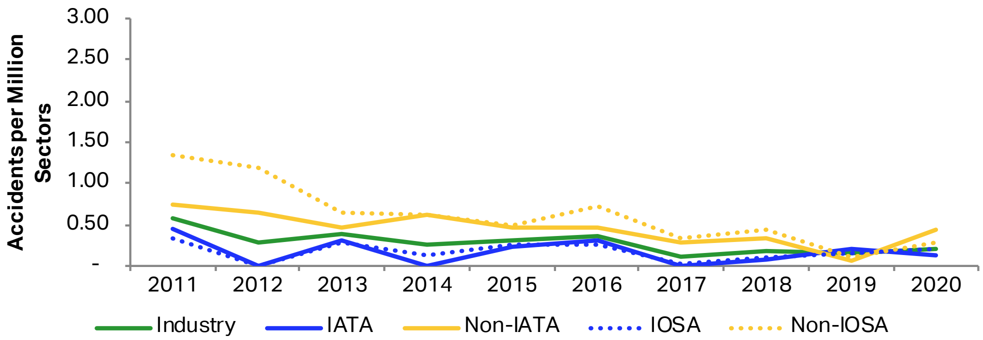
HULL LOSS

'Hull Loss' refers to the aircraft being damaged beyond repair or the costs related to the repair being above the commerical value of the aircraft.

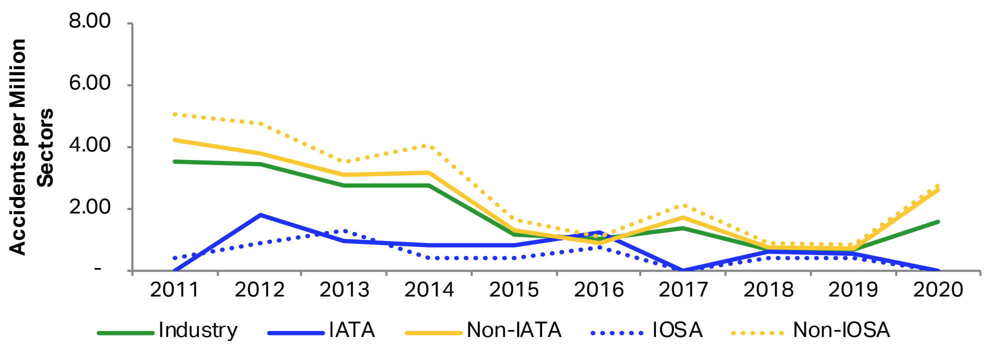
Jet & Turboprop Aircraft



Jet Aircraft



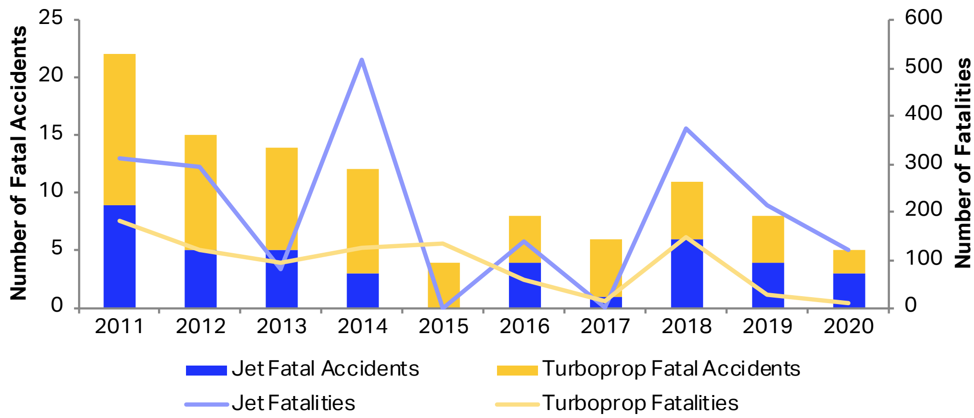
Turboprop Aircraft



FATALITIES

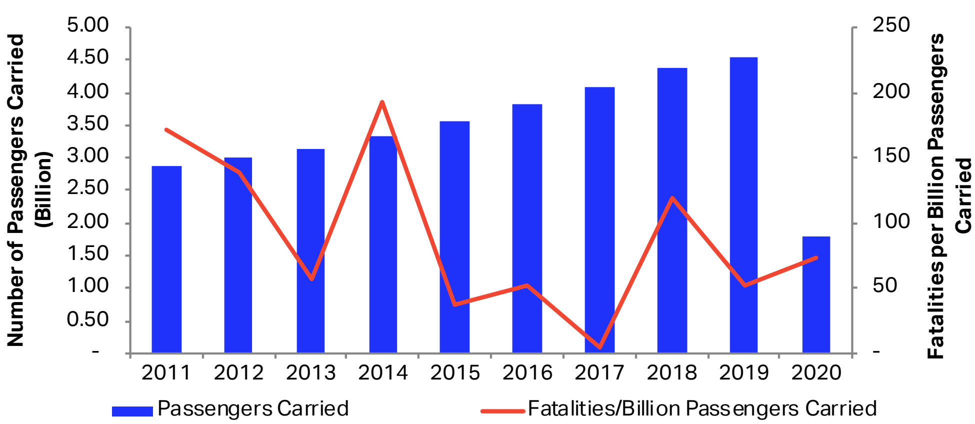
The graph below shows the total number of fatalities (line and vertical right axis) and the number of fatal accidents (stacked bar and vertical left axis) split between aircraft propulsion. The reader needs to be aware that the data is not being normalized by the aircraft flight count; therefore, discretion should be used. Interpreting and applying this data should be used in reference to the accident rate graphs presented on the previous pages.

Number of Fatalities and Fatal Accidents



The graph below shows the constant increase in passengers carried over the year and a ratio metric related to the number of fatalities by the number of passengers carried on a specific year. The sharp drop in 2020 is due to the COVID-19 pandemic.

Number of Passengers Carried and Fatality Ratio per Passenger Carried



Passengers Carried Data Source: [IATA / Industry Economic Performance]

3

2020 in Review

COMMERCIAL AIRLINES OVERVIEW

FLEET SIZE AND SECTORS FLOWN

	Jet	Turboprop	Total
World Fleet	34,097	3,452	37,549
Sector Landings (Millions)	19.1	3.1	22.2

Source: OAG, ch-aviation
Note: World Fleet includes in-service and stored aircraft operated by commercial airlines as at year-end.

CARGO OPERATING FLEET

	Jet	Turboprop
Percentage of Operating Fleet in All-Cargo Use	9.5%	9.4%

Source: ch-aviation
Note: Operating Fleet includes in-service and stored aircraft operated by commercial airlines as at year-end.

REGIONAL BREAKDOWN

	AFI	ASPAC	CIS	EUR	LATAM/ CAR	MENA	NAM	NASIA
Jet - Sector Landings (Millions)	0.30	3.20	0.73	3.18	1.13	0.97	5.52	4.03
Turboprop - Sector Landings (Millions)	0.31	1.00	0.09	0.63	0.43	0.02	0.57	0.08

AIRCRAFT ACCIDENTS

Note: Summaries of all the year's accidents are presented in Annex 3.

NUMBER OF ACCIDENTS

	Jet	Turboprop	Total
Total	27	11	38
Hull Losses	4	5	9
Substantial Damage	23	6	29
Fatal	3	2	5
Full-Loss Equivalents	1.1	1.9	3.0
Fatalities*	121	11	132
Fatalities of people not on board the aircraft	*1*	*0*	*1*

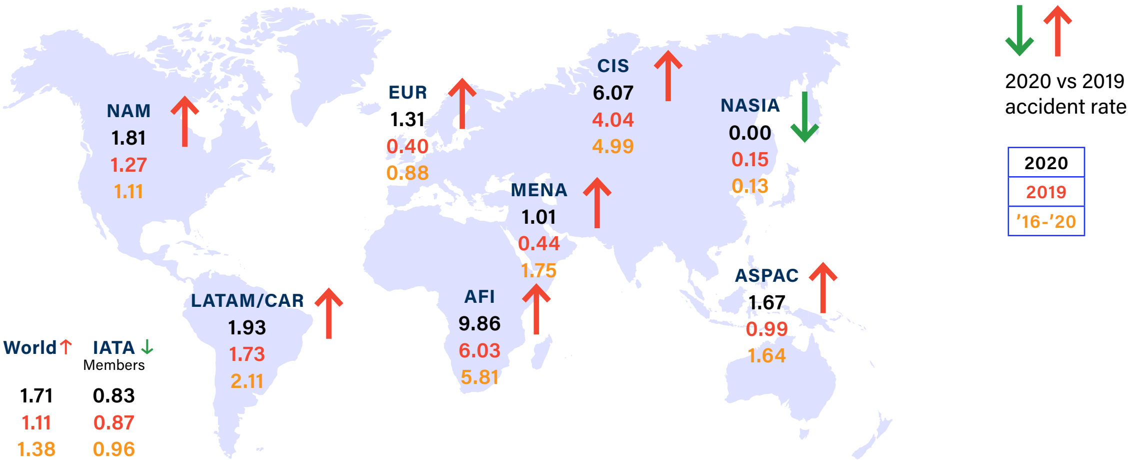
**People on board only*

ACCIDENTS PER OPERATOR REGION

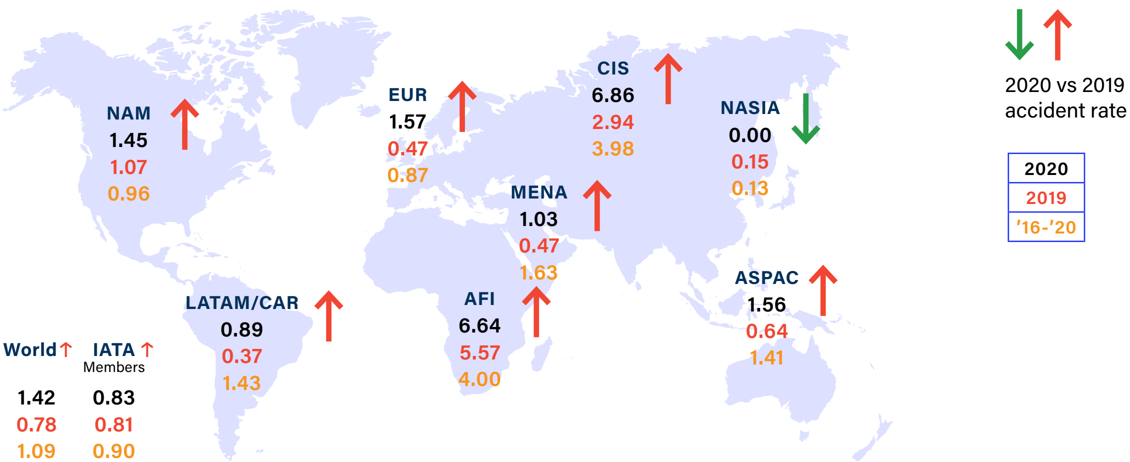
	AFI	ASPAC	CIS	EUR	LATAM/ CAR	MENA	NAM	NASIA
Total	6	7	5	5	3	1	11	0
Hull Losses	4	2	1	1	1	0	0	0
Substantial Damage	2	5	4	4	2	1	11	0
Fatal	2	2	0	1	0	0	0	0
Full-Loss Equivalents	1.9	1.1	0.0	0.0	0.0	0.0	0.0	0.0
Fatalities	11	118	0	3	0	0	0	0

ALL ACCIDENT RATE

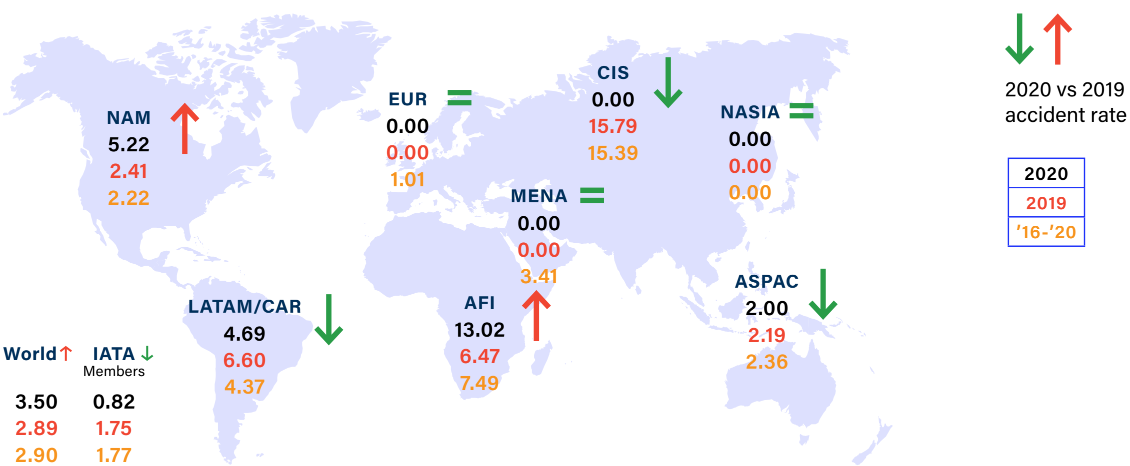
Jet & Turboprop Aircraft



Jet Aircraft

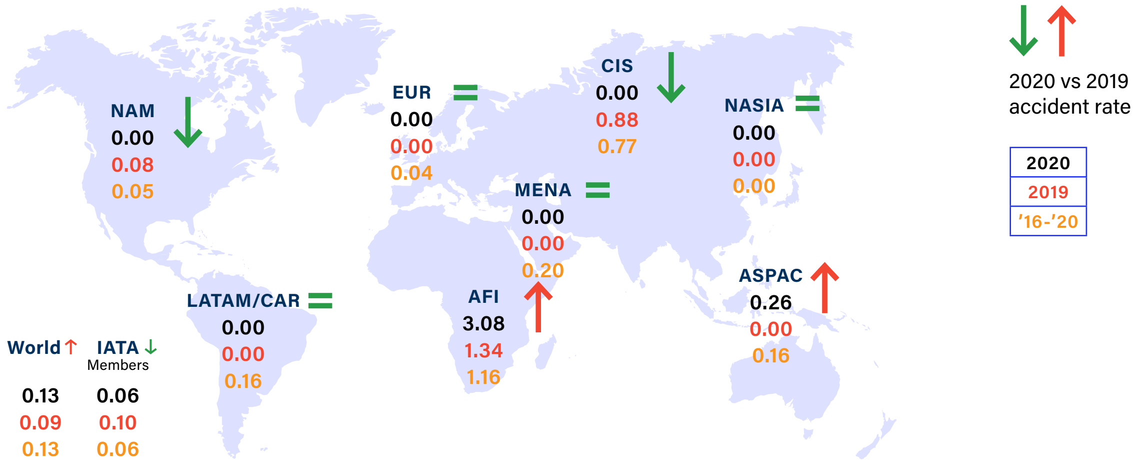


Turboprop Aircraft

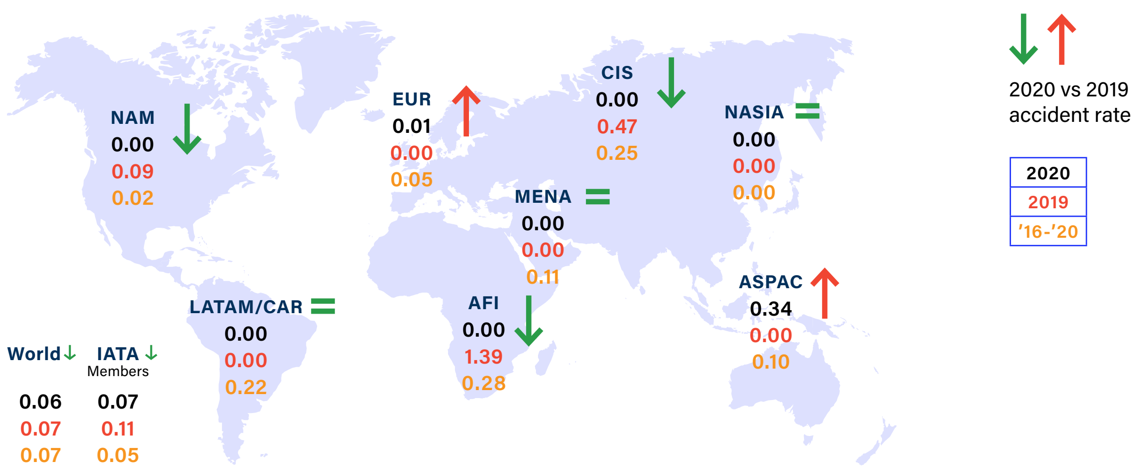


FATALITY RISK

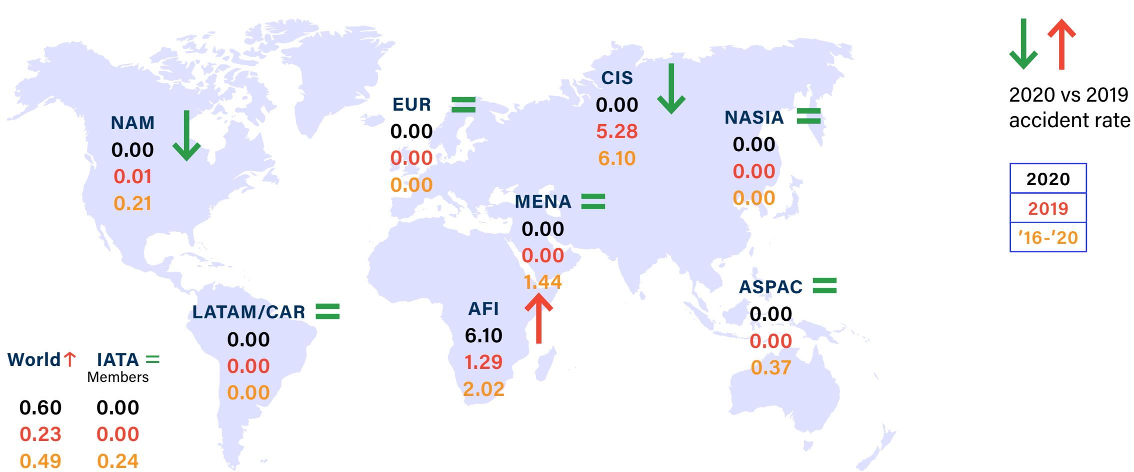
Jet & Turboprop Aircraft



Jet Aircraft

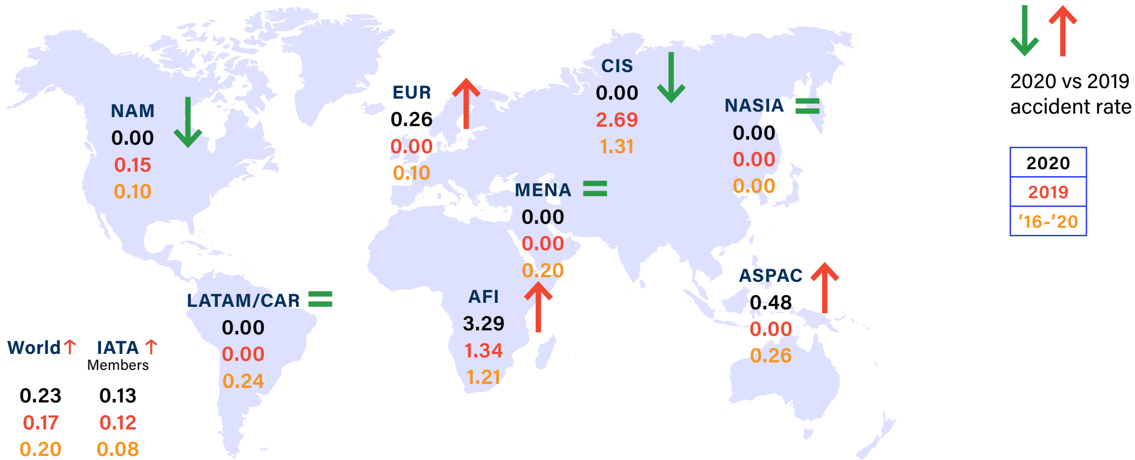


Turboprop Aircraft

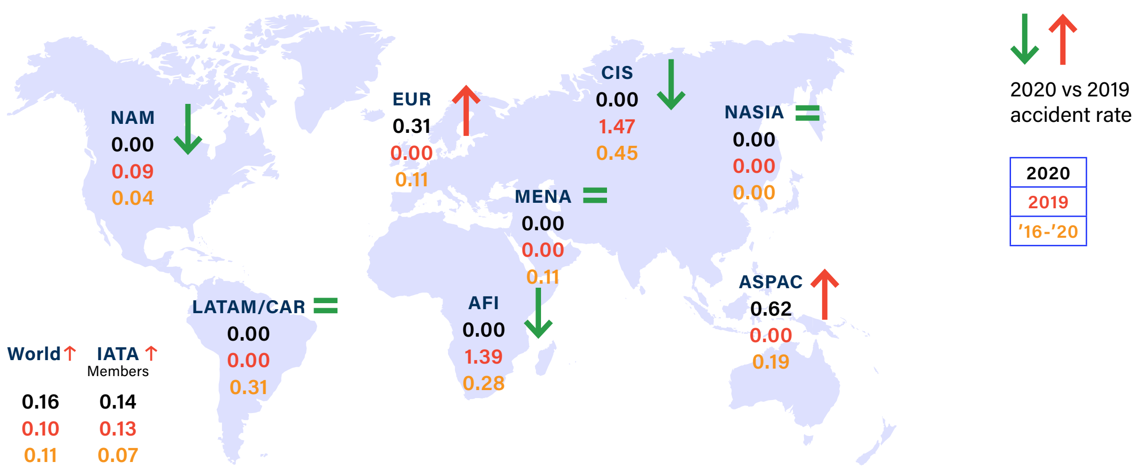


FATAL ACCIDENTS

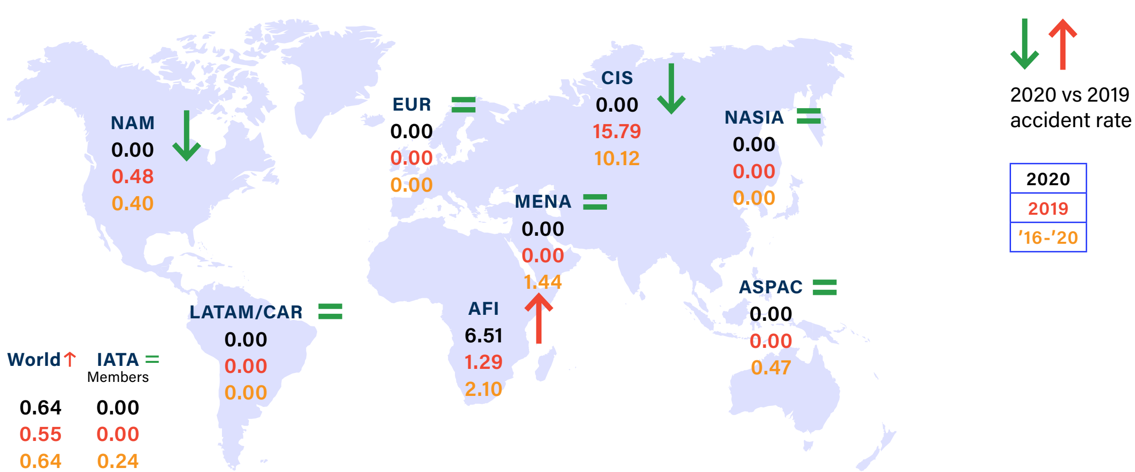
Jet & Turboprop Aircraft



Jet Aircraft

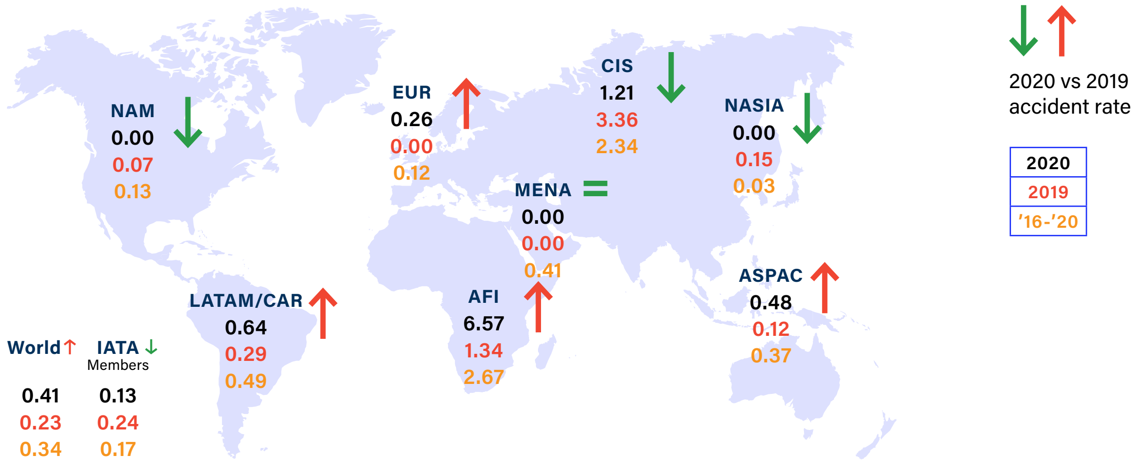


Turboprop Aircraft

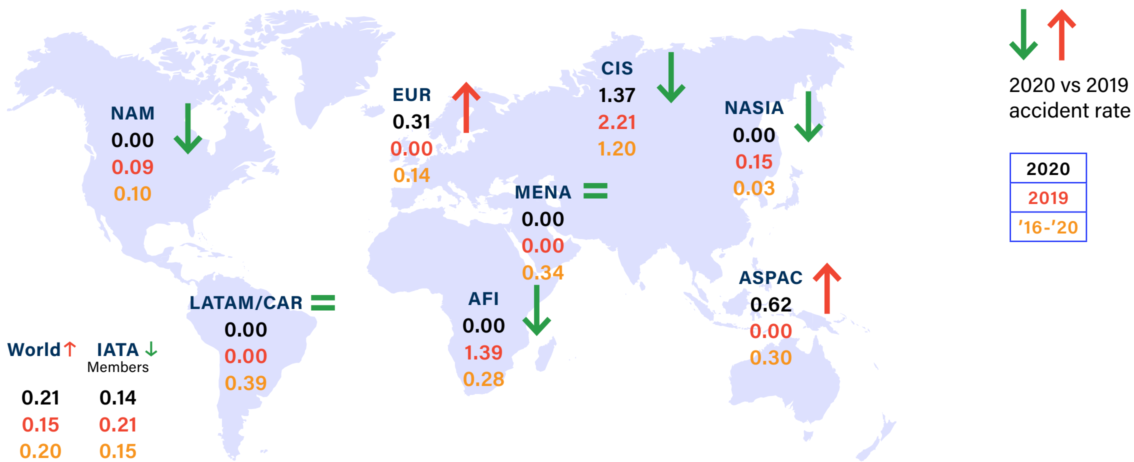


HULL LOSS

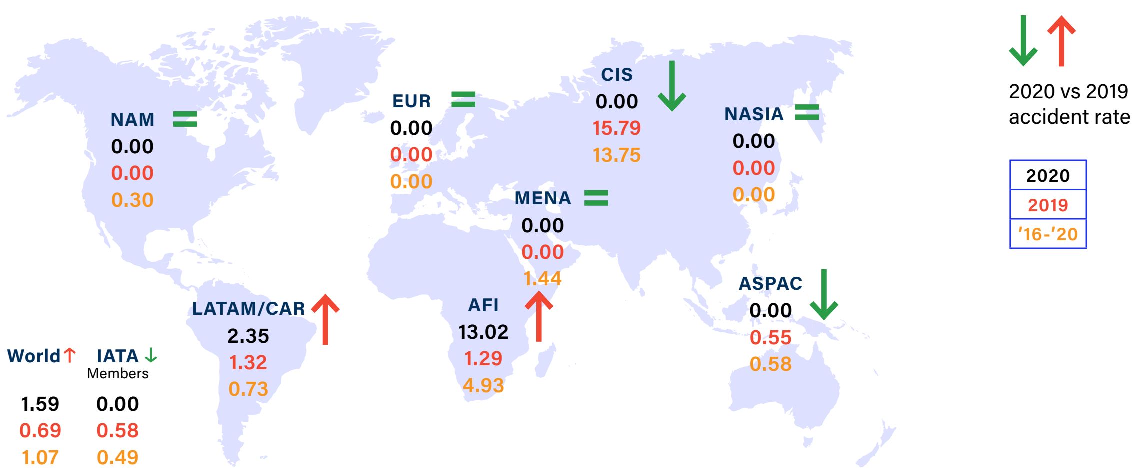
Jet & Turboprop Aircraft



Jet Aircraft



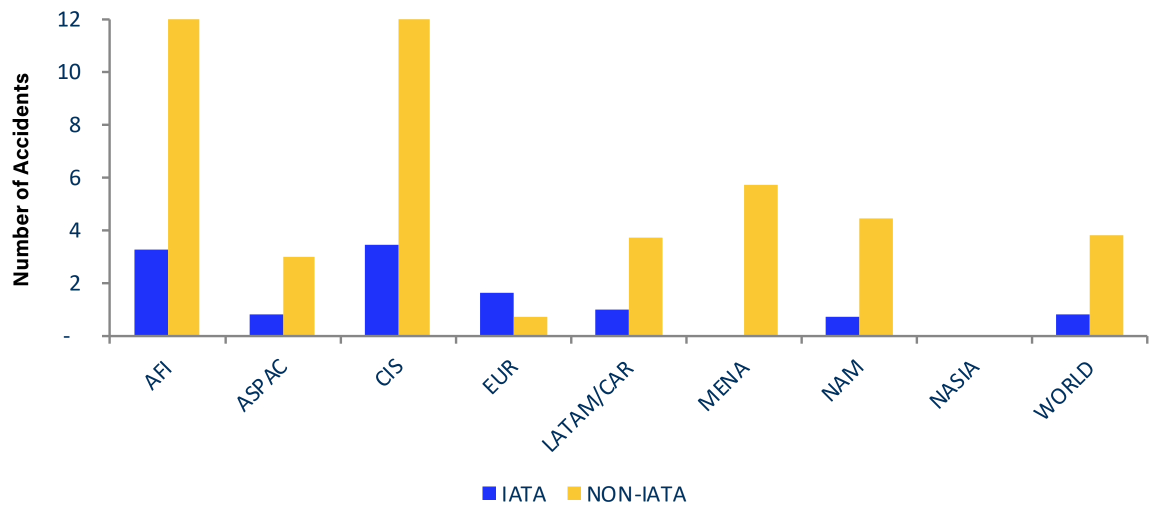
Turboprop Aircraft



IATA Member Airlines vs. Nonmembers — Total Accident Rate by Region

In an effort to better indicate the safety performance of IATA member airlines vs. nonmembers, IATA has determined the total accident rate for each, regionally and globally. IATA member airlines outperformed nonmembers in the AFI, ASPAC, CIS, LATAM/CAR, MENA and NAM regions.

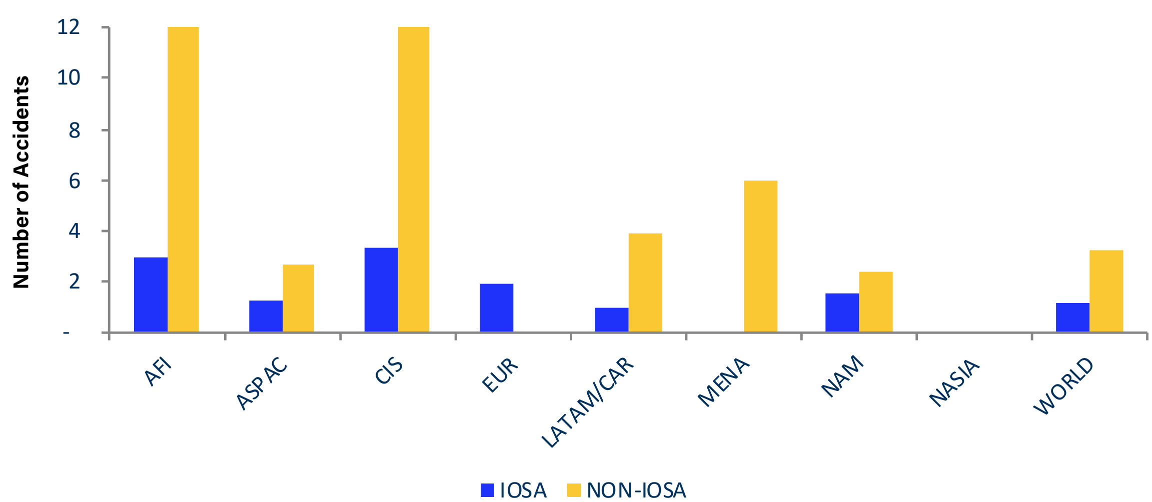
2020 Accident Rate: IATA Member Airlines vs. Nonmembers



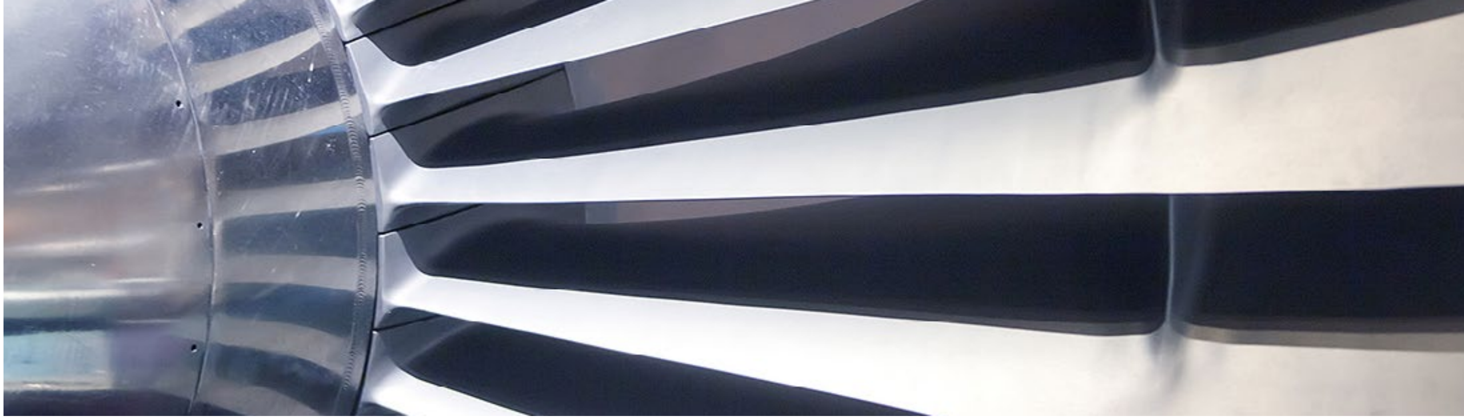
IOSA-Registered Airlines vs. Non-IOSA —Total Accidents and Fatalities by Region

In an effort to better indicate the safety performance of IOSA-registered airlines vs. non-IOSA, IATA has determined the total accident rate for each, regionally and globally. IOSA-registered airlines outperformed non-registered airlines in the AFI, ASPAC, CIS, LATAM/CAR, MENA and NAM regions. The non-IOSA-registered airline accident rate was about four times higher than for IOSA-registered airlines in 2020.

2020 Accident Rate: IOSA-Registered vs. Non-Registered



4

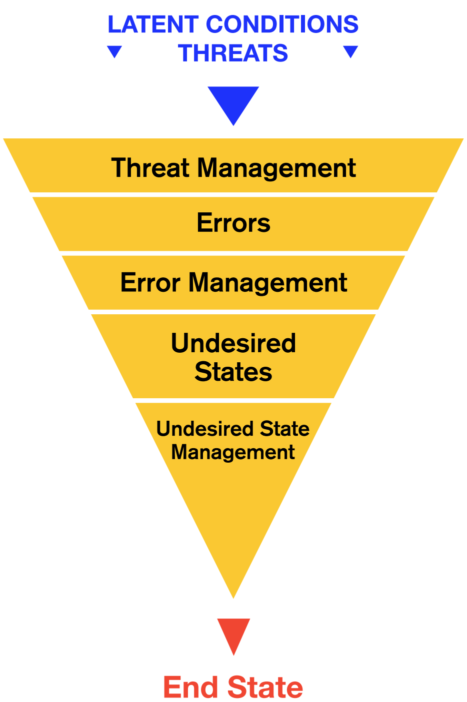


In-Depth Accident Analysis 2016 to 2020

INTRODUCTION TO THREAT AND ERROR MANAGEMENT

The Human Factors Research Project at the University of Texas in Austin developed Threat and Error Management (TEM) as a conceptual framework to interpret data obtained from both normal and abnormal operations. For many years, IATA has worked closely with the University of Texas Human Factors Research Team, ICAO, IATA member airlines and OEMs to apply TEM to its many safety activities.

THREAT AND ERROR MANAGEMENT FRAMEWORK



DEFINITIONS

Latent Conditions: Conditions present in the system before the accident, made evident by triggering factors. These often relate to deficiencies in organizational processes and procedures.

Threat: An event or error that occurs outside the influence of the flight crew, but which requires flight crew attention and management to properly maintain safety margins.

Flight Crew Error: An observed flight crew deviation from organizational expectations or crew intentions.

Undesired Aircraft State (UAS): A flight crew-induced aircraft state that clearly reduces safety margins; a safety compromising situation that results from ineffective TEM. An UAS is recoverable.

End State: An end state is a reportable event. An End State is unrecoverable.

Distinction between 'Undesired Aircraft State' and 'End State': An UAS is recoverable (e.g., an unstable approach from which a go-around would recover the situation). An End State is unrecoverable (e.g., a runway excursion where the aircraft comes to rest off the runway).

ACCIDENT CLASSIFICATION SYSTEM

At the request of member airlines, manufacturers and other organizations involved in the Safety Report, IATA developed an accident classification system based on the TEM framework. The purpose of the taxonomy is to:

- Acquire more meaningful data
- Extract further information/intelligence
- Formulate relevant mitigation strategies/safety recommendations

Unfortunately, some accident reports do not contain sufficient information at the time of the analysis to adequately assess contributing factors. When an event cannot be properly classified due to a lack of information, it is classified under the Insufficient Information category. Where possible, these accidents have been assigned an End State. It should also be noted that the contributing factors that have been classified do not always reflect all the factors that played a part in an accident, but rather those known at the time of the analysis.

Important note: In the in-depth analysis presented in Chapters 4 and 5, the percentages shown with regard to contributing factors (e.g., % of threats and errors noted) are based on the number of accidents in each category. Accidents classified as Insufficient Information are excluded from this part of the analysis. The number of Insufficient Information accidents is noted at the bottom of each analysis of contributing factors. However, accidents classified as Insufficient Information are part of the overall statistics (e.g., % of accidents that were fatal or resulted in a hull loss).

Annex 1 contains definitions and detailed information regarding the types of accidents and aircraft included in the Safety Report as well as the breakdown of IATA regions. The complete IATA TEM-based accident classification system for flight is presented in Annex 2.

ANALYSIS BY ACCIDENT CATEGORY AND REGION

This section presents an in-depth analysis of 2016 to 2020 occurrences by accident category and regional distribution. Definitions of these categories can be found in Annex 2. The countries that make up each of the IATA regions can be found in Annex 1. An in-depth regional analysis can be found in Section 5.

Referring to the accident categories helps an operator to:

- Structure safety activities and set priorities.
- Recall key risk areas (i.e., when a type of accident does not occur in a given year).
- Provide resources for well-identified prevention strategies.
- Address the categories, both systematically and continuously, within the airline's safety management system (SMS).

2020 Aircraft Accidents – Accident Count

Number of accidents: 38
Number of fatalities: 132

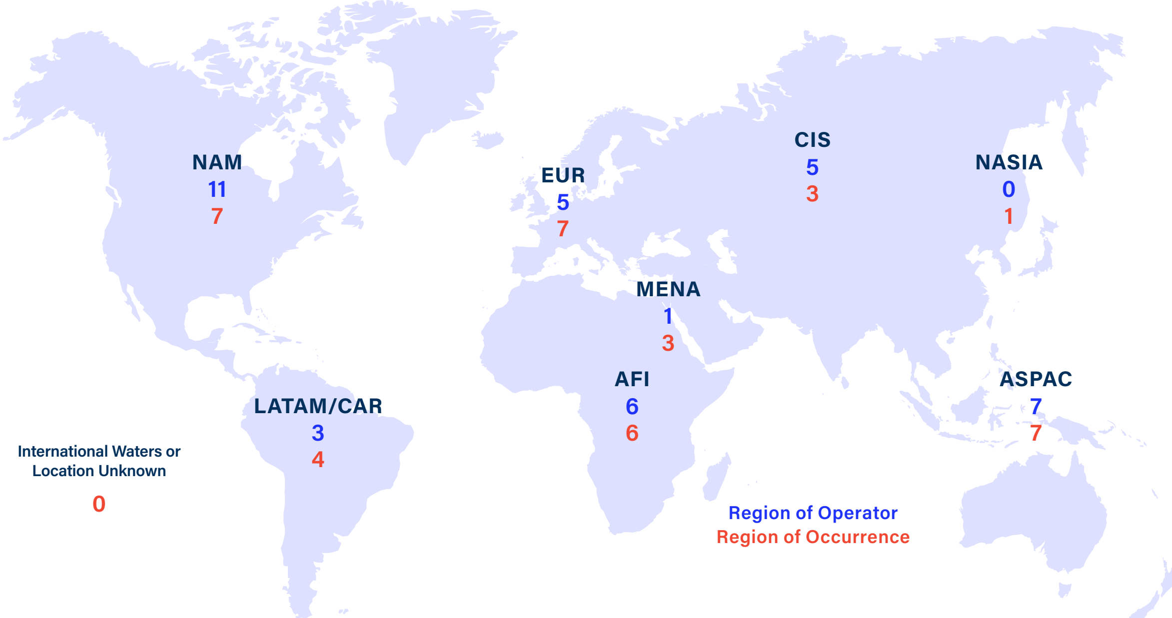
Accident Count % of Total	2020
IATA Member	34%
Full-Loss Equivalents	8%
Fatal	13%
Hull Losses	24%

Passenger	Cargo	Ferry	Jet	Turboprop
63%	37%	0%	71%	29%

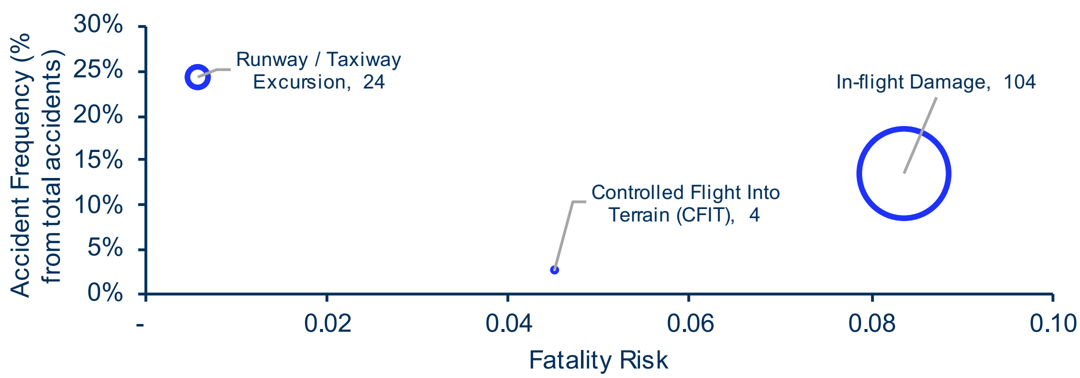
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2020 Aircraft Accidents – Accident Rate*

Accident rate: 1.71

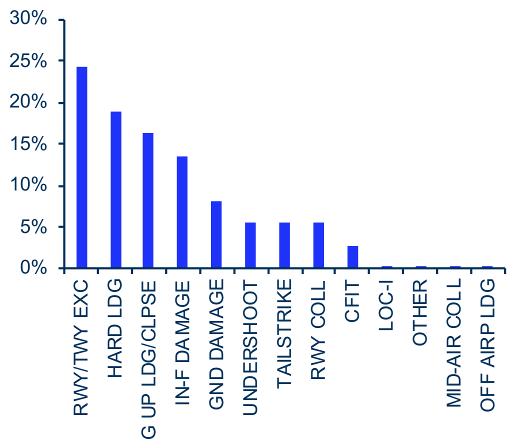
Accident Rate*	2020
IATA Member	0.83
Fatality Risk**	0.13
Fatal	0.23
Hull Losses	0.41

Jet	Turboprop	
1.42	3.50	Accident rates for Passenger, Cargo and Ferry are not available.

*Number of accidents per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2020)

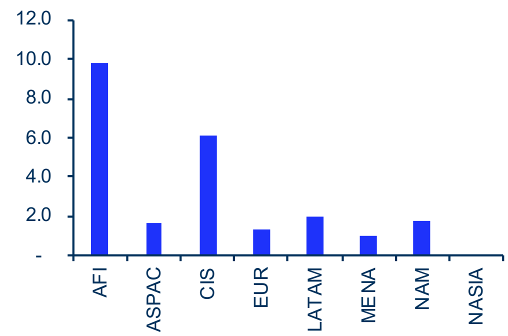
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of [Acronyms/Abbreviations section] for full names.

Regional Accident Rate (2020)

Accident per million sectors



Accidents per Phase of Flight (2020)

Total number of accidents (fatal vs. nonfatal)

Refer to list of [Phase of Flight definitions] for full names

2020 Aircraft Accidents – Contributing Factors

2020 Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	47%
Regulatory Oversight	45%
Flight Operations	34%
Selection Systems	34%
Mgmt Decisions, incl. regul. decision (cost cut)	29%
Flight Ops: SOPs & Checking	26%
Maintenance Operations	21%
Flight Ops: Training Systems	21%
Maintenance Ops: SOPs & Checking	13%
Change Management	8%
Dispatch	5%
Design	5%
Dispatch Ops: SOPs & Checking	3%
Flight Watch/Following/Support	3%
Technology & Equipment	3%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	39%
SOP Adherence/SOP Cross-verification	29%
Failure to GOA after destabilization on approach	26%
Pilot-to-Pilot Communication	13%
Callouts	13%
Failure to GOA after abnormal runway contact	8%
ATC	5%
Crew to External Communication	5%
Briefings	5%
Normal Checklist	3%
Documentation	3%
Systems/Radios/Instruments	3%
Wrong Altimeter Reference Settings (QNH, QFE)	3%
Automation	3%
Wrong Weight & Balance/Fuel Information	3%

2020 Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	45%
Wind/Windshear/Gusty Wind	39%
Aircraft Malfunction	34%
Airport Facilities	26%
Maintenance Events	21%
Gear/Tire	21%
Poor Visibility/IMC	21%
Thunderstorms	18%
Contaminated Runway/Taxiway - poor braking action	16%
Optical Illusion/visual misperception	11%
Inad overrun area/trench/ditch/prox of structures	11%
Nav Aids	8%
Hydraulic System Failure	8%
Ground-based Nav Aid Malfunction or not available	5%
Contained Engine Failure/Powerplant Malfunction	5%
Foreign Objects, FOD	5%
Brakes	5%
Poor sign/lighting, faint markings,rwy/txy closure	5%
Electrical Power Generation Failure	5%
Wildlife/Birds/Foreign Object	5%
Air Traffic Services	5%
Dispatch / Paperwork	3%
Lack of Visual Reference	3%
Extensive / Uncontained Engine Failure	3%
Flight Controls	3%

2020 Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	29%
Unstable Approach	29%
Long/floated/bounced/firm/off-center/crabbed landinging	29%
Continued Landing after Unstable Approach	29%
Abrupt Aircraft Control	26%
Operation Outside Aircraft Limitations	16%
Unnecessary Weather Penetration	11%
Brakes/Thrust Reversers/Ground Spoilers	8%
Loss of Aircraft Control While on the Ground	5%
Weight & Balance	5%
Landing Gear	3%
Controlled Flight Towards Terrain	3%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	26%
Monitor/Cross-check	21%
In-flight Decision-making/contingency management	18%
Captain should show leadership	11%
Leadership	11%
Communication Environment	8%
Workload Management	5%
Plans Stated	5%
Taxiway/Runway Management	5%
FO is assertive when necessary	5%
Evaluation of Plans	5%
SOP Briefing/Planning	3%
Inquiry	3%

Note: one accident was not classified due to insufficient data; this accident was subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

Evidence-Based Training (EBT)

The aim of an EBT program is to identify, develop and evaluate the competencies required by pilots to operate safely, effectively and efficiently in a commercial air transport environment. This is accomplished by managing the most relevant threats and errors based on evidence collected in operations and training.

Why?

Overall flight crew performance is the primary contributing factor to accidents and incidents. The EBT initiative proposes an innovative pilot training methodology, which arose from concerns that traditional recurrent training and licensing were no longer meeting the needs of airline pilots.

IATA's Role?

Since 2008, IATA has led the development of EBT and has supported its implementation across the world. EBT was endorsed by ICAO in 2013, mixed EBT has been possible in Europe since 2016, and EASA enabled full EBT implementation in 2020. Over 50 airlines are engaged in the development of EBT for their own organizations and are in various stages of readiness. A team of current and experienced IATA captains can assist airlines, ATOs and CAAs with all aspects of EBT implementation.

IATA Consulting can assist you with every aspect of EBT implementation

EBT Pre-Implementation

- Deliver awareness workshop(s) to top management and operational staff.
- Assess organization (AOC-ATO) needs.
- Propose options and associated EBT implementation plan.
- Obtain buy-in from your CAA.
- Support internal EBT awareness and communication plan.

Competencies for Pilots and Instructors

- Support the definition and implementation of your pilot and instructor competency grading system.
- Train and assess your EBT instructor core group in accordance with your competency performance standards.

EBT Program Design

- Support your EBT program design.

EBT Tools

- Propose technical solutions for training data collection and analysis.

EBT Monitoring

- Propose technical solutions for training data collection and analysis.
- Adjustment and continuous improvement of the training program

CONTACT

If you need help to qualify a lead, prepare a proposal or want more information on EBT, contact EBT@IATA.org

IATA Consulting

2016-2020 Aircraft Accidents – Accident Count

Number of accidents: 262
Number of fatalities: 1,112

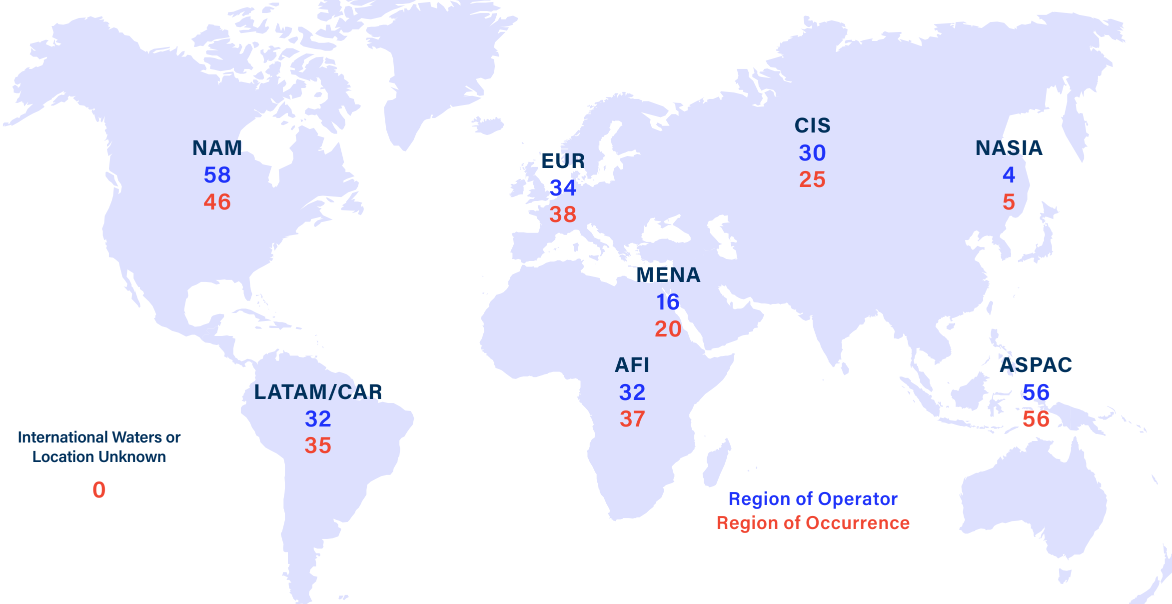
Accident Count % of Total	2016-2020
IATA Member	40%
Full-Loss Equivalents	10%
Fatal	15%
Hull Losses	24%

Passenger	Cargo	Ferry	Jet	Turboprop
79%	21%	1%	66%	34%

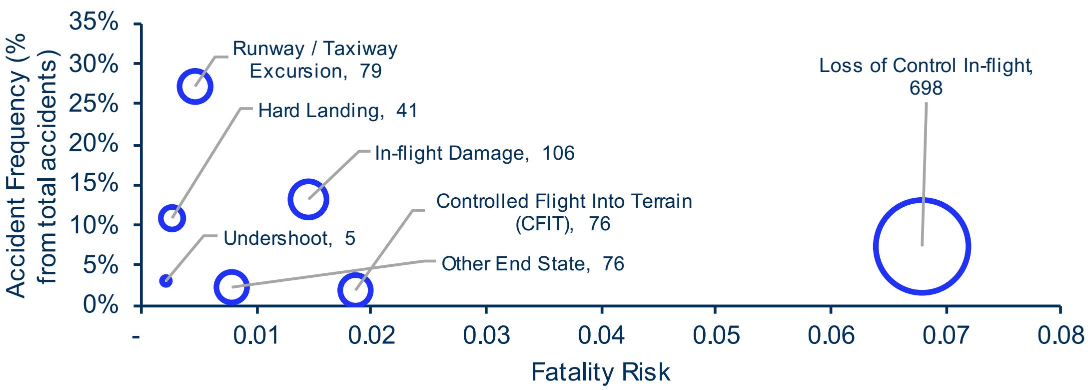
Note: the sum may not add to 100% due to rounding.

