IATA

SAFETY REPORT 2017

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NOTICE

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Senior Vice-President Foreword

Gilberto Lopez Meyer
Senior Vice-President
Safety and Flight Operations

Dear colleagues,

The top-line safety figures for 2017 convey a persuasive message about our industry: flying is safe. The reasons are simple. There were no passenger fatalities on jet transport aircraft last year. The 2017 fatality risk in four regions (Latin America/Caribbean, Sub-Saharan Africa, the Middle East and North Africa, and North Asia) was zero. There was a total of 45 accidents worldwide in 2017, down from an average of 75 per year in each of the preceding five years.

IATA member airlines achieved an even higher level, with zero fatal accidents or hull losses in 2017 involving either jet or turboprop equipment.

Yet, there is still ample room for improvement. The industry experienced six fatal accidents last year, and we had some well-publicized events in which the outcomes could have been far worse than they were. Turboprop operations continue to account for a disproportionate share of the accident toll. They generated around 20% of all sectors flown last year, yet represented 44% of all accidents and 83% of all fatal accidents. Two of the five fatal turboprop accidents occurred in North America, so it is not a challenge that is confined to the developing world.

Cargo operations is another area in need of additional attention. In 2017, there were 13 cargo aircraft accidents, 29% of the total number of accidents. Twelve of the 19 onboard fatalities last year and 35 on-ground fatalities involved cargo aircraft.

While every accident is different, in 2017, many of the fatal accidents shared some things in common: the airline was not on the IATA Operational Safety Audit (IOSA) registry; operations were being conducted in a remote and/or challenging environment; and, older equipment was involved.

Turning to accident categories, Runway Excursion continued to dominate, with 17 last year; although none involved fatalities, outcomes certainly could have been different. Controlled Flight into Terrain, Loss of Control - In-flight, and Runway Undershoot accounted for all the deaths. These four categories must continue to be the central focus of our operational safety efforts.

It is my privilege to offer you this 54th edition of the IATA Safety Report and to welcome Stephen Hough as the Chairman of the Accident Classification Technical Group (ACTG). I encourage you to share the vital information contained in these pages with your colleagues. I would like to thank the IATA Operations Committee (OPC), Safety Group (SG), Cabin Operations Safety Technical Group (COSTG) and all IATA staff involved for their cooperation and expertise, essential for the creation of this report.

"As aviation safety professionals, we must keep focus and continue with our work: the promotion of safety first."

Chairman Foreword

Stephen Hough
Chairman, IATA Accident Classification Technical Group

There have been many headlines regarding commercial aviation safety in 2017 and how safe it has been. The number of accidents and fatalities has been extremely low and the statistics you will see in this report reflect that. If we look at some of the longer-term trends, as opposed to just the last year, we also see good news. Accidents numbers are reducing while sectors flown are increasing year after year, demonstrating that the industry is extremely safe. So, something to celebrate? Well, yes, any improvement in safety and reduction in lives lost is great news, but (and there is nearly always a 'but'…) we cannot and shall not pat ourselves on the back and say "job done" because, of course, it is not.

2017 was a safer year and it is following the trend, but there were many 'close calls', incidents that could easily have become accidents and accidents that could have had a more severe outcome. In these cases, there were no safety barriers remaining. It was only a matter of fortunate circumstances or last-second interventions that prevented the outcomes from being worse. It is here that hazard identification is of paramount importance in helping us maintain our low accident rate. Our partner technical group, the IATA Hazard Identification Technical Group (HITG), is doing great work in this regard, as well as identifying emerging risks. Ultimately, it is, of course, up to operators worldwide to be proactive at their level for this to be effective. We can expect that there will be years in the future when the numbers may go in a direction that we do not want. They are so low now that it will not take much for it to look like a 'bad' year. Our focus should be on maintaining the overall downward trend in the five-year rate.

As aviation safety professionals (and by the fact you are reading this report you are likely to be one or at least an interested party), we must keep focus and continue with our work: the promotion of safety first. The perception after a 'good' year, where little or nothing happens, is that we are safe and the focus, especially in a financially challenging industry, can potentially shift. It is now, in this moment, that we must build on this success and really maintain our focus.

As we review this year's report, we see that again Runway Excursion is our most common accident; these often have differing contributory factors, such as manual handling, unstable approach, gear/tire failure or a combination of these. The fatality risk from these kinds of accidents is generally low, but a rate reduction in this common accident category is an area to concentrate on.

Chairman Foreword, Cont'd

Loss of Control – In-flight has been a focus area for some years after high-profile accidents. The accidents we see now are of a nature that is not necessarily what we have considered the recent norm or are training for, the high-altitude upset, but a loss of control when the crew is faced with an unusual or emergency situation. Situations that in themselves are recoverable, normally by following standard operating procedures, are resulting in accidents where crew lose control of the situation and then the aircraft. Contributory factors to this may be crew experience, selection, training or reliance on automation.

With fewer accidents, it becomes even more important to gain every lesson from each one. It is here that I must mention an issue that was highlighted last year: each accident must be investigated. We have seen far too many occasions where an accident is not investigated by the state, a report is not issued or the state investigation is not independent. Those states that lack capability or resources need assistance from international or regional bodies. A timely, detailed and factual report is vital to our work, but we are still not achieving transparency and openness.

This is my first year as Chairman of the Accident Classification Technical Group (ACTG) and I take over a group that has been expertly guided by my predecessor, Dr. Dieter Reisinger. Dieter has been Chairman for 12 of the 13 years that he has been a member of the ACTG. He has been instrumental in ensuring that the classification and analysis of accidents, and the direction of the ACTG, has been of the highest order. The quality and standing of this report is very much due to his hard work, and he has made a great contribution to worldwide aviation safety. It is an honor to take over from him and a pleasure to continue to work with him as he remains a member of the group. I endeavor to maintain his high standards and give him the greatest of thanks.

I also thank the ACTG members, a fine collection of aviation safety professionals who make this report possible by providing advice, expertise and opinion. Their support, as member airline representatives, manufactures, union representatives or safety experts, is invaluable. As is the support of their organizations in allowing their attendance to further our common goal of improved aviation safety and fewer accidents.

Lastly, I thank you, the reader, for taking the time and effort to read this report. It shows that you too are invested and interested in aviation safety. The understanding of what has gone wrong or could go wrong in the future is still vitally important, even when so much of what we do goes right.

Fly safely.

Safety Report 2017 Executive Summary

International Air Transport Association (IATA) **member airlines** carried their passengers safely in 2017, without fatal accidents or hull losses. The purpose of this report is not only to point out this success, but also to identify areas for improvement.

While it is easy to be seduced by what has been called the safest year on record, the data in this report indicates that there is room for significant improvement in worldwide industry safety. Areas for improvement include regions with accident rates above the global average, types of operation (such as cargo), older generation turboprops, and notably, operations that do not adhere to the standards of the IATA Operational Safety Audits (IOSA).

IATA has a **Six-Point Safety Strategy** to continuously drive enhancements in six key areas:

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

Over the last decade, as detailed in **Section 2, Decade Review,** the industry continued the 10-year trend of a declining accident rate and reducing fatality risk. All indicators show a downward trend over the past 10 years. IATA and the International Civil Aviation Organization (ICAO) are focused on continuously reducing fatality risks in the industry.

Section 3, 2017 Review, shows that accidents in the runway environment persist. There were 17 Runway Excursions, albeit with zero fatalities, indicating an area where further improvements can be made. The ICAO Global Runway Safety Action Plan released in November 2017 identifies the stakeholder mitigations that must be actioned to address this issue.

The accident categories with fatalities in 2017 were:

- Controlled Flight into Terrain (1), with four crew fatalities and 35 on-ground fatalities
- Loss of Control – In-flight (4), with 11 fatalities
- Undershoot (1), with four fatalities

The accident categories with no fatalities in 2017 were:

- Runway Excursion (17)
- In-flight Damage (4)
- Ground Damage (2)
- Hard Landing (2)
- Gear Up Landing/Gear Collapse (5)
- Tail Strike (4)
- Off-Airport Landing/Ditching (1)
- Undershoot (2)
- Runway Collision (2)

In 2017:

- The global accident rate was 1.08 per million sectors, compared to 0.50 for IATA members.
- The all-accident rate for airlines on the IOSA registry was nearly four times better than that of non-IOSA airlines (0.56 vs. 2.17).
- 48.8% of the world's accidents in 2017 occurred in the Africa (AFI) and Asia-Pacific (ASPAC) regions.
- 24.4% of the world's accidents in 2017 involved ASPAC-based operators.
- There were 11 accidents in the AFI region, nine involving AFI-based operators, including six Runway Excursions.
- The largest number of accidents occurred in Generation 2 turboprops and Generation 3 jets.[1]
- There were no fatal accidents in Generation 4 jets or Generation 3 turboprops.[1]
- 44% of the world's accidents involved turboprops, while the global turboprop fleet is one fifth the size of the jet fleet.
- Four of the six fatal accidents in 2017 were in cargo operations.

1 Aircraft Generations, as defined in ICAO Doc 9995, Manual of Evidence–Based Training.

- Five of the fatal accidents involved Generation 2 turboprops.
- More fatalities (including fatalities on the ground) occurred from cargo operations than passenger operations.
- IATA membership and IOSA accreditation for non-IATA members continued to show a strong correlation with improved safety performance.

The five-year data analysis **(2013 - 2017 Analysis, Section 4)** shows that the all-accident rate is declining, as is the hull loss rate, the fatal accident rate and the fatality risk. Not only is the rate of accidents measured against sectors flown reducing, but the total number of accidents is in decline.

Between 2013 and 2017:

- The most common accident was Runway/Taxiway Excursion, followed by Gear Up Landing/Gear Collapse and Hard Landings, in that order.
- The top three latent conditions contributing to accidents were Regulatory Oversight, Safety Management and Flight Operations.
- The top three threats were Weather, Aircraft Malfunction and Wind/Wind Shear/Gusts.
- The top three errors were Manual Handling/Flight Controls, Standard Operating Procedure (SOP) Adherence/Cross-verification, Callouts, and Pilot-to-Pilot Communication.
- The most common undesired aircraft state, from which a recovery is still possible, was Long/Floated/Bounced/Firm/Off-center/Crabbed landing, followed by Vertical, Lateral or Speed Deviation and Unstable Approaches.
- The most common countermeasures absent in the accidents were Overall Crew Performance, followed by Monitor/Cross-Check and Leadership.

Regional Analysis 2013 - 2017 (Section 5):

- The ASPAC region and ASPAC-based operators had the highest total number of accidents, 82 and 81 respectively. This represents 24% of the total accidents worldwide in the last five years. Indonesian operators had 23 accidents in the period.

Regional Analysis 2017 (Section 5):

- The accident rate for North American (NAM), European (EUR), Middle Eastern and North African (MENA) and North Asian (NASIA) operators was below the global rate.
- The accident rate for operators from the Commonwealth of Independent States (CIS), Asia-Pacific (ASPAC), Africa (AFI) and Latin-America and Caribbean (LATAM/CAR) was above the global rate, but below the previous five-year rate (2012-2016).
- AFI operators had nine accidents, including four hull losses. As the region with the lowest number of aircraft movements, this translates into the highest regional operator accident rate of 2017, 6.87 compared to 2.43 in 2016.
- ASPAC operators had 11 accidents, including two hull losses. There was one fatal accident. The ASPAC operator accident rate for 2017 was 1.54, down from 2.33 in 2016.
- CIS operators had five accidents, including three hull losses and two fatal accidents. The CIS operator accident rate for 2017 was 4.13, down from 5.15 in 2016.
- EUR operators had six accidents, including one hull loss and one fatal accident resulting in the death of 35 persons on the ground as well as the crew. The EUR operator accident rate improved from 1.13 in 2016 to 0.67 in 2017.
- LATAM/CAR operators had six accidents, including one hull loss, but no fatal accidents. The LATAM/CAR operator accident rate declined from 2.80 in 2016 to 1.88 in 2017.
- MENA operators had one accident resulting in substantial damage, but no fatalities. The MENA operator accident rate declined significantly from 5.75 in 2016 to 0.49 in 2017.
- NAM operators had seven accidents with two hull losses, both of which were fatal. Both fatal accidents were turboprops; one was a cargo operation. The NAM regional operator accident rate declined from 0.95 in 2016 to 0.57 in 2017.
- NASIA operators had zero accidents with a regional operator accident rate of zero.

Cargo Accidents 2017 (Section 6):

- There were 13 cargo aircraft accidents, four of which were fatal, resulting in 12 onboard fatalities and 35 on-ground fatalities. The 13 accidents represent almost one third of all accidents.
- The most common contributory factors to cargo accidents in 2017 were very similar to those listed above in the five-year analysis.

Cabin Safety (Section 7) includes an in-depth analysis of unruly passengers and shows most passengers behave appropriately onboard aircraft and unruly passenger reports represent a very low percentage of passengers carried. The majority of reports are attributed to intoxication through alcohol or other substances, including sleeping medication. More details on the responsible service of alcohol and management of unruly passengers are contained in the IATA Cabin Operations Safety Best Practices Guide, which is distributed free of charge to all IATA member airlines, and available for purchase from the IATA online store.

The IATA/Industry Accident Classification Technical Group (ACTG) classified the accidents for this report and compiled the **Report Findings and IATA Prevention Strategies (Section 8)**. This year, for the first time, the ACTG distinguished between 'Primary' and 'Secondary' contributory factors. This analysis shows that human factors are often the weak link. The ACTG believes this points to underlying failings of selection, training, organizational culture, regulatory oversight, equipment, as well as the use and comprehension of English. These failings must be addressed to strengthen the human component of the system.

The ACTG continues to be concerned about the quality of accident investigations around the world. There are examples of investigations that appear to invoke the protections of ICAO Annex 13, but none of the benefits. Such investigations lack objectivity, transparency, collaboration and communication. In some cases, the report was not made public, denying the opportunity to share the learnings for the benefit of the wider industry.

Accident data from 2017 indicates that Loss of Control – In-flight (LOC-I) and Controlled Flight into Terrain (CFIT) accidents continue to carry the highest fatality risk. The CFIT cargo jet accident, which crashed on a village, had the highest number of fatalities in 2017. While operators should continue to train to eliminate these types of accidents, accidents in the runway environment must not be ignored, even though the fatality risk is low.

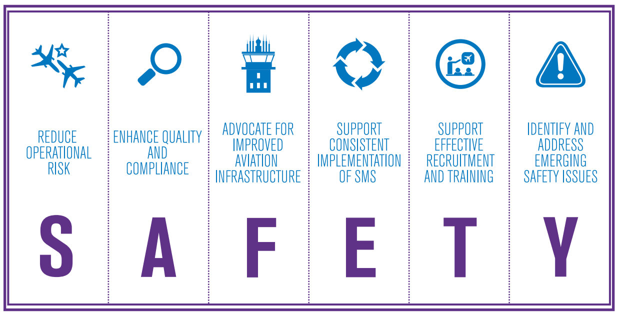
Incident data shows that precursors to a runway incursion or excursion occur frequently. The incident in Medan, where a landing jet clipped wings with a turboprop as it was incorrectly entering the runway, is a prime example. The near accident was a warning that a loss-of-life event in the runway environment is possible.

The **STEADES Analysis of Runway Safety (Section 9)** looks at incidents in the runway environment. Strongly supporting the concerns of the ACTG, the Safety Trends Evaluation, Analysis and Data Exchange System (STEADES) found that, at the time the analysis was released, there was one runway incursion event reported in the STEADES database every day. While the safety barriers were effective in preventing these incidents from becoming accidents, it must be a priority for the industry to reduce the number of these events.

IATA Safety Strategy

The IATA Six-Point Safety Strategy was developed in consultation with the IATA Safety Group (SG) and is endorsed by IATA's Operations Committee (OPC). While the strategy is unchanged from last year, it remains subject to continuous review to ensure that it is current and relevant.

IATA continues to use this safety strategy to drive its action towards an integrated, data-driven approach for managing safety risks to continuously improve aviation safety.



IATA'S SIX-POINT STRATEGY

IATA's Safety Strategy is a holistic approach to identifying organizational and operational safety issues. Its key pillars are improved technology, regulatory harmonization, training and awareness.

IATA works closely with industry stakeholders to ensure each of these pillars is leveraged to address the six safety strategies, namely:

1. Reduce operational risk

2. Enhance quality and compliance

3. Advocate for improved aviation infrastructure

4. Support consistent implementation of Safety Management Systems (SMS)

5. Support effective recruitment and training

6. Identify and address emerging safety issues

Each of these key areas breaks down into several sub-categories to address specific aspects of the strategy.

Security is also key to maintaining operations resilient to threats. Some of the work carried out by IATA in this area is described in this section.

REDUCE OPERATIONAL RISK

Operational risks are the primary concern of any airline. IATA continues to work with the industry to implement safety programs that revolve around identifying and controlling these safety elements. IATA's data-driven assessments and analyses, together with the SG, which is comprised of safety experts from member airlines, have identified key safety issues and decided to focus on them to improve safety in aviation. We can break down the top safety issues into:

- Airport Infrastructure
- Cabin/Flight Deck Smoke/Fire/Fumes
- Controlled Flight Into Terrain (CFIT)
- Dangerous Goods
- Ground Ops and Cargo - Loading Errors/Integrity, Loadsheet. Third Party Oversight
- Human Performance Flight Crew CRM, Competence, Fitness for Duty, Fatigue and Mental Health. Maintenance Error and Procedural non-compliance
- Loss of Control – In-flight (LOC-I)
- Maintenance Error and Procedural non-compliance
- Mid-Air Collision (MAC) (Inc. UAV's) – (ATC: Somalia/ Myanmar)
- Runway Safety including runway excursions and runway collision, resulting from a runway incursion or Incorrect Landing/Takeoff Surface

IATA is developing safety performance indicators (SPIs) to monitor events in these categories and precursors to more serious incidents and accidents. The approach of measuring safety performance is essential for effective safety management and decision-making. Furthermore, four of the above are accident end states, which IATA is working to address as follows:

Loss of Control – In-flight (LOC-I):

Fortunately, LOC-I is a relatively rare occurrence. Of all reported accidents from 2013-2017, this type of accident accounted for only 9%. Unfortunately, LOC-I generally has a high-severity outcome; it often has catastrophic results with very few, if any, survivors. Accordingly, 93% of all LOC-I accidents have resulted in fatalities. IATA continues to work with industry to reduce the likelihood of this risk area. Some of the activities are:

- Reviewing occurrences in the last 10 years
- Understanding common hazards that may lead to LOC-I and contributing factors, such as meteorological factors and aircraft malfunction affecting flight control
- Understanding manual handling errors and decision-making

Furthermore, IATA Training and Licensing, with the support of its Pilot Training Task Force (PTTF), has developed a manual entitled *Guidance Material and Best Practices for the Implementation of Upset Prevention and Recovery Training (UPRT)* to help address factors contributing to LOC-I.

Mitigating LOC-I occurrences will only marginally reduce the total number of global aircraft accidents, but it will significantly reduce the overall number of aircraft accident fatalities.

Controlled Flight into Terrain (CFIT)

There have been major CFIT accidents in the last five years, representing 4% of total accidents during the reporting time frame from 2013 through 2017. Although the CFIT accident rate has declined, it is still a concern due to the high number of fatalities this accident category causes.

To understand and mitigate CFIT accidents, IATA is committed to:

- Reviewing occurrences in the last ten years
- Understanding human performance deficiencies
- Understanding the common hazards that may lead to CFIT accidents
- Understanding the contributing factors affecting loss of situational awareness

IATA encourages mitigations to CFIT, which include, but are not limited to:

- Strong adherence to crew procedures
- Enhanced Ground Proximity Warning System (E-GPWS) and updating the databases
- Enhancing Crew Resource Management (CRM); and Pilot Monitoring
- Use of the Continuous Descent Final Approach (CDFA) technique, where a continuous descent is maintained along a vertical path
- Implementation of a Performance-based Navigation (PBN) concept

Runway Safety

IATA worked closely with ICAO in 2017 to analyze runway safety from Global Aviation Data Management (GADM) programs and develop the ICAO Global Runway Safety Action Plan (GRSAP). This was published in November 2017, coincident with the Second ICAO Runway Safety Symposium in Lima, Peru, which IATA contributed to. Section 9 of this report is dedicated to the IATA analysis of Runway Safety data.

The implementation of SMS, the establishment of local Runway Safety Teams (RST), and technology advances have certainly enabled all stakeholders, including aircraft operators, air navigation service providers (ANSPs) and airport operators, to improve runway safety. However, accidents continue to occur on runways, and the rate and number of runway incursions remain steady. Findings from accident and incident reports have been used to create new recommendations and associated guidance materials included in the 3rd edition of the European Action Plan for the Prevention of Runway Incursions (EAPPRI), which was issued in 2017. The new recommendations are the result of the combined efforts of organizations representing all areas of air traffic and airport operations. These organizations include, but are not limited to, airport operators, ANSPs, aircraft operators, and regulators/national aviation authorities. IATA provided a lead role in coordinating airline contributions. The latest edition of EAPPRI provides an opportunity for aviation industry stakeholders and organizations to refocus, redeploy, and reactivate their runway incursion prevention activities. It also continues to emphasize the need for a mutual exchange of information and data between organizations to facilitate lesson learning and assist in the enhancement of runway safety.

Mid-Air Collision

The EUROCONTROL Safety Improvement Sub-Group (SISG) identified Traffic Alert and Collision Avoidance System (TCAS) Resolution Advisory (RA) Not Followed as one of the 'Top 5' Air Traffic Management (ATM) Operational Safety Priorities in 2017 and launched a study. It was determined in the planning stage of this study that the best source of information is the pilots themselves. A voluntary online survey was proposed and was supported by IATA and several European aircraft operators. The survey prompted 3,800 responses from 90 countries. IATA, together with industry stakeholders, will be working on raising awareness of the importance of correct compliance with a TCAS RA and eliminating noncompliance. The SG believes that operators should develop a risk-based TCAS Minimum Equipment List (MEL) policy, so that, for example, an aircraft cannot dispatch into airspace that uses In-flight Broadcast Procedures (IFBP) with an unserviceable TCAS.

It is the view of SG members and observers that operators should use their Flight Data Monitoring (FDM) programs to monitor pilot response to TCAS RA to ensure that they are carried out correctly and in a timely manner, addressing any identified shortcomings through training and awareness campaigns.

Safety Predictive Analytics Research Center

On 7 February 2018, IATA and the Civil Aviation Authority of Singapore (CAAS) announced the signing of a Memorandum of Collaboration (MoC) to establish a Safety Predictive Analytics Research Center (SPARC) in Singapore. The MoC was signed by Alexandre de Juniac, Director General and CEO of IATA, and Kevin Shum, Director General of CAAS.

The intent of SPARC is to leverage operational safety information that is available under IATA's GADM initiative, assess potential hazards and identify safety risks, many of which are otherwise very difficult or impossible to foresee. Affected end users across the aviation community can then work collaboratively at the system level to address and implement appropriate safety measures to mitigate, or even prevent, occurrences where possible.

Ground Operations Safety

The IATA/Industry Airside Safety Group works on ground safety issues, including, but not limited to:

- Drug and alcohol policy
- Human factors training for ground staff
- Occupational health and safety, including hearing protection
- Airport design
- Ground damage to aircraft, including:
  - Damage severity assessments
  - Time out of service
  - Quality and culture of reporting
  - Costs
  - Found versus reported damage
- Load sheet and loading errors
- Maturing SMS in Ground Service Providers
- Enhancing SMS guidance in the Airport Handling Manual and IATA Safety Audit for Ground Operations (ISAGO) standards
- Supplier safety standards
- Ground service equipment under wing policy
- Safety promotion through the 'We are Safety' campaign
- Enhancement of safety training for ground staff
- Development of ground safety performance indicators
- Jet bridge maintenance standards, records and operator training
- Airport authority risk assessments
- Gate management

Fatigue Management

Flight crew and cabin crewmember fatigue is acknowledged as a hazard that predictably degrades various types of human performance and can contribute to aviation accidents and incidents.

Fatigue management refers to the methods by which operators and operational personnel address the safety implications of fatigue. ICAO Standards and Recommended Practices (SARPs) support two distinct approaches: the prescriptive fatigue management approach and the Fatigue Risk Management System (FRMS) approach.

Under a prescriptive fatigue management approach, operations must remain within prescribed limits established by the regulator for flight time, flight duty periods, duty periods and rest periods. In addition, the operator manages fatigue hazards using the SMS processes that are in place for managing other types of hazards.

The FRMS approach represents an opportunity for operators to use advances in scientific knowledge to improve safety and increase operational flexibility. A FRMS is a specialized system that uses SMS principles and processes to specifically identify and manage crewmember fatigue as a hazard.

With FRMS, the operator must identify and assess potential fatigue risks prior to conducting operations under the FRMS as well as identify and assess actual fatigue risks proactively during operations. Having a FRMS still requires setting maximum limits, but these are proposed by the operator and must be approved by the regulator.

With the support of the IATA Fatigue Management Task Force (FMTF), IATA has participated in the development of new standards published in the cobranded IATA/ICAO/IFALPA *Fatigue Management Guide for Airline Operators*. IATA has also proposed a series of guidance materials and information papers to help the industry implement fatigue management principles. All the documents developed with the support of the IATA FMTF can be download free of charge from www.iata.org.

ENHANCE QUALITY AND COMPLIANCE

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

IATA Operational Safety Audit

The IATA Operational Safety Audit (IOSA) program is an internationally recognized and accepted evaluation system designed to assess the operational management and control systems of an airline. IOSA is generally recognized as the 'gold standard' for operators. All IATA members are IOSA registered and must remain registered to maintain IATA membership. The IOSA program lessens the burden on the industry by representing a global standard that is utilized by numerous regulators to complement their oversight activities on commercial operators.

IATA Standard Safety Assessment Program

The IATA Standard Safety Assessment (ISSA) program is a voluntary evaluation program, produced at the request of the industry, to extend the benefits of operational safety and efficiency that emanated from the IOSA program to the operators of smaller aircraft that are not eligible for IOSA.

The ISSA program offers entry into an IATA Assessment Registry to operators that utilize aircraft with a maximum takeoff weight (MTOW) below 5,700 kg. It also offers a one-term registration opportunity to operators of aircraft with an MTOW above 5,700 kg.

IATA Safety Audit for Ground Operators

ISAGO improves ground safety and aims to reduce accidents, incidents and risk in ground operations. ISAGO is a standardized and structured audit program of Ground Service Providers (GSPs); that is, ground handling companies operating at airports. It uses internationally recognized operational standards that have been developed by global experts. The audits are conducted by highly trained and experienced auditors.

The latest analysis conducted with IATA Ground Damage data indicated (with clear and strong statistical evidence) that ISAGO had made a positive impact on safety culture and safety performance of the GSPs. ISAGO-registered GSPs exhibited a better reporting culture, with 70% of their damage incidents reported compared to only 32% for non-ISAGO GSPs. ISAGO GSPs also experienced significantly less severe damage.

IATA Fuel Quality Pool

The IATA Fuel Quality Pool (IFQP) is a group of more than 170 airlines that work together to assess the implementation of safety and quality standards and procedures at aviation fuel facilities. IFQP-qualified inspectors perform the inspections at airports worldwide, against industry regulations, and the reports are shared among the IFQP members. By providing comprehensive training of inspectors and development of industry-standard inspection procedures, IFQP members obtain enhanced safety and improved quality control standards for fuel facilities at the airport, in compliance with airline regulatory requirements.

IATA De-Icing/Anti-Icing Quality Control Pool

The IATA De-Icing/Anti-Icing Quality Control Pool (DAQCP) is a group of more than 100 airlines that audit de/anti-icing providers and share the inspection reports and workload at various locations worldwide. Its main goal is to ensure that safety guidelines, quality control recommendations and standards for de/anti-icing procedures are followed at all airports.

IATA Drinking Water Quality Pool

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

ADVOCATE FOR IMPROVED AVIATION INFRASTRUCTURE

Airline operators are heavily investing in fleet and network expansion as well as onboard avionics. Regions across the world are experiencing double-digit traffic growth, but are faced with bottlenecks and a lack of infrastructure to cope with the growth. The regulatory framework and Air Traffic Management (ATM) capabilities must evolve in a harmonized context to meet the pace of advancing technologies. We also need to ensure that new entrants and airspace users are safely and efficiently integrated into the airspace.

It is important for us as an industry to move towards a future vision of the ATM system that looks at ATM from a gate-to-gate perspective. Key drivers for change and operational improvements are safety, efficiency and cost-effectiveness. Within that context, IATA is working with member airlines and key partners, such as ICAO, the Civil Air Navigation Services Organization (CANSO), state regulators and ANSPs, to ensure that ATM operations and infrastructure improve the level of safety, enhance efficiency, reduce CO_2 emissions, and are supported by a positive cost-benefit analysis.

Performance-based Navigation with Vertical Guidance

At their 37th General Assembly in September 2010, ICAO member states agreed to complete a national performance-based navigation (PBN) implementation plan as a matter of urgency. The aim was to achieve PBN approach procedures with vertical guidance for all instrument runway ends by 2016.

Due to slow progress, IATA continues to engage states, ANSPs, and airlines to accelerate implementation of Approaches with Vertical Guidance (APV) procedures and demonstrate the risks associated with the continued use of non-precision approaches.

Irresponsible Use of Unmanned Aircraft Systems

Small Unmanned Aircraft Systems (UAS), or drones, represent a potential hazard to civil aviation, particularly in the case of their irresponsible use in close proximity to airports and manned aircraft. Small UAS are being used by people unfamiliar with the safety risks, or with little awareness of civil aviation and its regulation. As such, it is critical to ensure that the relevant risk assessment models and proper SMSs are in place for UAS operations. Within that context, IATA has been working with industry partners to ensure awareness of the safety risks resulting from the operation of small UAS close to aircraft and airports. All material produced under this campaign can be accessed on the IATA website.

Unmanned Traffic Management and Space Traffic Management

To ensure the safe integration of new entrants and new airspace users, IATA is working with ICAO and key regulatory bodies to ensure that the system architecture and safety provisions are available for the safe operation of these new entrants in lower altitudes as well as in FL600 and above. Work will continue throughout 2018 with these key stakeholders.

SUPPORT CONSISTENT IMPLEMENTATION OF SAFETY MANAGEMENT SYSTEMS

The implementation of the various elements of SMS has been ongoing for over 10 years, and as demonstrated through IOSA, most airlines have them in place. However, this does not mean the work ends. In fact, it is just beginning.

In 2017, the IATA SMS-related activities focused on practical applications of SMS principles as well as enablers of an effective system. The purpose was to drive effective implementation and use of SMS in the aviation industry. Additionally, continuous monitoring of the findings related to IOSA SMS-designated SARPs helps IATA identify needs to develop targeted supporting guidance and training material.

Specifically, the activities included:

IATA Safety Information Exchange Program

To promote an open exchange of safety information aimed at continuously improving aviation safety, IATA has developed a program to facilitate information sharing and analysis between states, state-registered airlines, and other key stakeholders. The program establishes a forum where the participants engage in collaborative activities to identify, analyze and mitigate leading aviation safety risks. Program involvement is voluntary and at the sole discretion of the individual participants.

The program model is based on others already in place with noted achievements in safety advancements, such as the Commercial Aviation Safety Team (CAST) in the USA and the Brazilian Aviation Safety Team (BAST) in Brazil. Based on a framework of continuous improvement, this state/industry partnership is key to set and achieve sustainable and effective safety goals.

IATA is working with various stakeholders to facilitate the establishment of new state/industry safety teams in 2018.

Safety Culture – A Key Enabler of Safety Management

IATA continues to promote the importance of safety culture as a primary enabler of effective safety management. In a practical sense, all the elements of a SMS can be in place, but if people are not using or following them, the efforts are futile. The next logical step for effective implementation is to focus on safety culture.

IATA has developed and launched the IATA Aviation Safety Culture (I-ASC) survey, specifically designed for the aviation industry. I-ASC results provide insight into the daily challenges and perceived risk areas of frontline and management employees. It helps organizations identify specific areas of improvement and hazards, ultimately contributing to improvements in safety performance. It also provides organizations with the means to meet ICAO SMS/State Safety Program (SSP) requirements to measure and continuously improve their safety culture.

Successfully deployed in 2017, as more operators conduct this survey, the results will allow for the added benefit of benchmarking capabilities on a global, regional and alliance basis.

Annex 19 Amendments – Guidance Material

IATA continued its participation on the ICAO Safety Management Panel, with a specific focus in 2017 to finalize the development of ICAO guidance material to support the Annex 19 amendments. The 4th Edition of the ICAO Safety Management Manual is expected to be made available in early 2018. It will be complemented by the ICAO Safety Management Implementation (SMI) website that provides examples, tools and supporting educational material on an informational basis. The website is geared to all service providers, and can be found here.

IATA Issue Review Meeting and Hazard Identification Technical Group

The IATA Issue Review Meeting (IRM) is a twice annual safety meeting, where airlines can freely share their experiences so that the broader community can learn and work to prevent similar events or risks at their own airlines. Not only does this demonstrate the willingness of our industry to share in the interest of safety, but this open review of significant industry accidents, incidents, potential incidents and risks spanning the entire global sphere of commercial air transportation allows real issues to be identified and further analyzed by the IATA Hazard Identification Technical Group (HITG) and raised to the IATA SG. This is a key input to the SG's determination of industry risks that need IATA action.

IATA is pleased to report that, in 2017, the decision was made to expand the distribution of IRM Bulletins to a much broader audience. Typically only distributed to those who attended the meeting, the IRM Bulletin provides a summary of the issues discussed at the respective meeting in a de-identified way. Now, even more organizations can benefit from this meeting.

We look forward to welcoming you at an upcoming IRM. More information on the IRM, HITG and SG can be found here.

SUPPORT EFFECTIVE TRAINING

Training and Licensing

The IATA Training and Licensing portfolio is a multifaceted portfolio that seeks to improve safety through enhanced pilot training and qualification. Working with the IATA Pilot Training Task Force, IATA participates in the development of new standards and publishes guidance materials and best practices to help operators and training organizations implement these standards.

IATA supports a consistent approach to flight crew training, from the selection process through initial and recurrent training by promoting competency-based training programs such as Multi-Crew Pilot License (MPL) and Evidence-based Training (EBT). IATA also addresses specific areas of training by proposing UPRT and flight crew monitoring guidance materials.

Note: All guidance materials developed under IATA Training and Licensing can be downloaded for free from our webpage.

Multi-Crew Pilot License Training

Progress in the design and reliability of modern aircraft, a rapidly changing operational environment, and the need to better address the human factors issue prompted an industry review of pilot training. The traditional hours-based qualification process fails to guarantee competency in all cases.

Therefore, the industry saw a need to develop a new paradigm for competency-based training and assessment of airline pilots: MPL training.

MPL moves from task-based to competency-based training in a multi-crew setting from the initial stages of training. CRM and Threat and Error Management (TEM) skills are embedded throughout the training. Most incidents and accidents in civil aviation are still caused by human factors such as a lack of interpersonal skills (e.g., communication, leadership and teamwork), workload management, situational awareness, and structured decision-making. MPL requires full-time embedded, as opposed to added on, CRM and TEM training.

The second edition and cobranded IATA/IFALPA *MPL Implementation Guide* was published in 2015 to support airlines during their MPL implementation process.

Evidence-based Training

Evidence-based Training (EBT) applies the principles of competency-based training for safe, effective and efficient airline operations while addressing relevant threats. ICAO has defined competency as the combination of Knowledge, Skills and Attitudes (KSAs) required to perform tasks to a prescribed standard under certain conditions.

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. The following documents published by ICAO and IATA allow airlines to develop an effective EBT program:

- ICAO Manual of Evidence-based Training (Doc.9995)
- Updates to ICAO Procedures for Air Navigation Services - Training (PANS-TRG, Doc 9868)
- IATA/ICAO/IFALPA Evidence-based Training Implementation Guide
- IATA Data Report for Evidence-based Training

IATA is currently in the process of reviewing the 1st Edition of *Data Report for EBT*. Publication of the 2nd Edition is expected at the end of 2019.

Pilot Aptitude Testing

Designed to support aviation managers in the field of pilot selection, Pilot Aptitude Testing (PAT) is a structured, science-based candidate selection process. PAT helps avoid disappointed applicants, wasted training capacity, and early drop out due to medical reasons. Proven to be highly effective and efficient, PAT provides enhanced safety, lower overall training costs, higher training and operations performance success rates, a more positive working environment and reduced labor turnover. This is becoming particularly important in view of the projected increased demand for qualified pilots in the coming decades.

Upset Prevention and Recovery Training

Loss of Control – In-flight is one of the leading causes of fatalities in commercial aviation. This has led the industry to a revision of current training practices and the adoption of new regulations to address this phenomenon. The IATA manual, *Guidance Material and Best Practices for the Implementation of UPRT*, published in 2015, serves as guidance material for operators to develop an UPRT program as part of their recurrent training. It can also be considered when including UPRT in other programs, such as conversion, upgrading and type rating training. The document specifically focuses on practical guidance for UPRT instructor training. It also includes recommendations for operators cooperating with Approved Training Organizations (ATOs) providing licensing training for their *ab initio* cadets. It may be used for both traditional and competency-based training schemes.

Flight Crew Monitoring

The need to address flight crew monitoring came from aviation community consensus around the importance of enhancing monitoring skills, based on data analysis from various sources. The IATA document, *Guidance Material for Improving Flight Crew Monitoring*, published in 2016, provides practical guidance for operators and ATOs for the development of flight crew monitoring training. It also highlights how monitoring is embedded in all pilot competencies, and how these competencies serve as countermeasures in the TEM model.

Flight Crew Competency Framework

IATA is part of the ICAO Competency-based Training and Assessment Task Force (CBTA-TF), whose task consists of developing an ICAO airplane pilot competency framework for all pilot licenses, type rating, instrument rating and recurrent training. This implies a revision of the provisions related to MPL and EBT, including provisions in Annex 1 - Personnel Licensing, the PANS-TRG and Annex 6 Part 1. It also requires the updating of related guidance materials, including the Manual of Evidence-based Training (Doc 9995) and the Manual on Upset Prevention and Recovery Training (Doc 10011). Finally, it involves a proposal to increase the Flight Simulation Training Devices (FSTD) credit for licensing in Annex 1. This work began in March 2017 and is expected to continue until November 2020.

Instructor Qualification

Given the essential contribution of instructors and evaluators (IEs) to flight safety, IATA considered it important to propose solutions to enhance globally the level of competency of IEs. Therefore, the 1st Edition of *Guidance Material for Instructor and Evaluator Training* 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 recurrent training, by both operators and ATOs.

Engineering and Maintenance Training and Qualification Requirements

The aim of the Engineering and Maintenance (E&M) training and qualification program is to identify, develop and evaluate the competencies required by commercial aircraft maintenance personnel to operate safely, effectively and efficiently. This is accomplished by managing the most relevant risks, threats and errors, based on evidence. E&M 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 key factors to the success of E&M.

IDENTIFY AND ADDRESS EMERGING/ EVOLVING SAFETY ISSUES

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

Emerging/evolving risks that will increasingly need to be considered in the conversation of operational risk for aviation service providers include:

- Smart Baggage (see also Section 7, Cabin Safety)
- Lithium Batteries
- Unmanned Aircraft Systems (UAS)
- Cyber Security

Smart Baggage

IATA Cargo, through the IATA Dangerous Goods Board, issued an addendum to the 2018 edition of the *Dangerous Goods Regulations* to restrict the carriage of what is known as "smart" luggage; that is, luggage that is equipped with lithium batteries installed in the bag for use as a power bank to charge a Personal Electronic Device (PED) or to power motorized wheels on the bag. IATA Safety and Flight Operations (SFO) Safety has issued a guidance document on managing Smart Baggage with built-in lithium batteries and electronics.

Lithium Batteries

Since last year's IATA Safety Report, there have been several developments concerning the carriage of lithium batteries. Two guidance documents have been released by IATA SFO Safety, as follows:

- Enhanced Security Measures: PEDs in Carry-on Baggage *(Version 1: US restrictions; issued March 2017)*
- Enhanced Security Measures: PEDs in Carry-on Baggage *(Version 2: US and UK restrictions; issued April 2017)*

In response to the prohibition of certain PEDs in the cabin on flights into the US and the UK, and the ongoing prohibition of lithium batteries being carried as cargo on passenger aircraft, two new ICAO working groups were formed, as follows:

- Multi-Disciplinary Working Group is tasked with assessing the risks posed by the carriage of PEDs in aircraft holds and developing possible mitigations.
- Flight Operations Panel Cargo Safety Sub-Group (FLTOPS-CSSG) is tasked with developing revisions to Annex 6 (and associated guidance material) to address the carriage of cargo that has the potential to affect flight safety. This pertains specifically to dangerous goods, including lithium batteries. Subject matter experts from both the IATA Safety and IATA Cargo departments are members of the sub-group supporting the development of the changes to Annex 6 and the associated guidance material.

Separately, the SAE G-27 Committee, which was established at the request of ICAO, is reaching the final stages of its work to develop a performance standard that can be used to test packages containing lithium batteries. The purpose of the committee is to ensure that, in the event of a thermal runaway of a lithium cell in the package, there are no hazardous effects outside the package.

The SAE G-27 Committee convened through conference calls and physical meetings during 2017 to progress the development of the performance standard. The work of the G-27 Committee has been supported by a small team tasked with writing the standard and developing the technical test requirements.

At the time of writing, the expected final meeting of the G-27 Committee is scheduled for February/March 2018 in Brussels. It is expected that this meeting will produce the draft language for the standard agreed to. If the committee is satisfied with this draft, the standard will be sent out to the full committee for ballot. If the committee votes to adopt the standard, it will then be submitted to SAE for final approval. Alongside this process, the relevant ICAO body will determine if the standard is suitable for adoption into the ICAO Technical Instructions.

IATA Safety and IATA Cargo continue to represent the industry in the discussion on the carriage of lithium batteries and participate in the work of the applicable ICAO panels.

Unmanned Aircraft Systems

UAS represent a potential hazard to civil aviation, particularly in the case of their irresponsible use in close proximity to airports and manned aircraft. Small UAS are being used by people unfamiliar with the safety risks, or have little awareness of civil aviation and its regulation. As such, it is critical to ensure that the relevant risk assessment models and proper safety management systems are in place for UAS operations.

IATA works closely with key stakeholders, including:

- Airlines for Europe (A4E)
- Airports Council International Europe (ACI)
- Civil Air Navigation Services Organization (CANSO)
- European Cockpit Association (ECA)
- European Helicopter Association (EHA)
- International Federation of Air Line Pilots' Association (IFALPA)
- International Federation of Air Traffic Controllers' Associations (IFATCA)

IATA is instrumental in bringing together different aviation stakeholders to speak with one voice on UAS to ensure that the relevant authorities are fundamentally aware of the airspace user's position regarding requirements for the safe operation and integration of UAS Joint Safety Statements contained in. This leadership will continue as we navigate through challenging dialogue related to unsegregated operations (manned and unmanned aircraft sharing the same airspace).

ICAO issued a state letter on 20 March 2017 emphasizing state responsibilities to protect civil aircraft from 'pilotless' aircraft.

The transition from prescriptive to performance-based regulations for UAS and the establishment of acceptable target levels of safety will set the foundation for the implementation of future safety initiatives. IATA will continue to actively participate in policy and operational concept development of technology to enhance safety. Priority work areas include:

- Dynamic Geofencing – adaptable virtual barriers that are created using a combination of GPS and radio frequency connections (such as Wi-Fi or Bluetooth) to keep UAS from entering dangerous, restricted or sensitive airspace.
- Detect and Avoid (DAA) technology.
- Analysis of UAS incidents and accidents to identify trends and support SMS/SSP.

Cyber Security

In last year's IATA Safety Report, regarding cyber security, it was recorded that "IATA…should help airlines identify threats and/or risks via the…systems interfaces from application to application and from platform to platform". Further, it was reported that IATA should create a list of airline-controlled activities that may be used as an attack vector (Cyber Security, Aviation Cyber and Cyber Threat and Risk to Aircraft Correlating to Safety of Flight). Then, IATA should create an aviation cyber forum to foster exchange of information and ideas, increase knowledge and subject awareness and facilitate the sharing of best practices.

Following up on that report, IATA has proposed the creation of a new task force, designed to address these issues, the Aviation Cyber Security Task Force (ACSTF), which will report to the IATA Security Group (SEG). The objective of the ACSTF is to assemble industry expertise in this emerging aviation risk area, gather information, scope the threat and identify best practices for airlines related to the increasing probability of a cyber breach of aircraft systems. It is intended that nominations will include not only security managers, but also airline Information Technology experts, engineers and experts from Original Equipment Manufacturers (OEMs). It is envisaged that this task force will run for two years, will meet physically twice a year, and will hold bi-monthly teleconferences.

It remains that safety and security are IATA's top priorities. Airlines and OEMs demand the highest safety and security standards and protections for aircraft systems. Connectivity of aircraft systems, through traditional information technologies, aviation-specific protocols and radio-frequency (RF) communications, has extended the attack surface to the aircraft itself, both on the ground and in flight. Furthermore, the digital footprint of aircraft has increased and continues to do so. Therefore, the question of digital communication between systems, data validity and information/data security (the protection against intentional interference) has become increasingly relevant. With the potential for an increased probability of cybersecurity incidents, safety is a paramount concern.

By acting on cyber security issues, the new task force can protect member airlines' investment in connectivity and e-enablement, thus reinforcing IATA's mandate of supporting operational efficiency and safety.

SECURITY

ICAO Global Aviation Security Plan

The United Nations Security Council Resolution 2309 (2016) on Aviation Security reaffirmed the obligations of all states to ensure the security of all citizens and nationals of other states against terrorist attacks on air services operating within their territories as well as the safety of their citizens and nationals against terrorist attacks conducted against international civil aviation, wherever these may occur.

All states have been urged to ensure an effective, risk-based and sustainable implementation of ICAO Annex 17 standards at all airports within their jurisdiction and to urgently address any gaps or vulnerabilities that may be identified. In this regard, it is envisioned that the ICAO Global Aviation Security Plan (GASeP) will provide the necessary mandate leading up to the 40th ICAO Assembly in 2019 for states to continue to enhance aviation security.

IATA is a member of the GASeP Task Force, convened under the ICAO AVSEC Panel. The ICAO GASeP was formally endorsed by the ICAO Council in November 2017 and has clearly identified priority areas for ICAO, states and industry to collaborate in the enhancement of aviation security. Going forward, relevant IATA Working Groups, Strategic Partners and sponsors will be engaged to contribute to the delivery of the ICAO GASeP.

Personal Electronic Devices 'Ban'

In March 2017, the US Department of Homeland Security (DHS) issued a security directive to restrict oversized PED items from the cabin of US-bound flights originating from 10 airports throughout the Middle East and North Africa. The UK Department for Transport (DfT) followed a short time thereafter with similar restrictions. The extraordinary events surrounding the public threat from PEDs continues to raise several pertinent points for discussion as the industry aims to rally behind the cooperation and enhancement commitments espoused by the ICAO GASeP.

Discussions among experts revolved around the nature of the threat information. The effectiveness of existing checkpoint screening technologies, the variation of requirements between states, and the sovereignty of states when implementing the standards of ICAO Annex 17 dominated aviation security specialist groups. But one of the most important issues raised by the ban has been overlooked – the questions and challenges raised by the implementation of unilateral measures of an extraterritorial nature. The replacement of a 'ban' by the US DHS or Transport Security Administration (TSA) with alternative and/or additional measures imposed on airlines is central to this argument.

IATA recognizes that governments are responsible for safeguarding and protecting the civil aviation industry. Thus, when there is an urgent need for additional security measures to be implemented due to a time-sensitive security threat and/or vulnerability, the industry is always quick to comply. The industry fully accepts that short-term, unilateral, extraterritorial measures are required to protect against a specific threat. However, short-term solutions should not be used as long-term countermeasures for security. Terrorists are not going to stop searching for ways to circumvent security systems – the threat is here to stay.

In response, in May 2017, IATA facilitated a Security Summit in Washington, DC, which included SEG member airlines, airports, associations and regulators. The objective of the Summit was to identify measures that could be taken as an alternative to any expansion of the ban. These alternative measures would enhance security while reducing the impact on passengers and airlines.

In June 2017, DHS and TSA released a three-phased strategy to enhance US aviation security interests and provided an alternative means for affected carriers to, unlock, the ban. Following the release of new requirements issued by the TSA, the SEG has led the consultation efforts with the TSA in understanding the degree of flexibility in the implementation. This resulted in updated directives, with the latest released in December 2017, where clear alternative means of compliance for the interim on certain aspects of phase 2 of the measures were provided to effected airlines.

The current unilateral, extraterritorial measures are not a long-term solution, even if in some cases they are voluntary for airlines to implement. Arguably, the measures are also displacing a major onus for security, which is the primary responsibility of governments, onto the airlines.

The previous ban of PEDs from the cabin of aircraft required affected airlines to enforce restrictions by implementing additional measures resulting in carriage of PEDs in the hold. Airlines were left to manage residual security and safety risks. More recently, the roll out of the new measures continues to place disproportionate emphasis on airline security measures, where aspects of the new security directive are arguably a government responsibility. Identified vulnerabilities and thus risks to the industry ought to be successfully reduced and managed at central and/or primary checkpoint screening, carried out by authorities and/or organizations contracted by authorities with appropriate oversight.

Unilateral, extraterritorial security measures instituted by states are largely considered beyond the SARPs contained in ICAO Annex 17 and may affect existing bilateral aviation agreements between countries. They also cause regulatory risk for airlines that decided to not implement such measures. Sovereignty is such that some states preclude airlines from implementing secondary or a carrier's own requirements. Jurisdictional regulations at the point of departure may place the airline in a difficult regulatory compliance position at the point of arrival in another country. States need to recognize these measures within the SARPs framework by which bilateral agreements have been established.

Conflict Zones

July 2017 marked three years since the tragic events of MH17 over Ukraine. In the time since, militarized hostilities have continued and arguably increased in other areas where civil aviation aircraft are known to operate. Awareness of the risks are well known to industry and member airlines are actively engaged in undertaking risk assessments prior to the dispatch of aircraft based on IOSA standards.

During the ICAO AVSEC Panel 28 in May 2017, a new information sharing standard for the purposes of enhancing operator risk assessments was supported and included in the proposed Amendment 16 to Annex 17. This new standard was originally proposed by IATA following the recommendations contained in the MH17 Dutch Safety Board report. Moreover, in 2018, ICAO is expected to publish a Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones.

The IATA-hosted Security Forum extranet site is currently being enhanced with a view to promoting qualified links between airlines and vendors in the provision of security information sharing.

1

IATA Annual Safety Report

Safety is aviation's highest priority. More than seventy years ago, the global airline industry came together 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 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 54th year of publication. This 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. This document provides the industry with critical information, derived from the analysis of aviation accidents, to understand safety risks in the industry and propose mitigations.

The 2017 Safety Report was produced at the beginning of 2018 and presents trends and statistics based on knowledge of industry at the time. This report is made available to the industry for free distribution.

The Safety Report is a valuable tool as aviation works tirelessly to improve its already superb safety record.

Image courtesy of Embraer

SAFETY REPORT METHODS AND ASSUMPTIONS

The Safety Report is produced each year and 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. Firstly, that 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. Secondly, that the sectors used to create the accident rates are the most up-to-date available at the time of production. The sector information is updated on a regular basis and takes into account actual and estimated data. As new updates are provided the sector count becomes more accurate for previous years, which in turn allows for increased precision in accident rates.

ACCIDENT CLASSIFICATION TECHNICAL GROUP

The IATA Operations Committee (OPC) and its Safety Group (SG) created the Accident Classification Technical Group (ACTG) to analyze accidents, identity 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 the 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, including FlightGlobal and the accident investigation boards of the states where the accidents occurred. Once assembled, the ACTG validates each accident report using their expertise to develop an accurate assessment of the events.

2017 ACTG members:

Steve Hough (Chairman)
SAS

Ruben Morales (Vice-Chairman)
HONG KONG AIRLINES

Dieter Reisinger (Former Chairman)
AUSTRIAN AIRLINES

Marcel Comeau
AIR CANADA

Xavier Barriola
AIRBUS

Denis Landry
AIR LINE PILOTS ASSOCIATION (ALPA)

Tatyana Morozova
AIR ASTANA

Ivan Carvalho
AZUL BRAZILIAN AIRLINES

Marion Choudet
ATR

Robert Aaron Jr.
THE BOEING COMPANY

Richard Mayfield
THE BOEING COMPANY

David Fisher
BOMBARDIER AEROSPACE

Luis Savio dos Santos
EMBRAER

Yasuo Ishihara
HONEYWELL

Andrea Mulone (Database/Analysis)
IATA

Robert Holliday (Secretary)
IATA

Michael Henry
ICAO

Arnaud Du Bédat
IFALPA

Takahisa Otsuka
JAPAN AIRLINES

Martin Plumleigh
JEPPESEN

Peter Krupa
LUFTHANSA

Ayedh Almotairy
SAUDI ARABIAN AIRLINES

João Romão
TAP AIR PORTUGAL

Peter Kaumanns
VEREINIGUNG COCKPIT

Dmitry Ivanov
WORLD METEOROLOGICAL ORGANISATION

2

Decade in Review

AIRCRAFT ACCIDENTS AND FATALITIES

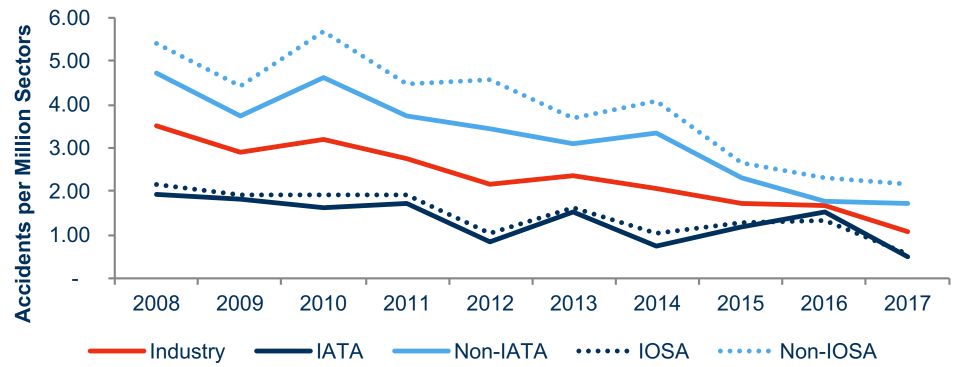
This section presents yearly accident rates for the past 10 years for each of the following accident metrics: all accidents, fatality risk, fatal accidents and hull losses, as well as general statistics on the number of fatalities and accident costs.