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2016-2020 Aircraft Accidents – Accident Rate*

Accident rate: 1.33

Average Accident Rate*	2016-2020
IATA Member	0.96
Fatality Risk**	0.13
Fatal	0.19
Hull Losses	0.33

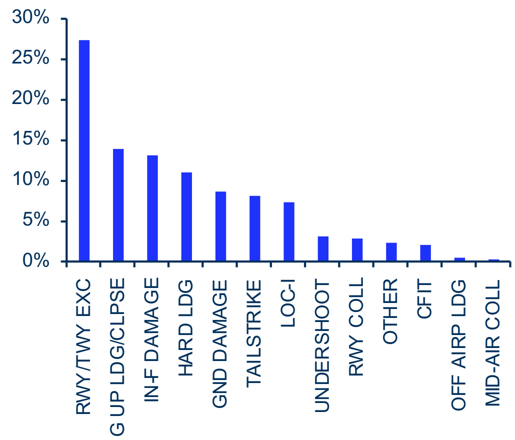
Jet	Turboprop	
1.05	2.83	Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

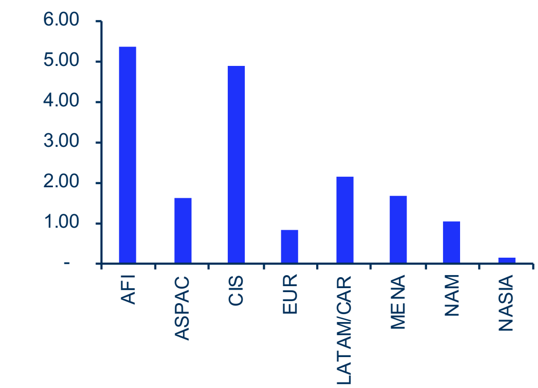
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

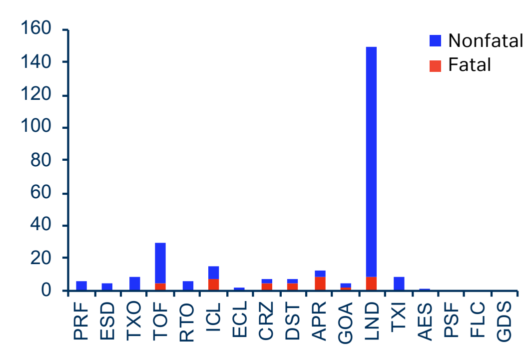
Regional Accident Rate (2016-2020)

Accident per million sectors



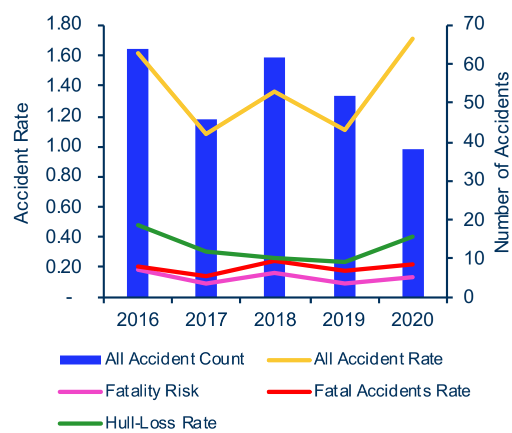
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



2016-2020 Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	37%
Regulatory Oversight	35%
Flight Operations	27%
Flight Ops: SOPs & Checking	19%
Selection Systems	17%
Flight Ops: Training Systems	16%
Mgmt Decisions, incl. regul. decision (cost cut)	12%
Maintenance Operations	12%
Maintenance Ops: SOPs & Checking	11%
Design	7%
Ground Operations	4%
Ground Ops: SOPs & Checking	4%
Dispatch	4%
Dispatch Ops: SOPs & Checking	3%
Technology & Equipment	3%
Change Management	3%
Ground Ops: Training Systems	2%
Ops Planning & Scheduling	2%
Maintenance Ops: Training Systems	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	41%
SOP Adherence/SOP Cross-verification	33%
Callouts	14%
Failure to GOA after destabilization on approach	13%
Pilot-to-Pilot Communication	11%
Failure to GOA after abnormal runway contact	8%
Abnormal Checklist	4%
Crew to External Communication	4%
Automation	4%
Normal Checklist	3%
Briefings	3%
ATC	3%
Systems/Radios/Instruments	3%
Wrong Weight & Balance/Fuel Information	3%
Documentation	3%
Ground Navigation	2%
Maintenance	1%

2016-2020 Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	37%
Aircraft Malfunction	31%
Wind/Windshear/Gusty Wind	25%
Airport Facilities	21%
Thunderstorms	16%
Gear/Tire	15%
Poor Visibility/IMC	14%
Maintenance Events	14%
Contaminated Runway/Taxiway - poor braking action	11%
Operational Pressure	9%
Nav Aids	6%
Ground Events	6%
Inad overrun area/trench/ditch/prox of structures	6%
Ground-based Nav Aid Malfunction or not available	6%
Fatigue	6%
Lack of Visual Reference	6%
Wildlife/Birds/Foreign Object	5%
Air Traffic Services	5%
Contained Engine Failure/Powerplant Malfunction	5%
Poor sign/lighting, faint markings,rwy/txy closure	4%
Optical Illusion/visual misperception	4%
Dispatch/Paperwork	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Traffic	3%
Icing Conditions	3%
Hydraulic System Failure	3%
Terrain/Obstacles	3%
Extensive/Uncontained Engine Failure	3%
Airport Perimeter Control/fencing/wildlife control	2%
Brakes	2%
MEL Item	2%
Avionics/Flight Instruments	1%
Electrical Power Generation Failure	1%
Foreign Objects, FOD	1%
Spatial Disorientation/somatogravic illusion	1%
Manuals/Charts/Checklists	1%
Flight Controls	1%
Structural Failure	1%

2016-2020 Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	26%
Vertical/Lateral/Speed Deviation	22%
Unstable Approach	18%
Abrupt Aircraft Control	17%
Continued Landing after Unstable Approach	16%
Unnecessary Weather Penetration	15%
Operation Outside Aircraft Limitations	12%
Brakes/Thrust Reversers/Ground Spoilers	6%
Engine	5%
Loss of Aircraft Control While on the Ground	5%
Controlled Flight Towards Terrain	4%
Flight Controls/Automation	3%
Weight & Balance	2%
Rejected Takeoff after V_1	2%
Ramp Movements, including when under marshalling	2%
Landing Gear	1%
Systems	1%
Runway/Taxiway Incursion	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	29%
Monitor/Cross-check	23%
In-flight Decision-making/contingency management	18%
Leadership	16%
Captain should show leadership	15%
Taxiway/Runway Management	9%
Workload Management	8%
FO is assertive when necessary	7%
Communication Environment	6%
Automation Management	5%
Evaluation of Plans	5%
Pro-active: In-flight decision-making	4%
Re-Active - Contingency Management	3%
Plans Stated	1%
Inquiry	1%
SOP Briefing/Planning	1%

Note: 28 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

"A continuous, systematic review of **Safety Risks** is essential during a period of change to effectively manage aviation hazards and risks through effective mitigations and safety improvement programs to meet the industry's needs."

IATA Safety

2016-2020 Fatal Aircraft Accidents – Accident Count

Number of accidents: 38
Number of fatalities: 1,112

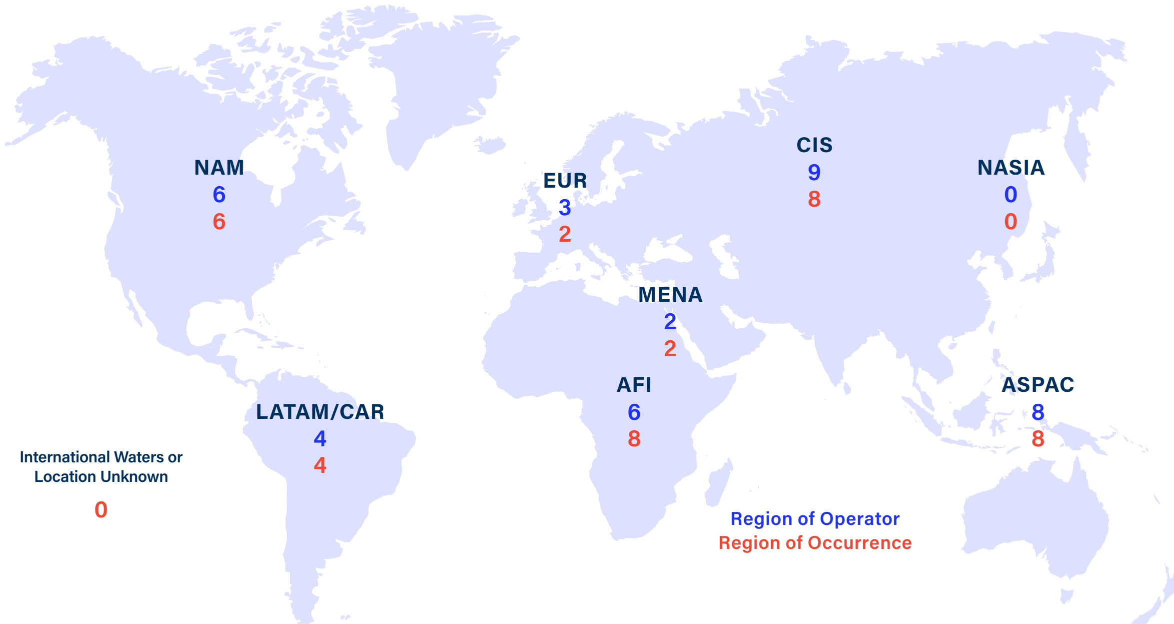
Accident Count % of Total	2016-2020
IATA Member	24%
Full-Loss Equivalents	69%
Fatal	100%
Hull Losses	92%

Passenger	Cargo	Ferry	Jet	Turboprop
61%	39%	0%	47%	53%

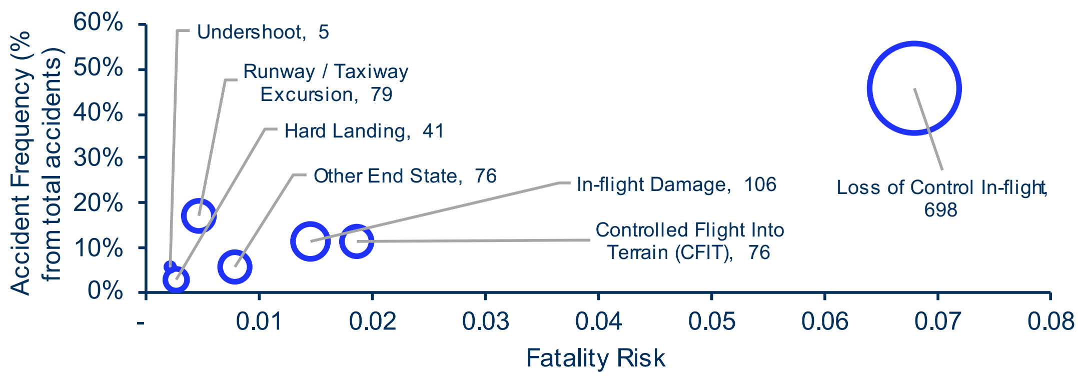
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2016-2020 Fatal Aircraft Accidents – Accident Rate*

Accident rate: 0.19

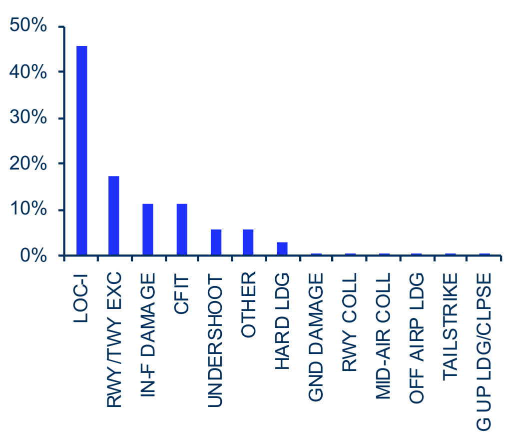
Average Accident Rate*	2016-2020
IATA Member	**0.08**
Fatality Risk**	**0.13**
Fatal	**0.19**
Hull Losses	**0.18**

Jet	Turboprop	
0.11	**0.64**	Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

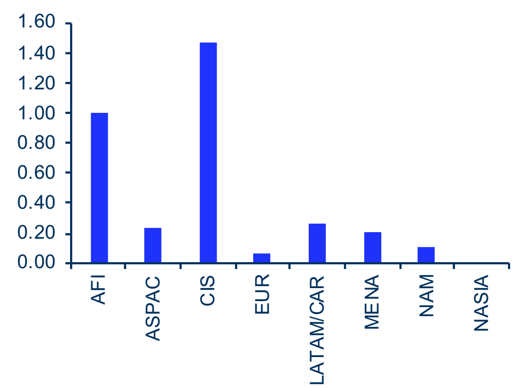
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

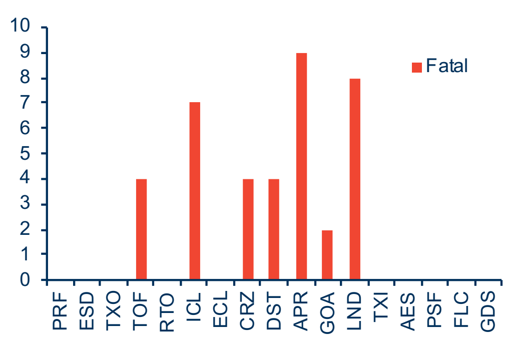
Regional Accident Rate (2016-2020)

Accident per million sectors



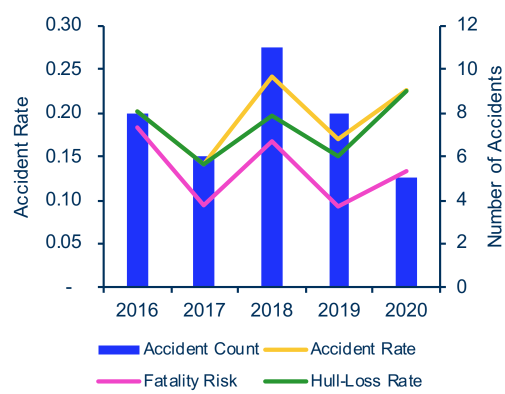
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal)



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



2016-2020 Fatal Aircraft Accidents – Contributing Factors

2016-2020 Fatal Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	71%
Regulatory Oversight	65%
Flight Operations	50%
Flight Ops: SOPs & Checking	41%
Mgmt Decisions, incl. regul. decision (cost cut)	41%
Selection Systems	35%
Flight Ops: Training Systems	32%
Dispatch	18%
Dispatch Ops: SOPs & Checking	15%
Ground Operations	9%
Ground Ops: SOPs & Checking	9%
Change Management	9%
Design	9%
Maintenance Operations	9%
Maintenance Ops: SOPs & Checking	9%
Ops Planning & Scheduling	6%
Maintenance Ops: Training Systems	3%
Flight Watch/Following/Support	3%
Technology & Equipment	3%
Ground Ops: Training Systems	3%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	56%
Manual Handling/Flight Controls	50%
Pilot-to-Pilot Communication	35%
Callouts	32%
Failure to GOA after destabilization on approach	26%
Crew to External Communication	15%
Abnormal Checklist	15%
Wrong Weight & Balance/Fuel Information	12%
Briefings	12%
ATC	12%
Documentation	12%
Systems/Radios/Instruments	9%
Normal Checklist	6%
Maintenance	3%
Failure to GOA after abnormal runway contact	3%
Dispatch	3%
Automation	3%

2016-2020 Fatal Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	53%
Aircraft Malfunction	32%
Poor Visibility/IMC	32%
Operational Pressure	29%
Wind/Windshear/Gusty Wind	21%
Contained Engine Failure/Powerplant Malfunction	18%
Thunderstorms	18%
Fatigue	18%
Air Traffic Services	15%
Dispatch/Paperwork	15%
Lack of Visual Reference	15%
Terrain/Obstacles	12%
Nav Aids	9%
Ground-based Nav Aid Malfunction or not available	9%
Inad overrun area/trench/ditch/prox of structures	9%
Maintenance Events	9%
Icing Conditions	9%
Airport Facilities	9%
Spatial Disorientation/somatogravic illusion	9%
Avionics/Flight Instruments	6%
Ground Events	6%
Structural Failure	3%
Crew Incapacitation	3%
Manuals/Charts/Checklists	3%
Hydraulic System Failure	3%
Wildlife/Birds/Foreign Object	3%
MEL Item	3%
Extensive/Uncontained Engine Failure	3%

2016-2020 Fatal Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	47%
Operation Outside Aircraft Limitations	47%
Unnecessary Weather Penetration	32%
Abrupt Aircraft Control	29%
Continued Landing after Unstable Approach	26%
Unstable Approach	24%
Controlled Flight Towards Terrain	21%
Brakes/Thrust Reversers/Ground Spoilers	12%
Long/floated/bounced/firm/off-center/crabbed landing	12%
Weight & Balance	9%
Flight Controls/Automation	9%
Engine	9%
Loss of Aircraft Control While on the Ground	3%
Unauthorized Airspace Penetration	3%
Landing Gear	3%
Systems	3%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	53%
Monitor/Cross-check	50%
In-flight Decision-making/contingency management	44%
Leadership	44%
Captain should show leadership	41%
Communication Environment	26%
FO is assertive when necessary	26%
Workload Management	21%
Evaluation of Plans	15%
Automation Management	15%
Taxiway/Runway Management	12%
Re-Active - Contingency Management	12%
Plans Stated	9%
Pro-active: In-flight decision-making	6%
SOP Briefing/Planning	6%
Inquiry	6%

Note: four accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

2016-2020 Nonfatal Aircraft Accidents – Accident Count

Number of accidents: 224
Number of fatalities: 0

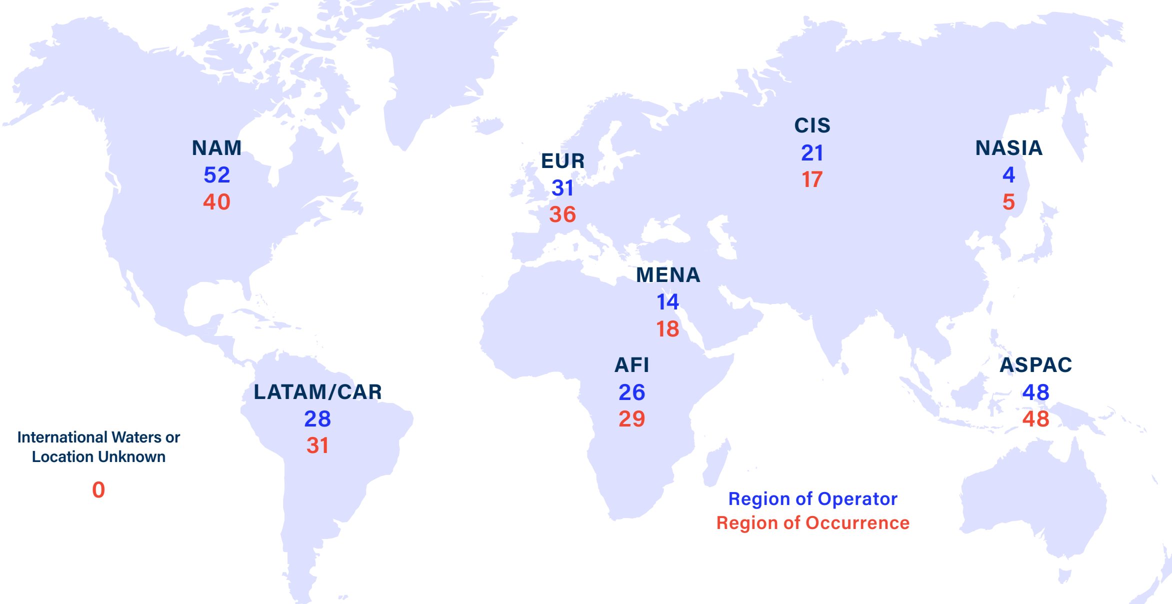
Accident Count % of Total	2016-2020
IATA Member	43%
Full-Loss Equivalents	0%
Fatal	0%
Hull Losses	13%

Passenger	Cargo	Ferry	Jet	Turboprop
82%	17%	1%	70%	30%

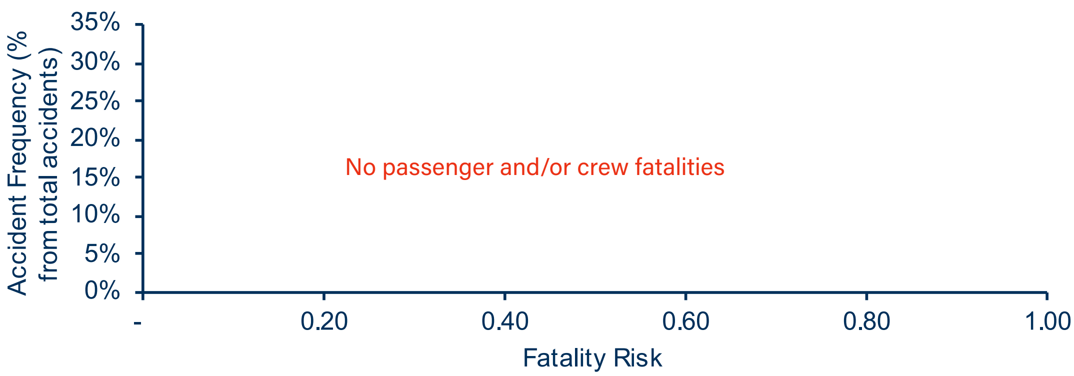
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2016-2020 Nonfatal Aircraft Accidents – Accident Rate*

Accident rate: 1.14

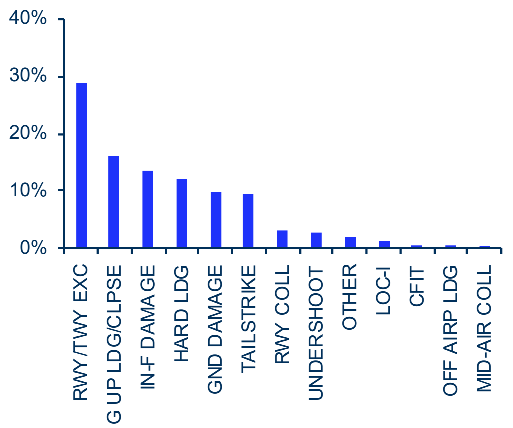
Accident Rate*	2016-2020
IATA Member	0.88
Fatality Risk**	–
Fatal	–
Hull Losses	0.15

Jet	Turboprop	
0.94	2.18	Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

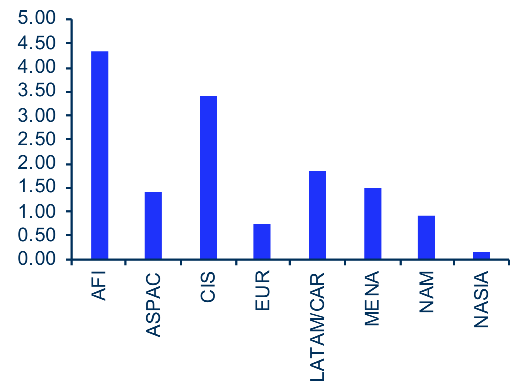
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

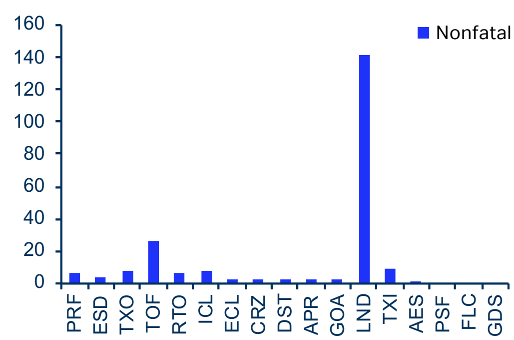
Regional Accident Rate (2016-2020)

Accident per million sectors



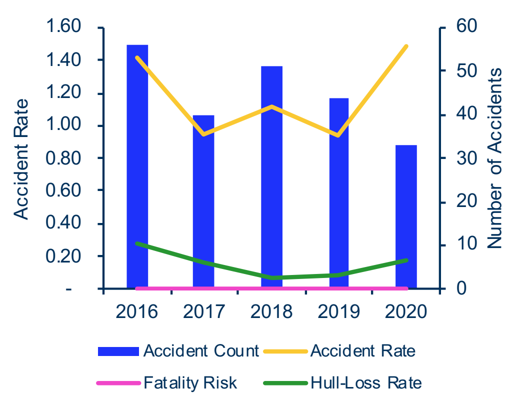
Accidents per Phase of Flight (2016-2020)

Total number of accidents (nonfatal)



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



2016-2020 Nonfatal Aircraft Accidents – Contributing Factors

2016-2020 Nonfatal Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	31%
Regulatory Oversight	30%
Flight Operations	23%
Flight Ops: SOPs & Checking	15%
Selection Systems	14%
Flight Ops: Training Systems	13%
Maintenance Operations	13%
Maintenance Ops: SOPs & Checking	11%
Mgmt Decisions, incl. regul. decision (cost cut)	7%
Design	6%
Ground Operations	3%
Ground Ops: SOPs & Checking	3%
Technology & Equipment	2%
Ground Ops: Training Systems	2%
Change Management	1%
Dispatch	1%
Ops Planning & Scheduling	1%
Maintenance Ops: Training Systems	1%
Cabin Operations	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	39%
SOP Adherence/SOP Cross-verification	29%
Failure to GOA after destabilization on approach	10%
Callouts	10%
Failure to GOA after abnormal runway contact	9%
Pilot-to-Pilot Communication	7%
Automation	4%
Abnormal Checklist	2%
Normal Checklist	2%
Ground Navigation	2%
Crew to External Communication	2%
Briefings	1%
Systems/Radios/Instruments	1%
ATC	1%
Documentation	1%
Wrong Weight & Balance/Fuel Information	1%
Wrong Altimeter Reference Settings (QNH, QFE)	1%
Maintenance	1%

2016-2020 Nonfatal Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	35%
Aircraft Malfunction	31%
Wind/Windshear/Gusty Wind	25%
Airport Facilities	23%
Gear/Tire	18%
Thunderstorms	15%
Maintenance Events	15%
Contaminated Runway/Taxiway - poor braking action	13%
Poor Visibility/IMC	11%
Ground Events	6%
Nav Aids	6%
Inad overrun area/trench/ditch/prox of structures	5%
Wildlife/Birds/Foreign Object	5%
Ground-based Nav Aid Malfunction or not available	5%
Poor sign/lighting, faint markings,rwy/txy closure	5%
Operational Pressure	5%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Optical Illusion/visual misperception	4%
Lack of Visual Reference	4%
Traffic	4%
Air Traffic Services	3%
Fatigue	3%
Hydraulic System Failure	3%
Extensive/Uncontained Engine Failure	2%
Airport Perimeter Control/fencing/wildlife control	2%
Icing Conditions	2%
Contained Engine Failure/Powerplant Malfunction	2%
Brakes	2%
Dispatch/Paperwork	2%
MEL Item	2%
Foreign Objects, FOD	1%
Electrical Power Generation Failure	1%
Flight Controls	1%
Terrain/Obstacles	1%
Primary Flight Control	1%
Secondary Flight Control	1%
Dangerous Goods	1%
Avionics/Flight Instruments	1%
Structural Failure	1%

2016-2020 Nonfatal Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	28%
Vertical/Lateral/Speed Deviation	18%
Unstable Approach	17%
Abrupt Aircraft Control	15%
Continued Landing after Unstable Approach	14%
Unnecessary Weather Penetration	12%
Operation Outside Aircraft Limitations	6%
Loss of Aircraft Control While on the Ground	5%
Brakes/Thrust Reversers/Ground Spoilers	4%
Engine	4%
Ramp Movements, including when under marshalling	2%
Flight Controls/Automation	2%
Rejected Takeoff after V_1	2%
Landing Gear	1%
Runway/Taxiway Incursion	1%
Weight & Balance	1%
Controlled Flight Towards Terrain	1%
Systems	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	25%
Monitor/Cross-check	18%
In-flight Decision-making/contingency management	13%
Leadership	11%
Captain should show leadership	10%
Taxiway/Runway Management	9%
Workload Management	5%
FO is assertive when necessary	3%
Pro-active: In-flight decision-making	3%
Automation Management	3%
Evaluation of Plans	3%
Communication Environment	3%
Re-Active - Contingency Management	2%
Inquiry	1%

Note: 24 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

2016-2020 IOSA Aircraft Accidents – Accident Count

Number of accidents: 133
Number of fatalities: 691

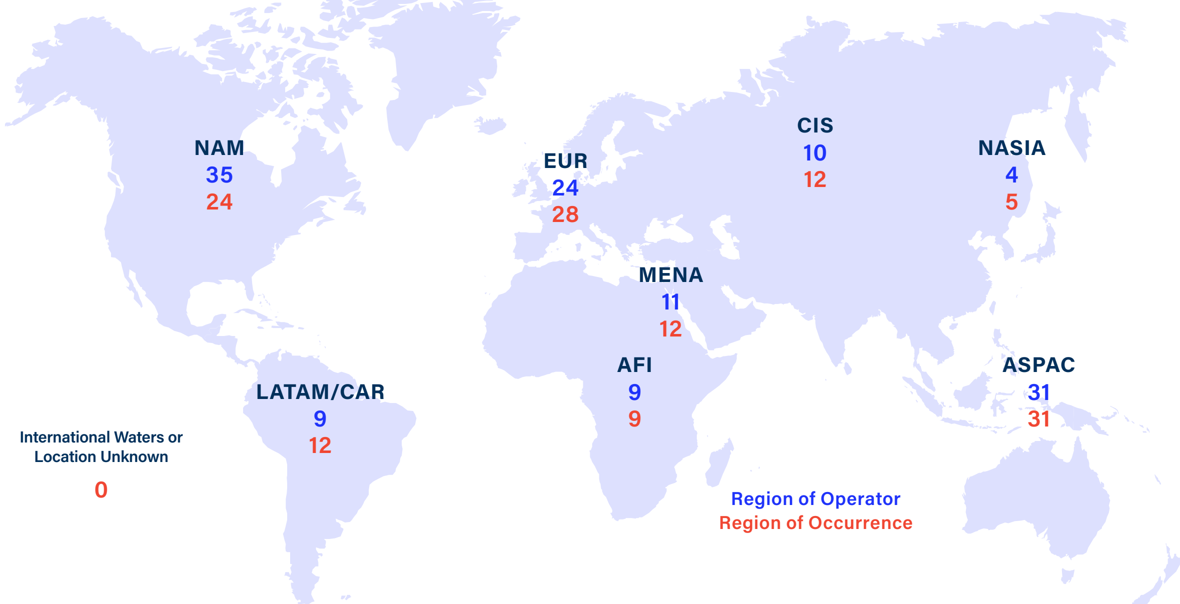
Accident Count % of Total	2016-2020
IATA Member	79%
Full-Loss Equivalents	7%
Fatal	9%
Hull Losses	17%

Passenger	Cargo	Ferry	Jet	Turboprop
93%	7%	0%	86%	14%

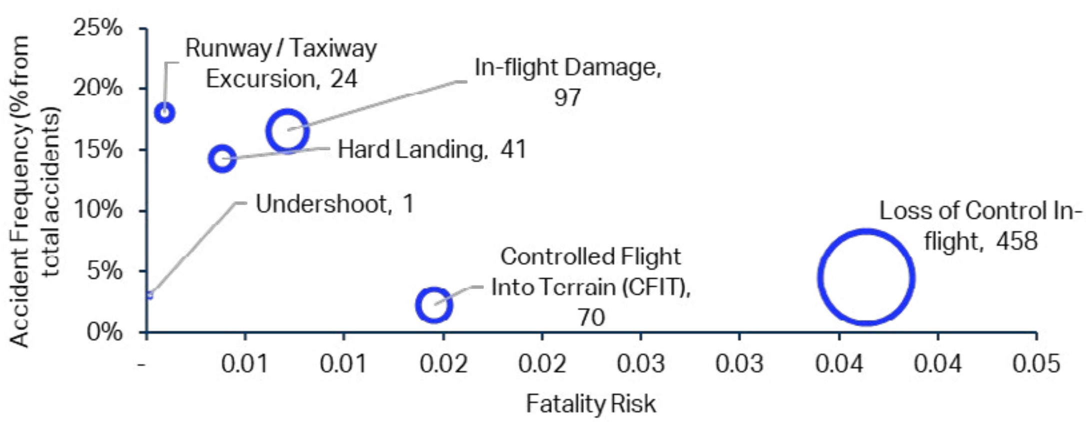
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2016-2020 IOSA Aircraft Accidents – Accident Rate*

Accident rate: 0.97

Accident Rate*	2016-2020
IATA Member	0.97
Fatality Risk**	0.06
Fatal	0.09
Hull Losses	0.16

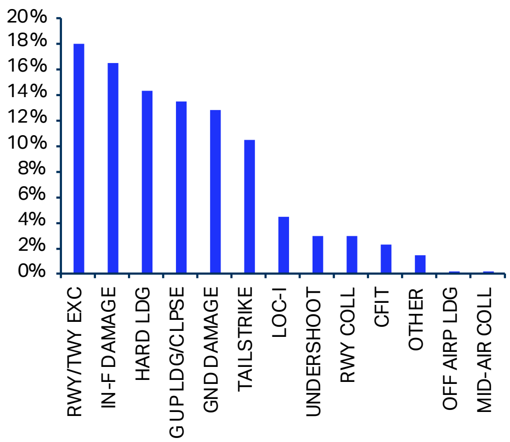
Jet	Turboprop	
0.90	1.68	Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

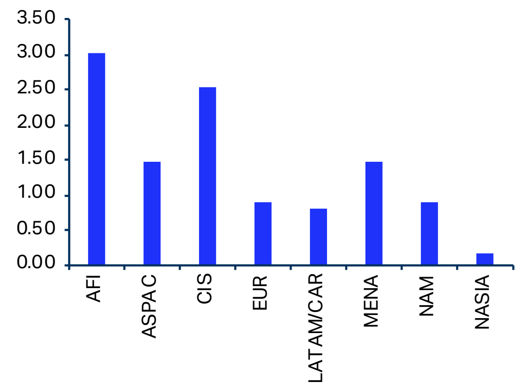
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

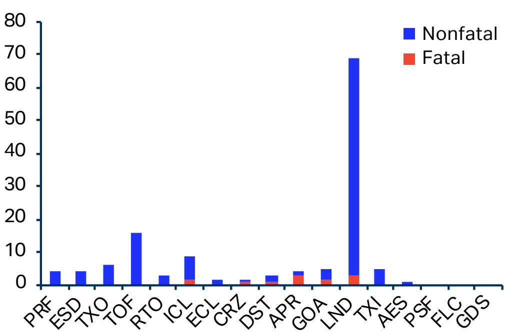
Regional Accident Rate (2016-2020)

Accident per million sectors



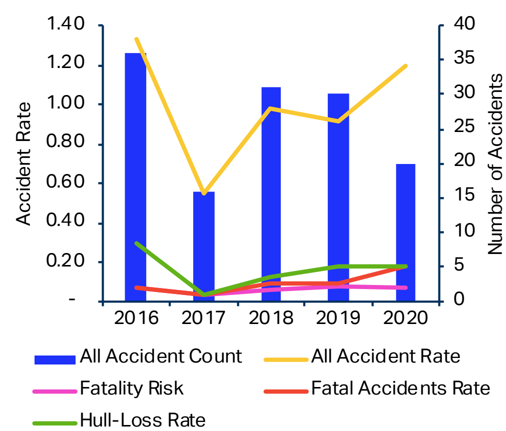
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



2016-2020 IOSA Aircraft Accidents – Contributing Factors

2016-2020 IOSA Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	28%
Safety Management	28%
Flight Operations	25%
Flight Ops: SOPs & Checking	21%
Flight Ops: Training Systems	18%
Selection Systems	15%
Maintenance Operations	11%
Maintenance Ops: SOPs & Checking	10%
Mgmt Decisions, incl. regul. decision (cost cut)	9%
Design	8%
Ground Operations	3%
Change Management	3%
Technology & Equipment	3%
Ground Ops: SOPs & Checking	2%
Ground Ops: Training Systems	2%
Maintenance Ops: Training Systems	2%
Cabin Operations	1%
Ops Planning & Scheduling	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	44%
SOP Adherence/SOP Cross-verification	34%
Failure to GOA after destabilization on approach	16%
Pilot-to-Pilot Communication	14%
Callouts	14%
Failure to GOA after abnormal runway contact	10%
Automation	6%
Abnormal Checklist	4%
Crew to External Communication	3%
Systems/Radios/Instruments	3%
Ground Navigation	3%
Normal Checklist	3%
Briefings	2%
ATC	2%
Documentation	1%
Maintenance	1%
Wrong Altimeter Reference Settings (QNH, QFE)	1%
Wrong Weight & Balance/Fuel Information	1%

2016-2020 IOSA Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	38%
Wind/Windshear/Gusty Wind	27%
Aircraft Malfunction	27%
Airport Facilities	18%
Thunderstorms	17%
Poor Visibility/IMC	16%
Gear/Tire	16%
Maintenance Events	14%
Contaminated Runway/Taxiway - poor braking action	10%
Ground Events	7%
Fatigue	6%
Operational Pressure	6%
Lack of Visual Reference	6%
Traffic	6%
Wildlife/Birds/Foreign Object	6%
Fire/Smoke (Cockpit/Cabin/Cargo)	6%
Air Traffic Services	5%
Inad overrun area/trench/ditch/prox of structures	5%
Optical Illusion/visual misperception	4%
Poor sign/lighting, faint markings,rwy/txy closure	4%
Contained Engine Failure/Powerplant Malfunction	3%
Nav Aids	3%
Ground-based Nav Aid Malfunction or not available	3%
Extensive/Uncontained Engine Failure	2%
Hydraulic System Failure	2%
Dispatch/Paperwork	2%
Spatial Disorientation/somatogravic illusion	2%
Terrain/Obstacles	2%
Airport Perimeter Control/fencing/wildlife control	2%
Manuals/Charts/Checklists	2%
Foreign Objects, FOD	2%
Icing Conditions	2%
Electrical Power Generation Failure	1%
Dangerous Goods	1%
MEL Item	1%
Avionics/Flight Instruments	1%

2016-2020 IOSA Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	29%
Long/floated/bounced/firm/off-center/crabbed landing	27%
Unstable Approach	21%
Continued Landing after Unstable Approach	20%
Abrupt Aircraft Control	19%
Unnecessary Weather Penetration	16%
Operation Outside Aircraft Limitations	8%
Brakes/Thrust Reversers/Ground Spoilers	6%
Flight Controls/Automation	6%
Engine	4%
Controlled Flight Towards Terrain	4%
Loss of Aircraft Control While on the Ground	3%
Ramp Movements, including when under marshalling	3%
Rejected Takeoff after V_1	1%
Weight & Balance	1%
Systems	1%
Runway/Taxiway Incursion	1%
Landing Gear	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	33%
Monitor/Cross-check	23%
Leadership	21%
Captain should show leadership	19%
In-flight Decision-making/contingency management	16%
Workload Management	10%
FO is assertive when necessary	9%
Communication Environment	9%
Automation Management	7%
Taxiway/Runway Management	7%
Pro-active: In-flight decision-making	5%
Re-Active - Contingency Management	3%
Evaluation of Plans	2%
Plans Stated	2%
SOP Briefing/Planning	1%
Inquiry	1%

Note: eight accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

> **Safety Connect** supports the delivery of a connected IATA community where IATA safety improvement programs actively support IATA members, and the wider industry, to continually reduce the likelihood of aviation incidents and accidents.

IATA Safety

2016-2020 Non-IOSA Aircraft Accidents – Accident Count

Number of accidents: 129

Number of fatalities: 421

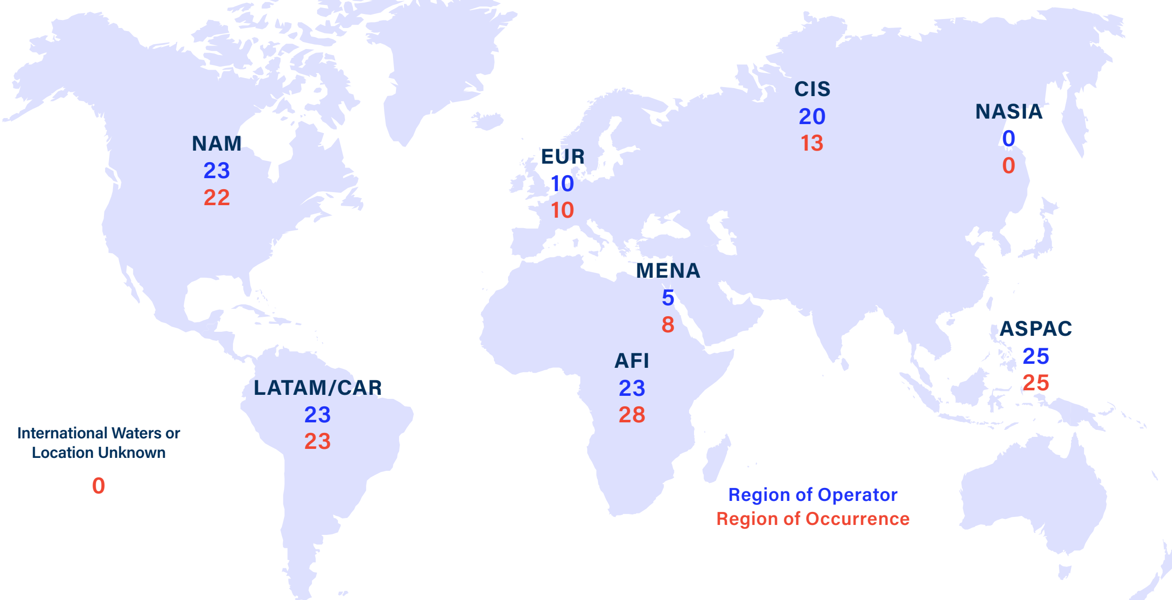
Accident Count % of Total	2016-2020
IATA Member	0%
Full-Loss Equivalents	14%
Fatal	20%
Hull Losses	33%

Passenger	Cargo	Ferry	Jet	Turboprop
64%	35%	2%	47%	53%

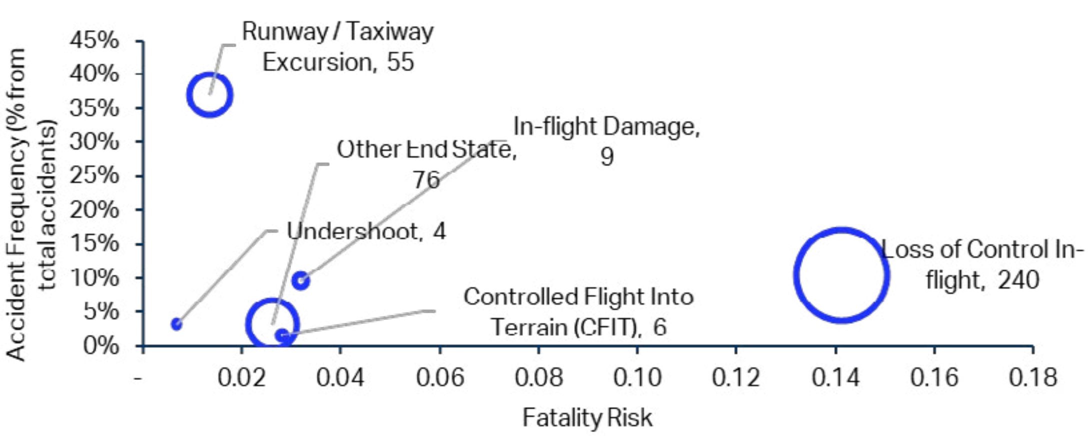
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

2016-2020 Non-IOSA Aircraft Accidents – Accident Rate*

Accident rate: 2.18

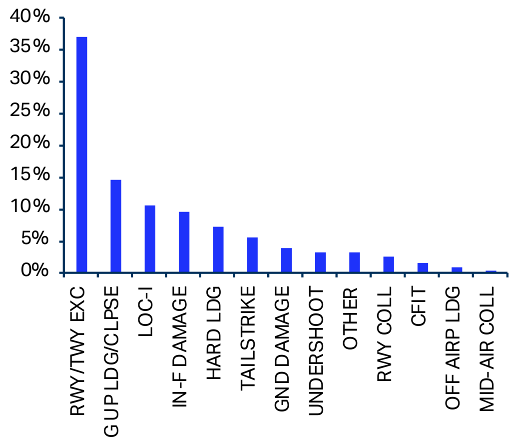
Accident Rate*	2016-2020
IATA Member	-
Fatality Risk**	0.30
Fatal	0.44
Hull Losses	0.71

Jet	Turboprop	
1.52	3.47	Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

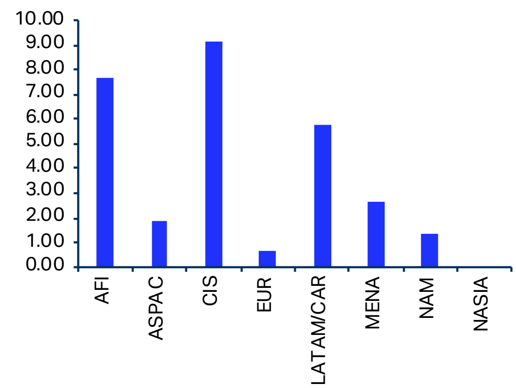
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

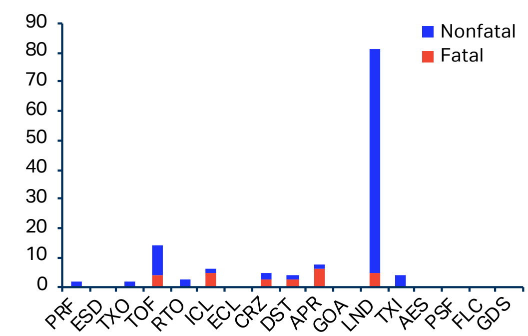
Regional Accident Rate (2016-2020)

Accident per million sectors



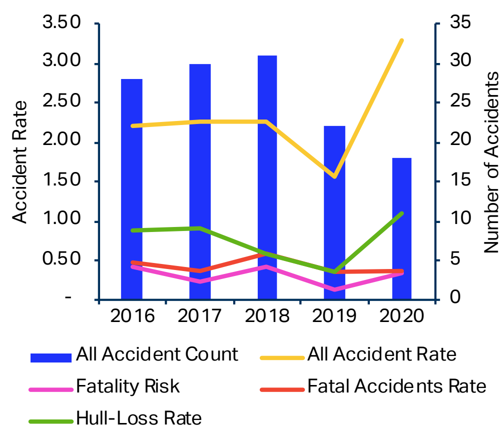
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



2016-2020 Non-IOSA Aircraft Accidents – Contributing Factors

2016-2020 Non-IOSA Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	46%
Regulatory Oversight	43%
Flight Operations	29%
Selection Systems	19%
Flight Ops: SOPs & Checking	17%
Mgmt Decisions, incl. regul. decision (cost cut)	16%
Flight Ops: Training Systems	14%
Maintenance Operations	14%
Maintenance Ops: SOPs & Checking	11%
Dispatch	8%
Ground Ops: SOPs & Checking	5%
Dispatch Ops: SOPs & Checking	5%
Ground Operations	5%
Design	5%
Ops Planning & Scheduling	3%
Ground Ops: Training Systems	3%
Technology & Equipment	2%
Change Management	2%
Maintenance Ops: Training Systems	1%
Flight Watch/Following/Support	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	37%
SOP Adherence/SOP Cross-verification	33%
Callouts	13%
Failure to GOA after destabilization on approach	9%
Pilot-to-Pilot Communication	8%
Failure to GOA after abnormal runway contact	6%
Wrong Weight & Balance/Fuel Information	5%
Documentation	5%
Abnormal Checklist	5%
Crew to External Communication	5%
ATC	4%
Briefings	4%
Normal Checklist	3%
Automation	2%
Systems/Radios/Instruments	2%
Dispatch	1%
Maintenance	1%
Ground Navigation	1%

2016-2020 Non-IOSA Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	37%
Aircraft Malfunction	36%
Airport Facilities	24%
Wind/Windshear/Gusty Wind	22%
Maintenance Events	15%
Gear/Tire	15%
Thunderstorms	15%
Poor Visibility/IMC	13%
Contaminated Runway/Taxiway - poor braking action	13%
Operational Pressure	11%
Nav Aids	10%
Ground-based Nav Aid Malfunction or not available	9%
Inad overrun area/trench/ditch/prox of structures	7%
Contained Engine Failure/Powerplant Malfunction	6%
Dispatch/Paperwork	5%
Air Traffic Services	5%
Lack of Visual Reference	5%
Icing Conditions	5%
Wildlife/Birds/Foreign Object	5%
Poor sign/lighting, faint markings,rwy/txy closure	5%
Ground Events	5%
Fatigue	5%
Hydraulic System Failure	4%
Optical Illusion/visual misperception	4%
Terrain/Obstacles	4%
Brakes	4%
MEL Item	3%
Extensive/Uncontained Engine Failure	3%
Airport Perimeter Control/fencing/wildlife control	3%
Flight Controls	2%
Fire/Smoke (Cockpit/Cabin/Cargo)	2%
Avionics/Flight Instruments	2%
Structural Failure	2%
Electrical Power Generation Failure	2%
Spatial Disorientation/somatogravic illusion	1%
Secondary Flight Controls	1%
Foreign Objects, FOD	1%
Traffic	1%
Crew Incapacitation	1%
Primary Flight Controls	1%

2016-2020 Non-IOSA Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	24%
Operation Outside Aircraft Limitations	17%
Unstable Approach	15%
Abrupt Aircraft Control	15%
Vertical/Lateral/Speed Deviation	15%
Unnecessary Weather Penetration	14%
Continued Landing after Unstable Approach	12%
Loss of Aircraft Control While on the Ground	6%
Engine	5%
Brakes/Thrust Reversers/Ground Spoilers	5%
Weight & Balance	4%
Controlled Flight Towards Terrain	4%
Rejected Takeoff after V_1	3%
Landing Gear	2%
Runway/Taxiway Incursion	1%
Unauthorized Airspace Penetration	1%
Systems	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	25%
Monitor/Cross-check	22%
In-flight Decision-making/contingency management	20%
Taxiway/Runway Management	12%
Leadership	10%
Captain should show leadership	10%
Evaluation of Plans	7%
Workload Management	5%
FO is assertive when necessary	5%
Communication Environment	4%
Re-Active - Contingency Management	4%
Automation Management	3%
Pro-active: In-flight decision-making	3%
Inquiry	2%
Plans Stated	1%
SOP Briefing/Planning	1%

Note: 20 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

Loss of Control — In-flight – Accident Count

2020	Number of accidents:	0	Number of fatalities:	0
2016-2020	Number of accidents:	19	Number of fatalities:	698

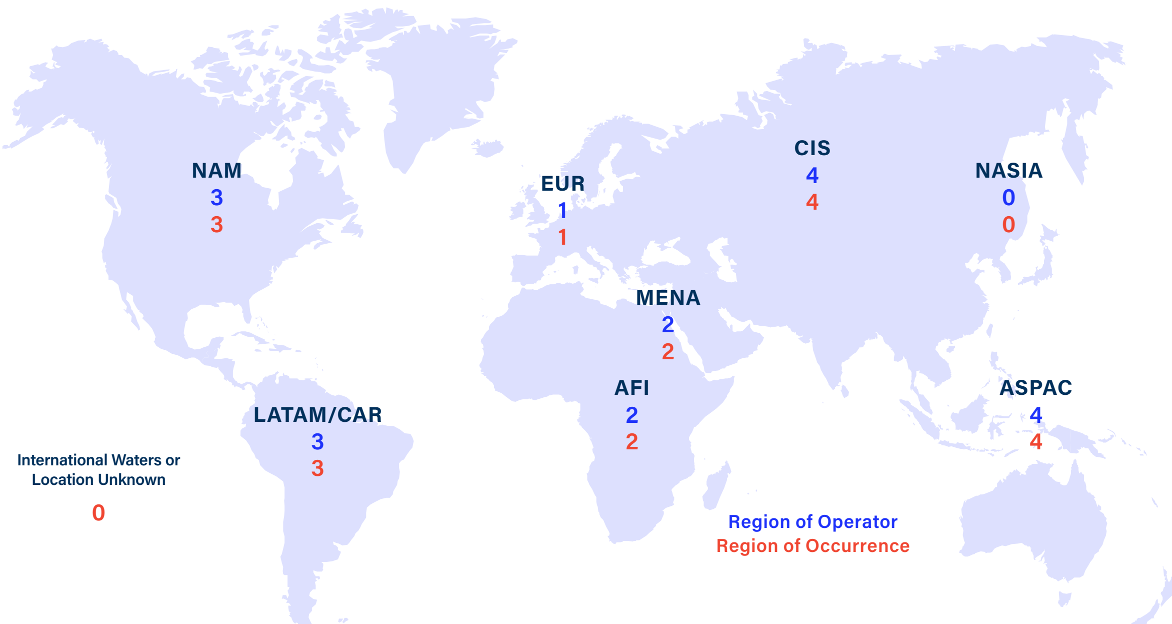
Accident Count % of Total	2020	'16-'20
IATA Member	0%	26%
Full-Loss Equivalents	0%	70%
Fatal	0%	84%
Hull Losses	0%	95%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	0%	0%	0%	0%	0%
2016-2020	68%	32%	0%	58%	42%

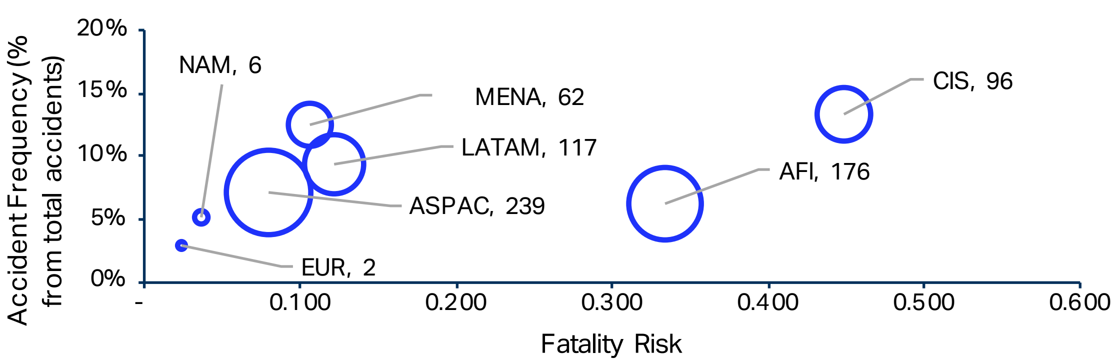
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Loss of Control — In-flight – Accident Rate*

2020 Accident rate: –
2016-2020 Accident rate: 0.10

Accident Rate*	2020	'16-'20
IATA Member	–	0.05
Fatality Risk**	–	0.07
Fatal	–	0.08
Hull Losses	–	0.09

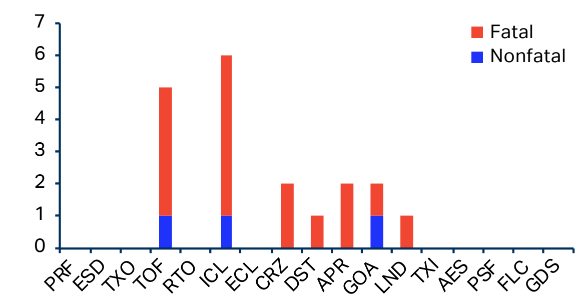
	Jet	Turboprop
2020	–	–
2016-2020	0.07	0.26

Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

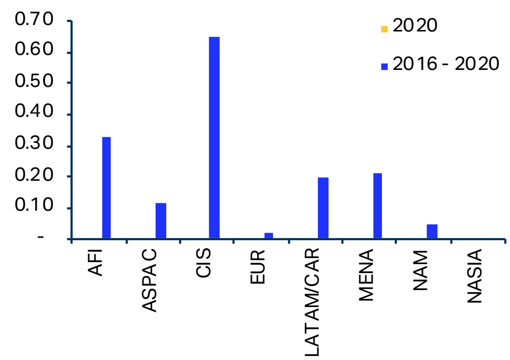
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



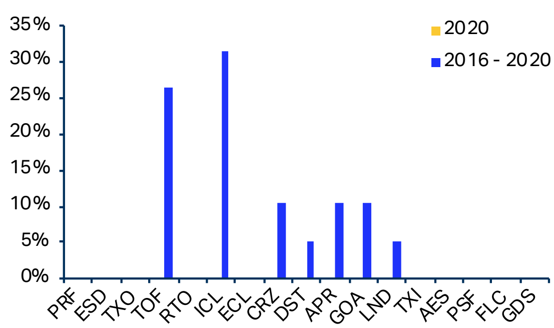
Regional Accident Rate (2016-2020)

Accident per million sectors



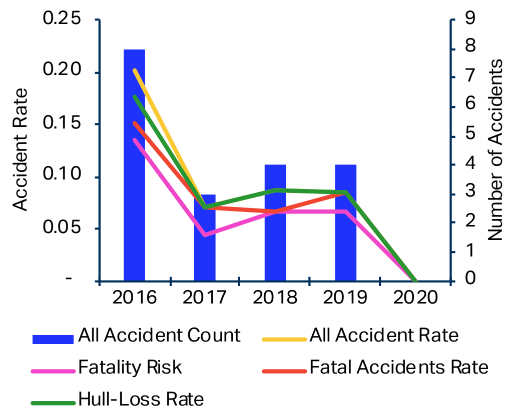
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Loss of Control — In-flight

LATENT CONDITIONS

	Percentage Contribution
Safety Management	63%
Flight Operations	53%
Regulatory Oversight	53%
Flight Ops: SOPs & Checking	47%
Mgmt Decisions, incl. regul. decision (cost cut)	37%
Selection Systems	37%
Flight Ops: Training Systems	37%
Dispatch Ops: SOPs & Checking	16%
Ground Ops: SOPs & Checking	16%
Ground Operations	16%
Dispatch	16%
Design	11%
Change Management	11%
Ground Ops: Training Systems	5%
Maintenance Ops: SOPs & Checking	5%
Maintenance Ops: Training Systems	5%
Maintenance Operations	5%
Ops Planning & Scheduling	5%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	47%
Manual Handling/Flight Controls	47%
Pilot-to-Pilot Communication	32%
Abnormal Checklist	21%
Callouts	21%
Systems/Radios/Instruments	16%
Wrong Weight & Balance/Fuel Information	11%
Automation	11%
Documentation	11%
Normal Checklist	5%
Maintenance	5%
Failure to GOA after destabilization on approach	5%
Crew to External Communication	5%

Loss of Control — In-flight

THREATS

	Percentage Contribution
Meteorology	47%
Aircraft Malfunction	37%
Contained Engine Failure/Powerplant Malfunction	26%
Poor Visibility/IMC	21%
Icing Conditions	16%
Fatigue	16%
Wind/Windshear/Gusty Wind	16%
Lack of Visual Reference	16%
Operational Pressure	16%
Spatial Disorientation/somatogravic illusion	16%
Avionics/Flight Instruments	11%
Ground Events	11%
Dispatch/Paperwork	11%
Maintenance Events	11%
Airport Facilities	5%
Manuals/Charts/Checklists	5%
Air Traffic Services	5%
Wildlife/Birds/Foreign Object	5%
Inad overrun area/trench/ditch/prox of structures	5%
Thunderstorms	5%
MEL Item	5%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Operation Outside Aircraft Limitations	42%
Vertical/Lateral/Speed Deviation	37%
Abrupt Aircraft Control	26%
Flight Controls/Automation	21%
Unnecessary Weather Penetration	16%
Weight & Balance	11%
Continued Landing after Unstable Approach	5%
Systems	5%
Unstable Approach	5%
Long/floated/bounced/firm/off-center/crabbed landing	5%
Engine	5%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	53%
Monitor/Cross-check	47%
Leadership	42%
Captain should show leadership	37%
In-flight Decision-making/contingency management	32%
Workload Management	26%
FO is assertive when necessary	21%
Communication Environment	16%
Automation Management	16%
Pro-active: In-flight decision-making	5%
Taxiway/Runway Management	5%
Re-Active - Contingency Management	5%
SOP Briefing/Planning	5%
Evaluation of Plans	5%

Note: all of the accidents were classified.

Refer to the list of Accident Classification Taxonomy.

See overview of LOC-I and related ACTG recommendations

Controlled Flight into Terrain – Accident Count

2020 Number of accidents: 1 Number of fatalities: 4
2016-2020 Number of accidents: 5 Number of fatalities: 76

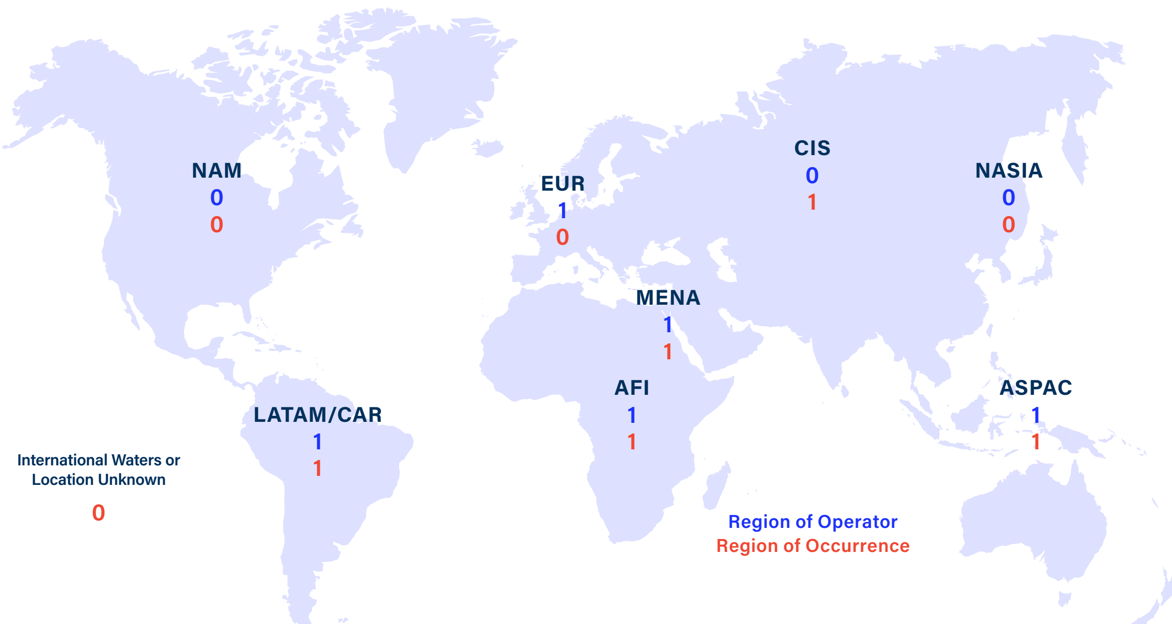
Accident Count % of Total	2020	'16-'20
IATA Member	0%	20%
Full-Loss Equivalents	100%	73%
Fatal	100%	80%
Hull Losses	100%	80%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	0%	100%	0%	0%	100%
2016-2020	40%	60%	0%	20%	80%

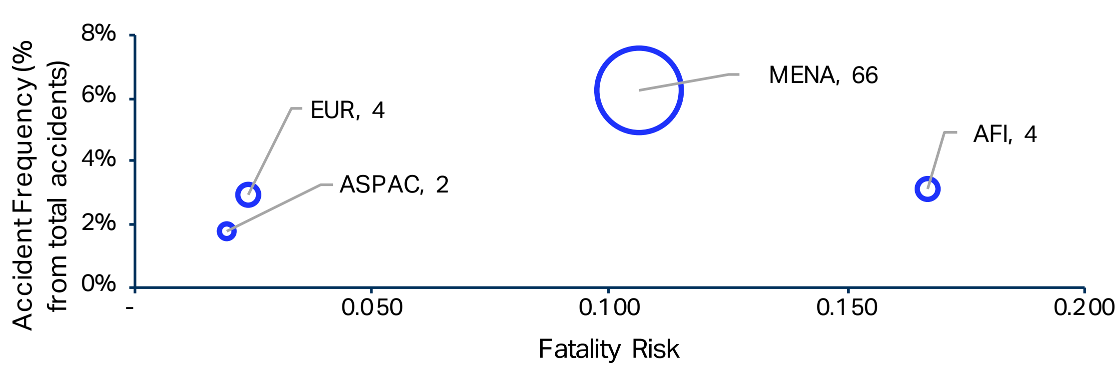
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Controlled Flight into Terrain – Accident Rate*

2020 Accident rate: 0.05
2016-2020 Accident rate: 0.03

Accident Rate*	2020	'16-'20
IATA Member	–	0.01
Fatality Risk**	0.05	0.02
Fatal	0.05	0.02
Hull Losses	0.05	0.02

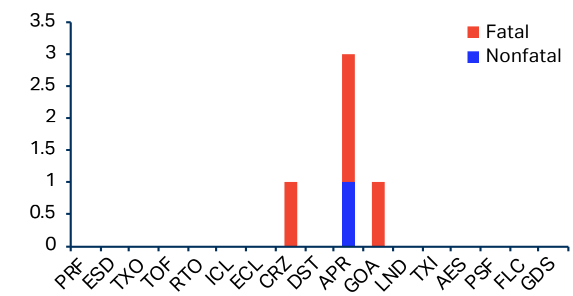
	Jet	Turboprop
2020	–	0.32
2016-2020	0.01	0.13

Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

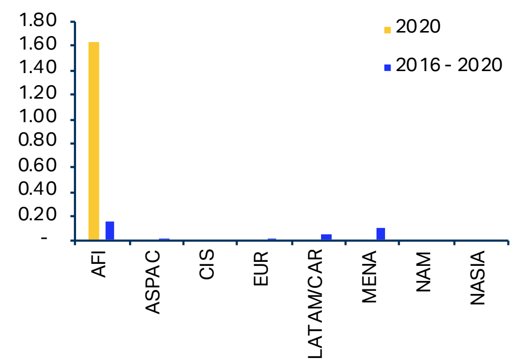
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



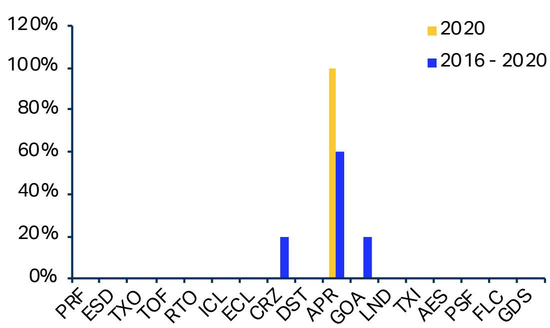
Regional Accident Rate (2016-2020)

Accident per million sectors



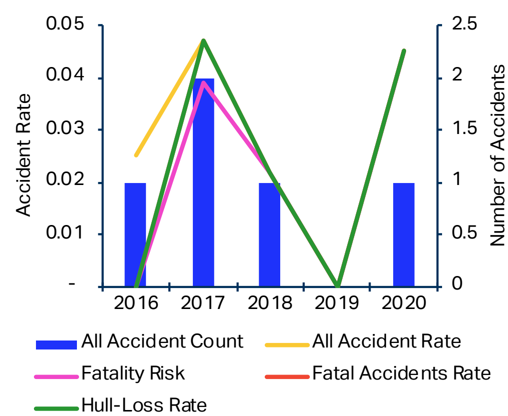
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Note: The fatal accident rate and hull loss rate share the same value.

Controlled Flight into Terrain – Contributing Factors

Controlled Flight into Terrain

LATENT CONDITIONS

	Percentage Contribution
Flight Operations	100%
Regulatory Oversight	100%
Safety Management	80%
Flight Ops: SOPs & Checking	80%
Mgmt Decisions, incl. regul. decision (cost cut)	60%
Selection Systems	60%
Flight Ops: Training Systems	40%
Dispatch	20%
Flight Watch/Following/Support	20%
Technology & Equipment	20%

THREATS

	Percentage Contribution
Meteorology	100%
Poor Visibility/IMC	100%
Ground-based Nav Aid Malfunction or not available	60%
Lack of Visual Reference	60%
Operational Pressure	60%
Nav Aids	60%
Terrain/Obstacles	60%
Air Traffic Services	40%
Manuals/Charts/Checklists	20%
Fatigue	20%
Dispatch/Paperwork	20%
Poor sign/lighting, faint markings,rwy/txy closure	20%
Wind/Windshear/Gusty Wind	20%
Airport Facilities	20%

Controlled Flight into Terrain

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	80%
Callouts	60%
Manual Handling/Flight Controls	40%
Failure to GOA after destabilization on approach	20%
Pilot-to-Pilot Communication	20%
Briefings	20%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Unnecessary Weather Penetration	80%
Vertical/Lateral/Speed Deviation	60%
Abrupt Aircraft Control	40%
Operation Outside Aircraft Limitations	40%
Engine	40%
Unstable Approach	20%
Continued Landing after Unstable Approach	20%

COUNTERMEASURES

	Percentage Contribution
In-flight Decision-making/contingency management	100%
Monitor/Cross-check	100%
Overall Crew Performance	80%
Leadership	60%
Captain should show leadership	60%
FO is assertive when necessary	60%
Communication Environment	20%
Re-Active - Contingency Management	20%
Automation Management	20%

Note: all of the accidents were classified.

Refer to the list of Accident Classification Taxonomy.

See overview of CFIT and related ACTG recommendations

Mid-Air Collision – Accident Count

2020	Number of accidents: 0	Number of fatalities: 0
2016-2020	Number of accidents: 0	Number of fatalities: 0

Accident Count % of Total	2020	'16-'20
IATA Member	0%	0%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	0%	0%	0%	0%	0%
2016-2020	0%	0%	0%	0%	0%

Note: the sum may not add to 100% due to rounding

There were no accidents during the reporting period.

Mid-Air Collision – Accident Rate*

2020 Accident rate: –
2016-2020 Accident rate: –

Accident Rate*	2020	'16-'20
IATA Member	–	0%
Fatality Risk**	–	0%
Fatal	–	0%
Hull Losses	–	0%

	Jet	Turboprop
2020	–	–
2016-2020	–	–

Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

There were no accidents during the reporting period.

Mid-Air Collision – Contributing Factors

At least three accidents are required before the accident classification is provided.

See overview of Mid-Air Collision and related ACTG recommendations

Runway/Taxiway Excursion – Accident Count

2020 Number of accidents: 9 Number of fatalities: 24
2016-2020 Number of accidents: 70 Number of fatalities: 79

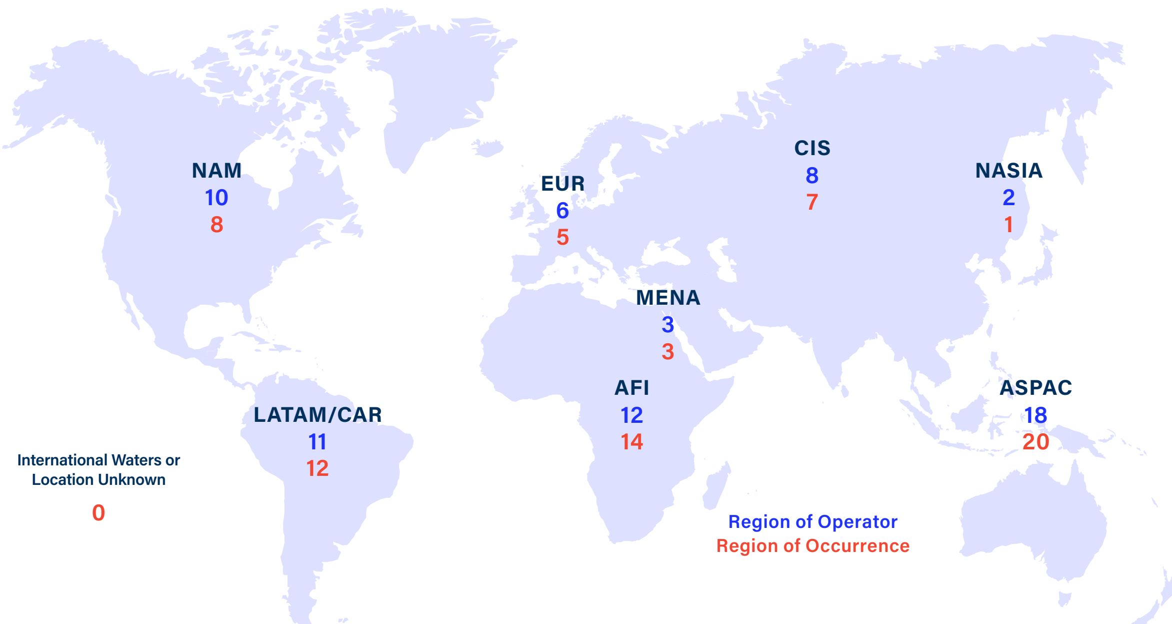
Accident Count % of Total	2020	'16-'20
IATA Member	22%	26%
Full-Loss Equivalents	1%	1%
Fatal	22%	9%
Hull Losses	44%	27%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	78%	22%	0%	67%	33%
2016-2020	81%	19%	0%	60%	40%

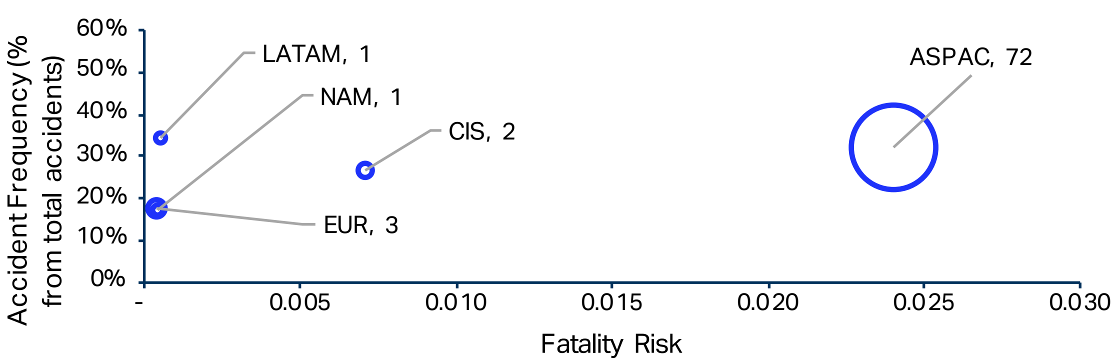
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Runway/Taxiway Excursion – Accident Rate*

2020 Accident rate: 0.41
2016-2020 Accident rate: 0.36

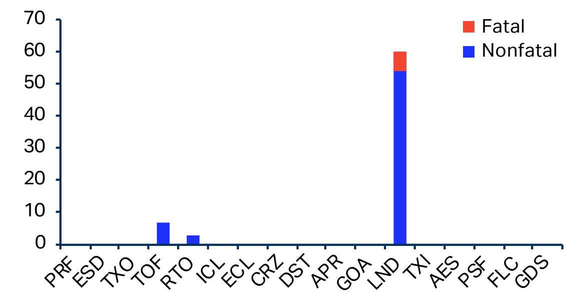
Accident Rate*	2020	'16-'20
IATA Member	0.13	0.16
Fatality Risk**	0.01	0.00
Fatal	0.09	0.03
Hull Losses	0.18	0.10

	Jet	Turboprop	
2020	0.31	0.95	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.25	0.90	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

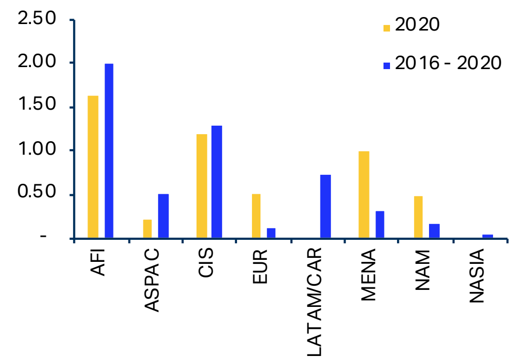
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



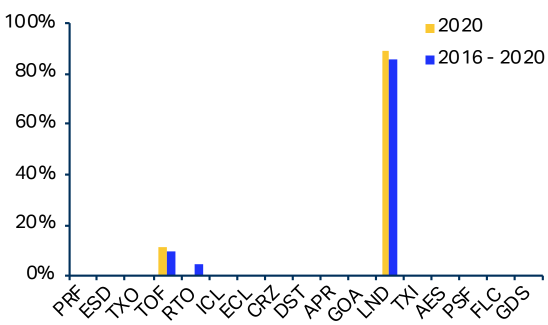
Regional Accident Rate (2016-2020)

Accident per million sectors



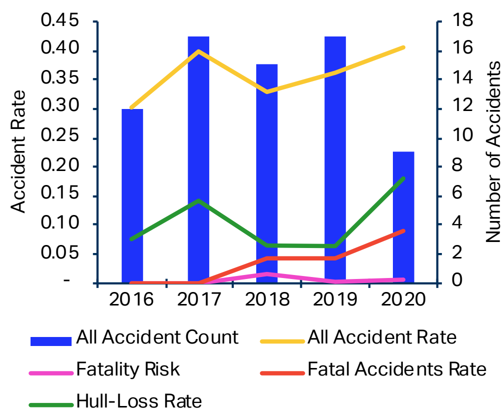
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Runway/Taxiway Excursion – Contributing Factors

Runway/Taxiway Excursion

LATENT CONDITIONS

	Percentage Contribution
Safety Management	45%
Regulatory Oversight	43%
Flight Operations	30%
Selection Systems	20%
Flight Ops: SOPs & Checking	17%
Flight Ops: Training Systems	15%
Maintenance Operations	12%
Mgmt Decisions, incl. regul. decision (cost cut)	10%
Maintenance Ops: SOPs & Checking	10%
Technology & Equipment	5%
Design	3%
Change Management	3%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	55%
SOP Adherence/SOP Cross-verification	42%
Failure to GOA after destabilization on approach	23%
Callouts	20%
Pilot-to-Pilot Communication	13%
Failure to GOA after abnormal runway contact	10%
Automation	7%
Briefings	5%
Normal Checklist	5%
Crew to External Communication	5%
ATC	5%
Abnormal Checklist	3%
Ground Navigation	2%

Runway/Taxiway Excursion

THREATS

	Percentage Contribution
Airport Facilities	55%
Meteorology	55%
Wind/Windshear/Gusty Wind	37%
Contaminated Runway/Taxiway - poor braking action	37%
Thunderstorms	30%
Aircraft Malfunction	23%
Poor Visibility/IMC	17%
Inad overrun area/trench/ditch/prox of structures	15%
Operational Pressure	12%
Maintenance Events	8%
Poor sign/lighting, faint markings,rwy/txy closure	8%
Optical Illusion/visual misperception	7%
Fatigue	7%
Ground-based Nav Aid Malfunction or not available	7%
Icing Conditions	7%
Nav Aids	7%
Air Traffic Services	5%
Gear/Tire	5%
Contained Engine Failure/Powerplant Malfunction	5%
MEL Item	5%
Brakes	3%
Hydraulic System Failure	3%
Airport Perimeter Control/fencing/wildlife control	3%
Wildlife/Birds/Foreign Object	3%
Terrain/Obstacles	3%
Primary Flight Controls	2%
Lack of Visual Reference	2%
Electrical Power Generation Failure	2%
Crew Incapacitation	2%
Flight Controls	2%
Fire/Smoke (Cockpit/Cabin/Cargo)	2%

Runway/Taxiway Excursion

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	40%
Unstable Approach	23%
Unnecessary Weather Penetration	23%
Continued Landing after Unstable Approach	23%
Vertical/Lateral/Speed Deviation	23%
Brakes/Thrust Reversers/Ground Spoilers	17%
Abrupt Aircraft Control	13%
Operation Outside Aircraft Limitations	13%
Loss of Aircraft Control While on the Ground	12%
Engine	5%
Rejected Takeoff after V_1	5%
Flight Controls/Automation	3%
Unauthorized Airspace Penetration	2%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	38%
Taxiway/Runway Management	28%
In-flight Decision-making/contingency management	25%
Monitor/Cross-check	22%
Leadership	17%
Captain should show leadership	15%
Workload Management	12%
Communication Environment	7%
Re-Active - Contingency Management	5%
Automation Management	5%
Evaluation of Plans	5%
Pro-active: In-flight decision-making	3%
Plans Stated	2%
FO is assertive when necessary	2%

Note: 10 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

See overview of Runway/Taxiway Excursion and related ACTG recommendations

In-flight Damage – Accident Count

2020 Number of accidents: 5 Number of fatalities: 104
2016-2020 Number of accidents: 34 Number of fatalities: 106

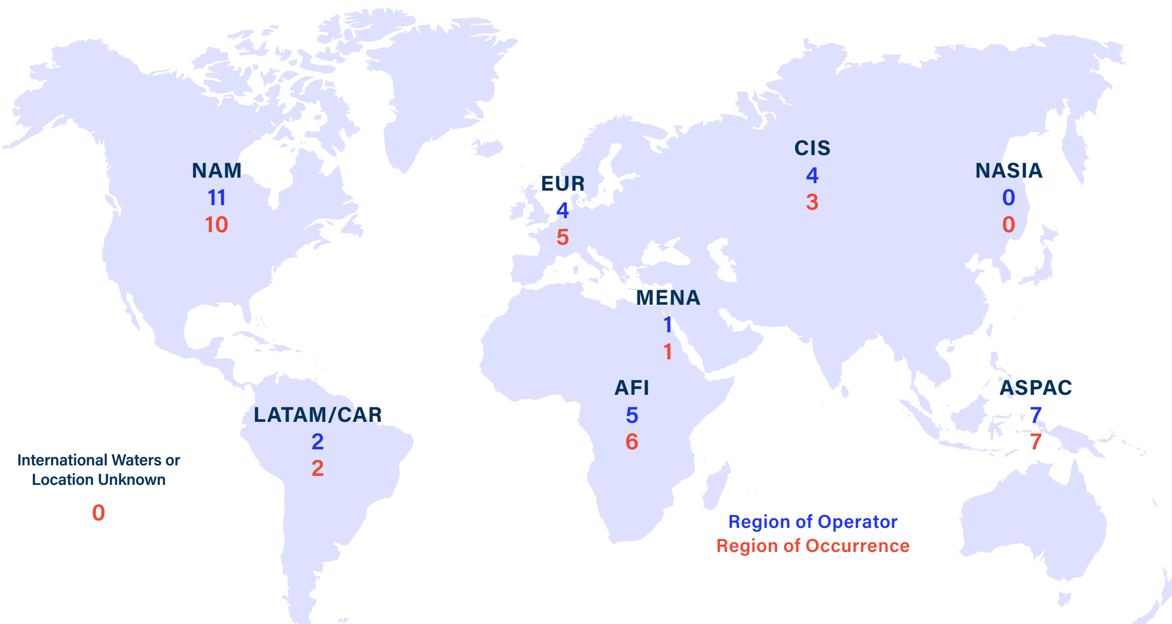
Accident Count % of Total	2020	'16-'20
IATA Member	40%	59%
Full-Loss Equivalents	37%	8%
Fatal	40%	12%
Hull Losses	40%	18%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	60%	40%	0%	80%	20%
2016-2020	85%	15%	0%	82%	18%

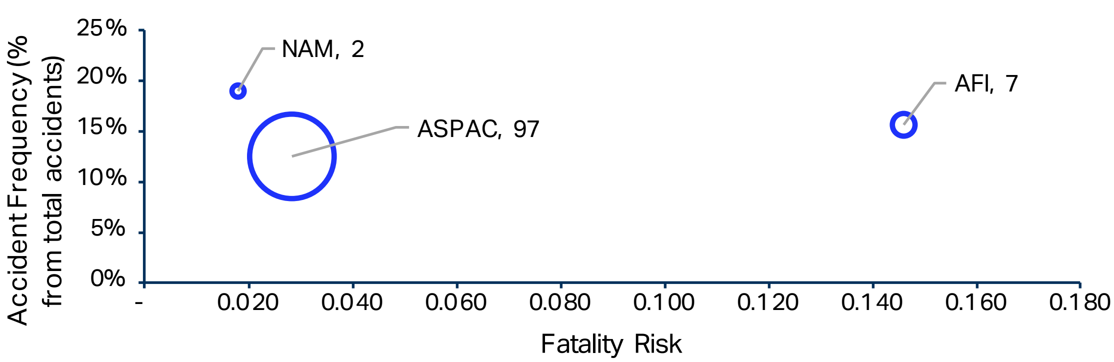
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



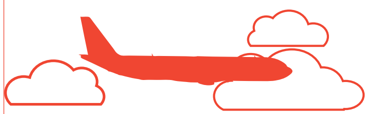
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

In-flight Damage – Accident Rate*

2020 Accident rate: 0.23
2016-2020 Accident rate: 0.17



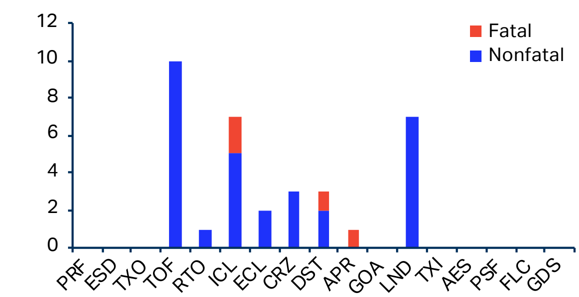
Accident Rate*	2020	'16-'20
IATA Member	0.13	0.18
Fatality Risk**	0.08	0.01
Fatal	0.09	0.02
Hull Losses	0.09	0.03

	Jet	Turboprop	
2020	0.21	0.32	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.17	0.19	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

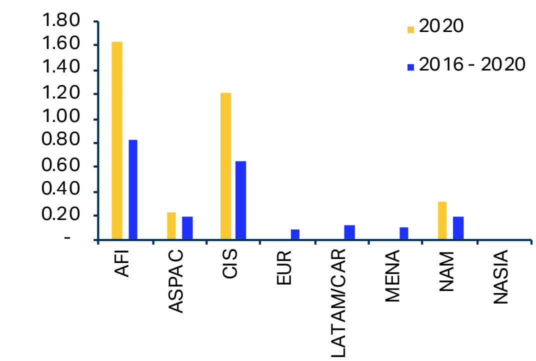
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



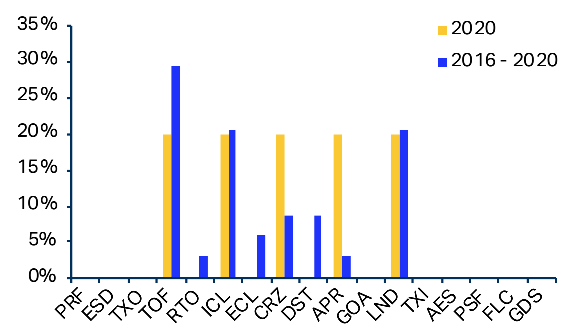
Regional Accident Rate (2016-2020)

Accident per million sectors



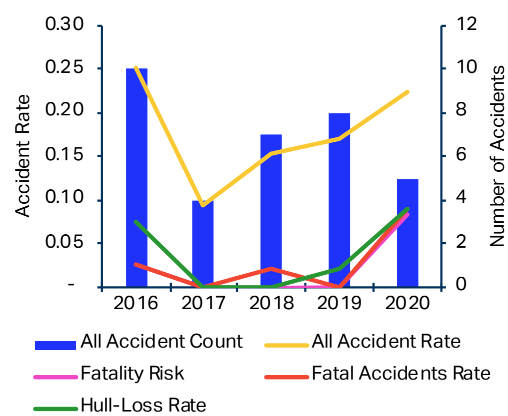
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



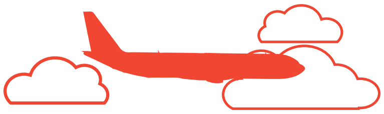
Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



In-flight Damage – Contributing Factors

In-flight Damage



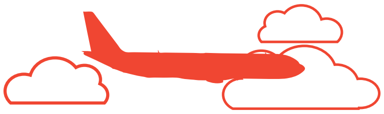
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	34%
Safety Management	28%
Mgmt Decisions, incl. regul. decision (cost cut)	16%
Design	13%
Maintenance Ops: SOPs & Checking	13%
Maintenance Operations	13%
Flight Operations	6%
Flight Ops: SOPs & Checking	6%
Ground Operations	3%
Dispatch Ops: SOPs & Checking	3%
Change Management	3%
Ground Ops: SOPs & Checking	3%
Dispatch	3%
Selection Systems	3%
Flight Ops: Training Systems	3%
Ground Ops: Training Systems	3%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	9%
SOP Adherence/SOP Cross-verification	9%
Failure to GOA after abnormal runway contact	3%
Failure to GOA after destabilization on approach	3%
Callouts	3%
Wrong Weight & Balance/Fuel Information	3%
Briefings	3%
ATC	3%
Crew to External Communication	3%
Pilot-to-Pilot Communication	3%
Documentation	3%
Normal Checklist	3%

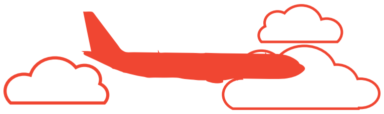
In-flight Damage



THREATS

	Percentage Contribution
Aircraft Malfunction	53%
Maintenance Events	22%
Wildlife/Birds/Foreign Object	22%
Meteorology	19%
Extensive/Uncontained Engine Failure	19%
Airport Facilities	16%
Fire/Smoke (Cockpit/Cabin/Cargo)	13%
Gear/Tire	13%
Thunderstorms	13%
Contained Engine Failure/Powerplant Malfunction	9%
Contaminated Runway/Taxiway - poor braking action	9%
Foreign Objects, FOD	6%
Structural Failure	6%
Ground Events	6%
Brakes	6%
Hydraulic System Failure	6%
Dispatch/Paperwork	6%
Wind/Windshear/Gusty Wind	6%
Airport Perimeter Control/fencing/wildlife control	6%
Flight Controls	3%
Electrical Power Generation Failure	3%
Secondary Flight Controls	3%
Poor Visibility/IMC	3%

In-flight Damage



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Unnecessary Weather Penetration	16%
Operation Outside Aircraft Limitations	9%
Abrupt Aircraft Control	9%
Vertical/Lateral/Speed Deviation	6%
Landing Gear	3%
Weight & Balance	3%
Long/floated/bounced/firm/off-center/crabbed landing	3%
Continued Landing after Unstable Approach	3%
Unstable Approach	3%

COUNTERMEASURES

	Percentage Contribution
In-flight Decision-making/contingency management	6%
Evaluation of Plans	6%
Inquiry	3%
Workload Management	3%
FO is assertive when necessary	3%
Leadership	3%
Re-Active - Contingency Management	3%
Monitor/Cross-check	3%
Captain should show leadership	3%
Plans Stated	3%
Overall Crew Performance	3%
Communication Environment	3%
SOP Briefing/Planning	3%

Note: two accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

> “A commitment to safety should not be a priority, but a value that shapes decision-making all the time, at every level.”

Tillerson, R., quoted in International Association of Oil and Gas Producers, Shaping safety culture through safety leadership. OGP Report No. 452 (P.2). October 2013.

“Every company desires safe operations, but the challenge is to translate this desire into action. Written rules, standards and procedures, while important and necessary, are not enough. Companies must develop a culture in which the value of safety is embedded in every level of the workforce.

We define culture as the unwritten standards and norms that shape mind-sets, attitudes and behaviours.

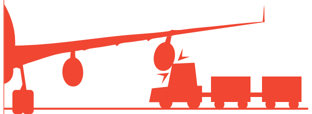
A culture of safety starts with leadership, because leadership drives culture and culture drives behavior. Leaders influence culture by setting expectations, building structure, teaching others and demonstrating stewardship.

A commitment to safety and operational integrity begins with management. But management alone cannot drive the entire culture.

For a culture of safety to flourish, it must be embedded throughout the organization.”

Ground Damage – Accident Count

2020	Number of accidents: 3	Number of fatalities: 0
2016-2020	Number of accidents: 22	Number of fatalities: 0



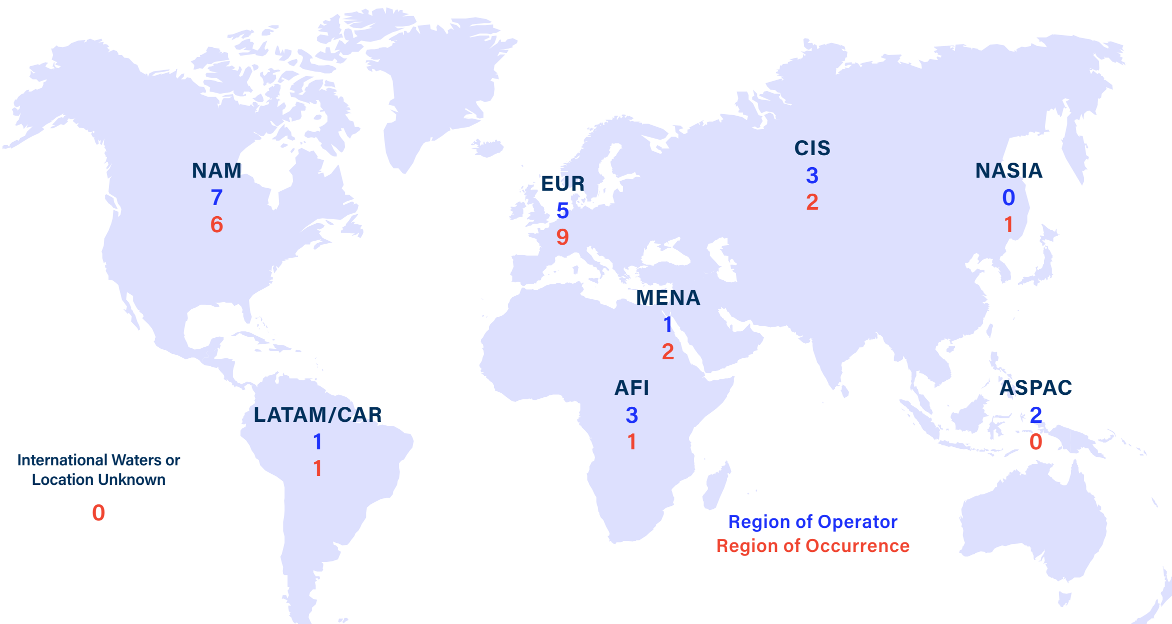
Accident Count % of Total	2020	'16-'20
IATA Member	67%	68%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	33%	67%	0%	100%	0%
2016-2020	86%	14%	0%	91%	9%

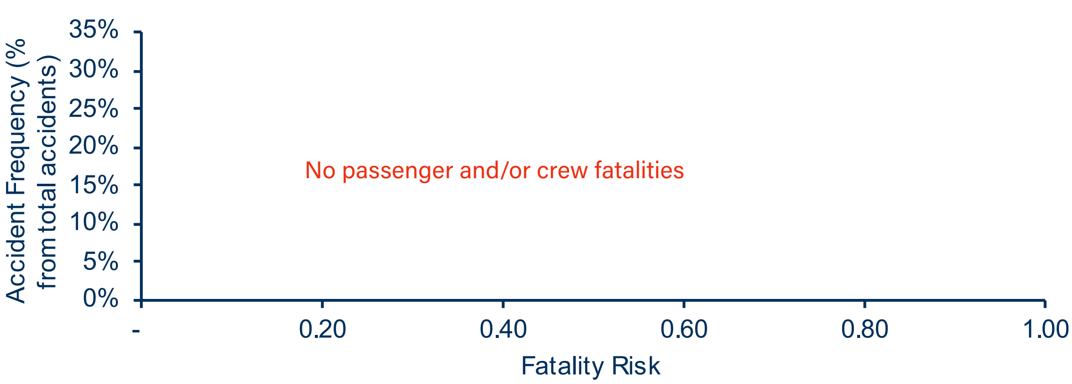
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



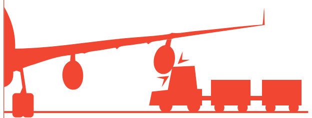
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Ground Damage – Accident Rate*

2020 Accident rate: 0.14
2016-2020 Accident rate: 0.11



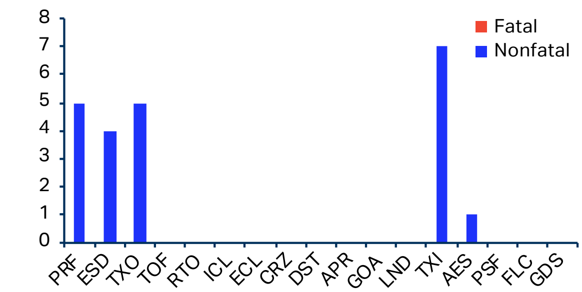
Accident Rate*	2020	'16-'20
IATA Member	0.13	0.14
Fatality Risk**	–	–
Fatal	–	–
Hull Losses	–	–

	Jet	Turboprop	
2020	0.16	–	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.12	0.06	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

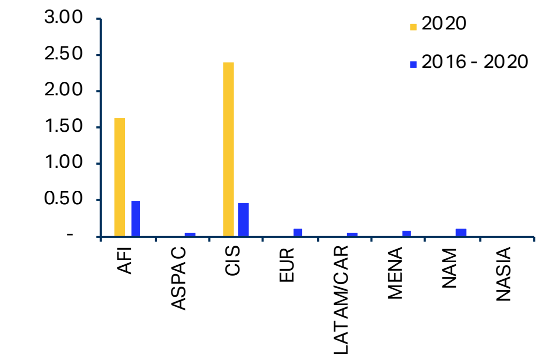
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



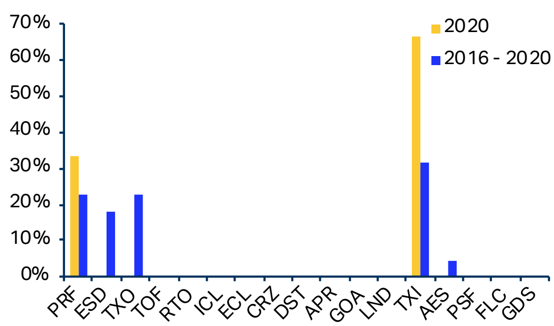
Regional Accident Rate (2016-2020)

Accident per million sectors



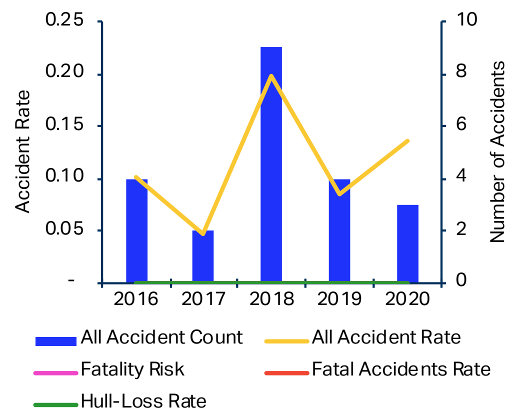
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

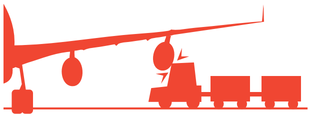
See Annex 1 for the definitions of metrics used



Note: The fatal accident rate, fatality risk, and hull loss rate share the same value.

Ground Damage – Contributing Factors

Ground Damage



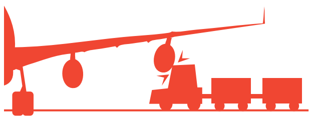
LATENT CONDITIONS

	Percentage Contribution
Ground Operations	33%
Ground Ops: SOPs & Checking	28%
Safety Management	22%
Ground Ops: Training Systems	17%
Regulatory Oversight	11%
Flight Ops: Training Systems	6%
Maintenance Operations	6%
Flight Ops: SOPs & Checking	6%
Design	6%
Flight Operations	6%

THREATS

	Percentage Contribution
Ground Events	44%
Traffic	39%
Maintenance Events	11%
Airport Facilities	11%
Meteorology	11%
Aircraft Malfunction	11%
Operational Pressure	6%
Poor sign/lighting, faint markings,rwy/txy closure	6%
Air Traffic Services	6%
Inad overrun area/trench/ditch/prox of structures	6%
Dangerous Goods	6%
Fire/Smoke (Cockpit/Cabin/Cargo)	6%
Poor Visibility/IMC	6%
Hydraulic System Failure	6%
Wind/Windshear/Gusty Wind	6%

Ground Damage



FLIGHT CREW ERRORS

	Percentage Contribution
Ground Navigation	17%
Callouts	6%
SOP Adherence/SOP Cross-verification	6%
Manual Handling/Flight Controls	6%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Ramp Movements, including when under marshalling	17%
Loss of Aircraft Control While on the Ground	11%
Operation Outside Aircraft Limitations	6%

COUNTERMEASURES

	Percentage Contribution
Taxiway/Runway Management	11%
Overall Crew Performance	11%
Leadership	6%
Captain should show leadership	6%

Note: four accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

See overview of Ground Damage and related ACTG recommendations

Undershoot – Accident Count

2020 Number of accidents: 2 Number of fatalities: 0
2016-2020 Number of accidents: 8 Number of fatalities: 5

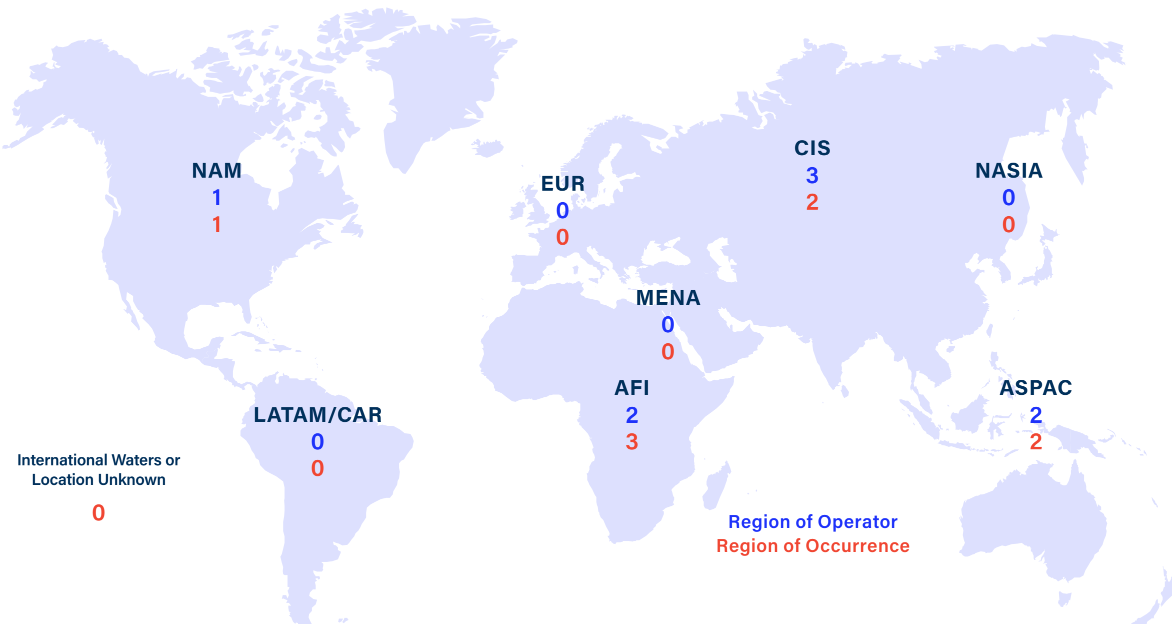
Accident Count % of Total	2020	'16-'20
IATA Member	50%	38%
Full-Loss Equivalents	0%	5%
Fatal	0%	25%
Hull Losses	0%	38%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	100%	0%	0%	100%	0%
2016-2020	75%	25%	0%	63%	38%

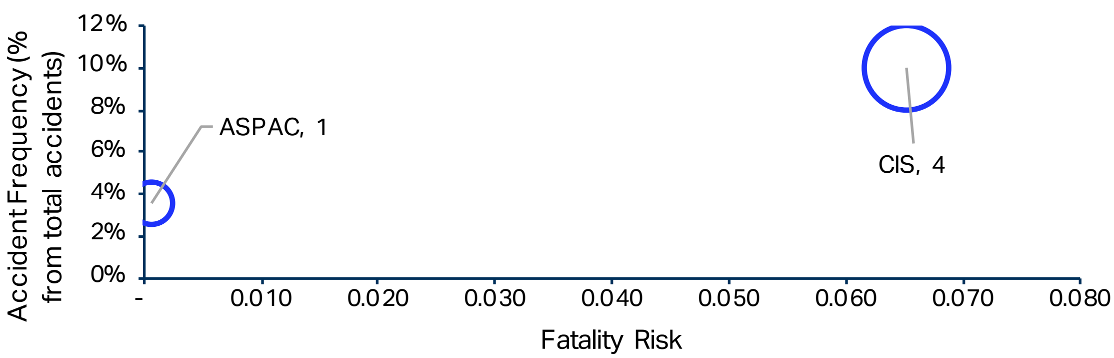
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Undershoot – Accident Rate*

2020 Accident rate: 0.09
2016-2020 Accident rate: 0.04

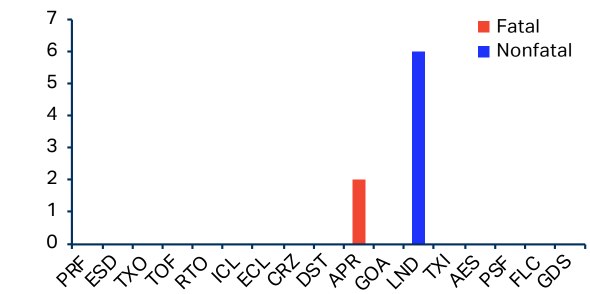
Accident Rate*	2020	'16-'20
IATA Member	0.06	0.03
Fatality Risk**	–	0.00
Fatal	–	0.01
Hull Losses	–	0.02

	Jet	Turboprop	
2020	0.10	–	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.03	0.10	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

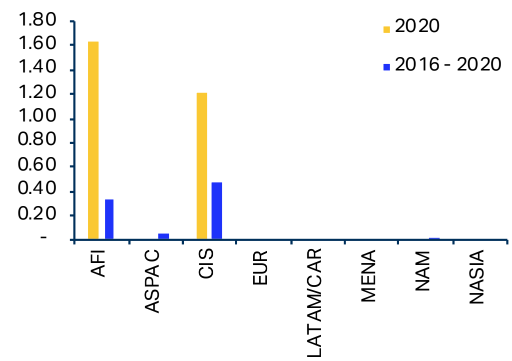
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



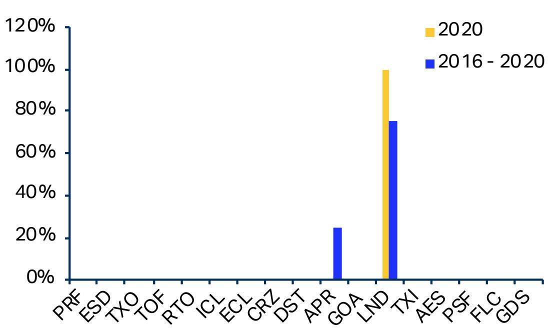
Regional Accident Rate (2016-2020)

Accident per million sectors



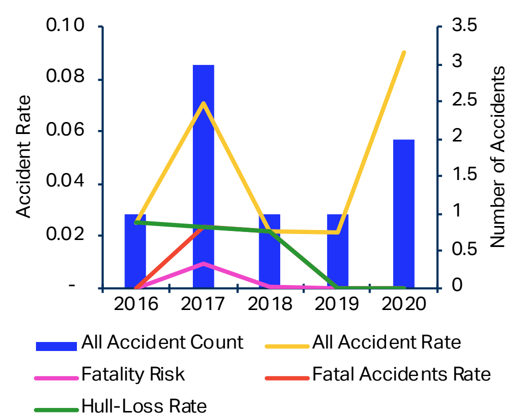
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total

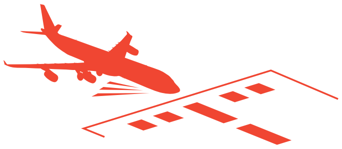


Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Undershoot



LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	57%
Safety Management	57%
Flight Ops: SOPs & Checking	43%
Flight Operations	43%
Selection Systems	29%
Flight Ops: Training Systems	29%
Technology & Equipment	14%

THREATS

	Percentage Contribution
Nav Aids	71%
Meteorology	71%
Wind/Windshear/Gusty Wind	57%
Ground-based Nav Aid Malfunction or not available	57%
Poor Visibility/IMC	43%
Optical Illusion/visual misperception	29%
Lack of Visual Reference	29%
Operational Pressure	29%
Airport Facilities	29%
Poor sign/lighting, faint markings,rwy/txy closure	29%
Thunderstorms	29%
Inad overrun area/trench/ditch/prox of structures	14%
Air Traffic Services	14%
Contaminated Runway/Taxiway - poor braking action	14%

Undershoot

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	57%
Manual Handling/Flight Controls	43%
Pilot-to-Pilot Communication	43%
Failure to GOA after destabilization on approach	29%
Wrong Altimeter Reference Settings (QNH, QFE)	14%
Systems/Radios/Instruments	14%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Continued Landing after Unstable Approach	57%
Unstable Approach	57%
Vertical/Lateral/Speed Deviation	43%
Unnecessary Weather Penetration	43%
Long/floated/bounced/firm/off-center/crabbed landing	14%

COUNTERMEASURES

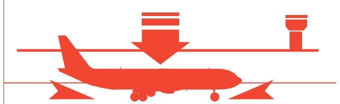
	Percentage Contribution
Overall Crew Performance	43%
Monitor/Cross-check	43%
Leadership	29%
Communication Environment	29%
FO is assertive when necessary	29%
Automation Management	14%
Captain should show leadership	14%

Note: one accident was not classified due to insufficient data; this accident was subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

Hard Landing – Accident Count

2020 Number of accidents: 7 Number of fatalities: 0
2016-2020 Number of accidents: 28 Number of fatalities: 41



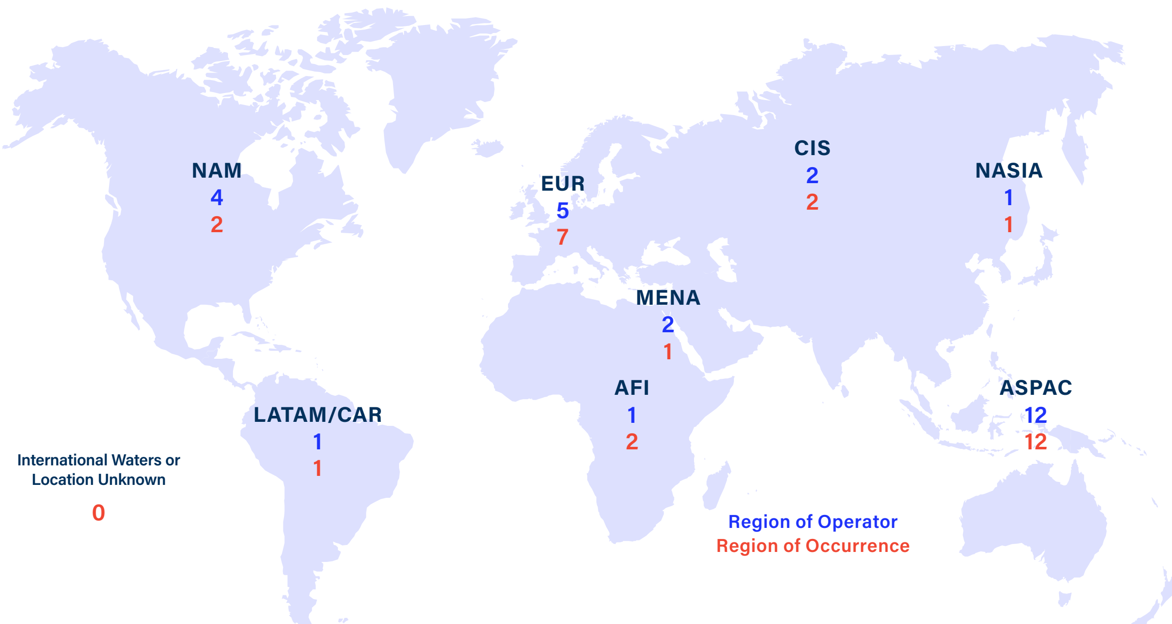
Accident Count % of Total	2020	'16-'20
IATA Member	29%	61%
Full-Loss Equivalents	0%	2%
Fatal	0%	4%
Hull Losses	0%	7%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	100%	0%	0%	71%	29%
2016-2020	89%	11%	0%	79%	21%

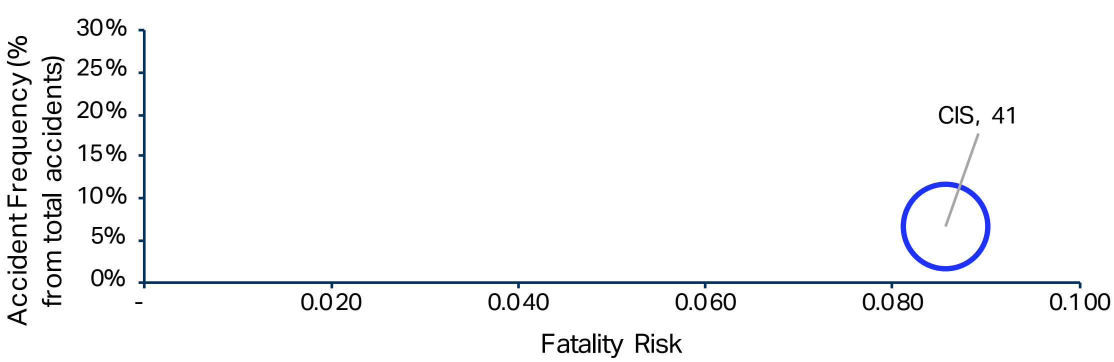
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



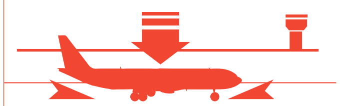
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Hard Landing – Accident Rate*

2020 Accident rate: 0.32
2016-2020 Accident rate: 0.14



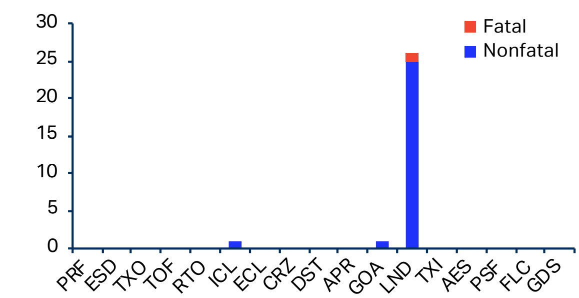
Accident Rate*	2020	'16-'20
IATA Member	0.13	0.16
Fatality Risk**	–	0.00
Fatal	–	0.01
Hull Losses	–	0.01

	Jet	Turboprop	
2020	0.26	0.64	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.13	0.19	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

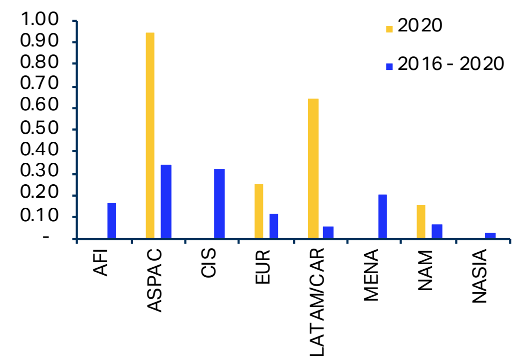
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



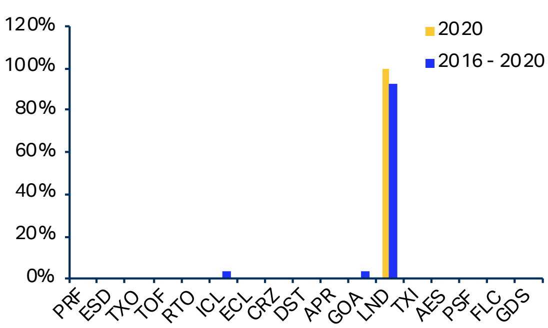
Regional Accident Rate (2016-2020)

Accident per million sectors



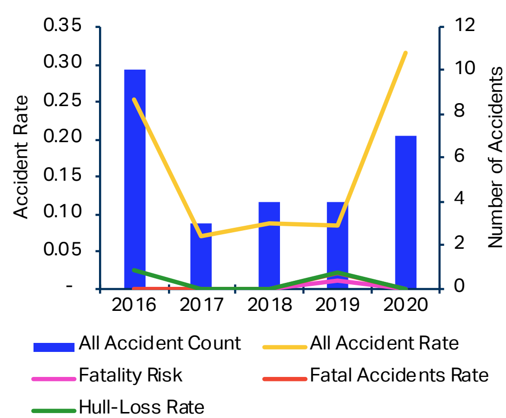
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total

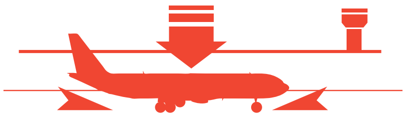


Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Hard Landing



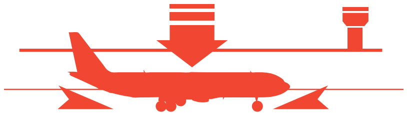
LATENT CONDITIONS

	Percentage Contribution
Flight Ops: Training Systems	32%
Flight Operations	32%
Flight Ops: SOPs & Checking	25%
Selection Systems	25%
Safety Management	21%
Regulatory Oversight	11%
Technology & Equipment	4%
Mgmt Decisions, incl. regul. decision (cost cut)	4%

THREATS

	Percentage Contribution
Meteorology	61%
Wind/Windshear/Gusty Wind	57%
Thunderstorms	36%
Poor Visibility/IMC	18%
Lack of Visual Reference	14%
Ground-based Nav Aid Malfunction or not available	7%
Nav Aids	7%
Fatigue	7%
Optical Illusion/visual misperception	4%
Operational Pressure	4%
Aircraft Malfunction	4%

Hard Landing



FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	89%
SOP Adherence/SOP Cross-verification	46%
Failure to GOA after destabilization on approach	32%
Failure to GOA after abnormal runway contact	21%
Callouts	18%
Automation	7%
Crew to External Communication	7%
Maintenance	4%
ATC	4%
Normal Checklist	4%
Pilot-to-Pilot Communication	4%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	71%
Unstable Approach	54%
Abrupt Aircraft Control	54%
Vertical/Lateral/Speed Deviation	54%
Continued Landing after Unstable Approach	46%
Unnecessary Weather Penetration	14%
Loss of Aircraft Control While on the Ground	7%
Operation Outside Aircraft Limitations	7%
Engine	7%
Brakes/Thrust Reversers/Ground Spoilers	4%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	43%
Monitor/Cross-check	29%
Captain should show leadership	18%
In-flight Decision-making/contingency management	18%
Leadership	14%
Pro-active: In-flight decision-making	14%
Automation Management	7%
Re-Active - Contingency Management	4%

Note: all of the accidents were classified.