Image courtesy of Boeing

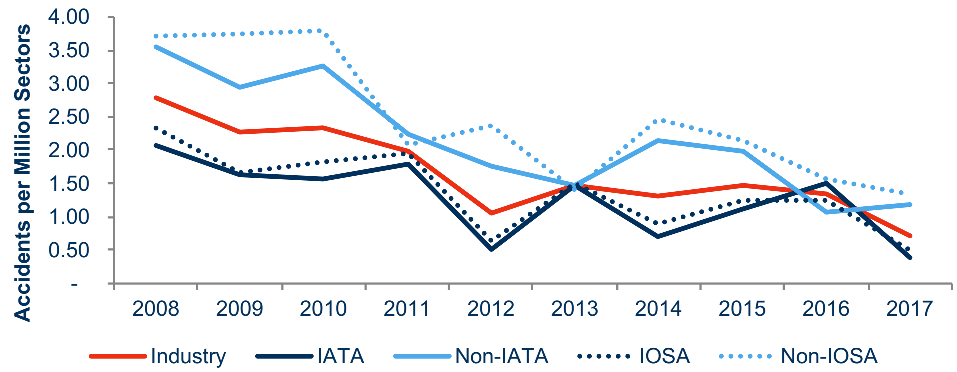
ALL ACCIDENTS

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

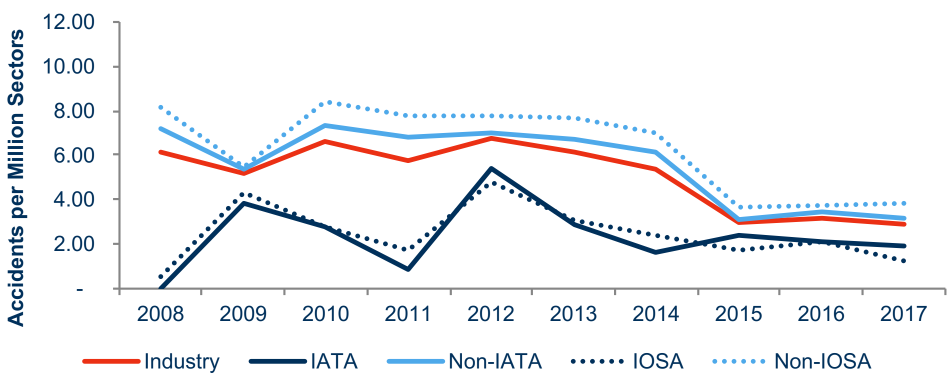
Jet & Turboprop Aircraft



Jet Aircraft



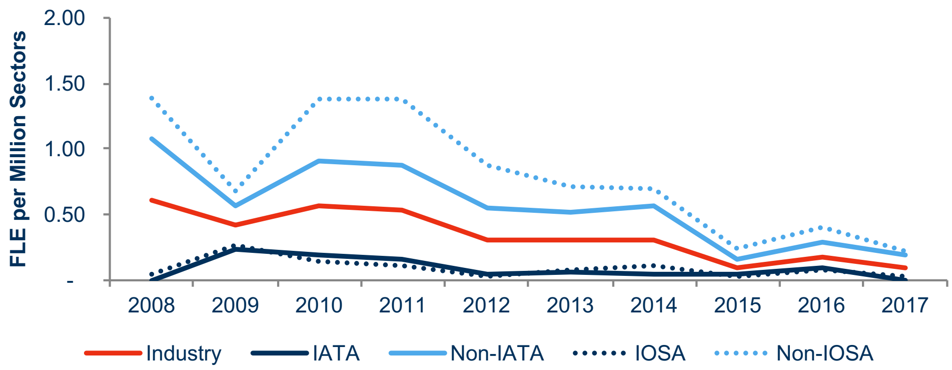
Turboprop Aircraft



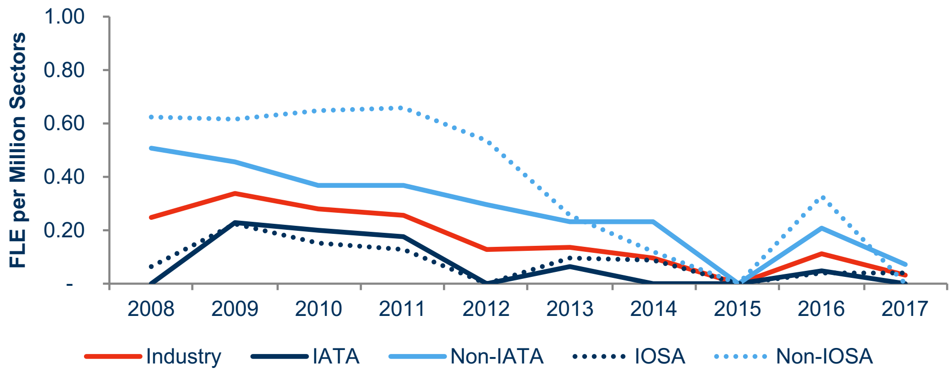
FATALITY RISK

Fatality Risk: Full-Loss Equivalents (FLE) per 1 Million Sectors. For definition of 'full-loss equivalent', please see Annex 1.

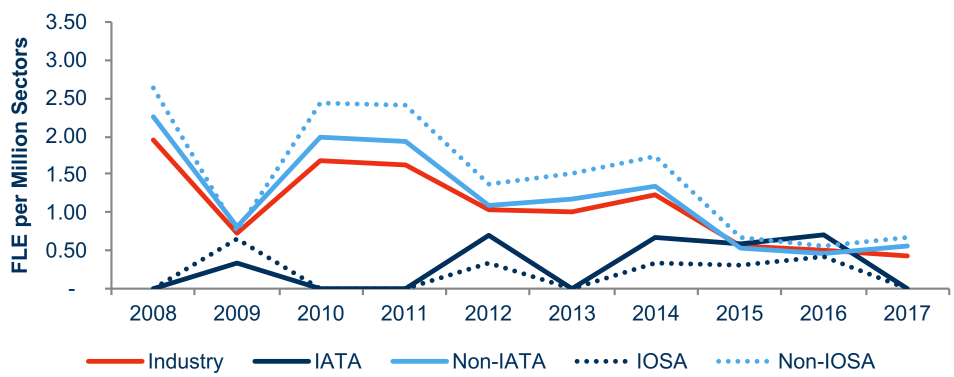
Jet & Turboprop Aircraft



Jet Aircraft



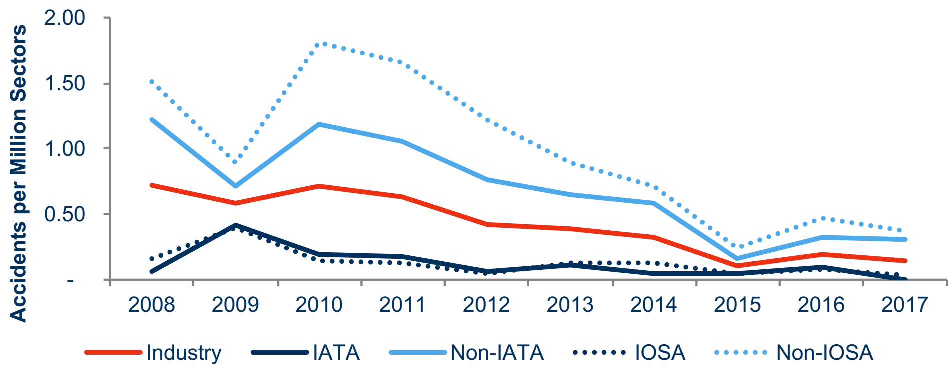
Turboprop Aircraft



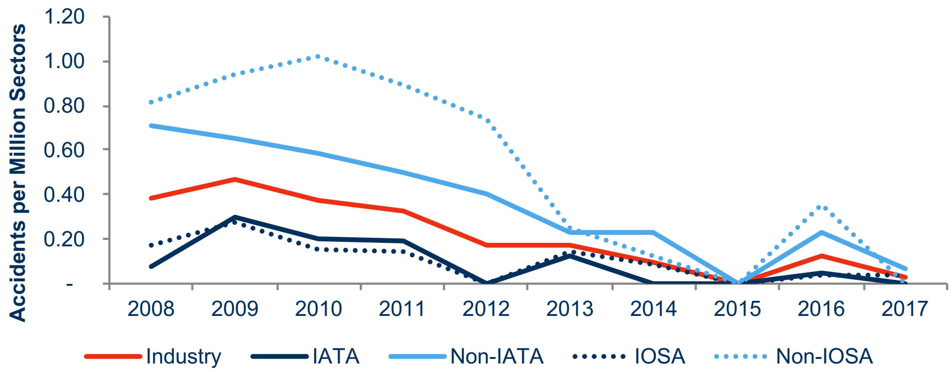
FATAL ACCIDENTS

'Fatal Accidents' refer to accidents with at least one person on board the aircraft perishing as a result of the crash.

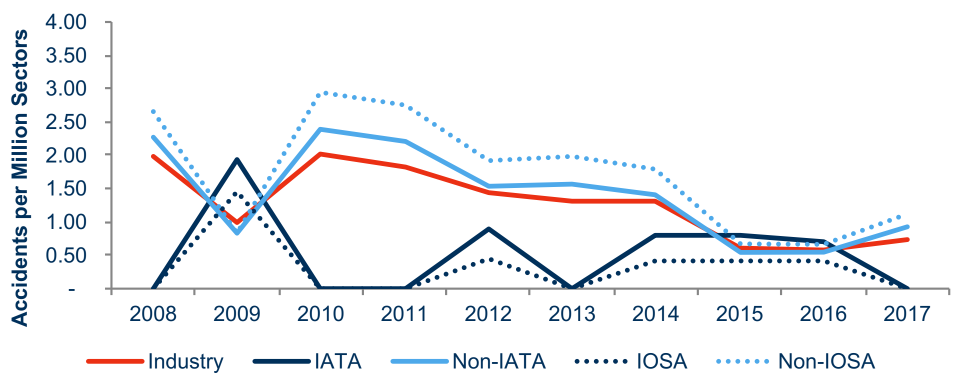
Jet & Turboprop Aircraft



Jet Aircraft



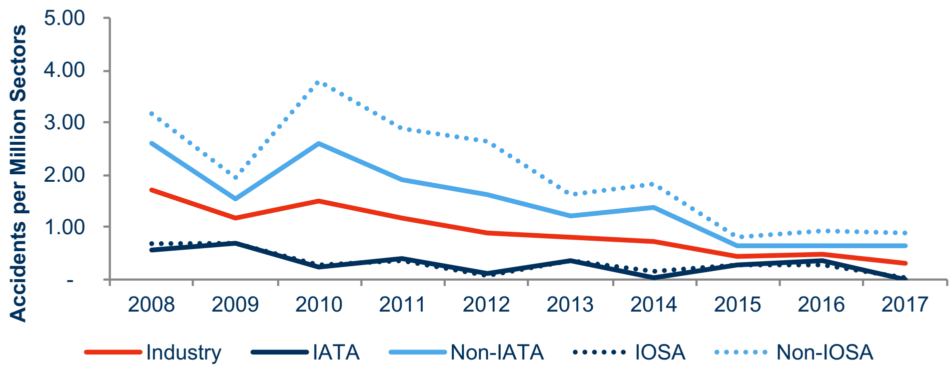
Turboprop Aircraft



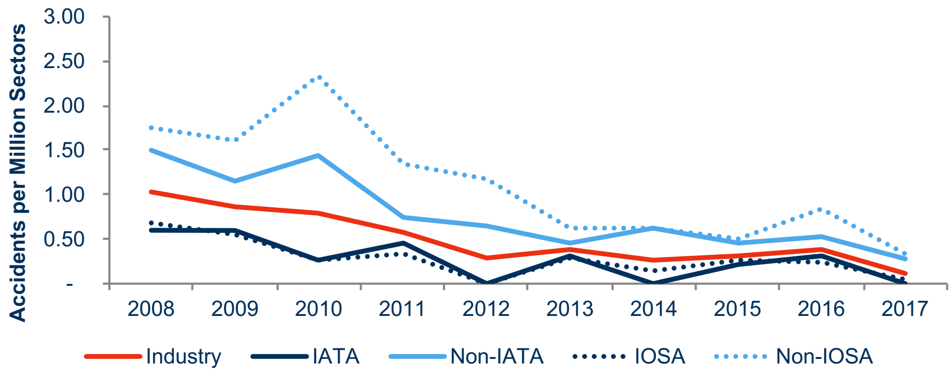
HULL LOSSES

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

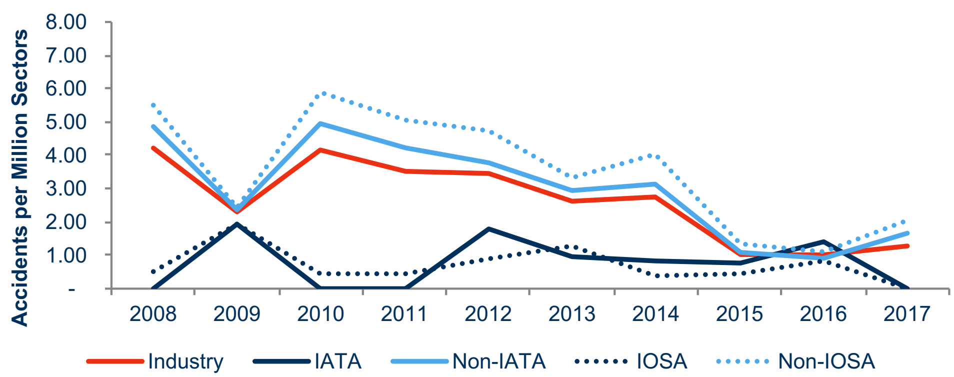
Jet & Turboprop Aircraft



Jet Aircraft



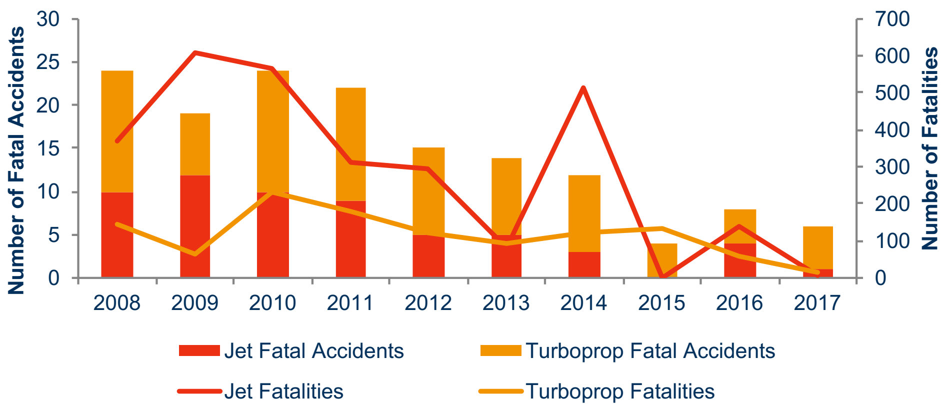
Turboprop Aircraft



FATALITIES

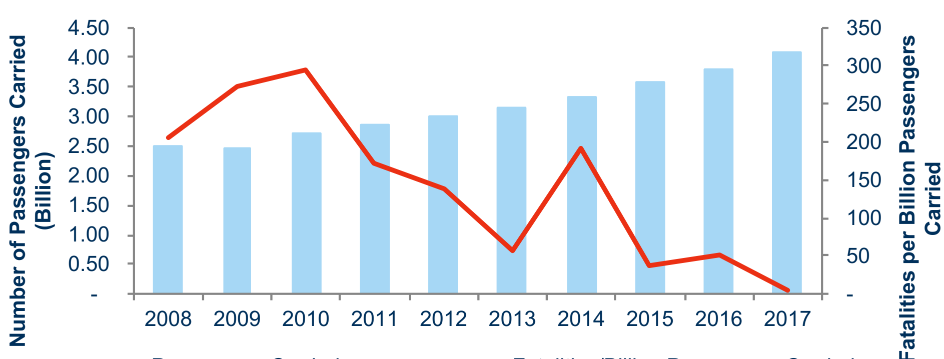
The graph below shows the total number of fatalities (line and vertical right axis) and the number of fatal accidents (stacked bar and vertical left axis) split between aircraft propulsion type. The reader needs to be aware that the data is not normalized by the aircraft flight count, therefore discretion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

Number of Fatalities and Fatal Accidents



The graph below shows the constant increase in the number of passengers carried over the past 10 years as well as a ratio metric related to the number of fatalities by the number of passengers carried in a specific year.

Number of Passengers Carried and Fatalities per Passengers Carried

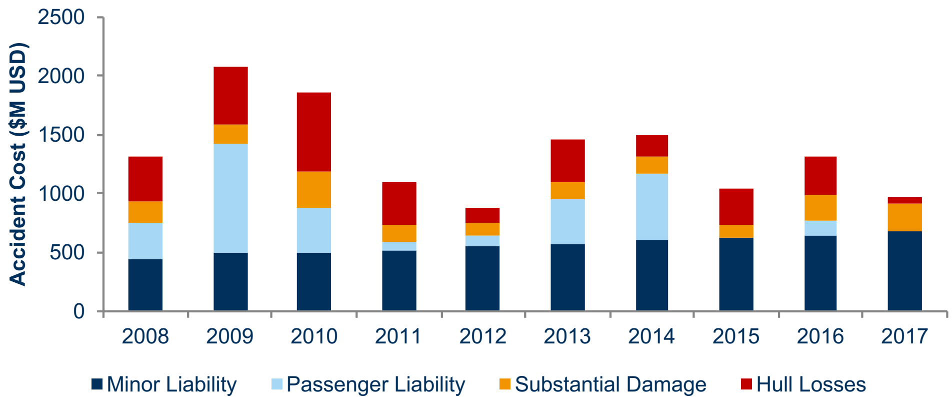


Passengers Carried Data Source: IATA / Industry Economic Performance

ACCIDENT COSTS

The graphs below show the estimated costs for all losses involving jet and turboprop aircraft over the last 10 years. The figures presented are from operational accidents and exclude security-related events and acts of violence.

Jet Aircraft



Source: Ascend FlightGlobal

Turboprop Aircraft

Source: Ascend FlightGlobal

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GADM, ISO 9001:2015 and ISO 27001 certified, is big data application supported by data warehousing technology that assists the industry to identify emerging trends and flag risks that you can mitigate through improved safety programs. Pulled from a multitude of sources, GADM is the most comprehensive airline operational database available.

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- Gain insights into global trends
- Anticipate safety concerns before they become an issue
- See if your safety issues are shared by the industry

For more information and to join,
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IATA

3

2017 in Review

COMMERCIAL AIRLINES OVERVIEW

FLEET SIZE, HOURS AND SECTORS FLOWN

	Jet	Turboprop	Total
World Fleet	26,150	5,567	31,717
Sector Landings (Millions)	35.0	6.9	41.9

Source: Ascend - a FlightGlobal Advisory Service
Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of year end.

CARGO OPERATING FLEET

	Jet	Turboprop
Percentage of Operating Fleet in All-Cargo Use	7.4%	19.4%

Source: Ascend - a FlightGlobal Advisory Service
Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of year end.

REGIONAL BREAKDOWN

	AFI	ASPAC	CIS	EUR	LATAM/CAR	MENA	NAM	NASIA
Jet - Sector Landings (Millions)	0.61	5.50	1.09	7.57	2.46	1.90	10.11	5.69
Turboprop - Sector Landings (Millions)	0.70	1.65	0.12	1.37	0.73	0.12	2.13	0.09

AIRCRAFT ACCIDENTS

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

NUMBER OF ACCIDENTS

	Jet	Turboprop	Total
Total	25	20	45
Hull Losses	4	9	13
Substantial Damage	21	11	32
Fatal	1	5	6
Full-Loss Equivalents	1.0	3.0	4.0
Fatalities*	4	15	19
Fatalities of people not on board the aircraft	*35*	*0*	*35*

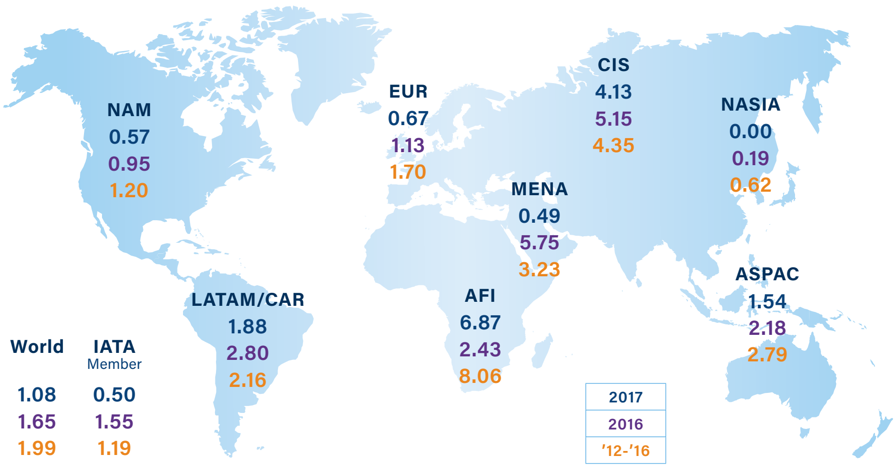
**People on board only*

ACCIDENTS PER OPERATOR REGION

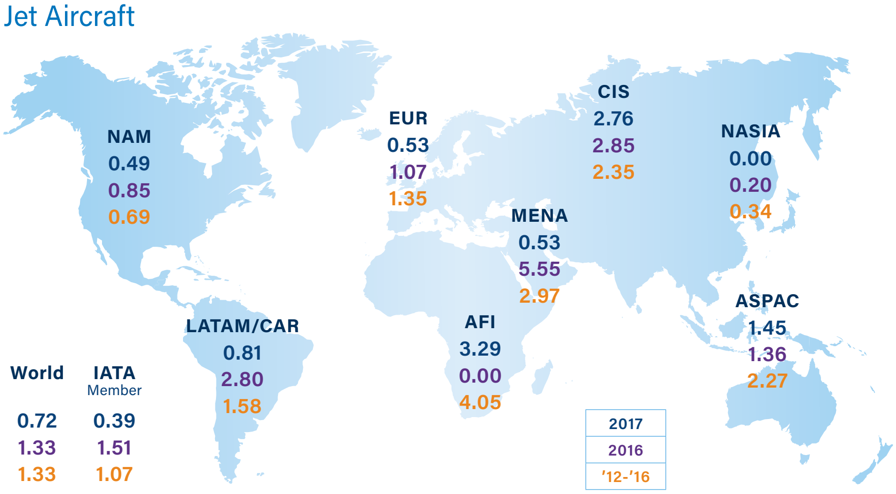
	AFI	ASPAC	CIS	EUR	LATAM/CAR	MENA	NAM	NASIA
Total	9	11	5	6	6	1	7	0
Hull Losses	4	2	3	1	1	0	2	0
Substantial Damage	5	9	2	5	5	1	5	0
Fatal	0	1	2	1	0	0	2	0
Full-Loss Equivalents	0.0	0.7	1.3	1.0	0.0	0.0	1.0	0.0
Fatalities	0	2	10	4	0	0	3	0

ALL ACCIDENTS

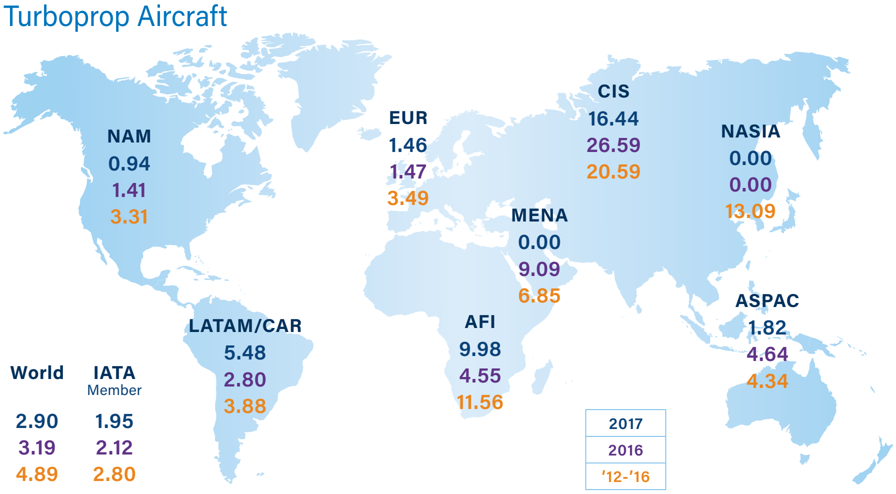
Jet & Turboprop Aircraft



Jet Aircraft

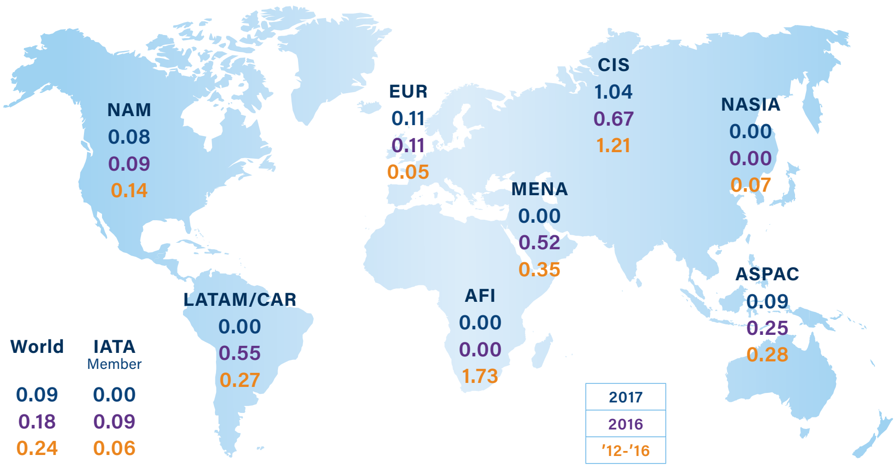


Turboprop Aircraft

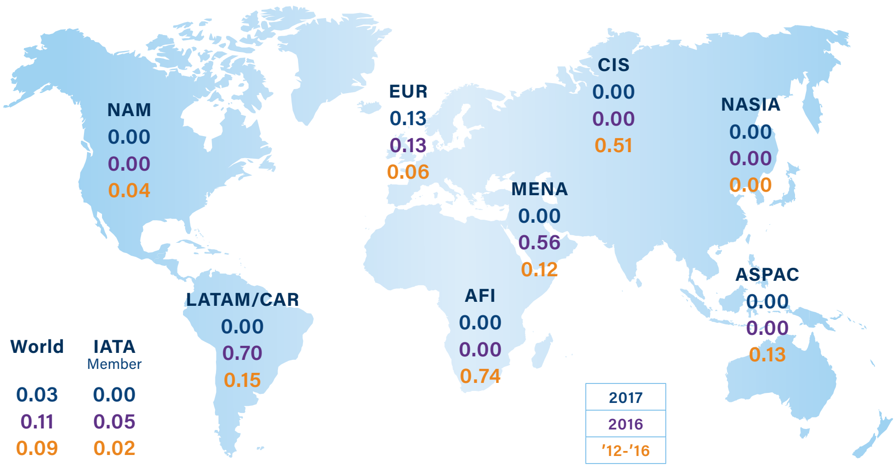


FATALITY RISK

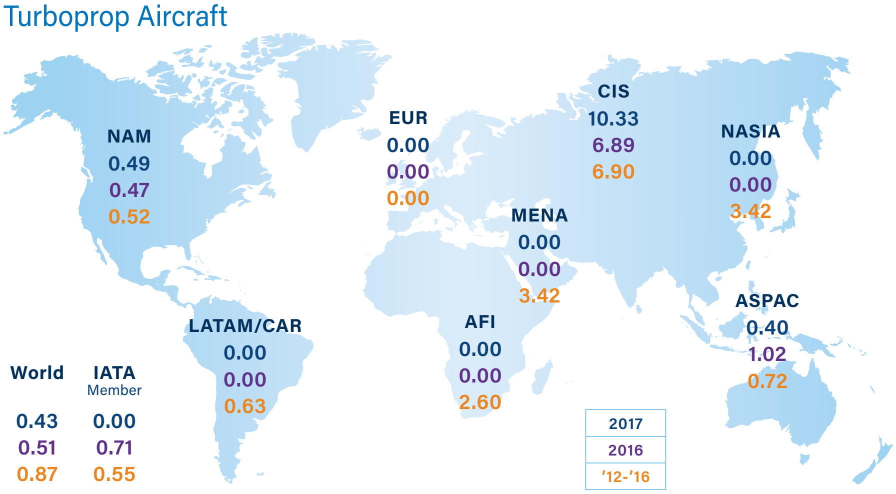
Jet & Turboprop Aircraft



Jet Aircraft

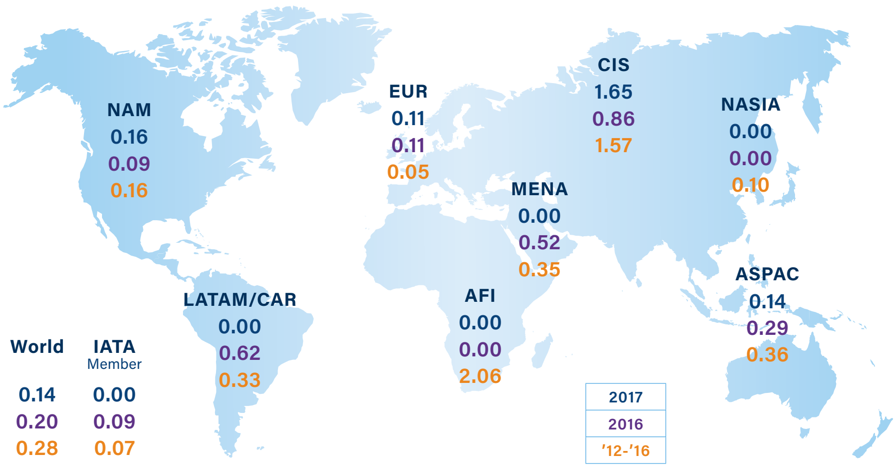


Turboprop Aircraft

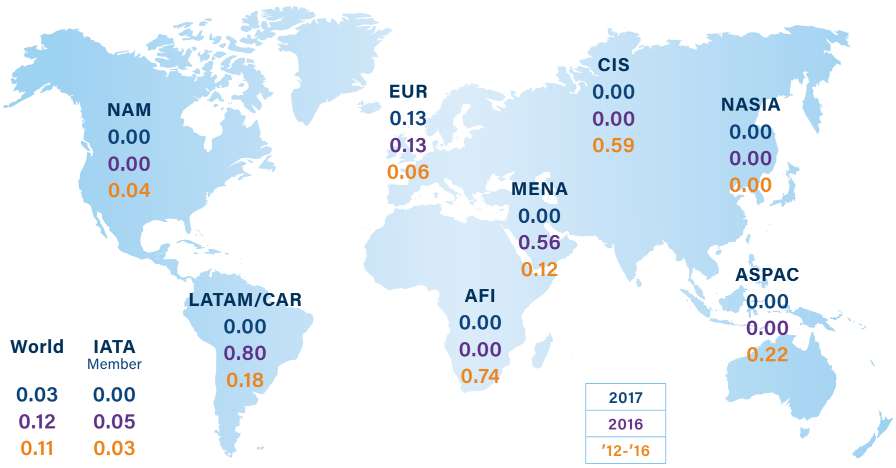


FATAL ACCIDENTS

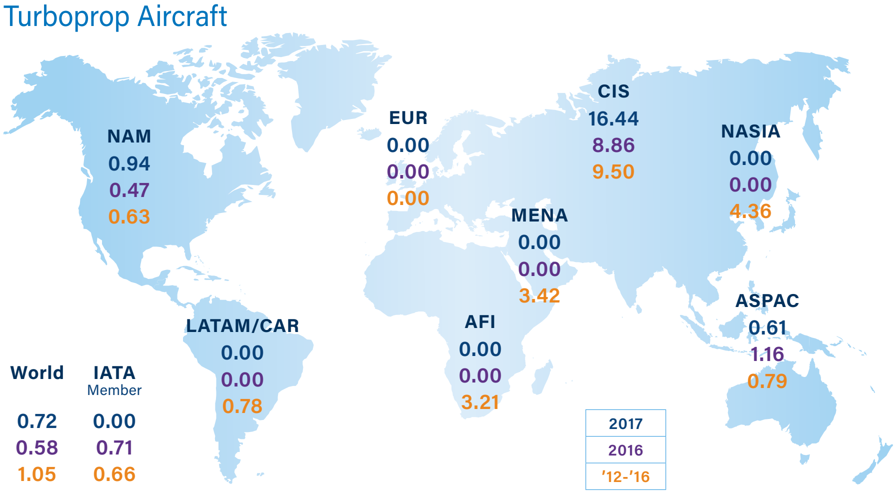
Jet & Turboprop Aircraft



Jet Aircraft

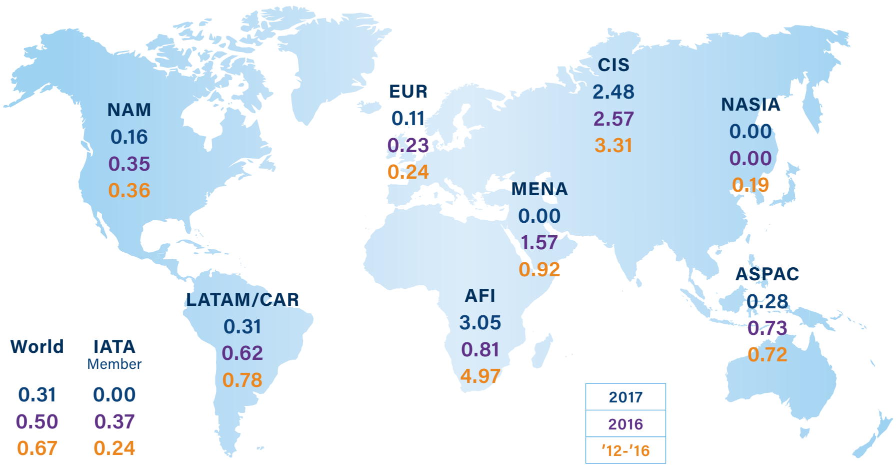


Turboprop Aircraft

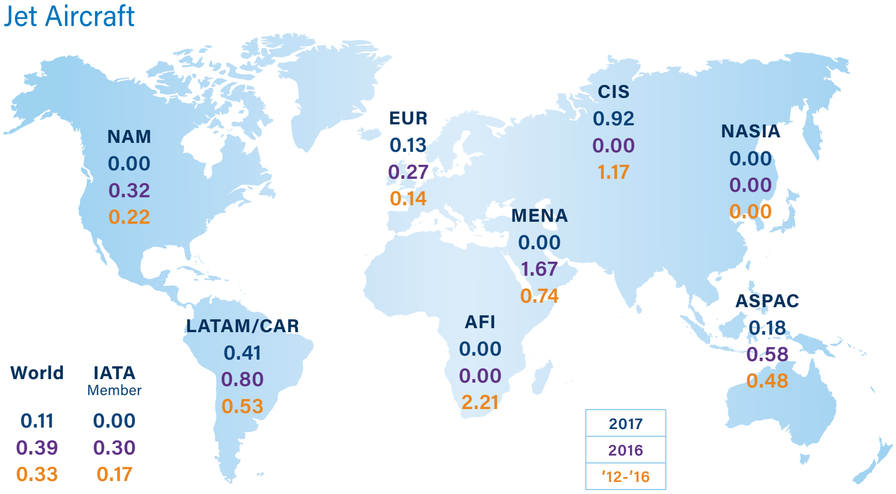


HULL LOSSES

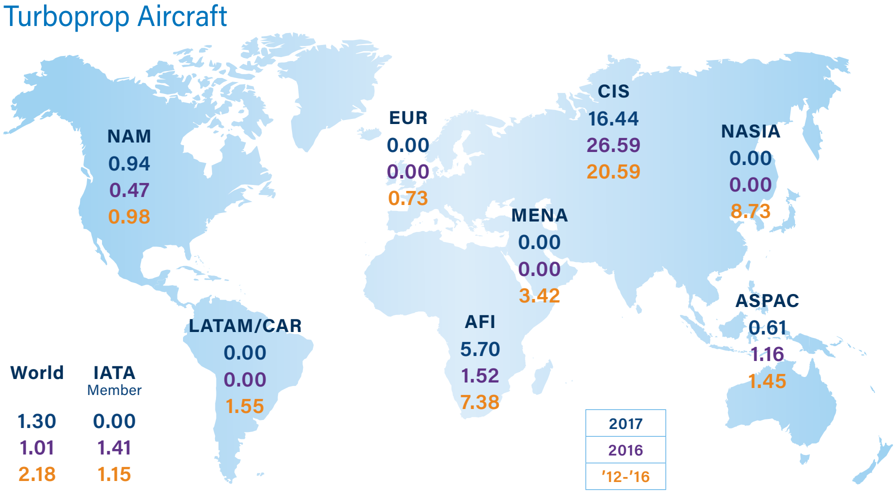
Jet & Turboprop Aircraft



Jet Aircraft



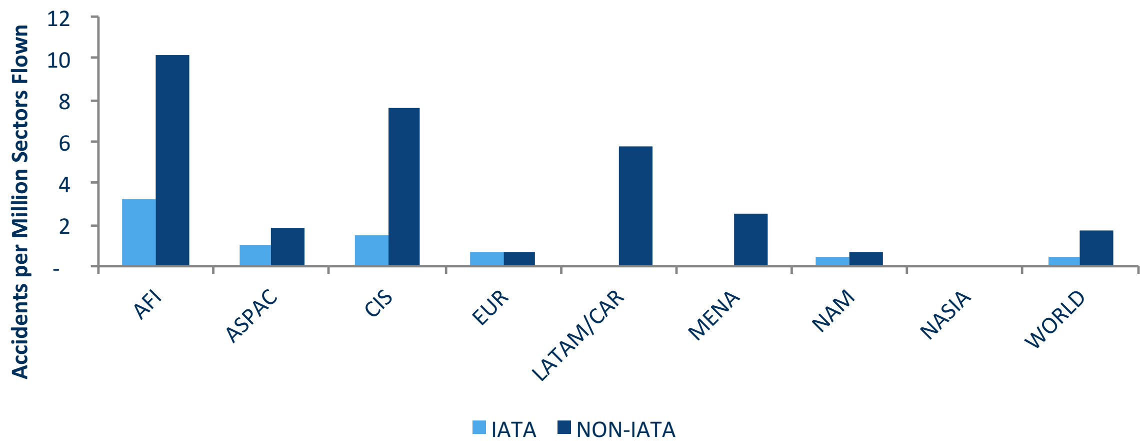
Turboprop Aircraft



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 region and globally. IATA member airlines outperformed nonmembers in the AFI, ASPAC, CIS and LATAM/CAR regions.

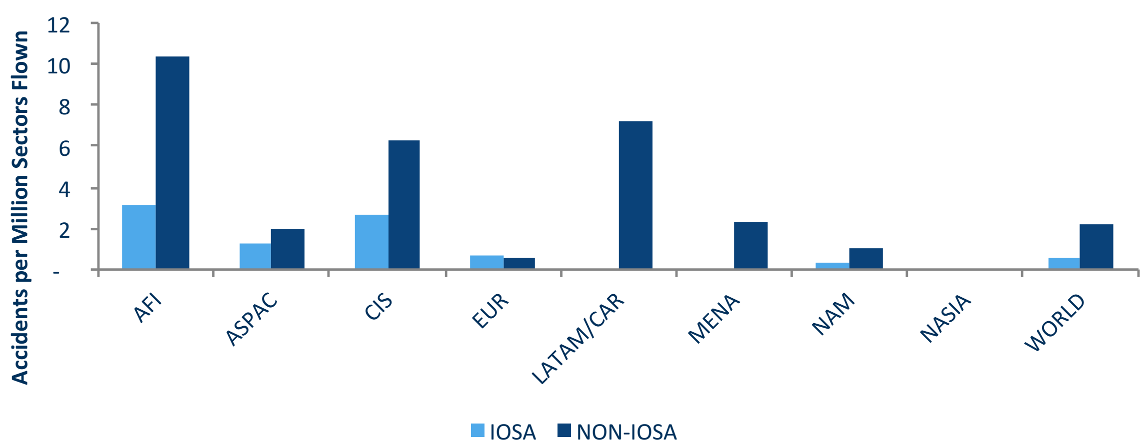
2017 Accident Rate: IATA Member Airlines vs. Nonmembers



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 region and globally. IOSA-registered airlines outperformed non-registered ones in the AFI, ASPAC, CIS and LATAM/CAR regions. The non-IOSA-registered airline accident rate was two times higher than for IOSA-registered airlines in 2017.

2017 Accident Rate: IOSA-Registered vs. Non-Registered



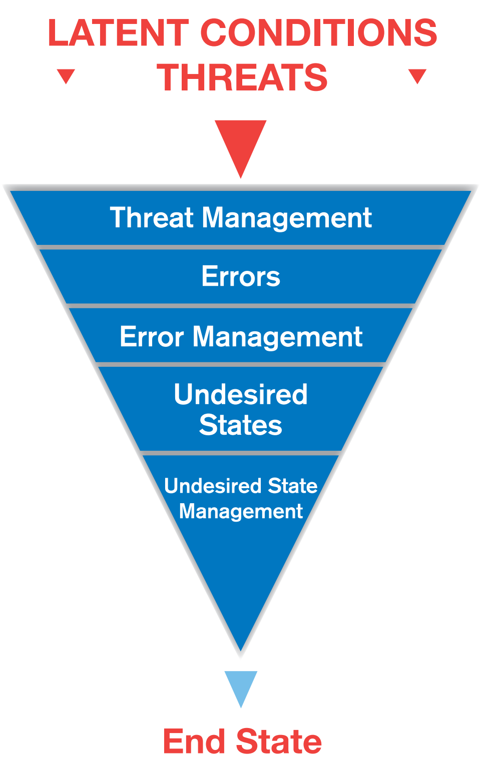
4

In-Depth Accident Analysis 2013 to 2017

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, the International Civil Aviation Organization (ICAO), member airlines and manufacturers 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 threat/error management. 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 Sections 4 through 6, the percentages shown with regards 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 section of contributing factors in Addendums A, B and C. 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 that are included in the Safety Report analysis as well as the breakdown of IATA regions.

The complete IATA TEM-based accident classification system for flight is presented in Annex 2.

ORGANIZATIONAL AND FLIGHT CREW-AIMED COUNTERMEASURES

Every year, the ACTG classifies accidents and, with the benefit of hindsight, determines actions or measures that could have been taken to prevent an accident. These proposed countermeasures are in two categories, systemic countermeasures and last-line-of-defense countermeasures that frontline personnel could action. Systemic countermeasures can be put in place by operators or state regulators. These countermeasures are based on activities, processes or systemic issues internal to the airline operation or state's oversight activities. Frontline personnel countermeasures are primarily directed towards flight crew, which may have been effective in managing the threat or errors identified in the accident analysis.

Countermeasures for other personnel, such as air traffic controllers, ground crew, cabin crew or maintenance staff are important, but they are not considered at this time.

Each event was coded with potential countermeasures that, with the benefit of hindsight, could have altered the outcome of events. A statistical compilation of the countermeasures is presented in Section 8 of this report.

ANALYSIS BY ACCIDENT CATEGORY AND REGION

This section presents an in-depth analysis of 2013 to 2017 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 – Definitions. An in-depth regional analysis can be found in Section 5.

Referring to these accident categories helps an operator to:

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

2017 Aircraft Accidents – Accident Count

Number of accidents: 45
Number of fatalities: 19

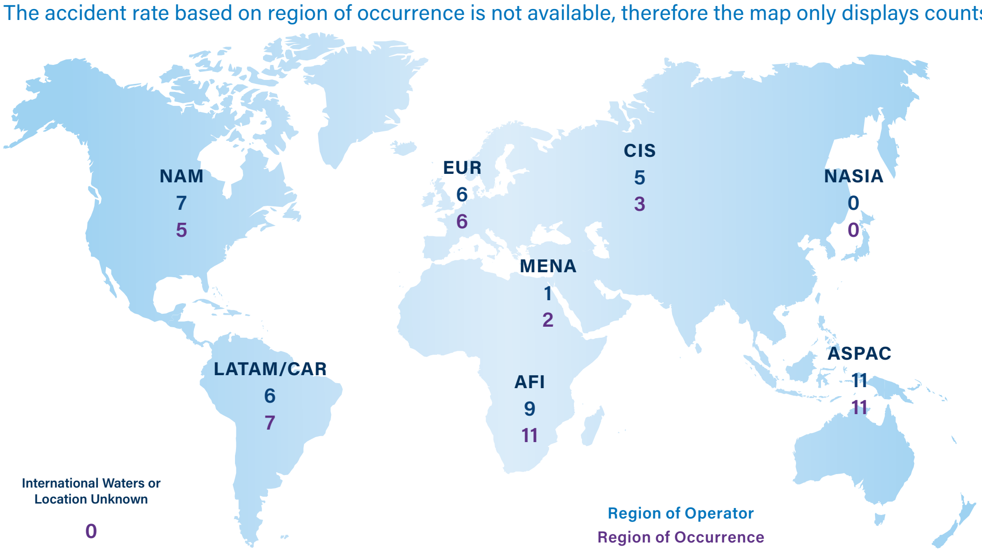
Accident Count % of Total	2017
IATA Member	24%
Full-Loss Equivalents	9%
Fatal	13%
Hull Losses	29%

Passenger	Cargo	Ferry	Jet	Turboprop
71%	29%	0%	56%	44%

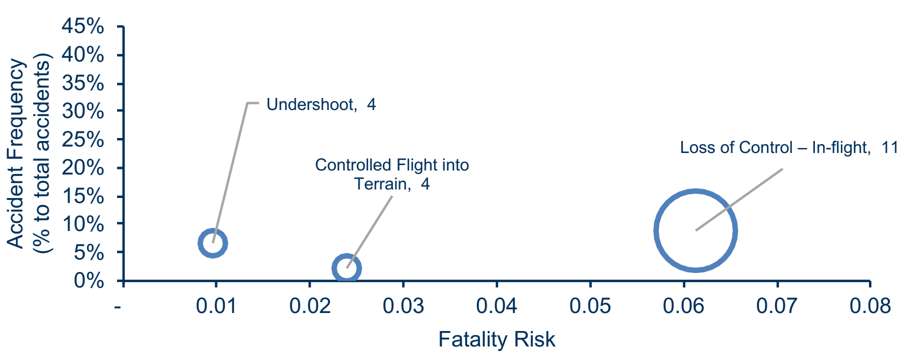
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2017)

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



Accident Category Frequency and Fatality Risk (2017)



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.

Top Primary Contributing factors

Latent Conditions

N/A

Threats

Air Traffic Services:
11%

Flight Crew Errors

Manual Handling/Flight Controls:
64%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
33%

Countermeasure

Overall Crew Performance:
25%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2017 Aircraft Accidents – Accident Rate*

Accident rate*: 1.08

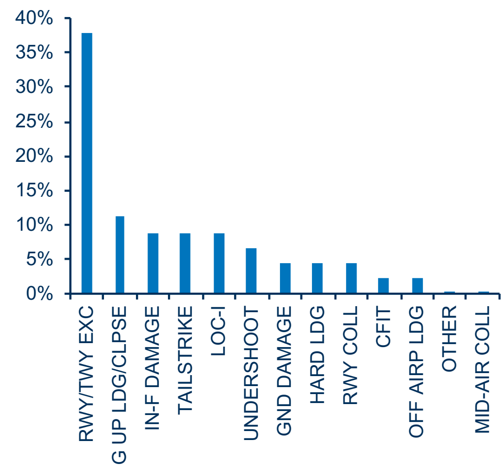
Accident Rate*	2017
IATA Member	0.50
Fatality Risk**	0.09
Fatal	0.14
Hull Losses	0.31

Jet	Turboprop	
0.72	2.90	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 (2017)

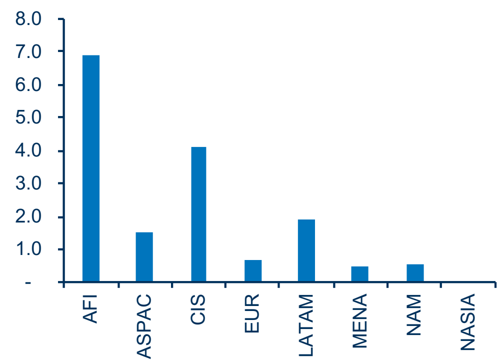
Distribution of accidents as percentage of total



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

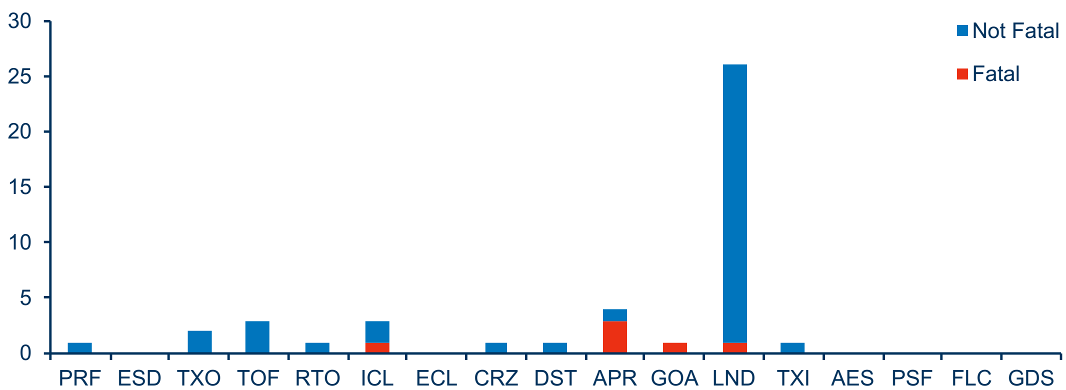
Regional Accident Rate (2017)

Accidents per Million Sectors



Accidents per Phase of Flight (2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Refer to List of Phase of Flight definitions for full names

2013-2017 Aircraft Accidents – Accident Count

Number of accidents: 340
Number of fatalities: 1176

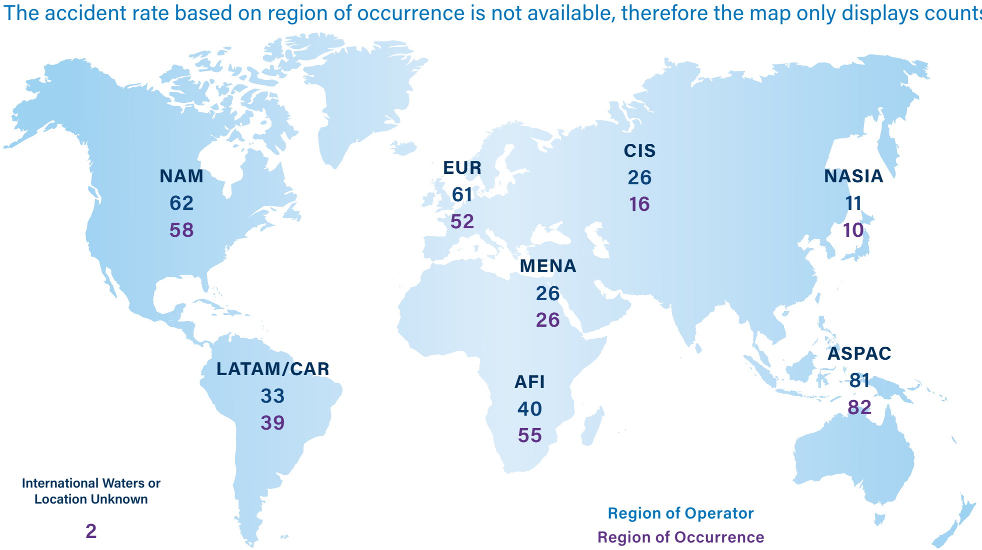
Accident Count % of Total	2013-2017
IATA Member	32%
Full-Loss Equivalents	11%
Fatal	13%
Hull Losses	31%

Passenger	Cargo	Ferry	Jet	Turboprop
76%	22%	3%	58%	42%

Note: the sum may not add to 100% due to rounding.
Statistics include a propeller accident happened in 2016.

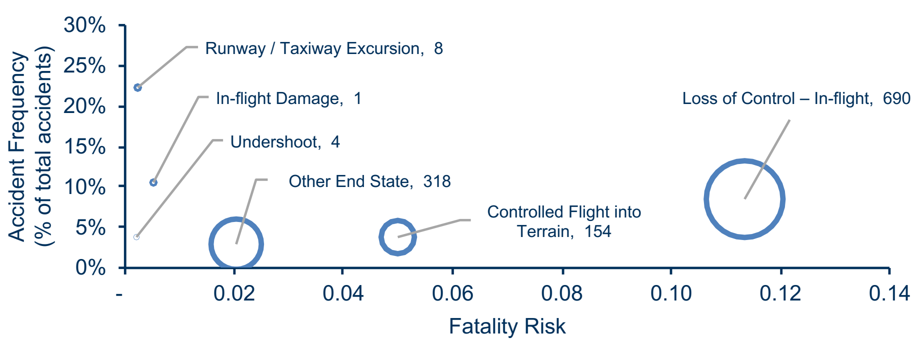
Number of Accidents per Region (2013-2017)

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



Note: An-74 Hard Landing. Location: Barneo Ice Base (International Waters)
B777 (MH370). Location: unknown
B1900, presumingly crashed near Sao Tome and Principe. Wreckage not known to have been found

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
33%

Threats

Meteorology:
29%

Flight Crew Errors

Manual Handling/Flight Controls:
34%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
24%

Countermeasure

Overall Crew Performance:
21%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2013-2017 Aircraft Accidents – Accident Rate*

Accident rate*: 1.76

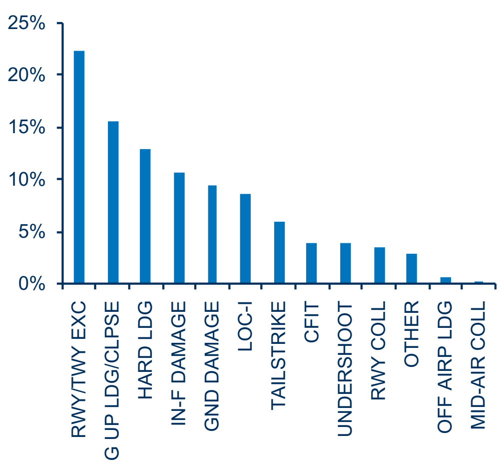
Accident Rate*	2013-2017
IATA Member	1.10
Fatality Risk**	0.19
Fatal	0.23
Hull Losses	0.55

Jet	Turboprop	
1.25	4.11	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 (2013-2017)

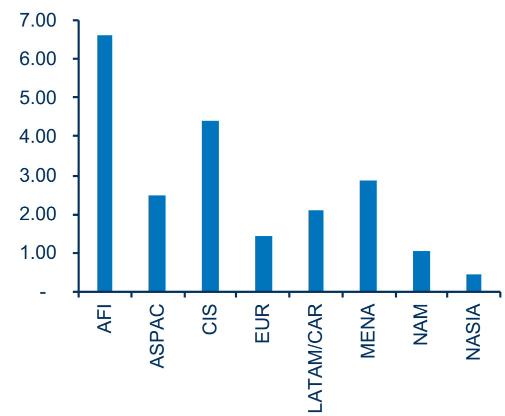
Distribution of accidents as percentage of total



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

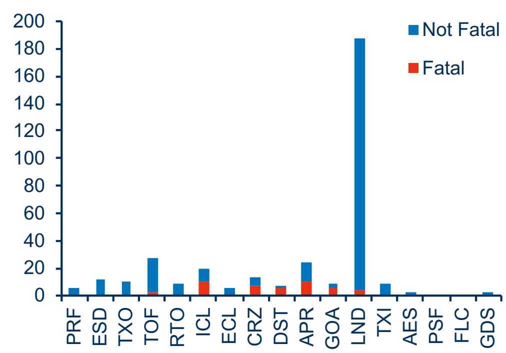
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



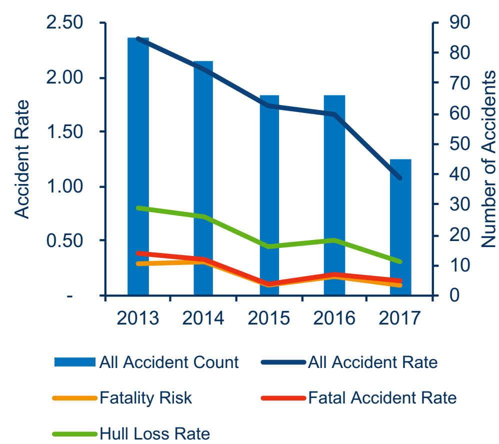
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



2013-2017 Fatal Aircraft Accidents – Accident Count

Number of accidents: 45
Number of fatalities: 1176

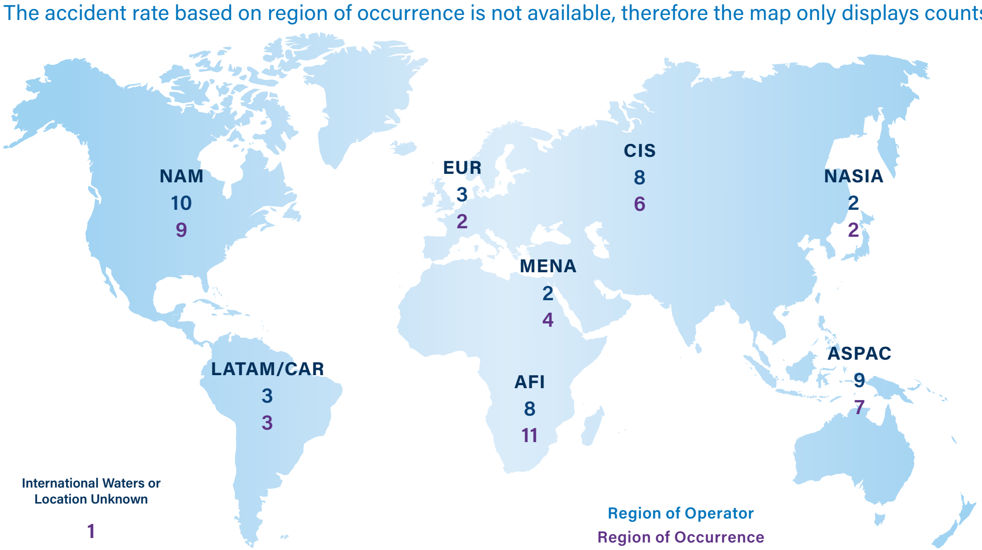
Accident Count % of Total	2013-2017
IATA Member	13%
Full-Loss Equivalents	85%
Fatal	100%
Hull Losses	100%

Passenger	Cargo	Ferry	Jet	Turboprop
44%	51%	4%	29%	69%

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

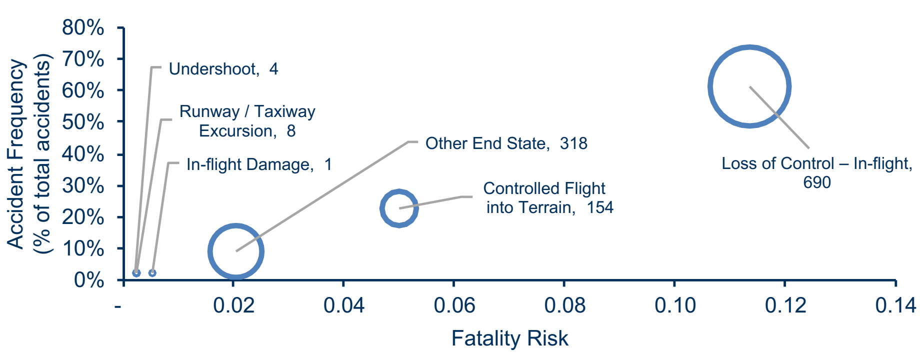
Number of Accidents per Region (2013-2017)

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



Note: B777 (MH370). Location: unknown
B1900, presumingly crashed near Sao Tome and Principe. Wreckage not known to have been found

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
40%

Threats

Meteorology:
40%

Flight Crew Errors

SOP Adherence/Cross-verification:
50%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
33%

Countermeasure

Leadership:
33%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2013-2017 Fatal Aircraft Accidents – Accident Rate*

Accident rate*: 0.23

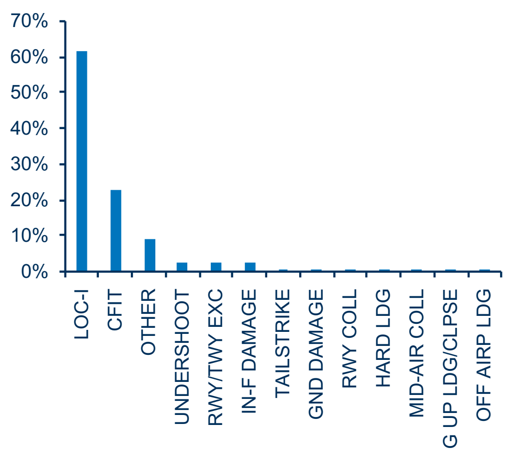
Accident Rate*	2013-2017
IATA Member	0.08
Fatality Risk**	0.20
Fatal	0.23
Hull Losses	0.23

Jet	Turboprop	
0.08	0.90	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 (2013-2017)

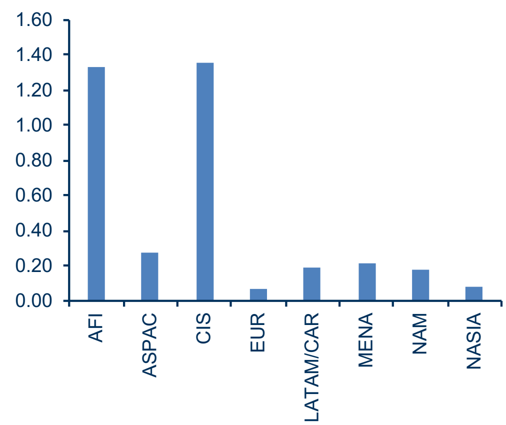
Distribution of accidents as percentage of total



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

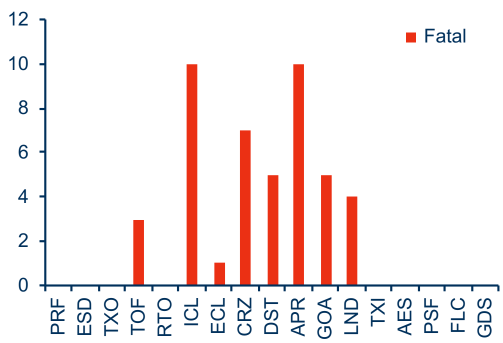
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



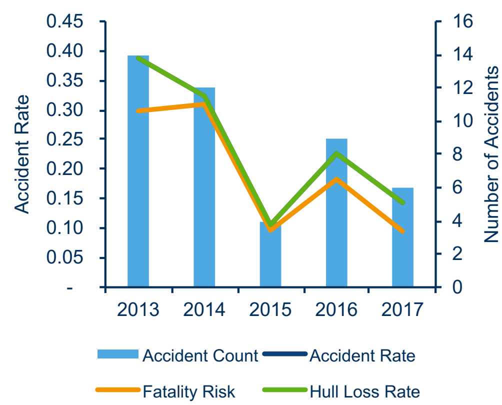
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



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

2013-2017 Nonfatal Aircraft Accidents – Accident Count

Number of accidents: 295
Number of fatalities: 0

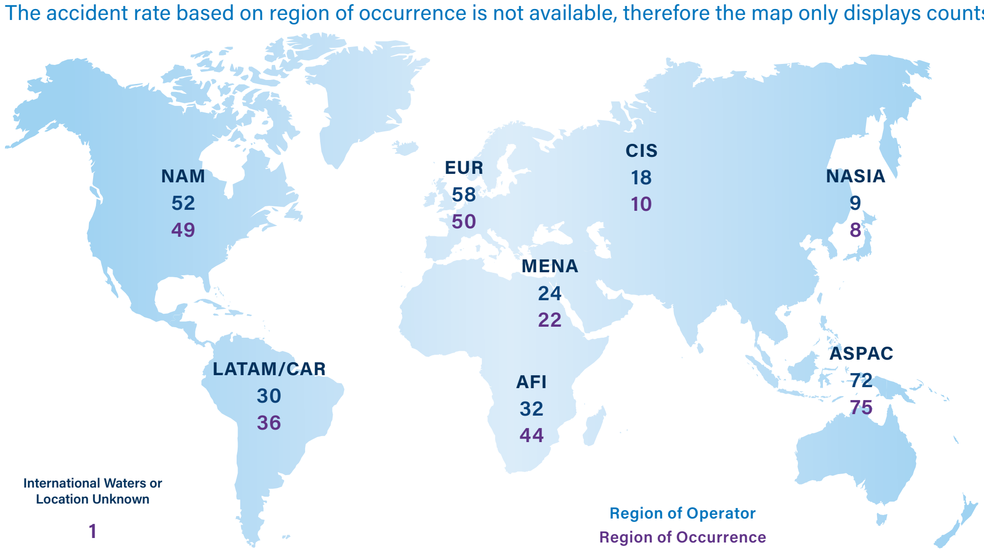
Accident Count % of Total	2013-2017
IATA Member	33%
Full-Loss Equivalents	0%
Fatal	0%
Hull Losses	21%

Passenger	Cargo	Ferry	Jet	Turboprop
80%	18%	2%	63%	37%

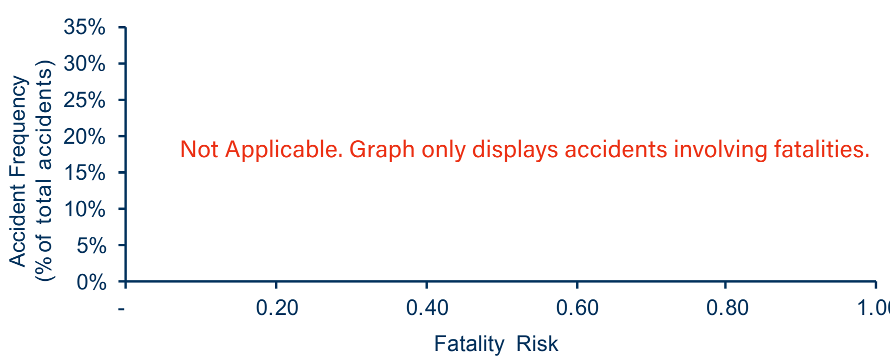
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
32%

Threats

Aircraft Malfunction:
28%

Flight Crew Errors

Manual Handling/Flight Controls:
35%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
26%

Countermeasure

Overall Crew Performance:
19%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2013-2017 Nonfatal Aircraft Accidents – Accident Rate*

Accident rate*: 1.53

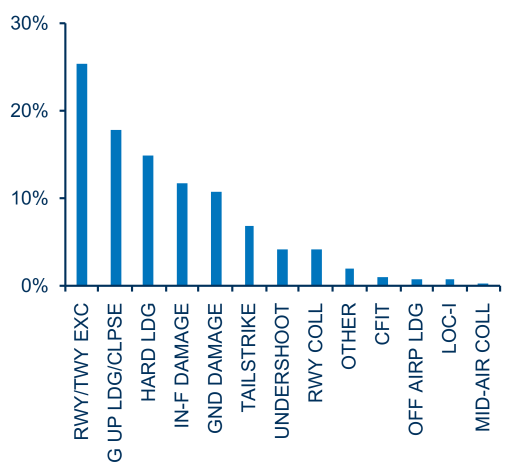
Accident Rate*	2013-2017
IATA Member	1.03
Fatality Risk**	0.00
Fatal	0.00
Hull Losses	0.33

Jet	Turboprop	
1.17	3.21	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 (2013-2017)

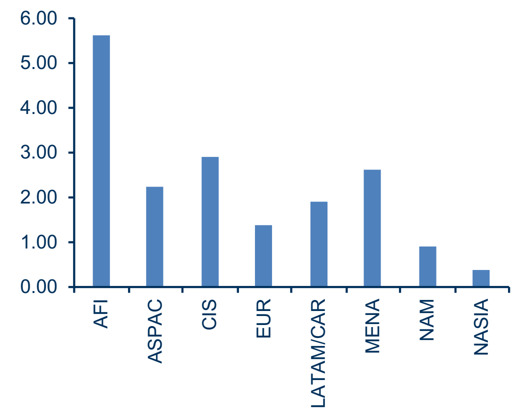
Distribution of accidents as percentage of total



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

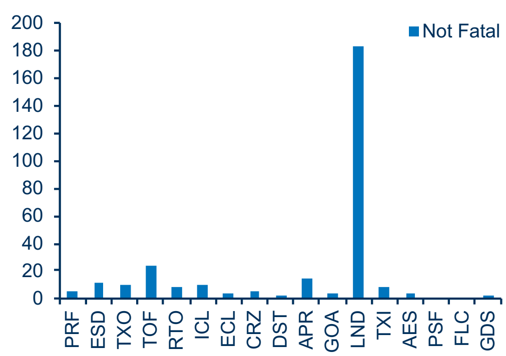
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



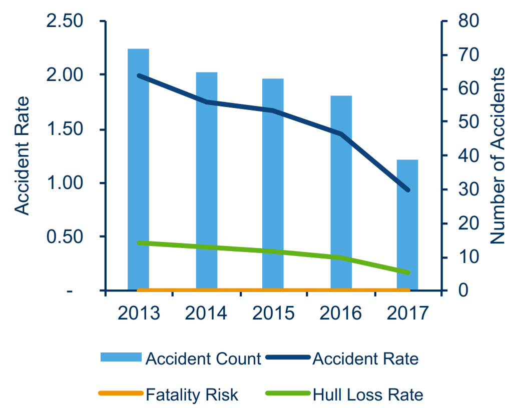
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



2013-2017 IOSA Aircraft Accidents – Accident Count

Number of accidents: 150
Number of fatalities: 614

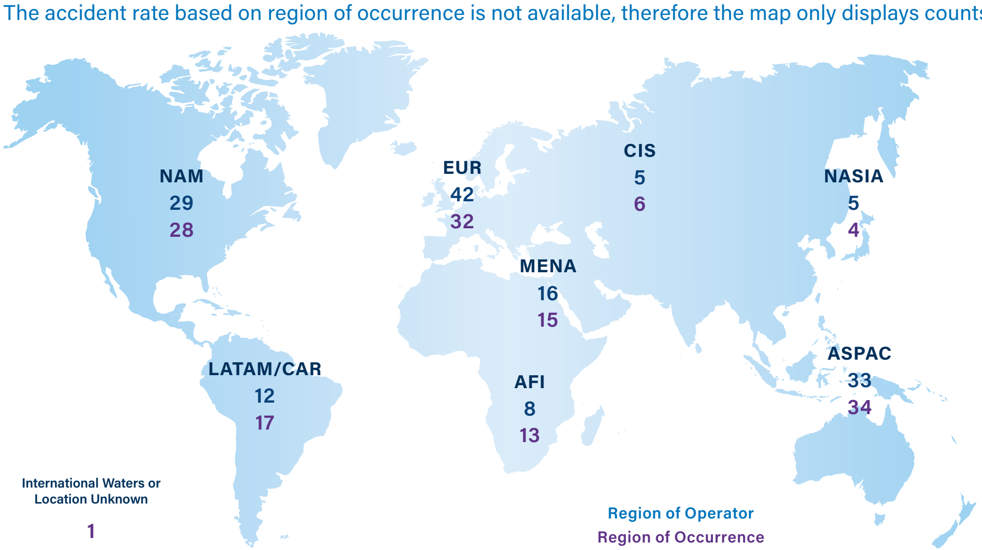
Accident Count % of Total	2013-2017
IATA Member	72%
Full-Loss Equivalents	6%
Fatal	7%
Hull Losses	19%

Passenger	Cargo	Ferry	Jet	Turboprop
91%	9%	1%	83%	17%

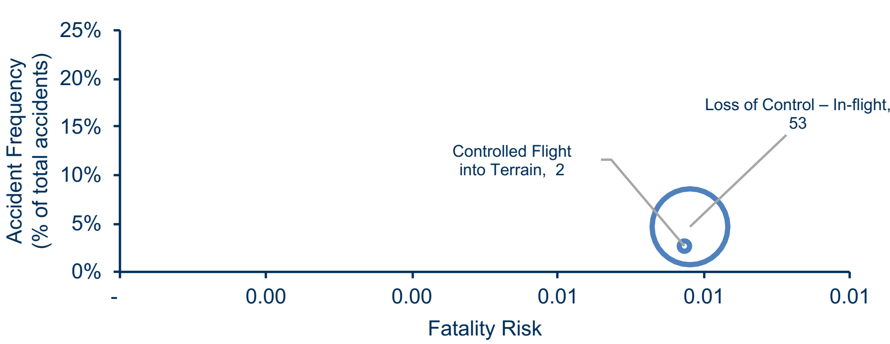
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
24%

Threats

Aircraft Malfunction:
28%

Flight Crew Errors

Manual Handling/Flight Controls:
30%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
20%

Countermeasure

Overall Crew Performance:
19%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2013-2017 IOSA Aircraft Accidents – Accident Rate*

Accident rate*: 1.16

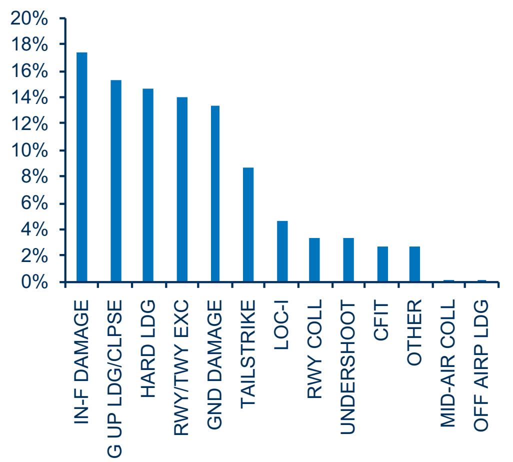
Accident Rate*	2013-2017
IATA Member	1.10
Fatality Risk**	0.07
Fatal	0.08
Hull Losses	0.22

Jet	Turboprop	
1.07	2.08	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 (2013-2017)

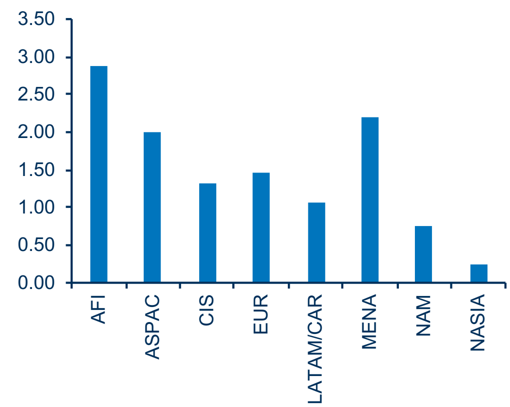
Distribution of accidents as percentage of total



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

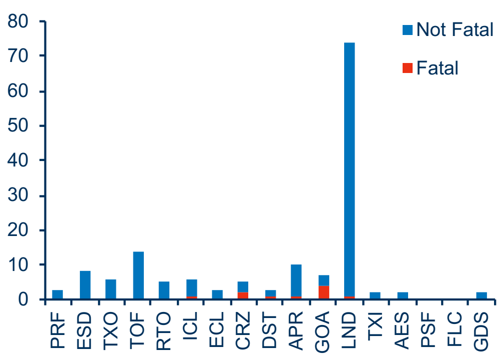
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



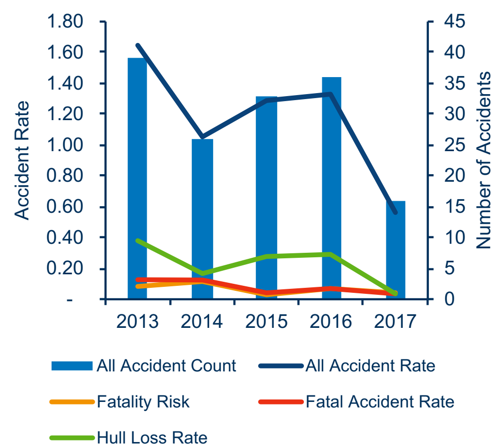
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



2013-2017 Non-IOSA Aircraft Accidents – Accident Count

Number of accidents: 190
Number of fatalities: 562

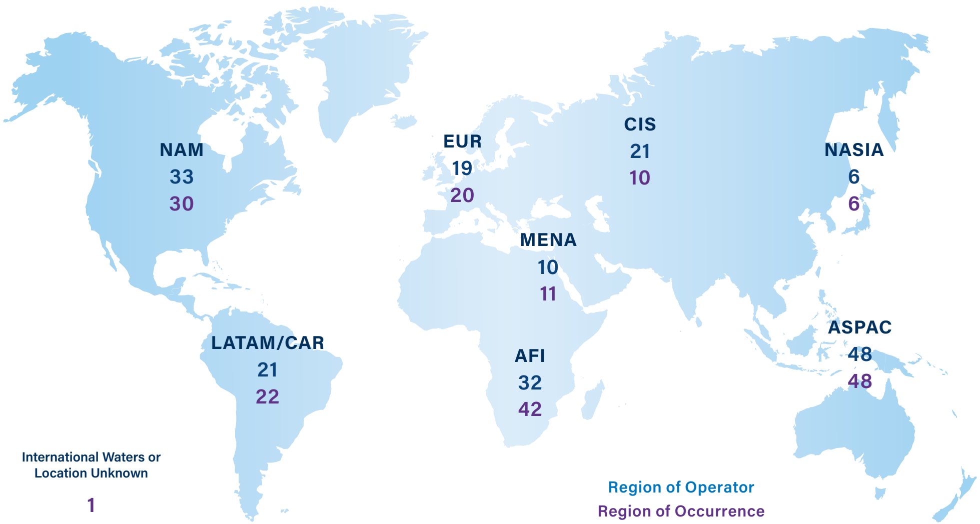
Accident Count % of Total	2013-2017
IATA Member	0%
Full-Loss Equivalents	15%
Fatal	18%
Hull Losses	40%

Passenger	Cargo	Ferry	Jet	Turboprop
64%	32%	4%	38%	60%

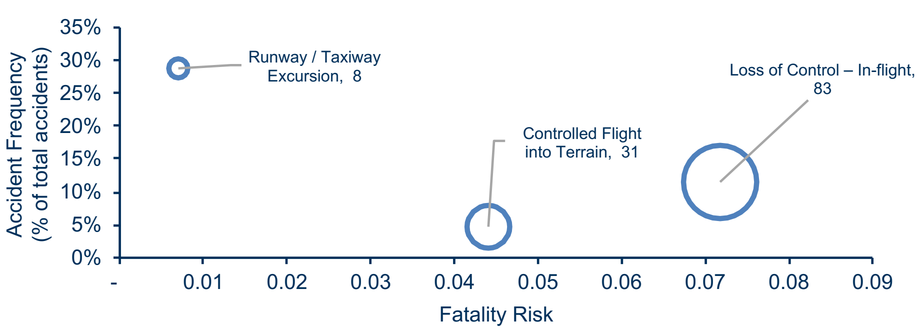
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
42%

Threats

Meteorology:
30%

Flight Crew Errors

Manual Handling/Flight Controls:
37%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
27%

Countermeasure

Overall Crew Performance:
22%

For more info regarding primary contributing factors see section 8

➤ See detailed view

2013-2017 Non-IOSA Aircraft Accidents – Accident Rate*

Accident rate*: 2.99

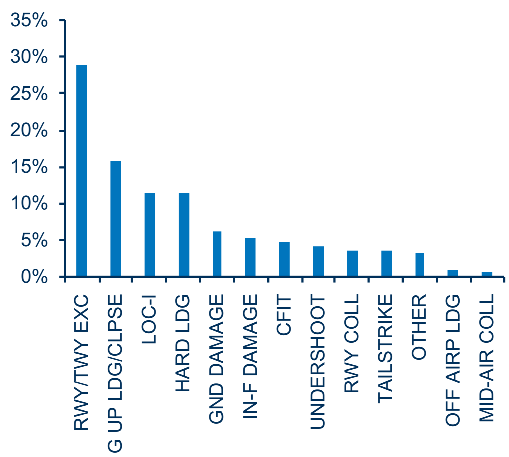
Accident Rate*	2013-2017
IATA Member	0.00
Fatality Risk**	0.45
Fatal	0.53
Hull Losses	1.21

Jet	Turboprop	
1.77	5.21	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 (2013-2017)

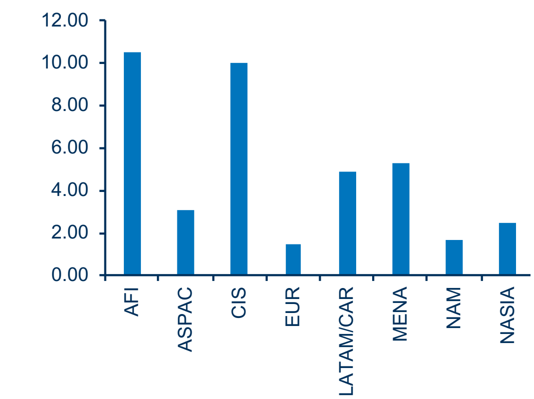
Distribution of accidents as percentage of total



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

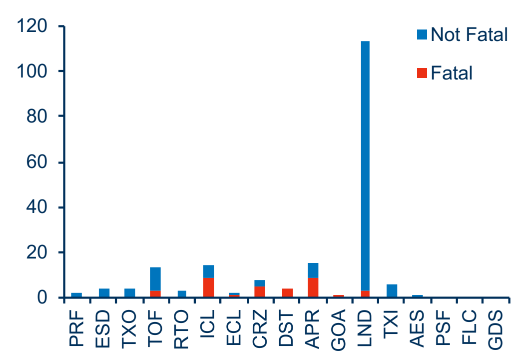
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



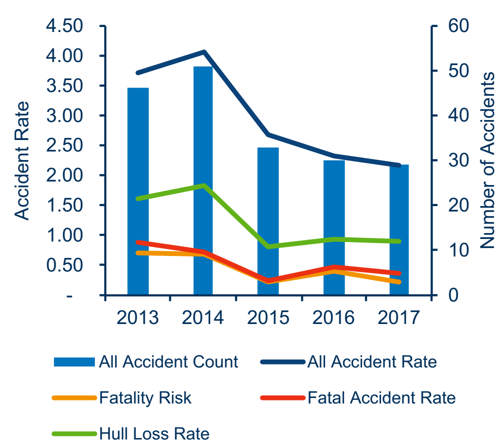
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Controlled Flight into Terrain – Accident Count

2017 Number of accidents: 1 Number of fatalities: 4

2013-2017 Number of accidents: 13 Number of fatalities: 154

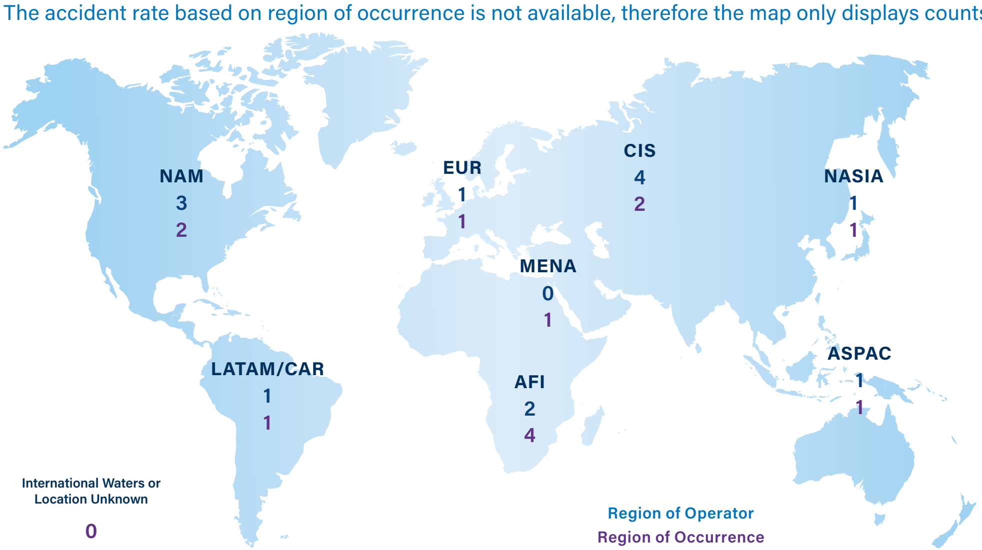
Accident Count % of Total	2017	'13-'17
IATA Member	0%	15%
Full-Loss Equivalents	100%	66%
Fatal	100%	77%
Hull Losses	100%	92%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	0%	100%	0%	100%	0%
2013-2017	31%	62%	8%	23%	77%

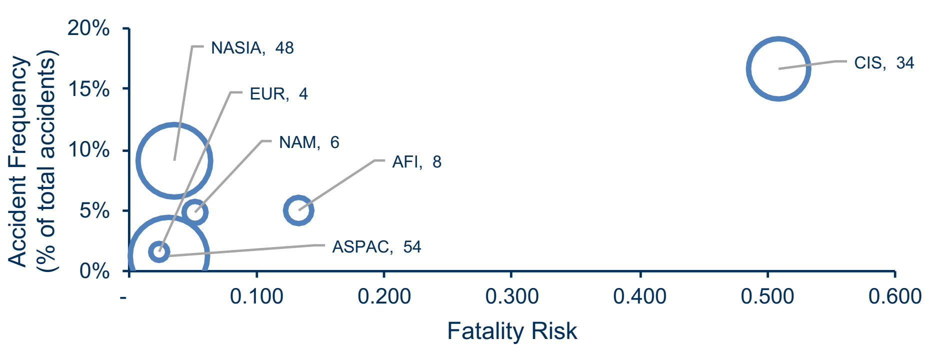
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight: 78%

Threats

Meteorology: 56%

Flight Crew Errors

SOP Adherence/Cross-verification: 67%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation: 56%

Countermeasure

Monitor/Cross-check: 56%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Controlled Flight into Terrain – Accident Rate*

2017 Accident rate: 0.02
2013-2017 Accident rate: 0.07

Accident Rate*	2017	'13-'17
IATA Member	0.00	0.02
Fatality Risk**	0.02	0.04
Fatal	0.02	0.05
Hull Losses	0.02	0.06

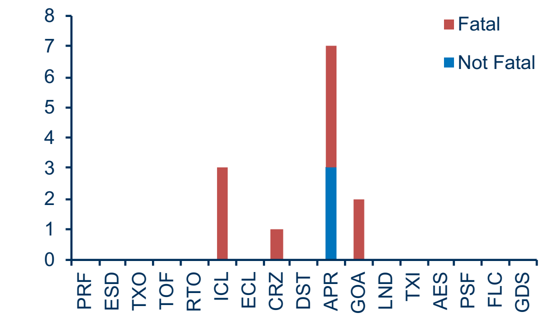
	Jet	Turboprop
2017	0.03	0.00
2013-2017	0.02	0.29

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

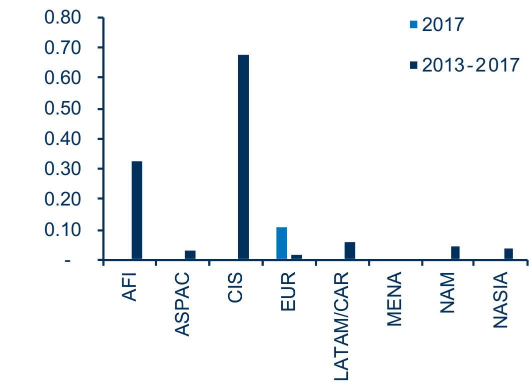
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



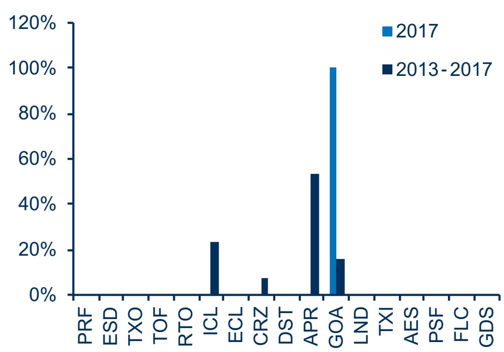
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



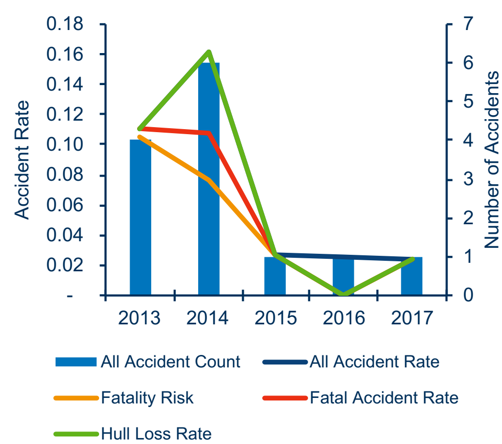
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Loss of Control – In-flight – Accident Count

2017 Number of accidents: 4 Number of fatalities: 11
2013-2017 Number of accidents: 29 Number of fatalities: 690

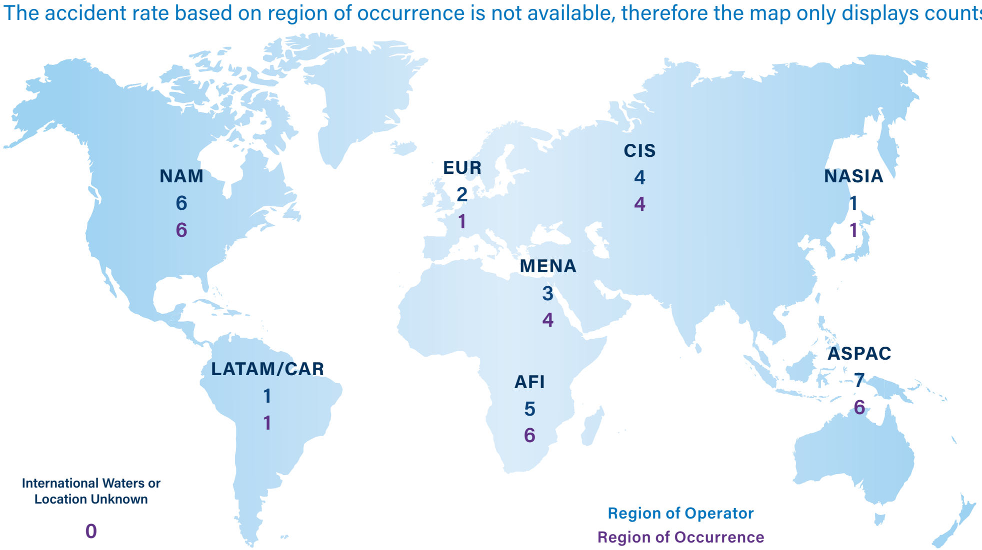
Accident Count % of Total	2017	'13-'17
IATA Member	0%	17%
Full-Loss Equivalents	64%	67%
Fatal	100%	93%
Hull Losses	100%	97%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	50%	50%	0%	0%	100%
2013-2017	55%	41%	3%	31%	69%

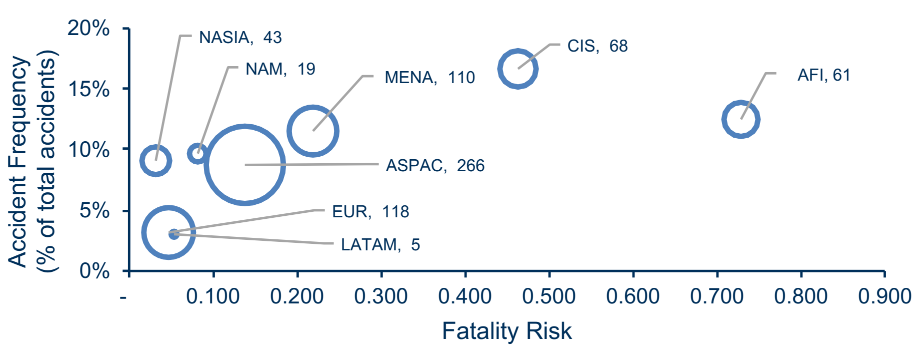
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Flight Operations:
30%

Threats

Aircraft Malfunction:
39%

Flight Crew Errors

SOP Adherence/Cross-verification:
39%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
26%

Countermeasure

Overall Crew Performance:
35%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Loss of Control – In-flight – Accident Rate*

2017 Accident rate: 0.10
2013-2017 Accident rate: 0.15

Accident Rate*	2017	'13-'17
IATA Member	0.00	0.05
Fatality Risk**	0.06	0.10
Fatal	0.10	0.14
Hull Losses	0.10	0.15

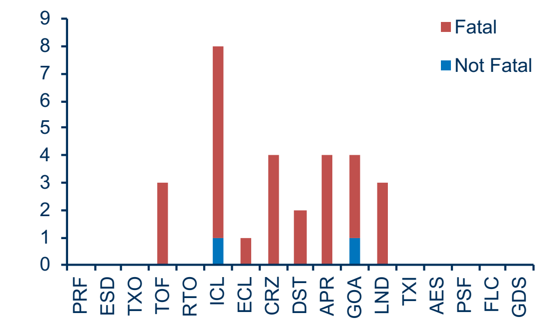
	Jet	Turboprop
2017	0.00	0.58
2013-2017	0.06	0.58

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

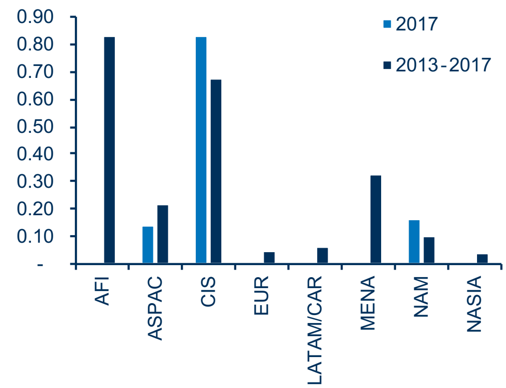
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



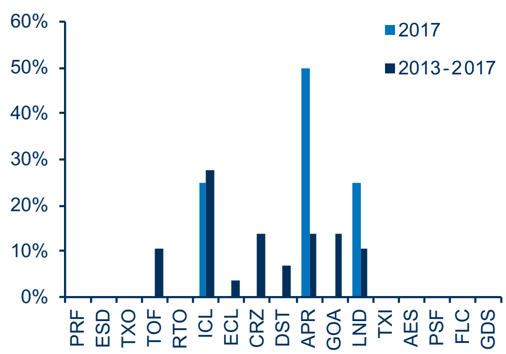
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



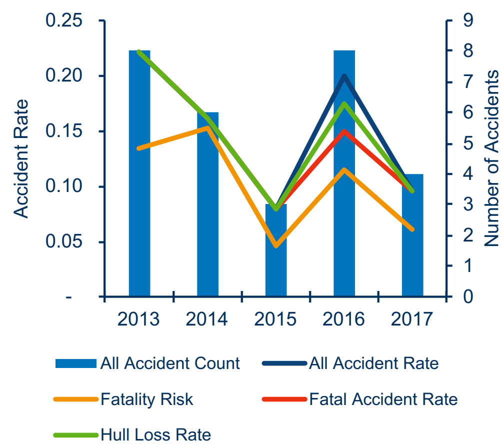
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



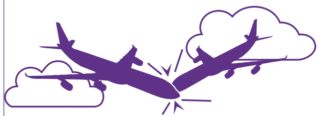
Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Mid-air Collision – Accident Count

2017 Number of accidents: 0 Number of fatalities: 0
2013-2017 Number of accidents: 1 Number of fatalities: 0



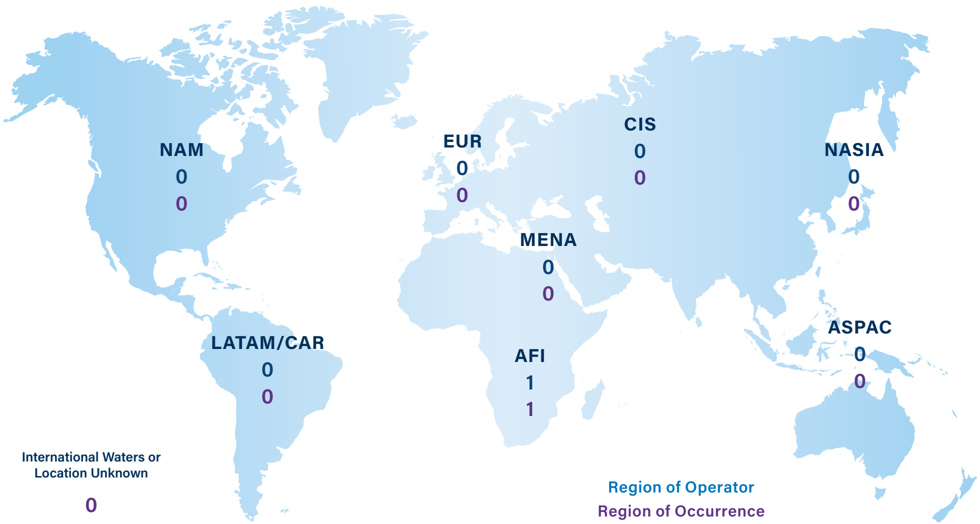
Accident Count % of Total	2017	'13-'17
IATA Member	0%	0%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	0%	0%	0%	0%	0%
2013-2017	100%	0%	0%	100%	0%

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

Number of Accidents per Region (2013-2017)

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



Note: This report only considers fatalities on board of commercial revenue flights. However, it is important to highlight that in 2016 a mid-air collision involving a commercial jet and a noncommercial aircraft (HS-125 ambulance configuration) resulted in the crash and death of all on board of the HS-125. The B737 suffered substantial damage.

Accident Category Frequency and Fatality Risk (2013-2017)

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.

Top Contributing factors

Latent Conditions

At least three accidents required to display classification

Threats

At least three accidents required to display classification

Flight Crew Errors

At least three accidents required to display classification

Undesired Aircraft State

At least three accidents required to display classification

Countermeasure

At least three accidents required to display classification

For more info regarding primary contributing factors see section 8

➤ See detailed view

Mid-air Collision – Accident Rate*

2017 Accident rate: 0.00
2013-2017 Accident rate: 0.01

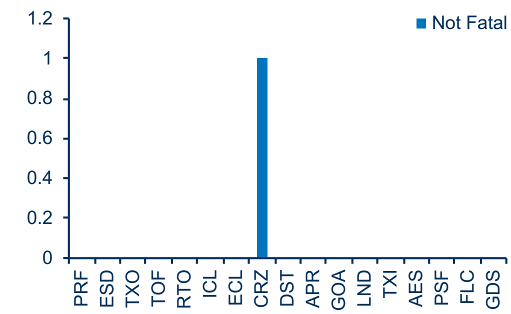
Accident Rate*	2017	'13-'17
IATA Member	0.00	0.00
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.00

	Jet	Turboprop	
2017	0.00	0.00	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.01	0.00	

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

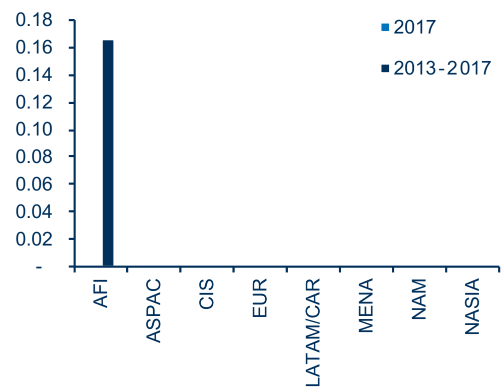
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



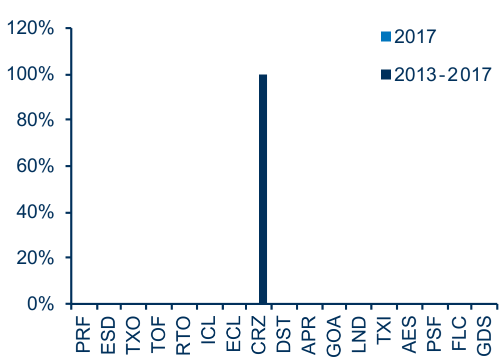
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



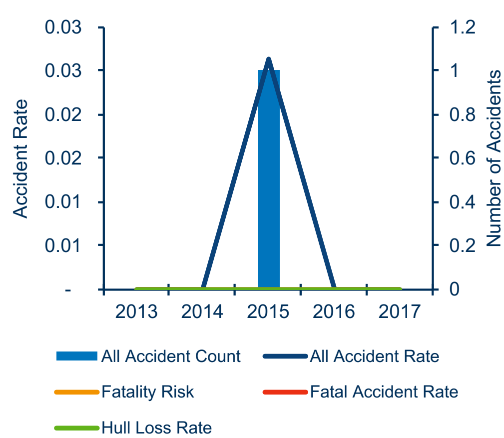
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Runway/Taxiway Excursion – Accident Count

2017	Number of accidents: 17	Number of fatalities: 0
2013-2017	Number of accidents: 76	Number of fatalities: 8

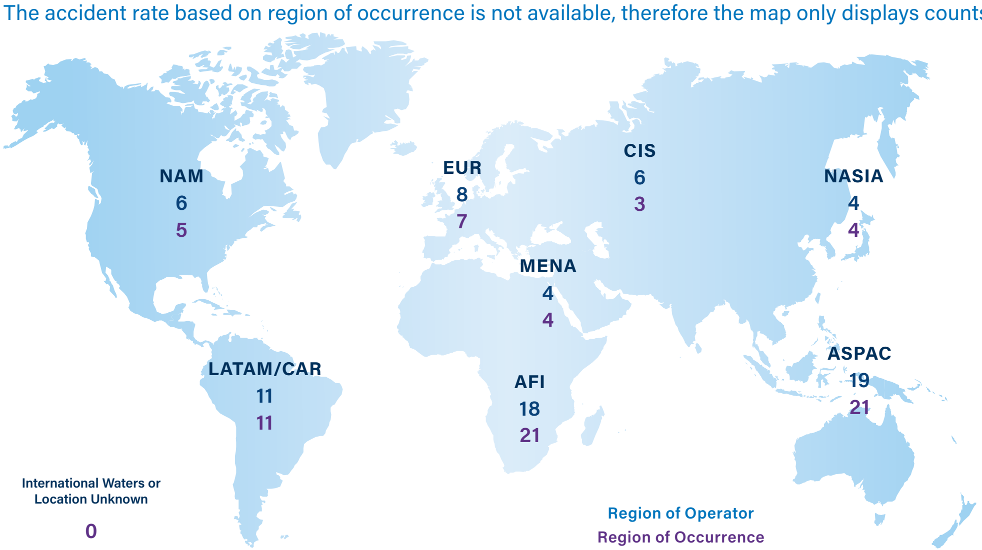
Accident Count % of Total	2017	'13-'17
IATA Member	12%	20%
Full-Loss Equivalents	0%	1%
Fatal	0%	1%
Hull Losses	35%	36%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	65%	35%	0%	53%	47%
2013-2017	74%	26%	0%	55%	43%

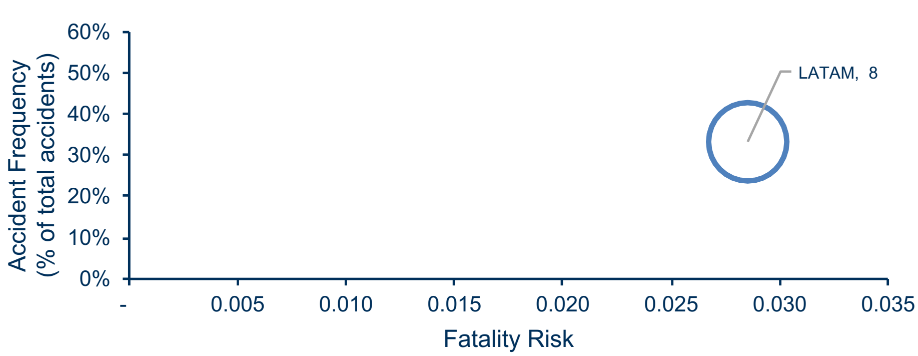
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
45%

Threats

Meteorology:
45%

Flight Crew Errors

Manual Handling/Flight Controls:
38%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
43%

Countermeasure

Overall Crew Performance:
28%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Runway/Taxiway Excursion – Accident Rate*

2017 Accident rate: 0.41
2013-2017 Accident rate: 0.39

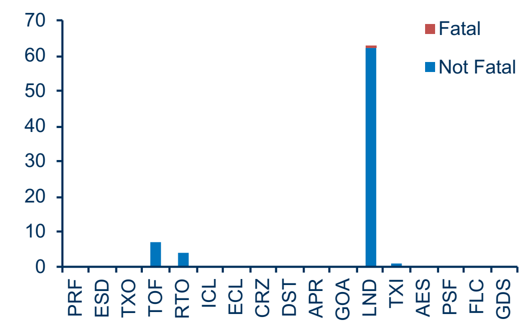
Accident Rate*	2017	'13-'17
IATA Member	0.09	0.15
Fatality Risk**	0.00	0.00
Fatal	0.00	0.01
Hull Losses	0.14	0.14

	Jet	Turboprop	
2017	0.26	1.16	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.26	0.96	

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

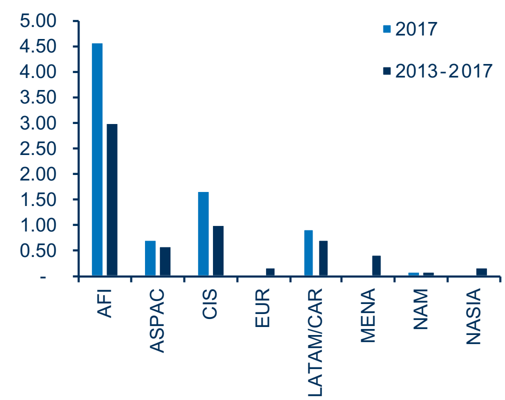
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



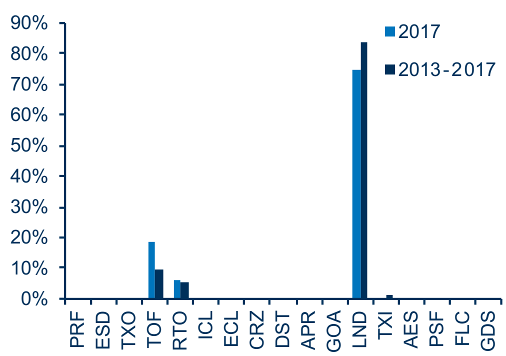
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



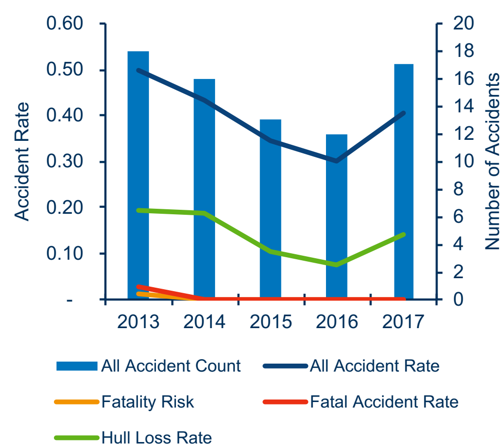
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



In-flight Damage – Accident Count

2017	Number of accidents: 4	Number of fatalities: 0
2013-2017	Number of accidents: 36	Number of fatalities: 1

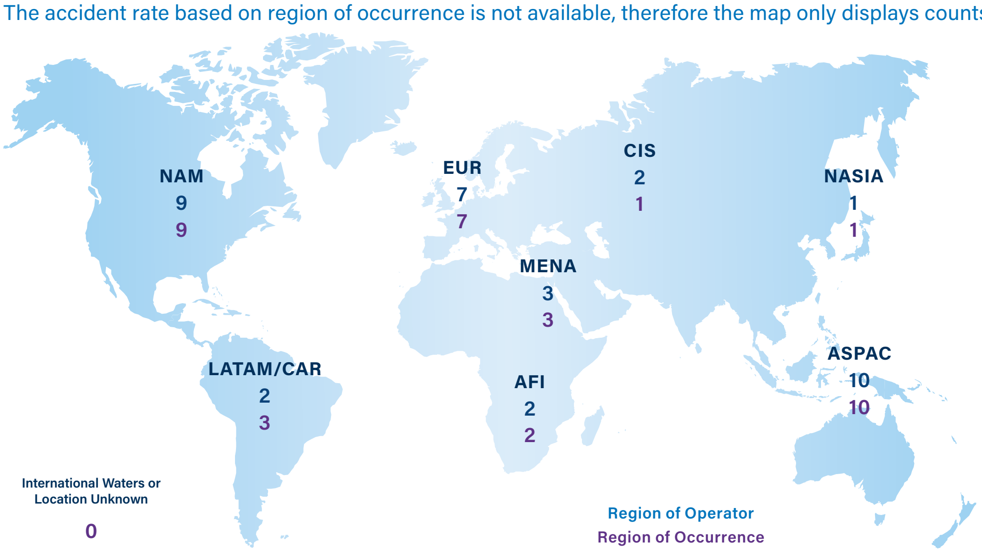
Accident Count % of Total	2017	'13-'17
IATA Member	50%	58%
Full-Loss Equivalents	0%	3%
Fatal	0%	3%
Hull Losses	0%	11%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	100%	0%
2013-2017	86%	14%	0%	86%	14%

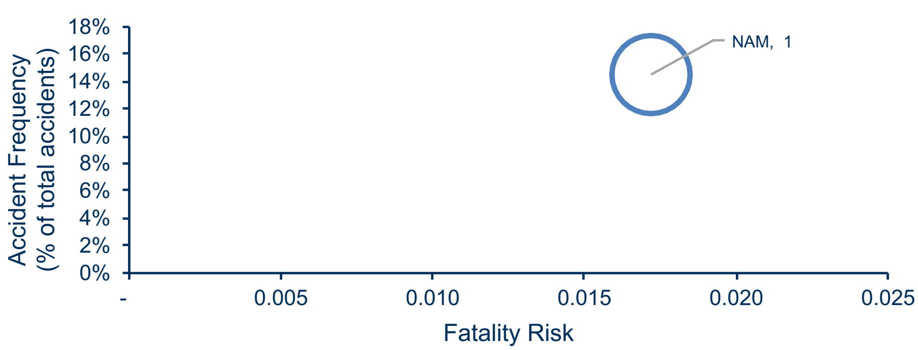
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Design:
15%