Refer to the list of Accident Classification Taxonomy.

Gear-up Landing/Gear Collapse – Accident Count

2020	Number of accidents: 6	Number of fatalities: 0
2016-2020	Number of accidents: 36	Number of fatalities: 0

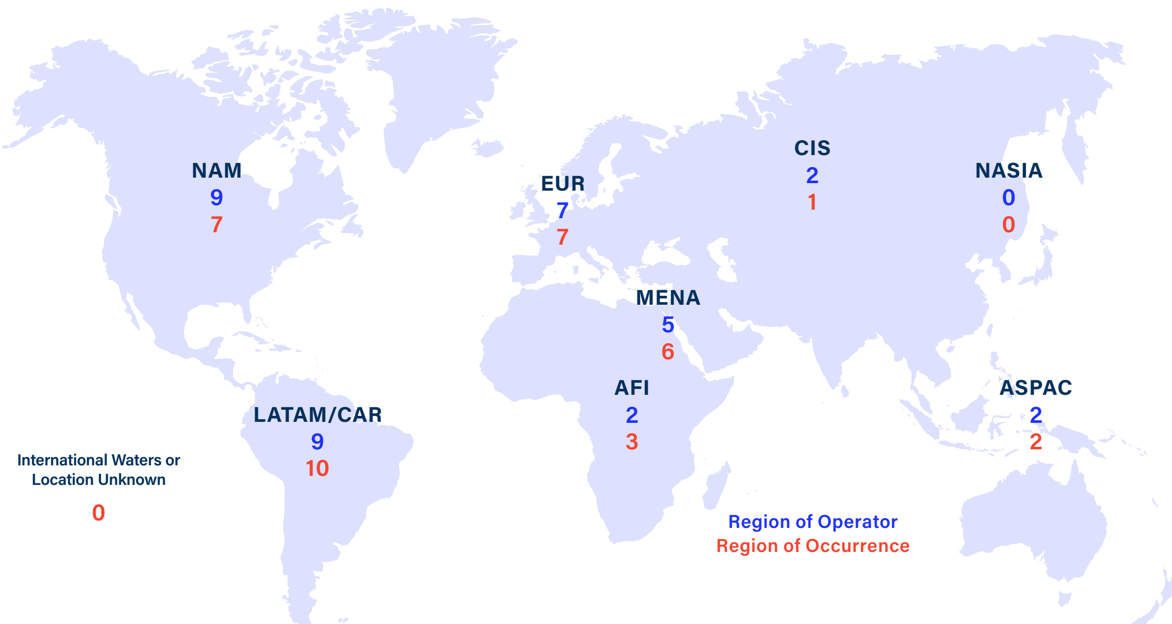
Accident Count % of Total	2020	'16-'20
IATA Member	50%	36%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	17%	11%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	50%	50%	0%	67%	33%
2016-2020	72%	25%	3%	58%	42%

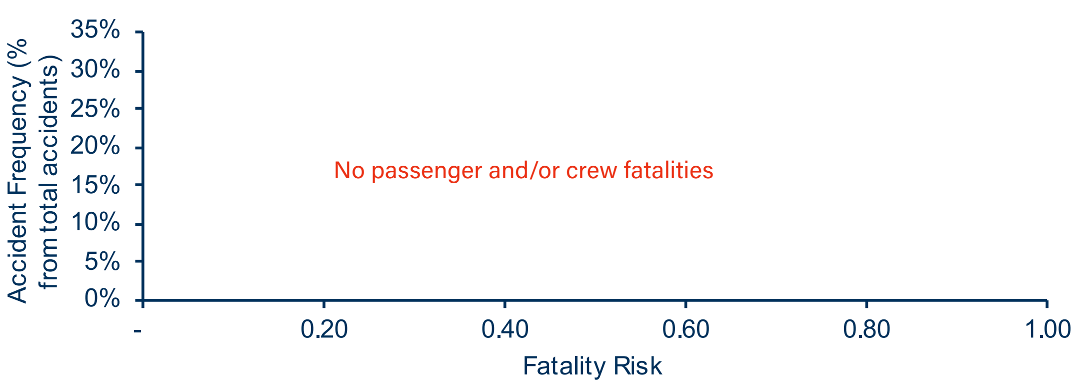
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Gear-up Landing/Gear Collapse – Accident Rate*

2020 Accident rate: 0.27
2016-2020 Accident rate: 0.18

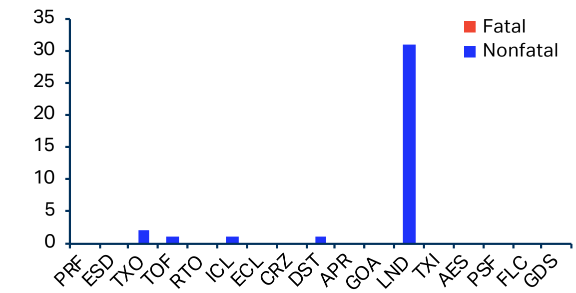
Accident Rate*	2020	'16-'20
IATA Member	0.19	0.12
Fatality Risk**	–	–
Fatal	–	–
Hull Losses	0.05	0.02

	Jet	Turboprop	
2020	0.21	0.64	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.13	0.48	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

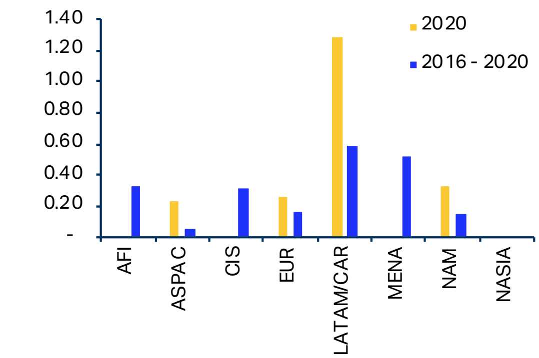
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



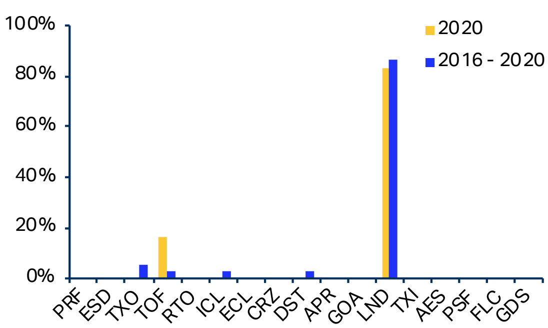
Regional Accident Rate (2016-2020)

Accident per million sectors



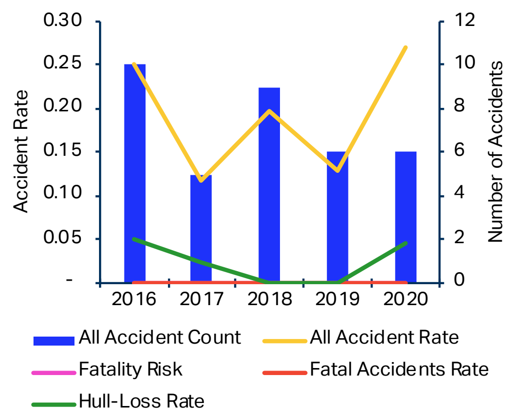
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Note: The fatal accident rate and fatality risk share the same value.

Gear-up Landing/Gear Collapse – Contributing Factors

Gear-up Landing/Gear Collapse

LATENT CONDITIONS

	Percentage Contribution
Maintenance Operations	41%
Maintenance Ops: SOPs & Checking	35%
Safety Management	29%
Regulatory Oversight	29%
Design	21%
Mgmt Decisions, incl. regul. decision (cost cut)	9%
Flight Operations	9%
Flight Ops: Training Systems	6%
Flight Ops: SOPs & Checking	6%
Selection Systems	6%
Maintenance Ops: Training Systems	3%
Dispatch	3%
Ops Planning & Scheduling	3%
Dispatch Ops: SOPs & Checking	3%
Cabin Operations	3%

THREATS

	Percentage Contribution
Aircraft Malfunction	85%
Gear/Tire	85%
Maintenance Events	47%
Hydraulic System Failure	6%
Poor sign/lighting, faint markings,rwy/txy closure	3%
Meteorology	3%
Wind/Windshear/Gusty Wind	3%
Thunderstorms	3%
Electrical Power Generation Failure	3%
Airport Facilities	3%
Dispatch/Paperwork	3%
Ground-based Nav Aid Malfunction or not available	3%
Nav Aids	3%
Operational Pressure	3%
Poor Visibility/IMC	3%

Gear-up Landing/Gear Collapse

FLIGHT CREW ERRORS

	Percentage Contribution
Abnormal Checklist	6%
SOP Adherence/SOP Cross-verification	6%
Systems/Radios/Instruments	3%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Landing Gear	6%
Operation Outside Aircraft Limitations	3%
Unstable Approach	3%
Systems	3%
Unnecessary Weather Penetration	3%

COUNTERMEASURES

	Percentage Contribution
In-flight Decision-making/contingency management	6%
Overall Crew Performance	3%
Communication Environment	3%
Workload Management	3%
FO is assertive when necessary	3%
Captain should show leadership	3%
Monitor/Cross-check	3%
Pro-active: In-flight decision-making	3%
Evaluation of Plans	3%
Leadership	3%

Note: two accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

Tail Strike – Accident Count

2020	Number of accidents: 2	Number of fatalities: 0
2016-2020	Number of accidents: 21	Number of fatalities: 0

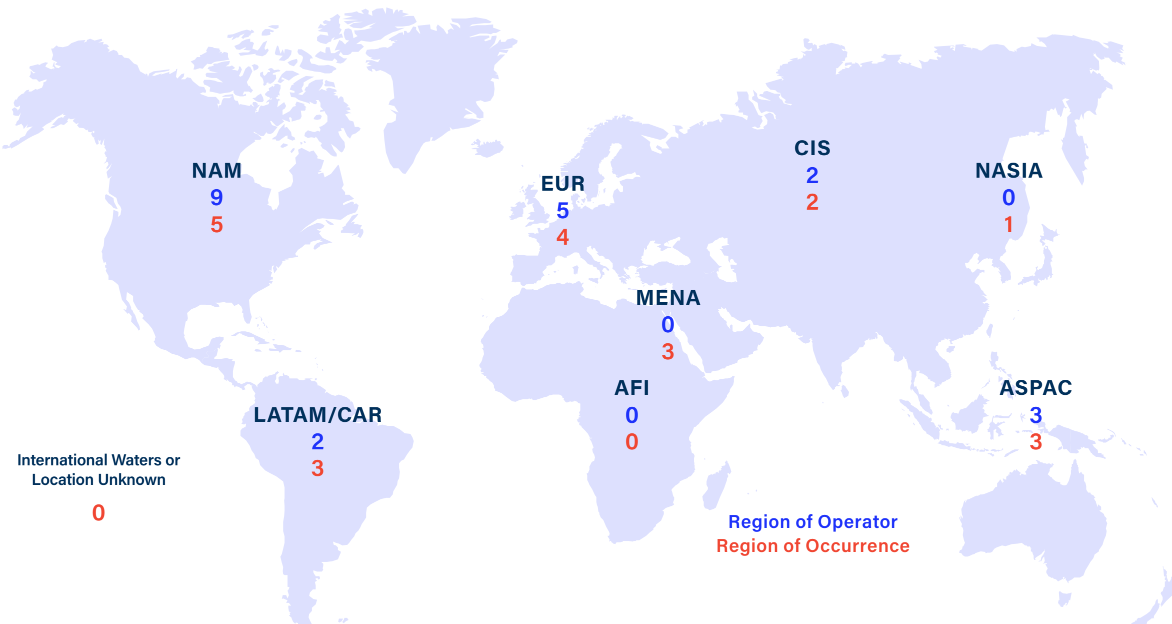
Accident Count % of Total	2020	'16-'20
IATA Member	50%	52%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	50%	50%	0%	100%	0%
2016-2020	90%	10%	0%	86%	14%

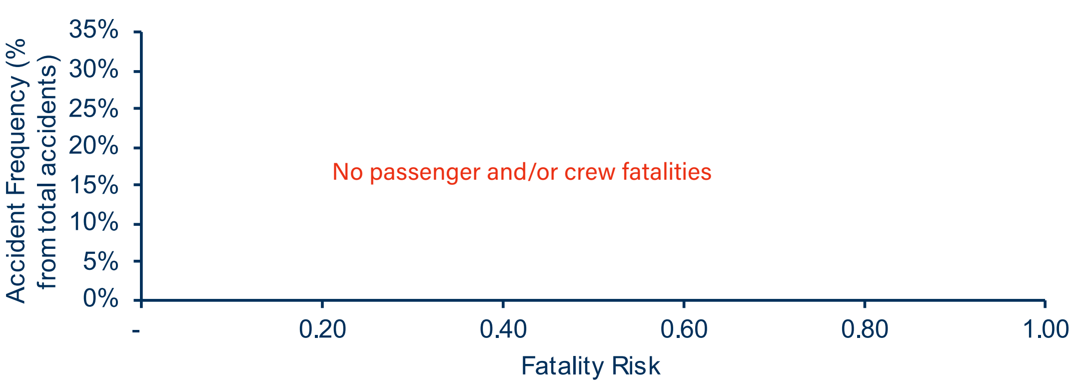
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



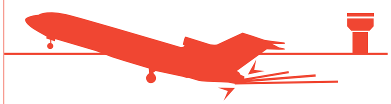
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Tail Strike – Accident Rate*

2020 Accident rate: 0.09
2016-2020 Accident rate: 0.11



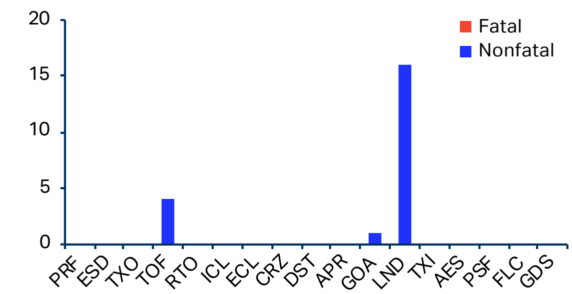
Accident Rate*	2020	'16-'20
IATA Member	0.06	0.10
Fatality Risk**	–	–
Fatal	–	–
Hull Losses	–	–

	Jet	Turboprop	
2020	0.10	–	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.11	0.10	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

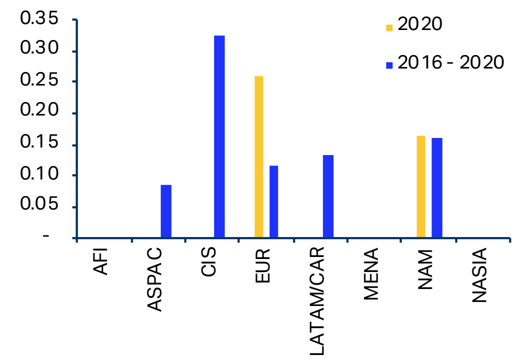
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



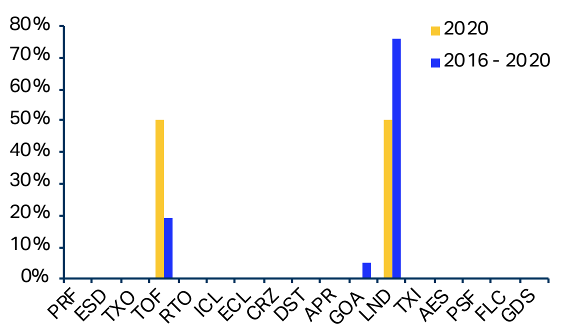
Regional Accident Rate (2016-2020)

Accident per million sectors



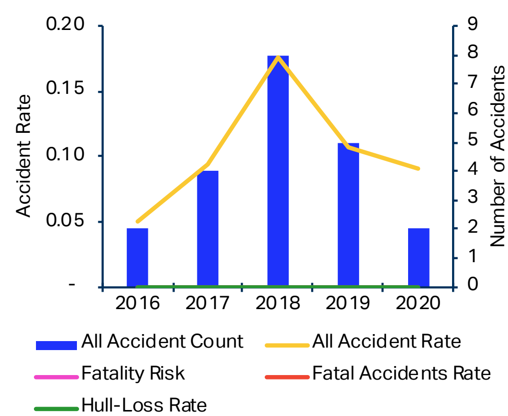
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Note: The fatal accident rate, fatality risk, and hull loss rate share the same value.

Tail Strike – Contributing Factors

Tail Strike

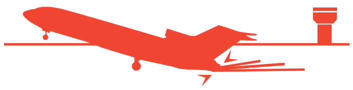
LATENT CONDITIONS

	Percentage Contribution
Flight Operations	32%
Flight Ops: SOPs & Checking	16%
Safety Management	16%
Regulatory Oversight	11%
Flight Ops: Training Systems	11%
Dispatch	5%
Selection Systems	5%
Ops Planning & Scheduling	5%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	84%
SOP Adherence/SOP Cross-verification	63%
Failure to GOA after abnormal runway contact	32%
Pilot-to-Pilot Communication	21%
Documentation	11%
Callouts	11%
Wrong Weight & Balance/Fuel Information	11%
Failure to GOA after destabilization on approach	11%
Automation	5%
Normal Checklist	5%
Systems/Radios/Instruments	5%

Tail Strike



THREATS

	Percentage Contribution
Meteorology	42%
Wind/Windshear/Gusty Wind	37%
Poor Visibility/IMC	11%
Fatigue	11%
Dispatch/Paperwork	11%
Thunderstorms	5%
Terrain/Obstacles	5%
Ground Events	5%
Optical Illusion/visual misperception	5%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	63%
Abrupt Aircraft Control	37%
Vertical/Lateral/Speed Deviation	37%
Unstable Approach	26%
Continued Landing after Unstable Approach	21%
Operation Outside Aircraft Limitations	11%
Weight & Balance	11%
Unnecessary Weather Penetration	5%
Flight Controls/Automation	5%
Brakes/Thrust Reversers/Ground Spoilers	5%

COUNTERMEASURES

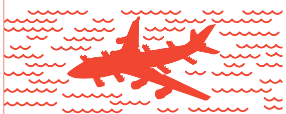
	Percentage Contribution
Monitor/Cross-check	47%
Overall Crew Performance	42%
Leadership	26%
Captain should show leadership	26%
Workload Management	16%
In-flight Decision-making/contingency management	16%
Communication Environment	11%
FO is assertive when necessary	11%
Automation Management	11%
Evaluation of Plans	5%
Re-Active - Contingency Management	5%

Note: two accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

Off-Airport Landing/Ditching – Accident Count

2020	Number of accidents: 0	Number of fatalities: 0
2016-2020	Number of accidents: 1	Number of fatalities: 0



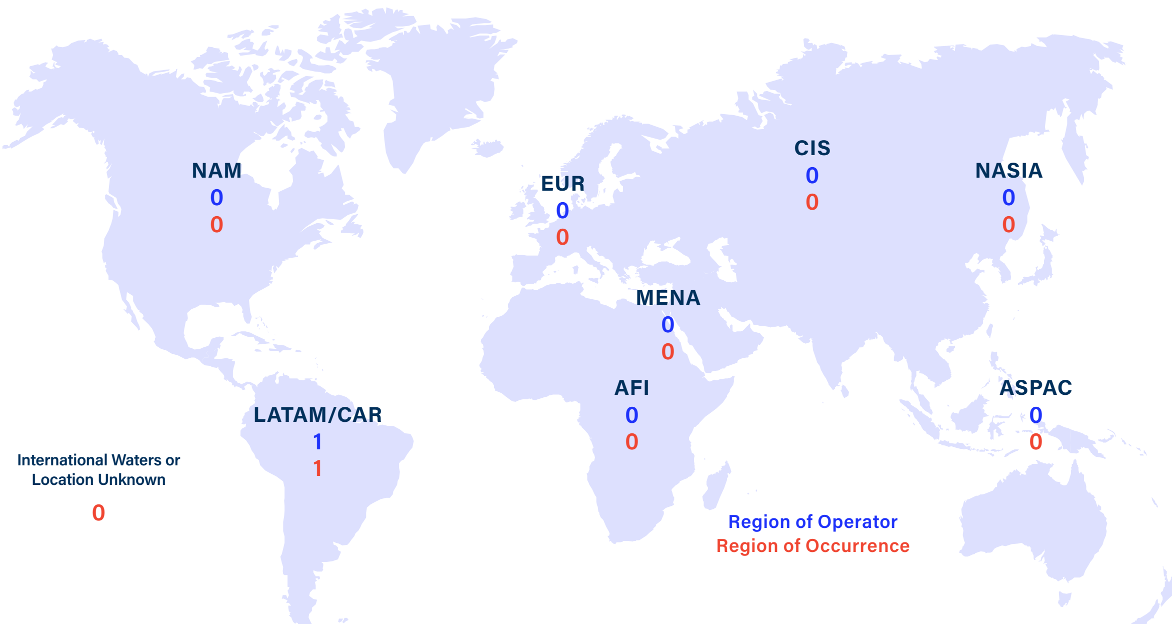
Accident Count % of Total	2020	'16-'20
IATA Member	0%	0%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	0%	0%	0%	0%	0%
2016-2020	0%	100%	0%	0%	100%

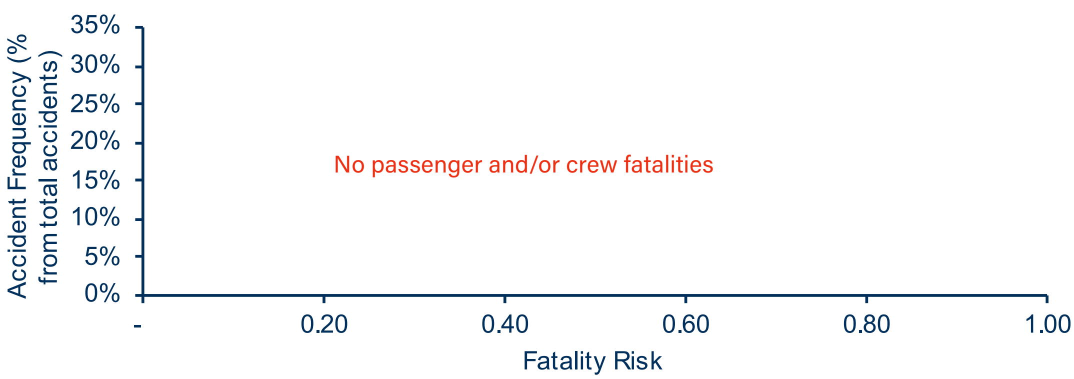
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)

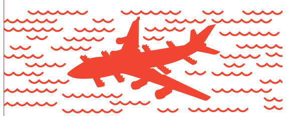


The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Off-Airport Landing/Ditching – Accident Rate*

2020 Accident rate: –

2016-2020 Accident rate: 0.01



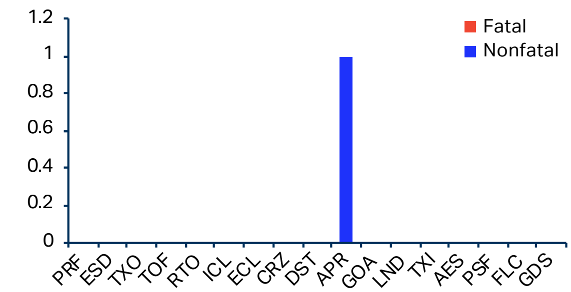
Accident Rate*	2020	'16-'20
IATA Member	–	–
Fatality Risk**	–	–
Fatal	–	–
Hull Losses	–	–

	Jet	Turboprop	
2020	–	–	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	–	0.03	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

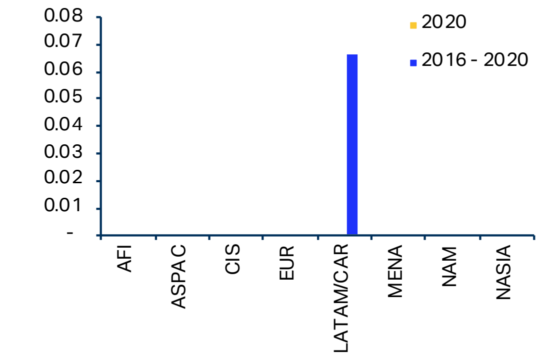
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



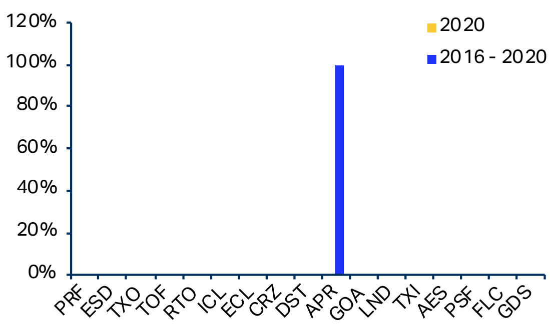
Regional Accident Rate (2016-2020)

Accident per million sectors



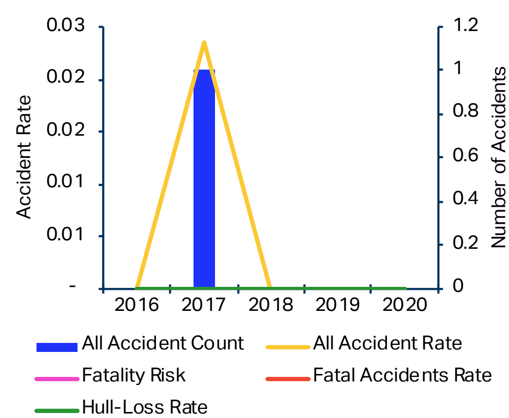
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



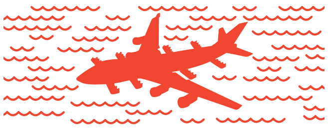
Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Note: The fatal accident rate, fatality risk, and hull loss rate share the same value.

Off-Airport Landing/Ditching

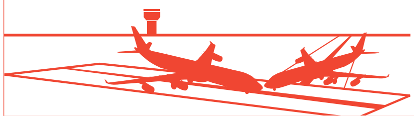


At least three accidents are required before the accident classification is provided. This category only contained one accident in the past 5 years.


FAULT
OFF
PRESS
LDG ELEV
AUTO
-2
0
DITCHING

Runway Collision – Accident Count

2020	Number of accidents: 2	Number of fatalities: 0
2016-2020	Number of accidents: 7	Number of fatalities: 0



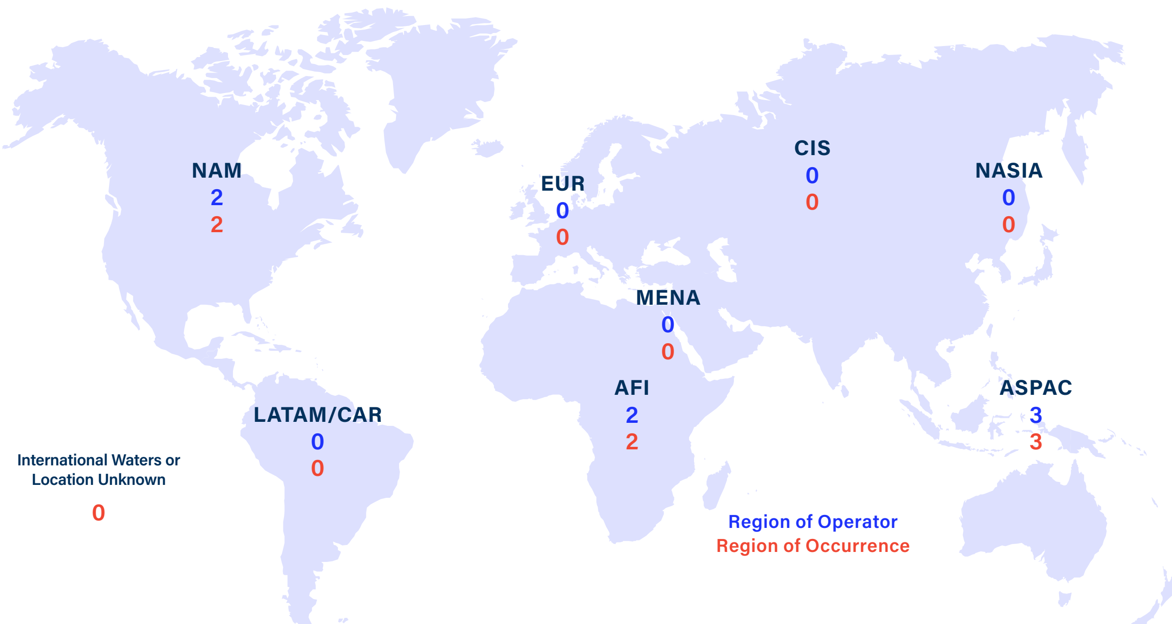
Accident Count % of Total	2020	'16-'20
IATA Member	0%	14%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	50%	29%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	**0%**	**100%**	**0%**	**50%**	**50%**
2016-2020	**71%**	**29%**	**0%**	**43%**	**57%**

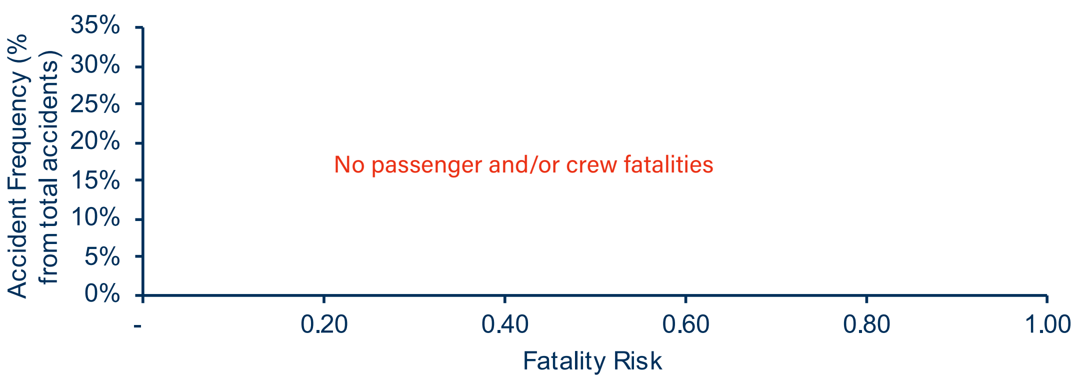
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Runway Collision – Accident Rate*

2020	Accident rate: 0.09
2016-2020	Accident rate: 0.04

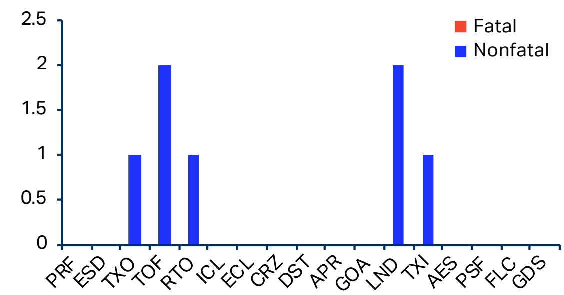
Accident Rate*	2020	'16-'20
IATA Member	–	0.01
Fatality Risk**	–	–
Fatal	–	–
Hull Losses	0.05	0.01

	Jet	Turboprop	
2020	0.05	0.32	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.02	0.13	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

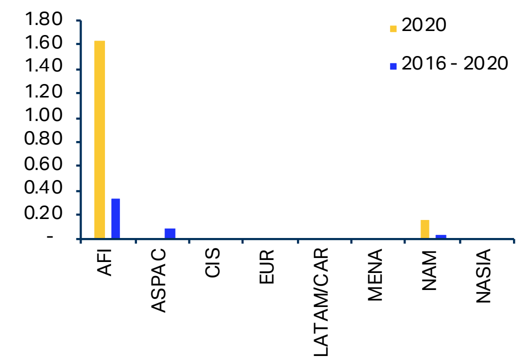
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



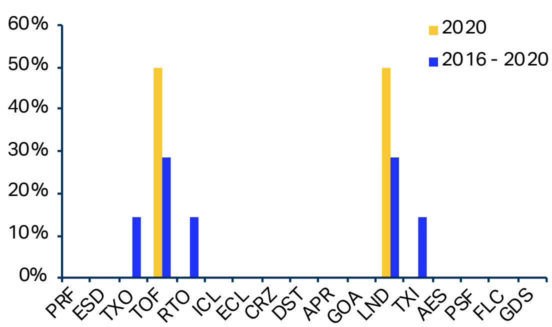
Regional Accident Rate (2016-2020)

Accident per million sectors



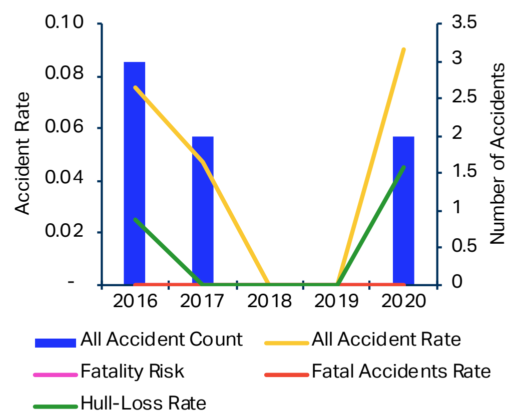
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



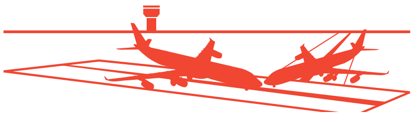
Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Note: The fatal accident rate and fatality risk share the same value.

Runway Collision



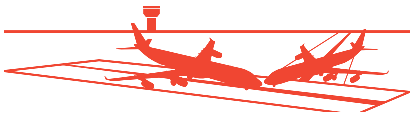
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	71%
Safety Management	43%
Mgmt Decisions, incl. regul. decision (cost cut)	29%
Flight Operations	14%
Change Management	14%
Flight Ops: Training Systems	14%
Maintenance Ops: SOPs & Checking	14%
Maintenance Operations	14%

THREATS

	Percentage Contribution
Air Traffic Services	43%
Airport Facilities	43%
Poor Visibility/IMC	29%
Meteorology	29%
Wildlife/Birds/Foreign Object	29%
Contaminated Runway/Taxiway - poor braking action	14%
Wind/Windshear/Gusty Wind	14%
Icing Conditions	14%
Traffic	14%
Airport Perimeter Control/fencing/wildlife control	14%
Optical Illusion/visual misperception	14%
Foreign Objects, FOD	14%
Inad overrun area/trench/ditch/prox of structures	14%

Runway Collision



FLIGHT CREW ERRORS

	Percentage Contribution
Briefings	14%
Crew to External Communication	14%
Callouts	14%
Ground Navigation	14%
SOP Adherence/SOP Cross-verification	14%
Manual Handling/Flight Controls	14%
ATC	14%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Runway/Taxiway Incursion	29%
Long/floated/bounced/firm/off-center/crabbed landing	14%
Ramp Movements, including when under marshalling	14%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	29%
Inquiry	14%
Monitor/Cross-check	14%
Evaluation of Plans	14%
Taxiway/Runway Management	14%
In-flight Decision-making/contingency management	14%
Pro-active: In-flight decision-making	14%

Note: all of the accidents were classified.

Refer to the list of Accident Classification Taxonomy.

Jet Aircraft Accidents – Accident Count

2020	Number of accidents:	27	Number of fatalities:	121
2016-2020	Number of accidents:	174	Number of fatalities:	853

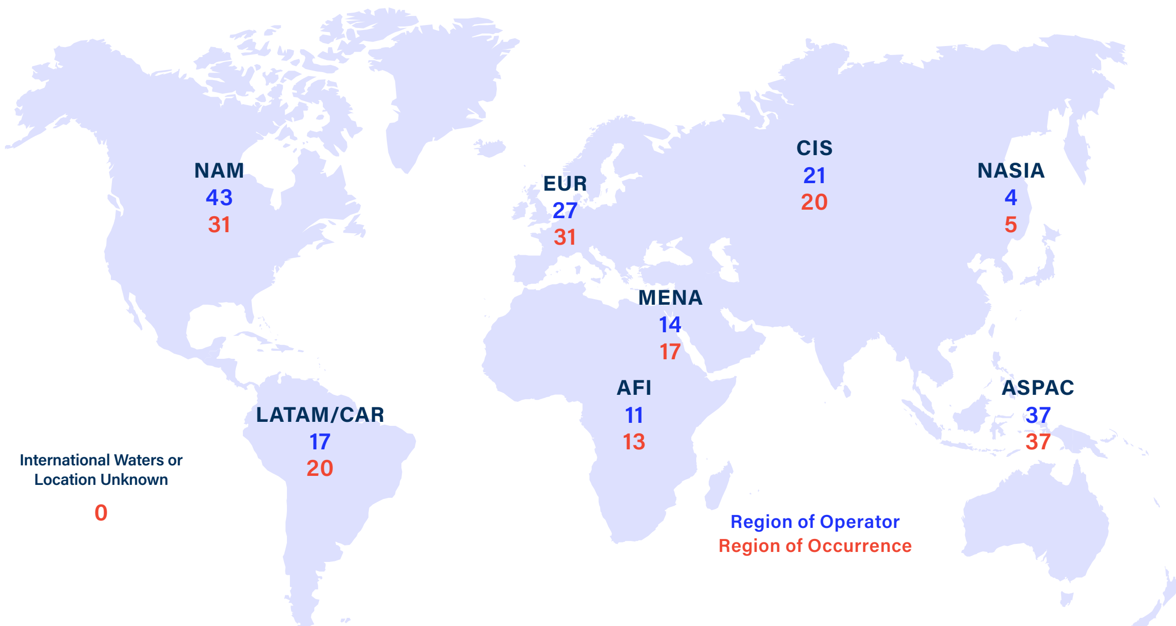
Accident Count % of Total	2020	'16-'20
IATA Member	44%	52%
Full-Loss Equivalents	4%	3%
Fatal	11%	10%
Hull Losses	15%	19%

	Passenger	Cargo	Ferry
2020	**70%**	**30%**	**0%**
2016-2020	**84%**	**16%**	**0%**

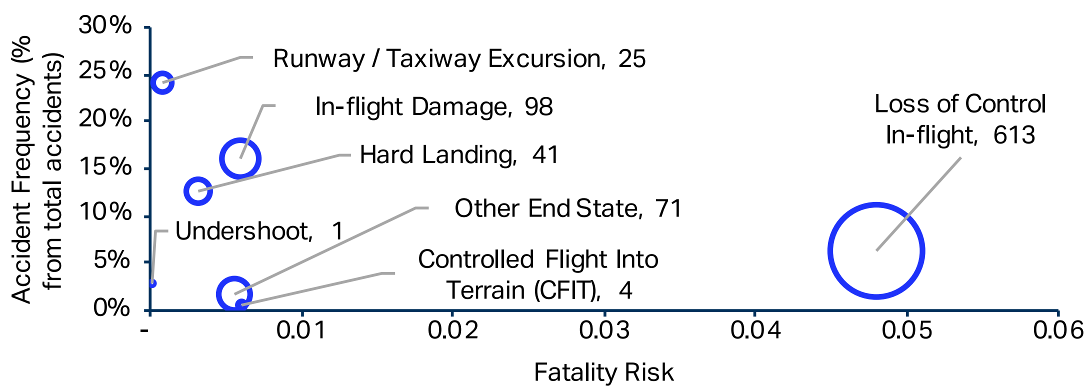
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Jet Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.42
2016-2020 Accident rate: 1.05

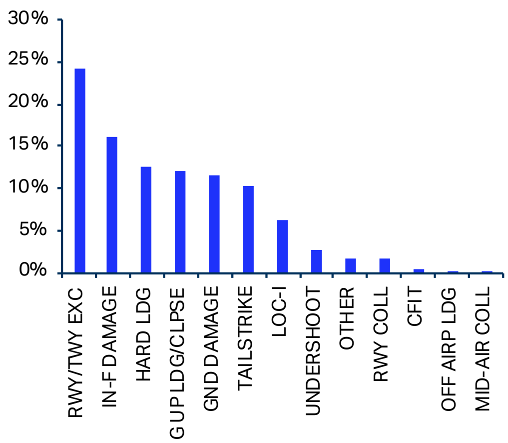
Accident Rate*	2020	'16-'20
IATA Member	0.83	0.89
Fatality Risk**	0.05	0.03
Fatal	0.16	0.11
Hull Losses	0.21	0.20

Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

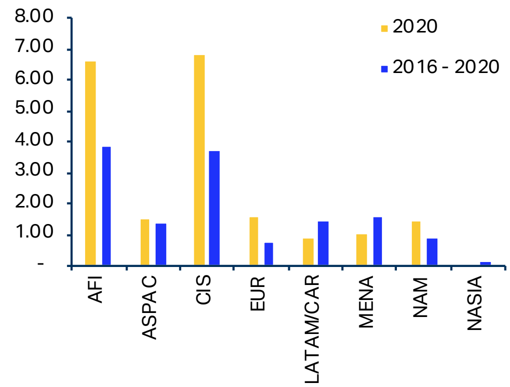
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of [Acronyms/Abbreviations section] for full names.

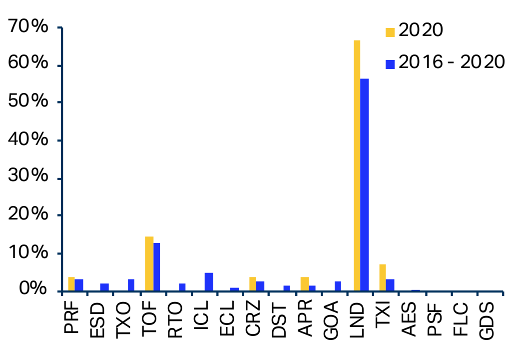
Regional Accident Rate (2016-2020)

Accident per million sectors



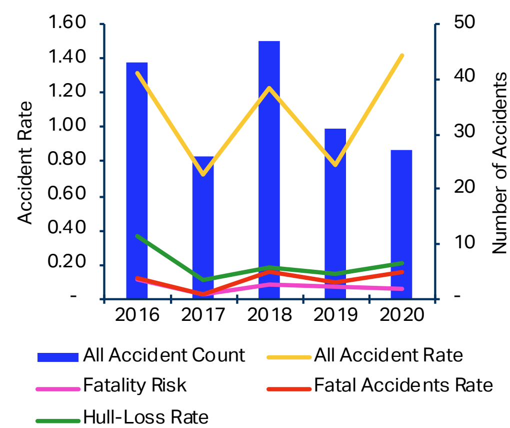
Accidents per Phase of Flight (2016-2020)

Total number of accidents



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Jet Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Safety Management	36%
Regulatory Oversight	33%
Flight Operations	24%
Flight Ops: SOPs & Checking	19%
Flight Ops: Training Systems	17%
Selection Systems	15%
Maintenance Operations	13%
Maintenance Ops: SOPs & Checking	11%
Mgmt Decisions, incl. regul. decision (cost cut)	9%
Design	9%
Ground Operations	4%
Dispatch	4%
Ground Ops: SOPs & Checking	4%
Technology & Equipment	4%
Dispatch Ops: SOPs & Checking	3%
Change Management	2%
Ground Ops: Training Systems	2%
Ops Planning & Scheduling	1%
Maintenance Ops: Training Systems	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	45%
SOP Adherence/SOP Cross-verification	35%
Failure to GOA after destabilization on approach	15%
Callouts	14%
Pilot-to-Pilot Communication	14%
Failure to GOA after abnormal runway contact	9%
Automation	6%
Crew to External Communication	4%
Normal Checklist	3%
ATC	3%
Abnormal Checklist	3%
Briefings	2%
Systems/Radios/Instruments	2%
Wrong Weight & Balance/Fuel Information	2%
Ground Navigation	2%
Documentation	2%
Maintenance	1%
Wrong Altimeter Reference Settings (QNH, QFE)	1%
Dispatch	1%

Jet Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	37%
Aircraft Malfunction	29%
Wind/Windshear/Gusty Wind	26%
Airport Facilities	22%
Maintenance Events	17%
Thunderstorms	16%
Gear/Tire	15%
Contaminated Runway/Taxiway - poor braking action	14%
Poor Visibility/IMC	12%
Operational Pressure	8%
Ground Events	7%
Lack of Visual Reference	6%
Fatigue	6%
Nav Aids	5%
Inad overrun area/trench/ditch/prox of structures	5%
Air Traffic Services	5%
Wildlife/Birds/Foreign Object	5%
Poor sign/lighting, faint markings,rwy/txy closure	4%
Traffic	4%
Ground-based Nav Aid Malfunction or not available	4%
Icing Conditions	4%
Optical Illusion/visual misperception	4%
Hydraulic System Failure	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Extensive/Uncontained Engine Failure	4%
Dispatch/Paperwork	3%
MEL Item	2%
Spatial Disorientation/somatogravic illusion	2%
Brakes	2%
Contained Engine Failure/Powerplant Malfunction	2%
Flight Controls	1%
Electrical Power Generation Failure	1%
Avionics/Flight Instruments	1%
Foreign Objects, FOD	1%
Airport Perimeter Control/fencing/wildlife control	1%
Structural Failure	1%
Primary Flight Controls	1%
Dangerous Goods	1%
Secondary Flight Controls	1%
Manuals/Charts/Checklists	1%

Jet Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	28%
Vertical/Lateral/Speed Deviation	24%
Unstable Approach	21%
Continued Landing after Unstable Approach	19%
Abrupt Aircraft Control	16%
Unnecessary Weather Penetration	13%
Operation Outside Aircraft Limitations	12%
Brakes/Thrust Reversers/Ground Spoilers	6%
Flight Controls/Automation	4%
Engine	3%
Weight & Balance	2%
Loss of Aircraft Control While on the Ground	2%
Ramp Movements, including when under marshalling	2%
Controlled Flight Towards Terrain	2%
Rejected Takeoff after V_1	1%
Systems	1%
Runway/Taxiway Incursion	1%
Landing Gear	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	30%
Monitor/Cross-check	22%
In-flight Decision-making/contingency management	17%
Leadership	17%
Captain should show leadership	16%
Taxiway/Runway Management	12%
Workload Management	9%
Automation Management	7%
Communication Environment	6%
FO is assertive when necessary	6%
Re-Active - Contingency Management	4%
Pro-active: In-flight decision-making	4%
Evaluation of Plans	4%
Plans Stated	2%
SOP Briefing/Planning	1%
Inquiry	1%

Note: 13 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

IATA SAFETY ISSUE REVIEW MEETING

A bi-annual industry meeting for safety professionals: **air carriers, airports, manufacturers, and ground service providers.**

Date of the next **SIRM** to be announced.

The SIRM is held under the **Chatham House Rule**, which means this is a **protected forum** for participants to **openly discuss safety risks,** hazards, **lessons learned from accidents** and **incidents, and the shared results of safety studies.**

Special COVID-19 Bulletin

Lessons learned from today's operational experiences and de-identified case studies.