Threats

Aircraft Malfunction:
32%

Flight Crew Errors

SOP Adherence/Cross-verification:
15%

Undesired Aircraft State

Unnecessary Weather Penetration:
6%

Countermeasure

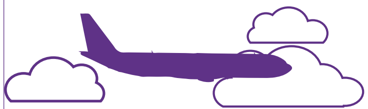
Leadership:
3%

For more info regarding primary contributing factors see section 8

➤ See detailed view

In-flight Damage – Accident Rate*

2017 Accident rate: 0.10
2013-2017 Accident rate: 0.19



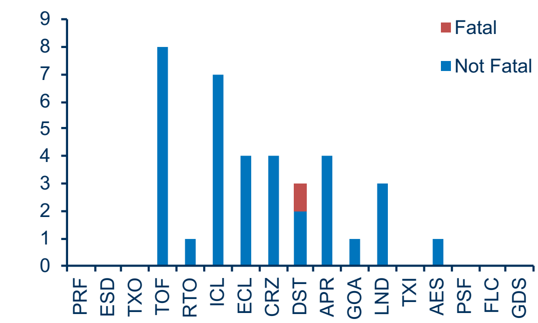
Accident Rate*	2017	'13-'17
IATA Member	0.09	0.21
Fatality Risk**	0.00	0.01
Fatal	0.00	0.01
Hull Losses	0.00	0.02

	Jet	Turboprop	
2017	**0.11**	**0.00**	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	**0.20**	**0.15**	

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

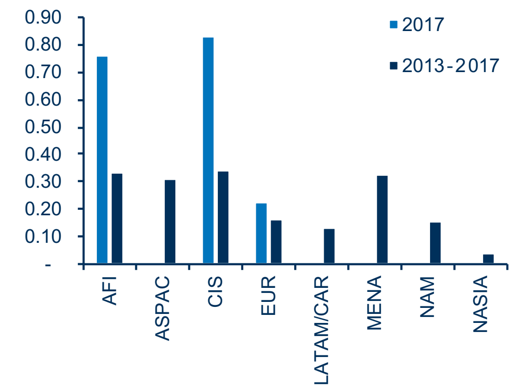
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



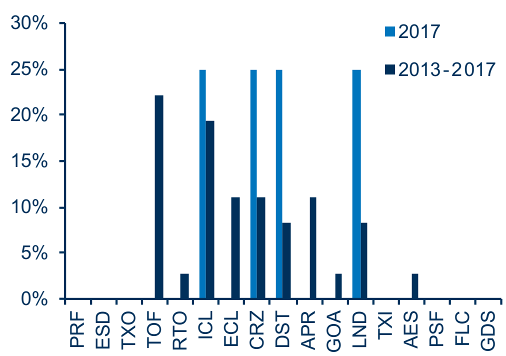
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



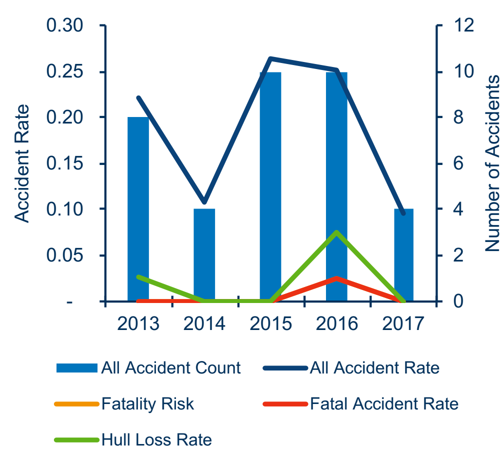
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Ground Damage – Accident Count

2017 Number of accidents: 2 Number of fatalities: 0
2013-2017 Number of accidents: 32 Number of fatalities: 0

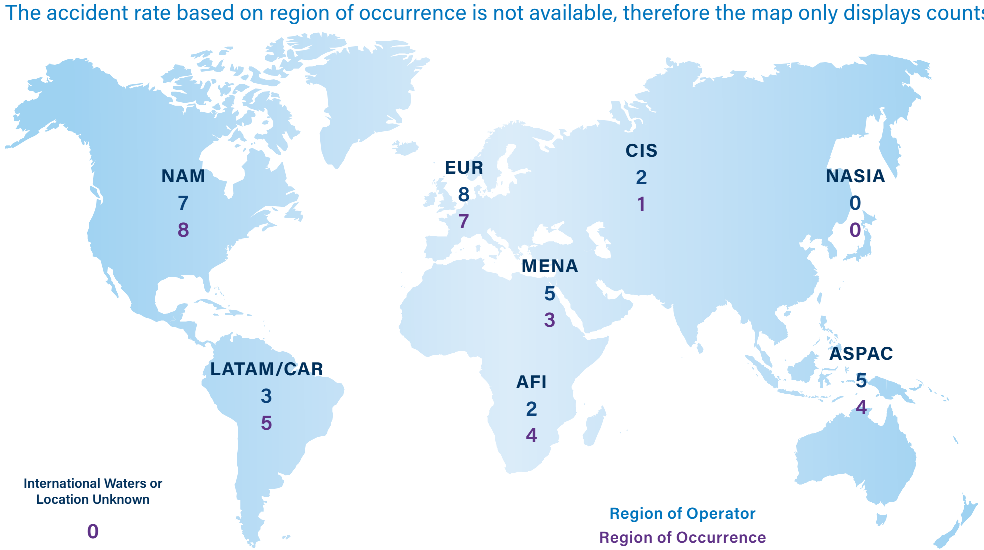
Accident Count % of Total	2017	'13-'17
IATA Member	50%	50%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	13%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	100%	0%
2013-2017	91%	6%	3%	84%	16%

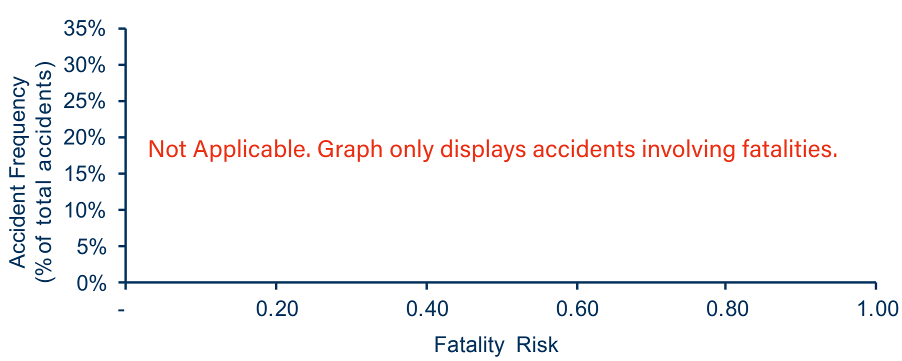
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
21%

Threats

Ground Events:
21%

Flight Crew Errors

SOP Adherence/Cross-verification:
11%

Undesired Aircraft State

Ramp Movements:
11%

Countermeasure

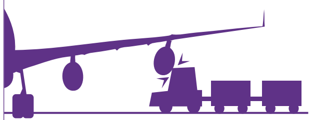
Overall Crew Performance:
14%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Ground Damage – Accident Rate*

2017 Accident rate: 0.05
2013-2017 Accident rate: 0.17



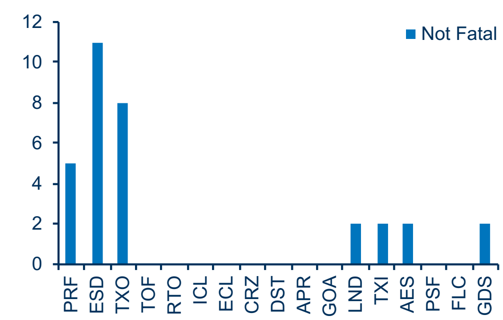
Accident Rate*	2017	'13-'17
IATA Member	0.05	0.16
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.02

	Jet	Turboprop	
2017	0.06	0.00	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.17	0.15	

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

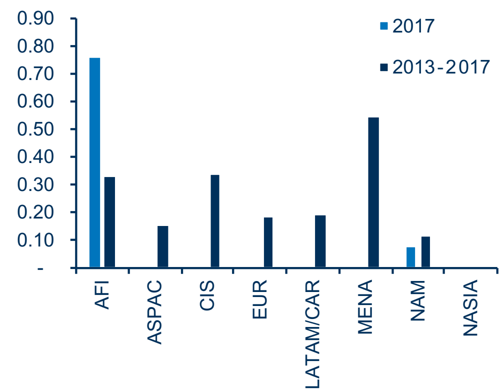
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



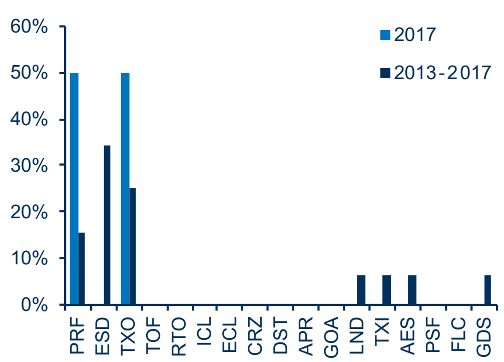
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



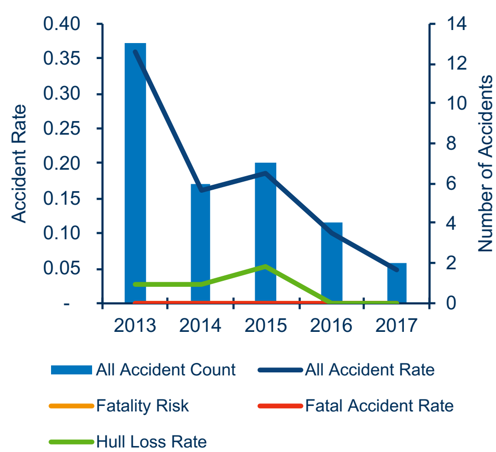
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Undershoot – Accident Count

2017	Number of accidents: 3	Number of fatalities: 4
2013-2017	Number of accidents: 13	Number of fatalities: 4

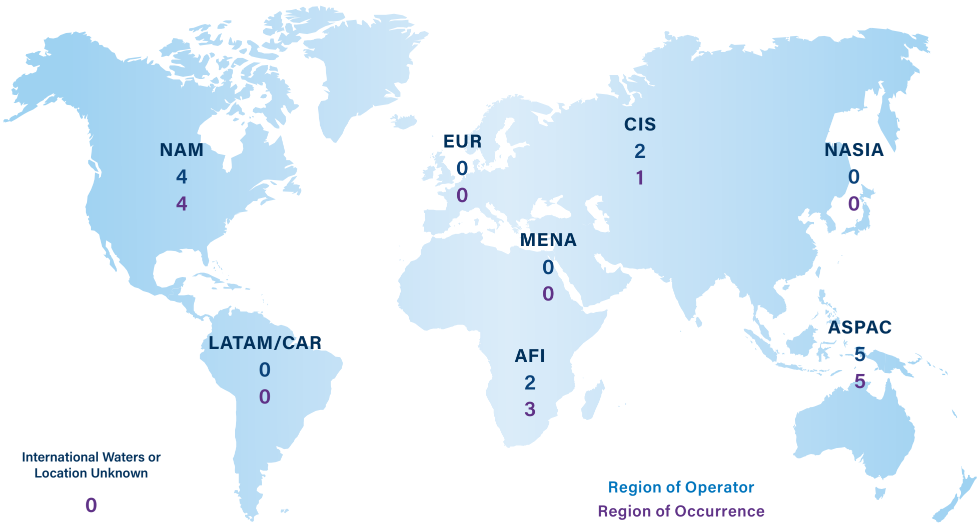
Accident Count % of Total	2017	'13-'17
IATA Member	33%	31%
Full-Loss Equivalents	13%	3%
Fatal	33%	8%
Hull Losses	33%	38%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	33%	67%	0%	33%	67%
2013-2017	69%	23%	8%	46%	54%

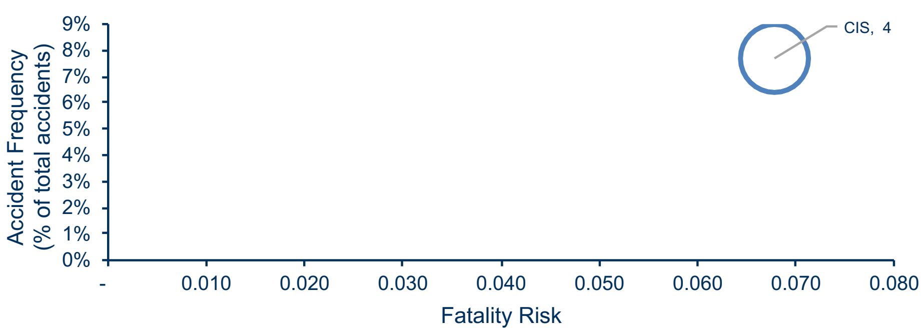
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
55%

Threats

Meteorology:
64%

Flight Crew Errors

Manual Handling/Flight Controls:
45%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
64%

Countermeasure

Overall Crew Performance:
36%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Undershoot – Accident Rate*

2017	Accident rate: 0.07
2013-2017	Accident rate: 0.07

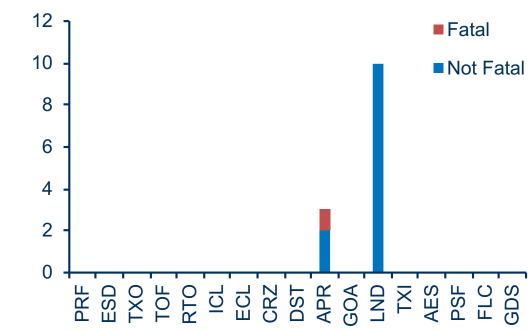
Accident Rate*	2017	'13-'17
IATA Member	0.05	0.04
Fatality Risk**	0.01	0.00
Fatal	0.02	0.01
Hull Losses	0.02	0.03

	Jet	Turboprop	
2017	0.03	0.29	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.04	0.20	

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

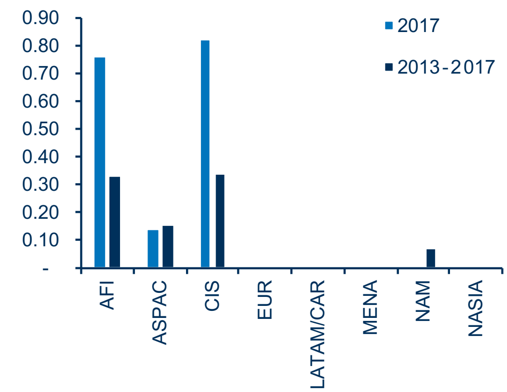
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



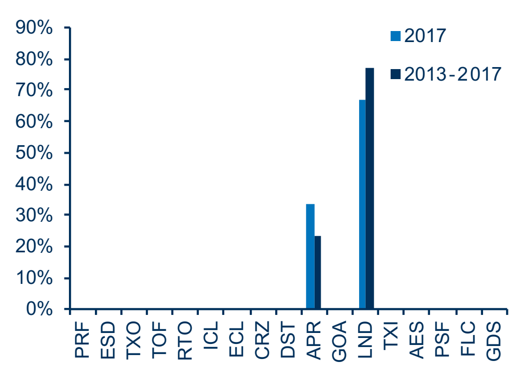
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



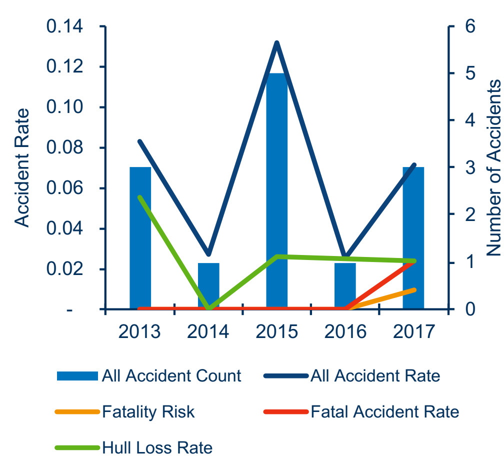
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



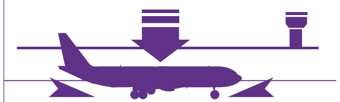
Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Hard Landing – Accident Count

2017	Number of accidents: 2	Number of fatalities: 0
2013-2017	Number of accidents: 44	Number of fatalities: 0



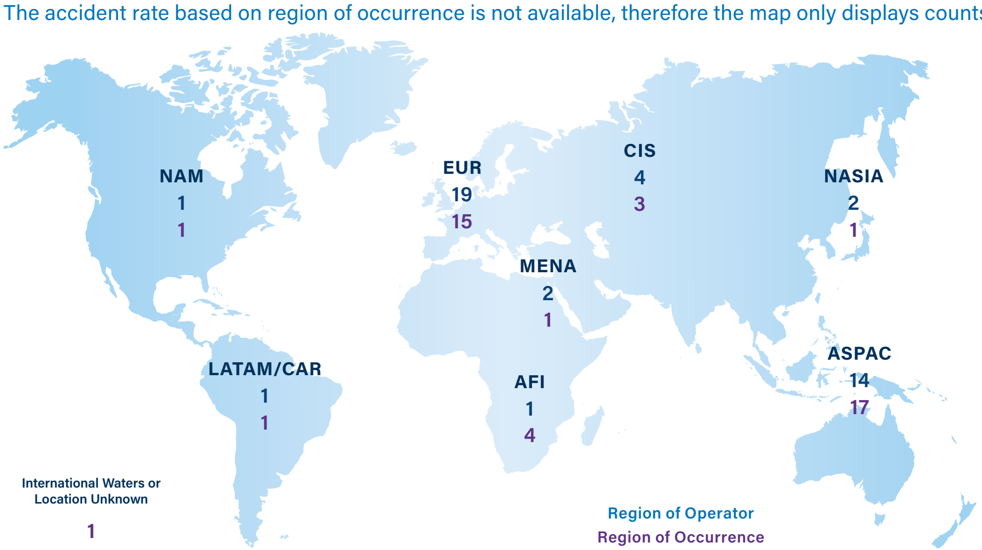
Accident Count % of Total	2017	'13-'17
IATA Member	50%	41%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	20%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	50%	50%
2013-2017	82%	16%	2%	66%	34%

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

Number of Accidents per Region (2013-2017)

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



Note: An-74 Hard Landing. Location: Barneo Ice Base (International Waters)

Accident Category Frequency and Fatality Risk (2013-2017)

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.

Top Contributing factors

Latent Conditions

Flight Operations:
21%

Threats

Meteorology:
40%

Flight Crew Errors

Manual Handling/Flight Controls:
70%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
51%

Countermeasure

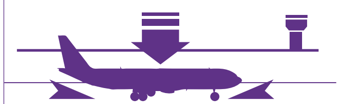
Overall Crew Performance:
30%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Hard Landing – Accident Rate*

2017 Accident rate: 0.05
2013-2017 Accident rate: 0.23



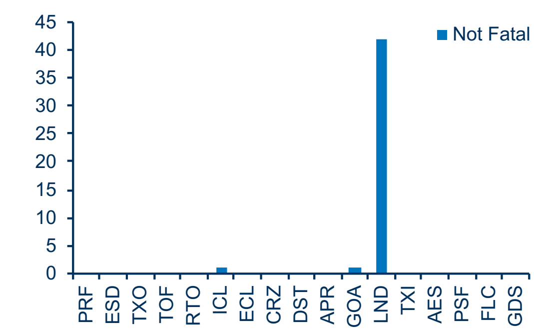
Accident Rate*	2017	'13-'17
IATA Member	0.05	0.18
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.05

	Jet	Turboprop	
2017	0.03	0.14	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.18	0.44	

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

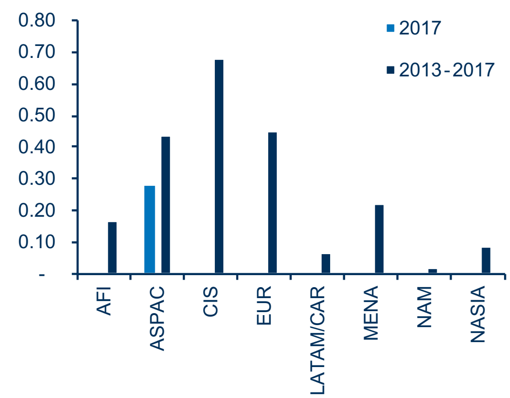
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



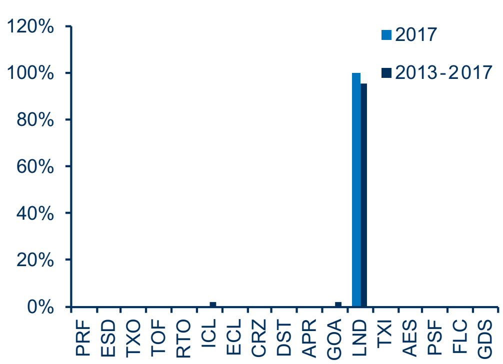
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



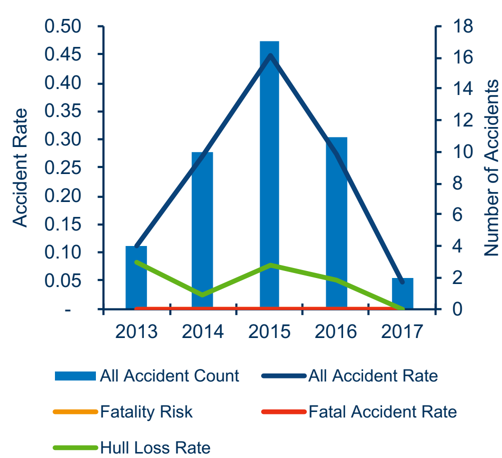
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Gear-up Landing/Gear Collapse – Accident Count

2017 Number of accidents: 5 Number of fatalities: 0
2013-2017 Number of accidents: 53 Number of fatalities: 0

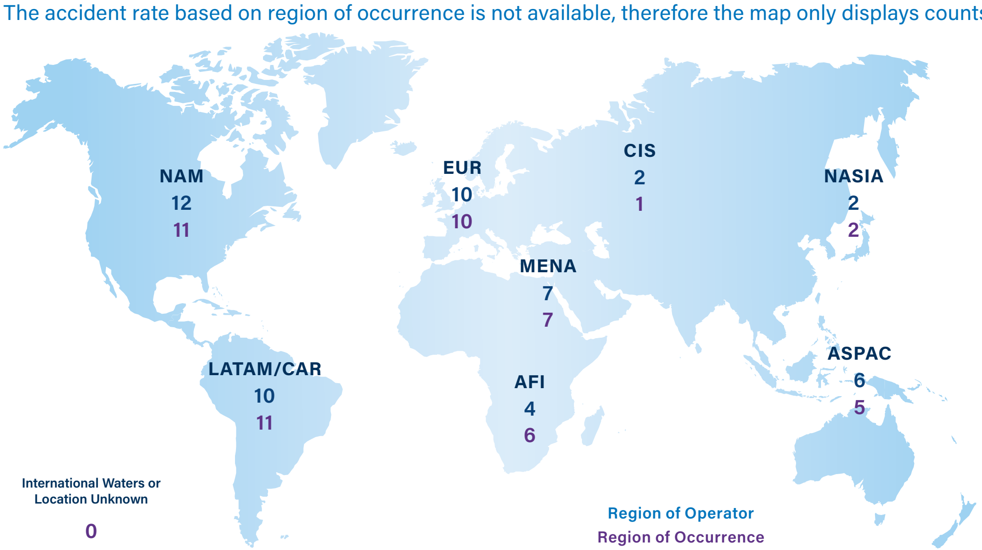
Accident Count % of Total	2017	'13-'17
IATA Member	40%	26%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	20%	19%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	80%	20%	0%	40%	60%
2013-2017	77%	21%	2%	47%	51%

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

Number of Accidents per Region (2013-2017)

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



Top Contributing factors

Latent Conditions

Maintenance Operations:
28%

Threats

Gear/Tire:
77%

Flight Crew Errors

Manual Handling/Flight Controls:
2%

Undesired Aircraft State

Long/floated/bounced/firm/off-center/crabbed land:
2%

Countermeasure

N/A

For more info regarding primary contributing factors see section 8

➤ See detailed view

Accident Category Frequency and Fatality Risk (2013-2017)

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*

2017 Accident rate: 0.12
2013-2017 Accident rate: 0.27

Accident Rate*	2017	'13-'17
IATA Member	0.09	0.14
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.02	0.05

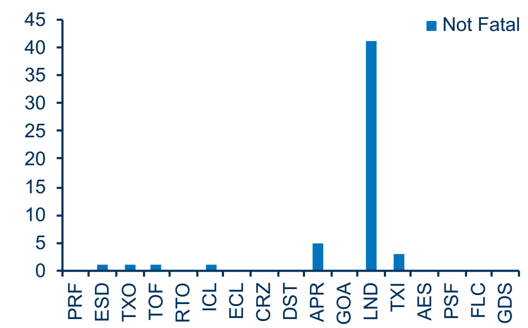
	Jet	Turboprop
2017	0.06	0.43
2013-2017	0.16	0.79

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

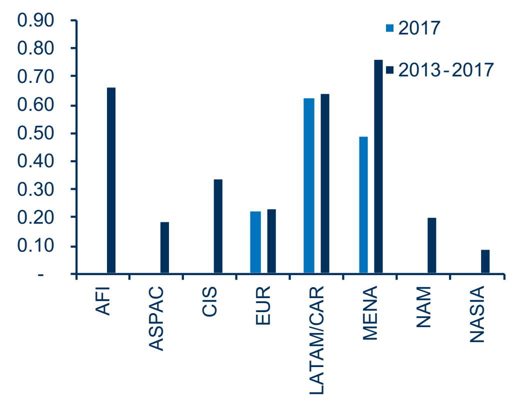
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



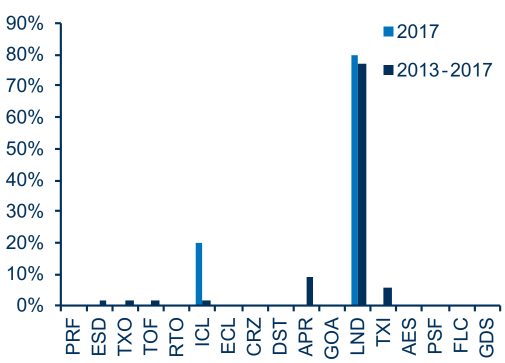
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



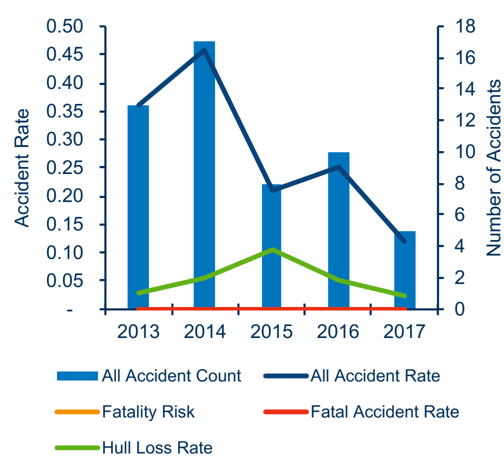
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Tailstrike – Accident Count

2017	Number of accidents: 4	Number of fatalities: 0
2013-2017	Number of accidents: 20	Number of fatalities: 0

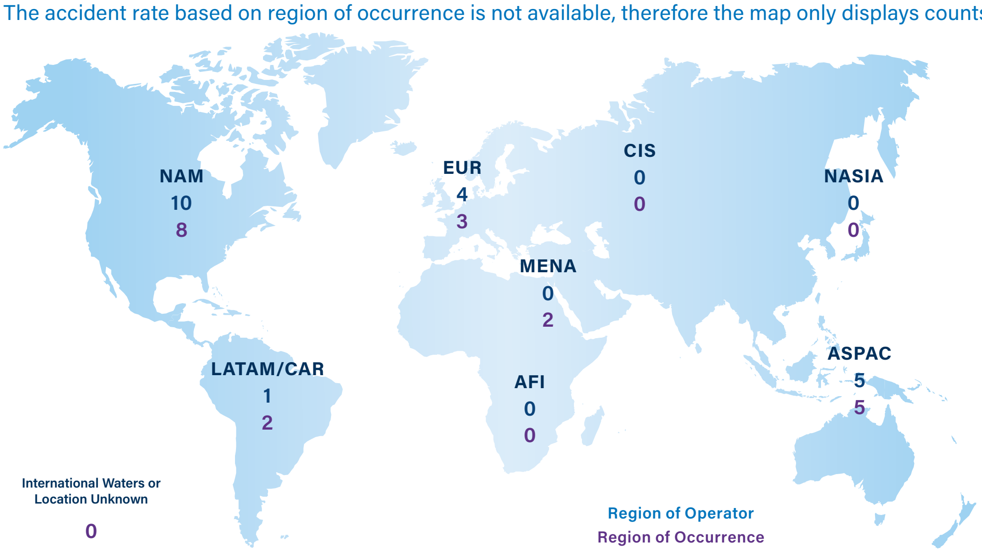
Accident Count % of Total	2017	'13-'17
IATA Member	50%	50%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	5%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	100%	0%
2013-2017	85%	15%	0%	80%	20%

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

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)

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.

Top Contributing factors

Latent Conditions

Flight Operations:
16%

Threats

Meteorology:
16%

Flight Crew Errors

Manual Handling/Flight Controls:
47%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
26%

Countermeasure

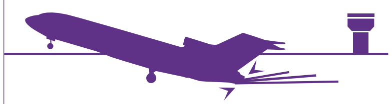
Overall Crew Performance:
21%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Tailstrike – Accident Rate*

2017 Accident rate: 0.10
2013-2017 Accident rate: 0.10



Accident Rate*	2017	'13-'17
IATA Member	0.09	0.10
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.01

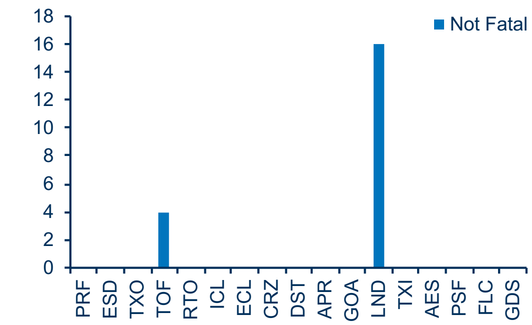
	Jet	Turboprop
2017	0.11	0.00
2013-2017	0.10	0.12

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

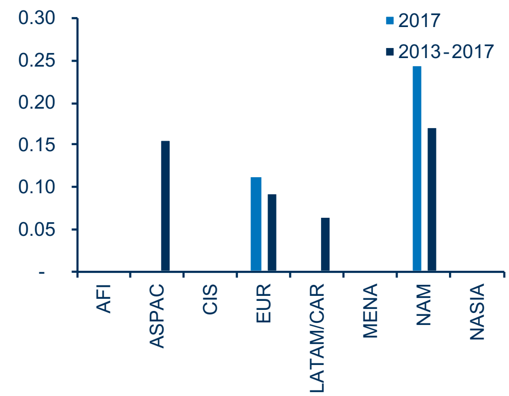
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



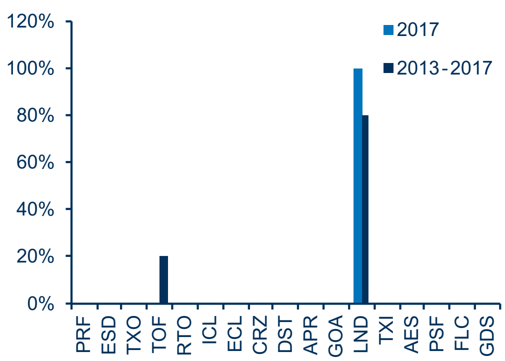
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



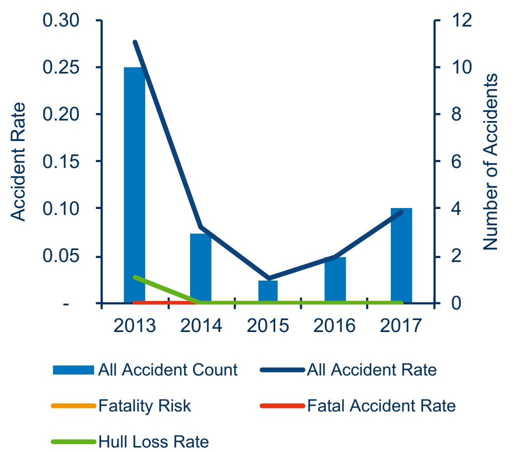
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



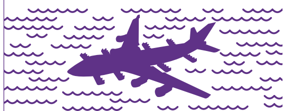
Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Off-Airport Landing/Ditching – Accident Count

2017	Number of accidents: 1	Number of fatalities: 0
2013-2017	Number of accidents: 2	Number of fatalities: 0



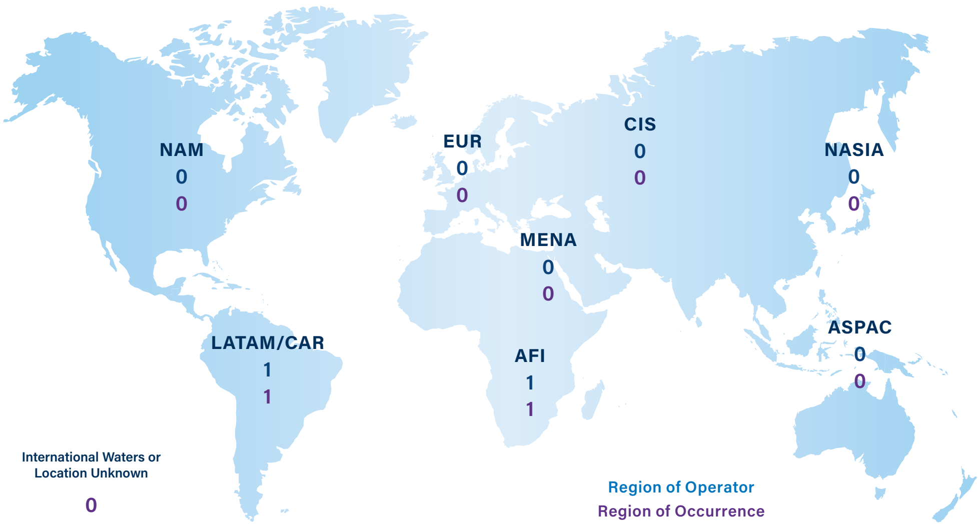
Accident Count % of Total	2017	'13-'17
IATA Member	0%	0%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	0%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	0%	100%	0%	0%	100%
2013-2017	0%	50%	50%	50%	50%

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

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)

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.

Top Contributing factors

Latent Conditions

At least three accidents required to display classification

Threats

At least three accidents required to display classification

Flight Crew Errors

At least three accidents required to display classification

Undesired Aircraft State

At least three accidents required to display classification

Countermeasure

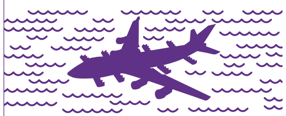
At least three accidents required to display classification

For more info regarding primary contributing factors see section 8

➤ See detailed view

Off-Airport Landing/Ditching – Accident Rate*

2017 Accident rate: 0.02
2013-2017 Accident rate: 0.01



Accident Rate*	2017	'13-'17
IATA Member	0.00	0.00
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.00

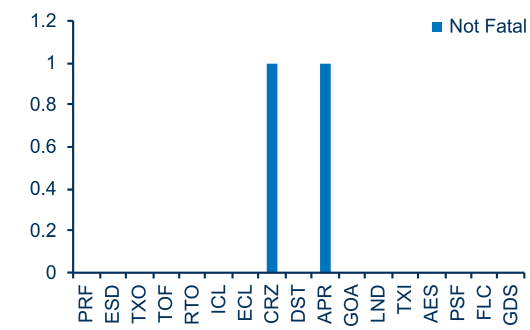
	Jet	Turboprop
2017	0.00	0.14
2013-2017	0.01	0.03

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

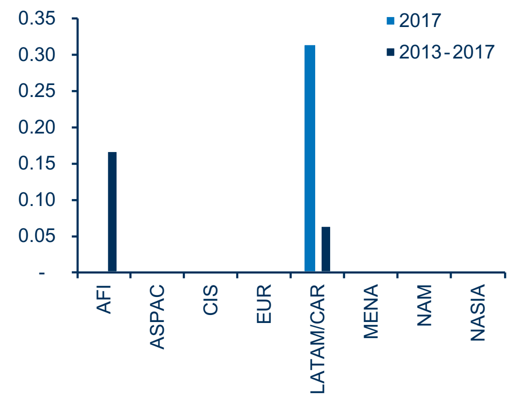
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



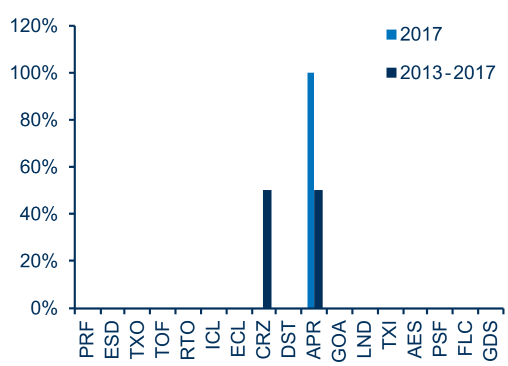
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



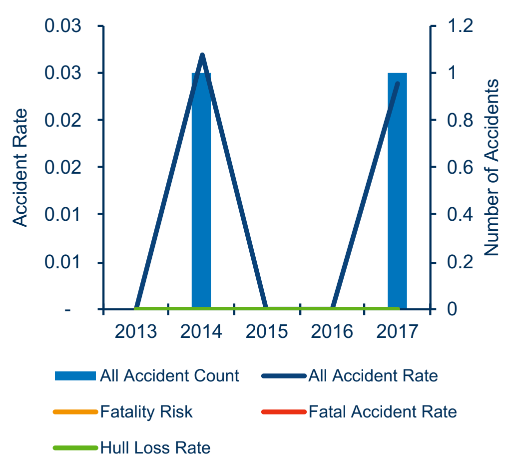
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Runway Collision – Accident Count

2017	Number of accidents: 2	Number of fatalities: 0
2013-2017	Number of accidents: 12	Number of fatalities: 0

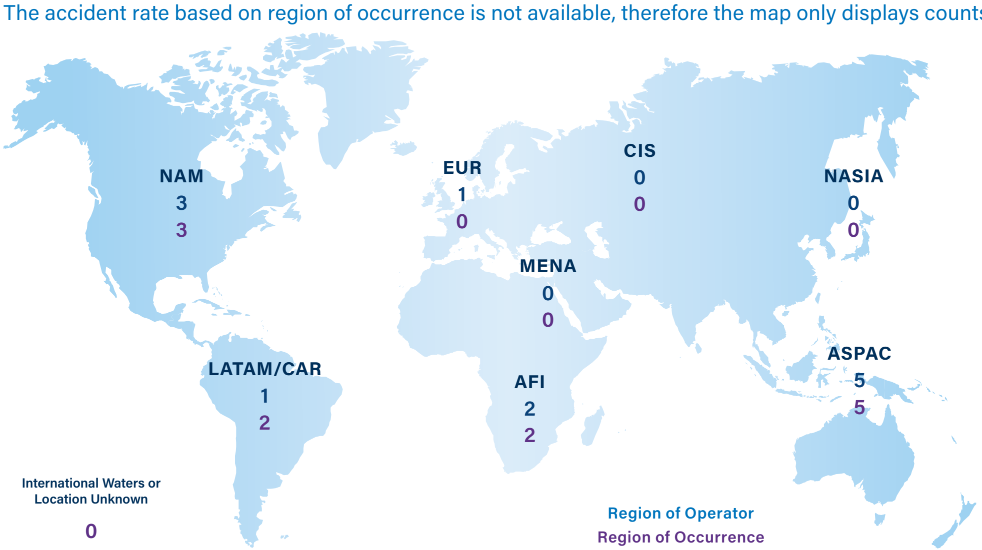
Accident Count % of Total	2017	'13-'17
IATA Member	0%	17%
Full-Loss Equivalents	0%	0%
Fatal	0%	0%
Hull Losses	0%	17%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	50%	50%
2013-2017	100%	0%	0%	33%	67%

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

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)

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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
58%

Threats

Airport Perimeter Control/ Fencing/Wildlife Control:
42%

Flight Crew Errors

Air Traffic Control:
8%

Undesired Aircraft State

Runway/Taxiway Incursion:
17%

Countermeasure

Inquiry:
8%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Runway Collision – Accident Rate*

2017 Accident rate: 0.05
2013-2017 Accident rate: 0.06

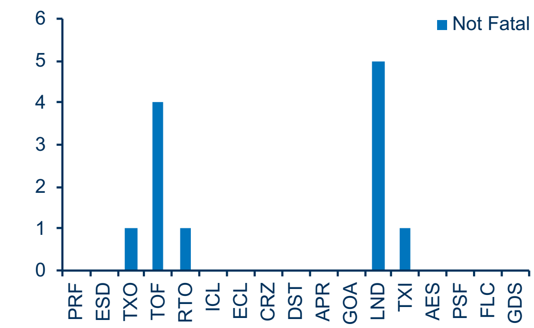
Accident Rate*	2017	'13-'17
IATA Member	0.00	0.02
Fatality Risk**	0.00	0.00
Fatal	0.00	0.00
Hull Losses	0.00	0.01

	Jet	Turboprop	
2017	0.03	0.14	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	0.03	0.23	

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

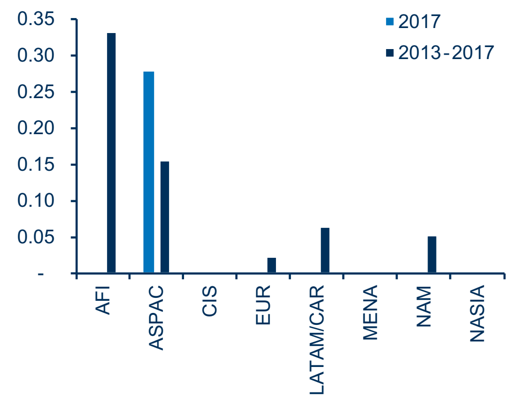
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



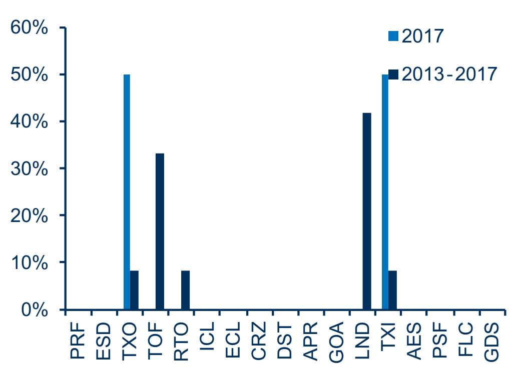
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



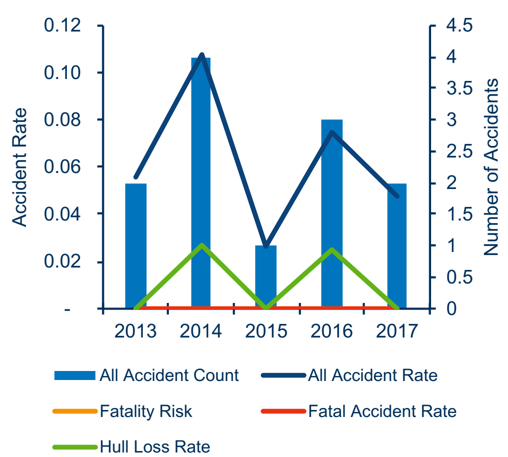
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



5-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Jet Aircraft Accidents – Accident Count

2017	Number of accidents: 25	Number of fatalities: 4
2013-2017	Number of accidents: 198	Number of fatalities: 744

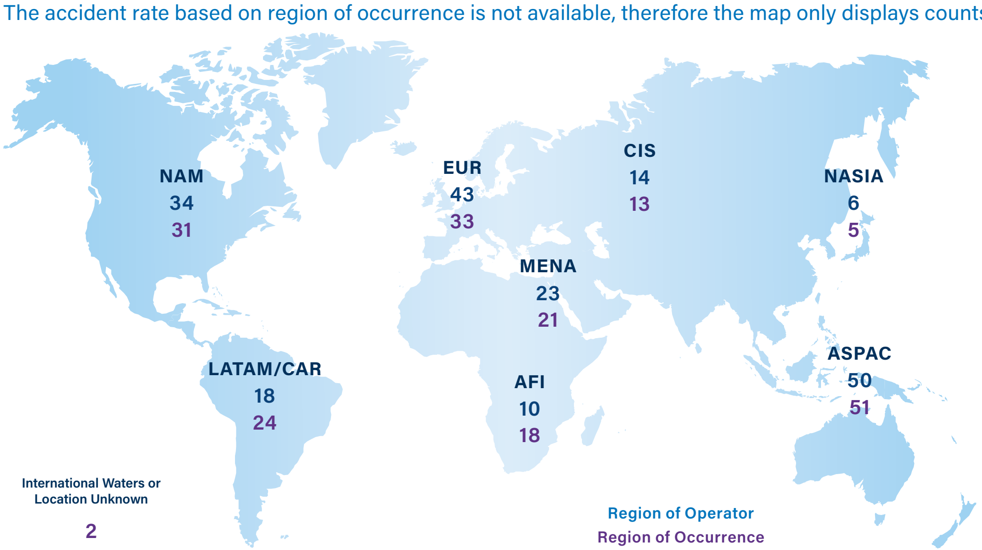
Accident Count % of Total	2017	'13-'17
IATA Member	32%	47%
Full-Loss Equivalents	0%	1%
Fatal	4%	7%
Hull Losses	16%	23%

	Passenger	Cargo	Ferry
2017	84%	16%	0%
2013-2017	84%	15%	1%

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

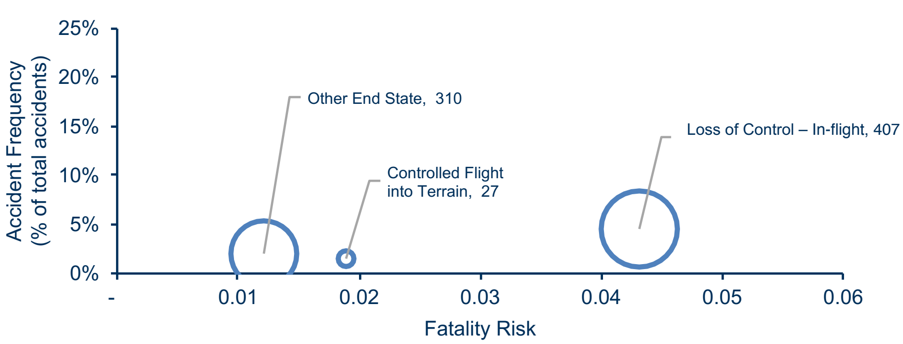
Number of Accidents per Region (2013-2017)

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



Note: An-74 Hard Landing. Location: Barneo Ice Base (International Waters)
B777 (MH370). Location: unknown

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight: 29%

Threats

Meteorology: 30%

Flight Crew Errors

Manual Handling/Flight Controls: 35%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing: 26%

Countermeasure

Overall Crew Performance: 20%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Jet Aircraft Accidents – Accident Rate*

2017 Accident rate: 0.72
2013-2017 Accident rate: 1.25

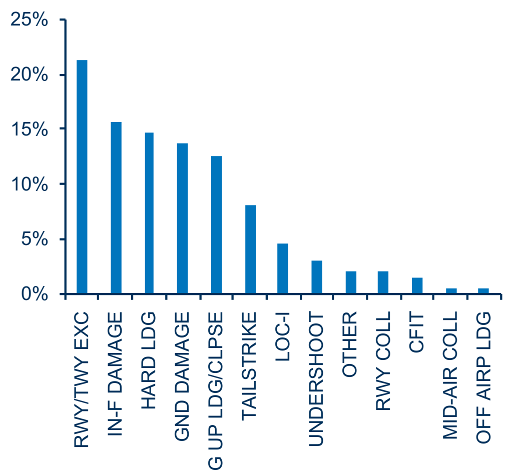
Accident Rate*	2017	'13-'17
IATA Member	0.39	1.02
Fatality Risk**	0.00	0.01
Fatal	0.03	0.08
Hull Losses	0.11	0.29

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 (2013-2017)

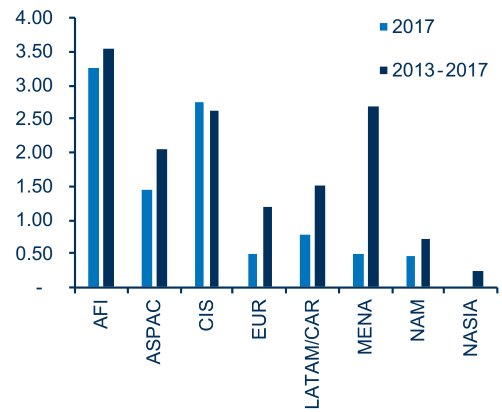
Distribution of accidents as percentage of total



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

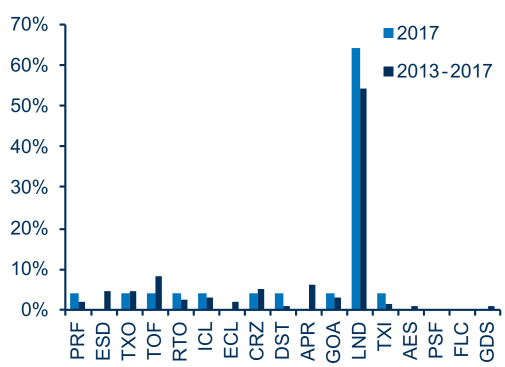
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



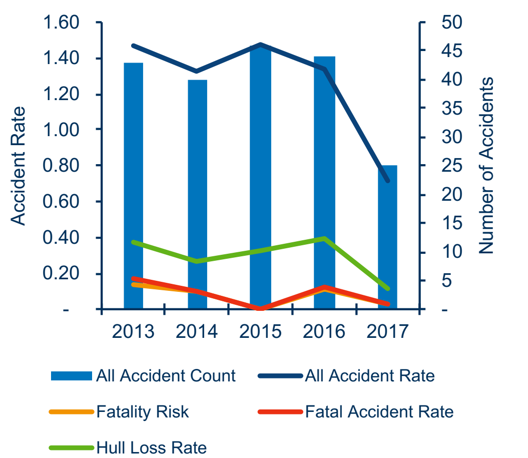
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Turboprop Aircraft Accidents – Accident Count

2017	Number of accidents: 20	Number of fatalities: 15
2013-2017	Number of accidents: 141	Number of fatalities: 428

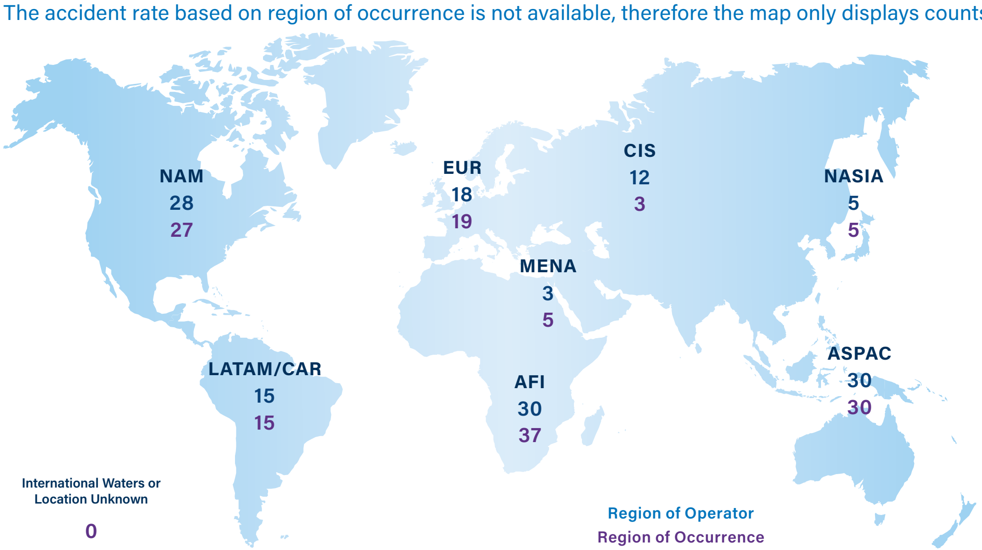
Accident Count % of Total	2017	'13-'17
IATA Member	15%	10%
Full-Loss Equivalents	0%	2%
Fatal	25%	22%
Hull Losses	45%	43%

	Passenger	Cargo	Ferry
2017	55%	45%	0%
2013-2017	65%	30%	5%

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

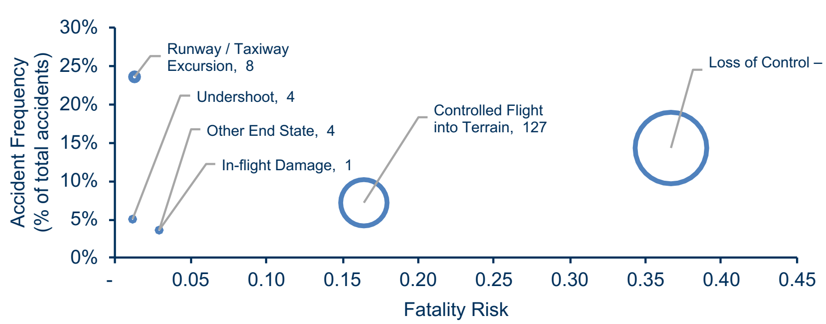
Number of Accidents per Region (2013-2017)

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



Note: B1900, presumingly crashed near Sao Tome and Principe.
Wreckage not known to have been found.