Download a copy

For more information or to contribute to the next edition of the Bulletin, please contact IATA SIRM

Turboprop Aircraft Accidents – Accident Count

2020	Number of accidents: 11	Number of fatalities: 11
2016-2020	Number of accidents: 88	Number of fatalities: 259

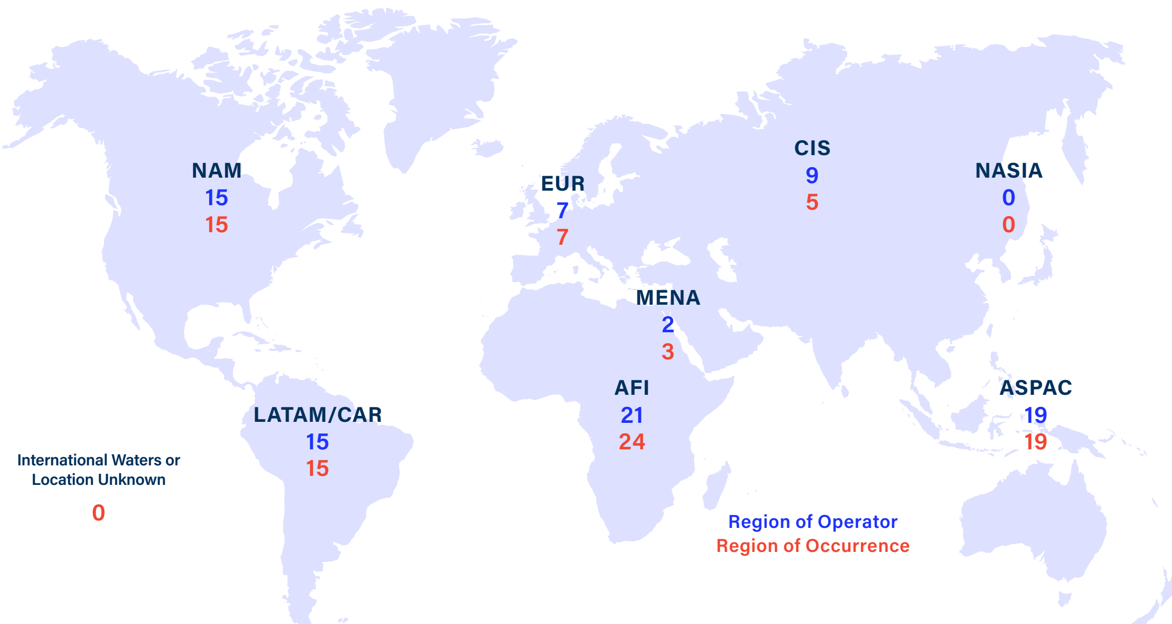
Accident Count % of Total	2020	'16-'20
IATA Member	9%	16%
Full-Loss Equivalents	0%	2%
Fatal	18%	23%
Hull Losses	45%	35%

	Passenger	Cargo	Ferry
2020	45%	55%	0%
2016-2020	67%	31%	2%

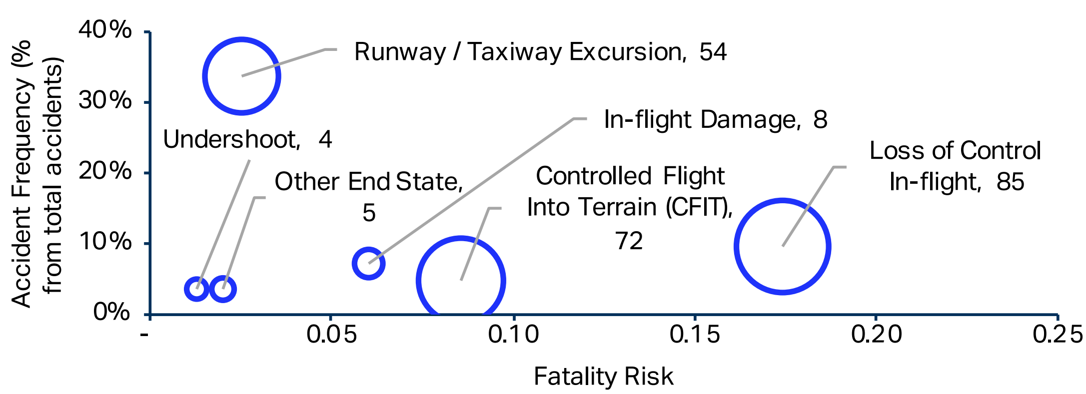
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Turboprop Aircraft Accidents – Accident Rate*

2020 Accident rate: 3.50
2016-2020 Accident rate: 2.83

Accident Rate*	2020	'16-'20
IATA Member	0.82	1.82
Fatality Risk**	–	0.06
Fatal	0.64	0.64
Hull Losses	1.59	1.00

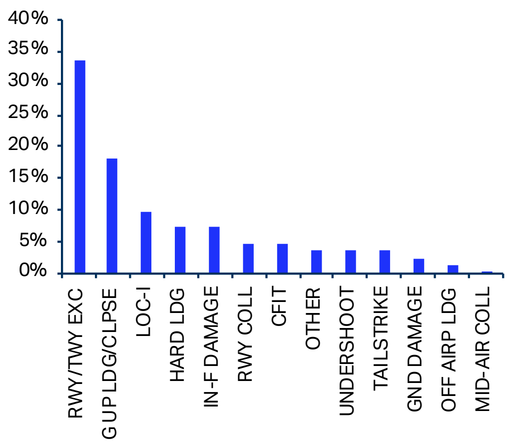
Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

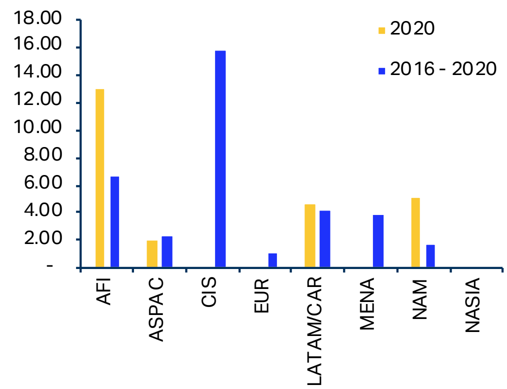
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

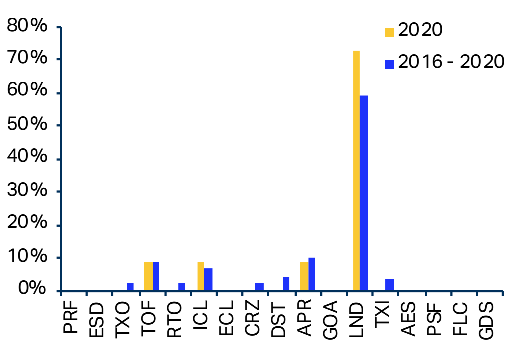
Regional Accident Rate (2016-2020)

Accident per million sectors



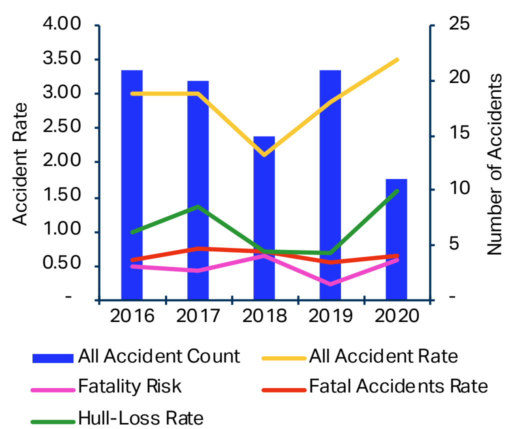
Accidents per Phase of Flight (2016-2020)

Total number of accidents



Five-Year Trend (2016-2020)

See Annex 1 for the definitions of metrics used



Turboprop Aircraft Accidents – Contributing Factors

Turboprop Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	39%
Safety Management	38%
Flight Operations	32%
Selection Systems	22%
Mgmt Decisions, incl. regul. decision (cost cut)	20%
Flight Ops: SOPs & Checking	19%
Flight Ops: Training Systems	14%
Maintenance Operations	11%
Maintenance Ops: SOPs & Checking	9%
Ground Ops: SOPs & Checking	4%
Ground Operations	4%
Dispatch	4%
Ops Planning & Scheduling	3%
Design	3%
Change Management	3%
Ground Ops: Training Systems	3%
Cabin Operations	1%
Dispatch Ops: SOPs & Checking	1%
Flight Watch/Following/Support	1%
Maintenance Ops: Training Systems	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	32%
SOP Adherence/SOP Cross-verification	30%
Callouts	12%
Failure to GOA after destabilization on approach	8%
Abnormal Checklist	7%
Pilot-to-Pilot Communication	7%
Failure to GOA after abnormal runway contact	5%
Briefings	4%
Wrong Weight & Balance/Fuel Information	3%
Normal Checklist	3%
Systems/Radios/Instruments	3%
Documentation	3%
ATC	3%
Crew to External Communication	3%
Ground Navigation	1%

Turboprop Aircraft Accidents

THREATS

	Percentage Contribution
Aircraft Malfunction	38%
Meteorology	38%
Wind/Windshear/Gusty Wind	22%
Poor Visibility/IMC	20%
Airport Facilities	19%
Gear/Tire	16%
Thunderstorms	15%
Contained Engine Failure/Powerplant Malfunction	11%
Nav Aids	9%
Ground-based Nav Aid Malfunction or not available	9%
Operational Pressure	9%
Inad overrun area/trench/ditch/prox of structures	8%
Terrain/Obstacles	8%
Maintenance Events	7%
Fatigue	5%
Air Traffic Services	5%
Lack of Visual Reference	5%
Contaminated Runway/Taxiway - poor braking action	5%
Wildlife/Birds/Foreign Object	5%
Dispatch/Paperwork	5%
Optical Illusion/visual misperception	4%
Ground Events	4%
Poor sign/lighting, faint markings,rwy/txy closure	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Airport Perimeter Control/fencing/wildlife control	4%
Icing Conditions	3%
Crew Incapacitation	1%
Foreign Objects, FOD	1%
Structural Failure	1%
Electrical Power Generation Failure	1%
Avionics/Flight Instruments	1%
Manuals/Charts/Checklists	1%
Brakes	1%
Traffic	1%
Hydraulic System Failure	1%

Turboprop Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	20%
Abrupt Aircraft Control	19%
Unnecessary Weather Penetration	19%
Vertical/Lateral/Speed Deviation	18%
Operation Outside Aircraft Limitations	14%
Unstable Approach	12%
Loss of Aircraft Control While on the Ground	9%
Continued Landing after Unstable Approach	9%
Engine	8%
Controlled Flight Towards Terrain	8%
Brakes/Thrust Reversers/Ground Spoilers	4%
Landing Gear	3%
Rejected Takeoff after V_1	3%
Flight Controls/Automation	1%
Systems	1%
Runway/Taxiway Incursion	1%
Unauthorized Airspace Penetration	1%
Weight & Balance	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	27%
Monitor/Cross-check	23%
In-flight Decision-making/contingency management	19%
Captain should show leadership	14%
Leadership	14%
FO is assertive when necessary	8%
Communication Environment	7%
Evaluation of Plans	7%
Workload Management	5%
Taxiway/Runway Management	4%
Pro-active: In-flight decision-making	4%
Inquiry	1%
Re-Active - Contingency Management	1%

Note: 15 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Refer to the list of Accident Classification Taxonomy.

5

In-Depth Regional Accident Analysis

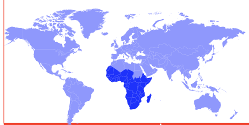
Following the same model as the in-depth analysis by accident category presented in Chapter 4, this chapter presents an overview of occurrences and their contributing factors broken down by the region of the involved operator(s). The purpose of this chapter is to identify issues that operators located in the same region may share, in order to develop adequate prevention strategies.

Note: IATA determines the accident region based on the operator's "home" country as specified in the operator's Air Operator Certificate (AOC). For example, if a Canadian-registered operator has an accident in Europe, this accident is considered a North American accident. For a complete list of countries assigned per region, consult Annex 1.

Image courtesy of Boeing

Africa Aircraft Accidents – Accident Count

2020	Number of accidents: 6	Number of fatalities: 11
2016-2020	Number of accidents: 32	Number of fatalities: 198



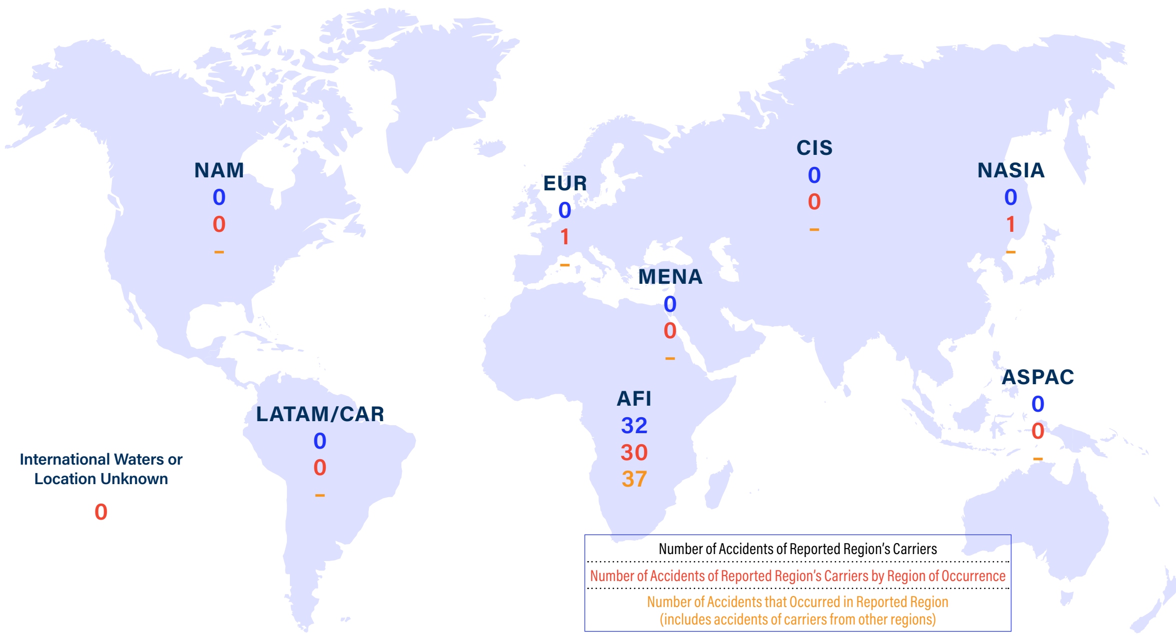
Accident Count % of Total	2020	'16-'20
IATA Member	17%	28%
Full-Loss Equivalents	31%	18%
Fatal	33%	19%
Hull Losses	67%	41%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	17%	83%	0%	33%	67%
2016-2020	59%	41%	0%	34%	66%

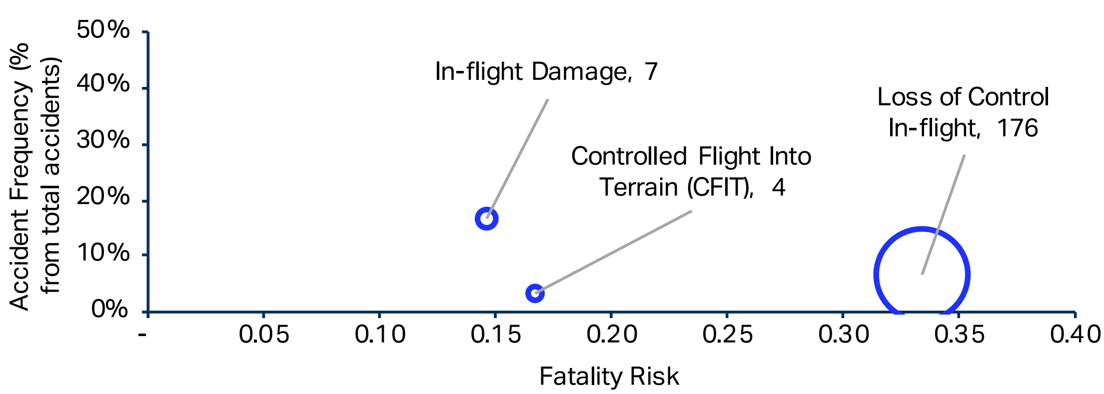
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



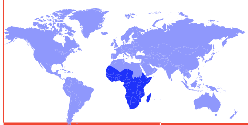
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Africa Aircraft Accidents – Accident Rate*

2020 Accident rate: 9.86
2016-2020 Accident rate: 5.34



Accident Rate*	2020	'16-'20
IATA Member	3.27	3.21
Fatality Risk**	3.08	0.98
Fatal	3.29	1.00
Hull Losses	6.57	2.17

	Jet	Turboprop
2020	6.64	13.02
2016-2020	3.84	6.72

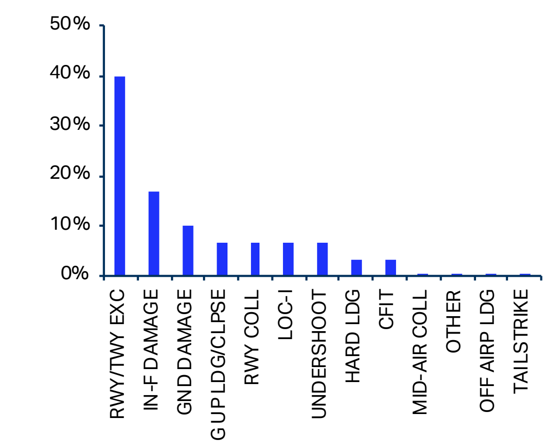
Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

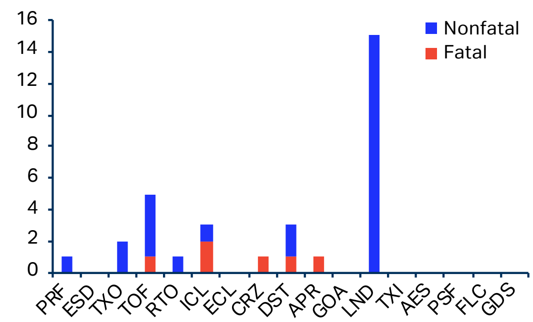
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

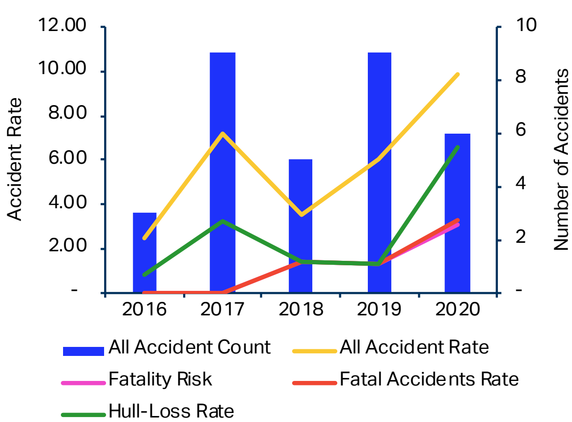
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



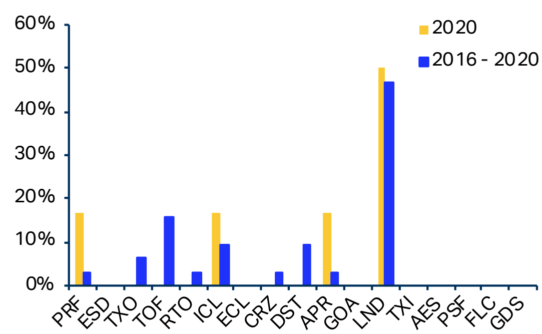
Regional Accident Rate (2016-2020)

Accident per million sectors



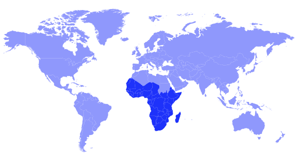
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



AFI Aircraft Accidents – Contributing Factors

Africa Aircraft Accidents



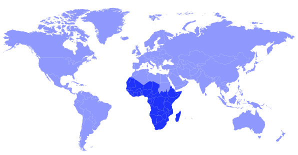
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	57%
Safety Management	52%
Mgmt Decisions, incl. regul. decision (cost cut)	39%
Change Management	13%
Selection Systems	13%
Flight Operations	13%
Maintenance Operations	9%
Dispatch	9%
Flight Ops: Training Systems	9%
Design	9%
Flight Ops: SOPs & Checking	9%
Ground Ops: SOPs & Checking	4%
Ground Operations	4%
Technology & Equipment	4%
Maintenance Ops: SOPs & Checking	4%
Flight Watch/Following/Support	4%
Dispatch Ops: SOPs & Checking	4%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	26%
Documentation	9%
Wrong Weight & Balance/Fuel Information	9%
Crew to External Communication	9%
ATC	9%
Ground Navigation	4%
SOP Adherence/SOP Cross-verification	4%
Automation	4%
Abnormal Checklist	4%

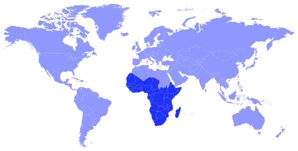
Africa Aircraft Accidents



THREATS

	Percentage Contribution
Airport Facilities	35%
Meteorology	26%
Aircraft Malfunction	22%
Wildlife/Birds/Foreign Object	22%
Wind/Windshear/Gusty Wind	17%
Nav Aids	17%
Thunderstorms	17%
Gear/Tire	13%
Ground-based Nav Aid Malfunction or not available	13%
Inad overrun area/trench/ditch/prox of structures	13%
Poor sign/lighting, faint markings,rwy/txy closure	9%
Poor Visibility/IMC	9%
Maintenance Events	9%
Airport Perimeter Control/fencing/wildlife control	9%
Contaminated Runway/Taxiway - poor braking action	4%
Brakes	4%
Dangerous Goods	4%
Optical Illusion/visual misperception	4%
Dispatch/Paperwork	4%
Lack of Visual Reference	4%
Foreign Objects, FOD	4%
Contained Engine Failure/Powerplant Malfunction	4%
Ground Events	4%
Terrain/Obstacles	4%
Extensive/Uncontained Engine Failure	4%
Hydraulic System Failure	4%

Africa Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Unnecessary Weather Penetration	22%
Long/floated/bounced/firm/off-center/crabbed landing	17%
Vertical/Lateral/Speed Deviation	9%
Continued Landing after Unstable Approach	9%
Operation Outside Aircraft Limitations	9%
Loss of Aircraft Control While on the Ground	9%
Ramp Movements, including when under marshalling	4%
Flight Controls/Automation	4%
Weight & Balance	4%
Unstable Approach	4%
Controlled Flight Towards Terrain	4%

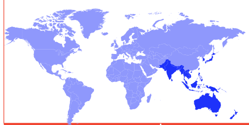
COUNTERMEASURES

	Percentage Contribution
In-flight Decision-making/contingency management	22%
Overall Crew Performance	17%
Captain should show leadership	13%
Leadership	13%
Monitor/Cross-check	13%
Taxiway/Runway Management	13%
Workload Management	9%
Automation Management	9%
Pro-active: In-flight decision-making	9%
Evaluation of Plans	4%
Re-Active - Contingency Management	4%

Note: nine accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Asia/Pacific Aircraft Accidents – Accident Count

2020	Number of accidents: 7	Number of fatalities: 118
2016-2020	Number of accidents: 56	Number of fatalities: 411



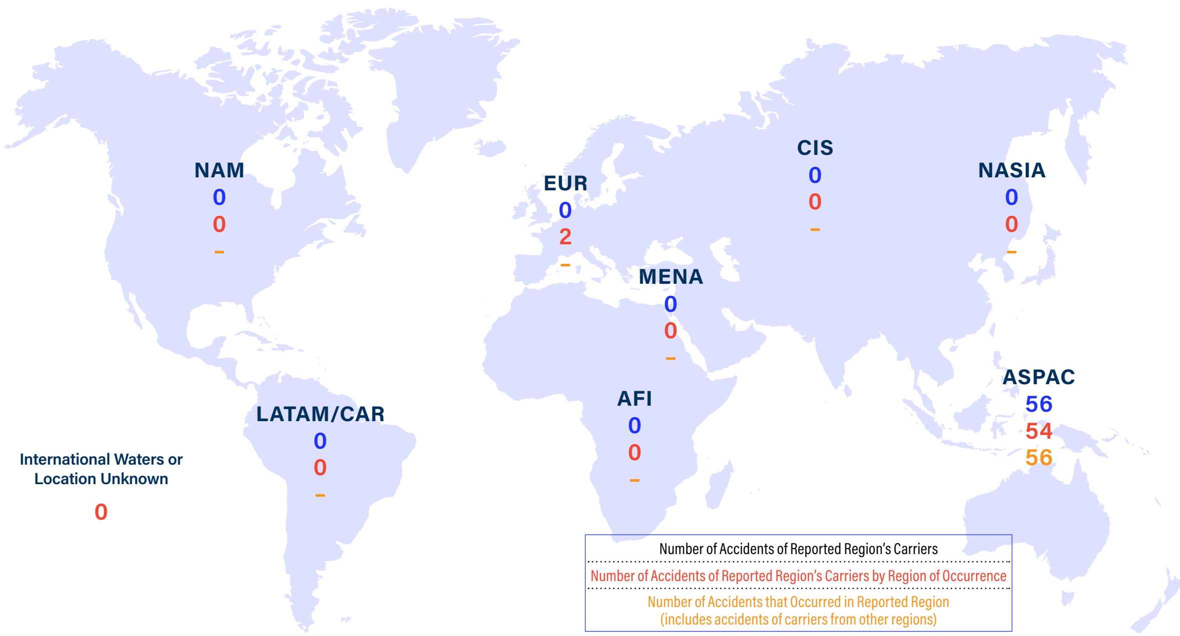
Accident Count % of Total	2020	'16-'20
IATA Member	29%	39%
Full-Loss Equivalents	16%	9%
Fatal	29%	14%
Hull Losses	29%	21%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	86%	14%	0%	71%	29%
2016-2020	88%	13%	0%	66%	34%

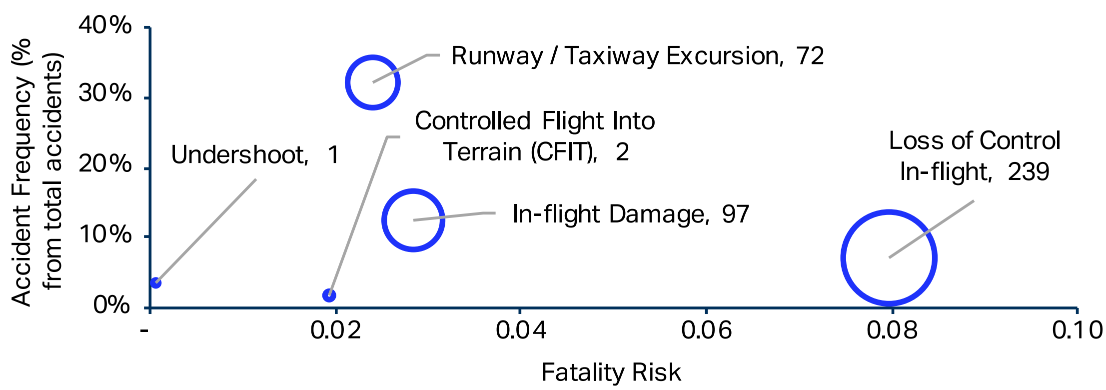
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



Accident Category Frequency and Fatality Risk (2016-2020)

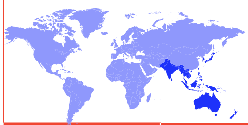


The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Asia/Pacific Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.67

2016-2020 Accident rate: 1.62



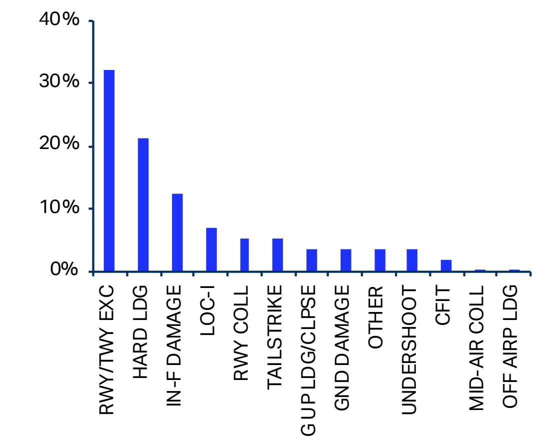
Accident Rate*	2020	'16-'20
IATA Member	0.79	1.49
Fatality Risk**	0.26	0.15
Fatal	0.48	0.23
Hull Losses	0.48	0.35

	Jet	Turboprop	
2020	1.56	2.00	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	1.39	2.39	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

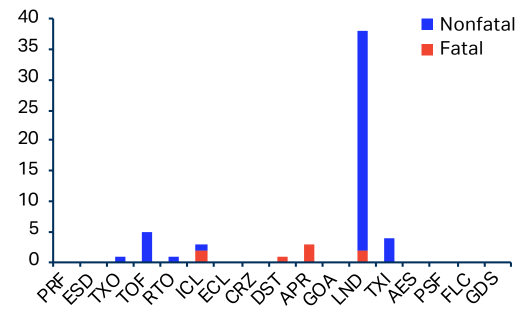
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of [Acronyms/Abbreviations section] for full names.

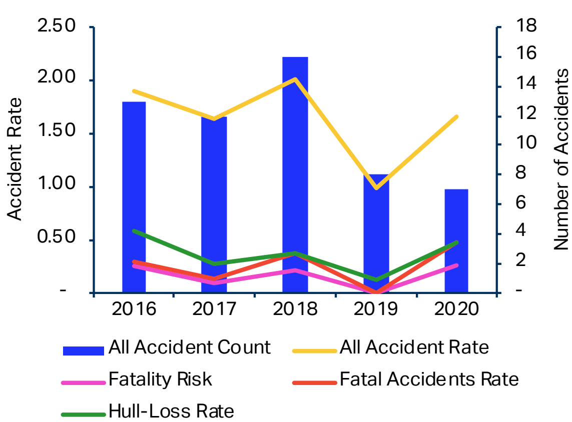
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



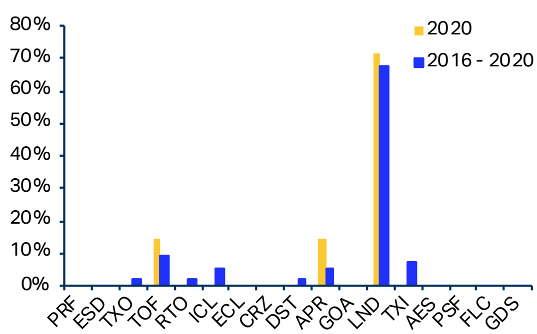
Regional Accident Rate (2016-2020)

Accident per million sectors



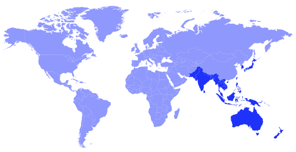
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



ASPAC Aircraft Accidents – Contributing Factors

Asia/Pacific Aircraft Accidents



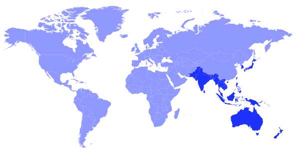
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	52%
Safety Management	44%
Flight Operations	31%
Flight Ops: Training Systems	29%
Flight Ops: SOPs & Checking	21%
Selection Systems	19%
Maintenance Operations	15%
Maintenance Ops: SOPs & Checking	13%
Mgmt Decisions, incl. regul. decision (cost cut)	12%
Change Management	4%
Technology & Equipment	4%
Design	4%
Maintenance Ops: Training Systems	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	56%
SOP Adherence/SOP Cross-verification	44%
Failure to GOA after destabilization on approach	29%
Callouts	29%
Pilot-to-Pilot Communication	21%
Crew to External Communication	10%
Ground Navigation	8%
Abnormal Checklist	6%
ATC	6%
Briefings	4%
Maintenance	4%
Normal Checklist	4%
Systems/Radios/Instruments	2%
Automation	2%

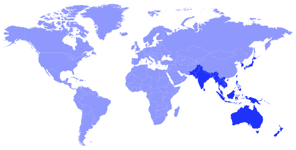
Asia/Pacific Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	38%
Aircraft Malfunction	27%
Thunderstorms	25%
Poor Visibility/IMC	21%
Airport Facilities	21%
Wind/Windshear/Gusty Wind	17%
Maintenance Events	13%
Poor sign/lighting, faint markings,rwy/txy closure	10%
Air Traffic Services	10%
Nav Aids	10%
Lack of Visual Reference	10%
Contaminated Runway/Taxiway - poor braking action	10%
Ground-based Nav Aid Malfunction or not available	10%
Contained Engine Failure/Powerplant Malfunction	8%
Fire/Smoke (Cockpit/Cabin/Cargo)	8%
Optical Illusion/visual misperception	8%
Operational Pressure	6%
Gear/Tire	6%
Inad overrun area/trench/ditch/prox of structures	6%
Traffic	4%
Terrain/Obstacles	4%
Fatigue	4%
Wildlife/Birds/Foreign Object	2%
Crew Incapacitation	2%
Foreign Objects, FOD	2%
Avionics/Flight Instruments	2%
Manuals/Charts/Checklists	2%
Dispatch/Paperwork	2%
Extensive/Uncontained Engine Failure	2%

Asia/Pacific Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	40%
Long/floated/bounced/firm/off-center/crabbed landing	37%
Unstable Approach	33%
Continued Landing after Unstable Approach	29%
Abrupt Aircraft Control	23%
Unnecessary Weather Penetration	17%
Operation Outside Aircraft Limitations	13%
Controlled Flight Towards Terrain	8%
Brakes/Thrust Reversers/Ground Spoilers	8%
Engine	8%
Ramp Movements, including when under marshalling	6%
Runway/Taxiway Incursion	4%
Flight Controls/Automation	4%
Landing Gear	2%
Loss of Aircraft Control While on the Ground	2%
Unauthorized Airspace Penetration	2%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	46%
Monitor/Cross-check	37%
Leadership	23%
Captain should show leadership	21%
In-flight Decision-making/contingency management	17%
Taxiway/Runway Management	15%
Workload Management	12%
FO is assertive when necessary	12%
Communication Environment	8%
Automation Management	6%
Pro-active: In-flight decision-making	6%
Inquiry	4%
Re-Active - Contingency Management	4%
SOP Briefing/Planning	2%
Evaluation of Plans	2%
Plans Stated	2%

Note: four accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

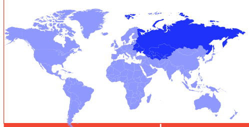
> It is possible to fly
> without motors,
> but not without
> knowledge and skill.

Wilbur Wright

Letter to Octave Chanute (13 May 1900)

Commonwealth of Independent States (CIS) Aircraft Accidents – Accident Count

2020 Number of accidents: 5 Number of fatalities: 0
2016-2020 Number of accidents: 30 Number of fatalities: 168



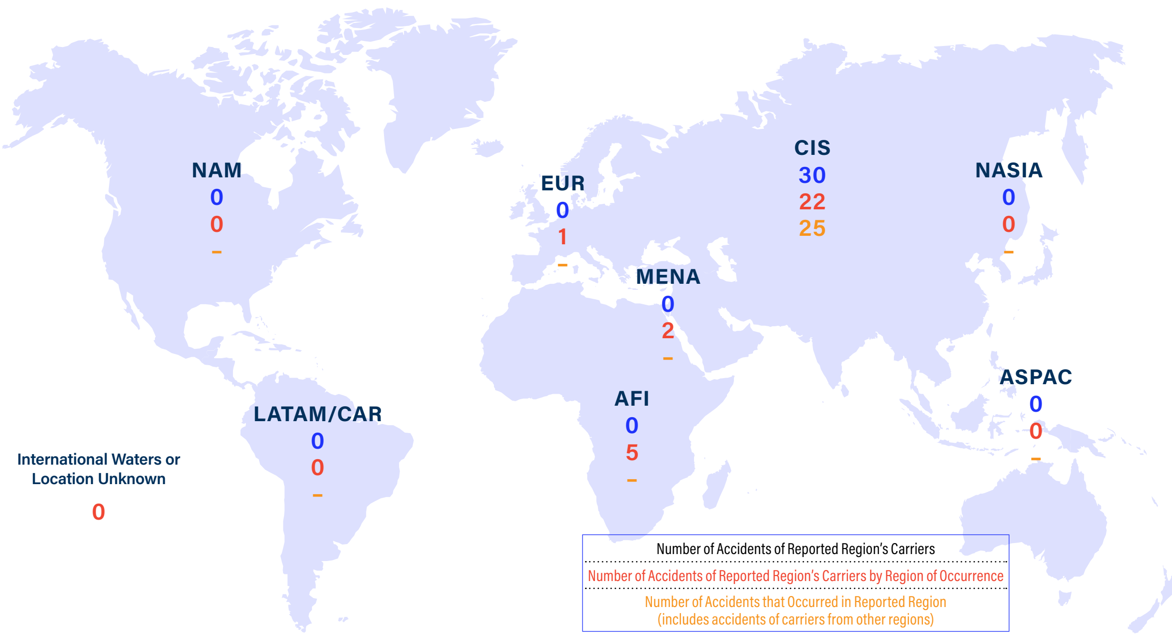
Accident Count % of Total	2020	'16-'20
IATA Member	40%	30%
Full-Loss Equivalents	0%	17%
Fatal	0%	30%
Hull Losses	20%	50%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	40%	60%	0%	100%	0%
2016-2020	67%	30%	3%	70%	30%

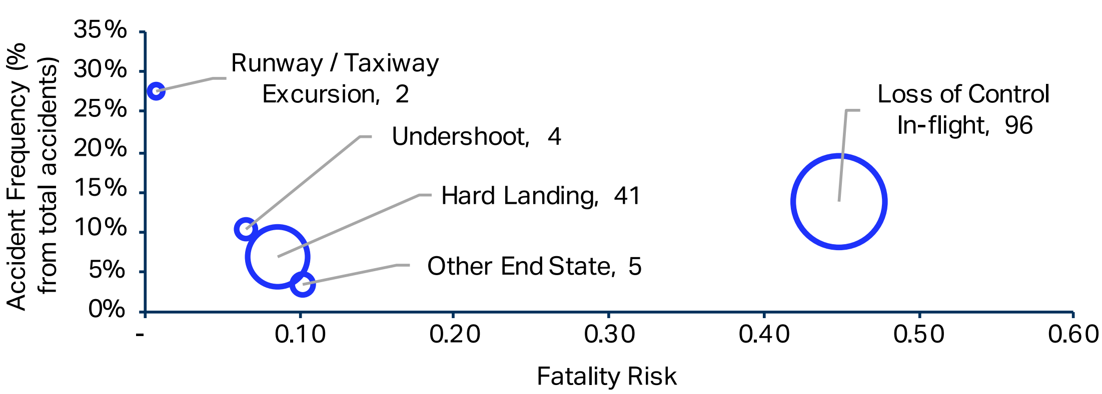
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



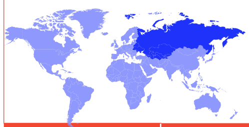
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Commonwealth of Independent States (CIS) Aircraft Accidents – Accident Rate*

2020 Accident rate: 6.07
2016-2020 Accident rate: 4.89



Accident Rate*	2020	'16-'20
IATA Member	3.43	2.39
Fatality Risk**	–	0.85
Fatal	–	1.47
Hull Losses	1.21	2.44

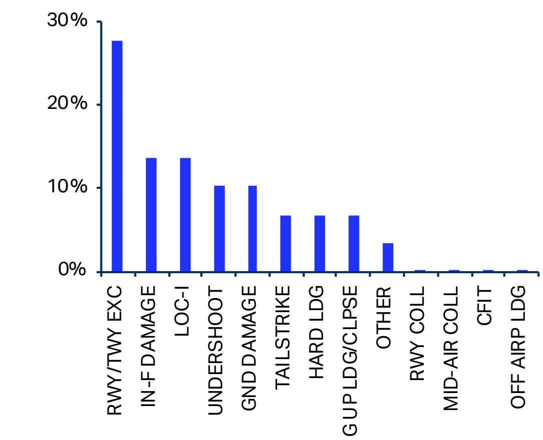
	Jet	Turboprop
2020	6.86	–
2016-2020	3.77	15.85

Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

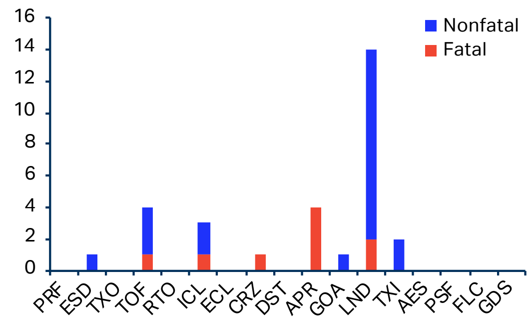
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

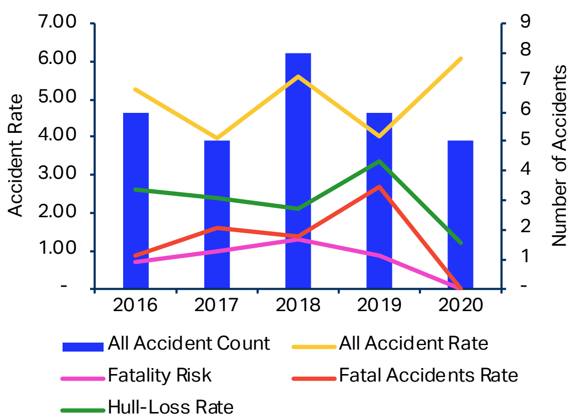
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



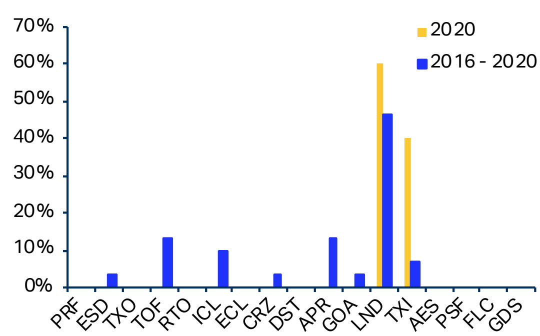
Regional Accident Rate (2016-2020)

Accident per million sectors

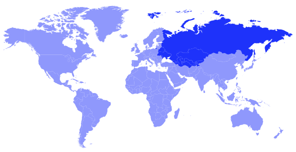


Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Commonwealth of Independent States Aircraft Accidents



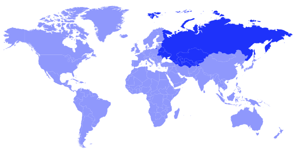
LATENT CONDITIONS

	Percentage Contribution
Safety Management	41%
Regulatory Oversight	33%
Flight Operations	30%
Flight Ops: SOPs & Checking	26%
Flight Ops: Training Systems	15%
Maintenance Operations	11%
Maintenance Ops: SOPs & Checking	7%
Ground Ops: SOPs & Checking	7%
Ground Operations	7%
Selection Systems	7%
Design	4%
Dispatch	4%
Ground Ops: Training Systems	4%
Ops Planning & Scheduling	4%
Dispatch Ops: SOPs & Checking	4%
Mgmt Decisions, incl. regul. decision (cost cut)	4%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	52%
Manual Handling/Flight Controls	41%
Failure to GOA after destabilization on approach	11%
Normal Checklist	7%
Callouts	7%
Systems/Radios/Instruments	7%
Pilot-to-Pilot Communication	7%
Documentation	4%
Wrong Weight & Balance/Fuel Information	4%
Briefings	4%
Wrong Altimeter Reference Settings (QNH, QFE)	4%
Abnormal Checklist	4%

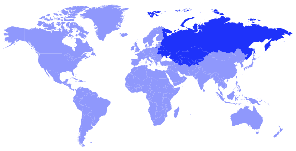
Commonwealth of Independent States Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	52%
Airport Facilities	44%
Wind/Windshear/Gusty Wind	33%
Aircraft Malfunction	33%
Thunderstorms	30%
Contaminated Runway/Taxiway - poor braking action	26%
Inad overrun area/trench/ditch/prox of structures	19%
Contained Engine Failure/Powerplant Malfunction	15%
Gear/Tire	11%
Icing Conditions	11%
Poor Visibility/IMC	11%
Maintenance Events	11%
Air Traffic Services	11%
Operational Pressure	11%
Ground-based Nav Aid Malfunction or not available	7%
Hydraulic System Failure	7%
Nav Aids	7%
MEL Item	7%
Wildlife/Birds/Foreign Object	7%
Optical Illusion/visual misperception	7%
Airport Perimeter Control/fencing/wildlife control	7%
Ground Events	7%
Electrical Power Generation Failure	7%
Flight Controls	4%
Secondary Flight Controls	4%
Spatial Disorientation/somatogravic illusion	4%
Extensive/Uncontained Engine Failure	4%
Poor sign/lighting, faint markings,rwy/txy closure	4%
Fatigue	4%
Dispatch/Paperwork	4%
Brakes	4%

Commonwealth of Independent States Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Unnecessary Weather Penetration	22%
Long/floated/bounced/firm/off-center/crabbed landing	22%
Unstable Approach	19%
Continued Landing after Unstable Approach	15%
Brakes/Thrust Reversers/Ground Spoilers	15%
Abrupt Aircraft Control	11%
Vertical/Lateral/Speed Deviation	11%
Operation Outside Aircraft Limitations	11%
Loss of Aircraft Control While on the Ground	7%
Rejected Takeoff after V_1	4%
Systems	4%

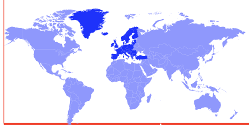
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	30%
In-flight Decision-making/contingency management	26%
Captain should show leadership	15%
Leadership	15%
Monitor/Cross-check	15%
Taxiway/Runway Management	11%
Communication Environment	7%
Re-Active - Contingency Management	7%
Evaluation of Plans	7%
Workload Management	4%
Pro-active: In-flight decision-making	4%
FO is assertive when necessary	4%
SOP Briefing/Planning	4%

Note: three accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Europe Aircraft Accidents – Accident Count

2020	Number of accidents: 5	Number of fatalities: 3
2016-2020	Number of accidents: 34	Number of fatalities: 9



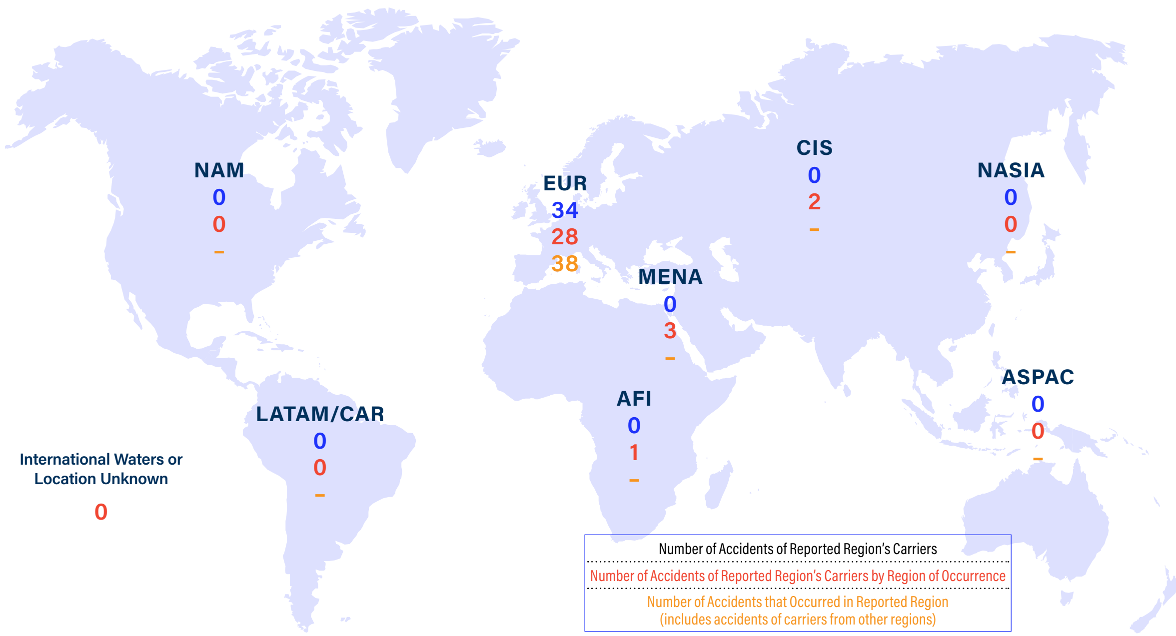
Accident Count % of Total	2020	'16-'20
IATA Member	80%	65%
Full-Loss Equivalents	0%	6%
Fatal	20%	9%
Hull Losses	20%	12%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	80%	20%	0%	100%	0%
2016-2020	85%	15%	0%	79%	21%

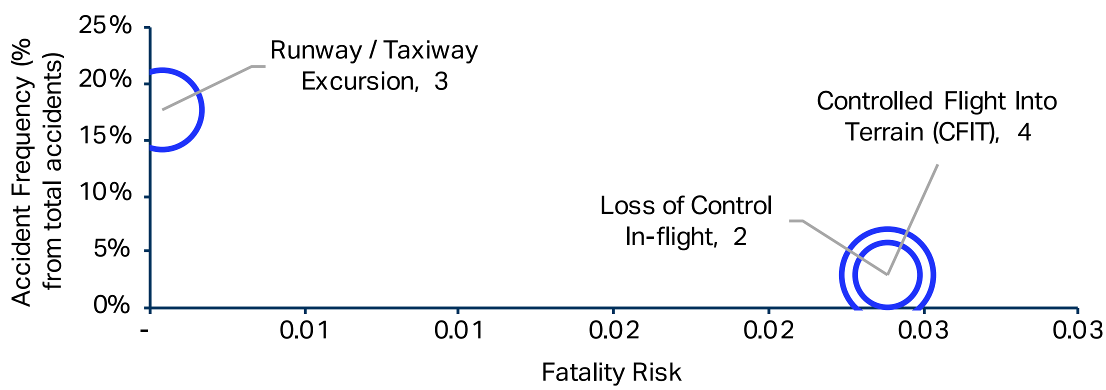
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



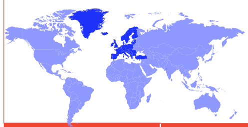
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Europe Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.31
2016-2020 Accident rate: 0.81



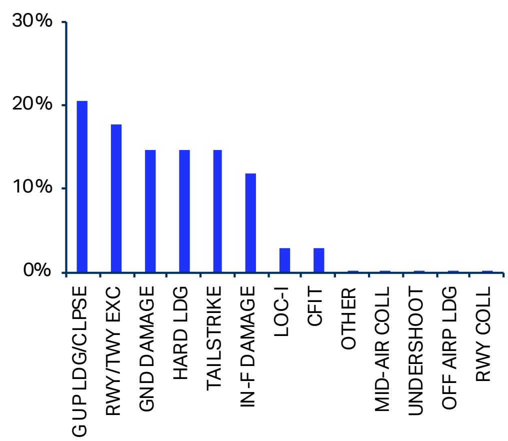
Accident Rate*	2020	'16-'20
IATA Member	1.63	0.95
Fatality Risk**	0.00	0.05
Fatal	0.26	0.07
Hull Losses	0.26	0.10

	Jet	Turboprop	
2020	1.57	–	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.76	1.13	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

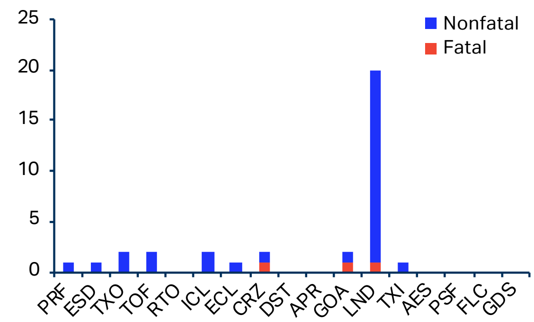
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

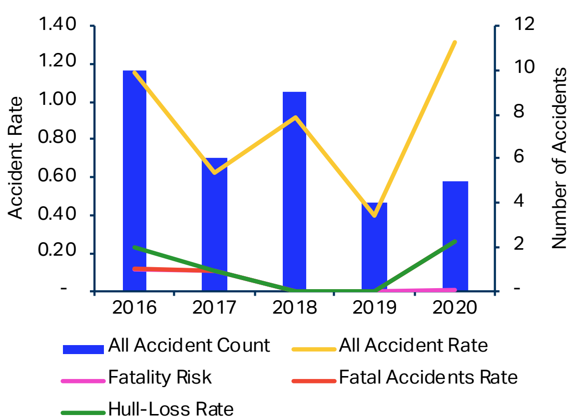
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



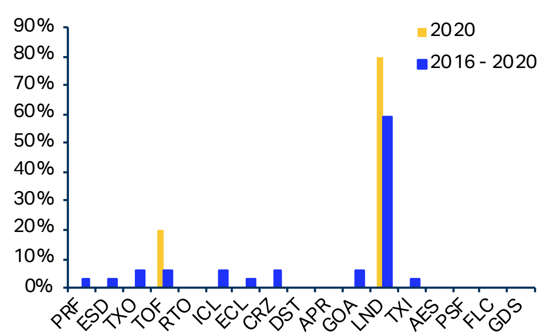
Regional Accident Rate (2016-2020)

Accident per million sectors

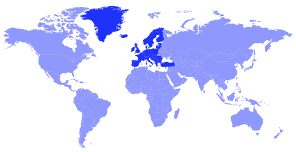


Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



Europe Aircraft Accidents



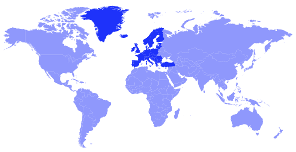
LATENT CONDITIONS

	Percentage Contribution
Safety Management	25%
Flight Operations	25%
Selection Systems	22%
Flight Ops: SOPs & Checking	22%
Regulatory Oversight	19%
Flight Ops: Training Systems	19%
Design	9%
Maintenance Ops: SOPs & Checking	9%
Ground Operations	9%
Maintenance Operations	9%
Ground Ops: SOPs & Checking	6%
Mgmt Decisions, incl. regul. decision (cost cut)	6%
Ground Ops: Training Systems	3%
Change Management	3%
Technology & Equipment	3%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	47%
Manual Handling/Flight Controls	41%
Callouts	19%
Pilot-to-Pilot Communication	13%
Automation	13%
Failure to GOA after destabilization on approach	9%
Systems/Radios/Instruments	3%
Briefings	3%
ATC	3%
Abnormal Checklist	3%
Crew to External Communication	3%

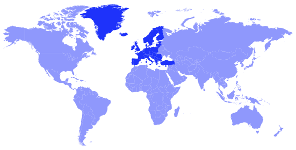
Europe Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	44%
Wind/Windshear/Gusty Wind	34%
Aircraft Malfunction	31%
Gear/Tire	19%
Fatigue	19%
Poor Visibility/IMC	16%
Airport Facilities	16%
Operational Pressure	13%
Contaminated Runway/Taxiway - poor braking action	13%
Ground Events	9%
Maintenance Events	9%
Thunderstorms	9%
Lack of Visual Reference	9%
Air Traffic Services	6%
Traffic	6%
Brakes	3%
Avionics/Flight Instruments	3%
Icing Conditions	3%
Inad overrun area/trench/ditch/prox of structures	3%
MEL Item	3%
Wildlife/Birds/Foreign Object	3%
Hydraulic System Failure	3%
Optical Illusion/visual misperception	3%
Contained Engine Failure/Powerplant Malfunction	3%
Extensive/Uncontained Engine Failure	3%

Europe Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	31%
Vertical/Lateral/Speed Deviation	28%
Unstable Approach	25%
Continued Landing after Unstable Approach	25%
Abrupt Aircraft Control	22%
Operation Outside Aircraft Limitations	9%
Unnecessary Weather Penetration	9%
Loss of Aircraft Control While on the Ground	6%
Brakes/Thrust Reversers/Ground Spoilers	6%
Landing Gear	3%
Controlled Flight Towards Terrain	3%
Weight & Balance	3%
Engine	3%
Flight Controls/Automation	3%

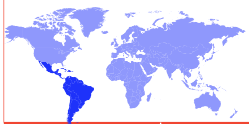
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	41%
Monitor/Cross-check	25%
In-flight Decision-making/contingency management	19%
Leadership	16%
Captain should show leadership	13%
Automation Management	9%
Re-Active - Contingency Management	6%
Taxiway/Runway Management	6%
Communication Environment	6%
Plans Stated	3%
FO is assertive when necessary	3%

Note: two accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Latin America & the Caribbean Aircraft Accidents – Accident Count

2020	Number of accidents: 3	Number of fatalities: 0
2016-2020	Number of accidents: 32	Number of fatalities: 189



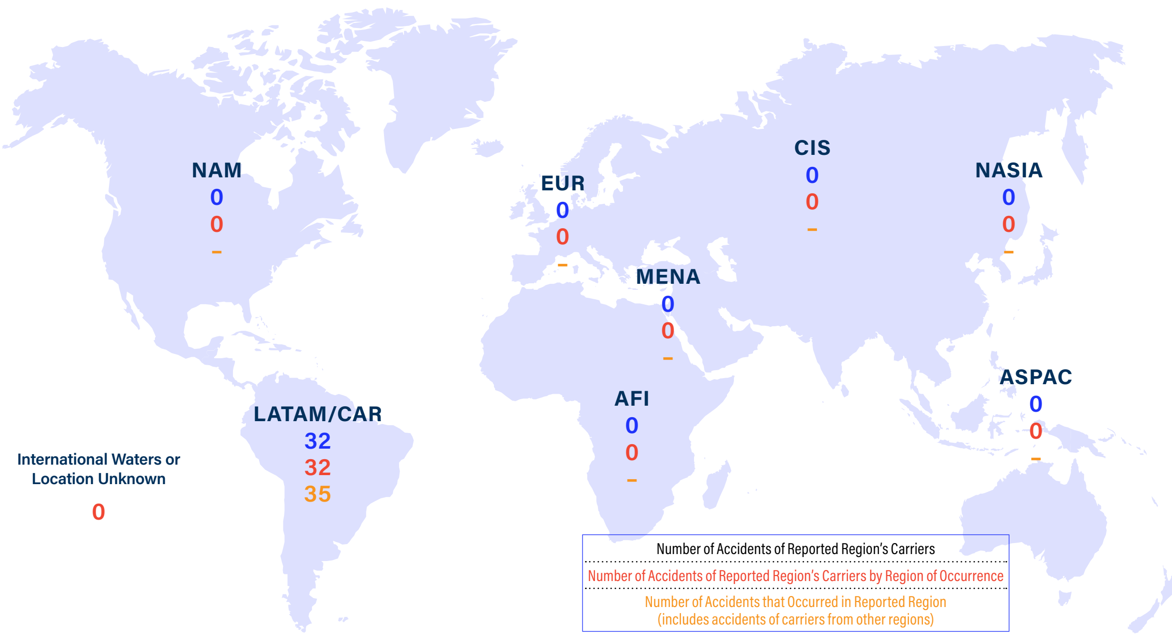
Accident Count % of Total	2020	'16-'20
IATA Member	33%	16%
Full-Loss Equivalents	0%	9%
Fatal	0%	13%
Hull Losses	33%	22%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	67%	33%	0%	33%	67%
2016-2020	81%	19%	0%	53%	47%

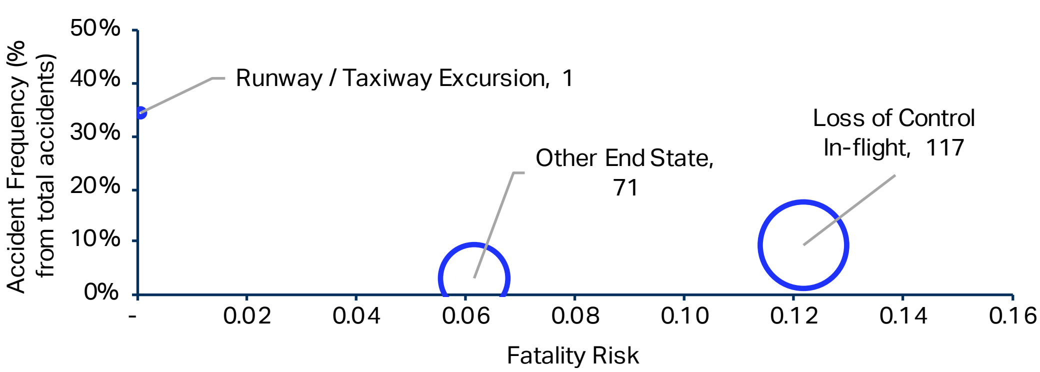
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



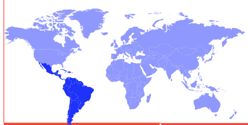
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Latin America & the Caribbean Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.93
2016-2020 Accident rate: 2.13



Accident Rate*	2020	'16-'20
IATA Member	0.99	0.50
Fatality Risk**	–	0.18
Fatal	–	0.27
Hull Losses	0.64	0.47

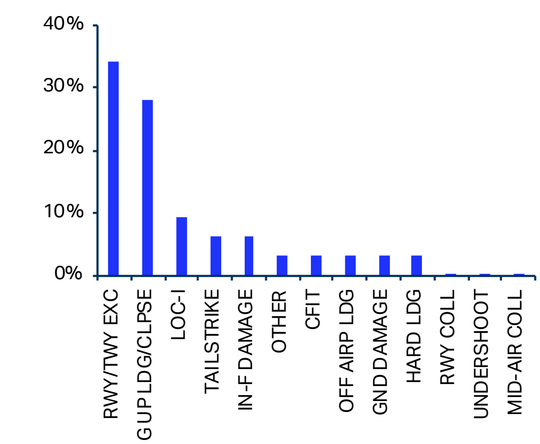
	Jet	Turboprop	
2020	0.89	4.69	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	1.49	4.23	

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

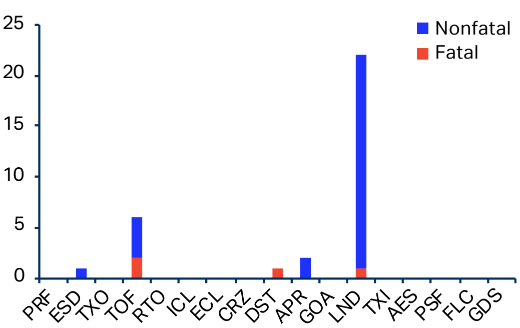
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of [Acronyms/Abbreviations section] for full names.