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
40%

Threats

Aircraft Malfunction:
39%

Flight Crew Errors

Manual Handling/Flight Controls:
32%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
19%

Countermeasure

Overall Crew Performance:
22%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Turboprop Aircraft Accidents – Accident Rate*

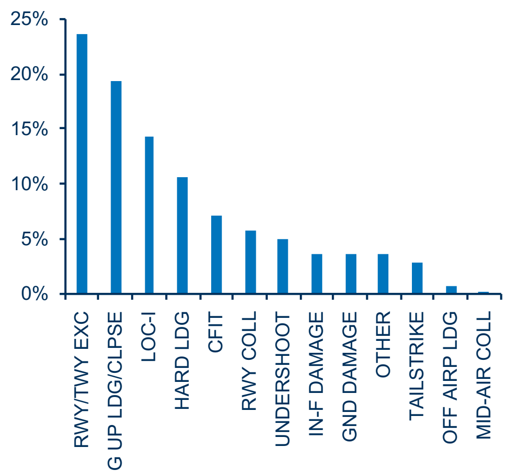
2017	Accident rate: 2.90		Accident Rate*	2017	'13-'17
2013-2017	Accident rate: 4.11		IATA Member	1.95	2.15
			Fatality Risk**	0.00	0.07
			Fatal	0.72	0.90
			Hull Losses	1.30	1.75

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 (2013-2017)

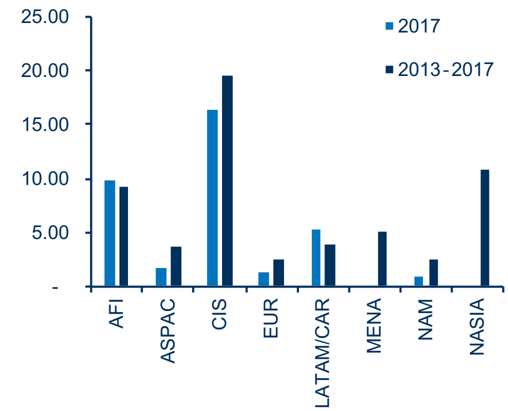
Distribution of accidents as percentage of total



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

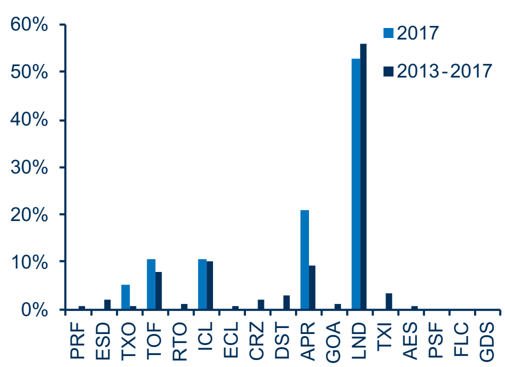
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



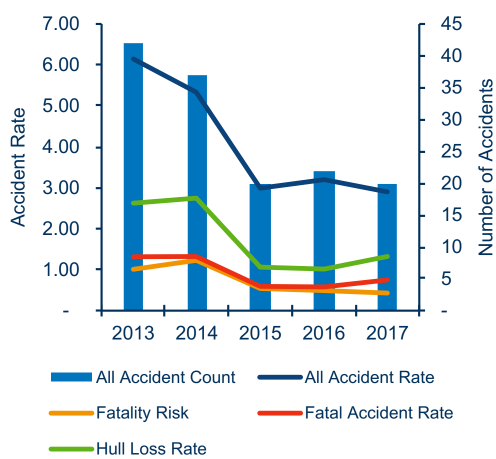
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



"In 2017 operators accident rates in NAM, EUR, MENA and NASIA were below the global rate and above the global rate in CIS, ASPAC, AFI and LATAM."

5

In-Depth Regional Accident Analysis

Following the same model as the in-depth analysis by accident category presented in Section 4, this section presents an overview of occurrences and their contributing factors broken down by the region of the involved operator(s).

The purpose of this section 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).

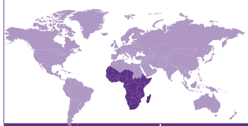
For example, if a Canadian-registered operator has an accident in Europe, this accident is considered a North American accident.

For a complete list of countries assigned per region, please consult Annex 1.

Image courtesy of Bombardier

Africa Aircraft Accidents – Accident Count

	Number of accidents	Number of fatalities
2017	9	0
2013-2017	40	74



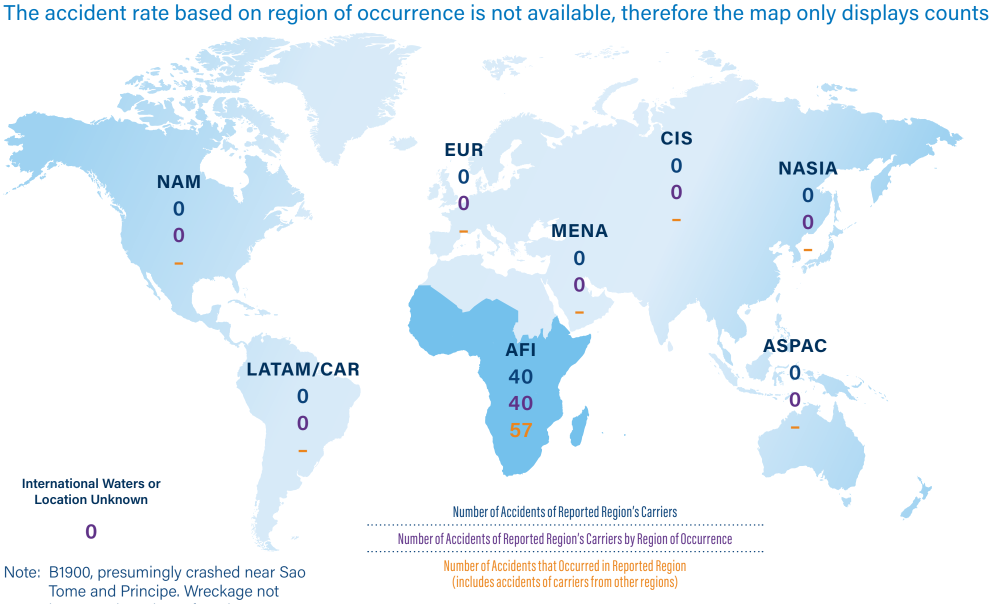
Accident Count % of Total	2017	'13-'17
IATA Member	22%	15%
Full-Loss Equivalents	0%	18%
Fatal	0%	20%
Hull Losses	44%	50%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	56%	44%	0%	22%	78%
2013-2017	55%	35%	10%	25%	75%

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

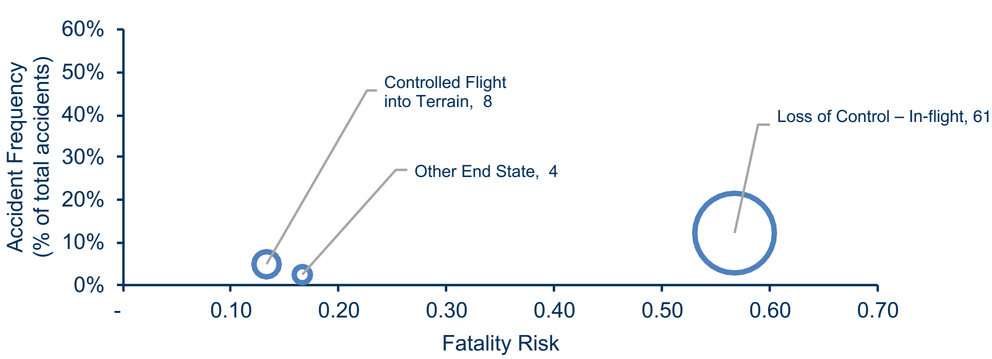
Number of Accidents per Region (2013-2017)

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



Note: B1900, presumingly crashed near Sao Tome and Principe. Wreckage not known to have been found.

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight: 57%

Threats

Aircraft Malfunction: 29%

Flight Crew Errors

Manual Handling/Flight Controls: 19%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing: 29%

Countermeasure

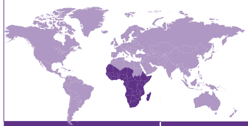
Captain Should Show Leadership: 14%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Africa Aircraft Accidents – Accident Rate*

2017 Accident rate: 6.87
2013-2017 Accident rate: 6.64



Accident Rate*	2017	'13-'17
IATA Member	3.22	2.32
Fatality Risk**	0.00	1.19
Fatal	0.00	1.33
Hull Losses	3.05	3.32

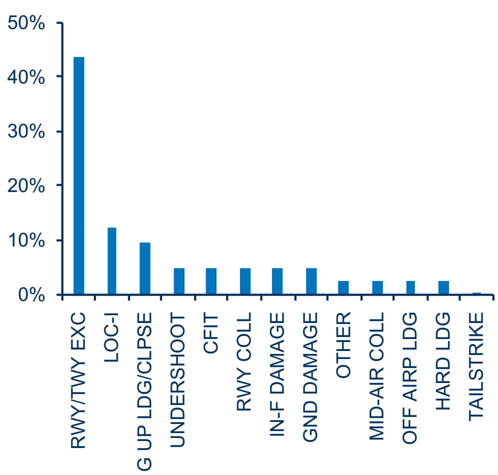
	Jet	Turboprop
2017	3.29	9.98
2013-2017	3.56	9.33

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 (2013-2017)

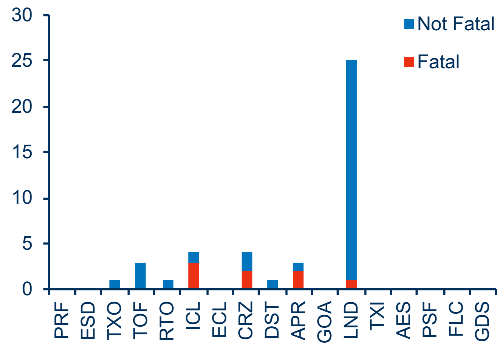
Distribution of accidents as percentage of total



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

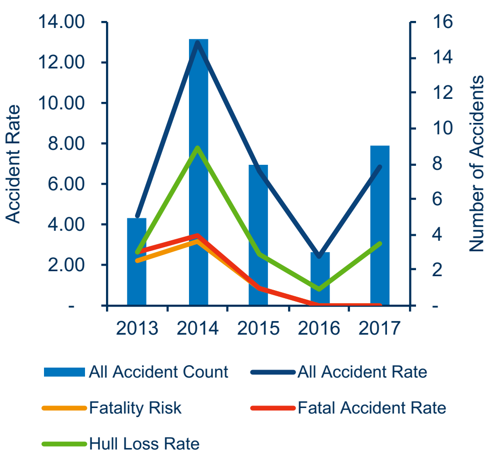
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



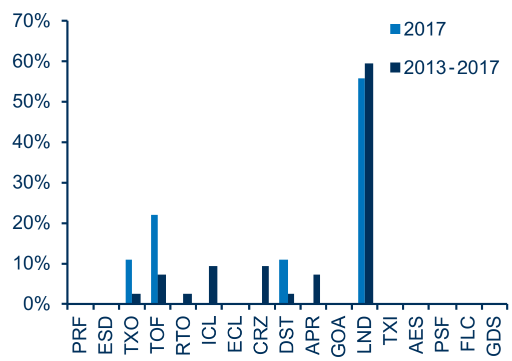
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



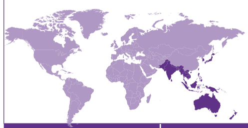
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Asia/Pacific Aircraft Accidents – Accident Count

2017	Number of accidents: 11	Number of fatalities: 2
2013-2017	Number of accidents: 80	Number of fatalities: 559



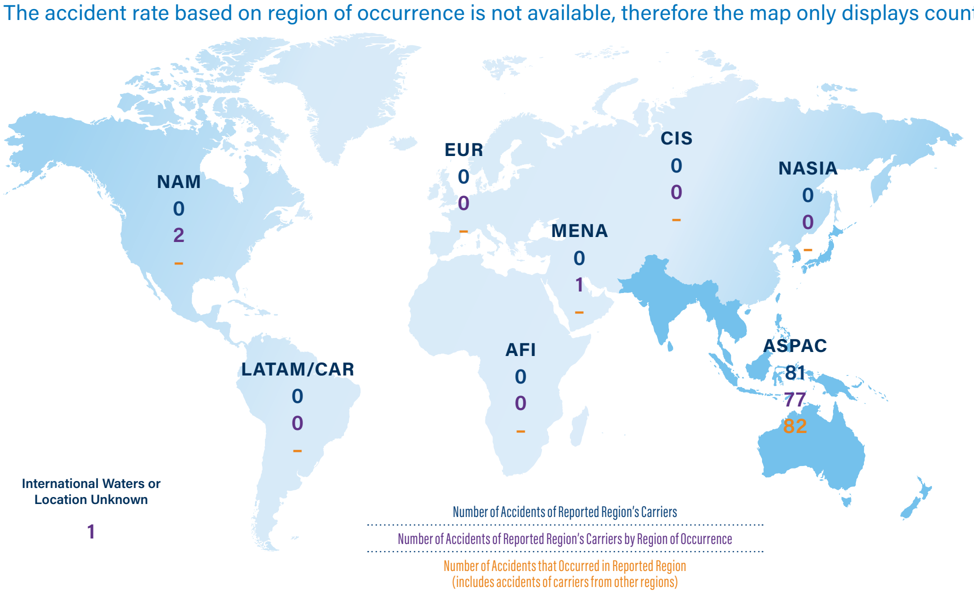
Accident Count % of Total	2017	'13-'17
IATA Member	27%	33%
Full-Loss Equivalents	6%	8%
Fatal	9%	10%
Hull Losses	18%	24%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	82%	18%	0%	73%	27%
2013-2017	85%	15%	1%	63%	38%

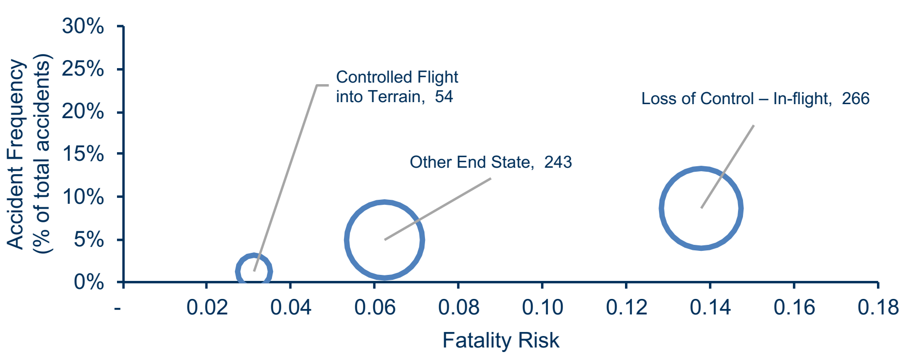
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
58%

Threats

Meteorology:
25%

Flight Crew Errors

Manual Handling/Flight Controls:
43%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
29%

Countermeasure

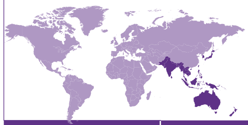
Overall Crew Performance:
25%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Asia/Pacific Aircraft Accidents – Accident Rate*

		Accident Rate*	2017	'13-'17
2017	Accident rate: 1.54	IATA Member	1.05	2.14
2013-2017	Accident rate: 2.49	Fatality Risk**	0.09	0.20
		Fatal	0.14	0.25
		Hull Losses	0.28	0.59

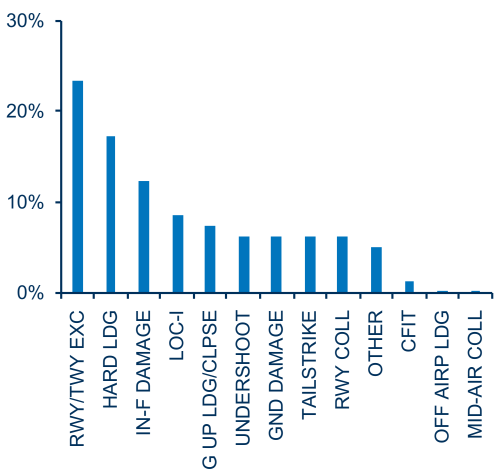


	Jet	Turboprop	
2017	1.45	1.82	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	2.05	3.84	

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

Accident Category Distribution (2013-2017)

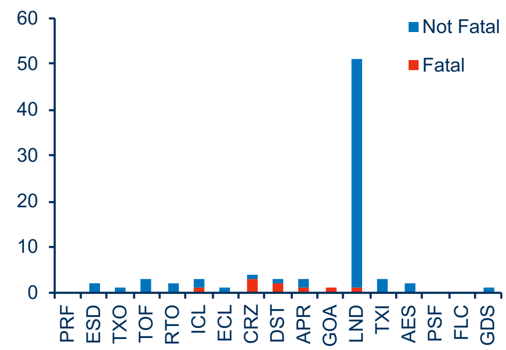
Distribution of accidents as percentage of total



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

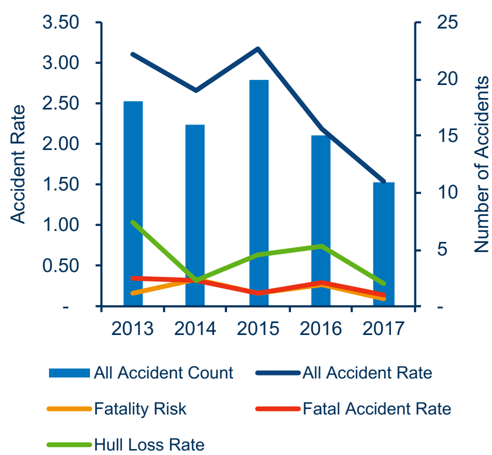
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



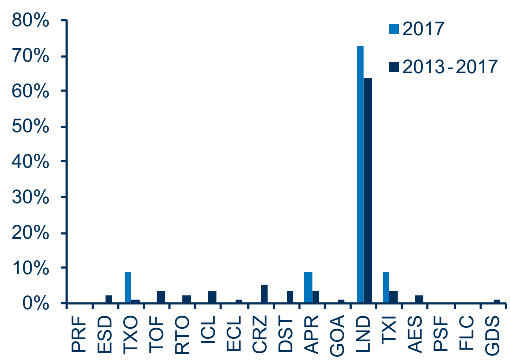
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



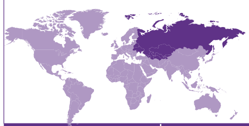
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



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

2017	Number of accidents: 5	Number of fatalities: 10
2013-2017	Number of accidents: 26	Number of fatalities: 106



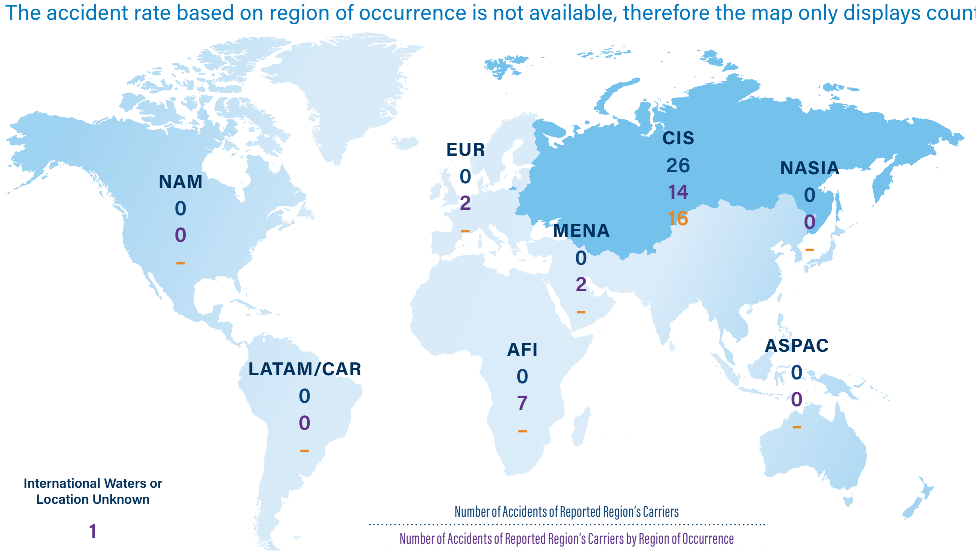
Accident Count % of Total	2017	'13-'17
IATA Member	20%	4%
Full-Loss Equivalents	25%	24%
Fatal	40%	31%
Hull Losses	60%	69%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	60%	40%	0%	60%	40%
2013-2017	58%	35%	8%	54%	46%

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

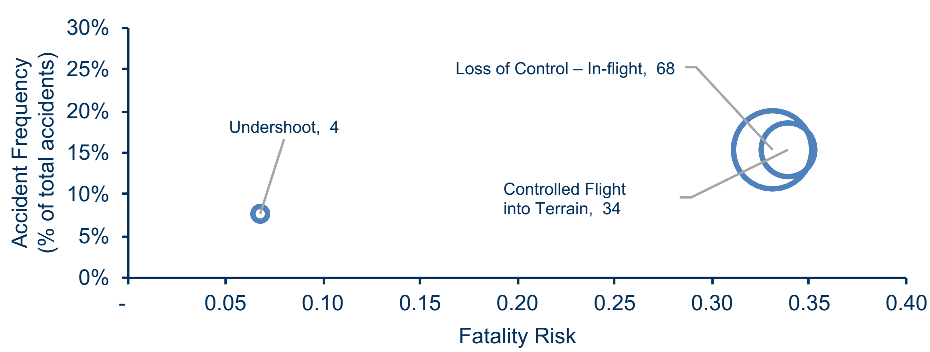
Number of Accidents per Region (2013-2017)

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



Note. An-74 Hard Landing. Location: Barneo Ice Base (International Waters).

Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
32%

Threats

Meteorology:
55%

Flight Crew Errors

Manual Handling/Flight Controls:
36%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
27%

Countermeasure

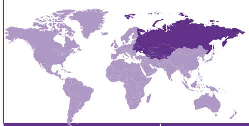
Overall Crew Performance:
14%

For more info regarding primary contributing factors see section 8

➤ See detailed view

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

2017 Accident rate: 4.13
2013-2017 Accident rate: 4.41



Accident Rate*	2017	'13-'17
IATA Member	1.45	0.30
Fatality Risk**	1.04	1.04
Fatal	1.65	1.36
Hull Losses	2.48	3.05

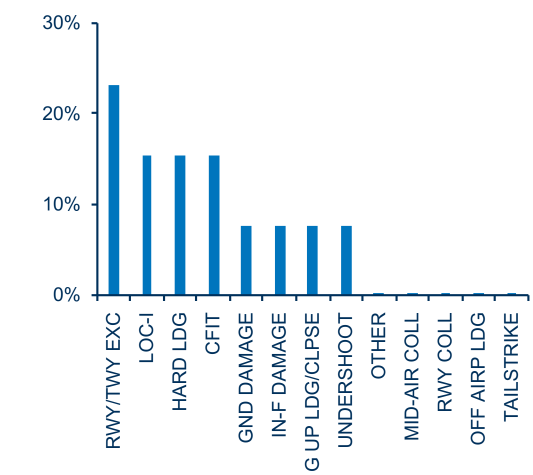
	Jet	Turboprop
2017	2.76	16.44
2013-2017	2.65	19.55

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 (2013-2017)

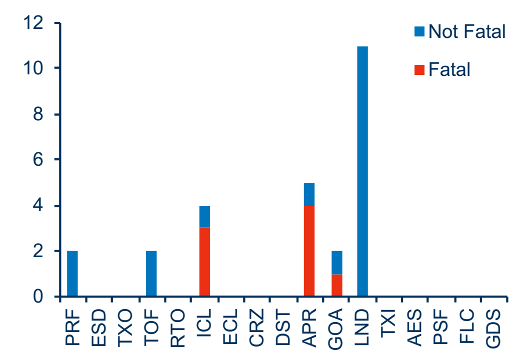
Distribution of accidents as percentage of total



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

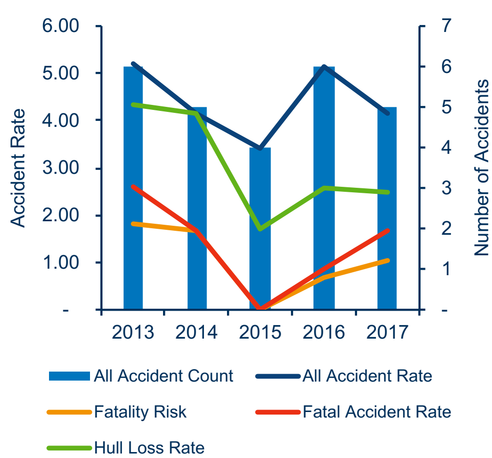
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



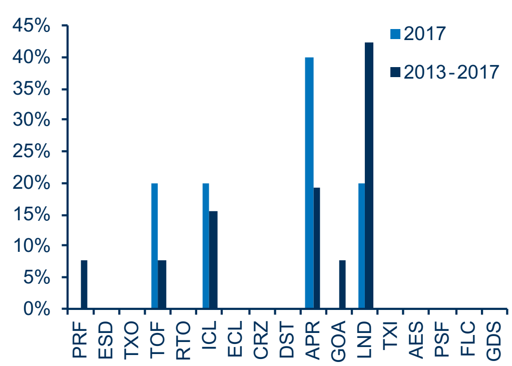
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



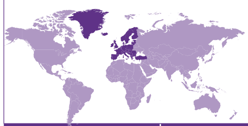
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Europe Aircraft Accidents – Accident Count

2017	Number of accidents: 6	Number of fatalities: 4
2013-2017	Number of accidents: 61	Number of fatalities: 122



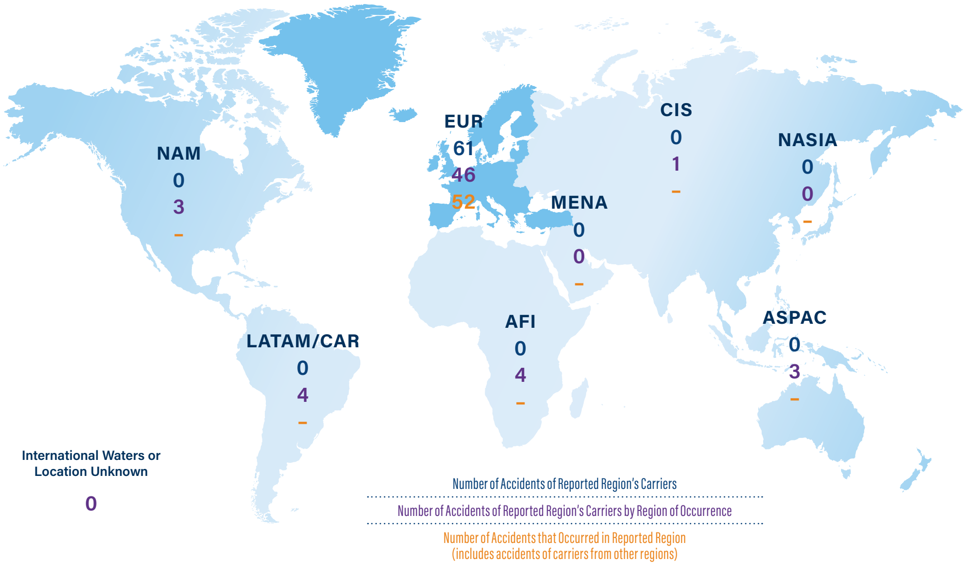
Accident Count % of Total	2017	'13-'17
IATA Member	50%	49%
Full-Loss Equivalents	17%	5%
Fatal	17%	5%
Hull Losses	17%	15%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	83%	17%	0%	67%	33%
2013-2017	84%	15%	2%	70%	30%

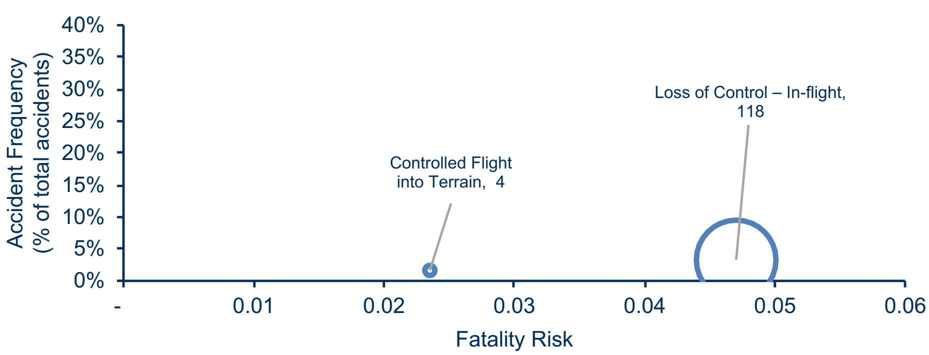
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Flight Operations:
18%

Threats

Meteorology:
32%

Flight Crew Errors

Manual Handling/Flight Controls:
40%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
28%

Countermeasure

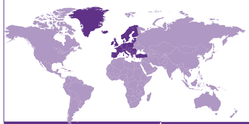
Overall Crew Performance:
26%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Europe Aircraft Accidents – Accident Rate*

2017 Accident rate: 0.67
2013-2017 Accident rate: 1.43



Accident Rate*	2017	'13-'17
IATA Member	0.67	1.36
Fatality Risk**	0.11	0.07
Fatal	0.11	0.07
Hull Losses	0.11	0.21

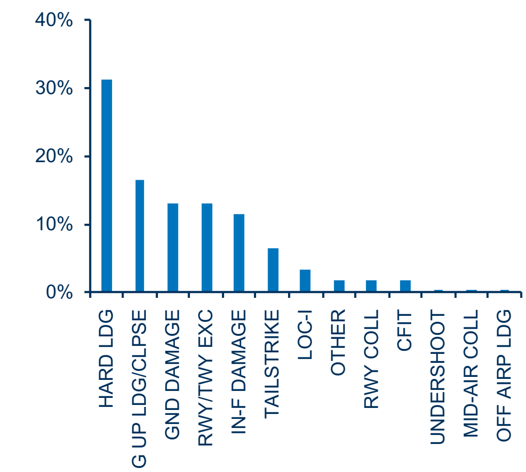
	Jet	Turboprop
2017	0.53	1.46
2013-2017	1.20	2.65

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 (2013-2017)

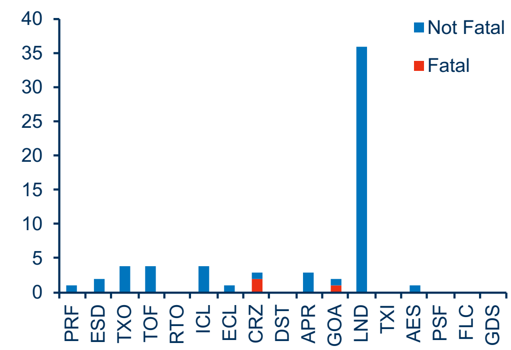
Distribution of accidents as percentage of total



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

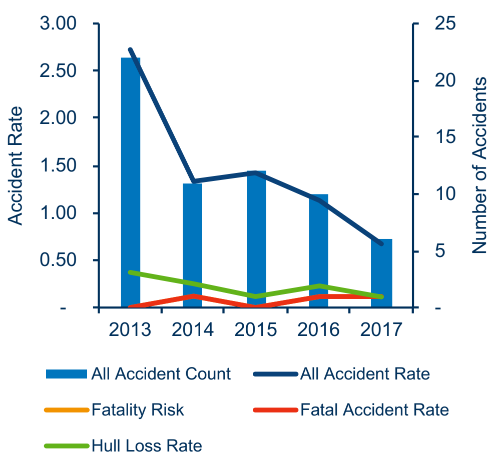
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



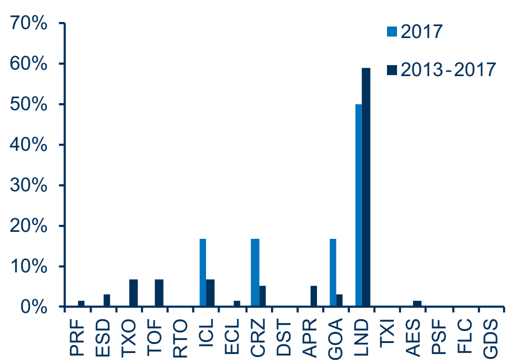
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Latin America & the Caribbean Aircraft Accidents – Accident Count

2017	Number of accidents: 6	Number of fatalities: 0
2013-2017	Number of accidents: 33	Number of fatalities: 84

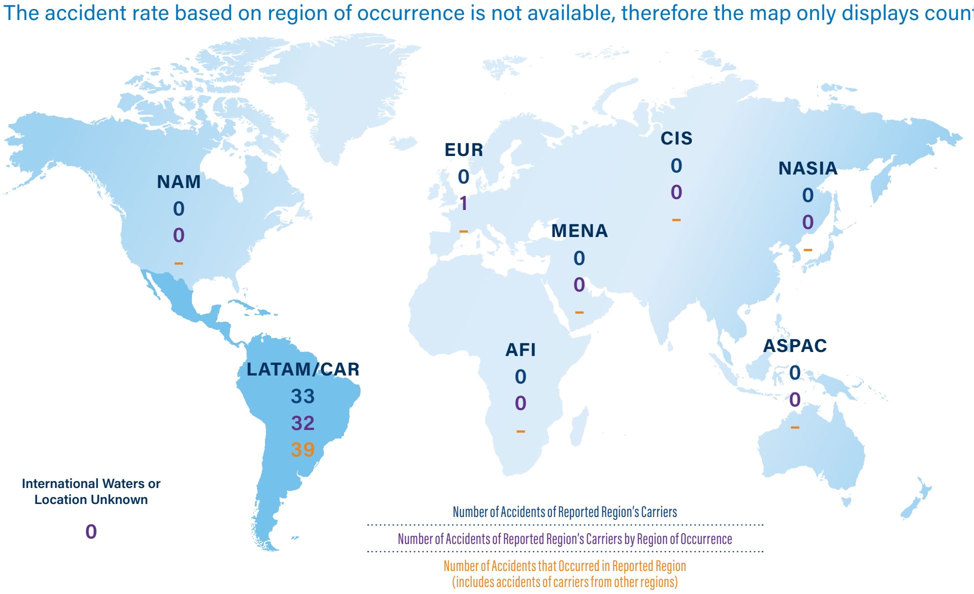
Accident Count % of Total	2017	'13-'17
IATA Member	0%	24%
Full-Loss Equivalents	0%	7%
Fatal	0%	9%
Hull Losses	17%	30%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	50%	50%	0%	33%	67%
2013-2017	76%	24%	0%	55%	45%

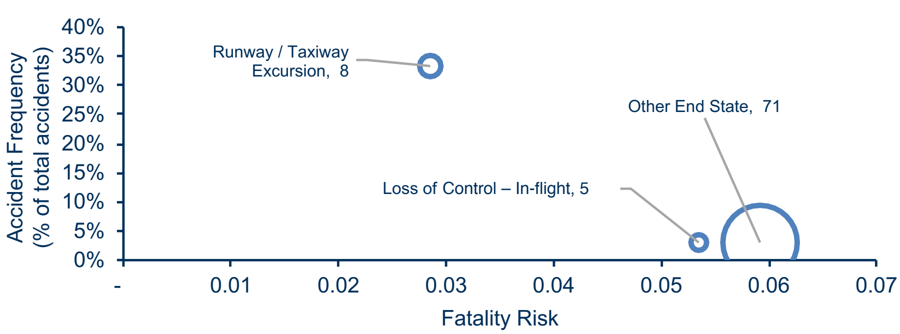
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Safety Management:
35%

Threats

Aircraft Malfunction:
42%

Flight Crew Errors

SOP Adherence/Cross-verification:
15%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
15%

Countermeasure

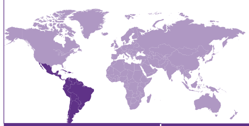
Overall Crew Performance:
19%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Latin America & the Caribbean Aircraft Accidents – Accident Rate*

2017 Accident rate: 1.88
2013-2017 Accident rate: 2.12



Accident Rate*	2017	'13-'17
IATA Member	0.00	0.82
Fatality Risk**	0.00	0.14
Fatal	0.00	0.19
Hull Losses	0.31	0.64

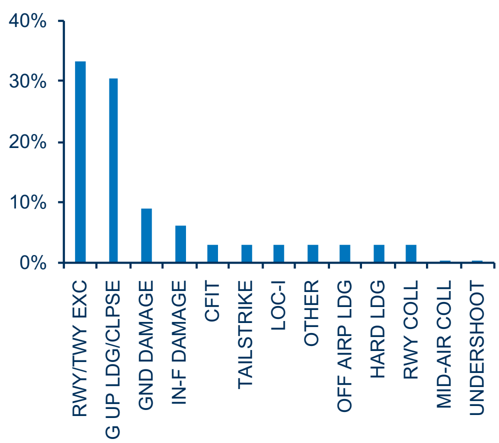
	Jet	Turboprop
2017	0.81	5.48
2013-2017	1.53	3.94

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 (2013-2017)

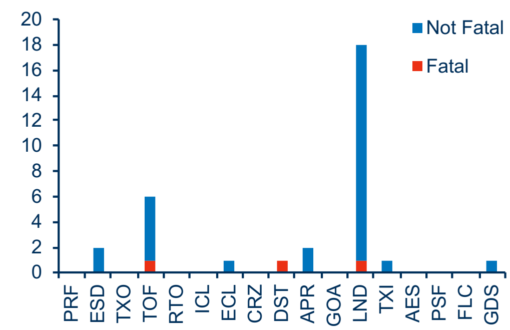
Distribution of accidents as percentage of total



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

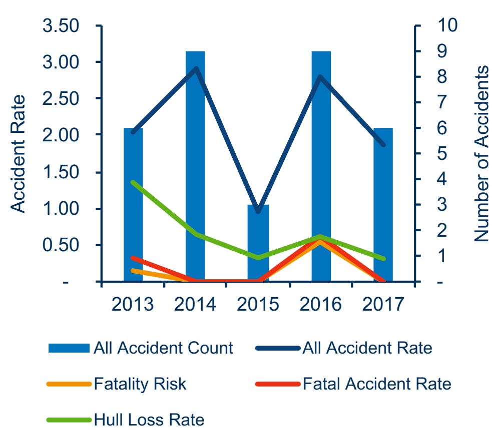
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



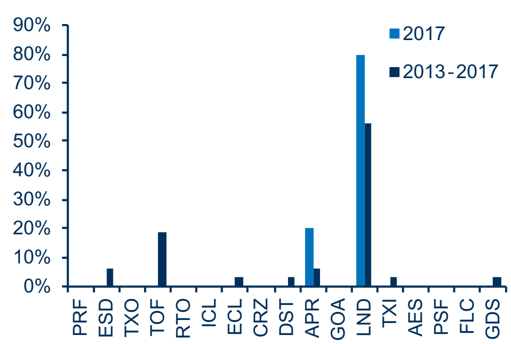
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



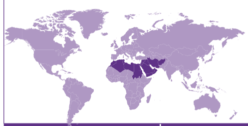
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Middle East & North Africa Aircraft Accidents – Accident Count

2017	Number of accidents: 1	Number of fatalities: 0
2013-2017	Number of accidents: 26	Number of fatalities: 110



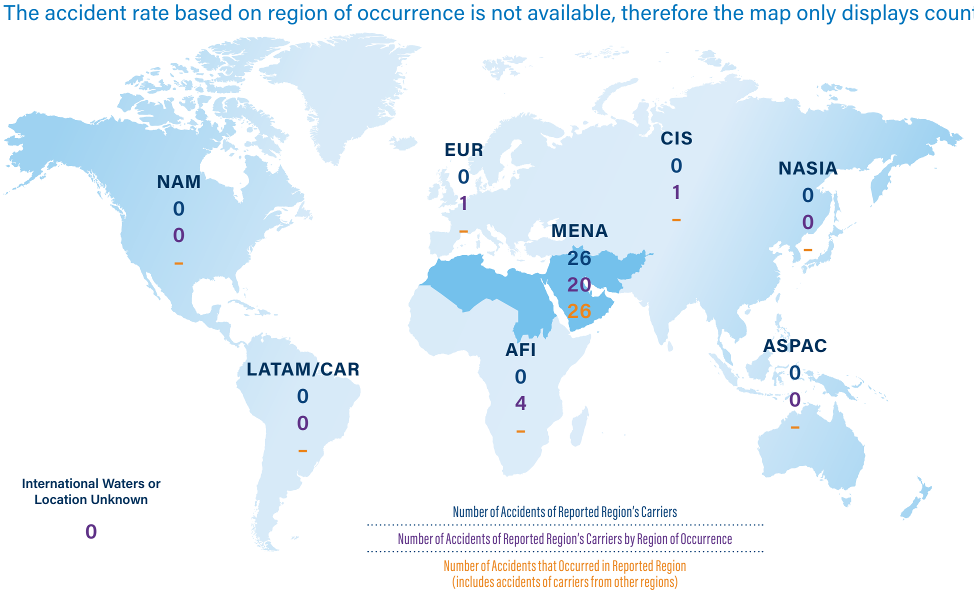
Accident Count % of Total	2017	'13-'17
IATA Member	0%	58%
Full-Loss Equivalents	0%	8%
Fatal	0%	8%
Hull Losses	0%	27%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	100%	0%	0%	100%	0%
2013-2017	92%	4%	4%	88%	12%

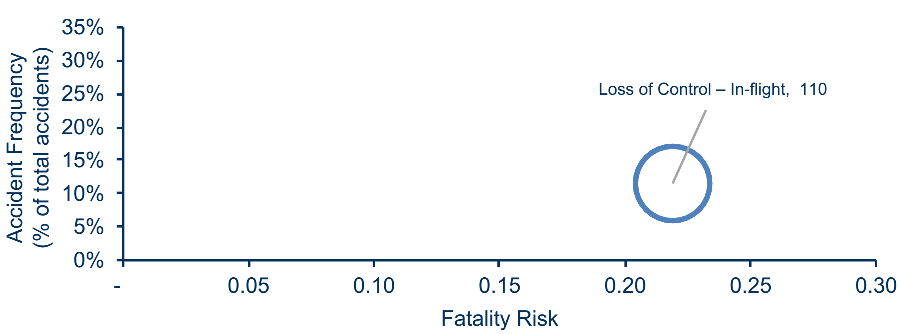
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Safety Management:
36%

Threats

Aircraft Malfunction:
36%

Flight Crew Errors

Manual Handling/Flight Controls:
32%

Undesired Aircraft State

Loss of Aircraft Control while on the Ground:
18%

Countermeasure

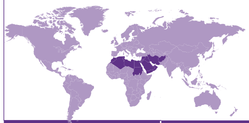
Overall Crew Performance:
27%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Middle East & North Africa Aircraft Accidents – Accident Rate*

2017 Accident rate: 0.49
2013-2017 Accident rate: 2.85



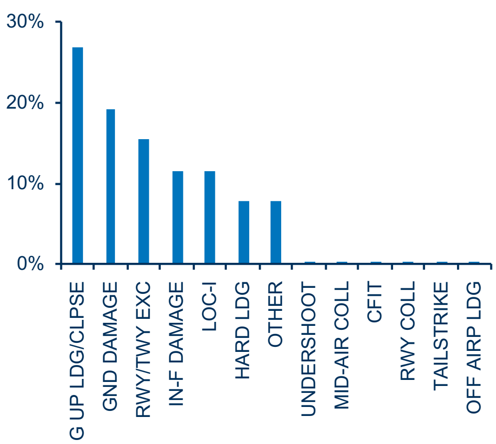
Accident Rate*	2017	'13-'17
IATA Member	0.00	2.07
Fatality Risk**	0.00	0.22
Fatal	0.00	0.22
Hull Losses	0.00	0.77

	Jet	Turboprop	
2017	0.53	0.00	Accident rates for Passenger, Cargo and Ferry are not available.
2013-2017	2.69	5.15	

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

Accident Category Distribution (2013-2017)

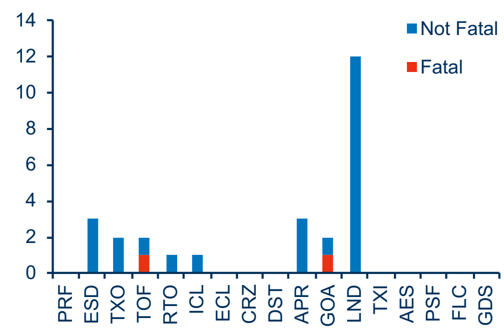
Distribution of accidents as percentage of total



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

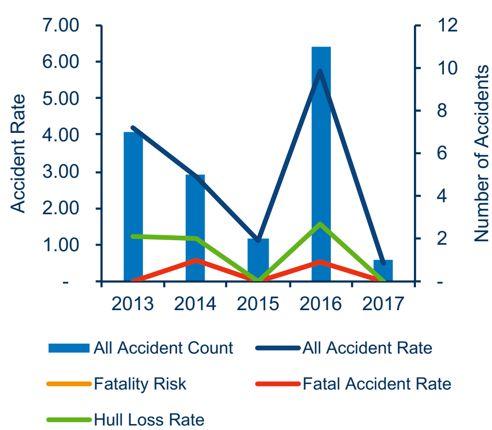
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



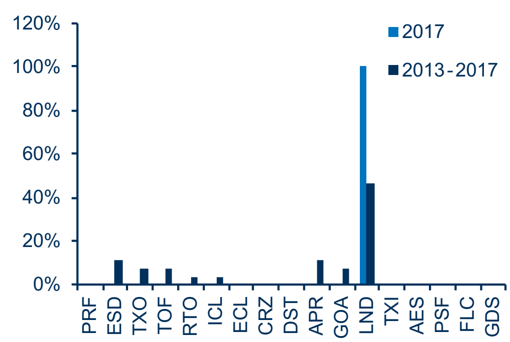
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



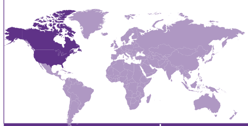
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



North America Aircraft Accidents – Accident Count

2017	Number of accidents: 7	Number of fatalities: 3
2013-2017	Number of accidents: 62	Number of fatalities: 26



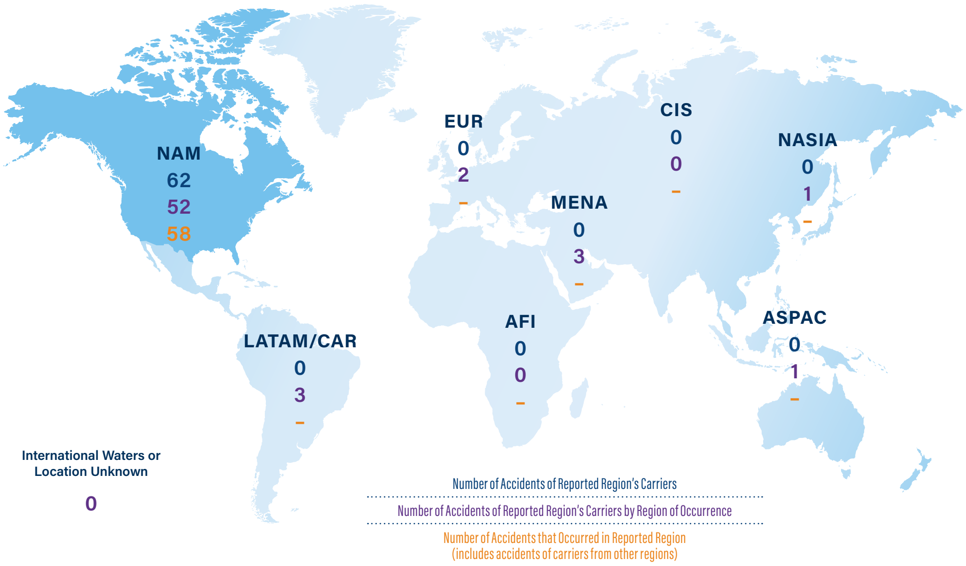
Accident Count % of Total	2017	'13-'17
IATA Member	29%	27%
Full-Loss Equivalents	15%	14%
Fatal	29%	16%
Hull Losses	29%	32%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	86%	14%	0%	71%	29%
2013-2017	71%	29%	0%	55%	45%

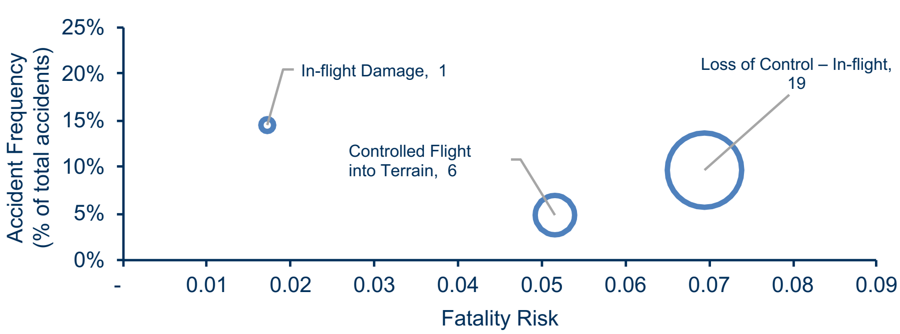
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
17%

Threats

Aircraft Malfunction:
38%

Flight Crew Errors

Manual Handling/Flight Controls:
25%

Undesired Aircraft State

Vertical/Lateral/Speed Deviation:
19%

Countermeasure

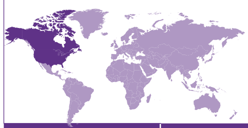
Monitor/Cross-check:
13%

For more info regarding primary contributing factors see section 8

➤ See detailed view

North America Aircraft Accidents – Accident Rate*

2017 Accident rate: 0.57
2013-2017 Accident rate: 1.07



Accident Rate*	2017	'13-'17
IATA Member	0.42	0.81
Fatality Risk**	0.08	0.15
Fatal	0.16	0.17
Hull Losses	0.16	0.34

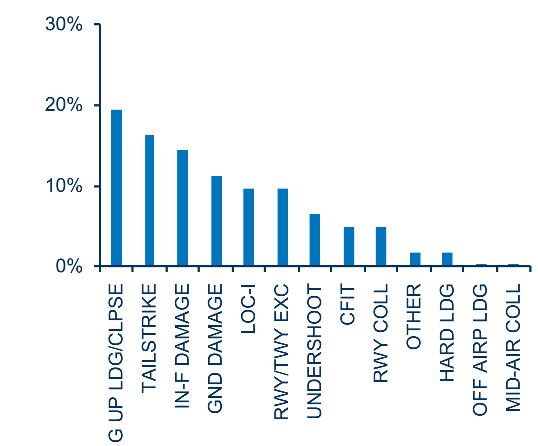
	Jet	Turboprop
2017	0.49	0.94
2013-2017	0.72	2.54

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 (2013-2017)

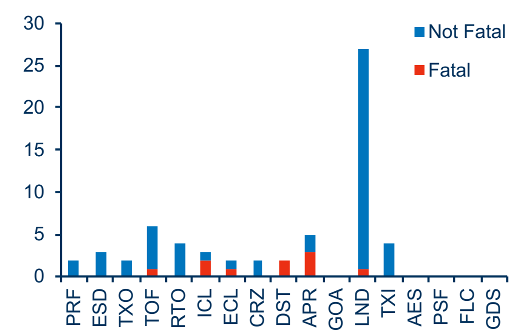
Distribution of accidents as percentage of total



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

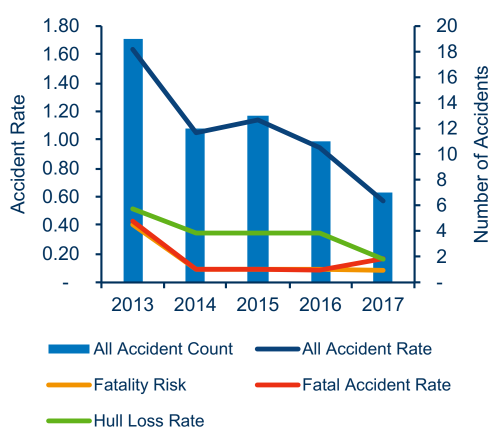
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



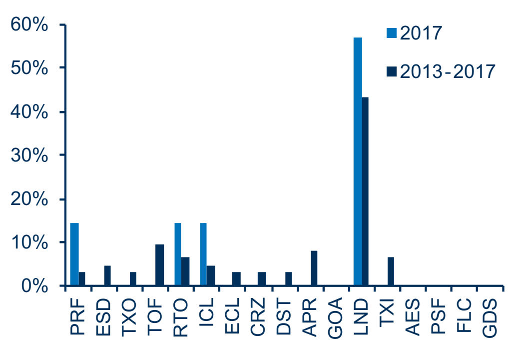
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



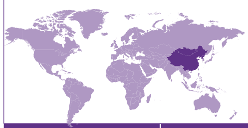
Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



North Asia Aircraft Accidents – Accident Count

2017	Number of accidents: 0	Number of fatalities: 0
2013-2017	Number of accidents: 11	Number of fatalities: 91



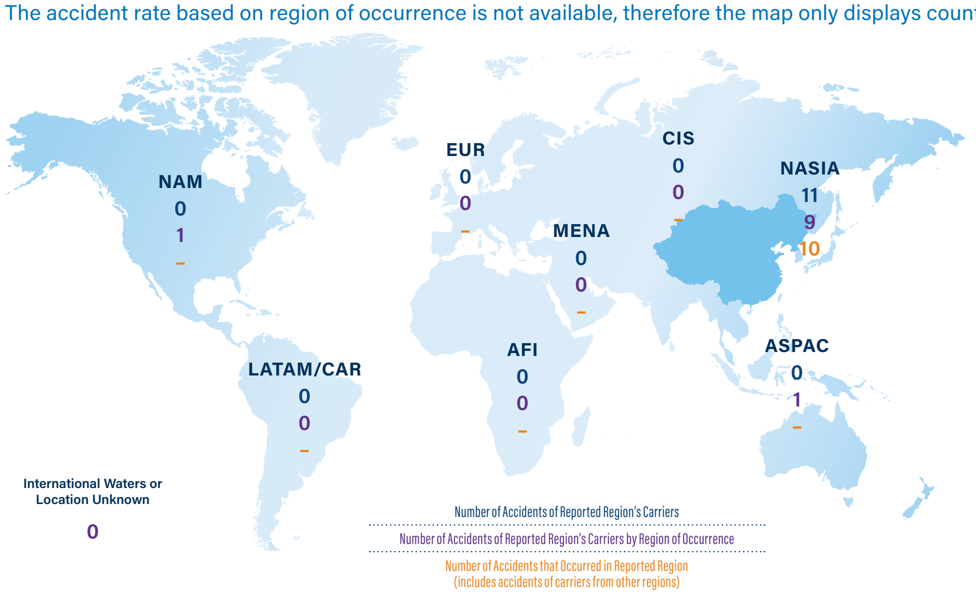
Accident Count % of Total	2017	'13-'17
IATA Member	0%	45%
Full-Loss Equivalents	0%	14%
Fatal	0%	18%
Hull Losses	0%	27%

	Passenger	Cargo	Ferry	Jet	Turboprop
2017	0%	0%	0%	0%	0%
2013-2017	73%	27%	0%	55%	45%

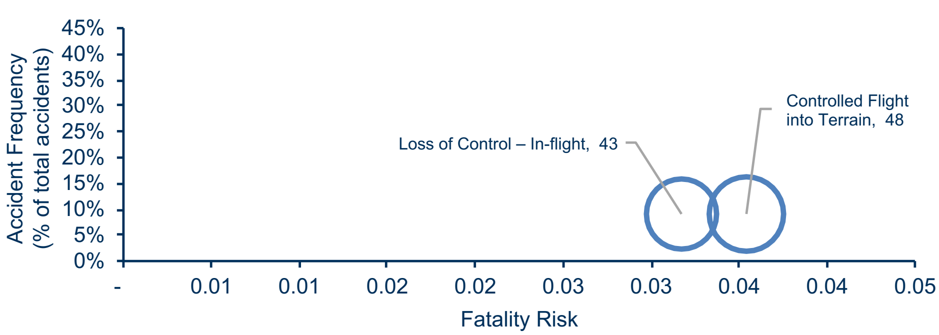
Note: the sum may not add to 100% due to rounding

Number of Accidents per Region (2013-2017)

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



Accident Category Frequency and Fatality Risk (2013-2017)



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.

Top Contributing factors

Latent Conditions

Flight Operations:
40%

Threats

Meteorology:
60%

Flight Crew Errors

Manual Handling/Flight Controls:
60%

Undesired Aircraft State

Operation Outside Aircraft Limitations:
40%

Countermeasure

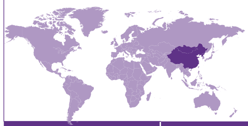
Monitor/Cross-check:
70%

For more info regarding primary contributing factors see section 8

➤ See detailed view

North Asia Aircraft Accidents – Accident Rate*

2017 Accident rate: 0.00
2013-2017 Accident rate: 0.47



Accident Rate*	2017	'13-'17
IATA Member	0.00	0.25
Fatality Risk**	0.00	0.07
Fatal	0.00	0.09
Hull Losses	0.00	0.13

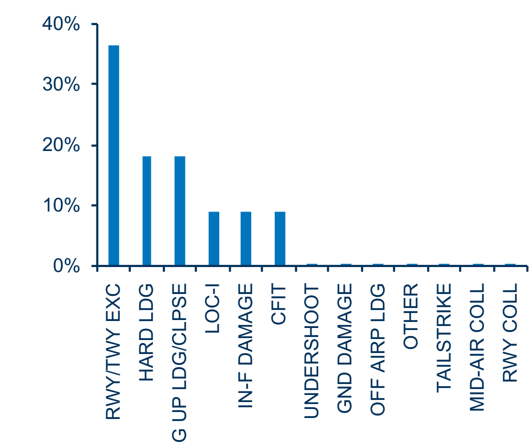
	Jet	Turboprop
2017	0.00	0.00
2013-2017	0.26	10.91

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 (2013-2017)

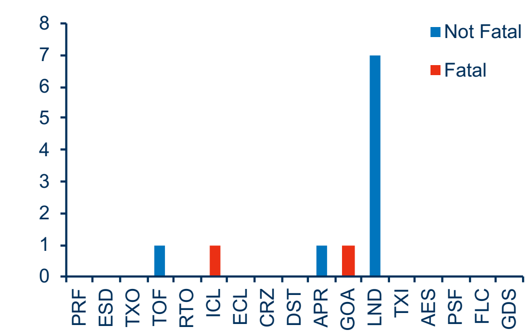
Distribution of accidents as percentage of total



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

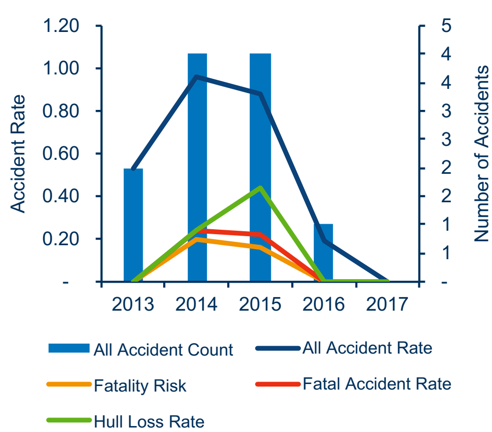
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



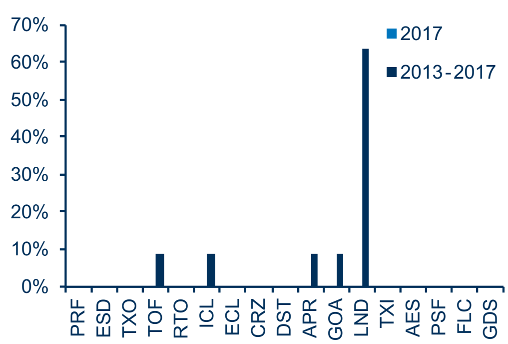
Regional Accident Rate (2013-2017)

Accidents per Million Sectors



Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



6

Analysis of Cargo Aircraft Accidents

2017 CARGO OPERATOR OVERVIEW

CARGO VS. PASSENGER OPERATIONS FOR JET AIRCRAFT

	Fleet Size	HL	HL / 1000 ACTF	SD	SD / 1000 ACTF	Total Acc	Acc / 1000 ACTF
Cargo	2,123	3	1.41	1	0.47	4	1.88
Passenger	24,027	1	0.04	20	0.83	21	0.87
Total	26,150	4	0.15	21	0.80	25	0.96

HL = Hull Loss SD = Substantial Damage

Note: Fleet Size includes both in-service and stored aircraft operated by commercial airlines.
Cargo aircraft are defined as dedicated cargo, mixed passenger/cargo (combi) or quick-change configurations.

CARGO VS. PASSENGER OPERATIONS FOR TURBOPROP AIRCRAFT

	Fleet Size	HL	HL / 1000 ACTF	SD	SD / 1000 ACTF	Total Acc	Acc / 1000 ACTF
Cargo	1,279	6	4.691	3	2.346	9	7.04
Passenger	4,288	3	0.7	8	1.87	11	2.57
Total	5,567	9	1.617	11	1.976	20	3.59

HL = Hull Loss SD = Substantial Damage

Note: Fleet Size includes both in-service and stored aircraft operated by commercial airlines.
Cargo aircraft are defined as dedicated cargo, mixed passenger/cargo (combi) or quick-change configurations.

Cargo Aircraft Accidents – Accident Count

2017	Number of accidents: 13	Number of fatalities: 12
2013-2017	Number of accidents: 75	Number of fatalities: 119

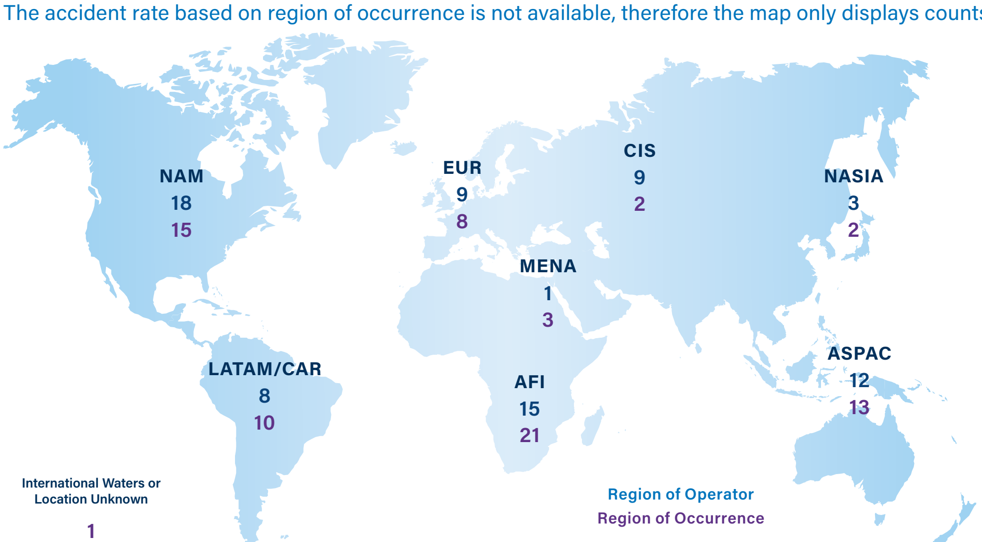
Accident Count % of Total	2017	'13-'17
IATA Member	0%	13%
Full-Loss Equivalents	24%	28%
Fatal	31%	31%
Hull Losses	69%	59%

	Jet	Turboprop
2017	31%	69%
2013-2017	40%	57%

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

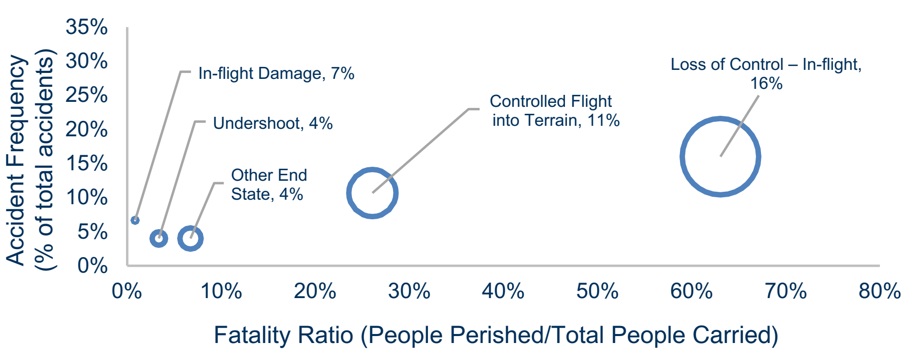
Number of Accidents per Region (2013-2017)

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



Note: An74 Hard Landing. Location: Barneo Ice Base (International Waters)

Accident Category Frequency and Fatality Risk (2013-2017)



Note: Since the sector count broken down by cargo flights is not available, rates cold not be calculated. The 'fatality risk' rate was therefore substituted by a 'fatality ratio' value, which is the total number of fatalities divided by the total number of people carried. Although this removes the effect of the percentage of people who perished in each fatal crash, it can still be used as a reference to determine which accident categories contributed the most to the amount of fatalities on cargo flights. Accident categories with no fatalities are not displayed.

Top Contributing factors

Latent Conditions

Regulatory Oversight:
37%

Threats

Aircraft Malfunction:
37%

Flight Crew Errors

Manual Handling/Flight Controls:
37%

Undesired Aircraft State

Long/Floated/Bounced/Firm/Off-center/Crabbed landing:
27%

Countermeasure

Overall Crew Performance:
22%

For more info regarding primary contributing factors see section 8

➤ See detailed view

Cargo Aircraft Accidents – Accident Rate*

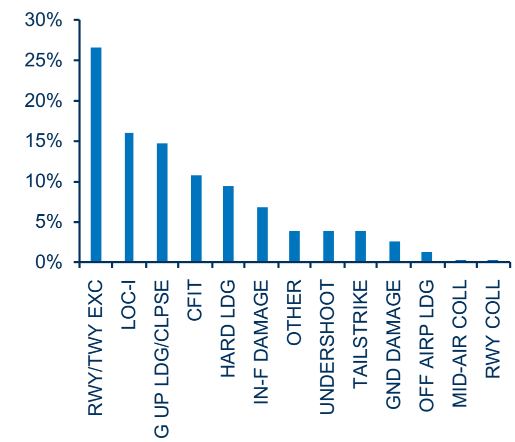
Accident rate*: –	Accident Rate*	2017
	IATA Member	–
	Fatality Risk**	–
	Fatal	–
	Hull Losses	–

Cargo	
–	Cargo accident rates are not available

Note: the number of sectors for cargo flights is not available and therefore the rate calculation is not being shown

Accident Category Distribution (2013-2017)

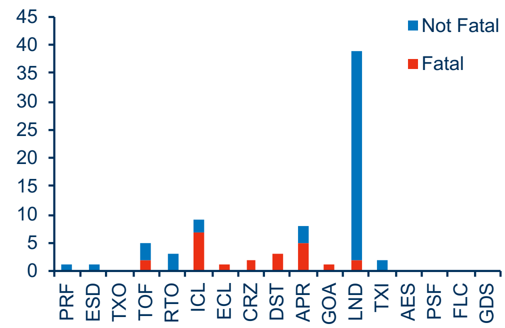
Distribution of accidents as percentage of total



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

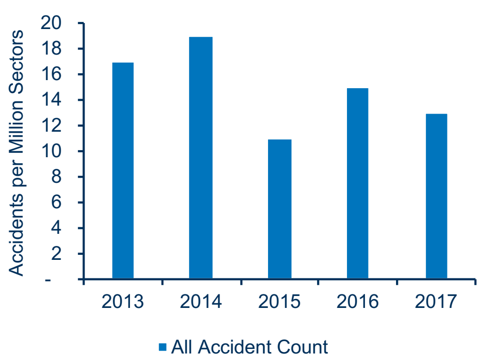
Accidents per Phase of Flight (2013-2017)

Total Number of Accidents (Fatal vs. Nonfatal)



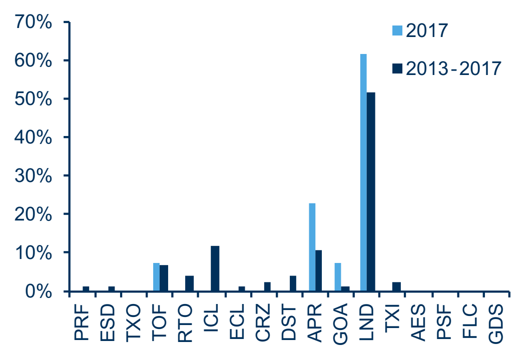
Five-Year Trend (2013-2017)

See Annex 1 for the definitions of different metrics used



Accidents per Phase of Flight (2013-2017)

Distribution of accidents as percentage of total



Cabin Operations Safety Conference

8-10 May, 2018 in Bangkok, Thailand

COSC – your source for real cabin safety answers

The IATA Cabin Operations and Safety Conference (COSC) brings together working experts from airlines, academia and IATA to respond to your reality.

Plenary sessions relating actual airline experience. Workshops led by cabin safety specialists. Direct answers to your personalized questions from authorities in subjects ranging from human trafficking and unruly passengers, to safety culture and audit readiness, with our speed networking feature. The IATA COSC has the answers to important questions in cabin operations and safety, to enable you to tackle any challenge.

Join us in Bangkok, 8-10 May inclusive.
www.iata.org/cabin-safety-conference

REGISTER NOW!

IATA

7

Cabin Safety

CABIN SAFETY

Cabin Safety is a broad subject, encompassing cabin ergonomics and design, normal and emergency operating procedures, cabin crew standards and requirements, continuous assessment of risks associated with onboard product and service, rules and regulations, security requirements, unruly passenger management and injury prevention.

Everything in an aircraft cabin involves an underlying aspect of safety and there is always the potential for an abnormal situation to escalate into an emergency. Therefore, it is sometimes difficult to understand and objectively measure the direct positive impact cabin safety risk assessment, regulations, policies, procedures and training can have on safe operations.

An effective and integrated Safety Management System (SMS) within an airline will help ensure that safety is considered at all stages of onboard service design. An effective open safety culture will also give cabin crew the confidence to report safety incidents and errors, confident in the knowledge that these reports are used to enhance safety.

IATA's role is to keep airlines informed of regulatory changes, give advice on best practices as well as new and emerging issues in cabin safety, and to act as a resource for help. IATA Cabin Safety continues to achieve these objectives using a variety of methods, communication tools and resources for airlines

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 enters its fifth year in 2018 and has become an established and popular venue for the exchange of ideas by, and education, of Cabin Safety specialists: www.iata.org/cabin-safety-conference. 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.

IATA CABIN OPERATIONS SAFETY TECHNICAL GROUP

While IATA represents all its member airlines, the Cabin Operations Safety Technical Group (COSTG) is established to maintain a close working link with the operational environment. The members of COSTG are industry experts in cabin safety areas of interest 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.

Image courtesy of Airbus

COSTF Members (2018-2019)

Lisa Mounce AMERICAN AIRLINES	Catherine Chan (Chair) CATHAY PACIFIC	Johnny Chin (Vice-Chair) SINGAPORE AIRLINES
Yuriy Tsybulskiy AIR ASTANA	Anabel Brough EMIRATES AIRLINE	Lerato Luti SOUTH AFRICAN AIRWAYS
Christiane Raspa AIR CANADA	Jonathan Jasper (Secretary) IATA	Martin Ruedisueli SWISS INTERNATIONAL AIR LINES
Anne Frederique Houlbreque AIR FRANCE	Berry Ochieng' KENYA AIRWAYS	Carlos Mouzaco Dias TAP PORTUGAL
Gennaro Anastasio ALITALIA	Alexandra Wolf LUFTHANSA	Mary Gooding VIRGIN ATLANTIC AIRWAYS
Ruben Inion AUSTRIAN AIRLINES	Rosnina Abdullah MALAYSIA AIRLINES BERHAD	Sophie O'Ferrall VIRGIN AUSTRALIA
Matthew Whipp BRITISH AIRWAYS	Warren Elias QATAR AIRWAYS	

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 that can be used to assess the efficacy of current procedures and mitigations

IATA CABIN OPERATIONS SAFETY BEST PRACTICES GUIDE (4th EDITION)

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.

Written and updated annually by a global team of cabin safety professionals, this guide includes standards and recommended practices from the IATA Operational Safety Audit (IOSA), ICAO and other regulators, combined with the extensive operational experience of member airlines. It suggests and gives guidance in the appropriate risk assessments to demonstrate the incorporation of SMS within cabin operations.

As with all safety-related reference documents, it is important to keep up-to-date with any changes and new requirements. This latest edition integrates all existing IATA Cabin Safety guidance material and toolkits, and includes new guidance on the acceptance of noncertified comfort devices, smart luggage, ICAO-recommended brace positions, the management of medical emergencies, unruly passengers and other cabin-related security procedures. This and other IATA guidance materials are available at: www.iata.org/cabin-safety.

HEALTH AND SAFETY GUIDELINES – PASSENGERS AND CREW

In the airline industry, health-related issues concerning passengers or crew are crucial in most activities: aircraft operations, passenger transport, cargo, etc. They cover matters as diverse as duty time limitation, transmission of communicable diseases and disinfection.

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.

IOSA AND CABIN OPERATIONS SAFETY

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 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.

ACCIDENTS – CABIN END STATES

This section of the 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 nonlife-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 and into or onto water.
- **Hull Loss/Nil Survivors:** Aircraft impact resulting in a complete hull loss with no survivors.

The factors contributing to most of the accidents detailed in the charts and graphs in this section are not attributed to cabin operations or the actions taken inside the cabin by the crew. The statistics do show, however, the result of an accident and highlight where cabin crew may have had a positive impact on the outcome and survivability of the aircraft occupants. These statistics can also be used to help airlines and training organizations to identify suitable practical training scenarios and training discussions.

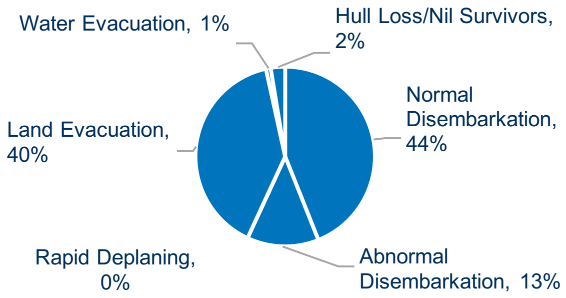
Cabin End States

	2017	2015-2017
Total 'Passenger-only' Accidents	32	138

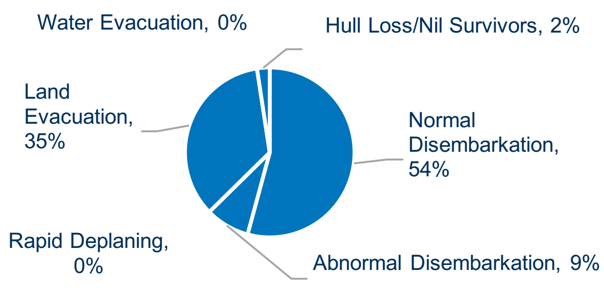
The total number of accidents in 2017 is 32, down from 49 in 2016. With so few accidents to review, it is not possible to identify trends or patterns and draw conclusions. Therefore, this figure has been added to data from 2015 and 2016. This combined three-year figure of 138 accidents is used in the following tables.

	2015-2017					
	Normal Disembarkation	Abnormal Disembarkation	Land Evacuation	Water Evacuation	Hull Loss/ Nil survivors	Total
All	51	15	47	1	3	117
IATA Member	28	5	14	1	1	49
IOSA-Registered	37	8	18	1	1	65
Fatal	0	0	2	1	3	6
Hull Loss	2	0	16	1	3	22
Jet	45	7	29	0	2	83
Turboprop	6	8	17	1	1	33

Cabin End State – Jet and Turboprop Aircraft



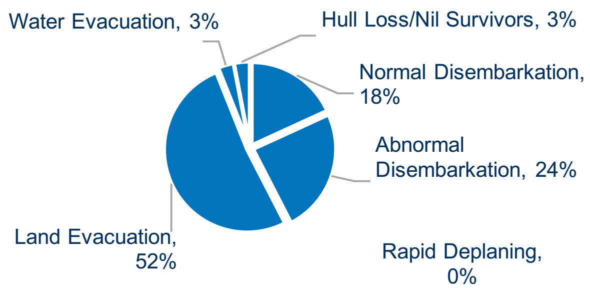
Cabin End State – Jet



In 63% of jet aircraft accidents, passengers were able to disembark the aircraft in an orderly manner using boarding doors, either normally (54%) or abnormally (9%). Evacuation procedures were necessary during 35% of accidents.

The majority of passenger jet aircraft are typically larger than turboprops and, therefore, more likely to be fitted with escape slides. Where there is no immediate danger to the occupants, it is usually preferred to use normal disembarkation methods to protect from the risks involved in using evacuation slides or sliding off wings.

Cabin End State - Turboprop

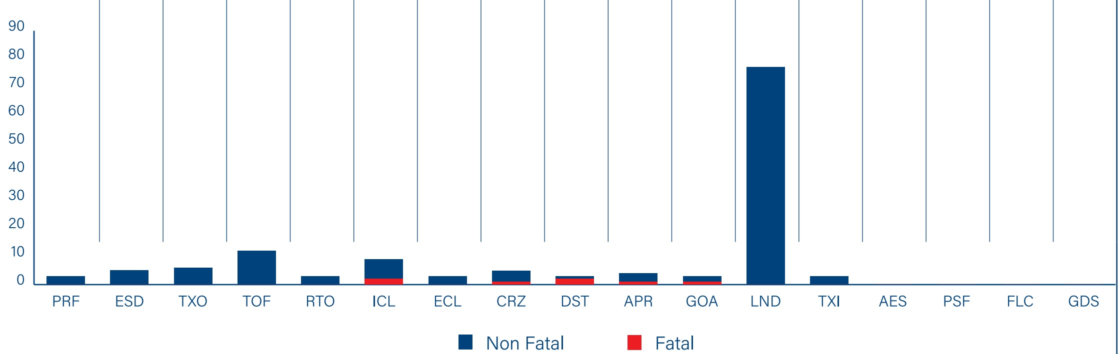


Normal disembarkation was possible in 18% of accidents with turboprop aircraft. Abnormal disembarkation methods were used in 24% of accidents and 52% resulted in an evacuation on land.

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 obvious.

Cabin End States per Phase of Flight (2015-2017)

	PRF	ESD	TXO	TOF	RTO	ICL	ECL	CRZ	DST	APR	GOA	LND	TXI	AES	PSF	FLC	GDS
Total Accidents	3	5	6	12	3	9	3	5	3	4	3	77	3	0	0	0	0
Normal Disembarkation	100%	80%	50%	25%	0%	56%	100%	60%	33%	75%	33%	26%	33%	0%	0%	0%	0%
Abnormal Disembarkation	0%	0%	17%	8%	0%	11%	0%	0%	0%	0%	0%	16%	0%	0%	0%	0%	0%
Rapid Deplaning	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Land Evacuation	0%	0%	17%	25%	100%	11%	0%	0%	0%	25%	33%	44%	67%	0%	0%	0%	0%
Water Evacuation	0%	0%	0%	0%	0%	11%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Hull Loss/Nil Survivors	0%	0%	0%	0%	0%	0%	0%	20%	33%	0%	33%	0%	0%	0%	0%	0%	0%



Total Accidents: 136

Note: please 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. The table's first row shows the total number of accidents for 2015-2017. Two accidents did not identify a phase of flight and are, therefore, not included in this set. The other rows show the cabin end state per phase of flight.

Landing is by far the most critical stage for cabin crew to be prepared for an accident. Other important phases are Takeoff and Initial Climb.

During the Takeoff and Landing stages, cabin crew are positioned at their crew seats and ready to act. The following table shows the importance of cabin crew mental preparedness for an evacuation at these most critical stages of flight.

Accident End States and Cabin End States (2015-2017)

	Total	Normal Disembarkation	Abnormal Disembarkation	Rapid Deplaning	Land Evacuation	Water Evacuation	Hull Loss/ Nil Survivors
Runway / Taxiway Excursion	26	0	6	0	20	0	0
Hard Landing	21	15	1	0	5	0	0
In-flight Damage	17	14	1	0	2	0	0
Gear-up Landing / Gear Collapse	16	1	5	0	10	0	0
Ground Damage	10	9	0	0	1	0	0
Undershoot	6	2	1	0	3	0	0
Runway Collision	5	2	1	0	2	0	0
Tailstrike	5	5	0	0	0	0	0
Loss of Control – In-flight	5	0	0	0	3	1	1
Other End State	3	1	0	0	1	0	1
Controlled Flight Into Terrai	2	1	0	0	0	0	1
Mid-air Collision	1	1	0	0	0	0	0
Off-Airport Landing / Ditching	0	0	0	0	0	0	0

This table shows the type of accidents with their associated Cabin End State and provides operators with useful information for cabin crew training exercises and discussion. It lists the accident types in order of frequency and demonstrates that most accidents happened on landing.

With few accidents to review, it is very difficult to identify trends or areas for focused attention. IATA Cabin Safety, therefore, regularly looks closely at incident data to identify where its activities may make a positive impact to enhance safety.

IATA Global Aviation Data Management (GADM) includes a business intelligence tool called the Safety Trend Evaluation, Analysis and Data Exchange System (STEADES™) that provides access to data, analysis and global safety trends on established key performance indicators in comparison to worldwide benchmarks.

The STEADES database is comprised of de-identified safety incident reports from over 198 participating airlines throughout the world, with an annual reporting rate now exceeding 200,000 reports. This data is regularly used by IATA Cabin Safety to support ongoing advocacy initiatives in relation to unruly passengers, as well as identify any trends that may require existing Cabin Safety guidance to be expanded.

Examples of existing STEADES cabin safety analyses include:

- Inadvertent slide deployments (ISDs)
- Fire, smoke and fume events
- Passenger and cabin crew injuries
- Turbulence injuries or incidents
- Unruly passenger incidents
- Operational pressure

At the time of writing this report, the submission of incident data is not complete for 2017. Therefore, 2016 data is used for the following unruly passenger analysis.

UNRULY PASSENGER REPORTS

There were 9,837 validated reports of unruly behavior identified on board aircraft during 2016, during 13,390,969 flights carried out by STEADES members. This demonstrates a global rate of approximately 0.7 incidents per 1,000 sectors, or approximately one incident per 1,424 sectors. This shows an improvement compared to previously published figures for 2015 of one incident per 1,280 flights. However, unlike previous years, the total for 2016 excludes incidents that occurred before the passenger boarded the aircraft.

Levels of Unruly Behavior

For this analysis, the established levels of disruptive behavior are levels 1 – 4, described as follows:

Level 1 incidents include verbal aggression toward crewmembers or other passengers, noncompliance with safety regulations such as smoking in the lavatories, refusing to comply with the fasten seatbelt signs, and standing during taxi in to retrieve personal items. Such incidents accounted for 86% of total reports.

Level 2 incidents create fear or require cabin crew intervention to de-escalate the situation. These reports represent 12% of total reports, an increase of one percentage point over figures for 2015.

Level 3 incidents are those where a direct threat to the safety of another person is reported. 0.7% of reports were classified as Level 3 behavior. While this may seem insignificant, these 66 reports relate to occasions where life was threatened on board an aircraft.

Level 4 incidents, which include attempts to enter the flight deck, are rare and 0.2% of reports in this dataset indicated such behavior, mostly unintentional. Of these 20 reports, three reports were identified as intentional attempts to cause disruption without involving weapons, five reports were attributed to mental health conditions, four reports attributed to intoxication, three reports wanted to complain to the captain regarding disruption of service, two reports mistook the flight deck door for a lavatory door, and three reports were unexplained intentional attempts to enter the flight deck while on the ground, therefore posing minimal risk to the flight.

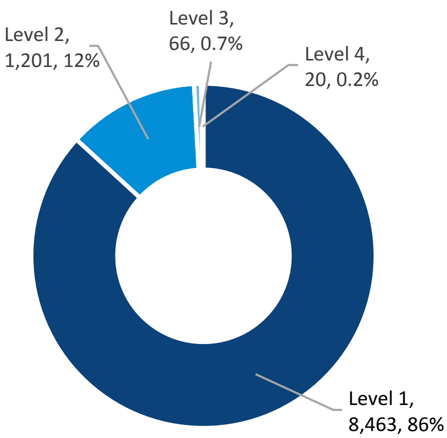
Level 1 Minor	Level 2 Moderate	Level 3 Serious	Level 4 Flight deck breach
▪ Noncompliant with safety regulations and policies ▪ Suspicious behavior ▪ Boisterous/lively/excitable ▪ Argumentative	▪ Physically aggressive ▪ Obscene or lewd physical contact ▪ Causing damage to aircraft fixtures or equipment	▪ Dangerous ▪ Display of or use of weapon ▪ Intent or threat to injure	▪ Attempt to enter the flight deck ▪ Act of sabotage ▪ Credible threat of unlawful seizure of the aircraft

Incidents (cont'd)

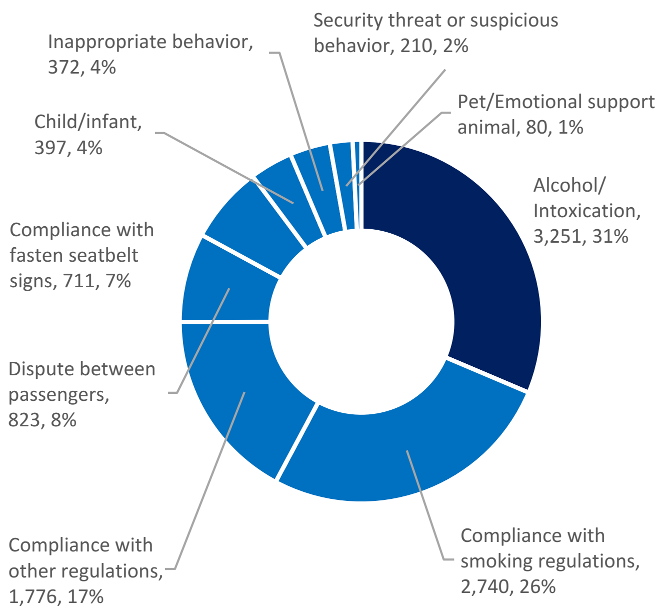
Types of Behavior Demonstrated

Classifications are not unique. For example, a passenger's unruly behavior could include intoxication, noncompliance with safety regulations and a dispute with another passenger. The following chart shows a breakdown of all different types of unruly behavior as a percentage of total reports.

Levels



Behavior types



Alcohol/Intoxication

Reports of intoxication include those attributed to alcohol and/or other substances. In some cases, the interaction between alcohol and medication, such as sleeping tablets, has been identified as the suspected cause of the unruly behavior. Intoxication is included in 31% of all reports of unruly behavior.

Approximately 28% of reports of intoxication included passengers consuming alcohol that was not served to them by cabin crew, contrary to airline policy.

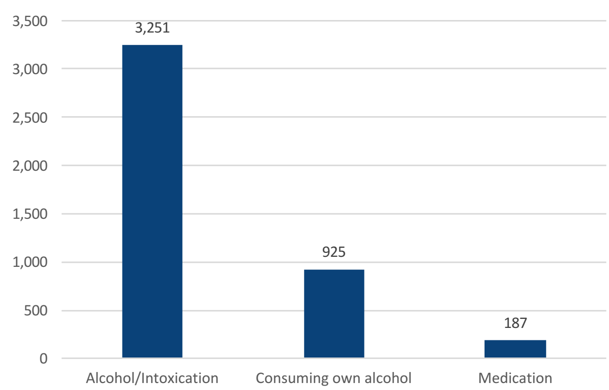
Approximately 14% of all incidents involving intoxication displayed behavior that was physical in nature and posed a significant safety risk to the aircraft, passengers or crew (i.e., Level 2 and above). A little over half (52%) of the 169 reports where a passenger was physically restrained by the cabin crew cited intoxication as a contributory factor.

Summary

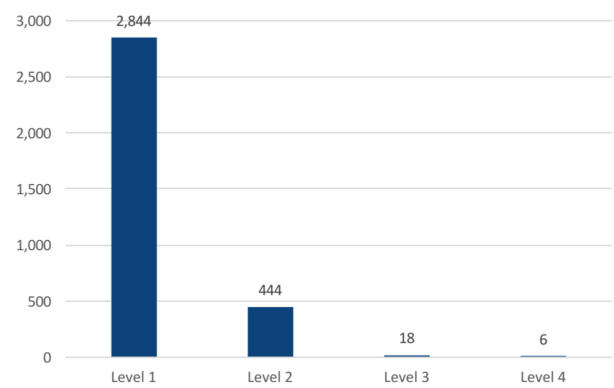
Unruly passenger behavior remains a concern for many airlines and IATA continues to support initiatives to ratify the 2014 Montreal Protocol and to moderate the purchase and consumption of alcohol at airports and on board aircraft.

A more detailed analysis of all aspects of unruly passenger reports in this dataset, including findings and recommendations, is available to participants in IATA's Global Aviation Data Management program, through the members' website.

Intoxication - Contributing Factors (2016)



Intoxication - Level of Behavior Shown (2016)



8

Report Findings and IATA Prevention Strategies

TOP FINDINGS, 2013-2017

Of the 340 accidents between 2013 and 2017:

- 32% involved IATA members
- 13% were fatal
- 76% involved passenger aircraft, 22% involved cargo aircraft and 3% involved ferry flights (note: numbers don't add up to 100% due to rounding)
- 58% involved jet aircraft and 42% involved turboprops
- 31% resulted in a hull loss
- 68% resulted in substantial damage
- 55% occurred during landing
- 22% of the fatal accidents occurred during approach

Top Three Contributing Factors

Latent Conditions (deficiencies in…)	1. Regulatory oversight 2. Safety management 3. Flight operations
Threats (Environmental)	1. Meteorology 2. Wind/Wind shear/Gusts 3. Airport facilities
Threats (Airline)	1. Aircraft malfunction 2. Gear/Tire 3. Maintenance events
Flight crew errors relating to latent conditions (deficiencies in…)	1. Manual handling/ Flight controls 2. SOP adherence/ Cross-verification 3. Callouts and pilot-to-pilot communication
Undesired aircraft states	1. Long, floated, bounced, firm, off-center or crabbed landing 2. Vertical/Lateral/Speed deviation 3. Unstable approach
End states	1. Runway excursion 2. Gear-up landing/Gear collapse 3. Hard landing

PROPOSED COUNTERMEASURES

Every year, the IATA Accident Classification Technical Group (ACTG) classifies accidents and, with the benefit of hindsight, determines actions or measures that could have been taken to prevent an accident. These proposed countermeasures can include issues within an organization or a country, or involve performance of frontline personnel, such as pilots or ground personnel. They are valid for accidents involving both Eastern and Western-built jet and turboprop aircraft.

This section presents countermeasures and the percentage of accidents that ACTG analysis determined may have been prevented if the countermeasures had been actioned beforehand. The intention is to help operators, regulators and flight crews enhance safety by strengthening these countermeasures.

Countermeasures are aimed at two levels:

- The operator or the state responsible for oversight. These countermeasures are based on activities, processes and systemic issues internal to airline operation or state oversight activities.
- Flight crew. These countermeasures are to help flight crew manage threats or errors during operations.

COUNTERMEASURES FOR THE OPERATOR AND THE STATE

Subject	Description	% of accidents where counter-measures could have been effective (2013-2017)
Regulatory oversight by the state of the operator	States must be responsible for establishing a safety program, in order to achieve an acceptable level of safety, encompassing the following responsibilities: ▪ Safety regulation ▪ Safety oversight ▪ Accident/incident investigation ▪ Mandatory/voluntary reporting systems ▪ Safety data analysis and exchange ▪ Safety assurance ▪ Safety promotion	**33%**
Safety management system (operator)	The operator should implement a safety management system (SMS) accepted by the state that, as a minimum: ▪ Identifies safety hazards ▪ Ensures that remedial action necessary to maintain an acceptable level of safety is implemented ▪ Provides for continuous monitoring and regular assessment of the safety level achieved ▪ Aims to make continuous improvements to the overall level of safety	**27%**
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 Competency-based Training (CBT) devices.	**12%**

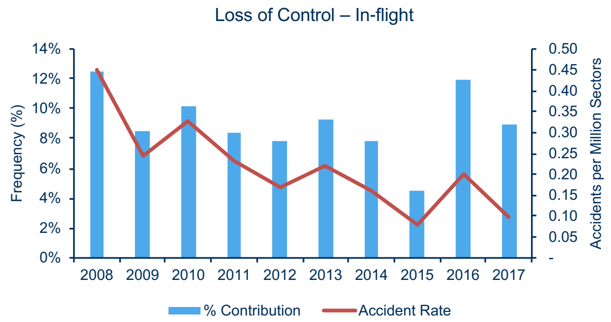
COUNTERMEASURES FOR FLIGHT CREWS

Subject	Description	% of accidents where counter-measures could have been effective (2013-2017)
Overall crew performance	Overall, crew members should perform well as risk managers, including flight, cabin and ground crew as well as their interactions with air traffic control (ATC).	**21%**
Monitor/Cross-check	Crewmembers should actively monitor and cross-check flight path, aircraft performance, systems and other crewmembers to ensure aircraft position, settings and crew actions are verified.	**17%**
Contingency management	Crewmembers should develop effective strategies to manage threats to safety.	**7%**
Leadership	▪ Captain Should Show Leadership and coordinate flight deck activities ▪ First Officer should be assertive when necessary and be able to take over as the leader	**8%**
Taxiway/Runway management	Crewmembers use caution and keep watch outside when navigating taxiways and runways	**5%**

LOSS OF CONTROL - IN-FLIGHT

In 2017, 9% of accidents were because of a loss of control - in-flight (LOC-I), resulting in 58% of the onboard fatalities. The operators were not IATA Operational Safety Audit (IOSA)-accredited airlines. In the last five years (2013-2017), there have been 29 LOC-I accidents with 690 fatalities.

The graph below indicates the percentage of all accidents that were LOC-I over the past ten years.



A discussion of loss of control usually starts with the premise of dependency on automation. However, in 2017, the four accidents were on early generation turboprops: two L410s, one SD330 and an ATR42. While they have automation, they are not the latest generation of technology. The circumstances were: an engine going into un-commanded beta range on approach, a go-around, a non-precision approach and a suspected icing on departure.

While aircraft malfunction and weather were contributing factors, the latent conditions of training, checking, standard operating procedures (SOPs) leading to manual handling, communication and application of SOPs are high on the errors list leading to the undesired aircraft states of speed and vertical/lateral flight path deviations.

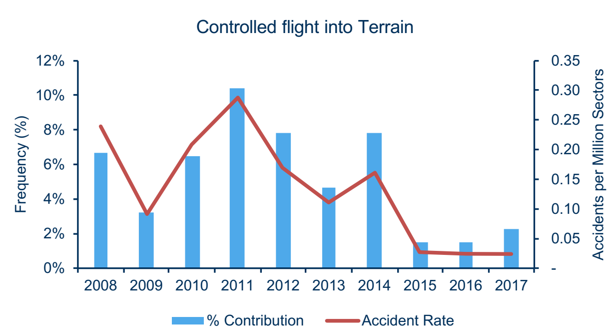
Recommendations to operators:

- Ensure flight crews have and maintain the necessary manual handling skills for all foreseeable in-flight scenarios.
- Ensure operations are conducted in accordance with SOPs.
- Ensure flight crews have the necessary communication and crew resource management (CRM) skills.
- Conduct training on energy management in a variety of scenarios, including, but not limited to: high altitude, low speed, engine failure, un-commanded engine conditions, go-arounds, non-precision approaches and icing conditions.
- Consult the IATA Guidance Material and Best Practices for the Implementation of Upset Prevention and Recovery Training (UPRT), the ICAO manual on UPRT as well as Flight Safety Foundation, Skybrary and other resources.
- Implement UPRT where possible.
- Carry out training scenarios under degraded flight control protection. Periodic simulator training should include unusual attitude exercises that are realistic to include extremes of center of gravity, weight, altitude and control status.
- Train flight crews on the onset of somatogravic illusion, the feeling where the perceived and actual acceleration vectors differ considerably, which can create spatial disorientation and lead to loss of control.
- Ensure flight crews have a comprehensive understanding of automation, flight director, and manual handling mode selection and control.
- Where possible, ensure that simulators have the latest upgrades to simulate high-altitude handling and upset recovery.
- Incorporate procedures to allow for manual flying of the airplane in line operations, under specified circumstances. Flight crews should be encouraged to use manual control and to exercise these skills on a regular basis. The Federal Aviation Administration (FAA)'s Safety Alerts for Operators (SAFO) 13002 Manual Flying Skills outlines recommendations, as for example, endorsed by European Aviation Safety Agency (EASA) and National Transportation Safety Board (NTSB).
- Efforts to restore or establish and maintain manual flying skills must be comprehensive and ongoing.
- Be mindful of the limitations of simulators to represent conditions out of the flight envelope and the possibility of providing negative training.
- Incorporate, where applicable, the Commercial Aviation Safety Team (CAST) safety enhancements.

CONTROLLED FLIGHT INTO TERRAIN

In 2017, there was one Controlled Flight into Terrain (CFIT) accident resulting in four onboard fatalities and 35 fatalities on the ground. In the last five years (2013-2017), there have been 13 CFIT accidents with 154 fatalities.

The graph below indicates the percentage of all accidents that were CFIT over the past ten years.



The most common threats identified in CFIT accidents were the lack of visual reference and navigation aids. Latent conditions that contributed to the realization of these threats were regulatory oversight (78%), technology and equipment (56%), SMS (44%), and flight operations training and checking (44%).

There is a very strong correlation between the lack of instrument landing systems (ILS) or state-of-the-art approach procedures, such as performance-based navigation (PBN). The malfunction or lack of ground-based navigation aids was a contributing factor in 56% of the CFIT accidents in the 2013-2017 period, an improvement of eight percentage points over the 2012-2016 period.

The installation/availability of precision approach aids would make a difference, but the threats can also be identified, assessed and managed, both in terms of the operation and its oversight, by the frontline personnel adhering to SOPs. 44% of the CFIT accidents in the last five years penetrated weather unnecessarily and 22% would have been prevented by a go-around from an unstable approach. Monitoring and cross-checking was identified as a countermeasure that may have been effective in preventing 56% of CFIT accidents. 77% of CFIT accidents involved turboprops between 2013 and 2017. IATA will be drilling into the data behind this statistic to search for factors that can be addressed.

Recommendations to operators:

- Use SMS principles to assess and mitigate risks in operations to airfields with non-precision or circling approach procedures.
- Implement Continuous Angle Non-Precision Approaches (CANPA) for a more stable descent profile than traditional "dive and drive" methods used for non-precision approaches.
- Consider replacing circling approaches in favor of using Area Navigation (RNAV) or Required Navigation Performance (RNP) approaches.
- Train flight crews to respond immediately to a hard Enhanced Ground Proximity Warning System (EGPWS) warning, and respect and respond to EGPWS soft warnings.
- Train flight crews to understand the limitations of EGPWS in scenarios such as non-precision approaches. Mandate procedures that ensure EGPWS databases are kept accurate and up-to-date. In other words, as soon as the database update is available. The current grace period is potentially a latent failure in the system. In addition, the latest modifications are incorporated in their particular Terrain Awareness Warning System (TAWS) or EGPWS computer and with Global Positioning System (GPS) providing aircraft position data directly to the computer.
- Airlines are encouraged to use simulators to show their crews exactly how close terrain is when the EGPWS warning occurs to reinforce the need for an immediate response to the warning to avoid the terrain. Time for reorientation is only available when the warning has ceased.
- Where possible, aircraft should be equipped with approved GPS so that accurate positioning and altitude data is available.
- Risk assess retrofitted navigation systems so that navigation source switching does not become a hazard.
- Ensure that flight crews are trained to understand the source of information driving terrain and navigation displays to ensure that accurate information is followed.
- Train flight crews to respect weather minima and not to penetrate weather unnecessarily.
- Train flight crews to go around from an unstable approach.
- Train and ensure effective implementation of SOPs, flight crew monitoring, cross-checking and pilot-to-pilot communication in all approaches when weather and visibility are factors.
- Use a Flight Operations Quality Assurance (FOQA) program to monitor compliance and reinforce a policy of go-around from an unstable approach.
- Consult the IATA Guidance Material for Improving Flight Crew Monitoring.

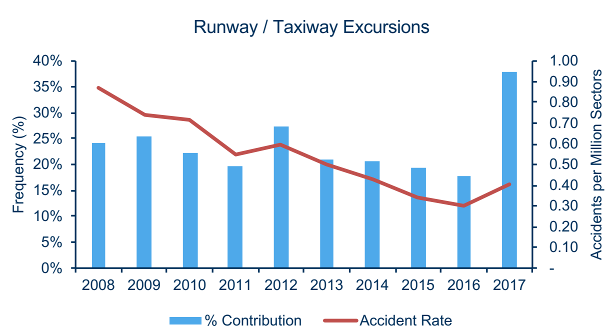
Recommendations to regulators/states:

- Implement precision approaches or PBN approaches to reduce the risk of CFIT accidents.
- Adopt CANPA for non-precision approaches.
- Mandate the use of TAWS in air transport aircraft.
- Provide to manufacturers the respective terrain data when a new airport opens.
- Comply with ICAO recommendations and guidelines regarding PBN implementation.

RUNWAY/TAXIWAY EXCURSIONS

In 2017, there were 17 runway/taxiway excursion accidents with zero fatalities. They consisted of eight veer offs, eight overruns and one taxiway excursion. In the last five years (2013-2017), there have been 76 runway excursion accidents with eight fatalities.

The graph below indicates the percentage of all accidents that were runway/taxiway excursions over the past ten years.



In this category, the most common latent issues are regulatory oversight (45%), SMS (42%) and flight operations training and checking (22%). These systemic issues are compounded by the most common threats of: weather (45%), airport facilities (32%) wind and wind shear (25%) and contaminated runway surface (25%). The resulting flight crew errors were: manual handling (38%), SOP adherence (32%) and callouts (12%). The most common recoverable undesired aircraft states were: long/floated/bounced/firm/off-center/crabbed landing (43%), speed or lateral/vertical path deviation (18%) and a continued landing from an unstable approach (13%).

Recommendations to operators:

- Train flight crew to go-around from a long/floated/bounced/firm/off-center/crabbed landing.
- Implement a policy of go-around from an unstable approach.
- Train flight crews to monitor and make effective callouts and pilot-to-pilot interactions to ensure a stable approach is achieved or a go-around is performed.
- Define the touchdown aiming point as the target.
- Implement a policy of landing in the touchdown zone or consider performing a go-around.
- Use a FOQA program to monitor compliance and reinforce a policy of go-around from an unstable approach.
- Use a FOQA program to monitor long landings.
- Review the ICAO Global Runway Safety Action Plan released in November 2017, which identifies the stakeholder mitigations to runway safety issues.
- Familiarize themselves and flight crews with the ICAO global format for runway surface condition reporting, which will become effective in November 2020.
- Train pilots to make an early decision to use the maximum available deceleration capability of the aircraft whenever landing performance is compromised.
- Adopt landing performance prediction technology, where practicable.
- Instruct flight crews and dispatchers to calculate stopping distances on every landing.
- Review the IATA Runway Excursion Risk Reduction Toolkit on www.iata.org and the runway safety I-kit., which contains available Runway Safety Products.
- Consult the 3rd edition of the IATA/CANSO/IFALPA/IFATCA Unstable Approaches – Risk Mitigation, Procedures and Best Practices
- Consult the 3rd edition of the European Action Plan for the Prevention of Runway Incursions (EAPPRI),
- Incorporate, where applicable, the CAST safety enhancements.
- Deploy on board technology, as feasible, to reduce or prevent landing overruns.

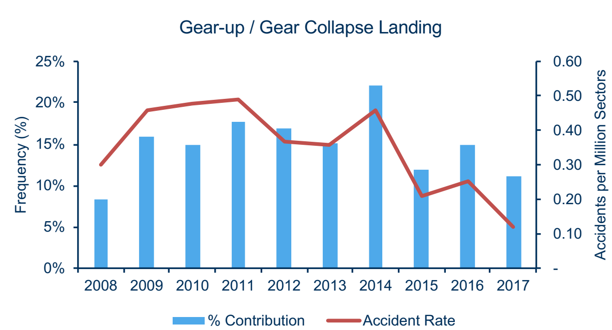
Recommendations to regulators and industry:

- Encourage implementation of SMS for all airlines.
- Encourage a policy of rejected landing in the case of long landings.
- Require training in bounced landing recovery techniques.
- Train pilots in crosswind and tailwind landings up to the maximum manufacturer-certified winds.
- Encourage airlines to develop campaigns to establish SOPs.
- Review the ICAO Global Runway Safety Action Plan released in November 2017, which identifies the stakeholder mitigations to runway safety issues.
- Adopt the ICAO global format for runway surface condition reporting, which will become effective in November 2020.
- Install Runway End Safety Area (RESA), arrestor beds and similar runway excursion prevention technologies and infrastructure to help reduce the severity of runway excursions.
- Allow the use of reverse thrust for safety or landing performance improvement. Noise considerations must be secondary.
- Incorporate, where applicable, the CAST safety enhancements.

AIRCRAFT TECHNICAL FAILURES AND SAFETY MAINTENANCE

In 2017, there were five accidents in the gear up/gear collapsed landing category, with zero fatalities. In the last five years (2013-2017), there have been 53 accidents in the gear up/gear collapsed landing category with zero fatalities.

The graph below indicates the percentage of all accidents that were gear up/gear collapsed landings over the past ten years.



Maintenance was a latent condition in 28% of events over the last five years. In 77% of accidents, gear or tire malfunction was a factor. Only 2% of accidents were the result of manual handling.

Recommendations to operators:

- Functional check flights (FCF) or shakedown cruises after heavy aircraft maintenance are recommended to verify that the aircraft is operating normally.
- Ensure all flight crew fully understand the Minimum Equipment List (MEL) and apply operational risk factors to MEL go-no-go decision-making.

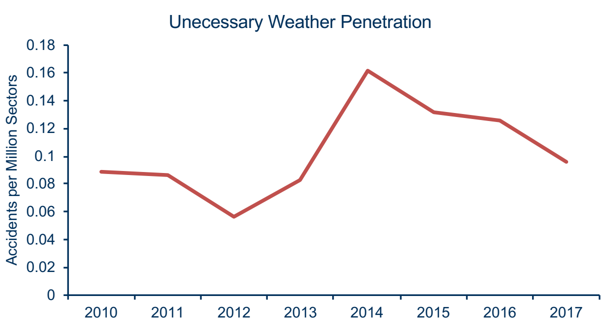
Recommendations to Maintenance Repair Operator (MRO)/Airline Maintenance:

- Implement a Line Operations Safety Audit (LOSA) system for their maintenance activity.
- Address procedural noncompliance in maintenance.
- Address maintenance error and human factors issues.
- Ensure all maintenance staff fully understand the MEL and also discuss with the flight crew operational risk factors specific to the operation.

CONTINUATION OF AIRLINE OPERATION DURING SEVERE WEATHER

Airline operations may be completely suspended by severe weather in some parts of the world. Meteorology was identified as a factor in 26% of accidents in 2017 and 29% of accidents during the five-year period of 2013 to 2017. Unnecessary weather penetration was a factor in 11% of the accidents in 2017.

The graph below shows the rate of accidents where meteorology as a contributing factor was present.



Airports are encouraged to provide aviation weather services to Air Traffic Services (ATS) units, airline operators, flight crewmembers, dispatchers and airport management by supplying the necessary meteorological information in a timely and accurate manner. Flight crews also need to be able to identify and avoid poor weather conditions whenever possible and applicable. The ACTG believes that there is a need for improved real-time weather information available in the cockpit, improved awareness of weather phenomena by all key personnel involved with the planning and execution of a flight, and technology development for advanced forecast and presentation of weather pertinent to a particular flight.

Recommendations to operators:

- Consider tools that allow dispatch offices to provide crews with the most up-to-date weather information possible.
- Ensure that airport ATS observations and forecasts are disseminated to aircraft pilots and flight dispatchers for preflight planning.
- Develop a contingency plan, involving dispatch and crew support, that clearly defines guidance at an organizational level on who is responsible to cease operations.
- Clearly define limits for wind and gusts in the Operations Manual.
- Review the ICAO Global Runway Safety Action Plan released in November 2017, which identifies the stakeholder mitigations to runway safety issues.

Recommendations to airports:

- Provide a meteorological office that issues alerts of low-level wind shear and turbulence within three nautical miles of the runway thresholds for relay by air traffic controllers to approaching and departing aircraft.
- Disseminate ATS observations and forecasts to aircraft pilots and flight dispatchers for preflight planning.
- Issue alerts for low-level wind shear and turbulence within three nautical miles of the runway thresholds for relay by air traffic controllers to approaching and departing aircraft.

CREW RESOURCE MANAGEMENT

Overall crew performance was identified as an absent countermeasure in 2% of accidents in 2017 and 21% over the last five years (2013-2017). Social and communication skills are a vital part of overall crew performance. Ultimately, an electronic system cannot be designed for every possible threat and efficient crew interaction is critical for the mitigation of potential threats.

CRM and Threat and Error Management (TEM) continues to be an important factor in aviation safety, especially in more conservative social environments. While implemented at many operators, CRM is not universally applied, and many airlines have ineffective or unformalized CRM training programs in place. As the worldwide recruitment of new pilots grows enhancing or re-establishing CRM/TEM training is necessary to ensure competence is established through training rather than experience.

In cultural environments where a high social gradient exists, strict SOPs help establish clear lines of communication and allow for first officers to pass critical situational information to the captain without compromising their position or causing the captain to "lose face". The ACTG identified aircraft accidents where a third person on the flight deck may have exacerbated this effect. It is also true that there are examples of aircraft incidents where the third person has been beneficial. Effective crew pairing with respect to seniority and experience can promote optimal conditions for crew performance.

Recommendations to operators:

- CRM training should include and emphasize assertiveness and identify specific cases where the social gradient or rank distance between the captain and first officer is high enough to impede effective communications. Focus on specific cultural factors when applicable.
- Encourage captains to allow first officers to demonstrate assertiveness and leadership. Communicate that despite rank or position, the captain is still human and capable of making mistakes. Ensure that captains understand they are not infallible.

- Specific callouts of information or decision requirements at critical points in the flight may help the first officer to overcome the social gradient between crewmembers. Properly developed SOPs with clear instructions may empower first officers to take over the flight controls when the situation requires assertiveness.

- A process for debriefing CRM issues that arose during line operations will give the pilot essential feedback on his or her performance.

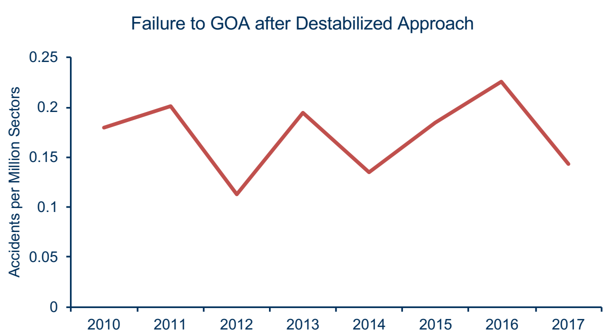
- Develop a defined role for a third pilot on the flight deck to create an understanding of that person's role and prevent any unwanted side effects, which could potentially inhibit the normal interaction of the operating pilots.

- Consult the IATA Guidance Material for Improving Flight Crew Monitoring.

GO-AROUNDS

Failure to go around after a destabilized approach was a contributing factor in 11% of the accidents between 2013 and 2017. While focus on go-arounds is of extreme importance, the handling of the aircraft after a go-around is initiated needs to be a topic of discussion, especially in circumstances not foreseen during simulator training.

The chart below shows the rate of accidents where failure to go around after destabilized approach was a contributing factor.