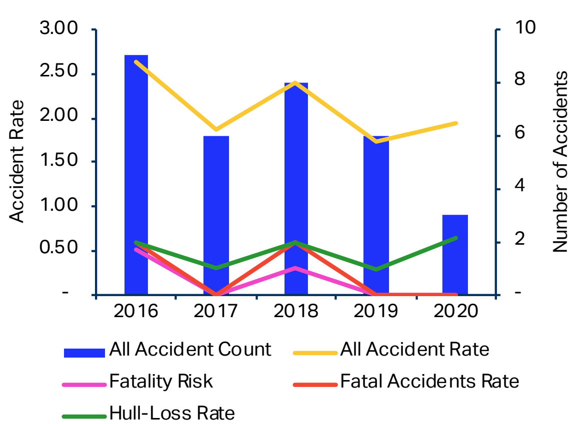
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



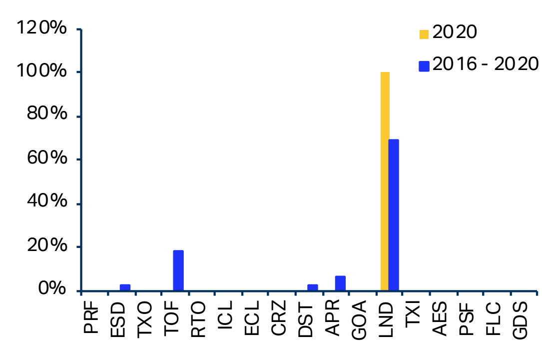
Regional Accident Rate (2016-2020)

Accident per million sectors



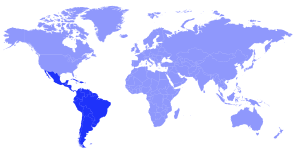
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



LATAM / CAR Aircraft Accidents – Contributing Factors

Latin America & the Caribbean Aircraft Accidents



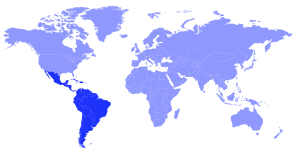
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	38%
Safety Management	38%
Flight Operations	31%
Selection Systems	28%
Dispatch	21%
Flight Ops: SOPs & Checking	21%
Mgmt Decisions, incl. regul. decision (cost cut)	17%
Dispatch Ops: SOPs & Checking	14%
Maintenance Ops: SOPs & Checking	10%
Maintenance Operations	10%
Design	10%
Flight Ops: Training Systems	10%
Ops Planning & Scheduling	7%
Cabin Operations	3%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	24%
SOP Adherence/SOP Cross-verification	24%
Documentation	10%
Wrong Weight & Balance/Fuel Information	10%
Callouts	10%
Abnormal Checklist	7%
Pilot-to-Pilot Communication	7%
ATC	3%
Briefings	3%
Dispatch	3%
Crew to External Communication	3%
Normal Checklist	3%
Systems/Radios/Instruments	3%

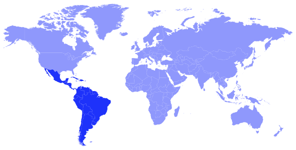
Latin America & the Caribbean Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	38%
Meteorology	21%
Maintenance Events	21%
Dispatch/Paperwork	17%
Gear/Tire	17%
Operational Pressure	14%
Airport Facilities	14%
Poor Visibility/IMC	10%
Wind/Windshear/Gusty Wind	10%
Nav Aids	7%
Lack of Visual Reference	7%
Thunderstorms	7%
Ground-based Nav Aid Malfunction or not available	7%
Contaminated Runway/Taxiway - poor braking action	7%
Inad overrun area/trench/ditch/prox of structures	3%
Ground Events	3%
Optical Illusion/visual misperception	3%
Hydraulic System Failure	3%
Terrain/Obstacles	3%
Electrical Power Generation Failure	3%
Fire/Smoke (Cockpit/Cabin/Cargo)	3%
Airport Perimeter Control/fencing/wildlife control	3%
Wildlife/Birds/Foreign Object	3%
Brakes	3%
Poor sign/lighting, faint markings,rwy/txy closure	3%
Air Traffic Services	3%
Manuals/Charts/Checklists	3%

Latin America & the Caribbean Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Operation Outside Aircraft Limitations	14%
Long/floated/bounced/firm/off-center/crabbed landing	14%
Unnecessary Weather Penetration	14%
Abrupt Aircraft Control	14%
Vertical/Lateral/Speed Deviation	10%
Weight & Balance	10%
Landing Gear	3%
Controlled Flight Towards Terrain	3%
Unstable Approach	3%
Rejected Takeoff after V_1	3%
Systems	3%
Engine	3%
Brakes/Thrust Reversers/Ground Spoilers	3%

COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	21%
In-flight Decision-making/contingency management	21%
Overall Crew Performance	17%
Captain should show leadership	10%
Leadership	10%
FO is assertive when necessary	10%
Workload Management	10%
Evaluation of Plans	7%
Communication Environment	7%
Inquiry	3%
Plans Stated	3%
Taxiway/Runway Management	3%
Pro-active: In-flight decision-making	3%

Note: three accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

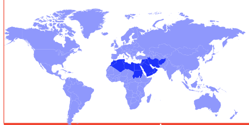
> During times of significant change, it is important that managing fatigue and operational safety remain a primary focus for operators. As such Operators must continue encouraging their crew members to provide fatigue and safety reports without fear of consequence.

IATA / IFALPA Joint Statement (2020)

Managing crew fatigue during industry recovery from pandemic

Middle East & North Africa Aircraft Accidents – Accident Count

2020	Number of accidents: 1	Number of fatalities: 0
2016-2020	Number of accidents: 16	Number of fatalities: 128



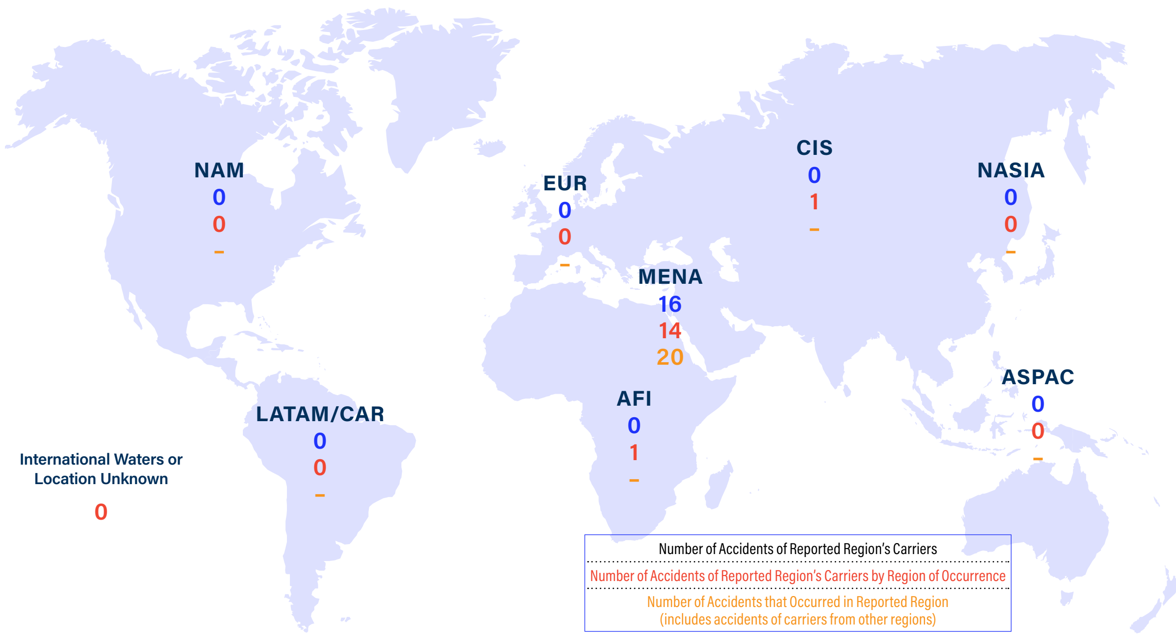
Accident Count % of Total	2020	'16-'20
IATA Member	0%	69%
Full-Loss Equivalents	0%	13%
Fatal	0%	13%
Hull Losses	0%	25%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	100%	0%	0%	100%	0%
2016-2020	94%	0%	6%	88%	13%

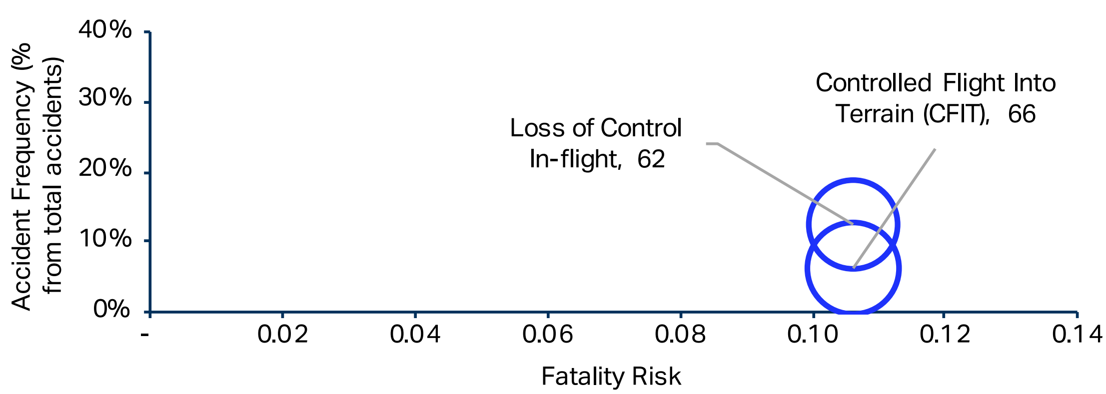
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



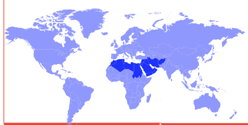
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

Middle East & North Africa Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.01
2016-2020 Accident rate: 1.70



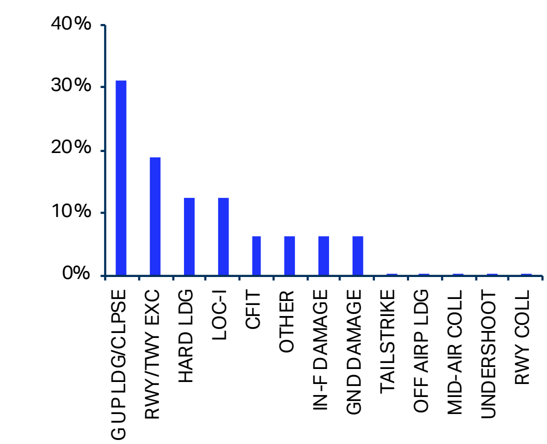
Accident Rate*	2020	'16-'20
IATA Member	-	1.45
Fatality Risk**	-	0.21
Fatal	-	0.21
Hull Losses	-	0.42

	Jet	Turboprop	
2020	1.03	-	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	1.57	3.89	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

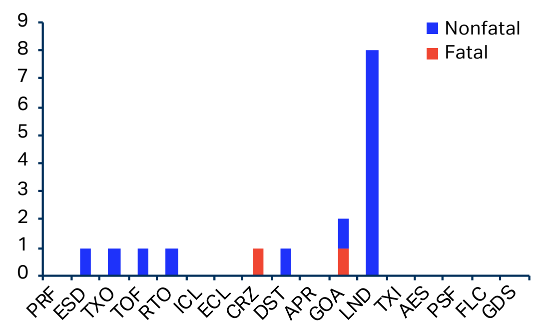
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

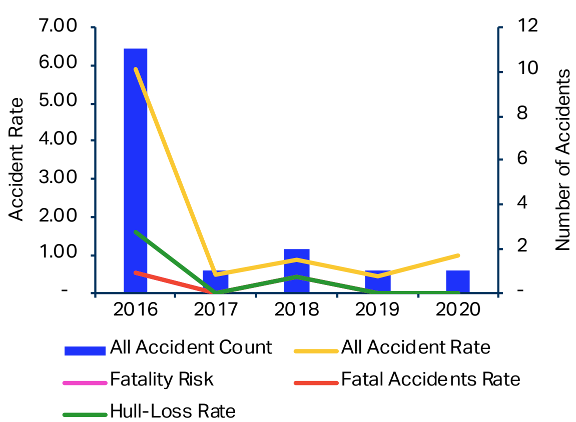
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



Regional Accident Rate (2016-2020)

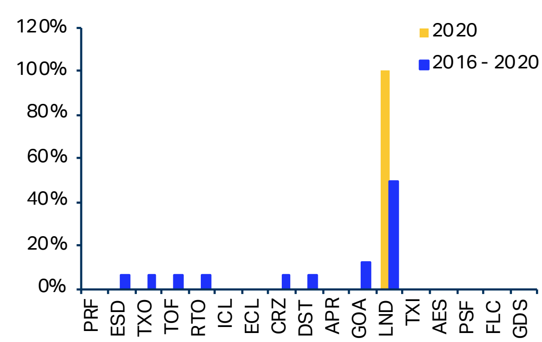
Accident per million sectors



Note: The fatal accident rate and fatality risk share the same value.

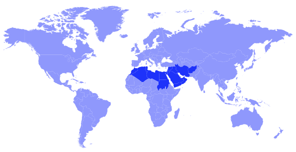
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



MENA Aircraft Accidents – Contributing Factors

Middle East & North Africa Aircraft Accidents



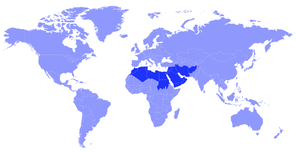
LATENT CONDITIONS

	Percentage Contribution
Safety Management	47%
Flight Operations	33%
Regulatory Oversight	33%
Flight Ops: SOPs & Checking	27%
Selection Systems	20%
Design	20%
Maintenance Ops: SOPs & Checking	13%
Maintenance Operations	13%
Mgmt Decisions, incl. regul. decision (cost cut)	7%
Flight Ops: Training Systems	7%
Ops Planning & Scheduling	7%
Technology & Equipment	7%
Maintenance Ops: Training Systems	7%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	47%
Callouts	27%
SOP Adherence/SOP Cross-verification	20%
Pilot-to-Pilot Communication	13%
Automation	13%
Briefings	7%
Abnormal Checklist	7%
Failure to GOA after destabilization on approach	7%

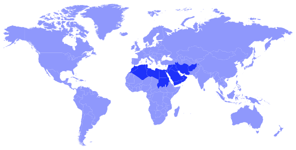
Middle East & North Africa Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	40%
Gear/Tire	33%
Meteorology	27%
Maintenance Events	27%
Wind/Windshear/Gusty Wind	20%
Operational Pressure	13%
Poor Visibility/IMC	13%
Ground Events	7%
Fire/Smoke (Cockpit/Cabin/Cargo)	7%
Fatigue	7%
Spatial Disorientation/somatogravic illusion	7%
Icing Conditions	7%
Hydraulic System Failure	7%
Lack of Visual Reference	7%
Contaminated Runway/Taxiway - poor braking action	7%
Terrain/Obstacles	7%
Air Traffic Services	7%
Avionics/Flight Instruments	7%
Airport Facilities	7%

Middle East & North Africa Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	27%
Engine	20%
Operation Outside Aircraft Limitations	20%
Abrupt Aircraft Control	13%
Vertical/Lateral/Speed Deviation	13%
Unstable Approach	7%
Unnecessary Weather Penetration	7%
Loss of Aircraft Control While on the Ground	7%
Controlled Flight Towards Terrain	7%
Rejected Takeoff after V_1	7%
Flight Controls/Automation	7%
Continued Landing after Unstable Approach	7%

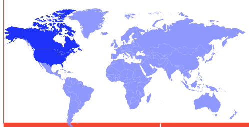
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	20%
Monitor/Cross-check	20%
Taxiway/Runway Management	13%
Communication Environment	13%
Captain should show leadership	13%
Leadership	13%
FO is assertive when necessary	13%
In-flight Decision-making/contingency management	13%
Workload Management	7%
Evaluation of Plans	7%
Automation Management	7%
Re-Active - Contingency Management	7%

Note: one accident was not classified due to insufficient data; this accident was subtracted from the total accident count in the calculation of contributing factor frequency.

North America Aircraft Accidents – Accident Count

2020	Number of accidents: 11	Number of fatalities: 0
2016-2020	Number of accidents: 58	Number of fatalities: 9



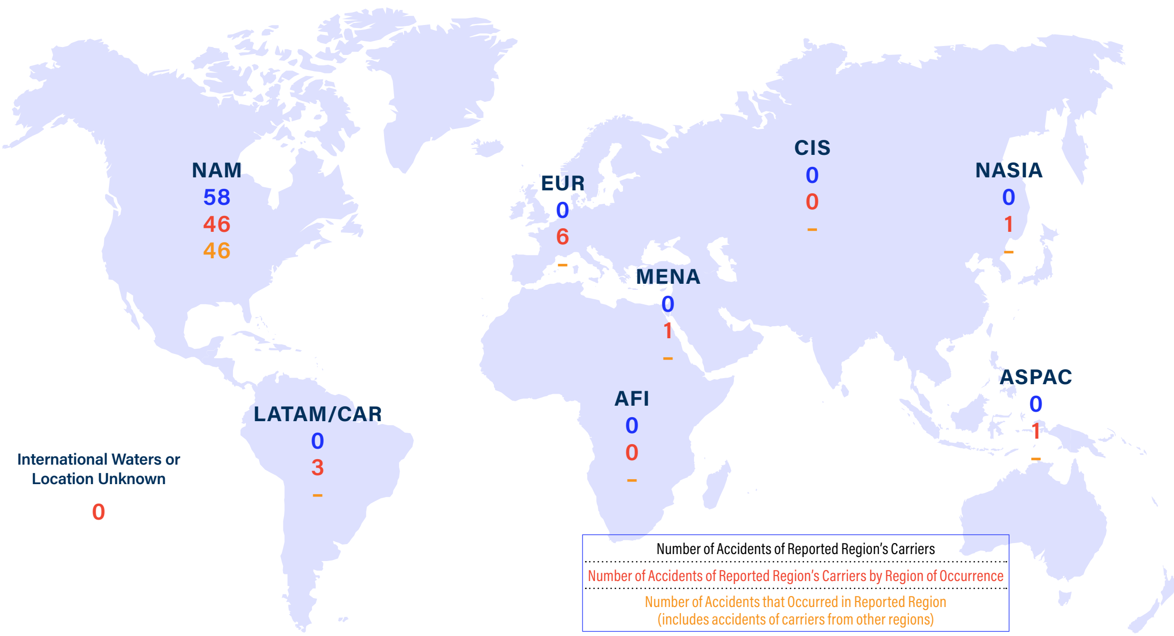
Accident Count % of Total	2020	'16-'20
IATA Member	27%	40%
Full-Loss Equivalents	0%	5%
Fatal	0%	10%
Hull Losses	0%	14%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	73%	27%	0%	73%	27%
2016-2020	76%	24%	0%	74%	26%

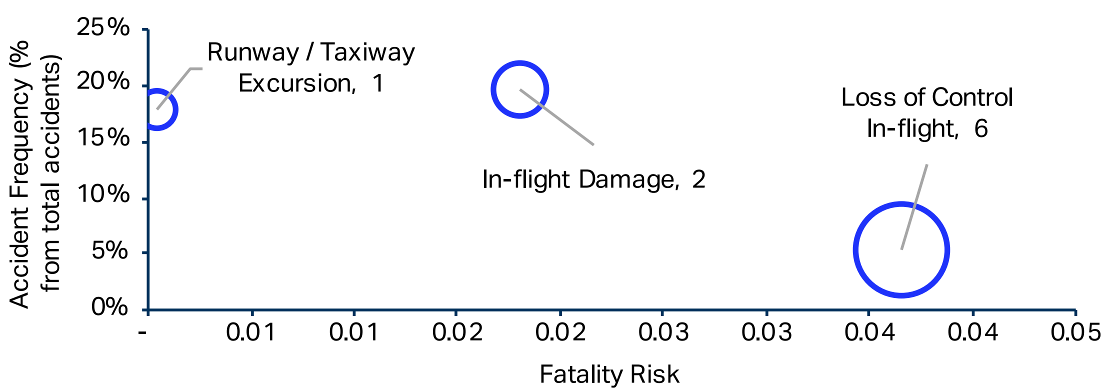
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



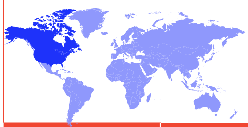
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

North America Aircraft Accidents – Accident Rate*

2020 Accident rate: 1.81
2016-2020 Accident rate: 1.04



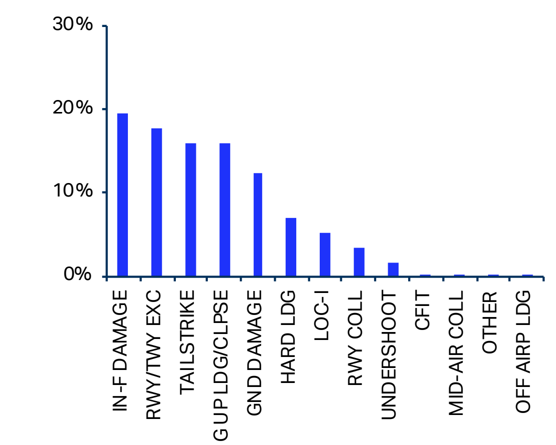
Accident Rate*	2020	'16-'20
IATA Member	0.70	0.95
Fatality Risk**	–	0.06
Fatal	–	0.11
Hull Losses	–	0.14

	Jet	Turboprop	
2020	1.45	5.22	Accident rates for Passenger, Cargo and Ferry are not available.
2016-2020	0.91	1.73	

*Total number of accidents calculated per 1 million flights **Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

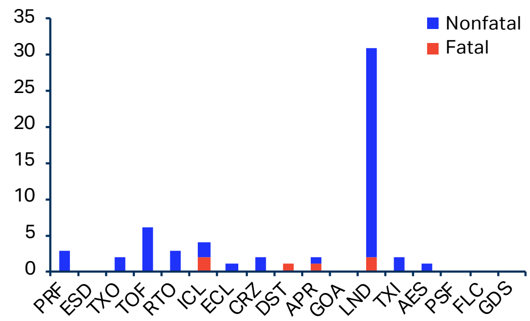
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of [Acronyms/Abbreviations section](#) for full names.

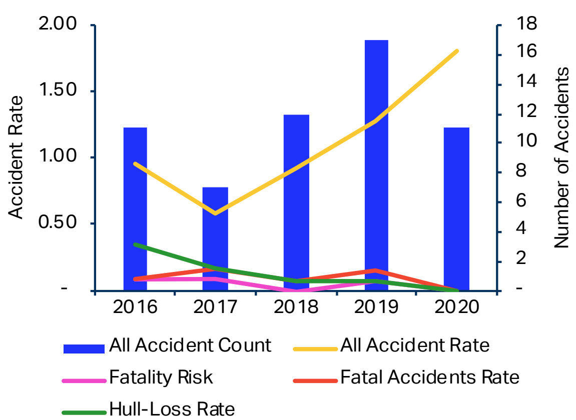
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



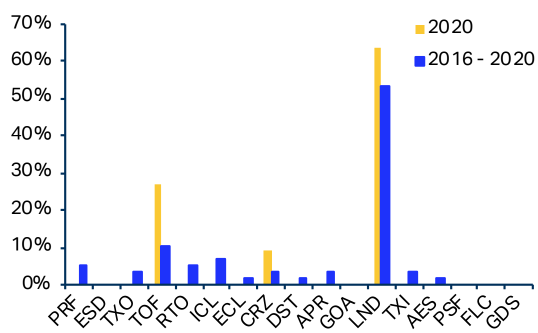
Regional Accident Rate (2016-2020)

Accident per million sectors



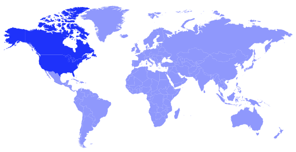
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



NAM Aircraft Accidents – Contributing Factors

North America Aircraft Accidents



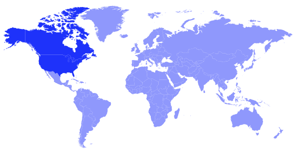
LATENT CONDITIONS

	Percentage Contribution
Safety Management	24%
Flight Operations	22%
Regulatory Oversight	20%
Maintenance Operations	15%
Maintenance Ops: SOPs & Checking	13%
Flight Ops: SOPs & Checking	13%
Mgmt Decisions, incl. regul. decision (cost cut)	9%
Selection Systems	9%
Ground Ops: SOPs & Checking	7%
Ground Operations	7%
Flight Ops: Training Systems	7%
Ground Ops: Training Systems	6%
Design	4%
Maintenance Ops: Training Systems	2%
Technology & Equipment	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	37%
SOP Adherence/SOP Cross-verification	24%
Failure to GOA after destabilization on approach	11%
Pilot-to-Pilot Communication	9%
Callouts	4%
Briefings	2%
Systems/Radios/Instruments	2%
Automation	2%
Normal Checklist	2%
Abnormal Checklist	2%

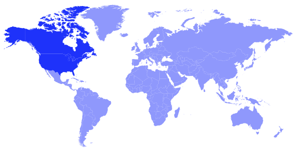
North America Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	39%
Aircraft Malfunction	33%
Wind/Windshear/Gusty Wind	30%
Gear/Tire	20%
Maintenance Events	15%
Poor Visibility/IMC	13%
Airport Facilities	13%
Contaminated Runway/Taxiway - poor braking action	11%
Thunderstorms	9%
Ground Events	9%
Traffic	7%
Fatigue	6%
Operational Pressure	6%
Icing Conditions	6%
Ground-based Nav Aid Malfunction or not available	4%
Structural Failure	4%
Extensive/Uncontained Engine Failure	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Nav Aids	4%
Wildlife/Birds/Foreign Object	4%
Foreign Objects, FOD	2%
Terrain/Obstacles	2%
MEL Item	2%
Primary Flight Controls	2%
Hydraulic System Failure	2%
Dispatch/Paperwork	2%
Flight Controls	2%
Inad overrun area/trench/ditch/prox of structures	2%
Spatial Disorientation/somatogravic illusion	2%
Contained Engine Failure/Powerplant Malfunction	2%
Poor sign/lighting, faint markings,rwy/txy closure	2%
Lack of Visual Reference	2%

North America Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/floated/bounced/firm/off-center/crabbed landing	20%
Abrupt Aircraft Control	19%
Vertical/Lateral/Speed Deviation	19%
Unstable Approach	13%
Continued Landing after Unstable Approach	11%
Operation Outside Aircraft Limitations	9%
Unnecessary Weather Penetration	9%
Loss of Aircraft Control While on the Ground	4%
Flight Controls/Automation	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Rejected Takeoff after V_1	2%
Controlled Flight Towards Terrain	2%
Engine	2%

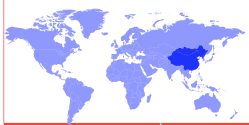
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	19%
Monitor/Cross-check	17%
Leadership	15%
Captain should show leadership	15%
In-flight Decision-making/contingency management	11%
Evaluation of Plans	7%
Workload Management	7%
Taxiway/Runway Management	6%
FO is assertive when necessary	6%
Automation Management	6%
Communication Environment	6%
Pro-active: In-flight decision-making	4%

Note: five accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

North Asia Aircraft Accidents – Accident Count

2020	Number of accidents: 0	Number of fatalities: 0
2016-2020	Number of accidents: 4	Number of fatalities: 0



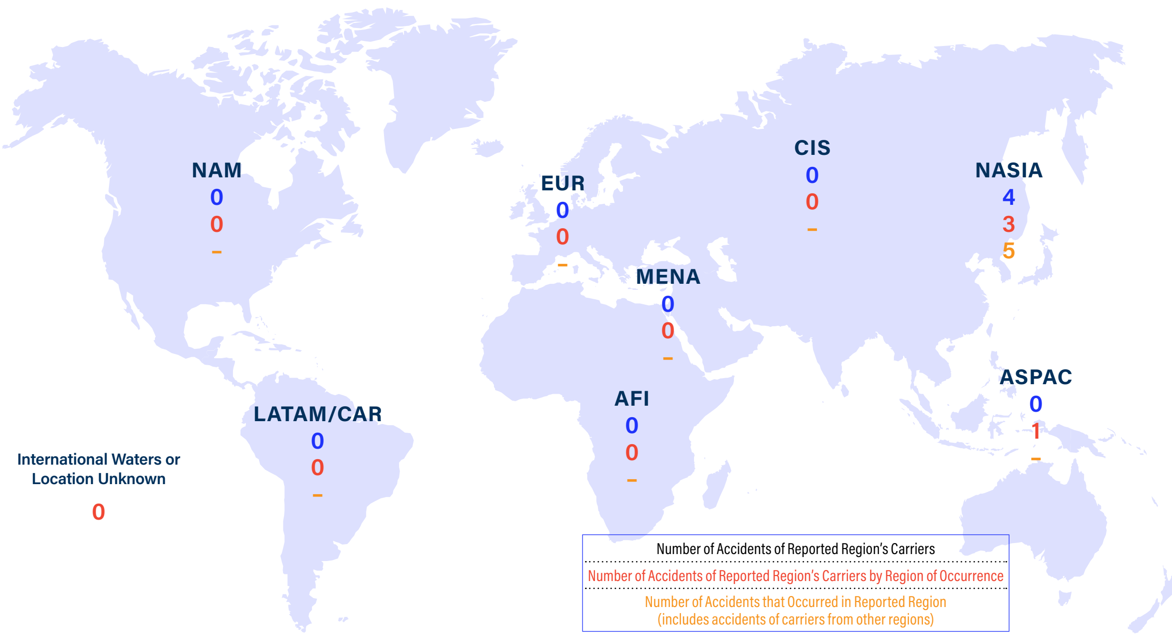
Accident Count % of Total	2020	'16-'20
IATA Member	0%	100%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	25%

	Passenger	Cargo	Ferry	Jet	Turboprop
2020	0%	0%	0%	0%	0%
2016-2020	100%	0%	0%	100%	0%

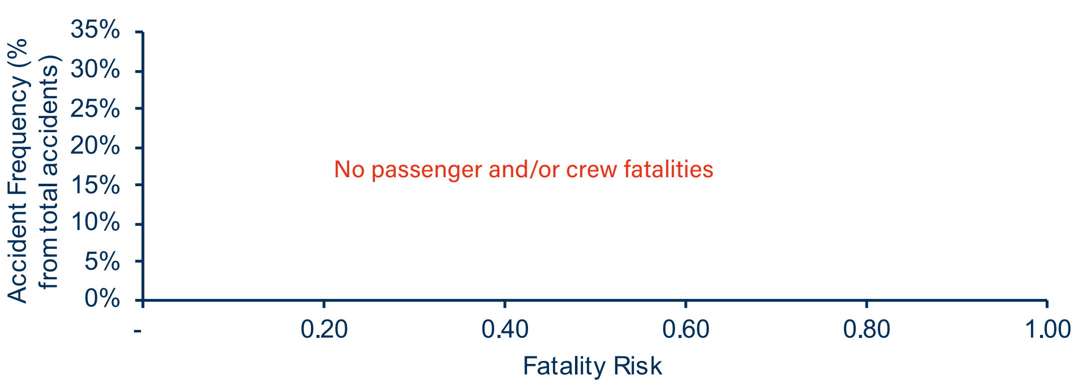
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2016-2020)

The accident rate based on region of occurrence is not available, therefore the map only displays counts



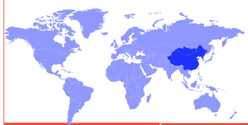
Accident Category Frequency and Fatality Risk (2016-2020)



The graph shows the relationship between the accident category frequency and the fatality risk, measured as the number of full-loss equivalents per 1 million flights. The size of the bubble is an indication of the number of fatalities for each category (value displayed). The graph does not display accidents without fatalities.

North Asia Aircraft Accidents – Accident Rate*

2020 Accident rate: –
2016-2020 Accident rate: 0.14



Accident Rate*	2020	'16-'20
IATA Member	0.00	0.17
Fatality Risk**	0.00	–
Fatal	0.00	–
Hull Losses	0.00	0.04

	Jet	Turboprop
2020	–	–
2016-2020	0.15	–

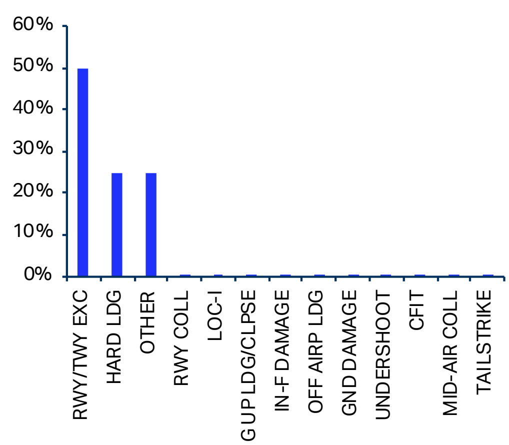
Accident rates for Passenger, Cargo and Ferry are not available.

*Total number of accidents calculated per 1 million flights

**Number of full-loss equivalents per 1 million flights

Accident Category Distribution (2016-2020)

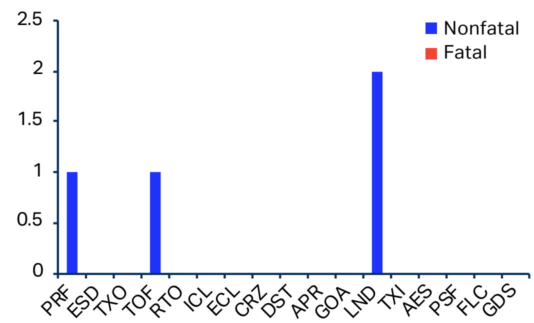
Distribution of accidents as percentage of total



Note: End State names have been abbreviated.
Refer to list of Acronyms/Abbreviations section for full names.

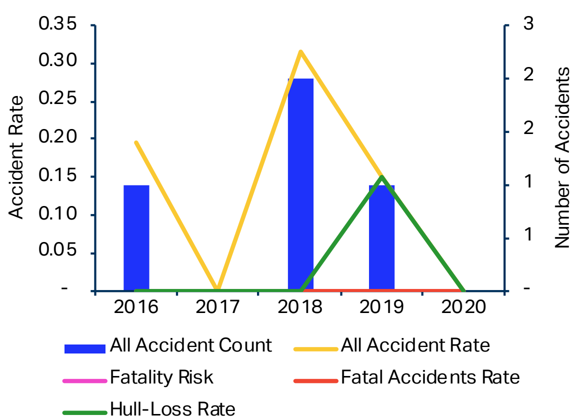
Accidents per Phase of Flight (2016-2020)

Total number of accidents (fatal vs. nonfatal)



Regional Accident Rate (2016-2020)

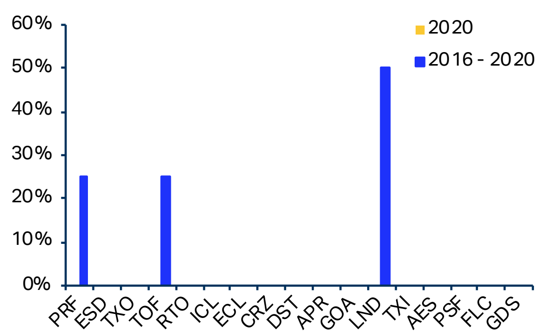
Accident per million sectors



Note: The fatal accident rate and fatality risk share the same value.

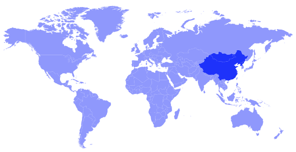
Accidents per Phase of Flight (2016-2020)

Distribution of accidents as percentage of total



NASIA Aircraft Accidents – Contributing Factors

North Asia Aircraft Accidents



LATENT CONDITIONS

	Percentage Contribution
Flight Ops: Training Systems	67%
Flight Operations	67%
Selection Systems	67%
Safety Management	33%
Flight Ops: SOPs & Checking	33%

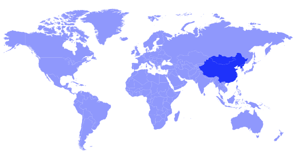
THREATS

	Percentage Contribution
Meteorology	100%
Wind/Windshear/Gusty Wind	100%
Thunderstorms	67%
Airport Facilities	33%
Contaminated Runway/Taxiway - poor braking action	33%
Aircraft Malfunction	33%
Poor Visibility/IMC	33%
Operational Pressure	33%
Fire/Smoke (Cockpit/Cabin/Cargo)	33%
Ground Events	33%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	100%
SOP Adherence/SOP Cross-verification	67%
Failure to GOA after destabilization on approach	67%
Normal Checklist	33%
Pilot-to-Pilot Communication	33%

North Asia Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Unstable Approach	67%
Long/floated/bounced/firm/off-center/crabbed landing	67%
Unnecessary Weather Penetration	67%
Vertical/Lateral/Speed Deviation	67%
Abrupt Aircraft Control	67%
Continued Landing after Unstable Approach	67%
Operation Outside Aircraft Limitations	67%
Loss of Aircraft Control While on the Ground	33%
Engine	33%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	67%
In-flight Decision-making/contingency management	33%
Workload Management	33%
Monitor/Cross-check	33%

Note: one accident was not classified due to insufficient data; this accident was subtracted from the total accident count in the calculation of contributing factor frequency.

6

Cabin Safety

IATA CABIN SAFETY

Cabin safety is at the heart of every activity in the cabin. While heavily regulated, there is usually a degree of flexibility for airlines to make their own decisions on products and services offered to passengers, as long as safety is considered and managed effectively.

IATA's role in the area of cabin safety is to keep airlines informed of regulatory changes, best practices, new and emerging issues, and to act as a resource for help. As the COVID-19 pandemic evolved in 2020, IATA worked hard to identify the risks posed by the presence of the virus and the associated sudden reduction of air traffic, furloughing of crews, reduced training and increased aircraft storage. To help manage these new risks appropriately, IATA provided a variety of guidance documents.

Incorporating a Safety Management System (SMS) within Cabin Operations is actively encouraged by IATA and we create and maintain standards and guidance for airlines to help them to do so effectively. Comprehensive risk assessments are used to help identify where new processes and procedures are needed and IATA has included examples in the COVID-19 operational guidance materials issued during 2020.

This section of the IATA Safety Report is intended to provide the reader with an update of the activities of IATA Cabin Safety in 2020, all of which are aimed at supporting IATA members worldwide and driving improvement to cabin operations and safety.

CABIN SAFETY PROMOTION

Safety promotion is a major component of SMS and the sharing of safety information is an important focus for IATA. The organization of global conferences and regional seminars brings together a broad spectrum of experts and stakeholders to exchange cabin safety information.

The global IATA Cabin Operations Safety Conference has become an established and popular venue for the exchange of ideas and education of cabin safety specialists. The format of this event aims to educate and inform delegates, with plenary and interactive workshops focusing on the issues identified through IATA's activities as needing attention.

With international travel restrictions and the spread of COVID-19, the 2020 event was postponed until 2021. Instead, IATA produced a series of webinars aimed at helping industry manage the challenges posed by the COVID-19 pandemic and advocated for a common approach to managing these risks worldwide.

IATA CABIN OPERATIONS SAFETY TECHNICAL GROUP

The IATA Cabin Operations Safety Technical Group (COSTG) is established to maintain a close working link with the operational environment.

The members of the COSTG are industry experts in the cabin safety environment and include safety investigators, policymakers, cabin crew trainers and safety auditors. A global representation of member airlines is maintained, and membership is reviewed every two years.

The COSTG mandate includes reviewing and updating the IOSA standards relating to cabin operations, updating all IATA Cabin Safety guidance materials, keeping IATA Cabin Safety informed of emerging risks within cabin operations and identifying key safety performance indicators (SPIs) that can be used to assess the efficacy of current procedures and mitigations.

COSTG MEMBERS

Retirements during 2020

IATA would like to acknowledge the input of the following individuals who have moved on from their position on COSTG during 2020:

Christiane Raspa
AIR CANADA

Lisa Mounce
AMERICAN AIRLINES

Rosnina Abdullah
MALAYSIA AIRLINES BERHAD

Johnny Chin
SINGAPORE AIRLINES

Lerato Luti
SOUTH AFRICAN AIRWAYS

Mary Gooding
VIRGIN ATLANTIC AIRWAYS

New members during 2020

IATA welcomes the following new members who have been successful in their application to join the COSTG.

Dorota Kaczmarczyk
AIR CANADA

Ioana Stoian
BLUE AIR

Edwin Fernandez
DELTA AIRLINES

Kris Hutchings
WESTJET

Esra Kav
TURKISH AIRLINES

Renata Garcia
GOL AIRLINES

Continuing members during 2020

Artem Fillipov
AIR ASTANA

Anne Frederique Houlbreque
AIR FRANCE

Gennaro Anastasio
ALITALIA

Matthew Whipp
BRITISH AIRWAYS

Catherine Chan (Chair)
CATHAY PACIFIC

Anabel Brough
EMIRATES AIRLINE

Berry Ochieng'
KENYA AIRWAYS

Julia Arnds
LUFTHANSA

Warren Elias
QATAR AIRWAYS

Martin Ruedisueli
SWISS INTERNATIONAL AIR LINES

Carlos Mouzaco Dias
TAP PORTUGAL

Sophie O'Ferrall
VIRGIN AUSTRALIA

IATA CABIN OPERATIONS SAFETY BEST PRACTICES GUIDE

The IATA Cabin Operations Safety Best Practices Guide is intended to give airlines the tools they need to create and update safety procedures and policies, using a global range of references and expert opinions. It is provided free of charge to IATA member airlines and available for purchase on the IATA Store.

This guide is normally updated annually by members of the COSTG. It includes standards and recommended practices from the IATA Operational Safety Audit (IOSA), ICAO and other regulators, combined with the extensive operational experience of our member airlines.

Before embarking on an update to the guide, we look at areas for improvement across the IOSA auditing findings and observations and seek feedback from our stakeholders and participants at the IATA Cabin Operations Safety Conference. We can then tailor any amendments to provide further up-to-date guidance in any areas that may need it.

With the COVID-19 pandemic, the annual review of the guidance will take place at a later time, as we have been focused on delivering much needed COVID-19 cabin-related guidance, which we hope will be of a temporary nature. While the industry gradually returns to its new normal, the Best Practices Guide will be updated to incorporate those items that we anticipate will remain valid as the pandemic subsides.

HEALTH AND SAFETY GUIDELINES – PASSENGERS AND CREW

IATA's Medical Advisory Group creates guidelines regarding the health and safety of passengers and crew and regularly reviews the recommendations on the carriage of emergency medical equipment, medications and first aid kits. These guidelines and many others are available at: www.iata.org/health.

Throughout 2020, this group has worked to advise industry on COVID-19-related issues such as infection prevention and control in the aircraft environment and identification of risks within the cabin with the aim to help restore passenger confidence by demonstrating that the cabin is a safe environment.

IOSA AND CABIN OPERATIONS SAFETY

The IOSA Standards Manual (ISM) includes Section 5 – Cabin Operations (CAB), which contains key elements of cabin safety, such as the IATA Standards and Recommended Practices (ISARPs) for:

- Management and control
- Training and qualification
- Line operations
- Cabin systems and equipment

These standards are reviewed annually by the COSTG and updated where necessary to enhance the understanding and application of safety standards globally. For more information on IOSA and to download the latest version of the ISM, go to: www.iata.org/iosa.

Within the revision to the ISM Ed. 14, which will become effective during 2021, the most notable changes to CAB standards are:

CAB 1.6.5 and 1.6.7 — On board manuals: Updated to adapt to the increasing provision of electronic manuals on board through portable electronic devices. In many cases, this negates the need for a hard copy of the operations manuals on board, provided access to electronic devices is maintained.

CAB 3.2.6 — Cabin crew seated during taxi: Updated to give clearer definitions of service and safety procedures, to help ensure only safety-related duties are carried out during taxi and cabin crew are seated without delay.

CAB 3.4.10 — Passenger briefings: Updated to include a variety of methods for passenger briefing as complimentary to the use of the passenger address (PA) system. Briefings can be delivered using seat messaging through IFE, announcements, individual personal briefings, etc. This is now also reflected in CAB 3.4.4 Cabin turbulence procedures.

ACCIDENTS – CABIN END STATES

This section of the IATA Safety Report highlights the categories of cabin safety end states that resulted from an accident. Only those that were classified as an accident in accordance with the IATA definition are included in this analysis.

The following definitions apply to the end states in this section:

- **Normal Disembarkation:** Passengers and/or crew exit the aircraft via boarding doors during normal operations.
- **Rapid Deplaning:** Passengers and/or crew rapidly exit the aircraft via boarding doors and jet bridges or stairs, as a precautionary measure.
- **Abnormal Disembarkation:** Passengers and/or crew exit the aircraft via boarding doors (normally assisted by internal aircraft or exterior stairs) after a non-life-threatening and non-catastrophic aircraft incident or accident and when away from the boarding gates or aircraft stands (e.g., on a runway or taxiway).
- **Evacuation (land):** Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits, or gaps in the fuselage; usually initiated in life-threatening and/or catastrophic events.
- **Evacuation (water):** Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits, or gaps in the fuselage into or onto water.
- **Hull Loss/Nil Survivors:** Aircraft impact resulting in a complete hull loss and/or no survivors.

Cabin End States

	2020	2018-2020
Total 'Passenger-only' Accidents	24	124

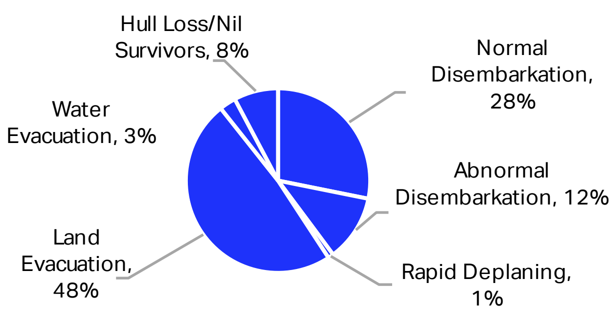
There were 24 passenger-only accidents in 2020. In order to identify patterns or trends, this figure is added to the previous two years data to create the following charts.

Unusually during 2020, one third (8) of these 24 passenger aircraft accidents did not receive a cabin end state classification as they are related to hard landings, tail strike or other incidents where damage was identified afterwards and there was no impact to cabin operations at the time of the event.

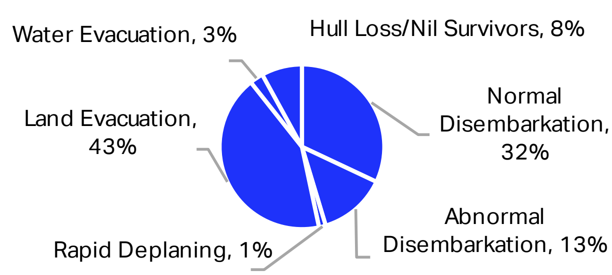
Overall, cabin end state classifications were identified in 102 of the 124 accidents in the data set for 2018 - 2020.

	2018-2020					
	Normal Disembarkation	Abnormal Disembarkation	Land Evacuation	Water Evacuation	Hull Loss/ Nil survivors	Total
All	29	12	50	3	8	102
IATA Member	17	7	19	1	3	47
IOSA-Registered	21	9	28	1	4	63
Fatal	0	1	7	2	8	18
Hull Loss	0	0	10	2	8	20
Jet	24	10	32	2	6	74
Turboprop	5	2	18	1	2	28

Cabin End State – Jet and Turboprop Aircraft



Cabin End State – Jet



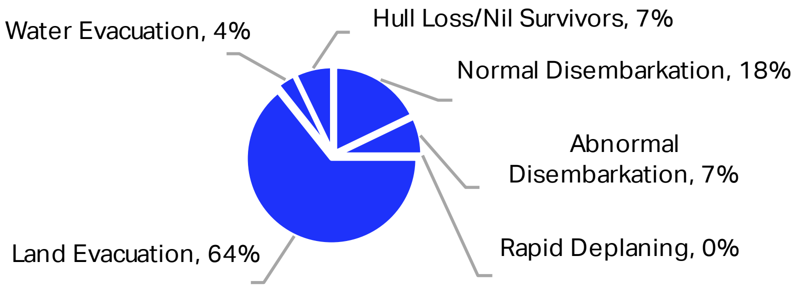
Passengers were able to disembark from the aircraft in an orderly manner using boarding doors, either normally (28%) or abnormally (12%) in 40% of these accidents.

Rapid deplaning procedures are a hybrid of evacuation and normal procedures, where disembarkation is carried out as a precaution. 1% of these accidents identified this cabin end state classification.

Land evacuation procedures were used in 48% of these accidents, while 3% required an evacuation on water.

In 45% of jet aircraft accidents, passengers were able to disembark the aircraft in an orderly manner using boarding doors, either normally (32%) or abnormally (13%). Evacuation procedures were carried out during 43% of accidents on jet aircraft.

Cabin End State - Turboprop

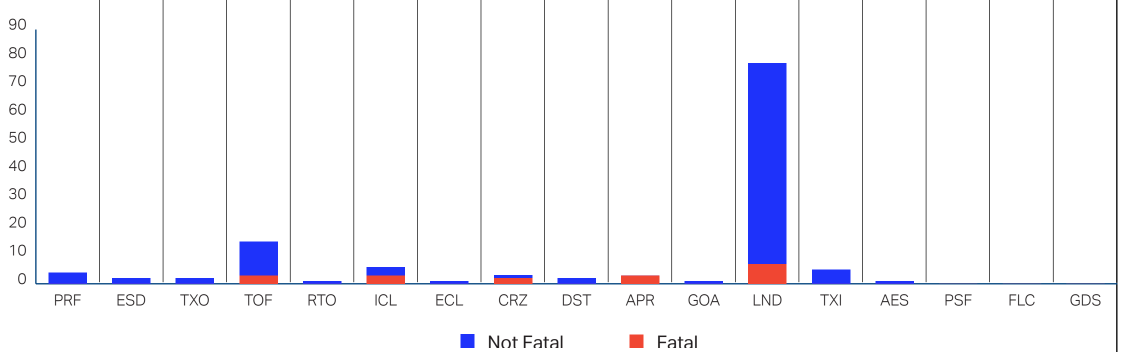


In turboprop aircraft accidents, normal disembarkation was possible in 18% of cases. Abnormal disembarkation methods were used in 7% of accidents and 64% resulted in an evacuation on land.

On these smaller aircraft, evacuation to the ground is easier to facilitate as evacuation systems such as integral steps pose less risk to the occupants. The distinction between abnormal disembarkation and evacuation is, therefore, less apparent than with larger jet aircraft.

Cabin End States per Phase of Flight (2018-2020)

	PRF	ESD	TXO	TOF	RTO	ICL	ECL	CRZ	DST	APR	GOA	LND	TXI	AES	PSF	FLC	GDS
Total Accidents	4	2	2	15	1	6	1	3	2	3	1	78	5	1	0	0	0
Normal Disembarkation	25%	0%	100%	47%	0%	17%	100%	0%	50%	0%	100%	18%	20%	0%	0%	0%	0%
Abnormal Disembarkation	0%	50%	0%	0%	0%	17%	0%	0%	0%	0%	0%	13%	0%	0%	0%	0%	0%
Rapid Deplaning	25%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land Evacuation	0%	0%	0%	20%	100%	17%	0%	0%	50%	0%	0%	54%	20%	100%	0%	0%	0%
Water Evacuation	0%	0%	0%	0%	0%	0%	0%	0%	0%	67%	0%	1%	0%	0%	0%	0%	0%
Hull Loss/Nil Survivors	0%	0%	0%	20%	0%	33%	0%	67%	0%	33%	0%	0%	0%	0%	0%	0%	0%



Total Accidents: 124

Note: Refer to Annex 1 for definition of each phase of flight
Percentages are calculated based on the total number of accidents, not all of which are classified with a cabin end state; therefore, sum may not add to 100%.

The above table shows the distribution of cabin end states per phase of flight. There were 22 accidents in which the cabin end state classification could not be clearly identified from the report; therefore, the columns do not always calculate to a total of 100%.

Fatalities were identified in accidents that occurred at the take-off, initial climb, cruise, approach and landing phases. In all but one of these accidents, cabin crew were secured in their crew seats and carrying out a silent review of safety procedures to increase readiness for evacuation should the need arise (Ref IATA Cabin Operations Safety Best Practices Guide, Section 12.6).

Accident End States and Cabin End States (2018-2020)

	Total	Normal Disembarkation	Abnormal Disembarkation	Rapid Deplaning	Land Evacuation	Water Evacuation	Hull Loss/ Nil Survivors
Runway / Taxiway Excursion	34	0	2	0	31	1	0
In-flight Damage	13	9	2	0	1	0	1
Tailstrike	12	12	0	0	0	0	0
Gear-up Landing / Gear Collapse	12	0	4	0	8	0	0
Hard Landing	10	3	3	0	4	0	0
Ground Damage	7	4	1	0	2	0	0
Loss of Control In-flight	7	0	0	0	1	0	6
Undershoot	4	0	0	0	3	1	0
Other End State	2	1	0	1	0	0	0
Controlled Flight Into Terrain	1	0	0	0	0	0	1
Off-Airport Landing / Ditching	0	0	0	0	0	0	0
Runway Collision	0	0	0	0	0	0	0
Mid-Air Collision	0	0	0	0	0	0	0

This table shows accident classifications and their associated Cabin End State, in order of frequency and can provide useful information for cabin crew training exercises and discussion.

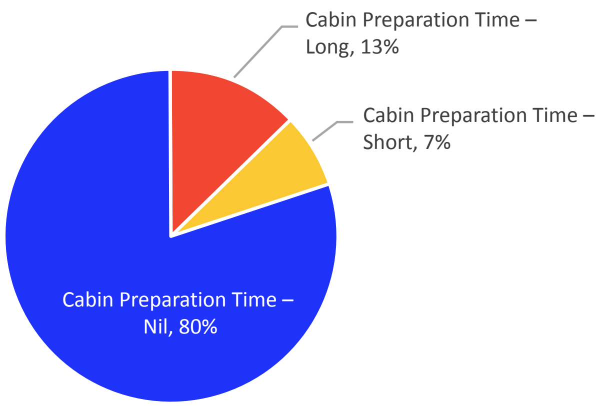
It shows, for example, that the most common event is a runway excursion and that this will most likely result in a land evacuation or abnormal disembarkation.

It also shows that gear collapse accidents resulted in eight land evacuation responses and four abnormal disembarkation events.

Water evacuation remains a very low probability with only two events in this dataset, but as the severity is high, procedures and training are focused on giving cabin crew the tools they may need to manage such rare situations. In these incidents, water evacuation was necessary following undershoot or runway excursion during the landing phase.

Note that within the full 2018-2020 dataset there are three water evacuation accidents, but one was not attributed to one of these accident end states.

Cabin Preparation Time



In each of the 16 passenger aircraft accidents during 2020 where a cabin end state was assigned, the amount of time available for the cabin crew to prepare the cabin and passengers after identification of an abnormal state was also determined.

As most accidents occurred during approach or landing, in 80% of occurrences the cabin crew had no time or opportunity to prepare over and above the normal cabin secure procedures.

In three of the accidents cabin crew were able to consider undertaking additional cabin preparation over the standard cabin secure procedures for landing, in one case up to 10 minutes, and in two cases longer. However, as the abnormal aircraft state occurred during preparation for landing, cabin crew had in most cases already secured the cabin.

Level of Cabin Preparation

Cabin crew were able to carry out emergency procedures in preparation for evacuation in one accident in 2020. In this case, the flight crew performed a go-around and several aircraft maneuvers before landing, allowing time and opportunity for cabin crew to brief and prepare passengers for subsequent evacuation.

In all other accidents, the cabin was prepared as per standard procedure for normal takeoff or landing.

This highlights that travelers should pay attention to the normal briefings provided before takeoff and they should not rely on the likelihood of additional briefings or preparation being carried out before an evacuation becomes necessary. While some believe that passenger briefings are no longer required upon every departure, they are in most cases the only opportunity for cabin crew to prepare passengers for a subsequent evacuation.

The Impact of COVID-19 on Cabin Operations

The spread of COVID-19 during 2020 caused an unprecedentedly sudden reduction in air traffic and the volume of passengers carried. Consequently, many airlines downsized their operations dramatically, laid off workers and disposed of aircraft through early retirement or temporary storage.

At the same time, while measures such as physical distancing within public places and the wearing of masks was becoming commonplace to help mitigate against the potential spread of infection, airlines needed to work hard to introduce new processes and procedures to restore confidence in air travel, reassuring travelers that the cabin environment is safe.

With the drastic reduction in operations, several exemptions to cabin crew recurrent safety training requirements were granted to address the immediate impact. Operators should be prepared to manage cabin crew skills atrophy, which may be caused by:

- Reduced training schedules or increased time between recurrent training.
- Reduced operational experience, overall or on a specific aircraft type that has been placed into temporary storage.
- Different cabin crew operational experience, for example, carrying cargo in the cabin instead of passengers.

Alignment and harmonization

To help address the issues faced by airlines due to the variety of interpretations of standards and recommendations on how best to manage the potential of infection spread through air travel, IATA actively participated in several global activities in an effort to ensure global recommendations were harmonized as far as practicable.

IATA has published the Health Standards Checklist that includes aspects of cabin operations within Section 1.8. These voluntary standards are based on global recommendations within the ICAO CART publications.

IATA also produced and published a range of guidance materials, the following of which relate to cabin operations.

Guidance for cabin operations
This guidance covers all aspects of cabin operations that are affected by the pandemic, from assessing the risks per route and identifying appropriate mitigation, to in-flight service, cabin waste management and unruly passengers. As the situation evolved, the guidance was updated several times to include new risks that were identified as airlines continued operations.

Guidance for crew health precautions
This guidance includes measures to be taken pre, during and after duty by airline crews operating during the pandemic.

Guidance for carriage of cargo in the passenger cabin
As the need for transporting medical supplies and equipment surpassed the need for passenger travel, many airlines offered to use their aircraft to transport such items. A task force was set up within IATA to identify the risks and potential mitigations and give structured advice to airlines allowing them to safely use the aircraft cabin to transport cargo. This guidance was updated frequently to incorporate changes made by regulators.

Guidance for flight operations
This guidance incorporates recommendations on the use of aircraft air conditioning systems, and identification and mitigation of risks surrounding the aircraft operation. It also includes some practical recommendations for flight crew to take in order to minimize their risk of exposure to the virus during operations.

Guidance for aircraft cleaning
Ensuring a clean environment is key to restoring passenger confidence in air travel and mitigating any potential spread of infection within the aircraft cabin. IATA's Ground Operations team worked closely with internal and external groups, including aircraft manufacturers, standard setting organizations, health authorities and regulators, to produce this guidance.

Guidance for accessible air travel
Before the pandemic broke, IATA was already working on many aspects of improving the experience of passengers with disabilities. These challenges were considered throughout the activities of 2020 and this guidance includes advice for airlines to ensure all passengers are afforded the same levels of protection and reassurance during the pandemic.

Communications materials
IATA published multiple communications materials to help promote the concept that the aircraft cabin is a safe environment. A variety of infographics and videos on issues such as health requirements, cabin air circulation and the requirements for wearing masks are available for airlines to use and promote to travelers.

Unruly passengers

The issue of unruly passengers and compliance with safety regulations has been an ongoing area of focus for IATA. Historically, our data has been captured within the STEADES program, but during 2020 this was transitioned to the Incident Data Exchange (IDX) program.

With COVID-19 impacting airline operations dramatically, this had a knock-on effect to the transition process to IDX, which does not yet have a sample size of data that allows for in-depth analysis of the current situation in relation to unruly passengers. In addition, compliance with wearing masks is a new category of unruly behavior and we have no historical data with which to compare.

Masks and face coverings
In January 2021, all members of the IATA COSTG were asked to provide data relating to passengers who refused to comply with requirements for wearing masks to support our ongoing activities in harmonization of global standards in this area. The available data are not yet enough to definitively provide a globally comparable rate to earlier analysis, however, the key observations include:

- Most passengers comply with the requirement to wear a mask or face covering on board, however, there is a marked regional difference in rates of those who do not. Asian airlines reported a very low rate of noncompliance at 0.23 incidents per 10,000 flights, while European and North American airlines reports varied from 3 to 166 incidents per 10,000 flights.
- Of the passengers who did not comply with the requirements, between 20% and 30% of them also refused to comply with other safety procedures or appeared to be intoxicated.
- As more passengers are vaccinated or recovered from COVID-19, they may consider that they do not need to wear a mask, which adds to the complexity for passenger-facing workers.
- Management of passenger compliance with wearing face coverings is sometimes problematic. Cabin crew might avoid challenging passengers who are not wearing masks to avoid confrontation and escalation of a situation, particularly where the risk is seen as a social compliance issue rather than directly endangering the safety of the aircraft.
- All respondents considered their existing unruly passenger policies and procedures to be adequate for handling such cases and rarely called for assistance from the authorities. Authorities are generally only called when a passenger continues to ignore repeated requests for compliance or acts in a manner that directly affects the safety or security of the aircraft and its occupants.
- In regions where mask wearing is not mandated by law, it has often become politicized and affects the travelers' perception of freedom and personal rights. The airline staff are faced with enforcing compliance with very little perceived backup from the authorities. Nevertheless, where authorities were called to assist, in most cases their responses were deemed to be supportive, appropriate, and consistent.

Each airline is required to perform its own risk assessment carefully to formulate appropriate mitigations to minimize transmission risks on board their aircraft. This risk assessment would be based on many factors including, for example, their own cabin configuration and layout, passenger booking figures, in-flight services and state health regulations. The decisions for appropriate policies and procedures will, therefore, differ between airlines.

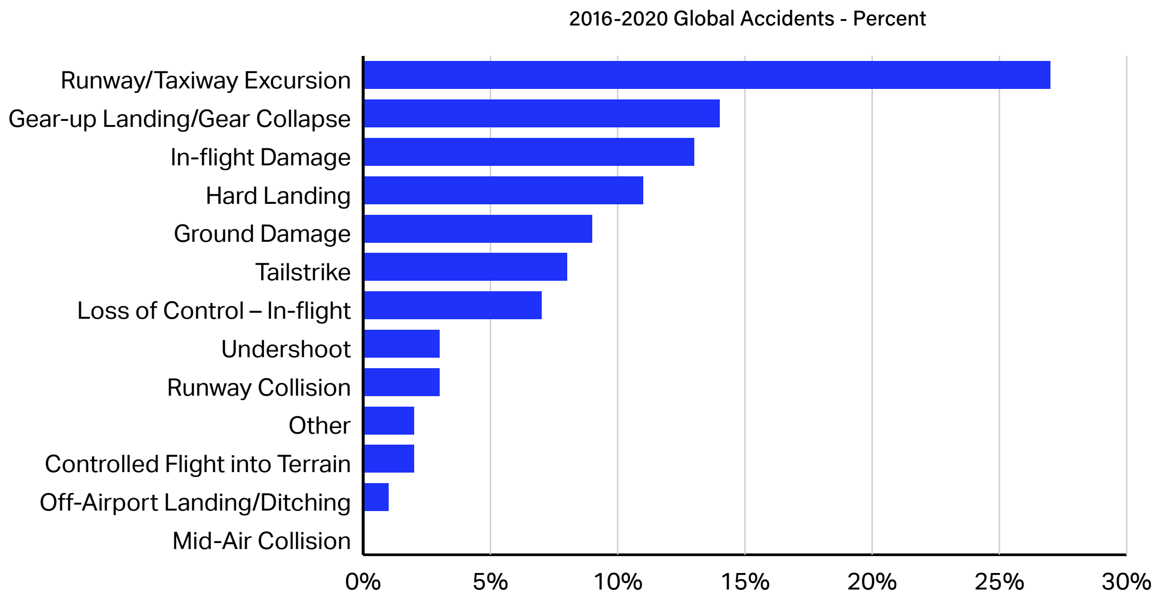
IATA continues to promote the wearing of face coverings until such time as the infection is under control and passenger volumes indicate confidence in air travel. IATA's guidance material also includes consideration of staggering or reducing in-flight services to minimize the number of passengers removing their face coverings simultaneously and the duration of exposure to potential transmission risks.

7

Report Findings

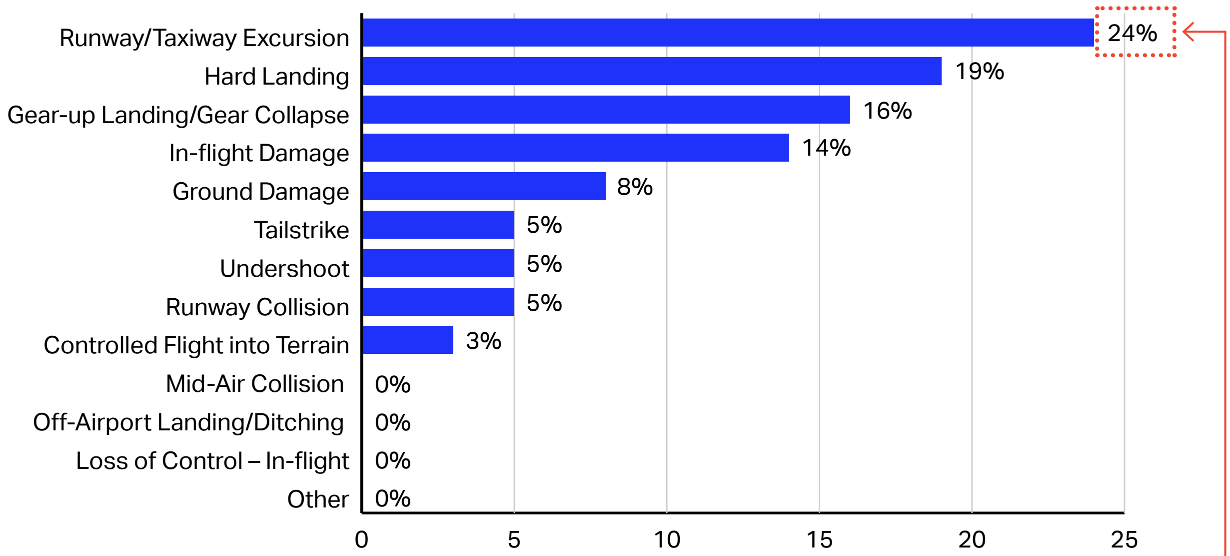
TOP FINDINGS: 2016-2020

Covering a five-year period, the 2016-2020 Accident End State Distribution, as a percentage of the total, as assigned by the ACTG, was as follows:



Note: Five accidents could not be classified due to insufficient information.

The Accident End State Distribution, as a percentage of the total of the 38 accidents that occurred in 2020, as assigned by the ACTG, was as follows:



Runway Excursion	4	**44%**
Runway Excursion Lateral	5	**56%**
Taxiway Excursion	0	**0%**

of total Runway/Taxiway Excursion

Note: One accident could not be classified due to insufficient information.

The accident end states with associated fatalities in 2020 were:

- In-flight Damage (2) with 104 fatalities
- Runway/Taxiway Excursion (2) with 24 fatalities
- Controlled Flight into Terrain (1) with 4 fatalities

With a full breakdown of each accident end state to follow, the table below provides an overview of 2020's performance compared to the five-year average.

2020 vs 2016-2020

	2020	Comparison vs 5Y	5 Y Average (2016-2020)
Number of accidents	38	▼	52
Fatality Risk	0.13	=	0.13
% of accidents involving IATA members	34%	▼	40%
% of fatal accidents	13%	▼	15%
% aircraft propulsion - Jet	71%	▲	66%
% aircraft propulsion - Turboprop	29%	▼	34%
% type of operations - Passenger	63%	▼	79%
% type of operations - Cargo	37%	▲	21%
% Hull losses	24%	=	24%

LOSS OF CONTROL — IN-FLIGHT

Background
Loss of Control — In-flight (LOC-I) refers to accidents in which the flight crew was unable to maintain control of the aircraft in flight, resulting in an unrecoverable deviation from the intended flight path. LOC-I can result from a wide range of contributing factors that include, among others, engine failures, icing, stalls, spatial disorientation, and other human factors. Reducing this accident category, through understanding of contributing factors and intervention strategies, is an industry priority.

Discussion
Although the LOC-I category represented only 7% of all accidents during the last five years (2016-2020), it resulted in the highest percentage of fatal accidents (42%) and fatalities (63%). Among all accident end states, LOC-I is the greatest factor leading to fatalities. LOC-I, therefore, deserves the highest attention that the commercial aviation safety sector can pay to it.

To assist the commercial aviation industry's awareness of LOC-I hazards and risks, IATA has developed an accident analysis report using data from LOC-I accidents. LOC-I is an avoidable hazard, and it is hoped that the contents of the interactive LOC-I Accident Analysis Report will help achieve the goal of building pilot awareness of the conditions that can lead to loss of control. In addition, it should be mentioned that maintaining high pilot competency standards through training that includes Crew Resource Management (CRM) and basic manual flying skills is the most effective barrier against LOC-I accidents. The report presents data from 64 LOC-I accidents that occurred over 10 years, spanning 2009 through 2018.

Recommendations
Some of the recommendations for operators to consider are:

- Conduct training on energy management in a variety of scenarios and flight phases, including, but not limited to: engine failure, thrust loss, and abnormal engine configurations.
- Institute Upset Prevention and Recovery Training (UPRT) using Full Flight Simulator (FFS) training modules as recommended in ICAO AC-RASG-AFI-01, 2018, Model AFI Advisory Circular on Loss of Control — In-flight (LOC-I) and Upset Prevention and Recovery Training.
- Provide classroom and simulator/in-aircraft training to flight crew on a regular basis that provides a positive experience considering the flight characteristics and performance of the aircraft being flown by the pilots.
- Include and emphasize training for pilots to monitor the aircraft flight path and system, and encourage manual intervention, as appropriate.
- Reinforce workload management as well as task allocation and prioritization to maximize monitoring during Areas of Vulnerability (AOV).
- Ensure training is completed within the validated training envelop of the Flight Simulation Training Devices (FSTD).
- Refer to IATA Guidance Material and Best Practices for the Implementation of Upset Prevention and Recovery Training (REV 2).
- Consult the 3rd edition of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA), which emphasizes both recognition and prevention.
- Incorporate, where applicable, the Commercial Aviation Safety Team (CAST) safety enhancements (SEs). All SEs, including 192-211 on Airplane State Awareness, are available on Skybrary.

Pilots can prevent and overcome LOC-I accidents through, but not limited to:

- Increase awareness of the precursors leading to an upset or stall.
- Take definitive action to recover from an upset.
- Increase awareness of the flight phases where poor monitoring can be most problematic.
- Strategically plan workload to maximize monitoring during AOV.
- Emphasize the briefing on pre-flight and, in certain phases, impending night or Instrument Meteorological Conditions (IMC) entries that complicate situational awareness and recovery.
- Increase awareness and understanding of certain controls and displays, such as the Flight Modes Annunciator (FMA) on the Primary Flight Display (PFD)/Electronic Attitude Director Indicator (EADI).
- Constant awareness of stall margin throughout all phases of flight.
- Download the LOC-I Accident Analysis Report to get an evaluation of the risk factors from LOC-I accidents and information designed to aid the industry in the implementation of mitigation strategies.

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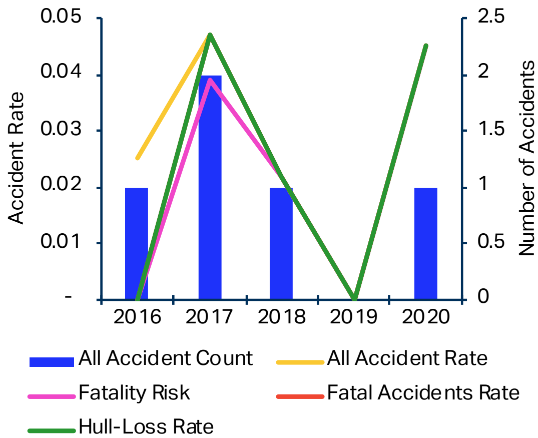
CONTROLLED FLIGHT INTO TERRAIN

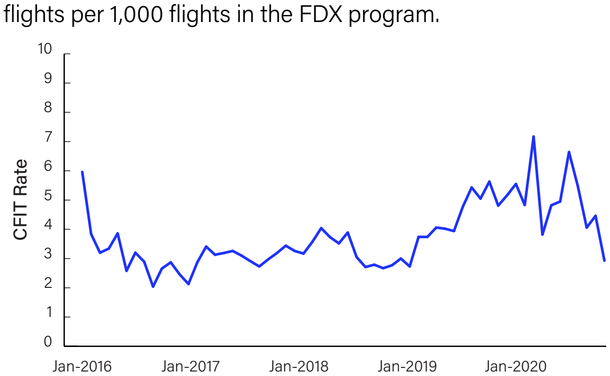
Background
Controlled Flight into Terrain (CFIT) is when an aircraft collides during flight with a terrain, water, or obstacle without indication of loss of control. Over the last five years, from 2016 to 2020, five CFIT accidents occurred, including four fatal accidents resulting in 76 fatalities. The number of CFIT accidents was down from 27 over the previous five-year period (2011-2015), including 24 fatal accidents resulting in 371 fatalities. There was one fatal accident in 2020 with four fatalities.



Note: The hull loss rate line overlaps the fatal rate line.

Historical data, over 15 years, shows a general downward trend for global CFIT accidents. The reduction in CFIT accidents can be associated with many causal factors, one of which is the widespread adoption of Ground Proximity Warning System (GPWS) and the improved Enhanced Ground Proximity Warning System (EGPWS), also known as Terrain Awareness Warning System (TAWS).

Discussion
Although few in number, the outcome of CFIT accidents is almost always catastrophic, and can cause a high number of fatalities. As such, IATA will continue identifying the risks through its Flight Data eXchange (FDX) and other monitoring programs, and reduce the number of accidents by raising awareness of the precursors and promoting safety measures. FDX is an aggregated de-identified database of Flight Data Analysis/Flight Operational Quality Assurance (FDA/FOQA)-type events that allows IATA to identify commercial flight safety issues that may not be visible to an airline with a dataset limited to its own operations. The chart below shows the eventful rate of CFIT/TAWS trend from January 2016 to November 2020. The FDX Eventful Rate is represented by the number of eventful flights per 1,000 flights in the FDX program.



Note: This trend excludes corporate jets.

Furthermore, industry partners have taken strong measures to address the issue using EGPWS (or TAWS). While this system cannot completely eradicate CFIT accidents, it has helped reduce the number by providing accurate advanced warning of rising terrain close to the runway environment. This advanced technology represents an efficient countermeasure to CFIT by enhancing the pilot's situational awareness. Loss of situational awareness is one of the main risks a pilot can face, including a distraction that diverts pilot attention from monitoring the instruments or scanning visually the aircraft environment. There are many factors that can distract a pilot and managing them are of paramount importance: workload management, managing fatigue, flight preparation and conducting effective briefings. Technology implementation, such as synthetic vision systems (augmented reality simulating terrain projected on the navigation display/cockpit windshield during approach) can also improve flight crew situational awareness and help mitigate CFIT.

Other efforts include the development of guidance material to assist operators in implementing specific training programs and procedures relating to EGPWS. In order for operators to derive the greatest safety benefit from the system, it is essential to have a training program in place to ensure flight crew can respond effectively to the system warnings, and are aware of all factors that can reduce the effectiveness and degradation of the system. Furthermore, operators should have procedures in place to ensure the EGPWS software and terrain databases are current and that the equipment remains serviceable at all times. These recommendations and additional information can be found in the IATA and Honeywell guidance and best practices material on performance assessment of pilot response to Enhanced Ground Proximity Warning System (EGPWS).

Data shows that a good number of CFIT accidents occur in the approach and landing phases of flight, implementation of precision approaches or performance-based navigation (PBN) approaches is an effective method to reduce the risk of CFIT accidents. Authorities and operators are, therefore, encouraged to comply with ICAO recommendations and guidelines regarding PBN implementation, particularly Approaches with Vertical Guidance (APV). Installation of lighting systems such as a visual glideslope indicator (VGSI) or a visual approach slope indicator system (VASIS) is another method to promote a Continuous Descent Final Approach (CDFA) technique that will help contribute to a stabilized approach. IATA encourages pilots, air traffic controllers, manufacturers, operators, regulators, air navigation service providers (ANSPs) and other stakeholders to consult the 3rd edition of the IATA/IFALPA/IFATCA/CANSO Unstable Approaches: Risk Mitigation Policies, Procedures and Best Practices.

The following table shows the common contributing factors to CFIT accidents from 2016 to 2020.

Latent Conditions	Regulatory oversight Flight Ops SOPs and checking Safety management
Threats	Meteorology Poor Visibility/IMC Lack of visual reference Ground-based NAV aid malfunction or not available
Undesired Aircraft States	Controlled flight towards terrain Vertical/lateral/speed deviation Unnecessary weather penetration
Errors	SOP adherence/SOP cross-verification Manual handling Callouts
Countermeasures	Monitor/Cross-check In-flight decision-making/ Contingency management Overall crew performance Captains should show leadership

IATA has also published a detailed interactive analysis report on CFIT accidents using 10-year data that can be found here. In this report, about 47% of CFIT accidents showed that pilots did not adequately respond to TAWS warnings. The mismanagement of threats and/or errors by pilots implies that pilot performance remains a major causal factor in CFIT accidents despite mitigation efforts.

Recommendations
The role of the competencies within the TEM model has been formalized at the international level with ICAO Doc 9868 (PANS-TRG) Amendment 7, which states that pilot competencies provide individual and team countermeasures to threats and errors resulting in undesired aircraft states and that CRM skills are embedded in the pilot competency framework model. The training programs, as a mitigation to CFIT, should place emphasis on pilot competencies, in particular application of procedures, situational awareness, leadership, teamwork and workload management. Hence, enhancing pilot performance and competency, both in normal and abnormal circumstances, will empower pilots to intervene with greater confidence and competence to prevent threats and/or hazards that could lead to high-risk outcomes. Operators must ensure their training programs robustly address potential deficiencies, highlight environmental threats, include technical/nontechnical factors such as human factors, reinforce operator SOPs, educate about fatigue, and train CRM techniques for the most effective prevention and threat mitigation strategies.

In the context of COVID-19, IATA has proposed training solutions to maintain and recover pilot competence. Consult the information presented here.

For all in-flight CFIT warnings resulting in near misses, or even false warnings, pilots should submit occurrence reports to enable investigations to be undertaken so deficiencies can be found. Training, whether it is academic or simulator training, should allow pilots to experience realistic situations that require timely decisions and correct responses. Simulator sessions providing pilots the opportunity to practice CFIT prevention strategies, including escape maneuvering, should be given during initial and transition training as well as part of recurrent training.

Another important element of continued improvement in CFIT accidents is the collection and sharing of flight data to identify hazards and mitigate related risks that can lead to an accident. The use of flight data monitoring (FDM) is essential as it identifies potential hazards in flight operations and provides accurate quantitative data. It also provides a good indicator of undesired aircraft states such as operation outside aircraft limitations. Lastly, the effective implementation of competency-based training and assessment (CBTA) and evidence-based training (EBT) will further enhance the knowledge, skill and attitude of pilots leading to higher standards and safer operations.

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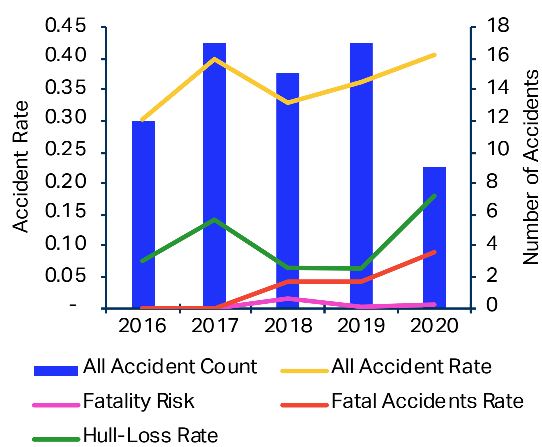
RUNWAY/TAXIWAY EXCURSIONS

Background
Despite the challenges brought about by the pandemic, runway/taxiway excursions remain one of IATA's top priorities. Although there has been a significant reduction in air travel, runway/taxiway excursions continue to occur. In fact, the Runway/Taxiway Excursion category had the highest frequency of accidents in 2020. Some risks might have been increased due to changes in runway and taxiway utilization, different traffic patterns, lower frequency of flights and others.

Despite the efforts to improve this accident category, the runway/taxiway excursion trend rate has stagnated in a range between 0.30 and 0.40 per million sectors over the past five years. The rate for 2020 was 0.41 per million sectors and it continues to be the highest end state accident rate. All of the nine accidents attributed as runway excursions in 2020 occurred during the landing phase of flight, except for a single takeoff excursion. Two runway excursions were fatal jet accidents, resulting in 24 fatalities. Seven of the nine accidents were passenger aircraft, and were split between five jets and two turboprops.



Discussion

Aside from two events involving mechanical failures, the 2020 runway excursion accidents share some common contributing factors that can broadly be described in two general areas that frequently overlap: meteorological-related conditions and flight crew performance. These common factors were identified by the ACTG in the TEM framework as follows:

Common runway excursion threats:

- Contaminated Runway/Taxiway – poor braking
- Wind/windshear/gusty wind
- Thunderstorms

Common runway excursion errors:

- Manual handling/flight controls
- Poor CRM behavior
- Failure to go-around after destabilization on approach

Most of the accidents from this year featured adverse weather reports of rain or snow and gusting winds. Aside from the effects of rain or snow on visibility, runway contamination continues to represent a major risk for runway excursions. Runway friction is important to both aircraft deceleration and lateral control; as such, timely, accurate and practical reporting for pilot assessment and decision-making is crucial. The development and use of a global reporting format (GRF), which provides a standardized method for use in takeoff and landing performance, will help mitigate the risk of runway excursions through the harmonized observation and reporting of runway surface conditions. This new methodology was scheduled to be implemented in November 2020, but in response to the COVID-19 pandemic and the associated challenges facing the aviation industry, ICAO has delayed the applicability date of the GRF until 4 November 2021.

Impact with snowbanks and a wet runway or windrows contributed to four of the runway excursion accidents in 2020. Flight crews base their performance calculations on a standard runway environment; therefore, changes to the runway width or surrounding clear area can have an impact on performance. A less-than-standard-width runway may impact crosswind limitations and restrict takeoff and landing weight. Clearly written and timely notices to pilots, either through the Notice to Airmen (NOTAM) system, automatic terminal information service (ATIS) or air traffic control (ATC), would help flight crews in this decision-making process.

One of the most common undesired aircraft states attributed to runway excursion accidents by the ACTG is "long/floated/bounced/firm/off-center/crabbed landing," which is often the result of the most common error: "manual handling/flight controls." It is the responsibility of the flight crew for the aircraft to arrive at the runway on speed, in the touchdown zone and with directional control. On every landing, the crew is faced with the task of energy management, to descend and decelerate from the high-energy cruise phase of flight to landing. Often, long, floated or bounced landings are a result of poor energy management and an unstable approach, which can be attributed to any number of human factors further compounded by additional threats such as gusty winds or contaminated runways. There are an increasing number of technological solutions available to assist pilots in the decision-making process, including, but not limited to, the use of energy-based technologies to alert pilots of a possibly impending runway excursion and command the flight crew to go-around or utilize deceleration devices.

Although advances in automation and system technologies have without a doubt brought greater opportunity for safe flight, the consequent lack of manual flying skills and correct decision-making under high workload and often 'cascading' events must be addressed. To address this concern and gain greater insight and understanding of this issue, IATA conducted a survey on "Aircraft Handling and Manual Flying Skills" to capture subjective feedback from pilots about their manual flying practices during everyday line operations and during operator training. The report can be found here.

Additionally, stabilized approach criteria have been a long-standing mitigation tool and are considered by the ACTG to be part of every operator's SOPs, which is why "continued landing after unstable approach" and "failure to go-around after destabilized approach" are frequently common contributing factors to this type of accident. Simulator training can be an effective countermeasure to prepare crews in a safe environment for adverse weather conditions, which are seldom seen in normal operation and can require performance near the limits of the aircraft and runway conditions. Training in decision-making, crew coordination and monitoring as well as go-around prior to as well as after touchdown are also important mitigating aspects to be considered.

A healthy SMS should include an FDM program to identify negative trends and potentially provide insights into the circumstances of incidents with qualitative data. The FDM data should be used to drive changes to training and operating procedures to correct negative trends before accidents occur. Normally, at larger airports and for commercial operators, the system favors stabilized approach criteria in that traffic volume is sufficient that ATC directs speed and altitude reductions, sequences traffic for ILS approaches with sufficient distance to make the energy management problem easier for flight crews to control. Since the outbreak of COVID-19 and the subsequent reduction in travel, most pilots have seen a major reduction in flight hours and many regulators have allowed exemptions to currency regulations, all of which serve to erode the skills necessary for smooth operations. To compound the situation, sparse air traffic results in more expeditious routing and less prompting by ATC, requiring pilots to rely more on their training and skill than in the past. Difficulty in maintaining situational awareness may be further complicated by distractions in the cockpit as pilots are concerned about their health, layoffs or even bankruptcy. Maintaining a sterile cockpit and adhering to SOPs is important in mitigating these threats. IATA, through the FDX database, has noted a significant increase in the number of unstable approaches, as noted in Operational Notice 002/2020. Key contributing factors identified were high airspeed and low engine thrust, symptoms of poor energy management and precursors to runway excursion accidents. Refer to Unstable Approaches content in the same section.

Recommendations

Numerous Safety Enhancements (SEs) have been developed by the Commercial Aviation Safety Team (CAST) to mitigate the risks of runway excursions. These enhancements address domains such runway safety areas, including, but not limited to, implementation of arrester beds, SOPs, training, proactive safety programs, aircraft design, communication between ATC and flight crews, airport operating procedures, landing distance assessment, and the use of available airplane stopping devices for landing scenarios with reduced or minimized landing distance margins. Since these SEs are aimed at reducing runway excursions, IATA encourages all stakeholders to review and incorporate, where applicable, these SEs.

The rate of runway excursion accidents is the highest in comparison to other end states, but typically has a low likelihood of fatality. This is due to overrun safety areas and clear areas surrounding most runways. The fatalities from two of the accidents in 2020 are attributed to runway excursions and damage occurring to the aircraft as it traveled through the runway safety area down steep terrain or through structures beyond the perimeter. The improper or insufficient use of deceleration devices are contributing factors. In some cases, it would have been possible for the aircraft to have stopped or at least departed the runway at a reduced speed had deceleration devices been used to their full potential. It is, therefore, important to mitigate fatalities from runway excursions by maintaining adequate runway overrun areas as required by ICAO Annex 14 Vol. 1. Arresting systems, such as Engineered Material Arresting Systems (EMAS), have also proven to mitigate damage by decelerating and safely stopping aircraft that overrun the runway end. A description of these systems and some guidelines for their use is available in a dedicated IFALPA Briefing Leaflet, which can be downloaded here.

The Global Runway Safety Action Plan (GRSAP), which was developed by Runway Safety Partners, should be consulted for recommendations on runway safety areas as well as other guidance created with the aid of industry partners on preventing runway excursions. Likewise, EUROCONTROL, in partnership with industry stakeholders, has recently issued guidance and best practices recommendations in their Global Action Plan for the Prevention of Runway Excursions.

Continuous improvements to stable approach criteria and policy compliance, including the discontinuation of an unstable approach, will reduce the risk of an accident. The 3rd edition of the IATA, CANSO, IFATCA and IFALPA Unstable Approaches: Risk Mitigation Policies, Procedures and Best Practices publication addresses the problems surrounding unstable approaches, a major contributor to accidents.

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UNSTABLE APPROACHES

Background

Despite improvements in the safety of operations, there remains the risk of an approach and landing accident. A stable approach means that the aircraft will arrive at the runway in the correct configuration, at the correct speed and power setting, and on the correct lateral and vertical path. An unstable approach is where one or more of these parameters is incorrect, and as a result carries an increased risk of an approach and landing incident and/or accident. Recognized industry practice is to recommend the pilot maintain a stabilized approach or execute a go-around, which is an essential safety maneuver for all flight crew. In this case, the pilot executing the go-around is considered to have demonstrated good situational awareness, decision-making and professionalism.

Discussion

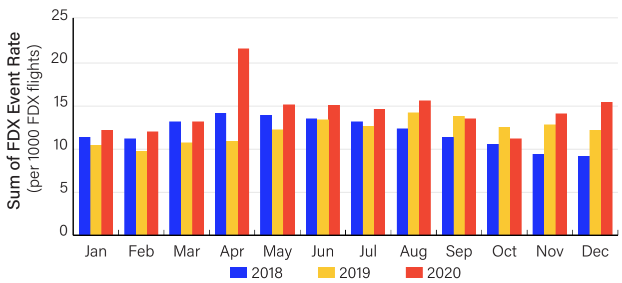
Unstable approaches significantly increase the risk of accidents during the approach and landing phases of flight. Looking at accident data for 2020 and the last five years, it is apparent that unstable approach is a factor in a number of accidents. Refer to the table below.

END STATES	2020	2016 -2020	UAS UNSTABLE APP	UAS CONTINUED LDG AFTER UNSTABLE APP	ERROR FAILURE TO G/A AFTER DESTABILIZATION ON APP
RWY/TWY EXCURSION	9	70	33% (14)	37% (14)	47% (14)
HARD LANDING	7	28	36% (15)	34% (13)	30% (9)
TAILSTRIKE	2	21	12% (5)	11% (4)	6% (2)
UNDERSHOOT	2	8	10% (4)	11% (4)	6% (2)
LOC-I	0	19	2% (1)	3% (1)	3% (1)
IN-FLIGHT DAMAGE	5	34	2% (1)	3% (1)	3% (1)
GEAR-UP LANDING / GEAR COLLAPSE	6	36	2% (1)	-	-
CFIT	1	5	-	-	-
MAC	0	0	-	-	-
GROUND DAMAGE	3	22	-	-	-
OFF-AIRPORT LANDING / DITCHING	0	1	-	-	-
RUNWAY COLLISION	2	7	-	-	-

Looking at data from the last five years (2016-2020), we can see that unstable approaches have been a contributing factor for the following types of accidents (End States):

- Runway / Taxiway Excursion (33%)
- Hard Landing (36%)
- Tailstrike (12%)
- Undershoot (10%)
- LOC-I (2%)
- In-flight Damage (2%)
- Gear-up Landing / Gear Collapse (2%)

Associated with these accidents is the fact that the flight crew have decided to continue these unstable approaches instead of executing a go-around. It seems evident that this is a very important issue that the industry must continue to address and make efforts to mitigate the inherent risks. Furthermore, the risks of unstable approaches during 2020 continue, according to the FDX. The data shows, when comparing unstable events on a monthly basis in 2020 vs. 2019 and 2018, it was apparent that the unstable approach rate increased sharply in April 2020 and returned to acceptable levels until November and December when a new upward trend is evident.



Unstable Approach Trend Rate – Global

Most airlines and other aviation organizations specify minimum acceptable criteria for the continuation of an approach to land. These criteria are detailed in the 3rd edition of the IATA, CANSO, IFATCA and IFALPA Unstable Approaches: Risk Mitigation Policies, Procedures and Best Practices, which also makes reference to the Flight Safety Foundation (FSF) Approach-and-Landing Accident Reduction (ALAR) Briefing Note 7-1, which suggests that "all flights must be stabilized by 1,000 feet above airport elevation in instrument meteorological conditions (IMC) and 500 feet above airport elevation in visual meteorological conditions (VMC)".

If an approach is not stable by a certain height above the ground, as specified in the company's SOPs, the pilot must execute a go-around. Failure to go-around from an unstable approach or an approach that becomes unstable is an intentional violation of SOPs.

Variations in required stabilization altitudes between operators, between approach types (precision/non-precision) and between meteorological conditions (IMC/VMC) could be a cause for potential confusion. Some applications of the stable approach principle do not distinguish between VMC and IMC approaches; this makes it easier to track compliance using FDM, whereas different altitudes require the FDM analyst to know which type of approach was being conducted and under what conditions.

Some operators also specify aircraft status at a 'should' gate ahead of the 'must' gate envisaged by the FSF system. This is typically 500 feet above the 'must' gate; for example, a 'should' gate at 1,000 ft. above ground level (AGL) followed by a 'must' gate at 500 ft. AGL. Failure to satisfy the former requires that corrective action be feasible and taken, whereas failure to satisfy the latter requires a go-around.

Globally, the main contributing factors for unstable approaches include, but are not limited to:

1. Adverse weather (e.g., strong or gusty winds, wind shear, turbulence).
2. ATC pressure to maximize number of movements (e.g., high approach speed).
3. Late change of runway.
4. Speed restriction inappropriate to the type of aircraft and/or to the weather conditions prevailing at the airport (e.g., low ceiling, poor visibility, tailwind at altitude).
5. Commercial pressure to maintain schedule.
6. Loss of situational awareness.
7. Flight crew fatigue.
8. Poor visibility and visual illusions.
9. Lack of monitoring by the pilots, including both Pilot Flying (PF) and Pilot Monitoring(PM).

Recommendations

- Consult with the recommendations listed in the 3rd edition of the IATA, CANSO, IFATCA and IFALPA Unstable Approaches: Risk Mitigation Policies, Procedures and Best Practices.
- Aircraft operators should implement policies and define clear criteria for the execution of stabilized approaches and mandate flight crews to execute a go-around if the approach is not within stabilized approach criteria through a non-punitive go-around policy. These policies should enable every flight crew member on the flight deck to call for a go-around at any time, unless an emergency situation dictates otherwise.
- Aircraft operators should publish SOPs and guidance as well as provide training highlighting the importance of active monitoring and effective intervention by the PM, independent of rank and experience, during descent, approach, approach path management and landing.
- Initial and recurrent simulator training should be provided on the competencies for safe go-around execution at various stages during the approach and landing, including shortly prior or during touchdown (before activation of thrust reversers).
- Aircraft operators should use their FDM programs to monitor and categorize unstable approaches using standardized criteria whenever provided by the industry (e.g., IATA FDX).
- Aircraft operators should monitor go-around policy compliance through their FDM programs and establish go-around safety performance indicators (SPIs) for monitoring through their SMS. In addition to monitoring go-arounds, aircraft operators should also monitor discontinued approaches.
- Aircraft operators should:
  - Define an unstable approach followed by a landing as a mandatory reporting event by the flight crew.
  - Minimize the need to report a go-around due to an unstable approach unless there is another significant event in relation to the go-around (e.g., flap overspeed).
- ANSPs should ensure the importance of stabilized approaches and aircraft energy management are included in initial and recurrent training of ATCOs. Aircraft operators should implement policies for flight crews not to accept ATC procedures and clearances that have the potential to increase the risk of being unstable at the landing gate.
- Like other alerting systems that are currently in use (ACAS/TCAS, EGPWS, windshear) the aviation industry should

develop on board real-time performance monitoring and alerting systems that will assist the flight crew with the land/go-around decision when the approach is not stabilized.

- Regulatory authorities should assess the performance of aircraft operators' processes for:
  - Safety data collection (e.g., flight data monitoring and reporting).
  - Identification and analysis of precursors and causal factors.
  - Participation in safety data sharing programs (e.g., EASA Data4Safety, IATA Global Aviation Data Management (GADM)).
- For more detailed information, check GAPPRE (Global Action Plan for Prevention of Runway Excursions)

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GROUND DAMAGE ACCIDENTS

Background
Damage to aircraft occurring while on the ground, including occurrences during (or as a result of) ground handling operations, collision while taxiing to/from a runway in use (excluding a runway collision), foreign object damage, and fire/smoke/fumes.

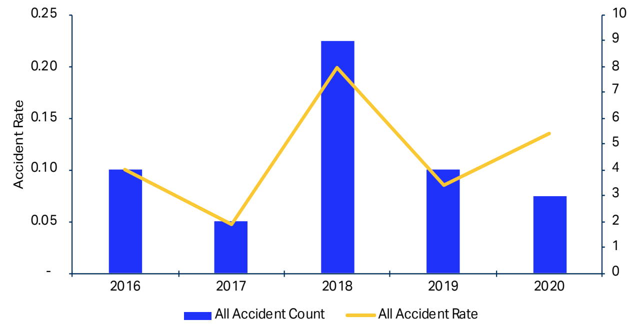
Other events included in this classification are:

- Collisions with aircraft, persons, animals, ground vehicles, obstacles, buildings, structures, etc. while on a surface other than the runway used for landing or intended for takeoff.
- Collisions that occur while servicing, boarding, loading, and deplaning the aircraft.
- Propeller/fan blade strikes.
- Pushback/power back/towing events.
- Jet blast and ground handling occurrences.
- Aircraft external pre-flight configuration errors (e.g., improper loading and improperly secured doors and latches) that lead to subsequent events.
- Includes all parking areas (e.g., ramps, gates, tiedowns).

Note: Ground collisions resulting from events categorized under Runway Collision are excluded from this category.

As specified in Annex 1, IATA has several ways to classify an accident, one of which is by the cost of the damage to the aircraft: the aircraft has sustained major structural damage that adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component exceeding US$1 million or 10% of the aircraft's hull reserve value, whichever is lower, or the aircraft has been declared a hull loss.

Discussion
Over the last five years (2016-2020), 22 ground damage accidents have occurred, down from 49 over the previous five-year period (2011-2015), with one fatal accident in 2011 that resulted in three fatalities. Historically, ground damage accidents tend to have a very low hull loss accident rate with 0.06 hull loss accidents per million sectors over the 10-year period (2011-2020). In 2020, there were three ground damage accidents, down from four accidents in 2019. There were no hull loss ground damage accidents nor fatal ground damage accidents in the reporting period from 2016-2020.



Looking at the common factors of the three ground damage accidents in 2020, in the latent conditions for ground operations, safety management was cited as a contributing factor in 33% of all ground damage accidents. Looking at the different threats, 33% were attributed to dangerous goods, hydraulic system failure, maintenance events and air traffic services. The common contributing factors cited in ground damage accidents in 2020 are as shown in the following table:

Latent Conditions	Safety Management
Threats	Dangerous Goods Hydraulic System Failure Maintenance Events Air Traffic Services
Undesired Aircraft States	Loss of Aircraft Control While on the Ground Operation Outside Aircraft Limitations

Other threats found in accidents were classified by ACTG from the perspectives of service providers and airports/regulators.

Service provider threats:

- High turnover of personnel
- Lack of positive safety culture implementation
- Lack of SMS implementation, or no interface with airline

SMS:

- Operational pressure/growth with no infrastructure growth
- Insufficient training/qualifications do not expire/no recurrent training
- Lack of technological innovation on ground service equipment (GSE)

Airport/Regulator threats:

- Infrastructure deficiencies and outdated aeronautical information publication (AIP)
- Unofficial communication of threats (e.g., use of safety bulletins instead of NOTAMs)
- No endorsement of a higher level of safety standards (e.g., IATA Safety Audit for Ground Operations (ISAGO) and/or IATA Ground Operations Manual (IGOM))
- After coordination with IATA Ground Operations Safety, taking into consideration the operational challenges arising from the COVID-19 pandemic and the subsequently massive number of aircraft parked in unusual places (e.g., taxiways and runways).

Recommendations

The ACTG decided to propose the following recommendations to airlines, service providers, airports and regulators to reduce the number and severity of ground damage accidents:

- To adopt IGOM standards in lieu of operator-specific requirements.
- For operators to provide ground service providers (GSPs) with clear instructions whenever there is a variation from the IGOM standards.
- To adopt the IATA Airport Handing Manual (AHM) Chapter 11 training recommendations.
- For GSPs to utilize ISAGO to support a reduction in station audits.
- Implementation of SMS.
- Operators should ensure their flight crew are familiar with the airport maneuvering area and procedures; especially during construction and unusual circumstances (i.e., parked aircraft due to COVID-19).

Back to Managing Safety in Aviation

MID-AIR COLLISION

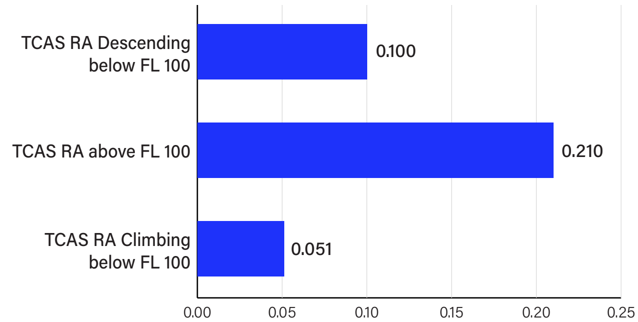
Background

Even though Mid-Air Collisions (MAC) occur rarely, the outcome is almost certainly catastrophic. The industry has made great effort over the past decades to prevent accidents in this category. But that does not mean in any way that we can ease up on our efforts; there are still things left to be done.

Discussion

Once again in 2020, we have not seen any accidents in this category, which is good news. But it is worth taking a look at the data in IATA's FDX database. FDX is an aggregated de-identified database of FDA/FOQA-type events that allows IATA to identify commercial flight safety issues that may not be visible to an airline with a dataset limited to its own operations.

From the aggregated de-identified FDX data on TCAS RA, 2,555 events occurred between January 2016 and December 2020 at the time of publication. Analyzing this data, the altitude bands where the TCAS RA events occurred were determined. As can be seen, the highest rate of events occurred above 10,000 feet when the aircraft was neither descending nor climbing. The rate calculated was 0.210 per 1,000 flights.



Mac Overall Category Rate

Implementing a TCAS monitoring program can bring safety to the next level. Collecting and analyzing TCAS events, through an FDM program, is essential to provide insight into flight operations for safety improvement. The results of these analyses typically discuss technical and operational issues related to the use and operation of the TCAS system. Additionally, the SMS should consider addressing through training (ground and flight) the findings that are related to flight crew performance.

To prevent accidents, it is essential to learn from previous accidents, incidents and undesired aircraft states reported via Air Safety Reports such as TCAS RAs. That being said, the following event provides a valuable learning opportunity to reduce the risk of accidents in future: an A321 nearly collided with a glider in the vicinity of a commercial airport in Europe while being vectored for final approach. Both planes were flying legally in airspace category E, where they both were allowed to operate, but unaware of each other. In the country of occurrence, gliders are granted exemptions from using a transponder. Also, the often-used GNSS-based Portable Collision Avoidance System (known as FLARM for "Flight Alarm") does not interact with airliners' ACAS. As FLARM does not generate information on the ATC's radar screens, 'see and avoid' remains the only (and often ineffective) barrier to prevent MAC. Two safety recommendations from the German BFU (Federal Bureau of Air Accident Investigation) have not been addressed by the governing entities since they were introduced in 2017:

1. The mandatory use of a transponder above 5,000 ft. mean sea level (MSL)/3,500 ft. GND.
2. Take steps to ensure commercial IFR flights are only operated in airspace where traffic information is available, separation is provided from all other traffic, and where TCAS is effective to prevent MAC.

Unfortunately, blind spots in the airspace structure and legislation/regulation will remain until these safety recommendations have been implemented and closed.

IATA continues to urge operators to use their FDM programs to monitor pilot response to TCAS RAs. The assessment of the pilot's compliance to ACAS orders should be made on a regular basis to determine if there are any safety issues that could be mitigated via training.

Operational experience has shown that the correct response by flight crew is dependent on the effectiveness of the initial and recurrent training in TCAS procedures. In the event of an RA, any delayed or incorrect flight crew response negates the effectiveness of the RA. Their actions will be the most important factors affecting the performance of the TCAS system. Many of the safety issues identified in operations can be inferred to a general lack of knowledge about the ACAS system, including its capabilities, benefits, limitations, and the associated operational procedures.

For these reasons, it is essential that pilots and controllers be trained on TCAS operations. Academic training as well as flight training in FSTDs will enhance flight crew understanding of how the TCAS system works, how they should respond to RAs, and the limitations of TCAS systems. It should be noted that some FSTDs have limited capabilities to display realistic traffic situations and are not always able to provide scenarios during a turn or even during climb/descend. For example, an FSTD's TCAS scenario is often designed to be triggered and delivered under specific circumstances (i.e., unaccelerated level flight). As a consequence, the flight crew is able to recognize in advance the TCAS RA event within the flight profile. The traffic popping up on the TCAS display will most likely become an intruder in short order. The surprise effect that is often observed in real-world TCAS RAs is not contained in this kind of training. As technology advances rapidly, FSTD manufacturers are encouraged to enhance the capabilities of their simulation devices to deliver more realistic scenarios, taking into account the expertise and safety recommendations of the operators.

A mentally unprepared crew faced with unknown TCAS scenarios could feel pressed to conduct an individual 'on-the-go' risk evaluation during the event, with a possible underestimation of the risk and subsequent non-adherence to TCAS RAs.

Recommendations:

- Flight crews should not delay the response or decide not to respond to an RA. IATA recommends all operators and flight crew to consult the Performance Assessment of Pilot Compliance with TCAS using FDM guidance material - 2nd Edition.
- Flight crews should refrain from switching their TCAS to 'TA only' and always use TCAS TA/RA mode, especially during approaches in high-density airspaces.
- FSTD manufacturers, airplane operators and ATCs should work together to develop realistic TCAS training scenarios that provide a wide variety of real-world scenarios.
- Existing FSTDs should be upgraded to be able to provide these scenarios.
- TCAS training should be improved to address these realistic scenarios as well as special cases (e.g., low-level TCAS descend RA, TCAS scenarios during parallel runway operations).
- Where commercial airline traffic is present, the regulator should ensure the ACAS systems of all traffic is compatible with each other and every traffic type known to the ATC unit. This also applies to unmanned aircraft.

Pilots have to be able to easily determine on their charts where the boundaries are between controlled and non-controlled airspaces.

Back to Managing Safety in Aviation

HUMAN FACTORS IN ACCIDENTS

Background:
After analysis and review of the last two years of accidents and their primary contributing factors, we can conclude that human error remains as a primary indicator. As the complexity of the cockpit environment has evolved and automation has increased, human factors, especially those safety-related, require a multi-disciplinary approach. Additionally, human factors in maintenance play an important role in a number of aviation incidents and accidents. This may be attributed to maintenance tasks either not performed correctly or omitted due to human errors.

Some of the main human factors analyzed included, but were not limited to:

- Lack of or poor communication
- Complacency, distraction and lack of or poor assertiveness
- Situational awareness
- Fatigue and stress
- Workload management
- Non-compliance with SOPs and norms
- Low resilience (poor response to pressure)
- Low maintenance performance: non-adherence to SOPs and lack of supervision
- Performance of Air Traffic Controller/Air Traffic Management

Discussion:
The list above indicates a predominant number of factors related to non-technical skills, which demonstrates a need to enhance not only technical training, but also human factors training to bring a change in mindset, attitude and culture of individuals.

The poor decision-making process highlighted as one of the major contributing factors in recent accidents shall involve a systematic approach to mental process that gathers the non-technical skills mentioned above.

Recommendation:
It is strongly recommended that the enhancement and optimization of human performance be a priority in airline training programs. In this way, CRM/TEM ground training, line-oriented flight training (LOFT) simulator training with updated scenarios to address airline reported events, Line Operations Safety Audit (LOSA) programs, and FDM/FOQA trends will capture all threats presented in operations. An important approach is the presence of a solid and proactive positive (just) culture policy where flight crew are encouraged to raise errors with confidence that this will be non-punitive.

The COVID-19 outbreak has brought unprecedented challenges to the industry. The structures and policies in place for SMS shall support and encourage organizational adaptation, a positive and open reporting culture, and foster flight crew resilience and team building. Therefore, a strong defense barrier to all the aforementioned challenges is a vibrant SMS program with a healthy focus on human factors.

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8

Global Aviation Data Management

In 2020, GADM focused on growing the membership for the Incident and Flight Data Exchange programs, while continuing with the development of new aviation safety analytics for our industry users.

Additionally, our service delivery and data management processes were further streamlined to optimize new member onboarding and shorten the data processing cycle to monthly from quarterly.

The GADM team held a series of webinars in 2020 and will continue to do so, ensuring the continuous delivery of valuable insights on safety and security occurrences.

For more information, visit the [GADM website.]

Incident Data Exchange (IDX)

The new IDX was launched at the end of 2019 to replace and expand on the former safety occurrence databases – Safety Trend Evaluation, Analysis and Data Exchange System (STEADES) and Ground Damage Database (GDDB). In 2020, the focus was onboarding airlines, GSPs and airport operators into the new platform.

The IDX program is a worldwide, aggregated, de-identified database of safety and security occurrence reports in the areas of flight operations, cabin operations, ground operations, maintenance, engineering and more.

In just one year, the IDX program managed to create a customer base of 69 participants, which represents more than 10% of worldwide commercial aviation traffic.

IDX benefits include the ability for users to:

- Access de-identified safety and security information.
- Benchmark themselves at the regional and global level.
- Anticipate operational challenges and risks at specific airports.
- Identify critical incident trends while setting targets for improvement.

In 2020, GADM released various focus area dashboards allowing users to access safety and security information, while helping them to identify emerging safety trends and risks provoked by the global COVID-19 crisis.

Accident Data Exchange (ADX)

The Accident Database also underwent a major transformation in 2020, and a revamped version of the platform is currently available to all GADM participants.

The Accident Data Exchange (ADX) complements the IATA Safety Report by providing easy access to all commercial aviation accidents since 2005 that meet the IATA Accident Inclusion Guidelines.

ADX provides rate-based information, which consists of normalizing accident numbers with global sectors to perform analyses that are statistically relevant.

In addition, ADX allows to easily extract statistics based on many variables, such as airport, aircraft, date, country, phase of flight, accident category, severity, type of operations, and much more.

GADM Data Science

GADM aims to develop data science capabilities and implement machine learning technologies to derive fast and cost-effective solutions for safety and security risk identification.

Starting in 2020, the GADM team collaborated with the Institute for Data Valorization (IVADO) and several universities, working on the following research projects:

- Natural Language Processor Application for Incident Report Analysis (University of Montreal)
- Correlative Flight Parameter Analysis (Polytechnique Montreal)

The engagement with academia enabled the GADM team to apply cutting-edge technologies into data-sharing programs. For example, GADM developed a machine learning model that identifies the correlations between features and unstable approaches by airport and altitude. This provides visibility to the hidden factors and their complex interactions, supporting analysts to understand the underlying patterns of unstable approaches.