Although normally practiced during annual and initial training, the go-around procedure is rarely flown in line operations and can be a challenging maneuver. Crews must be sufficiently familiar with flying go-arounds through initial and recurrent training.

Somatogravic head-up illusions during the unfamiliar forward acceleration in a go-around can lead to the incorrect perception by the flight crew that the nose of the aircraft is pitching up. This illusion can cause pilots to respond with an inappropriate nose-down input on the flight controls during the execution of a go-around. Such responses have led to periodic accidents.

There are also cases when the crew engage the autopilot to reduce the workload, but instead put the aircraft in an undesired situation due to a lack of situational awareness with the automation.

Airlines should not limit training scenarios to the initiation of a go-around at the approach minimum or missed approach point. Training scenarios should focus on current operational threats as well as traditional situations.

Recommendations to operators:

- Airlines are recommended to modify their approach procedures to call out "STABILIZED" or "GO-AROUND" at a given point to ensure a timely go-around is carried out. While a "STABLE" or "STABILIZED" callout might be required at either 1,000 feet or 500 feet above touchdown, the "GO-AROUND" command can and must be made at any time prior to deployment of thrust reversers (if installed).

- When developing crew training programs, operators are encouraged to create unexpected go-around scenarios at intermediate altitudes with instructions that deviate from the published procedure; this addresses both go-around decision-making and execution. The training should also include go-around execution with all engines operating, including level-off at a low altitude and go-arounds from long flares and bounced landings. Operators should also consider go-arounds, not only at heavy weight and one engine inoperative, which are the typical scenarios, but also at light weight with both engines operative in order to experience the higher dynamics. Crews should fly the go-around pitch and Flight Director bars and adapt the thrust to remain within flight parameters.

- Training should emphasize the significance of thrust reverser deployment for a go-around decision. From a technical point of view, a go-around may always be initiated before reverser deployment and never after reverser application, subject to other considerations.

- Introduce destabilized approach simulator training scenarios, which emphasize that deviations from the stabilized approach profile at low altitudes — below minimum descent altitude (MDA) or decision height (DH) — should require execution of a go-around.

- Airlines should incorporate training on somatogravic illusions during the initiation of a go-around. Simulators that combine the possibilities of both the hexapod and the human centrifuge are already available and in use, (e.g., for military training). They can be used to demonstrate the illusions during go-around initiation and train pilots for a correct reaction to the head-up illusion. As a preventive means, crews are recommended to brief the go-around, not delay it, respect minima, monitor the flight parameters, and fly the go-around pitch and the Flight Director bars, where available.

- A no-fault go-around policy should be promoted by the operators.

- Consult the 3rd edition of the IATA/CANSO/IFALPA/IFATCA Unstable Approaches – Risk Mitigation, Procedures and Best Practices

Recommendations to industry

- Authorities should examine if initial go-around altitudes may be increased, wherever possible, to give flight crews additional time to both reconfigure the aircraft and adjust to their new situation.

- Industry should support the development of operationally feasible simulators that can generate sustained g-forces for generic go-around training with regard to somatogravic illusions.

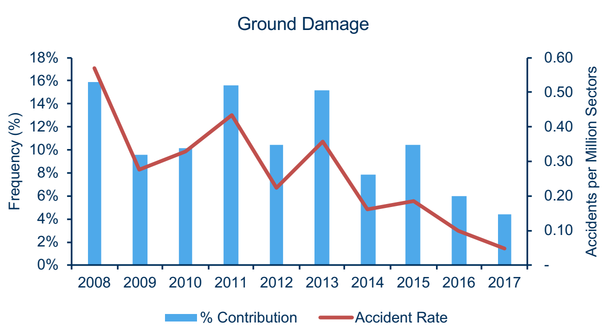
- Air traffic controllers should be reminded that any aircraft might execute a balked landing or missed approach. This will involve startle and surprise for the ATC, just as it might for the flight crew involved. The ATC should understand that the flight crew will immediately be involved in stabilizing the flight path, changing configuration, and communicating with each other. The flight crew will communicate with ATC as soon as they are able, and ATC should be prepared to clear other traffic and provide or approve an altitude and direction of flight. They should also understand that the aircraft might be entering a fuel critical state, such that routing and sequencing for diversion or subsequent landing must be without undue delay.

- Consult the 3rd edition of the IATA/CANSO/IFALPA/IFATCA Unstable Approaches – Risk Mitigation, Procedures and Best Practices

GROUND OPERATIONS AND GROUND DAMAGE PREVENTION

In 2017, there were two accidents categorized as ground damage. There were 32 such accidents between 2013 and 2017.

The graph below indicates the percentage of ground damage accidents over the previous ten years and its rate in accidents per million sectors. The downward trend, however, needs to be treated carefully because it does not include damage caused by ground operations-related incidents that do not fit the accident criteria. Ground damage continues to be a major cost for operators and requires a cooperative safety approach with all involved parties, including airlines, ground service providers, airport authorities and government.



Actual hands-on experience with a real aircraft is required to accurately gauge the size and position of the wings and airframe when moving on the ramp. This is particularly true as new aircraft with larger wingspans are being added to airline fleets. The risk of ground events is expected to increase as growth in traffic outpaces growth in airport capacity, resulting in more aircraft operating in a limited space.

Crews need to exercise increased vigilance during taxi operations in congested airports, near challenging gates, stands or other obstacles. Operators and crews should note:

- Not to rely solely on ground marshals or wing walkers for obstacle avoidance and/or clearance while taxiing.

- Turboprops can be especially prone to ground damage. Several cases of turboprops taxiing into ground carts were noted.

- ATC clearance to taxi is not an indication that it is safe to begin taxiing; surroundings must be monitored at all times.

Ground staff should be informed to respect lines and other markings depicting protected zones. As surface markings can differ from one airport to another, the ground crew is better positioned to ensure the safe positioning of the aircraft when approaching a parking spot or gate. Issues such as ground vehicles failing to give right-of-way to moving aircraft as well as movable stands, carts and other equipment being placed incorrectly, not being removed, or blowing into moving aircraft continue to affect safety on the ground.

Ground markings should be clear and well understood by ramp workers. Confusing and/or overlapping lines can contribute to improperly positioned aircraft and result in ground damage. Lines can be difficult to see in wet conditions; this can be helped by using contrast painting (i.e., a black border to taxi lines where the surface is concrete).

Damage to composite materials will not necessarily show visible signs of distress or deformation. Engineering and maintenance must remain on constant vigilance when dealing with newer aircraft that contain major composite structures.

Due to hesitation of some ground staff in submitting ground damage reports, the data available is not enough to be more effective in finding accident precursors, identifying hazards and mitigating risks.

All service providers, such as aircraft operators, maintenance organizations, ATS providers and airport operators need to be compliant with ICAO SMS Doc. 9859 to strengthen the concept of a proactive and predictive approach to reducing ground damage events.

IATA Safety Audit for Ground Operations (ISAGO) certifications may benefit all service providers in understanding high-risk areas within ground operations at all airports.

Recommendations to operators:

- Ensure crews receive taxi training that includes time spent in real aircraft (with wing walkers indicating the actual position of the wings to the pilot) to help accurately judge the size of the aircraft and its handling on the ground.

- Ensure crews inform ATC of aircraft position while waiting to enter the ramp area in preparation for a final parking slot to increase situational awareness and indicate that the aircraft may not be fully clear of the taxiway.

- Consider the utilization of stop locations for aircraft entering the ramp like those used while leaving ramp areas. Stop locations should ensure adequate clearance from movement areas while transitioning from ground control.

- Crew training with regards to effective communication during the taxi and brake setting procedure should be applied and reinforced.

- Inform crews of the unique nature of composite materials and reinforce that severely damaged composite materials may show no visible signs of distress.

- Train crews regarding the handling and responsibilities of taxi instructions. The taxi clearance does not ensure that no obstacles are present for the crew.

- Ensure compliance with ICAO Doc. 9859.

- Encourage all ground staff to report all ground damage events, incidents or violations through the Safety Reporting System and/or Aviation Confidential Reporting System (ACRS).

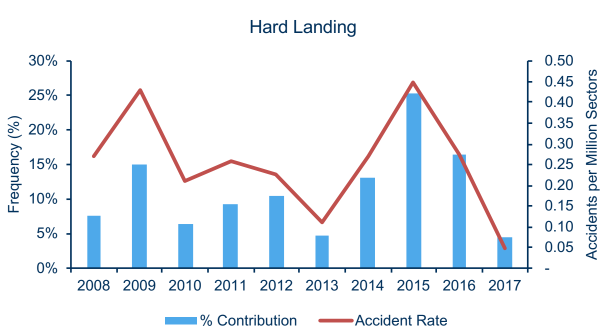
Recommendations to industry:

- Chart providers are encouraged to include as much information as possible on charts while maintaining legibility. Additionally, potential hazards and areas of confusion must be identified clearly.

- Manufacturers are asked to investigate the use of technology to assist crews in determining the proximity of aircraft to obstacles.

HARD LANDING

There were two hard landing events in 2017 compared to 44 in the previous five years. The graph below shows that the industry is back to low levels of events after a spike in 2015.



Frequent contributing factors to hard landings in the last five years were:

- Manual handling of the aircraft: 70%

- Long, floated or bounced landing: 51%

- Meteorology: 40%

- Flight operations (training systems): 19%

Meteorological phenomena and other factors that lead to a (late) destabilization of the final approach have again been identified as typical precursors of hard landings that led to accidents. Additionally, hard landings often either lead to or have been the result of bounced landings. For this reason in particular, the importance of flying stabilized approaches all the way to the landing, as well as the recovery of bounced landings, continue to be critical areas for crew training activities. At the same time, there are still limitations in the ability of simulators to induce occurrences such as bounced landings at a level of fidelity that is sufficiently high to avoid the danger of 'negative training'.

Recommendations to operators:

- Focus training for the correct landing parameters (e.g., pitch, power, visual picture) on every landing. This is to develop sufficient awareness and motor skills to always perform the landing the way the airplane manufacturer recommends and to always land at the correct location on the runway, regardless of how favorable or unfavorable the conditions are. Focus also must be on the fact that the landing is to be rejected should the aforementioned landing parameters not be met.

- Modify their approach procedures to include a callout such as "STABILIZED" or "GO-AROUND" at a certain gate to ensure a timely go-around is carried out. Emphasis should also be put on pilots to understand that a destabilization can occur at any altitude and that the set parameters are to be met at all times after the gate and until landing.

- Encourage early disconnection of the Auto Pilot. There are events when the crew has no time to enter into the aircraft loop by disconnecting at low altitudes, such as 200 feet, particularly in adverse conditions such as crosswind or gusts, in which case the approach may destabilize on very short final.

- Work with simulator manufacturers to overcome the challenges of simulating common precursors to hard landings in the training environment.

Recommendations to industry:

- Regulators are encouraged to evaluate landing training requirements.

RUNWAY COLLISION

There was one runway collision event in 2017, which counted as two accidents because two aircraft were involved: a landing jet and a turboprop lining up after misinterpreting or not clarifying a clearance. This was almost a catastrophic runway incursion, as the two aircraft wingtips collided causing substantial damage to both.

The IATA STEADES incident database indicates that there is a minor runway incursion incident occurring once every day on average. This level of incident occurrence is a precursor to an accident.

Recommendations to industry:

- All stakeholders should work together to eliminate all forms of runway incursion incidents.

IN-FLIGHT DECISION-MAKING

Looking back at a year such as 2017, with few accidents, leads one to learn from what went right. The industry is undergoing a shift from the avoidance of risk to making sure everything goes right. What went well and why did it go well? With over 100,000 flights every day, why did most of them go right? What can we learn from this? For example, the auto land operational philosophy ensures that the environment, equipment testing, training and regulations are controlled to achieve a *modus operandi* that virtually can't go wrong. Humans are expected to operate into more challenging airfields in more challenging conditions, and this is where the in-flight risk management and decision-making comes into play.

Many airlines offer strategies to their pilots for decision-making in abnormal conditions and failure cases. They are sound concepts based on TEM models and they are demonstrated to crews on a regular basis. One operator provides flight crew with an app to enter risk factors and identify points in the planned trip where risk is elevated, allowing them to plan ahead. As the accident analyses show, making the right decision at the right time can be critical for the safe completion of the flight.

Recommendations to operators:

- Create and train a model for in-flight decision-making in normal daily operations, including alternate assessment of weather, capacity, support and inbound delays, together with a diversions strategy.

- Train flight crews on dynamic risk assessment of likely scenarios they will face; this can be built into real-time Line Oriented Flight Training (LOFT) exercises.

- Provide full-time flight support to facilitate sound and safe operational decision-making.

FINAL STATEMENT

So, while the data supports 2017 being a very safe year due to a variety of issues, including industry approaches and the collaborative aspects of industry safety groups, there is clearly a great deal of room for improvement.

However, although the data shows a declining number of accidents and fatalities, there were a high number of serious events which could easily have made 2017 one of the worst years in aviation safety. It is incumbent on all of us to reflect on what went right and continue to apply those positive areas while eliminating the negative before an accident occurs.

Pilot Experience

In addition to the historical data, looking ahead, *ab initio* programs in the worldwide pilot community will see an influx of new pilots in the coming years. Ensuring that training programs are equipped to ensure without compromise that new pilots are equipped with the necessary competencies is an urgent priority for the industry. This must include high levels of CRM and TEM training. There have been documented accident investigations where one of the pilots had not received this training.

English Language

While English is the language of pilots, the industry has significant concerns regarding the comprehension of same. For example, crews may be able to read a checklist and comply with English proficiency requirements. However, testing should look deeper to ensure clear understanding of what a procedure actually means.

Regulators

Regulatory oversight tops the list of latent conditions leading to accidents, closely followed by SMS. The ACTG believes that risks and hazards can be identified in the systems of airlines by the state and the airline taking an active part in the application of sound safety management principles in both the oversight of operators and the management of airlines. In other words, where this latent condition exists, the operation is set up to fail before it starts and the addition of a few catalyst contributory factors results in an accident. It is no coincidence that the subsequent investigation lacks objectivity and sometimes leads to criminal charges against the pilot. Regulators must recognize that they have a role to influence the safety of every flight through their actions on every detail of the system that supports those flights. Notwithstanding the regulatory environment, operators must recognize the benefits of a SMS and the enhancements to safety and efficiency that an SMS will bring.

Accident Investigations

The ACTG continues to be concerned about the quality of accident investigations around the world. There are examples of investigations that appear to invoke the protections of ICAO Annex 13, but none of the benefits. Examples include a lack objectivity, transparency, collaboration and communication with key stakeholder expertise, such as manufacturers. In some cases, the final report is not circulated for comment prior to publication. There are also instances when the report is not made public to share the learnings for the benefit of the wider industry.

The Weakest Link

Training humans is still the weakest link in aviation safety. Overreliance on automation continues to manifest itself in serious industry incidents and will need further addressing by regulatory agencies around the world.

More industry events are being coupled with known industry concerns, such as the "startle effect", failure to adapt to automation being unavailable and not being given CBT instead of standardized "one-size-fits-all" training. More serious industry events are being caused by pilots' failure to perform an accepted industry maneuver – the go-around – when dictated by regulators, their airlines and accepted industry parameters. A go-around must be viewed everywhere as a safety maneuver and never used to sanction pilots.

Selection and Training

While manufacturers have either fitted or retrofitted revenue aircraft with the latest safety devices to assist crews with making proper and more timely decisions, those devices are not always used to their full potential. This is directly due to a lack of training to assist an airline's crews with becoming comfortable with the operation of these known and proven safety devices.

Training is a repeated theme throughout this report. This year, the ACTG divided contributing factors into primary and secondary. From one year of data, this shows the most common primary contributor is manual handling and the most common missing countermeasure is the performance of the flight crew, both as a team and individuals. Both these factors indicate a clear need for more training and they may even point further back into the system at initial pilot selection. The most common undesired aircraft states, from which the situation could be recovered and the accident prevented, were speed and vertical/lateral flight path deviations, unnecessary weather penetration as well as long, floated, bounced landings and unstable approaches. Again, all point at flight crew training to embed the ability to recognize a situation from which an escape can and must be made, as well as, of course, the capacity to conduct the required maneuver safely.

9

STEADES Analysis of Runway Safety

2017 RUNWAY SAFETY STATISTICS

Runway Safety occurrences remained one of the top safety risks to the aviation industry during 2017 and a continued focus of IATA's Safety and Flight Operations (SFO) team. Runway Safety comprises several accident end states, including:

- Runway and taxiway excursions
- Runway collision
- Runway undershoot
- Hard landings
- Tail strikes
- Gear-up landing/Gear collapse

Despite there being no associated fatalities in 2017, runway excursions were the most common accident end state and a continued area of concern for the industry. Runway Safety events occurred more frequently than Loss of Control – In-flight (LOC-I) (see Figure 1) and, in 2017, continued to be featured as one of IATA's top safety issues. During 2017, SFO continued to collaborate with external stakeholders on several industry initiatives to drive towards reducing this key operational safety metric.

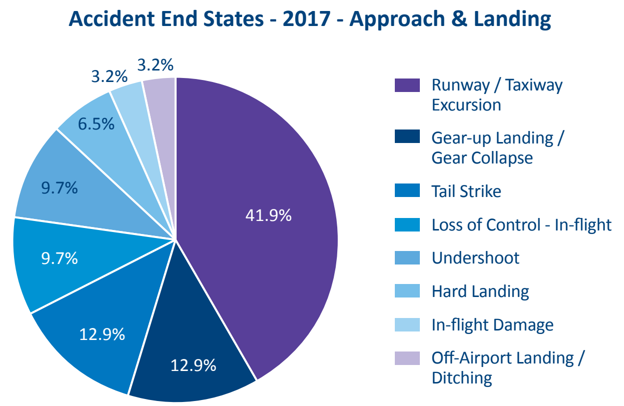


Figure 1. Distribution of accident end states, 2017
Source: IATA Accident Database

Safety data from IATA's Global Aviation Data Management (GADM) Accident Database showed that the largest proportion of all commercial aircraft accidents occurred during the approach and landing phases of flight, accounting for 63% of the total accidents recorded from 2013 to 2017.

Of the Runway Safety events included in IATA's Accident Database, runway and taxiway excursions continue to be the most common accident end state.

- Runway excursions occur when an aircraft departs the end or the side of a runway surface and can occur on either takeoff or landing.
- Runway excursion data excludes accidents where the aircraft did not initially land on a runway surface and takeoff excursions that did not start on a runway (e.g., inadvertent takeoffs from taxiways).

Runway Safety Threat and Error Management

A review of 2017 accidents recorded in IATA's Accident Database and coded by the Accident Classification Technical Group (ACTG) revealed the top threats encountered by aircraft involved in Runway Safety events. The most important were environmental factors, specifically wind shear and gusty conditions, which counted as a threat in 18% of the recorded accidents. Second in importance were issues with the airport markings and signage, optical illusions or visual misperception, along with other factors; each of these contributed to 12% of accidents (see Table 1).

THREATS	%
Wind/Wind shear/Gusty wind	18%
Other	12%
Poor/faint marking/signs for runway/taxiway closure	12%
Optical illusion / visual misperception	12%
Gear/Tire	9%
Contaminated runway/taxiway - poor braking action	9%
Maintenance events	6%
Air Traffic Services	6%
Thunderstorms	6%
Ground-based nav aid malfunction or not available	6%
Inadequate overrun area/trench/ditch/proximity of structures	3%
Contained Engine Failure/Powerplant Malfunction	3%
Aircraft	3%
Wildlife/Birds/Foreign Object	3%
Fatigue	3%
Poor visibility / Instrument Meteorological Conditions (IMC)	3%
Airport Perimeter Control/Fencing/Wildlife Control	3%
Operational Pressure	3%
Traffic	3%
Lack of Visual Reference	3%

Table 1. Runway Safety Events, Top Threats, 2017
Source: IATA Accident Database

Table 2 lists the top errors that further contributed to 2017's Runway Safety events. The ACTG found pilot manual handling and incorrect flight control inputs were apparent in 30% of cases. Unintentional noncompliance with standard operating procedures (SOPs) and/or cross-verification contributed to 15% of accidents. Failure to go around following an unstable approach was a contributing factor in 9% of events.

ERRORS	%
Manual Handling / Flight Controls	30%
Unintentional noncompliance	15%
Pilot-to-Pilot Communication	15%
Callouts	15%
Intentional noncompliance	12%
Failure to GOA after destabilization on approach	9%
Ground Navigation	6%
Systems / Radios / Instruments	3%
Normal Checklis	3%
Briefings	3%
Air Traffic Control (ATC)	3%
Unknown	3%

Table 2. Runway Safety Events, Top Errors, 2017
Source: IATA Accident Database

The ACTG has also reviewed several accidents that were classified as LOC-I, which evolve, in general, from several factors. Among the most prevalent are:

1. Reluctance of aircrew to reassess or disable automated functions of the aircraft
2. Reluctance to assume manual control of the aircraft
3. Weather-related phenomena and spatial disorientation

As evidenced by the accident threat and error statistics, enhancing pilot manual handling skills and strict adherence to SOPs will play a major role in preventing future accidents.

STEADES DATA ANALYSIS

In 2017, IATA's GADM department completed an analysis on behalf of the Flight Safety Foundation and EUROCONTROL to understand the 5-year trends of runway incursions and excursions.

Runway Incursions

Classified as an undesired aircraft state, runway incursions have the potential to lead to accident end states. The ACTG has coded two accidents in the last five years that identified runway incursions as an undesired aircraft state, which led to an accident, in both cases a runway collision. Both accidents occurred in Asia-Pacific (ASPAC), one in 2016 and the other in 2017.

A review of the Safety Trend Evaluation, Analysis and Data Exchange System (STEADES) database produced a dataset of over 6,500 reports and resulted in 1,971 classified runway incursions from January 2012 to December 2016. 90% (1,781) of these reports contained information regarding the region of occurrence, with North America (NAM) (41%) and Europe (EUR) (35%) incurring the highest number of occurrences (Figure 2).

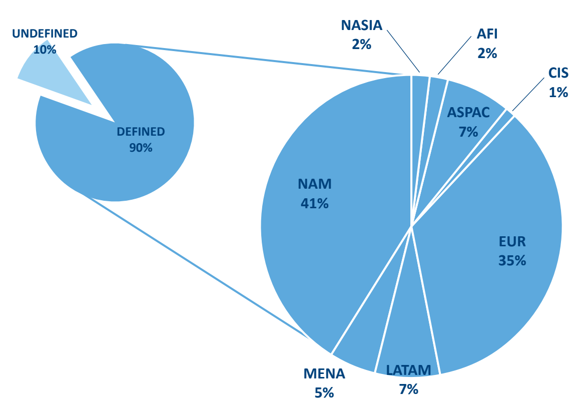


Figure 2. Region of Occurrence
Source: STEADES Database

At the time the analysis was released, it was found that, on average, there was one runway incursion event reported in the STEADES database every day.

Runway Excursions

Runway excursions are an accident end state with a low fatality risk, but high frequency of occurrence. Due to their significance as safety incidents and accidents, they continue to receive attention. Figure 3 shows the number of accidents related to runway excursions from January 2013 to December 2017.

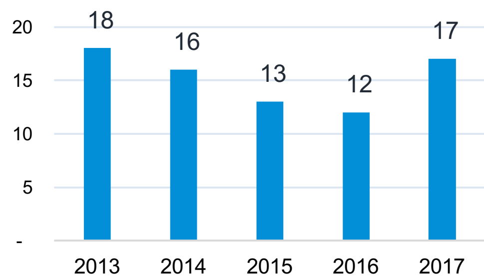


Figure 3. Frequency of Runway Excursions by Year
Source: Accident Database

From 2013 to 2017, the highest accident rate was found for operators in Africa (AFI), with 2.99 runway excursions per one million sectors; and the lowest was found for NAM operators with 0.10 per million sectors. It is worth noting that EUR, NAM and North Asia (NASIA) outperformed the global runway/taxiway excursion accident rate of 0.39 (Figure 4).

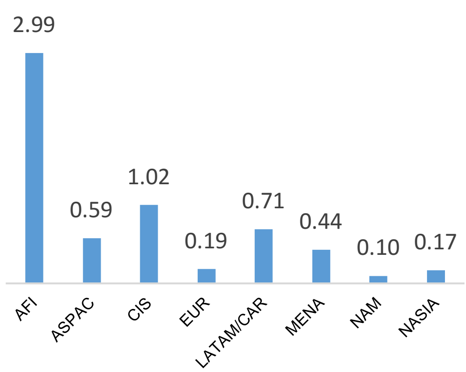


Figure 4. Runway Excursion Rates by IATA Region of Operator, 2013-2017. Source: Accident Database

Of the total number of runway excursions during the five-year period (76), 27 runway excursions resulted in hull loss, while 49 sustained substantial damage (Figure 5). One runway excursion resulted in a total of eight fatalities.

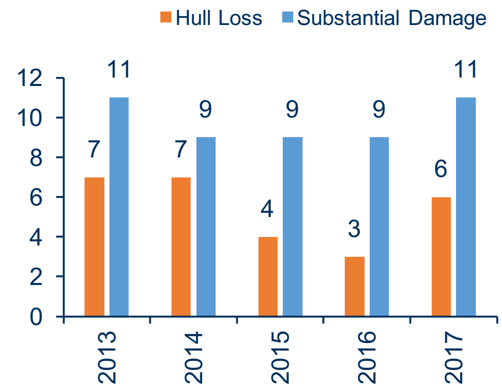


Figure 5. Runway Excursion Accidents by Severity
Source: Accident Database

Runway Safety Technologies and Systems

Runway Safety Technologies and Systems were introduced in 2009, alerting pilots to potential runway incursions and excursions. The primary aim is to improve pilot situational awareness and, if necessary, provide active protection. These systems are provided as standard on new production aircraft and may be retrofitted to some approved older aircraft types in service:

- Runway Overrun Protection Systems (ROPS)
- Runway Awareness and Advisory System (RAAS)
- Runway Status Lights (RWSL)

These technologies are not without their own challenges and the STEADES database holds several reports outlining occurrences involving these protection systems. A study completed in 2016 found that 82% of the reports contained information regarding the perceived accuracy of the warnings (Figure 6).

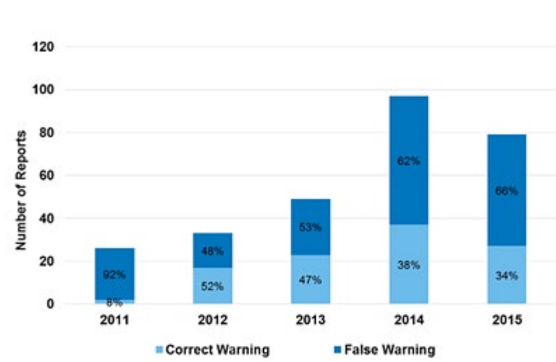


Figure 6. Runway Safety Nets – Warning Accuracy
Source: STEADES Database

Further analysis found 72% of the report summaries provided information on the countermeasures undertaken by the pilots, for both correct and perceived false warnings. With go-arounds performed in 35% of correct warning reports, 19 of these were due to unstable approach (Figure 7).

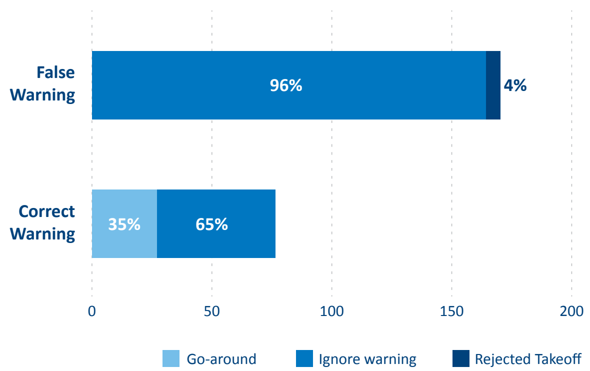


Figure 7. Runway Safety Nets – Countermeasures
Source: STEADES Database

15% (53) of report summaries had information regarding the errors that led up to the warning. Most reports listed incorrect aircraft configuration and incorrect pilot manual handling as the main two contributing factors (Figure 8).

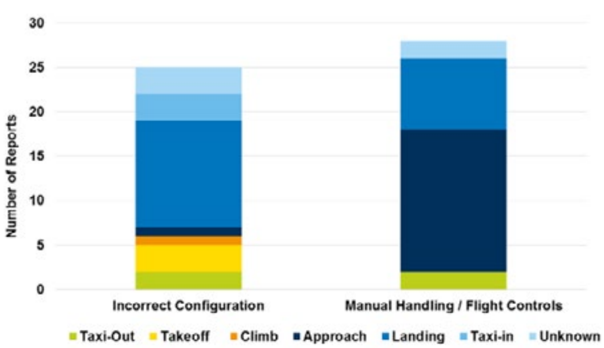


Figure 8. Runway Safety Nets – Errors Leading to the Warning
Source: STEADES Database.

The Way Forward

In the highly automated world of today's aviation, ensuring pilots retain their manual handling skills remains a challenge. Findings from different resources and research studies theorize the reasons for the degradation of pilots' manual handling skills may be due to:

- Pilots' reliance on automation
- Lack of knowledge and skills for manual flight operations
- Lack of opportunity to practice manual flying
- Inadequate pilot and flight deck monitoring
- Auto-flight mode confusion errors
- Fatigue
- Operators' policies encouraging the use of automation
- Nonadherence to SOPs

Enhancing manual handling skills and improving adherence to SOPs will play the biggest role in preventing accidents. IATA, together with the support of Safety Group members and the Pilot Training Task Force, will be conducting a survey into attitudes and airline processes to address the maintenance of manual handing flying skills and the effectiveness of Evidence-based Training. This study will form part of a wider piece of work to address this accident contributory factor.

In December 2017, IATA published the third edition of the IATA/CANSO/IFALPA/IFATCA Unstable Approaches – Risk Mitigation Policies, Procedures and Best Practices. Written in collaboration with key industry stakeholders to address the challenges surrounding unstable approaches, the publication emphasizes the importance of pilots, air traffic controllers and airport staff working together, along with regulators, training organizations and industry associations, to strengthen measures and procedures to reduce unstable approaches.

The Second ICAO Global Runway Safety Symposium was held in Peru in November 2017, and served as a medium to review and agree on the way forward for addressing runway safety as a priority for the global aviation community. Additionally, the aim of this symposium was to improve runway safety worldwide through global collaboration and an exchange of strategies and best practices.

One of the important outcomes of this symposium was the publication of the collaborative ICAO Global Runway Safety Action Plan, which was agreed upon by the Global Runway Safety Partners. This plan provides recommended actions for all runway safety stakeholders, including airports, aircraft manufactures, operators, states, and air navigation service providers, to apply runway safety enhancement and risk reduction measures, with an overall goal of reducing the global runway safety accident rate.

In addition to enhancing pilot manual handling skills, the implementation of advanced safety technologies has enabled all stakeholders, including aircraft operators, air navigation service providers and airport operators to improve runway safety.

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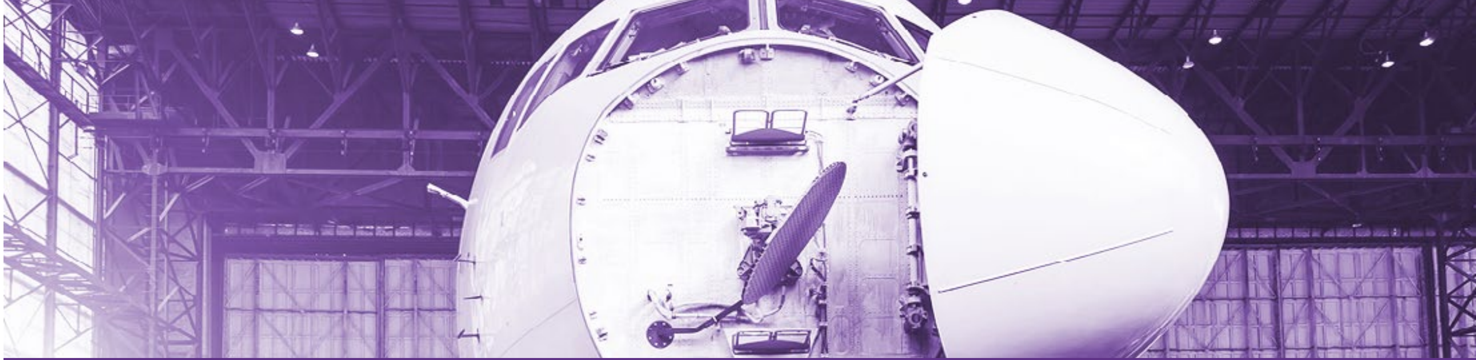


GSIE Harmonized Accident Rate

In the spirit of promoting aviation safety, the Department of Transportation of the United States, the Commission of the European Union, the International Air Transport Association (IATA) and the International Civil Aviation Organization (ICAO) signed a Memorandum of Understanding (MoU) on a Global Safety Information Exchange (GSIE) on 28 September 2010 during the 37th Session of the ICAO Assembly. The objective of the GSIE is to identify information that can be exchanged between the parties to enhance risk reduction activities in the area of aviation safety.

The GSIE developed a harmonized accident rate beginning in 2011. This was accomplished through close cooperation between ICAO and IATA to align accident definitions, criteria and analysis methods used to calculate the harmonized rate, which is considered a key safety indicator for commercial aviation operations worldwide. The joint analysis includes accidents meeting the ICAO Annex 13 criteria for all typical commercial airline operations for scheduled and nonscheduled flights.

Starting in 2013, ICAO and IATA have increasingly harmonized the accident analysis process and have developed a common list of accident categories to facilitate the sharing and integration of safety data between the two organizations.

At the time of publication of this report, ICAO data was not available. Therefore, the analysis of the harmonized accident rate will be published later in an addendum.

The tables on the following pages show full details of the GSIE harmonized categories.

Image courtesy of ATR

GSIE HARMONIZED ACCIDENT CATEGORIES

Category	Description
Controlled Flight into Terrain (CFIT)	Includes all instances where the aircraft was flown into terrain in a controlled manner, regardless of the crew's situational awareness. Does not include undershoots, overshoots or collisions with obstacles on takeoff and landing, which are included in Runway Safety.
Loss of Control – In-flight (LOC-I)	Loss of control in-flight that is not recoverable.
Runway Safety (RS)	Includes runway excursions and incursions, undershoot/overshoot, tail strike and hard landing events.
Ground Safety (GS)	Includes ramp safety, ground collisions as well as all ground servicing, preflight, engine start/departure and arrival events. Taxi and towing events are also included.
Operational Damage (OD)	Damage sustained by the aircraft while operating under its own power. This includes in-flight damage, foreign object debris (FOD) and all system or component failures.
Injuries to and/or Incapacitation of Persons (MED)	All injuries or incapacitations sustained by anyone coming into direct contact with any part of the aircraft structure. Includes turbulence-related injuries, injuries to ground staff coming into contact with the structure, engines or control surfaces of the aircraft and on-board injuries or incapacitations and fatalities not related to unlawful external interference.
Other (OTH)	Any event that does not fit into the categories listed above.
Unknown (UNK)	Any event where the exact cause cannot be reasonably determined through information or inference, or when there are insufficient facts to make a conclusive decision regarding classification.

Category	CICTT* Occurrence Categories	IATA Classification End States
Controlled Flight into Terrain (CFIT)	CFIT, CTOL	CFIT
Loss of Control – In-flight (LOC-I)	LOC-I	LOC-I
Runway Safety (RS)	RE, RI, ARC, USOS	Runway Excursion, Runway Collision, Tailstrike, Hard Landing, Undershoot, Gear-up Landing / Gear Collapse
Ground Safety (GS)	G-COL, RAMP, LOC-G	Ground Damage
Operational Damage (OD)	SCF-NP, SCF-PP	In-flight Damage
Injuries to and/or Incapacitation of Persons (MED)	CABIN, MED, TURB	None (excluded from IATA Safety Report)
Other (OTH)	All other CICTT Occurrence Categories	All other IATA End States
Unknown (UNK)	UNK	Insufficient Data

* CAST/ICAO Common Taxonomy Team

Primary Contributing Factors – Section 4

2017 Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
—	—

THREATS

	Percentage Contribution
Air Traffic Services	11%
Aircraft	11%
Aircraft Malfunction - Other	11%
Brakes	11%
Contaminated Runway/Taxiway - Poor braking action	11%
Environmental - Other	11%
Primary Flight Controls	11%
Traffic	11%
Wind/Wind shear/Gusty wind	11%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	64%
Ground Navigation	9%
Failure to Go Around (GOA)	9%
SOP adherence/Cross-verification – Intentional	9%
Failure to GOA after destabilization on approach	9%

2017 Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	33%
Unnecessary Weather Penetration	22%
Long/floated/bounced Landing	22%
Unstable Approach	11%
Continued Landing after Unstable Approach.	11%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	25%
Captain Should Show Leadership	25%
In-flight decision-making/Contingency management	25%
First Officer is assertive when necessary	25%

Note: The primary contributing factor frequency calculation is based on the total number of primary contributing factors per each category identified.

Addendum A

Top Contributing Factors – Section 4

2013-2017 Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	33%
Safety Management	27%
Flight Operations	18%
Flight Ops: SOPs & Checking	12%
Flight Ops: Training Systems	12%
Selection Systems	8%
Design	8%
Maintenance Operations	7%
Maintenance Ops: SOPs & Checking	7%
Management Decisions	6%
Technology & Equipment	4%
Change Management	3%
Maintenance Ops: Training Systems	2%
Dispatch	2%
Ground Operations	2%
Dispatch Ops: SOPs & Checking	2%
Operations Planning & Scheduling	1%
Ground Ops: Training Systems	1%
Ground Ops: SOPs & Checking	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	34%
SOP Adherence/SOP Cross-verification	27%
Callouts	8%
Pilot-to-Pilot Communication	8%
Automation	4%
Abnormal Checklist	3%
Systems/Radios/Instruments	2%
Crew to External Communication	2%
Normal Checklist	1%
Air Traffic Control	1%
Briefings	1%
Ground Crew	1%
Ground Navigation	1%

2013-2017 Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	29%
Aircraft Malfunction	29%
Wind/Wind shear/Gusty wind	16%
Gear/Tire	15%
Airport Facilities	13%
Maintenance Events	12%
Poor visibility/Instrument Meteorological Conditions	11%
Lack of Visual Reference	10%
Nav Aids	9%
Ground-based nav aid malfunction or not available	9%
Thunderstorms	8%
Contaminated runway/taxiway - poor braking action	7%
Air Traffic Services	6%
Operational Pressure	6%
Fatigue	5%
Wildlife/Birds/Foreign Object	5%
Ground Events	5%
Optical Illusion/visual misperception	5%
Poor/faint marking/signs for runway/taxiway closure	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Contained Engine Failure/Powerplant Malfunction	3%
Airport Perimeter Control/Fencing/Wildlife Control	3%
Terrain/Obstacles	2%
Extensive/Uncontained Engine Failure	2%
Dispatch/Paperwork	2%
Icing Conditions	1%
Traffic	1%
Brakes	1%
Inadequate overrun area/trench/ditch/proximity of structures	1%
Hydraulic System Failure	1%
Secondary Flight Controls	1%
Avionics/Flight Instruments	1%
Manuals/Charts/Checklists	1%
Flight Controls	1%
Crew Incapacitation	1%
Spatial Disorientation/somatogravic illusion	1%

2013-2017 Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	24%
Vertical/Lateral/Speed Deviation	19%
Unstable Approach	13%
Continued Landing after Unstable Approach	11%
Unnecessary Weather Penetration	8%
Abrupt Aircraft Control	8%
Operation Outside Aircraft Limitations	7%
Loss of Aircraft Control while on the Ground	5%
Engine	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Flight Controls/Automation	3%
Controlled Flight Towards Terrain	3%
Ramp Movements	2%
Rejected Takeoff after V1	1%
Weight & Balance	1%
Runway/Taxiway Incursion	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	21%
Monitor/Cross-check	17%
Leadership	8%
Captain Should Show Leadership	6%
Taxiway/Runway Management	5%
First Officer is assertive when necessary	5%
Automation Management	4%
Workload Management	4%
Communication Environment	3%
Evaluation of Plans	2%
Inquiry	1%

Note: 61 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Top Contributing Factors – Section 4

2013-2017 Fatal Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	40%
Flight Operations	37%
Safety Management	37%
Flight Ops: SOPs & Checking	27%
Selection Systems	23%
Flight Ops: Training Systems	20%
Management Decisions	17%
Technology & Equipment	17%
Dispatch	7%
Operations Planning & Scheduling	7%
Dispatch Ops: SOPs & Checking	7%
Design	3%
Change Management	3%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	50%
Manual Handling/Flight Controls	27%
Pilot-to-Pilot Communication	27%
Callouts	20%
Abnormal Checklist	13%
Systems/Radios/Instruments	10%
Automation	7%
Air Traffic Control	3%
Briefings	3%
Dispatch	3%
Wrong Weight & Balance/Fuel Information	3%
Crew to External Communication	3%
Documentation	3%

2013-2017 Fatal Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	40%
Aircraft Malfunction	33%
Lack of Visual Reference	30%
Ground-based nav aid malfunction or not available	23%
Poor visibility/Instrument Meteorological Conditions	23%
Nav Aids	23%
Fatigue	20%
Thunderstorms	20%
Contained Engine Failure/Powerplant Malfunction	17%
Operational Pressure	17%
Air Traffic Services	13%
Wind/Wind shear/Gusty wind	10%
Dispatch/Paperwork	7%
Spatial Disorientation/somatogravic illusion	7%
Terrain/Obstacles	7%
Maintenance Events	7%
Icing Conditions	3%
Avionics/Flight Instruments	3%
Optical Illusion/visual misperception	3%
Structural Failure	3%
Gear/Tire	3%

2013-2017 Fatal Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	33%
Unnecessary Weather Penetration	30%
Operation Outside Aircraft Limitations	20%
Controlled Flight Towards Terrain	17%
Continued Landing after Unstable Approach	10%
Abrupt Aircraft Control	10%
Engine	10%
Unstable Approach	10%
Flight Controls/Automation	7%
Weight & Balance	3%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	3%

COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	33%
Leadership	33%
Overall Crew Performance	33%
Captain Should Show Leadership	27%
First Officer is assertive when necessary	20%
Communication Environment	17%
Workload Management	10%
Automation Management	10%
Evaluation of Plans	7%
Inquiry	3%
Plans Stated	3%

Addendum A

Top Contributing Factors – Section 4

2013-2017 Nonfatal Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	32%
Safety Management	25%
Flight Operations	16%
Flight Ops: Training Systems	10%
Flight Ops: SOPs & Checking	10%
Maintenance Operations	8%
Maintenance Ops: SOPs & Checking	8%
Design	8%
Selection Systems	6%
Management Decisions	5%
Technology & Equipment	3%
Maintenance Ops: Training Systems	2%
Change Management	2%
Ground Operations	2%
Ground Ops: Training Systems	1%
Dispatch	1%
Dispatch Ops: SOPs & Checking	1%
Ground Ops: SOPs & Checking	1%
Operations Planning & Scheduling	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	35%
SOP Adherence/SOP Cross-verification	24%
Callouts	7%
Pilot-to-Pilot Communication	5%
Automation	3%
Abnormal Checklist	2%
Normal Checklist	2%
Crew to External Communication	2%
Ground Navigation	1%
Ground Crew	1%
Systems/Radios/Instruments	1%
Air Traffic Control	1%
Briefings	1%

2013-2017 Nonfatal Aircraft Accidents

THREATS

	Percentage Contribution
Aircraft Malfunction	28%
Meteorology	28%
Gear/Tire	17%
Wind/Wind shear/Gusty wind	17%
Airport Facilities	15%
Maintenance Events	13%
Poor visibility/Instrument Meteorological Conditions	10%
Contaminated runway/taxiway - poor braking action	8%
Lack of Visual Reference	8%
Nav Aids	7%
Ground-based nav aid malfunction or not available	7%
Thunderstorms	7%
Ground Events	6%
Wildlife/Birds/Foreign Object	6%
Air Traffic Services	6%
Poor/faint marking/signs for runway/taxiway closure	5%
Optical Illusion/visual misperception	5%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Operational Pressure	4%
Fatigue	3%
Airport Perimeter Control/Fencing/Wildlife Control	3%
Extensive/Uncontained Engine Failure	2%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Traffic	2%
Contained Engine Failure/Powerplant Malfunction	2%
Brakes	2%
Terrain/Obstacles	2%
Dispatch/Paperwork	1%
Hydraulic System Failure	1%
Icing Conditions	1%
Crew Incapacitation	1%
Flight Controls	1%
Manuals/Charts/Checklists	1%
Secondary Flight Controls	1%

2013-2017 Nonfatal Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	26%
Vertical/Lateral/Speed Deviation	18%
Unstable Approach	13%
Continued Landing after Unstable Approach	11%
Abrupt Aircraft Control	7%
Unnecessary Weather Penetration	6%
Operation Outside Aircraft Limitations	5%
Loss of Aircraft Control while on the Ground	5%
Brakes/Thrust Reversers/Ground Spoilers	4%
Engine	3%
Ramp Movements	2%
Flight Controls/Automation	2%
Rejected Takeoff after V1	1%
Runway/Taxiway Incursion	1%
Controlled Flight Towards Terrain	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	19%
Monitor/Cross-check	14%
Taxiway/Runway Management	6%
Leadership	5%
Captain Should Show Leadership	4%
First Officer is assertive when necessary	3%
Automation Management	3%
Workload Management	3%
Communication Environment	2%
Evaluation of Plans	1%

Addendum A

Top Contributing Factors – Section 4

2013-2017 IOSA Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	24%
Safety Management	19%
Flight Operations	16%
Flight Ops: Training Systems	12%
Design	10%
Flight Ops: SOPs & Checking	10%
Maintenance Operations	9%
Maintenance Ops: SOPs & Checking	9%
Selection Systems	6%
Management Decisions	5%
Technology & Equipment	5%
Change Management	4%
Ground Operations	2%
Operations Planning & Scheduling	2%
Maintenance Ops: Training Systems	2%
Ground Ops: Training Systems	1%
Cabin Operations	1%
Cabin Ops: SOPs & Checking	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	30%
SOP Adherence/SOP Cross-verification	24%
Callouts	11%
Pilot-to-Pilot Communication	10%
Automation	6%
Abnormal Checklist	4%
Systems/Radios/Instruments	3%
Ground Navigation	1%
Crew to External Communication	1%
Ground Crew	1%
Normal Checklist	1%
Air Traffic Control	1%
Briefings	1%

2013-2017 IOSA Aircraft Accidents

THREATS

	Percentage Contribution
Aircraft Malfunction	28%
Meteorology	28%
Gear/Tire	19%
Wind/Wind shear/Gusty wind	17%
Maintenance Events	16%
Airport Facilities	11%
Poor visibility/Instrument Meteorological Conditions	11%
Air Traffic Services	10%
Ground Events	8%
Nav Aids	7%
Lack of Visual Reference	7%
Ground-based nav aid malfunction or not available	7%
Thunderstorms	7%
Optical Illusion/visual misperception	6%
Fatigue	6%
Contaminated runway/taxiway - poor braking action	6%
Wildlife/Birds/Foreign Object	5%
Operational Pressure	5%
Fire/Smoke (Cockpit/Cabin/Cargo)	5%
Poor/faint marking/signs for runway/taxiway closure	4%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Traffic	2%
Extensive/Uncontained Engine Failure	2%
Manuals/Charts/Checklists	1%
Dispatch/Paperwork	1%
Terrain/Obstacles	1%
Airport Perimeter Control/Fencing/Wildlife Control	1%
Contained Engine Failure/Powerplant Malfunction	1%
Brakes	1%
Dangerous Goods	1%
Secondary Flight Controls	1%
Spatial Disorientation/somatogravic illusion	1%
Hydraulic System Failure	1%
Icing Conditions	1%
Flight Controls	1%

2013-2017 IOSA Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	20%
Vertical/Lateral/Speed Deviation	18%
Unstable Approach	12%
Continued Landing after Unstable Approach	9%
Abrupt Aircraft Control	9%
Unnecessary Weather Penetration	6%
Loss of Aircraft Control while on the Ground	6%
Operation Outside Aircraft Limitations	4%
Engine	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Ramp Movements	4%
Controlled Flight Towards Terrain	3%
Flight Controls/Automation	3%
Rejected Takeoff after V1	1%
Proceeding toward wrong taxiway/runway	1%
Weight & Balance	1%
Wrong taxiway/ramp/gate/hold spot	1%
Runway/Taxiway Incursion	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	19%
Monitor/Cross-check	17%
Leadership	10%
Captain Should Show Leadership	8%
First Officer is assertive when necessary	6%
Automation Management	6%
Communication Environment	6%
Workload Management	5%
Taxiway/Runway Management	4%

Note: 11 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Addendum A

Top Contributing Factors – Section 4

2013-2017 Non-IOSA Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	42%
Safety Management	33%
Flight Operations	20%
Flight Ops: SOPs & Checking	13%
Flight Ops: Training Systems	11%
Selection Systems	10%
Management Decisions	8%
Maintenance Ops: SOPs & Checking	6%
Design	5%
Maintenance Operations	5%
Dispatch Ops: SOPs & Checking	4%
Dispatch	4%
Technology & Equipment	4%
Maintenance Ops: Training Systems	2%
Change Management	1%
Ground Operations	1%
Ground Ops: SOPs & Checking	1%
Operations Planning & Scheduling	1%
Ground Ops: Training Systems	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	37%
SOP Adherence/SOP Cross-verification	30%
Callouts	6%
Pilot-to-Pilot Communication	5%
Abnormal Checklist	2%
Crew to External Communication	2%
Air Traffic Control	1%
Automation	1%
Systems/Radios/Instruments	1%
Briefings	1%
Normal Checklist	1%
Ground Navigation	1%
Ground Crew	1%
Documentation	1%
Wrong Weight & Balance/Fuel Information	1%
Dispatch	1%

2013-2017 Non-IOSA Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	30%
Aircraft Malfunction	29%
Airport Facilities	16%
Wind/Wind shear/Gusty wind	15%
Lack of Visual Reference	13%
Gear/Tire	12%
Poor visibility/Instrument Meteorological Conditions	11%
Nav Aids	11%
Ground-based nav aid malfunction or not available	11%
Thunderstorms	9%
Contaminated runway/taxiway - poor braking action	8%
Maintenance Events	8%
Operational Pressure	6%
Wildlife/Birds/Foreign Object	5%
Poor/faint marking/signs for runway/taxiway closure	5%
Contained Engine Failure/Powerplant Malfunction	5%
Airport Perimeter Control/Fencing/Wildlife Control	4%
Fatigue	4%
Terrain/Obstacles	3%
Air Traffic Services	3%
Fire/Smoke (Cockpit/Cabin/Cargo)	3%
Optical Illusion/visual misperception	3%
Icing Conditions	2%
Dispatch/Paperwork	2%
Ground Events	2%
Brakes	2%
Extensive/Uncontained Engine Failure	2%
Crew Incapacitation	1%
Hydraulic System Failure	1%
Avionics/Flight Instruments	1%
Traffic	1%
Flight Controls	1%
Spatial Disorientation/somatogravic illusion	1%
Inadequate overrun area/trench/ditch/proximity of structures	1%
Secondary Flight Controls	1%
Primary Flight Controls	1%
Structural Failure	1%

2013-2017 Non-IOSA Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	27%
Vertical/Lateral/Speed Deviation	20%
Unstable Approach	14%
Continued Landing after Unstable Approach	13%
Unnecessary Weather Penetration	10%
Operation Outside Aircraft Limitations	9%
Abrupt Aircraft Control	6%
Engine	4%
Loss of Aircraft Control while on the Ground	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Flight Controls/Automation	2%
Controlled Flight Towards Terrain	2%
Rejected Takeoff after V1	1%
Runway/Taxiway Incursion	1%
Weight & Balance	1%
Ramp Movements	1%
Unauthorized Airspace Penetration	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	22%
Monitor/Cross-check	16%
Taxiway/Runway Management	6%
Leadership	6%
Captain Should Show Leadership	5%
Evaluation of Plans	4%
First Officer is assertive when necessary	4%
Workload Management	2%
Automation Management	2%
Inquiry	1%
Plans Stated	1%
Communication Environment	1%
SOP Briefing/Planning	1%

Note: 50 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Addendum A

Top Contributing Factors – Section 4

Controlled Flight into Terrain

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	78%
Technology & Equipment	56%
Safety Management	44%
Flight Operations	44%
Selection Systems	33%
Flight Ops: SOPs & Checking	33%
Flight Ops: Training Systems	22%
Management Decisions	22%

THREATS

	Percentage Contribution
Nav Aids	56%
Ground-based nav aid malfunction or not available	56%
Meteorology	56%
Lack of Visual Reference	56%
Poor visibility/Instrument Meteorological Conditions	44%
Fatigue	33%
Air Traffic Services	22%
Thunderstorms	22%
Operational Pressure	22%
Spatial Disorientation/somatogravic illusion	11%
Poor/faint marking/signs for runway/taxiway closure	11%
Airport Facilities	11%
Terrain/Obstacles	11%
Dispatch/Paperwork	11%
Manuals/Charts/Checklists	11%
Optical Illusion/visual misperception	11%
Wind/Wind shear/Gusty wind	11%

Controlled Flight into Terrain

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	67%
Callouts	22%
Manual Handling/Flight Controls	11%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	56%
Unnecessary Weather Penetration	44%
Continued Landing after Unstable Approach	22%
Unstable Approach	22%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	11%

COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	56%
Overall Crew Performance	33%
Leadership	22%
First Officer is assertive when necessary	22%
Automation Management	11%
Captain Should Show Leadership	11%

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.