Based on the accomplishments, the research block for 2021 is planned to develop an automated anomaly detection model, supporting the proactive risk identification so GADM can discover meaningful precursors before major incidents occur.

Montreal is not only known as a global center of aviation, but also as an artificial intelligence hub and leading research center. To bring together various actors in the aviation industry and exchange knowledge and best practices of analytics and digital intelligence, GADM plays an active role in the community of interest in aviation, fostering an ecosystem between researchers, start-ups and aviation industry players in Montreal.

Flight Data Exchange (FDX)

FDX is IATA's premier global flight data sharing program. The program counted over 100 active member airlines at the close of 2020. The membership of the program is diverse and comes from different regions of the world, thus making the program truly global.

The FDX program offers member airlines access to in-depth analytics in areas of risk as well as the ability to benchmark their operations against other operators in the world from a regional or global perspective. The FDX platform is developed to be easy to navigate by providing member airlines with improved visualizations and refined filter criteria.

The program offers secure handling of flight data in a confidential and safe manner under strict guidance from IATA governance protocols, ISO data governance standards as well as international data protection standards.

For further information about any of our programs, email gadm@iata.org.

Addendum A

Fatality Risk

Definition

In 2015, IATA added another measure of air carrier safety to its annual Safety Report: **fatality risk.** This measure seeks to answer the following question: what was the exposure of a passenger or crew member to a catastrophic accident, where all people on board perished?

The equation to calculate the fatality risk is **Q = V/N**, where:

- **N** is the number of flights or sectors conducted during the period
- **V** is the total number of "full-loss equivalents" among the N flights or sectors

The full-loss equivalent for a given flight is the proportion of passengers and crew who do not survive an accident. For example:

- If a flight lands safely, the full-loss equivalent is zero.
- If a flight results in an accident in which all passengers and crew are killed, the full-loss equivalent is one.
- If a flight results in an accident in which half of passengers and crew are killed, the full-loss equivalent is 0.5.

V is the sum of all full-loss equivalents calculated for all N flights. In other words, the fatality risk rate (Q) is the sum of the individual accident full-loss equivalents divided by the total number of flights.

Examples

The following tables illustrate two examples:

Case 1: There were a total of four accidents during the period:

Accident	% of People-Onboard Who Perished	Full-Loss Equivalent
#1	0%	0
#2	100%	1
#3	50%	0.5
#4	50%	0.5
Total Full-Loss Equivalent		2
Number of Sectors		3,000,000
Fatality Risk		0.00000067
Fatality Risk (normalized per 1 million sectors)		0.67

In Case 1, there were a total of four accidents out of three million sectors. Of these four accidents, one had no fatalities, one was a complete hull loss with all on board killed, and two in which half on board perished. In total, there were two full-loss equivalents out of three million sectors, which equates to 0.67 full-loss equivalents per million sectors. In other words, the exposure of all passengers and crew who flew on those sectors to a catastrophic accident was 1 in 1.5 million flights.

Fatality Risk (cont'd)

Case 2: There were a total of six accidents:

Accident	% of People Onboard Who Perished	Full-Loss Equivalent
#1	0%	0
#2	10%	0.1
#3	20%	0.2
#4	50%	0.5
#5	30%	0.3
#6	40%	0.4
Total Full-Loss Equivalent		1.5
Number of Sectors		3,000,000
Fatality Risk		0.0000005
Fatality Risk (normalized per 1 million sectors)		0.50

In Case 2, there were a total of six accidents out of three million sectors. Of these six accidents, five experienced some fatalities, but there was no complete full loss. The total of the full-loss equivalents was 1.5. This equates to a fatality risk of 0.50 per million sectors. The exposure, in this case, was of one catastrophic accident per two million flights.

When comparing the above cases, the risk of perishing on a randomly selected flight is lower in Case 2 even though there were more accidents with fatalities. Case 1 had fewer fatal accidents, but they were more severe. Therefore, the odds of a passenger or crew losing their life on a given flight (fatality risk) is higher in Case 1 than in Case 2.

Considerations

It is important to note that the calculation of fatality risk does not consider the size of the airplane, how many people were on board, or the length of the flight. Rather, what is key is the percentage of people, from the total carried, who perished. It does not consider whether the accident was on a long-haul flight on a large aircraft where 25% of the passengers did not survive, or on a small commuter flight with the same ratio. The likelihood of perishing is the same.

Fatality risk, or full-loss equivalent, can easily be mistaken to represent the number of fatal accidents (or the fatal accident rate). Although fatality risk only exists once there is a fatal accident, they are not the same. While a fatal accident indicates an accident where at least one person perished, the full-loss equivalent indicates the proportion of people on board who perished.

Fatality risk provides a good baseline for comparison between accident categories. For example, Loss of Control — In-flight (LOC-I) is known to have a high fatality risk, but a low frequency of occurrence. Runway Excursion, on the other hand, has a low fatality risk, but a higher frequency of occurrence. It is possible, therefore, for the Runway Excursion category to have the same fatality risk as LOC-I if its frequency of occurrence is high enough so that the generally small full-loss equivalent for each individual accident produces the same total full-loss equivalent number as LOC-I (per million sectors).

Annex 1 – Definitions

Abnormal Disembarkation: Passengers and/or crew exit the aircraft via boarding doors (normally assisted by internal aircraft or exterior stairs) after an aircraft incident or accident and when away from the boarding gates or aircraft stands (e.g., onto a runway or taxiway); only in a non-life-threatening and non-catastrophic event.

Accident: IATA defines an accident as an event where ALL of the following criteria are satisfied:

- Person(s) have boarded the aircraft with the intention of flight (either flight crew or passengers).
- The intention of the flight is limited to normal commercial aviation activities, specifically scheduled/charter passenger or cargo service. Executive jet operations, training, and maintenance/test flights are excluded.
- The aircraft is turbine-powered and has a certificated Maximum Takeoff Weight (MTOW) of at least 5,700 kg (12,540 lb.).
- The aircraft has sustained major structural damage that adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component exceeding $1 million USD or 10% of the aircraft's hull reserve value, whichever is lower, or the aircraft has been declared a hull loss.

Accident Classification: Process by which actions, omissions, events, conditions, or a combination thereof, that led to an accident are identified and categorized.

Aircraft: Involved aircraft, used interchangeably with airplane(s).

Cabin Safety-related Event: Accident involving cabin operational issues (e.g., passenger evacuation, onboard fire, decompression, ditching) that requires actions by the operating cabin crew.

Captain: Involved pilot responsible for the operation and safety of the aircraft during flight time.

Commander: Involved pilot, in an augmented crew, responsible for the operation and safety of the aircraft during flight time.

Crew member: Anyone on board a flight who has duties connected with the sector of the flight during which the accident happened. It excludes positioning or relief crew, security staff, etc. (see definition of "Passenger" below).

Evacuation (Land): Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits or gaps in the fuselage (usually initiated in life-threatening and/or catastrophic events).

Evacuation (Water): Passengers and/or crew evacuate the aircraft via escape slides/slide rafts, doors, emergency exits or gaps in the fuselage and into or onto water.

Fatal Accident: Accident where at least one passenger or crew member is killed or later dies of their injuries, resulting from an operational accident. Events such as slips, trips and falls, food poisoning, or injuries resulting from turbulence or involving onboard equipment, which may involve fatalities, but where the aircraft sustains minor or no damage, are excluded.

Fatality: Passenger or crew member who is killed or later dies of their injuries resulting from an operational accident. Injured persons who die more than 30 days after an accident are excluded.

Fatality Risk: Sum of full-loss equivalents per 1 million sectors, measuring the exposure of a passenger or crew member to a non-survivable accident. A full-loss equivalent is related to the percentage of people on board who perished. Refer to Addendum A for additional information.

Full-Loss Equivalent: Number representing the equivalent of a catastrophic accident where all people onboard died. For an individual accident, the full-loss equivalent is a value between 0 and 1, representing the ratio between the number of people who perished and the number of people on board the aircraft. In a broader context, the full-loss equivalent is the sum of each accident's full-loss equivalent value. Refer to Addendum A for additional information.

Hazard: Condition, object or activity with the potential of causing injuries to persons, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

Hull Loss: Accident in which the aircraft is destroyed or substantially damaged and is not subsequently repaired for whatever reason, including a financial decision of the owner.

Hull Loss/Nil Survivors: Accident resulting in a complete hull loss with no survivors (used as a Cabin End State).

IATA Accident Classification System: Refer to Annexes 2 and 3 of this report.

IATA Regions: IATA determines the accident region based on the operator's home country as specified in the operator's Air Operator Certificate (AOC). For example, if a Canadian-registered operator has an accident in Europe, this accident is counted as a 'North American' accident. For a complete list of countries assigned per region, consult the following table:

IATA REGIONS

Region	Country
AFI	Angola
	Benin
	Botswana
	Burkina Faso
	Burundi
	Cameroon
	Cape Verde
	Central African Republic
	Chad
	Comoros
	Congo, Democratic Republic of
	Congo
	Côte d'Ivoire
	Djibouti
	Equatorial Guinea
	Eritrea
	Ethiopia
	Gabon
	Gambia
	Ghana
	Guinea
	Guinea-Bissau
	Kenya
	Lesotho
	Liberia
	Madagascar
	Malawi
	Mali
	Mauritania
	Mauritius
	Mozambique
	Namibia
	Niger
	Nigeria
	Rwanda
	São Tomé and Príncipe
	Senegal
	Seychelles
	Sierra Leone
	Somalia
	South Africa
	South Sudan

Region	Country
	Swaziland
	Tanzania, United Republic of
	Togo
	Uganda
	Zambia
	Zimbabwe
ASPAC	Australia[1]
	Bangladesh
	Bhutan
	Brunei Darussalam
	Cambodia
	Fiji Islands
	India
	Indonesia
	Japan
	Kiribati
	Korea, Republic of
	Lao People's Democratic Republic
	Malaysia
	Maldives
	Marshall Islands
	Micronesia, Federated States of
	Myanmar
	Nauru
	Nepal
	New Zealand[2]
	Pakistan
	Palau
	Papua New Guinea
	Philippines
	Samoa
	Singapore
	Solomon Islands
	Sri Lanka
	Thailand
	Timor-Leste
	Tonga
	Tuvalu
	Vanuatu
	Vietnam

Region	Country
CIS	Armenia
	Azerbaijan
	Belarus
	Georgia
	Kazakhstan
	Kyrgyzstan
	Moldova, Republic of
	Russian Federation
	Tajikistan
	Turkmenistan
	Ukraine
	Uzbekistan
EUR	Albania
	Andorra
	Austria
	Belgium
	Bosnia and Herzegovina
	Bulgaria
	Croatia
	Cyprus
	Czech Republic
	Denmark[3]
	Estonia
	Finland
	France[4]
	Germany
	Greece
	Holy See (Vatican City State)
	Hungary
	Iceland
	Ireland
	Italy
	Israel
	Kosovo
	Latvia
	Liechtenstein
	Lithuania
	Luxembourg
	Macedonia, the former Yugoslav Republic of
	Malta
	Monaco

Region	Country
	Montenegro
	Netherlands[5]
	Norway
	Poland
	Portugal
	Romania
	San Marino
	Serbia
	Slovakia
	Slovenia
	Spain
	Sweden
	Switzerland
	Turkey
	United Kingdom[6]
LATAM/ CAR	Antigua and Barbuda
	Argentina
	Bahamas
	Barbados
	Belize
	Bolivia
	Brazil
	Chile
	Colombia
	Costa Rica
	Cuba
	Dominica
	Dominican Republic
	Ecuador
	El Salvador
	Grenada
	Guatemala
	Guyana
	Haiti
	Honduras
	Jamaica
	Mexico
	Nicaragua
	Panama
	Paraguay
	Peru
	Saint Kitts and Nevis
	Saint Lucia

Region	Country
	Saint Vincent and the Grenadines
	Suriname
	Trinidad and Tobago
	Uruguay
	Venezuela
MENA	Afghanistan
	Algeria
	Bahrain
	Egypt
	Iran, Islamic Republic of
	Iraq
	Jordan
	Kuwait
	Lebanon
	Libya
	Morocco
	Oman
	Palestinian Territories
	Qatar
	Saudi Arabia
	Sudan
	Syrian Arab Republic
	Tunisia
	United Arab Emirates
	Yemen
NAM	Canada
	United States of America[7]
NASIA	China[8]
	Mongolia
	Korea, Democratic People's Republic of

[1]Australia includes:

Christmas Island
Cocos (Keeling) Islands
Norfolk Island
Ashmore and Cartier Islands
Coral Sea Islands
Heard Island and McDonald Islands

[2]New Zealand includes:

Cook Islands
Niue
Tokelau

[3]Denmark includes:

Faroe Islands
Greenland

[4]France includes:

French Guiana
French Polynesia
French Southern Territories
Guadalupe
Martinique
Mayotte
New Caledonia
Saint-Barthélemy
Saint Martin (French part)
Saint Pierre and Miquelon
Reunion
Wallis and Futuna

[5]Netherlands include:

Aruba
Curacao
Sint Maarten

[6]United Kingdom includes:

Akrotiri and Dhekelia
Anguilla
Bermuda
British Indian Ocean Territory
British Virgin Islands
Cayman Islands
Falkland Islands (Malvinas)
Gibraltar
Montserrat
Pitcairn
Saint Helena, Ascension and Tristan da Cunha
South Georgia and the South Sandwich Islands
Turks and Caicos Islands
British Antarctic Territory
Guernsey
Isle of Man
Jersey

[7]United States of America include:

American Samoa
Guam
Northern Mariana Islands
Puerto Rico
Virgin Islands, U.S.
United States Minor Outlying Islands

[8]China includes:

Chinese Taipei
Hong Kong
Macao

Incident: Occurrence, other than an accident, associated with the operation of an aircraft that affects or could affect the safety of operation.

In-flight Security Personnel: Individual who is trained, authorized and armed by the state and is carried on board an aircraft and whose intention is to prevent acts of unlawful interference.

Investigation: Process conducted for accident prevention, which includes the gathering and analysis of information, the drawing of conclusions (including the determination of causes) and, when appropriate, the making of safety recommendations.

Investigator in Charge: Person charged, based on their qualifications, with the responsibility for the organization, conduct and control of an investigation.

Involved: Directly concerned, or designated to be concerned, with an accident or incident.

Level of Safety: How far safety is to be pursued in a given context, assessed with reference to an acceptable risk, based on the current values of society.

Major Repair: A repair that, if improperly done, might appreciably affect the mass, balance, structural strength, performance, power plant operation, flight characteristics, or other qualities affecting the airworthiness of an aircraft.

Non-operational Accident: Includes accidents resulting from acts of deliberate violence (e.g., sabotage, war) and accidents that occur during crew training, demonstrations and test flights. Violence is believed to be a matter of security rather than flight safety. Crew training, demonstrations and test flights are considered to involve special risks inherent with these types of operations. Also included in this category are:

- Non-airline-operated aircraft (e.g., military or government-operated, survey, aerial work or parachuting flights).
- Accidents where there was no intention of flight.

Normal Disembarkation: Passengers and/or crew exit the aircraft via boarding doors during normal operations.

Occurrence: Any unusual or abnormal event involving an aircraft, including, but not limited to, an incident.

Operational Accident: Accident that is believed to represent the risks of normal commercial operation; generally an accident that occurs during normal revenue operations or a positioning flight.

Operator: Person, organization or enterprise engaged in, or offering to engage in, aircraft operations.

Passenger: Anyone on board a flight who, as far as may be determined, is not a crew member. Apart from normal revenue passengers, this includes off-duty staff members, positioning and relief flight crew members, etc., who have no duties connected with the sector of the flight during which the accident happened. Security personnel are included as passengers as their duties are not concerned with the operation of the flight.

Person: Any involved individual, including airport and Air Traffic Service (ATS) personnel.

Phase of Flight: The phase of flight definitions developed and applied by IATA are presented in the table on the following page.

Rapid Deplaning: Passengers and/or crew rapidly exit the aircraft via boarding doors and a jet bridge or stairs, as a precautionary measure.

Risk: Assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard, taking as reference the worst foreseeable situation.

Safety: State in which the risk of harm to persons or property is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management.

Sector: Operation of an aircraft between takeoff at one location and landing at another (other than a diversion).

Serious Injury: Injury sustained by a person in an accident and which meets one of the following:

- Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received.
- Results in a fracture of any bone (except simple fractures of fingers, toes or nose).
- Involves lacerations that cause severe hemorrhage or nerve, muscle or tendon damage.
- Involves injury to any internal organ.
- Involves second or third-degree burns, or any burns affecting more than 5% of the surface of the body.
- Involves verified exposure to infectious substances or injurious radiation.

Serious Incident: Incident involving circumstances indicating that an accident nearly occurred. *Note:* the difference between an accident and a serious incident lies only in the result.

Substantial Damage: Damage or structural failure, which adversely affects the structural strength, performance or flight characteristics of the aircraft, and which would normally require major repair or replacement of the affected component.

Notes:

- Bent fairing or cowling, dented skin, small punctured holes in the skin or fabric, minor damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage" for the purpose of this Safety Report.
- The ICAO Annex 13 definition is unrelated to cost and includes many incidents in which the financial consequences are minimal.

Unstable Approach: Approach where the IATA ACTG has knowledge about vertical, lateral or speed deviations in the portion of the flight close to landing. *Note:* this definition includes the portion immediately prior to touchdown and in this respect the definition might differ from other organizations. However, accident analysis gives evidence that a destabilization just prior to touchdown has contributed to accidents in the past.

PHASE OF FLIGHT DEFINITIONS

Flight Planning (FLP) This phase begins when the flight crew initiates the use of flight planning information facilities and becomes dedicated to a flight based upon a route and airplane; it ends when the crew arrives at the aircraft for the planned flight or the crew initiates a 'Flight Close' phase.

Preflight (PRF) This phase begins with the arrival of the flight crew at an aircraft for the flight; it ends when a decision is made to depart the parking position and/or start the engine(s). It may also end by the crew initiating a 'Post-flight' phase. *Note:* the PRF phase assumes the aircraft is sitting at the point at which the aircraft will be loaded or boarded, with the primary engine(s) not operating. If boarding occurs during this phase, it is done without any engine(s) operating. Boarding with any engine(s) operating is covered under 'Engine Start/Depart'.

Engine Start/Depart (ESD) This phase begins when the flight crew take action to have the aircraft moved from the parked position and/or take switch action to energize the engine(s); it ends when the aircraft begins to move under its own power or the crew initiates an 'Arrival/Engine Shutdown' phase. *Note:* the ESD phase includes the aircraft engine(s) start-up whether assisted or not and whether the aircraft is stationary with more than one engine shutdown prior to 'Taxi-out' (i.e., boarding of persons or baggage with engines running); it includes all actions of power back to position the aircraft for Taxi-out.

Taxi-out (TXO) This phase begins when the crew moves the aircraft forward under its own power; it ends when thrust is increased for 'Takeoff' or the crew initiates a 'Taxi-in' phase. *Note:* this phase includes taxi from the point of moving under the aircraft's own power, up to and including entering the runway and reaching the Takeoff position.

Takeoff (TOF) This phase begins when the crew increases the thrust for lift-off; it ends when an 'Initial Climb' is established or the crew initiates a 'Rejected Takeoff' phase.

Rejected Takeoff (RTO) This phase begins when the crew reduces thrust to stop the aircraft before the end of the Takeoff phase; it ends when the aircraft is taxied off the runway for a 'Taxi-in' phase or when the aircraft is stopped and engines shutdown.

Initial Climb (ICL) This phase begins at 35 feet above the runway elevation; it ends after the speed and configuration are established at a defined maneuvering altitude or to continue the climb for cruising. It may also end by the crew initiating an 'Approach' phase. *Note:* maneuvering altitude is that needed to safely maneuver the aircraft after an engine failure occurs, or predefined as an obstacle clearance altitude. ICL includes such procedures applied to meet the requirements of noise abatement climb or best angle/rate of climb.

En Route Climb (ECL) This phase begins when the crew establishes the aircraft at a defined speed and configuration, enabling the aircraft to increase altitude for cruising; it ends with the aircraft establishing a predetermined constant initial cruise altitude at a defined speed or by the crew initiating a 'Descent' phase.

Cruise (CRZ) This phase begins when the crew establishes the aircraft at a defined speed and predetermined constant initial cruise altitude and proceeds in the direction of a destination; it ends with the beginning of the 'Descent' phase for an approach or by the crew initiating an ECL phase.

Descent (DST) This phase begins when the crew departs the cruise altitude for an approach at a destination; it ends when the crew initiates changes in aircraft configuration and/or speeds to facilitate a landing on a specific runway. It may also end by the crew initiating an ECL or CRZ phase.

Approach (APR) This phase begins when the crew initiates changes in aircraft configuration and/or speeds enabling the aircraft to maneuver to land on a specific runway; it ends when the aircraft is in the landing configuration and the crew is dedicated to land on a specific runway. It may also end by the crew initiating a 'Go-around' phase.

Go-around (GOA) This phase begins when the crew aborts the descent to the planned landing runway during the APR phase; it ends after speed and configuration are established at a defined maneuvering altitude or to continue the climb for the purpose of cruise (same as the end of ICL.

Landing (LND) This phase begins when the aircraft is in the landing configuration and the crew is dedicated to touch down on a specific runway; it ends when the speed permits the aircraft to be maneuvered by means of taxiing for arrival at a parking area. It may also end by the crew initiating a GOA phase.

Taxi-in (TXI) This phase begins when the crew begins to maneuver the aircraft under its own power to an arrival area for parking; it ends when the aircraft ceases moving under its own power with a commitment to shut down the engine(s). It may also end by the crew initiating a TXO phase.

Arrival/Engine Shutdown (AES) This phase begins when the crew ceases to move the aircraft under its own power and a commitment is made to shut down the engine(s); it ends with a decision to shut down ancillary systems to secure the aircraft. It may also end by the crew initiating an ESD phase. *Note:* the AES phase includes actions required during a time when the aircraft is stationary with one or more engines operating while ground servicing may be taking place (i.e., deplaning persons or baggage with engine(s) running and/or refueling with engine(s) running).

Post-flight (PSF) This phase begins when the crew commences the shutdown of ancillary systems of the aircraft to leave the flight deck; it ends when the flight and cabin crew leave the aircraft. It may also end by the crew initiating a PRF phase.

Flight Close (FLC) This phase begins when the crew initiates a message to the flight-following authorities that the aircraft is secure and the crew is finished with the duties of the past flight; it ends when the crew has completed these duties or begins to plan for another flight by initiating a FLP phase.

Ground Servicing (GDS) This phase begins when the aircraft is stopped and available to be safely approached by ground personnel for the purpose of securing the aircraft and performing the duties applicable to the arrival of the aircraft (i.e., aircraft maintenance); it ends with completion of the duties applicable to the departure of the aircraft or when the aircraft is no longer safe to approach for the purpose of ground servicing (e.g., prior to crew initiating the TXO phase). *Note:* the GDS phase was identified by the need for information that may not directly require the input of flight or cabin crew. It is acknowledged as an entity to allow placement of the tasks required of personnel assigned to service the aircraft.

Annex 2
Accident Classification Taxonomy

1. LATENT CONDITIONS

Definition: Conditions present in the system before the accident and triggered by various possible factors.

Latent Conditions (deficiencies in...)	Examples
Design	↗ Design shortcomings ↗ Manufacturing defects
Regulatory Oversight	↗ Deficient regulatory oversight by the state or lack thereof
Management Decisions	↗ Cost cutting ↗ Stringent fuel policy ↗ Outsourcing and other decisions, which can impact operational safety
Safety Management	Absent or deficient: ↗ Safety policy and objectives ↗ Safety risk management (including hazard identification process) ↗ Safety assurance (including Quality Management) ↗ Safety promotion
Change Management	↗ Deficiencies in monitoring change; in addressing operational needs created by, for example, expansion or downsizing ↗ Deficiencies in the evaluation to integrate and/or monitor changes to establish organizational practices or procedures ↗ Consequences of mergers or acquisitions
Selection Systems	↗ Deficient or absent selection standards
Operations Planning and Scheduling	↗ Deficiencies in crew rostering and staffing practices ↗ Issues with flight and duty time limitations ↗ Health and welfare issues
Technology and Equipment	↗ Available safety equipment not installed (EGPWS, predictive wind shear, TCAS/ACAS, etc.)

1. LATENT CONDITIONS (CONT'D)

Flight Operations	See the following breakdown
Flight Operations: Standard Operating Procedures and Checking	↗ Deficient or absent: 1. Standard operating procedures (SOPs) 2. Operational instructions and/or policies 3. Company regulations 4. Controls to assess compliance with regulations and SOPs
Flight Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of flight crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Cabin Operations	See the following breakdown
Cabin Operations: Standard Operating Procedures and Checking	↗ Deficient or absent: 1. SOPs 2. Operational instructions and/or policies 3. Company regulations 4. Controls to assess compliance with regulations and SOPs
Cabin Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of cabin crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Ground Operations	See the following breakdown
Ground Operations: SOPs and Checking	↗ Deficient or absent: 1. SOPs 2. Operational instructions and/or policies 3. Company regulations 4. Controls to assess compliance with regulations and SOPs
Ground Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of ground crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices

1. LATENT CONDITIONS (CONT'D)

Maintenance Operations	See the following breakdown
Maintenance Operations: SOPs and Checking	↗ Deficient or absent: 1. SOPs 2. Operational instructions and/or policies 3. Company regulations 4. Controls to assess compliance with regulations and SOPs ↗ Includes deficiencies in technical documentation, unrecorded maintenance and the use of bogus parts/unapproved modifications
Maintenance Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of maintenance crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Dispatch	See the following breakdown
Dispatch: Standard Operating Procedures and Checking	↗ Deficient or absent: 1. SOPs 2. Operational instructions and/or policies 3. Company regulations 4. Controls to assess compliance with regulations and SOPs
Dispatch: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of dispatchers, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Flight Watch	↗ Flight Watch/ Flight Following
Other	↗ Not clearly falling within the other latent conditions

Note: All areas such as Training, Ground Operations or Maintenance include outsourced functions for which the operator has oversight responsibility.

2. THREATS

Definition: An event or error that occurs outside the influence of the flight crew, but which requires crew attention and management if safety margins are to be maintained.

Mismanaged threat: A threat that is linked to or induces a flight crew error.

Environmental Threats	Examples
Meteorology	See the following breakdown
	↗ Thunderstorms
	↗ Poor visibility/Instrument Meteorological Conditions (IMC)
	↗ Wind/wind shear/gusty wind
	↗ Icing conditions
	↗ Hail
Lack of visual reference	↗ Darkness/black hole effect ↗ Environmental situation, which can lead to spatial disorientation
Air Traffic Services	↗ Tough-to-meet clearances/restrictions ↗ Reroutes ↗ Language difficulties ↗ Controller errors ↗ Failure to provide separation (air/ground)
Wildlife/ Birds/Foreign Objects	↗ Self-explanatory
Airport Facilities	See the following breakdown
	↗ Poor signage, faint markings ↗ Runway/taxiway closures
	↗ Contaminated runways/taxiways ↗ Poor braking action
	↗ Trenches/ditches ↗ Inadequate overrun area ↗ Structures in close proximity to runway/taxiway
	↗ Inadequate airport perimeter control/fencing ↗ Inadequate wildlife control

2. THREATS (CONT'D)

Navigational Aids	See the following breakdown
	↗ Ground navigation aid malfunction ↗ Lack or unavailability (e.g., Instrument Landing System)
	↗ NAV aids not calibrated – unknown to flight crew
Terrain/Obstacles	↗ Self-explanatory
Traffic	↗ Aircraft striking other aircraft (e.g., during runway incursion) ↗ Ground vehicles hitting aircraft
Runway Surface Incursion	↗ Aircraft ↗ Vehicle ↗ Wildlife ↗ Other
Other	↗ Not clearly falling within the other environmental threats
Airline Threats	Examples
Aircraft Malfunction	See breakdown (on the next page)
MEL Item	↗ Minimum Equipment List (MEL) items with operational implications
Operational Pressure	↗ Operational time pressure ↗ Missed approach/diversion ↗ Other non-normal operations
Cabin Events	↗ Cabin events (e.g., unruly passenger) ↗ Cabin crew errors ↗ Distractions/interruptions
Ground Events	↗ Aircraft loading events ↗ Fueling errors ↗ Agent interruptions ↗ Improper ground support ↗ Improper deicing/anti-icing
Dispatch/Paperwork	↗ Load sheet errors ↗ Crew scheduling events ↗ Late paperwork changes or errors
Maintenance Events	↗ Aircraft repairs on ground ↗ Maintenance log problems ↗ Maintenance errors
Dangerous Goods	↗ Carriage of articles or substances capable of posing a significant risk to health, safety or property when transported by air
Manuals/ Charts/Checklists	↗ Incorrect/unclear chart pages or operating manuals ↗ Checklist layout/design issues
Other	↗ Not clearly falling within the other airline threats

2. THREATS (CONT'D)

Aircraft Malfunction Breakdown (Technical Threats)	Examples
Extensive/Uncontained Engine Failure	↗ Damage due to non-containment
Contained Engine Failure / Power plant Malfunction	↗ Engine overheat ↗ Propeller failure ↗ Failure affecting power plant components
Gear/Tire	↗ Failure affecting parking, taxi, takeoff or landing
Brakes	↗ Failure affecting parking, taxi, takeoff or landing
Flight Controls	See the following breakdown
Primary Flight Controls	↗ Failure affecting aircraft controllability
Secondary Flight Controls	↗ Failure affecting flaps, spoilers
Structural Failure	↗ Failure due to flutter, overload ↗ Corrosion/fatigue ↗ Engine separation
Fire/Smoke in Cockpit/Cabin/Cargo	↗ Fire due to aircraft systems ↗ Other fire causes
Avionics, Flight Instruments	↗ All avionics except autopilot and the Flight Management System (FMS) ↗ Instrumentation, including standby instruments
Autopilot/FMS	↗ Self-explanatory
Hydraulic System Failure	↗ Self-explanatory
Electrical Power Generation Failure	↗ Loss of all electrical power, including battery power
Other	↗ Not clearly falling within the other aircraft malfunction threats

3. FLIGHT CREW ERRORS

Definition: An observed flight crew deviation from organizational expectations or crew intentions.
Mismanaged error: An error that is linked to or induces additional error or an undesired aircraft state.

Aircraft Handling Errors	Examples
Manual Handling/Flight Controls	↗ Hand flying vertical, lateral, or speed deviations ↗ Approach deviations by choice (e.g., flying below the glide slope) ↗ Missed runway/taxiway, failure to hold short, taxi above speed limit ↗ Incorrect flaps, speed brake, autobrake, thrust reverser or power settings
Ground Navigation	↗ Attempting to turn down wrong taxiway/runway ↗ Missed taxiway/runway/gate
Automation	↗ Incorrect altitude, speed, heading, autothrottle settings, mode executed, or entries
Systems/ Radios/Instruments	↗ Incorrect packs, altimeter, fuel switch settings, or radio frequency dialed
Other	↗ Not clearly falling within the other errors
Procedural Errors	Examples
Standard Operating Procedures Adherence / Standard Operating Procedures Cross-verification	↗ Intentional or unintentional failure to cross-verify (automation) inputs ↗ Intentional or unintentional failure to follow SOPs ↗ Pilot flying makes own automation changes ↗ Sterile cockpit violations
Checklist	See the following breakdown
Normal Checklist	↗ Checklist performed from memory or omitted ↗ Wrong challenge and response ↗ Checklist performed late or at wrong time ↗ Checklist items missed
Abnormal Checklist	↗ Checklist performed from memory or omitted ↗ Wrong challenge and response ↗ Checklist performed late or at wrong time ↗ Checklist items missed
Callouts	↗ Omitted takeoff, descent, or approach callouts
Briefings	↗ Omitted departure, takeoff, approach, or handover briefing; items missed ↗ Briefing does not address expected situation

3. FLIGHT CREW ERRORS (CONT'D)

Documentation	See the following breakdown
	↗ Wrong weight and balance information, wrong fuel information
	↗ Wrong Automatic Terminal Information Service (ATIS), or clearance recorded
	↗ Misinterpreted items on paperwork
	↗ Incorrect or missing log book entries
Failure to Go Around	↗ Failure to go around after destabilization on approach ↗ Failure to go around after a bounced landing
Other Procedural	↗ Administrative duties performed after top of descent or before leaving active runway ↗ Incorrect application of MEL
Communication Errors	Examples
Crew to External Communication	See breakdown
With Air Traffic Control	↗ Flight crew to ATC – missed calls, misinterpretation of instructions, or incorrect read-backs ↗ Wrong clearance, taxiway, gate or runway communicated
With Cabin Crew	↗ Errors in Flight to Cabin Crew communication ↗ Lack of communication
With Ground Crew	↗ Errors in Flight to Ground Crew communication ↗ Lack of communication
With Dispatch	↗ Errors in Flight Crew to Dispatch communication ↗ Lack of communication
With Maintenance	↗ Errors in Flight to Maintenance Crew communication ↗ Lack of communication
Pilot-to-Pilot Communication	↗ Within Flight Crew miscommunication ↗ Misinterpretation ↗ Lack of communication

4. UNDESIRED AIRCRAFT STATES (UAS)

Definition: A flight-crew-induced aircraft state that clearly reduces safety margins; a safety-compromising situation that results from ineffective error management. An UAS is **recoverable**.

Mismanaged UAS: A UAS that is linked to or induces additional flight crew errors.

Undesired Aircraft States	Breakdown
Aircraft Handling	↗ Abrupt aircraft control
	↗ Vertical, lateral or speed deviations
	↗ Unnecessary weather penetration
	↗ Unauthorized airspace penetration
	↗ Operation outside aircraft limitations
	↗ Unstable approach
	↗ Continued landing after unstable approach
	↗ Long, floated, bounced, firm, porpoised, off-center landing ↗ Landing with excessive crab angle
	↗ Rejected takeoff after V1
	↗ Controlled flight toward terrain
	↗ Other
Ground Navigation	↗ Proceeding toward wrong taxiway/runway
	↗ Wrong taxiway, ramp, gate or hold spot
	↗ Runway/Taxiway Incursion
	↗ Ramp Movements, including when under marshalling
	↗ Loss of Aircraft Control While on the Ground
	↗ Other

4. UNDESIRED AIRCRAFT STATES (UAS) (CONT'D)

Incorrect Aircraft Configurations	↗ Brakes, thrust reversers, ground spoilers
	↗ Systems (fuel, electrical, hydraulics, pneumatics, air conditioning, pressurization/ instrumentation)
	↗ Landing gear
	↗ Flight controls/automation
	↗ Engine
	↗ Weight and balance
	↗ Other

5. END STATES

Definition: An end state is a reportable event. It is **unrecoverable**.

End States	Definitions
Controlled Flight into Terrain	↗ In-flight collision with terrain, water, or obstacle without indication of loss of control
Loss of Control — In-flight	↗ Loss of aircraft control while in flight
Runway Collision	↗ Any occurrence at an airport involving the incorrect presence of an aircraft, vehicle, person or wildlife on the protected area of a surface designated for the landing and takeoff of aircraft and resulting in a collision
Mid-Air Collision	↗ Collision between aircraft in flight
Runway/Taxiway Excursion	↗ A veer off or overrun off the runway or taxiway surface
In-flight Damage	Damage occurring while airborne, including: ↗ Weather-related events, technical failures, bird strikes and fire/smoke/fumes
Ground Damage	Damage occurring while on the ground, including: ↗ Occurrences during (or as a result of) ground handling operations ↗ Collision while taxiing to or from a runway in use (excluding a runway collision) ↗ Foreign object damage ↗ Fire/smoke/fumes

5. END STATES (CONT'D)

Undershoot	↗ A touchdown off the runway surface
Hard Landing	↗ Any hard landing resulting in substantial damage
Gear-up Landing/ Gear Collapse	↗ Any gear-up landing/collapse resulting in substantial damage (without a runway excursion)
Tail Strike	↗ Tail strike resulting in substantial damage
Off-Airport Landing/ Ditching	↗ Any controlled landing outside of the airport area

6. FLIGHT CREW COUNTERMEASURES

The following list includes countermeasures that the flight crew can take. Countermeasures from other areas, such as ATC, ground operations personnel and maintenance staff, are not considered at this time.

Team Climate		
Countermeasure	Definition	Example Performance
Communication Environment	Environment for open communication is established and maintained	Good cross-talk – flow of information is fluid, clear, and direct No social or cultural disharmonies; right amount of hierarchy gradient Flight crew member reacts to assertive callout of other crew member(s)
Leadership	See the following breakdown	
	Captain should show leadership and coordinate flight deck activities	In command, decisive, and encourages crew participation
	First Officer (FO) is assertive when necessary and is able to take over as the leader	FO speaks up and raises concerns
Overall Crew Performance	Overall, crew members should perform well as risk managers	Includes Flight, Cabin, Ground crew as well as their interactions with ATC
Other	Not clearly falling within the other categories	

6. FLIGHT CREW COUNTERMEASURES (CONT'D)

Planning		
SOP Briefing	The required briefing should be interactive and operationally thorough	Concise and not rushed – bottom lines are established
Plans Stated	Operational plans and decisions should be communicated and acknowledged	Shared understanding about plans – "Everybody on the same page"
Contingency Management	Crew members should develop effective strategies to manage threats to safety: ▪ Proactive: In-flight decision-making ▪ Reactive: Contingency management	↗ Threats and their consequences are anticipated ↗ Use all available resources to manage threats
Other	Not clearly falling within the other categories	
Execution		
Monitor/ Cross-check	Crew members should actively monitor and cross-check flight path, aircraft performance, systems and other crew members	Aircraft position, settings, and crew actions are verified
Workload Management	Operational tasks should be prioritized and properly managed to handle primary flight duties	↗ Avoid task fixation ↗ Do not allow work overload
Automation Management	Automation should be properly managed to balance situational and/or workload requirements	↗ Brief automation setup ↗ Effective recovery techniques from anomalies
Taxiway/Runway Management	Crew members use caution and keep watch outside when navigating taxiways and runways	Clearances are verbalized and understood – airport and taxiway charts or aircraft cockpit moving map displays are used when needed
Other	Not clearly falling within the other categories	
Review/Modify		
Evaluation of Plans	Existing plans should be reviewed and modified when necessary	Crew decisions and actions are openly analyzed to make sure the existing plan is the best plan
Inquiry	Crew members should not be afraid to ask questions to investigate and/or clarify current plans of action	"Nothing taken for granted" attitude – crew members speak up without hesitation
Other	Not clearly falling within the other categories	

7. ADDITIONAL CLASSIFICATIONS

Additional Classification	Breakdown
Insufficient Data	Accident does not contain sufficient data to be classified
Incapacitation	Crew member unable to perform duties due to physical or psychological impairment
Fatigue	Crew member unable to perform duties due to fatigue
Spatial Disorientation and Spatial/ Somatogravic Illusion (SGI)	SGI is a form of spatial disorientation that occurs when a shift in the resultant gravitoinertial force vector created by a sustained linear acceleration is misinterpreted as a change in pitch or bank attitude

Annex 3 – Accidents Summary

DATE	MANUFAC-TURER	AIRCRAFT	REGIS-TRATION	OPERATOR	LOCATION	PHASE	SERVICE	PROPUL-SION	SEVERITY	SUMMARY
20-01-07	Boeing	B737-800	TC-CCK	Pegasus	Sabiha Gokcen, Turkey	LND	Passenger	Jet	Substantial Damage	Runway excursion on landing
20-01-19	Fairchild (Swearingen)	Metro	C-GWVH	Perimeter	Shamattawa, Manitoba, Canada	LND	Passenger	Turboprop	Substantial Damage	The aircraft lost directional control during the landing rollout and went off the runway
20-01-27	Boeing (Douglas)	MD-83	EP-CPZ	Caspian Airlines	Bandar Mahshahr, Iran	LND	Passenger	Jet	Substantial Damage	The aircraft overran runway on landing
20-02-01	Boeing	B747-400	TC-MCT	ACT Airlines	Dammam/King Fahd Int'l , Saudi Arabia	TOF	Freighter	Jet	Substantial Damage	Tail strike on departure
20-02-03	Boeing	B767-300	C-GHOZ	Air Canada	Madrid/Barajas , Spain	TOF	Passenger	Jet	Substantial Damage	Engine shut down in flight, burst tyre on departure
20-02-03	Boeing	B747-400	N703CK	Kalitta Air	Los Angeles International, CA.	TOF	Freighter	Jet	Substantial Damage	Rejected takeoff due to trash bin on runway
20-02-05	Boeing	B737-800	TC-IZK	Pegasus	Sabiha Gokcen, Turkey	LND	Passenger	Jet	Hull Loss	The aircraft overran runway, impacted wall and broke up into three parts
20-02-07	Boeing	B757-200	TF-FIA	Icelandair	Keflavik, Iceland	LND	Passenger	Jet	Substantial Damage	Main gear collapse on landing
20-02-09	Boeing	B737-500	VQ-BPS	UTair	Usinsk, Russia	LND	Passenger	Jet	Substantial Damage	The aircraft landed short of runway, gear collapse and runway excursion on landing
20-02-21	Airbus	A320	CC-AWA	JetSmart	Puerto Montt/Ad El Tepual , Chile	LND	Passenger	Jet	Substantial Damage	Hard landing at about +3.6G
20-02-24	Fairchild (Swearingen)	Metro	C-GJVB	Perimeter	Dryden - Regional, Ontario, Canada	TOF	Passenger	Turboprop	Substantial Damage	The aircraft lost directional control during takeoff roll and exited the right side of the runway.
20-02-25	Boeing	B737-300	PK-YSG	Trigana Air	Jayapura - Sentani, Indonesia	TOF	Freighter	Jet	Substantial Damage	Runway excursion on backtrack
20-02-27	Airbus	A321	TC-JSH	Turkish Airlines	Istanbul, Turkey	LND	Passenger	Jet	Substantial Damage	The aircraft dropped both nose wheels on landing
20-02-28	Airbus	A300B4-203F	UP-A3003	Sigma Airlines	Sharjah International UAE	TXI	Freighter	Jet	Substantial Damage	No.1 engine collided with a tug which was parked in the equipment area
20-03-08	Boeing	B767-300	N477AX	Omni Air International	Shannon, Republic of Ireland	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a hard, bounced landing
20-03-21	Boeing	B757-200	N193AN	American Airlines	Las Vegas/Mccarran International, NV.	LND	Passenger	Jet	Substantial Damage	Tail strike on landing
20-05-19	Boeing	B737-800	N820TJ	iAero	United States Of America	CRZ	Passenger	Jet	Substantial Damage	The aircraft dropped parts of vertical tail
20-05-22	Airbus	A320	AP-BLD	Pakistan International Airlines	Karachi/Jinnah Int'l , Pakistan	APR	Passenger	Jet	Hull Loss	The aircraft crashed on a residential area during final approach

DATE	MANUFAC-TURER	AIRCRAFT	REGIS-TRATION	OPERATOR	LOCATION	PHASE	SERVICE	PROPUL-SION	SEVERITY	SUMMARY
20-06-14	Airbus	A320	VP-BDL	Ural Airlines	Sankt-Peterburg/ Pulkovo, Russia	TXI	Passenger	Jet	Substantial Damage	Ground collision between two Airbus A320
20-07-14	De Havilland (Bombardier)	Dash 8-400	5Y-VVU	Blue Bird Aviation	Beledweyne, Somalia	LND	Freighter	Turboprop	Hull Loss	Aircraft collided with runway obstacles and bursts into flames
20-07-22	Boeing	B777-200	ET-ARH	Ethiopian Airlines	Shanghai/Pudong , China	PRF	Freighter	Jet	Substantial Damage	The aircraft burned down on apron
20-08-03	Antonov	An-74	RA-74044	UTair Cargo	Gao , Mali	LND	Freighter	Jet	Hull Loss	The aircraft suffered a total electrical failure, overran runway on landing
20-08-06	Airbus	A321	VT-IUD	IndiGo	Delhi , India	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a hard landing
20-08-07	Boeing	B737-800	VT-AXH	Air India Express	Calicut , India	LND	Passenger	Jet	Hull Loss	The aircraft overran runway and fell into valley
20-08-13	Aircraft Industries (LET)	Let L-410	9S-GEN	Doren Air Congo	Bukavu-Kavumu, Democratic Repub. of the Congo	APR	Freighter	Turboprop	Hull Loss	Aircraft impacted forest on approach
20-08-19	Boeing	B767-300	N146FE	FedEx	Los Angeles International, CA.	LND	Freighter	Jet	Substantial Damage	Left main gear did not extend
20-08-22	Antonov	An-26	EX-126	South West Aviation	Juba , South Sudan	ICL	Freighter	Turboprop	Hull Loss	Lost height after departure
20-08-28	Boeing	B767-300	N423AX	Omni Air International	Bucuresti/Baneasa-Aurel Vlaicu , Romania	LND	Passenger	Jet	Substantial Damage	Left main gear collapse on landing
20-09-19	Fokker	Fokker 50	5Y-MHT	Silverstone Air Services	Mogadishu , Somalia	LND	Freighter	Turboprop	Hull Loss	Runway excursion on landing
20-10-14	Antonov	An-32	OB-2120-P	Aer Caribe Peru	Iquitos/Intl. Coronel Fap Francisco Secada Vignetta , Peru	LND	Freighter	Turboprop	Hull Loss	The aircraft went off runway
20-10-16	Airbus	A321	VN-A639	VietJet Air	Quang Binh/Dong Hoi , Vietnam	LND	Passenger	Jet	Substantial Damage	Hard landing at +4.27G
20-10-23	De Havilland (Bombardier)	Dash 8-400	JA845A	Oriental Air Bridge	Fukue , Japan	LND	Passenger	Turboprop	Substantial Damage	Hard touchdown and tail strike
20-10-24	Embraer	ERJ145	N674RJ	Envoy Air	Grand Bahama International	LND	Passenger	Jet	Substantial Damage	Runway excursion upon landing
20-11-13	Antonov	An-124	RA-82042	Volga-Dnepr Airlines	Novosibirsk/ Tolmachevo, Russia	LND	Freighter	Jet	Substantial Damage	The aircraft overran runway after uncontained engine failure and communication failure
20-11-16	ATR	ATR 72	VT-TMM	Trujet	Chennai, India	LND	Passenger	Turboprop	Substantial Damage	Hard landing and go around in Mysore, gear collapse in Chennai
20-11-26	ATR	ATR 72	C-FAFS	Calm Air	Repulse Bay, NU, Canada	LND	Freighter	Turboprop	Substantial Damage	Runway excursion on landing
20-11-28	Embraer	EMB110	CU-T1541	Cubana	La Habana/Jose Marti Intl., Cuba	LND	Passenger	Turboprop	Substantial Damage	Gear up landing
20-12-02	Boeing	B737-500	EY-560	Air Djibouti	Garowe, Puntland State of Somalia	LND	Passenger	Jet	Substantial Damage	The aircraft touched down short of runway, gear collapse on roll out

LIST OF ACRONYMS/ABBREVIATIONS

Accident Category Abbreviation

Abbreviation	Full Name
CFIT	Controlled Flight into Terrain
G UP LDG/CLPSE	Gear-up Landing/Gear Collapse
GND DAMAGE	Ground Damage
HARD LDG	Hard Landing
IN-F DAMAGE	In-Flight Damage
LOC-I	Loss of Control — In-flight
MID-AIR COLL	Mid-Air Collision
OFF AIRP LDG	Off-Airport Landing
OTHER	Other End State
RWY COLL	Runway Collision
RWY/TWY EXC	Runway/Taxiway Excursion
TAILSTRIKE	Tail Strike
UNDERSHOOT	Undershoot

List of Acronyms

Acronym	Meaning
AAPA	Association of Asia Pacific Airlines
ACAS	Airborne Collision Avoidance System
ACTG	Accident Classification Technical Group
ACyS	Aviation Cyber Security
AD	Airworthiness Directive
ADS-B	Automatic Dependent Surveillance-Broadcast
ADX	Accident Data Exchange
AFCAC	African Civil Aviation Commission
AFI	Africa
AFM	Aircraft Flight Manual
AFRAA	African Airlines Association
AGL	Above Ground Level
AGM	Annual General Meeting

List of Acronyms (Cont'd)

Acronym	Meaning
AHM	Airport Handling Manual
AIAG	AFI Incident Analysis Group
AIP	Aeronautical Information Publication
AIRPROX	Air Proximity
ALAR	Approach and Landing Accident Reduction
ALTA	Asociación Latinoamericana y del Caribe de Transporte Aéreo
AMDAR	Aircraft-based Meteorological Data Relay
AME	Africa and Middle East
ANAC	National Civil Aviation Agency of Brazil
ANSPs	Air Navigation Service Providers
AoA	Angle of Attack
AOC	Airline Operations Center
AOV	Areas of Vulnerability
APRAST	Asia-Pacific Regional Aviation Safety Team
APV	Approaches with Vertical Guidance
ARC	Abnormal Runway Contact
ASPAC	Asia-Pacific
ATAC	Air Transport Association of Canada
ATC	Air Traffic Control
ATCO	Air Traffic Control Officer
ATFM	Air Traffic Flow Management
ATIS	Automatic Terminal Information System
ATM	Air Traffic Management
ATMB	Air Traffic Management Bureau
AUPRTA	Airplane Upset Prevention and Recovery Training Aid
CA	Collaborative Arrangement
CAA	Civil Aviation Authority
CAAC	Civil Aviation Administration of China
CAAS	Civil Aviation Authority of Singapore
CAB	Cabin Operations
CANSO	Civil Air Navigation Services Organization
CART	Council Aviation Recovery Task Force

List of Acronyms (Cont'd)

Acronym	Meaning
CAST	Commercial Aviation Safety Team
CAUC	Civil Aviation University of China
CBTA	Competency-based Training and Assessment
CBTA-TF	Competency-based Training and Assessment Task Force
CCRD	COVID-19 Contingency Related Difference
CDC	Centers for Disease Control and Prevention
CDFA	Continuous Descent Final Approach
CEs	Critical Elements
CICTT	CAST/ICAO Common Taxonomy Team
CIS	Commonwealth of Independent States
CMA	Continuous Monitoring Approach
CNS	Communications, Navigation, Surveillance
CoPA	IATA Charter of Professional Auditors
COSTG	Cabin Operations Safety Technical Group
CRM	Crew Resource Management
CSTs	Collaborative Safety Teams
DAQCP	De/Anti-icing Quality Control Pool
DCSs	Departure Control Systems
EADI	Electronic Attitude Director Indicator
EASA	European Union Aviation Safety Agency
EASPG	European Regional Aviation System Planning Group
EBT	Evidence-based Training
EC	Extenuating Circumstances
ECAM	Electronic Centralized Aircraft Monitoring
EGPWS	Enhanced Ground Proximity Warning System
EI	Effective Implementation
EICAS	Engine-Indicating and Crew-Alerting System
EMAS	Engineered Material Arresting Systems
EUR	Europe
EUROCAE	European Organization for Civil Aviation Electronics
FAA	Federal Aviation Administration
FAPFH	Fatal Accidents per Flight Hour

List of Acronyms (Cont'd)

Acronym	Meaning
FDA	Flight Data Analysis
FDM	Flight Data Monitoring
FDX	Flight Data Exchange
FFS	Full-Flight Simulator
FIR	Flight Information Region
FLE	Full-Loss Equivalents
FMA	Flight Modes Annunciator
FOQA	Flight Operational Quality Assurance
FRMS	Fatigue Risk Management Systems
FSTD	Flight Simulation Training Devices
FTLs	Flight and Duty Time Limitations
GADM	Global Aviation Data Management
GAPPRE	Global Action Plan for the Prevention of Runway Excursions
GDDB	Ground Damage Database
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GRF	Global Reporting Format
GRSAP	Global Runway Safety Action Plan
GSE	Ground Support Equipment
GSPs	Ground Service Providers
HLA	High-Level Airspace
IAH	IOSA Auditor Handbook
I-ASC	IATA Aviation Safety Culture
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IDQP	IATA Drinking Water Quality Pool
IDX	Incident Data Exchange
IEs	Instructors and Evaluators
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Association
IFQP	IATA Fuel Quality Pool

List of Acronyms (Cont'd)

Acronym	Meaning
IGOM	IATA Ground Operations Manual
IMC	Instrument Meteorological Conditions
IOSA	IATA Operational Safety Audit
IPM	IOSA Program Manual
ISAGO	IATA Safety Audit for Ground Operations
ISARPs	IATA Standards and Recommended Practices
ISM	IOSA Standards Manual
ISPM	ISSA Program Manual
ISSA	IATA Standard Safety Assessment
ITA	IATA Turbulence Aware
ITOP	IATA Tactical Operations Portal
ITU	International Telecommunication Union
IVADO	Institute for Data Valorization
KPIs	Key Performance Indicators
LATAM/CAR	Latin American and Caribbean
LHD	Large Height Deviation
LOFT	Line Oriented Flight Training
LoS	Loss of Separation
MENA	Middle East and North Africa
MoU	Memorandum of Understanding
MTOW	Maximum Takeoff Weight
NM	Nautical Mile
NAM	North America
NASIA	North Asia
NAT	North Atlantic
NOTAM	Notice to Airmen
OEMs	Original Equipment Manufacturers
OJT	On-the-Job Training
OPS	Operations
OTS	Organized Track System
PA	Pan-America
PA	Passenger Address

List of Acronyms (Cont'd)

Acronym	Meaning
PANS-TRG	Personnel Licensing, the Procedures for Air Navigation Services - Training
PBN	Performance based Navigation
PFD	Primary Flight Display
POIs	Principal Operations Inspectors
PTLP	Personnel Training and Licensing Panel
PWS	Predictive Wind Shear
RA	Radar Altimeter
RA	Resolution Advisory
RASG-AFI	African Regional Aviation Safety Group
RASG-MID	Middle East Regional Aviation Safety Group
RASG-PA	Regional Aviation Safety Group – Pan American
RCG	Regional Coordination Group
RPTF	Regional Recovery Planning Task Force
RTCA	Radio Technical Commission for Aeronautics
RTS	Return to Service
RVSM	Reduced Vertical Separation Minimum
SAATM	Single Africa Air Transport Market
SAF	Sustainable Aviation Fuel
SAT	South Atlantic
SATCCo	State Air Traffic Control Commission Office
SCF-NP	System/Component Failure or Malfunction (Non-Powerplant)
SCF-PP	System/Component Failure or Malfunction (Powerplant)
SEIs	Safety Enhancement Initiatives
SEs	Safety Enhancements
SFGOAC	Safety, Flight and Ground Operations Advisory Committee
SFO	Safety and Flight Operations
SG	Safety Group
SIRM	Safety Issue Review Meeting
SLOP	Strategic Lateral Offset Procedure
SME	Subject Matter Expert
SMS	Safety Management System
SOPs	Standard Operating Procedure

List of Acronyms (Cont'd)

Acronym	Meaning
SPG	Systems Planning Group
SPI	Safety Performance Indicators
SRA	Safety Risk Assessment
SSC	Significant Safety Concern
SSGC	Secretariat Study Group on Cybersecurity
SSP	State Safety Program
STEADES	Safety Trend Evaluation, Analysis and Data Exchange System
TA	Traffic Advisory
TAWS	Terrain Awareness Warning System
TCAS	Traffic Collision Avoidance System
TCC	Temperature-Controlled Containers
TEM	Threat and Error Management
TERR POS	Terrain Position
TFSG	Trust Framework Study Group
TLS	Target Level of Safety
TSA	Total Systems Approach
UA	Unmanned Aircraft
UAE GCAA	United Arab Emirates General Civil Aviation Authority
UCRs	Undesired Condition Reports
ULD	Unit Load Device
UPRT	Upset Prevention and Recovery Training
UPU	Universal Postal Union
USOAP	Universal Safety Oversight Audit Program
UTM	Unmanned Traffic Management
VASIS	Visual Approach Slope Indicator System
VGSI	Visual Glideslope Indicator
VMC	Visual Meteorological Conditions
WICAP	WMO IATA Collaborative AMDAR Program
WMO	World Meteorological Organization

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