Addendum A

Top Contributing Factors – Section 4

Loss of Control – In-flight

LATENT CONDITIONS

	Percentage Contribution
Flight Operations	30%
Flight Ops: SOPs & Checking	22%
Safety Management	22%
Flight Ops: Training Systems	17%
Selection Systems	17%
Regulatory Oversight	17%
Operations Planning & Scheduling	9%
Management Decisions	9%
Dispatch	4%
Change Management	4%
Design	4%
Dispatch Ops: SOPs & Checking	4%

THREATS

	Percentage Contribution
Aircraft Malfunction	39%
Meteorology	30%
Lack of Visual Reference	22%
Contained Engine Failure/Powerplant Malfunction	22%
Poor visibility/Instrument Meteorological Conditions	17%
Nav Aids	13%
Operational Pressure	13%
Fatigue	13%
Ground-based nav aid malfunction or not available	13%
Thunderstorms	9%
Wind/Wind shear/Gusty wind	9%
Air Traffic Services	9%
Maintenance Events	9%
Gear/Tire	4%
Avionics/Flight Instruments	4%
Terrain/Obstacles	4%
Spatial Disorientation/somatogravic illusion	4%
Icing Conditions	4%

Loss of Control – In-flight

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	39%
Manual Handling/Flight Controls	35%
Pilot-to-Pilot Communication	30%
Callouts	22%
Abnormal Checklist	22%
Systems/Radios/Instruments	13%
Automation	13%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	26%
Operation Outside Aircraft Limitations	22%
Unnecessary Weather Penetration	17%
Engine	13%
Flight Controls/Automation	13%
Abrupt Aircraft Control	13%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	4%
Weight & Balance	4%
Continued Landing after Unstable Approach	4%
Unstable Approach	4%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	35%
Leadership	30%
Captain Should Show Leadership	26%
Monitor/Cross-check	26%
Communication Environment	17%
First Officer is assertive when necessary	13%
Automation Management	9%
Workload Management	9%

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

Top Contributing Factors – Section 4

Mid-air Collision

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

Addendum A

Top Contributing Factors – Section 4

Runway/Taxiway Excursion

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	45%
Safety Management	42%
Flight Operations	22%
Flight Ops: Training Systems	18%
Flight Ops: SOPs & Checking	17%
Selection Systems	8%
Change Management	5%
Management Decisions	3%
Design	3%
Technology & Equipment	2%
Dispatch Ops: SOPs & Checking	2%
Operations Planning & Scheduling	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	38%
SOP Adherence/SOP Cross-verification	32%
Callouts	12%
Pilot-to-Pilot Communication	7%
Automation	5%
Normal Checklist	2%
Ground Navigation	2%

Runway/Taxiway Excursion

THREATS

	Percentage Contribution
Meteorology	45%
Airport Facilities	32%
Wind/Wind shear/Gusty wind	25%
Contaminated runway/taxiway - poor braking action	25%
Poor visibility/Instrument Meteorological Conditions	15%
Lack of Visual Reference	13%
Aircraft Malfunction	13%
Thunderstorms	12%
Nav Aids	10%
Ground-based nav aid malfunction or not available	10%
Poor/faint marking/signs for runway/taxiway closure	8%
Fatigue	8%
Optical Illusion/visual misperception	7%
Air Traffic Services	7%
Terrain/Obstacles	3%
Contained Engine Failure/Powerplant Malfunction	3%
Operational Pressure	3%
Brakes	2%
Primary Flight Controls	2%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Manuals/Charts/Checklists	2%
Icing Conditions	2%
Wildlife/Birds/Foreign Object	2%
Maintenance Events	2%
Airport Perimeter Control/Fencing/Wildlife Control	2%
Flight Controls	2%
Crew Incapacitation	2%

Runway/Taxiway Excursion

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	43%
Vertical/Lateral/Speed Deviation	18%
Continued Landing after Unstable Approach	13%
Unstable Approach	12%
Loss of Aircraft Control while on the Ground	10%
Brakes/Thrust Reversers/Ground Spoilers	8%
Unnecessary Weather Penetration	8%
Abrupt Aircraft Control	7%
Operation Outside Aircraft Limitations	7%
Engine	5%
Flight Controls/Automation	2%

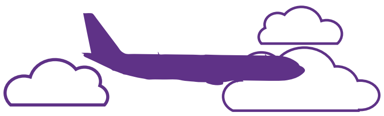
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	28%
Monitor/Cross-check	20%
Taxiway/Runway Management	18%
Leadership	8%
First Officer is assertive when necessary	7%
Captain Should Show Leadership	7%
Automation Management	3%
SOP Briefing/Planning	2%
Workload Management	2%
Evaluation of Plans	2%

Note: 16 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Top Contributing Factors – Section 4

In-flight Damage



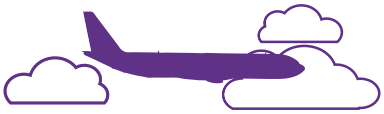
LATENT CONDITIONS

	Percentage Contribution
Design	15%
Safety Management	6%
Maintenance Operations	6%
Maintenance Ops: SOPs & Checking	6%
Regulatory Oversight	6%
Management Decisions	3%
Flight Operations	3%
Flight Ops: SOPs & Checking	3%

THREATS

	Percentage Contribution
Aircraft Malfunction	32%
Maintenance Events	15%
Fire/Smoke (Cockpit/Cabin/Cargo)	12%
Extensive/Uncontained Engine Failure	12%
Wildlife/Birds/Foreign Object	9%
Airport Facilities	6%
Thunderstorms	6%
Meteorology	6%
Contained Engine Failure/Powerplant Malfunction	3%
Gear/Tire	3%
Ground Events	3%
Airport Perimeter Control/Fencing/Wildlife Control	3%
Contaminated runway/taxiway - poor braking action	3%
Brakes	3%
Dangerous Goods	3%
Dispatch/Paperwork	3%
Structural Failure	3%

In-flight Damage



FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	15%
Pilot-to-Pilot Communication	3%
Callouts	3%
Automation	3%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Operation Outside Aircraft Limitations	6%
Unnecessary Weather Penetration	6%
Abrupt Aircraft Control	3%

COUNTERMEASURES

	Percentage Contribution
Captain Should Show Leadership	3%
Leadership	3%
Evaluation of Plans	3%
Communication Environment	3%
Automation Management	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.

Addendum A

Top Contributing Factors – Section 4

Ground Damage

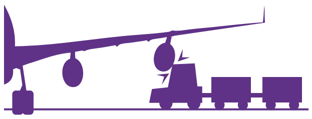
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	21%
Safety Management	14%
Ground Operations	11%
Design	7%
Ground Ops: SOPs & Checking	7%
Maintenance Ops: SOPs & Checking	7%
Ground Ops: Training Systems	4%
Maintenance Operations	4%

THREATS

	Percentage Contribution
Ground Events	21%
Aircraft Malfunction	18%
Fire/Smoke (Cockpit/Cabin/Cargo)	11%
Maintenance Events	11%
Traffic	7%
Brakes	7%
Hydraulic System Failure	7%
Operational Pressure	4%
Air Traffic Services	4%
Poor/faint marking/signs for runway/taxiway closure	4%
Airport Facilities	4%
Secondary Flight Controls	4%
Optical Illusion/visual misperception	4%
Gear/Tire	4%

Ground Damage



FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	11%
Crew to External Communication	7%
Abnormal Checklist	7%
Ground Crew	7%
Normal Checklist	4%
Air Traffic Control	4%
Systems/Radios/Instruments	4%
Manual Handling/Flight Controls	4%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Loss of Aircraft Control while on the Ground	11%
Ramp Movements	11%
Brakes/Thrust Reversers/Ground Spoilers	7%
Proceeding toward wrong taxiway/runway	4%
Engine	4%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	14%
Monitor/Cross-check	14%
Taxiway/Runway Management	7%
Workload Management	4%
First Officer is assertive when necessary	4%
Leadership	4%

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.

Addendum A

Top Contributing Factors – Section 4

Undershoot

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	55%
Safety Management	45%
Flight Operations	27%
Flight Ops: SOPs & Checking	18%
Management Decisions	18%
Technology & Equipment	9%
Flight Ops: Training Systems	9%
Change Management	9%

THREATS

	Percentage Contribution
Meteorology	64%
Poor visibility/Instrument Meteorological Conditions	36%
Wind/Wind shear/Gusty wind	36%
Nav Aids	36%
Ground-based nav aid malfunction or not available	36%
Airport Facilities	27%
Optical Illusion/visual misperception	27%
Lack of Visual Reference	18%
Poor/faint marking/signs for runway/taxiway closure	18%
Icing Conditions	9%
Thunderstorms	9%
Contaminated runway/taxiway - poor braking action	9%

Undershoot

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	45%
SOP Adherence/SOP Cross-verification	45%
Pilot-to-Pilot Communication	18%
Callouts	9%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	64%
Unnecessary Weather Penetration	27%
Unstable Approach	18%
Continued Landing after Unstable Approach	9%
Loss of Aircraft Control while on the Ground	9%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	9%

COUNTERMEASURES

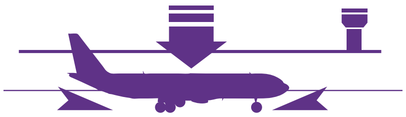
	Percentage Contribution
Overall Crew Performance	36%
Monitor/Cross-check	18%
Leadership	18%
First Officer is assertive when necessary	9%
Captain Should Show Leadership	9%

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.

Addendum A

Top Contributing Factors – Section 4

Hard Landing



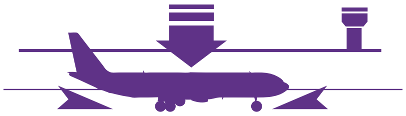
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	21%
Flight Operations	21%
Flight Ops: Training Systems	19%
Safety Management	14%
Flight Ops: SOPs & Checking	12%
Selection Systems	12%
Management Decisions	5%
Technology & Equipment	2%
Dispatch	2%
Dispatch Ops: SOPs & Checking	2%

THREATS

	Percentage Contribution
Meteorology	40%
Wind/Wind shear/Gusty wind	30%
Lack of Visual Reference	9%
Thunderstorms	9%
Operational Pressure	7%
Optical Illusion/visual misperception	7%
Poor visibility/Instrument Meteorological Conditions	7%
Airport Facilities	5%
Ground-based nav aid malfunction or not available	5%
Poor/faint marking/signs for runway/taxiway closure	5%
Nav Aids	5%
Dispatch/Paperwork	2%
Fatigue	2%
Aircraft Malfunction	2%
Gear/Tire	2%

Hard Landing



FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	70%
SOP Adherence/SOP Cross-verification	28%
Callouts	7%
Pilot-to-Pilot Communication	2%
Automation	2%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	51%
Unstable Approach	33%
Vertical/Lateral/Speed Deviation	26%
Continued Landing after Unstable Approach	21%
Abrupt Aircraft Control	21%
Unnecessary Weather Penetration	7%
Loss of Aircraft Control while on the Ground	5%
Operation Outside Aircraft Limitations	5%
Engine	2%
Flight Controls/Automation	2%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	30%
Monitor/Cross-check	16%
Automation Management	2%
Workload Management	2%
Leadership	2%
Taxiway/Runway Management	2%
Evaluation of Plans	2%
Captain Should Show Leadership	2%

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

Addendum A
Top Contributing Factors – Section 4

Gear-up Landing/Gear Collapse

LATENT CONDITIONS

	Percentage Contribution
Maintenance Ops: SOPs & Checking	28%
Maintenance Operations	28%
Design	19%
Regulatory Oversight	14%
Maintenance Ops: Training Systems	9%
Safety Management	9%
Management Decisions	5%
Dispatch Ops: SOPs & Checking	2%
Cabin Ops: SOPs & Checking	2%
Operations Planning & Scheduling	2%
Flight Ops: Training Systems	2%
Cabin Operations	2%
Flight Operations	2%
Dispatch	2%

THREATS

	Percentage Contribution
Aircraft Malfunction	77%
Gear/Tire	77%
Maintenance Events	40%
Operational Pressure	2%
Ground-based nav aid malfunction or not available	2%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Hydraulic System Failure	2%
Nav Aids	2%
Airport Facilities	2%

Gear-up Landing/Gear Collapse

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	2%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Operation Outside Aircraft Limitations	2%
Vertical/Lateral/Speed Deviation	2%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	2%

COUNTERMEASURES

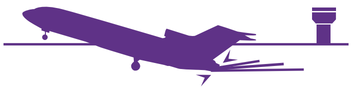
	Percentage Contribution
—	—

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.

Addendum A

Top Contributing Factors – Section 4

Tailstrike



LATENT CONDITIONS

	Percentage Contribution
Flight Operations	16%
Flight Ops: Training Systems	16%
Regulatory Oversight	11%
Change Management	11%
Safety Management	5%

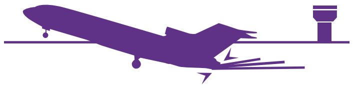
THREATS

	Percentage Contribution
Meteorology	16%
Wind/Wind shear/Gusty wind	11%
Lack of Visual Reference	5%
Ground-based nav aid malfunction or not available	5%
Fatigue	5%
Poor visibility/Instrument Meteorological Conditions	5%
Nav Aids	5%
Terrain/Obstacles	5%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	47%
SOP Adherence/SOP Cross-verification	26%
Pilot-to-Pilot Communication	16%
Systems/Radios/Instruments	5%
Callouts	5%
Normal Checklist	5%

Tailstrike



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	26%
Continued Landing after Unstable Approach	16%
Vertical/Lateral/Speed Deviation	11%
Unstable Approach	11%
Operation Outside Aircraft Limitations	11%
Unnecessary Weather Penetration	5%
Brakes/Thrust Reversers/Ground Spoilers	5%
Weight & Balance	5%

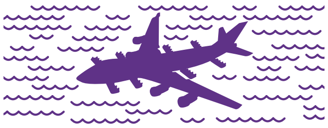
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	21%
Monitor/Cross-check	16%
Communication Environment	11%
Automation Management	11%
Captain Should Show Leadership	5%
Leadership	5%
First Officer is assertive when necessary	5%
Workload Management	5%

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.

Top Contributing Factors – Section 4

Off-Airport Landing/Ditching



LATENT CONDITIONS

	Percentage Contribution
Selection Systems	100%
Regulatory Oversight	100%
Flight Operations	100%
Dispatch	100%
Management Decisions	100%
Safety Management	100%

THREATS

	Percentage Contribution
—	—

FLIGHT CREW ERRORS

	Percentage Contribution
—	—

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
—	—

COUNTERMEASURES

	Percentage Contribution
—	—

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.

Top Contributing Factors – Section 4

Runway Collision

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	58%
Safety Management	33%
Flight Ops: Training Systems	8%
Maintenance Ops: SOPs & Checking	8%
Management Decisions	8%
Maintenance Operations	8%
Flight Operations	8%

THREATS

	Percentage Contribution
Airport Perimeter Control/Fencing/Wildlife Control	42%
Wildlife/Birds/Foreign Object	33%
Airport Facilities	33%
Air Traffic Services	25%
Poor visibility/Instrument Meteorological Conditions	25%
Meteorology	25%
Wind/Wind shear/Gusty wind	17%
Lack of Visual Reference	17%
Optical Illusion/visual misperception	8%
Icing Conditions	8%
Contaminated runway/taxiway - poor braking action	8%
Terrain/Obstacles	8%
Traffic	8%

Runway Collision

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	8%
Briefings	8%
Ground Navigation	8%
Callouts	8%
Crew to External Communication	8%
Air Traffic Control	8%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Runway/Taxiway Incursion	17%
Vertical/Lateral/Speed Deviation	8%
Ramp Movements	8%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	8%
Inquiry	8%
Monitor/Cross-check	8%

Note: all of the accidents were classified.

Addendum A

Top Contributing Factors – Section 4

Jet Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	29%
Safety Management	25%
Flight Operations	16%
Flight Ops: Training Systems	12%
Design	10%
Flight Ops: SOPs & Checking	9%
Selection Systems	8%
Maintenance Ops: SOPs & Checking	8%
Maintenance Operations	8%
Technology & Equipment	5%
Management Decisions	5%
Change Management	3%
Ground Operations	3%
Dispatch Ops: SOPs & Checking	2%
Operations Planning & Scheduling	2%
Dispatch	2%
Ground Ops: Training Systems	2%
Ground Ops: SOPs & Checking	1%
Maintenance Ops: Training Systems	1%
Cabin Operations	1%
Cabin Ops: SOPs & Checking	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	35%
SOP Adherence/SOP Cross-verification	29%
Callouts	10%
Pilot-to-Pilot Communication	8%
Automation	5%
Systems/Radios/Instruments	2%
Abnormal Checklist	2%
Normal Checklist	2%
Crew to External Communication	2%
Briefings	1%
Air Traffic Control	1%
Ground Crew	1%
Ground Navigation	1%
Documentation	1%
Dispatch	1%
Wrong Weight & Balance/Fuel Information	1%

Jet Aircraft Accidents

THREATS

	Percentage Contribution
Meteorology	30%
Aircraft Malfunction	22%
Maintenance Events	16%
Wind/Wind shear/Gusty wind	16%
Airport Facilities	15%
Gear/Tire	13%
Poor visibility/Instrument Meteorological Conditions	10%
Lack of Visual Reference	10%
Contaminated runway/taxiway - poor braking action	10%
Thunderstorms	9%
Air Traffic Services	8%
Ground-based nav aid malfunction or not available	8%
Nav Aids	8%
Fatigue	7%
Ground Events	7%
Optical Illusion/visual misperception	6%
Operational Pressure	5%
Wildlife/Birds/Foreign Object	5%
Fire/Smoke (Cockpit/Cabin/Cargo)	5%
Poor/faint marking/signs for runway/taxiway closure	4%
Terrain/Obstacles	2%
Extensive/Uncontained Engine Failure	2%
Traffic	2%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Dispatch/Paperwork	2%
Airport Perimeter Control/Fencing/Wildlife Control	2%
Secondary Flight Controls	1%
Brakes	1%
Contained Engine Failure/Powerplant Malfunction	1%
Hydraulic System Failure	1%
Flight Controls	1%
Icing Conditions	1%
Crew Incapacitation	1%
Dangerous Goods	1%
Primary Flight Controls	1%
Spatial Disorientation/somatogravic illusion	1%
Manuals/Charts/Checklists	1%
Avionics/Flight Instruments	1%

Jet Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	26%
Vertical/Lateral/Speed Deviation	20%
Unstable Approach	13%
Continued Landing after Unstable Approach	11%
Abrupt Aircraft Control	7%
Unnecessary Weather Penetration	7%
Operation Outside Aircraft Limitations	6%
Brakes/Thrust Reversers/Ground Spoilers	4%
Engine	3%
Loss of Aircraft Control while on the Ground	3%
Ramp Movements	3%
Flight Controls/Automation	3%
Controlled Flight Towards Terrain	2%
Weight & Balance	1%
Rejected Takeoff after V1	1%
Runway/Taxiway Incursion	1%
Unauthorized Airspace Penetration	1%
Wrong taxiway/ramp/gate/hold spot	1%
Proceeding toward wrong taxiway/runway	1%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	20%
Monitor/Cross-check	17%
Leadership	8%
Taxiway/Runway Management	7%
First Officer is assertive when necessary	6%
Captain Should Show Leadership	6%
Automation Management	5%
Workload Management	4%
Communication Environment	3%
Evaluation of Plans	1%
Inquiry	1%
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.

Top Contributing Factors – Section 4

Turboprop Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	40%
Safety Management	29%
Flight Operations	21%
Flight Ops: SOPs & Checking	16%
Flight Ops: Training Systems	11%
Management Decisions	10%
Selection Systems	9%
Maintenance Operations	6%
Maintenance Ops: SOPs & Checking	6%
Technology & Equipment	4%
Maintenance Ops: Training Systems	4%
Design	3%
Dispatch	2%
Change Management	1%
Dispatch Ops: SOPs & Checking	1%
Operations Planning & Scheduling	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	32%
SOP Adherence/SOP Cross-verification	25%
Pilot-to-Pilot Communication	7%
Callouts	5%
Abnormal Checklist	4%
Systems/Radios/Instruments	2%
Crew to External Communication	2%
Automation	2%
Air Traffic Control	1%
Briefings	1%
Ground Navigation	1%
Ground Crew	1%
Normal Checklist	1%

Turboprop Aircraft Accidents

THREATS

	Percentage Contribution
Aircraft Malfunction	39%
Meteorology	28%
Gear/Tire	19%
Wind/Wind shear/Gusty wind	17%
Poor visibility/Instrument Meteorological Conditions	13%
Nav Aids	11%
Airport Facilities	11%
Ground-based nav aid malfunction or not available	11%
Lack of Visual Reference	10%
Thunderstorms	7%
Contained Engine Failure/Powerplant Malfunction	7%
Operational Pressure	7%
Maintenance Events	6%
Wildlife/Birds/Foreign Object	5%
Airport Perimeter Control/Fencing/Wildlife Control	5%
Poor/faint marking/signs for runway/taxiway closure	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	3%
Air Traffic Services	3%
Optical Illusion/visual misperception	3%
Brakes	2%
Extensive/Uncontained Engine Failure	2%
Ground Events	2%
Icing Conditions	2%
Fatigue	2%
Dispatch/Paperwork	2%
Terrain/Obstacles	2%
Contaminated runway/taxiway - poor braking action	2%
Manuals/Charts/Checklists	1%
Structural Failure	1%
Spatial Disorientation/somatogravic illusion	1%
Inadequate overrun area/trench/ditch/proximity of structures	1%
Avionics/Flight Instruments	1%
Hydraulic System Failure	1%

Turboprop Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	19%
Vertical/Lateral/Speed Deviation	19%
Unstable Approach	12%
Unnecessary Weather Penetration	11%
Continued Landing after Unstable Approach	11%
Operation Outside Aircraft Limitations	8%
Loss of Aircraft Control while on the Ground	8%
Abrupt Aircraft Control	7%
Engine	6%
Controlled Flight Towards Terrain	4%
Brakes/Thrust Reversers/Ground Spoilers	2%
Flight Controls/Automation	2%
Rejected Takeoff after V1	1%
Runway/Taxiway Incursion	1%
Ramp Movements	1%

COUNTERMEASURES

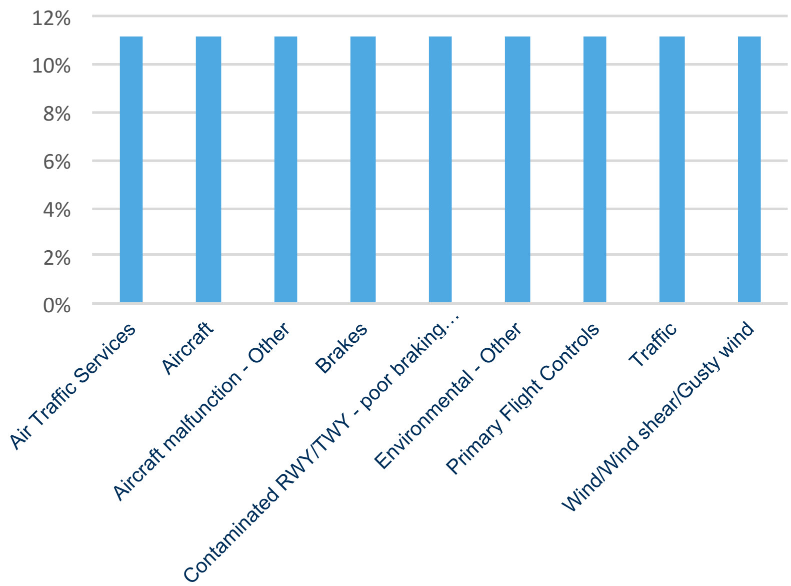
	Percentage Contribution
Overall Crew Performance	22%
Monitor/Cross-check	16%
Leadership	8%
Captain Should Show Leadership	6%
Workload Management	3%
Communication Environment	3%
First Officer is assertive when necessary	3%
Evaluation of Plans	3%
Automation Management	2%
Taxiway/Runway Management	1%
Inquiry	1%

Note: 40 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

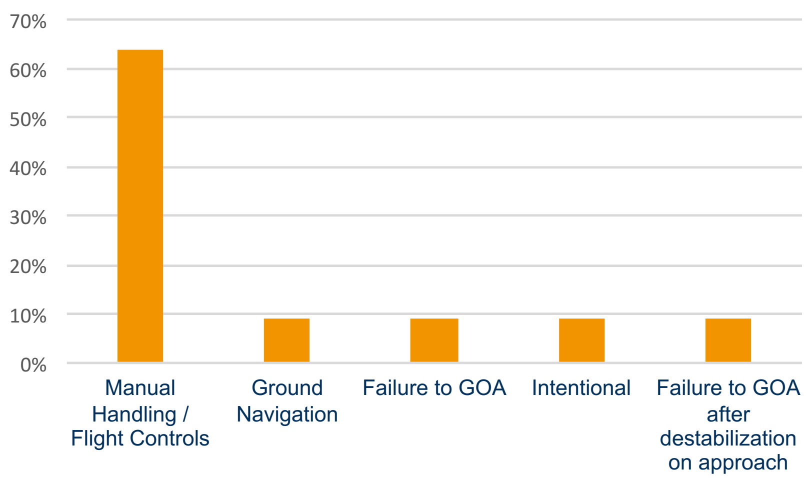
2017 Primary Contributing Factors

Accident Primary Contributing Factors Distribution

THREATS

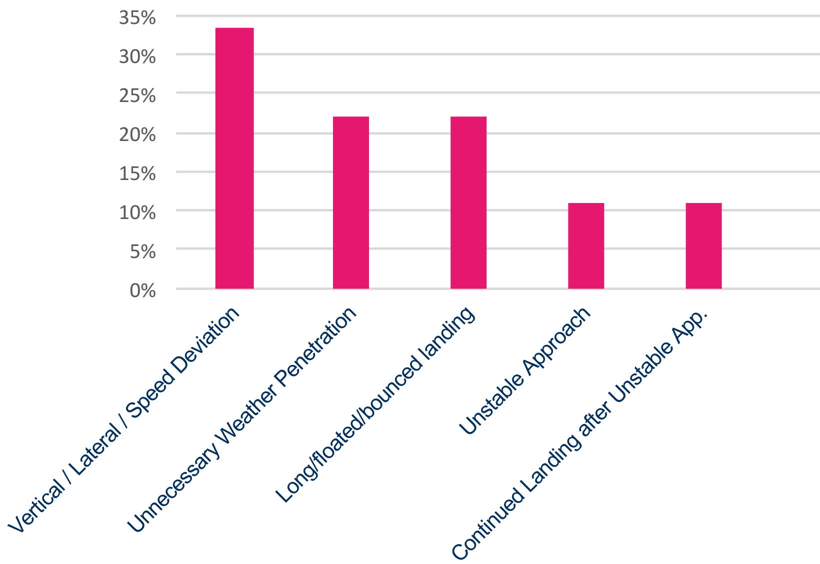


FLIGHT CREW ERRORS

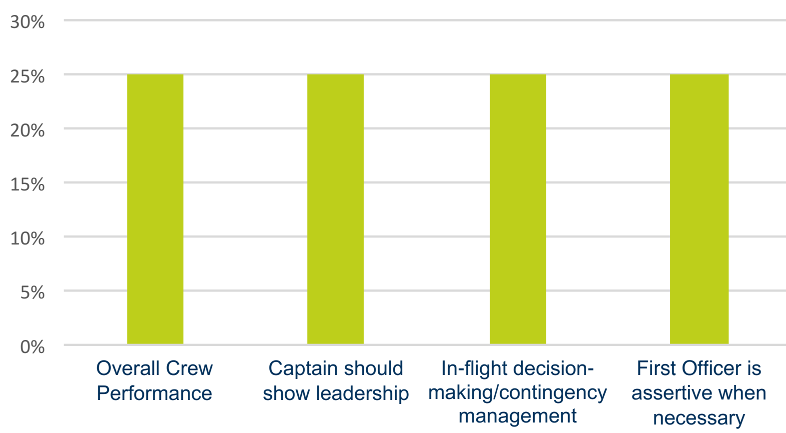


Accident Primary Contributing Factors Distribution

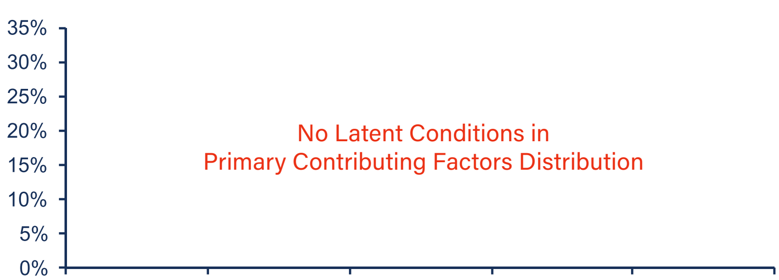
UNDESIRED AIRCRAFT STATE



COUNTERMEASURES



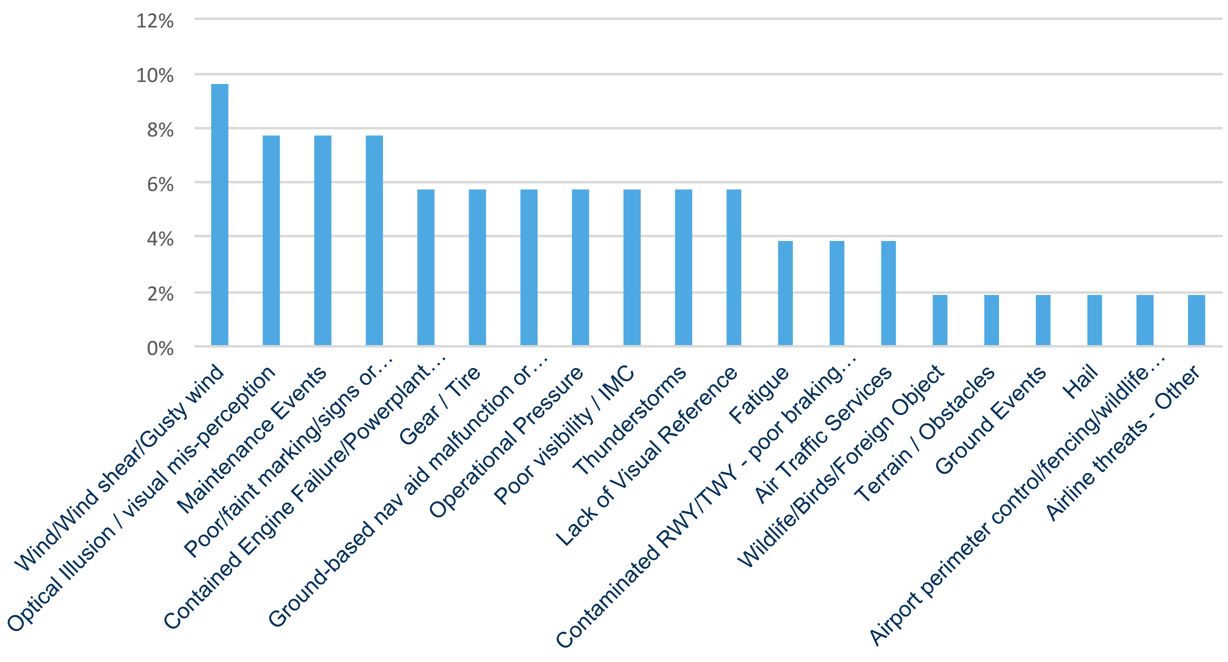
LATENT CONDITIONS



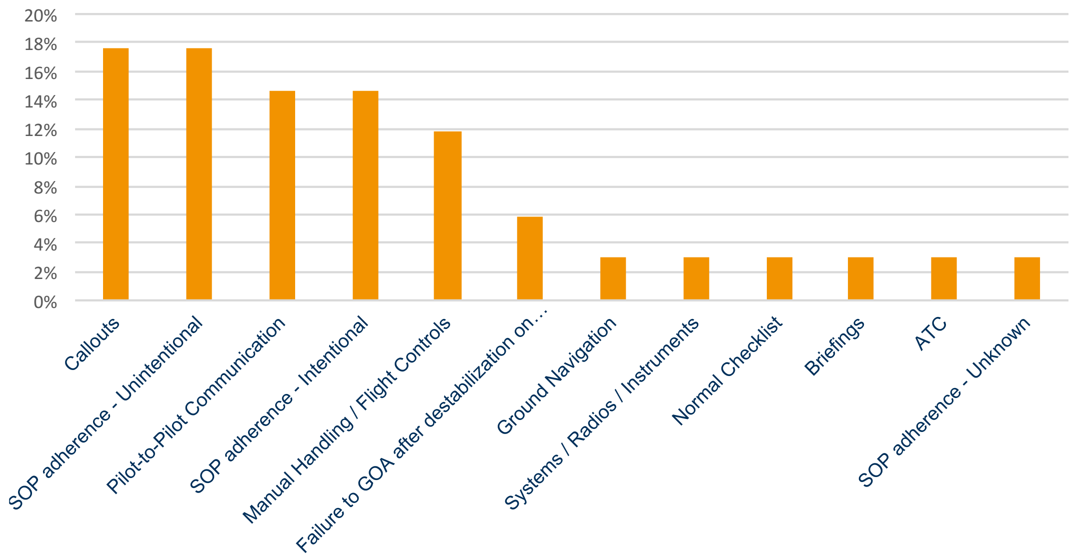
2017 Secondary Contributing Factors

Accident Secondary Contributing Factors Distribution

THREATS

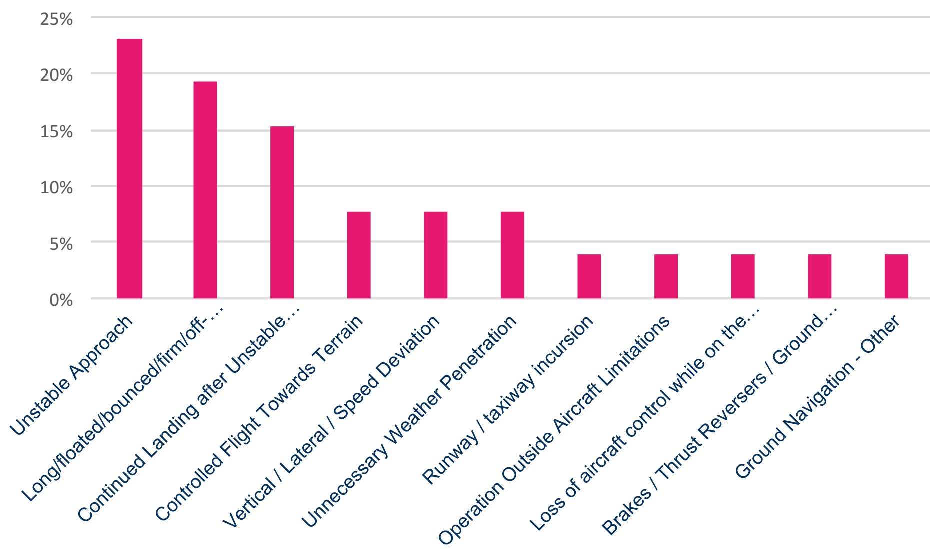


FLIGHT CREW ERRORS

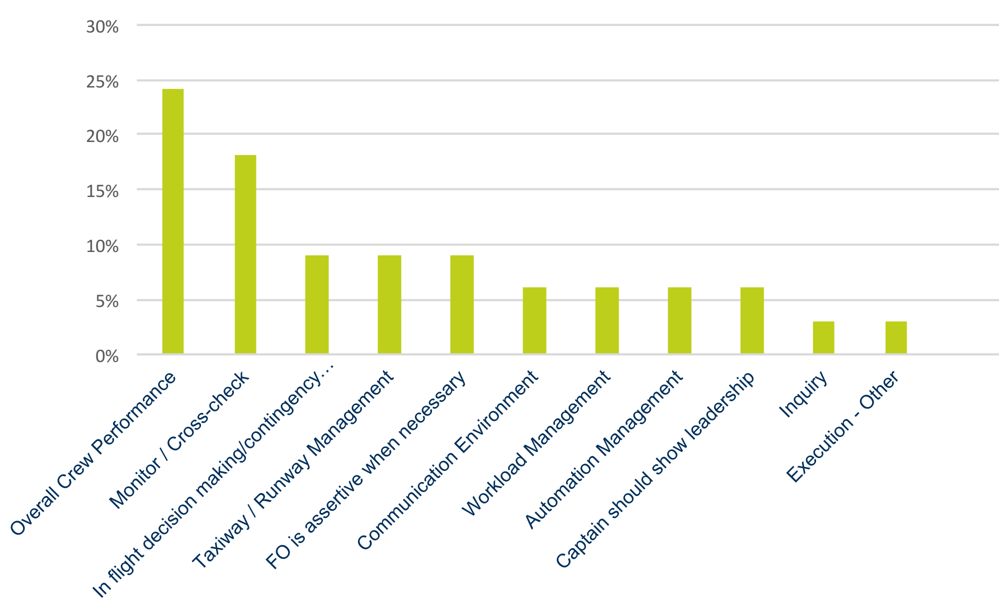


Accident Secondary Contributing Factors Distribution

UNDESIRED AIRCRAFT STATE

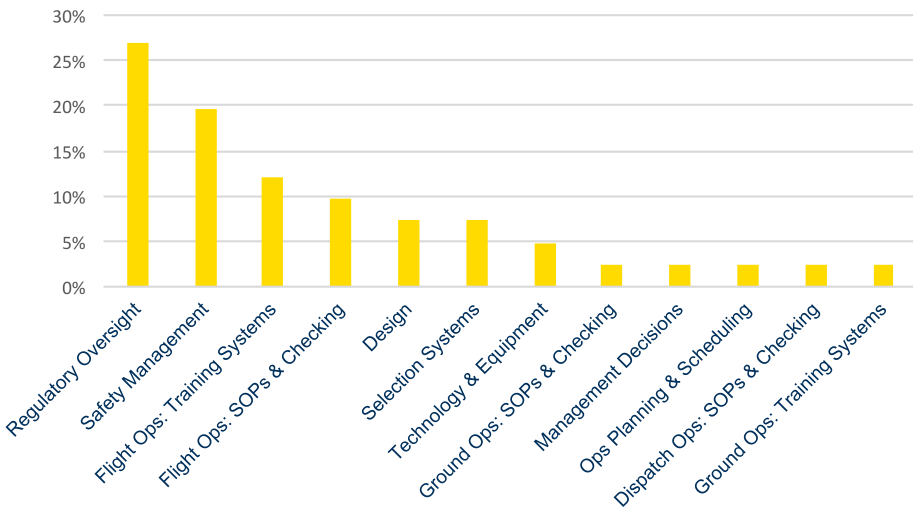


COUNTERMEASURES



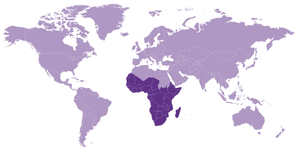
Accident Secondary Contributing Factors Distribution

LATENT CONDITIONS



Top Contributing Factors – Section 5

Africa Aircraft Accidents



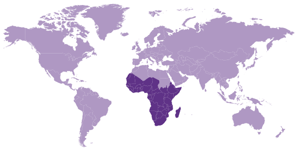
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	57%
Safety Management	48%
Management Decisions	14%
Technology & Equipment	10%
Maintenance Ops: SOPs & Checking	10%
Flight Ops: SOPs & Checking	10%
Dispatch Ops: SOPs & Checking	5%
Flight Ops: Training Systems	5%
Maintenance Operations	5%
Flight Operations	5%
Selection Systems	5%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	19%
SOP Adherence/SOP Cross-verification	14%
Pilot-to-Pilot Communication	10%
Callouts	5%
Systems/Radios/Instruments	5%

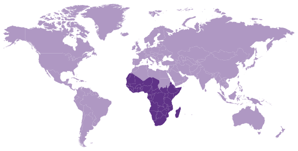
Africa Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	29%
Gear/Tire	24%
Maintenance Events	19%
Airport Facilities	19%
Nav Aids	14%
Ground-based nav aid malfunction or not available	14%
Wildlife/Birds/Foreign Object	14%
Meteorology	14%
Airport Perimeter Control/Fencing/Wildlife Control	14%
Contaminated runway/taxiway - poor braking action	10%
Poor visibility/Instrument Meteorological Conditions	10%
Ground Events	10%
Crew Incapacitation	5%
Lack of Visual Reference	5%
Hydraulic System Failure	5%
Extensive/Uncontained Engine Failure	5%
Secondary Flight Controls	5%
Wind/Wind shear/Gusty wind	5%
Thunderstorms	5%
Poor/faint marking/signs for runway/taxiway closure	5%
Operational Pressure	5%

Africa Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	29%
Vertical/Lateral/Speed Deviation	24%
Abrupt Aircraft Control	10%
Continued Landing after Unstable Approach	5%
Brakes/Thrust Reversers/Ground Spoilers	5%
Unauthorized Airspace Penetration	5%
Engine	5%
Unnecessary Weather Penetration	5%
Operation Outside Aircraft Limitations	5%
Flight Controls/Automation	5%
Loss of Aircraft Control while on the Ground	5%
Unstable Approach	5%

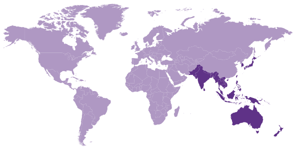
COUNTERMEASURES

	Percentage Contribution
Captain Should Show Leadership	14%
Leadership	10%
Overall Crew Performance	10%
First Officer is assertive when necessary	5%
Monitor/Cross-check	5%

Note: 19 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Top Contributing Factors – Section 5

Asia/Pacific Aircraft Accidents



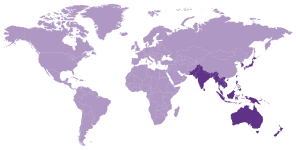
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	58%
Safety Management	40%
Flight Operations	22%
Flight Ops: Training Systems	18%
Flight Ops: SOPs & Checking	11%
Selection Systems	10%
Maintenance Operations	6%
Maintenance Ops: SOPs & Checking	6%
Management Decisions	4%
Design	4%
Change Management	3%
Technology & Equipment	3%
Maintenance Ops: Training Systems	1%
Ground Operations	1%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	43%
SOP Adherence/SOP Cross-verification	38%
Pilot-to-Pilot Communication	13%
Callouts	10%
Abnormal Checklist	4%
Crew to External Communication	4%
Air Traffic Control	3%
Ground Crew	3%
Automation	3%
Ground Navigation	3%
Systems/Radios/Instruments	1%
Briefings	1%

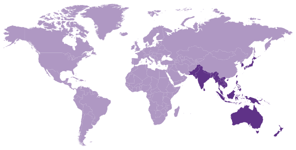
Asia/Pacific Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	25%
Airport Facilities	18%
Nav Aids	17%
Ground-based nav aid malfunction or not available	17%
Aircraft Malfunction	17%
Lack of Visual Reference	13%
Poor/faint marking/signs for runway/taxiway closure	10%
Poor visibility/Instrument Meteorological Conditions	10%
Thunderstorms	8%
Wind/Wind shear/Gusty wind	8%
Maintenance Events	8%
Contaminated runway/taxiway - poor braking action	7%
Fatigue	6%
Air Traffic Services	6%
Fire/Smoke (Cockpit/Cabin/Cargo)	6%
Optical Illusion/visual misperception	6%
Gear/Tire	6%
Ground Events	6%
Operational Pressure	4%
Wildlife/Birds/Foreign Object	4%
Contained Engine Failure/Powerplant Malfunction	4%
Terrain/Obstacles	3%
Airport Perimeter Control/Fencing/Wildlife Control	3%
Inadequate overrun area/trench/ditch/proximity of structures	3%
Dangerous Goods	1%
Crew Incapacitation	1%
Traffic	1%
Brakes	1%
Hydraulic System Failure	1%
Extensive/Uncontained Engine Failure	1%

Asia/Pacific Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	29%
Vertical/Lateral/Speed Deviation	24%
Unstable Approach	22%
Continued Landing after Unstable Approach	18%
Abrupt Aircraft Control	7%
Unnecessary Weather Penetration	6%
Ramp Movements	6%
Operation Outside Aircraft Limitations	4%
Loss of Aircraft Control while on the Ground	3%
Brakes/Thrust Reversers/Ground Spoilers	3%
Flight Controls/Automation	3%
Engine	3%
Controlled Flight Towards Terrain	3%
Runway/Taxiway Incursion	3%

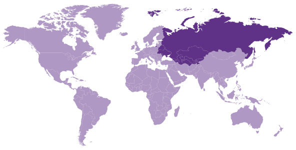
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	25%
Monitor/Cross-check	19%
Leadership	11%
First Officer is assertive when necessary	7%
Taxiway/Runway Management	6%
Captain Should Show Leadership	6%
Communication Environment	4%
Automation Management	4%
Workload Management	3%
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.

Top Contributing Factors – Section 5

Commonwealth of Independent States (CIS) Aircraft Accidents



LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	32%
Safety Management	27%
Flight Ops: SOPs & Checking	14%
Flight Operations	14%
Selection Systems	9%
Maintenance Operations	5%

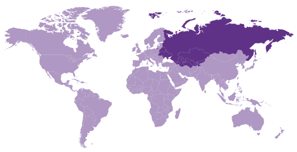
FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	36%
Manual Handling/Flight Controls	36%
Callouts	5%
Pilot-to-Pilot Communication	5%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	27%
Unnecessary Weather Penetration	27%
Vertical/Lateral/Speed Deviation	23%
Continued Landing after Unstable Approach	5%
Abrupt Aircraft Control	5%
Unstable Approach	5%

Commonwealth of Independent States (CIS) Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	55%
Aircraft Malfunction	36%
Poor visibility/Instrument Meteorological Conditions	36%
Wind/Wind shear/Gusty wind	23%
Lack of Visual Reference	18%
Airport Facilities	18%
Thunderstorms	18%
Contained Engine Failure/Powerplant Malfunction	14%
Nav Aids	9%
Ground-based nav aid malfunction or not available	9%
Air Traffic Services	9%
Contaminated runway/taxiway - poor braking action	9%
Gear/Tire	9%
Optical Illusion/visual misperception	9%
Fire/Smoke (Cockpit/Cabin/Cargo)	9%
Operational Pressure	9%
Maintenance Events	9%
Airport Perimeter Control/Fencing/Wildlife Control	5%
Terrain/Obstacles	5%
Dispatch/Paperwork	5%
Poor/faint marking/signs for runway/taxiway closure	5%
Wildlife/Birds/Foreign Object	5%

COUNTERMEASURES

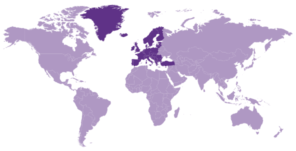
	Percentage Contribution
Overall Crew Performance	14%
Taxiway/Runway Management	9%
Evaluation of Plans	5%
Captain Should Show Leadership	5%
Automation Management	5%
Leadership	5%

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.

Addendum C

Top Contributing Factors – Section 5

Europe Aircraft Accidents



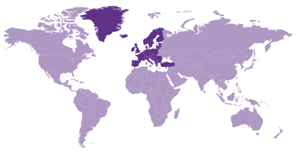
LATENT CONDITIONS

	Percentage Contribution
Flight Operations	18%
Flight Ops: Training Systems	16%
Flight Ops: SOPs & Checking	11%
Regulatory Oversight	11%
Safety Management	11%
Design	9%
Selection Systems	7%
Ground Operations	5%
Technology & Equipment	5%
Change Management	5%
Maintenance Operations	4%
Maintenance Ops: SOPs & Checking	4%
Ground Ops: Training Systems	4%
Ground Ops: SOPs & Checking	2%
Dispatch Ops: SOPs & Checking	2%
Dispatch	2%
Management Decisions	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	40%
SOP Adherence/SOP Cross-verification	28%
Callouts	11%
Automation	5%
Abnormal Checklist	4%
Systems/Radios/Instruments	2%
Pilot-to-Pilot Communication	2%

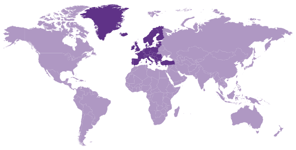
Europe Aircraft Accidents



THREATS

	Percentage Contribution
Meteorology	32%
Aircraft Malfunction	25%
Wind/Wind shear/Gusty wind	23%
Gear/Tire	16%
Fatigue	9%
Airport Facilities	9%
Thunderstorms	9%
Ground Events	9%
Air Traffic Services	9%
Operational Pressure	7%
Lack of Visual Reference	7%
Poor visibility/Instrument Meteorological Conditions	5%
Contaminated runway/taxiway - poor braking action	5%
Optical Illusion/visual misperception	4%
Maintenance Events	4%
Extensive/Uncontained Engine Failure	4%
Poor/faint marking/signs for runway/taxiway closure	2%
Manuals/Charts/Checklists	2%
Contained Engine Failure/Powerplant Malfunction	2%
Icing Conditions	2%
Wildlife/Birds/Foreign Object	2%
Brakes	2%
Fire/Smoke (Cockpit/Cabin/Cargo)	2%
Airport Perimeter Control/Fencing/Wildlife Control	2%
Avionics/Flight Instruments	2%
Traffic	2%
Inadequate overrun area/trench/ditch/proximity of structures	2%

Europe Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	28%
Vertical/Lateral/Speed Deviation	19%
Unstable Approach	18%
Continued Landing after Unstable Approach	16%
Operation Outside Aircraft Limitations	9%
Unnecessary Weather Penetration	9%
Abrupt Aircraft Control	9%
Loss of Aircraft Control while on the Ground	7%
Engine	4%
Proceeding toward wrong taxiway/runway	2%
Ramp Movements	2%
Controlled Flight Towards Terrain	2%
Brakes/Thrust Reversers/Ground Spoilers	2%

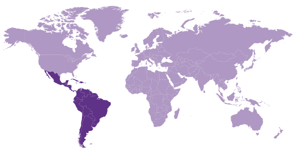
COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	26%
Monitor/Cross-check	16%
Leadership	5%
Captain Should Show Leadership	5%
Taxiway/Runway Management	5%
Automation Management	4%
First Officer is assertive when necessary	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.

Top Contributing Factors – Section 5

Latin America & the Caribbean Aircraft Accidents



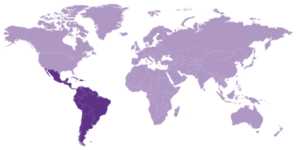
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	35%
Safety Management	35%
Flight Operations	19%
Dispatch	15%
Management Decisions	15%
Selection Systems	12%
Maintenance Operations	12%
Maintenance Ops: SOPs & Checking	12%
Dispatch Ops: SOPs & Checking	12%
Design	12%
Flight Ops: SOPs & Checking	12%
Operations Planning & Scheduling	4%
Cabin Operations	4%
Cabin Ops: SOPs & Checking	4%
Flight Ops: Training Systems	4%
Maintenance Ops: Training Systems	4%

FLIGHT CREW ERRORS

	Percentage Contribution
SOP Adherence/SOP Cross-verification	15%
Manual Handling/Flight Controls	15%
Pilot-to-Pilot Communication	8%
Air Traffic Control	4%
Crew to External Communication	4%
Dispatch	4%
Wrong Weight & Balance/Fuel Information	4%
Documentation	4%
Callouts	4%
Briefings	4%
Systems/Radios/Instruments	4%

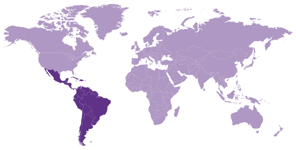
Latin America & the Caribbean Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	42%
Maintenance Events	31%
Gear/Tire	23%
Airport Facilities	19%
Meteorology	15%
Operational Pressure	12%
Contaminated runway/taxiway - poor braking action	12%
Thunderstorms	8%
Dispatch/Paperwork	8%
Nav Aids	8%
Ground-based nav aid malfunction or not available	8%
Wind/Wind shear/Gusty wind	4%
Traffic	4%
Poor visibility/Instrument Meteorological Conditions	4%
Poor/faint marking/signs for runway/taxiway closure	4%
Ground Events	4%
Fatigue	4%
Brakes	4%
Optical Illusion/visual misperception	4%
Airport Perimeter Control/Fencing/Wildlife Control	4%
Wildlife/Birds/Foreign Object	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Lack of Visual Reference	4%
Contained Engine Failure/Powerplant Malfunction	4%
Manuals/Charts/Checklists	4%
Air Traffic Services	4%
Hydraulic System Failure	4%

Latin America & the Caribbean Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	15%
Vertical/Lateral/Speed Deviation	8%
Weight & Balance	8%
Operation Outside Aircraft Limitations	8%
Continued Landing after Unstable Approach	4%
Unnecessary Weather Penetration	4%
Engine	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Controlled Flight Towards Terrain	4%
Abrupt Aircraft Control	4%
Unstable Approach	4%
Ramp Movements	4%

COUNTERMEASURES

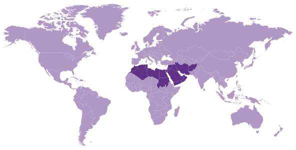
	Percentage Contribution
Overall Crew Performance	19%
Monitor/Cross-check	12%
Taxiway/Runway Management	8%
Captain Should Show Leadership	4%
Workload Management	4%
Communication Environment	4%
First Officer is assertive when necessary	4%
Evaluation of Plans	4%
Plans Stated	4%
Inquiry	4%
Leadership	4%

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

Addendum C

Top Contributing Factors – Section 5

Middle East & North Africa Aircraft Accidents



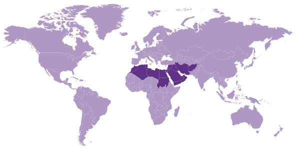
LATENT CONDITIONS

	Percentage Contribution
Safety Management	36%
Regulatory Oversight	27%
Design	23%
Flight Operations	23%
Flight Ops: SOPs & Checking	18%
Maintenance Ops: SOPs & Checking	14%
Maintenance Operations	14%
Flight Ops: Training Systems	14%
Selection Systems	14%
Technology & Equipment	5%
Operations Planning & Scheduling	5%
Maintenance Ops: Training Systems	5%
Management Decisions	5%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	32%
SOP Adherence/SOP Cross-verification	27%
Callouts	18%
Automation	9%
Normal Checklist	9%
Pilot-to-Pilot Communication	9%
Abnormal Checklist	9%
Ground Crew	5%
Systems/Radios/Instruments	5%
Crew to External Communication	5%

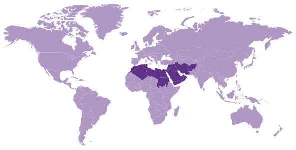
Middle East & North Africa Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	36%
Maintenance Events	27%
Meteorology	23%
Gear/Tire	23%
Wind/Wind shear/Gusty wind	14%
Air Traffic Services	14%
Airport Facilities	9%
Poor visibility/Instrument Meteorological Conditions	9%
Operational Pressure	9%
Lack of Visual Reference	9%
Contained Engine Failure/Powerplant Malfunction	5%
Fatigue	5%
Spatial Disorientation/somatogravic illusion	5%
Contaminated runway/taxiway - poor braking action	5%
Fire/Smoke (Cockpit/Cabin/Cargo)	5%
Wildlife/Birds/Foreign Object	5%
Brakes	5%
Icing Conditions	5%
Poor/faint marking/signs for runway/taxiway closure	5%
Avionics/Flight Instruments	5%
Ground Events	5%
Dispatch/Paperwork	5%
Inadequate overrun area/trench/ditch/proximity of structures	5%

Middle East & North Africa Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Loss of Aircraft Control while on the Ground	18%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	18%
Operation Outside Aircraft Limitations	14%
Engine	14%
Brakes/Thrust Reversers/Ground Spoilers	14%
Vertical/Lateral/Speed Deviation	9%
Unnecessary Weather Penetration	9%
Rejected Takeoff after V1	5%
Abrupt Aircraft Control	5%
Continued Landing after Unstable Approach	5%
Flight Controls/Automation	5%
Unstable Approach	5%

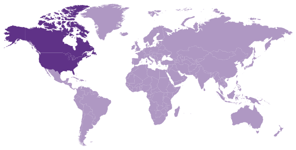
COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	27%
Overall Crew Performance	23%
Leadership	14%
Taxiway/Runway Management	14%
First Officer is assertive when necessary	14%
Workload Management	9%
Captain Should Show Leadership	9%
Communication Environment	5%
SOP Briefing/Planning	5%
Evaluation of Plans	5%
Automation Management	5%

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.

Top Contributing Factors – Section 5

North America Aircraft Accidents



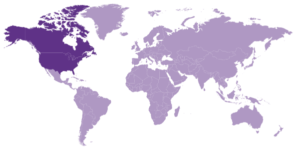
LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	17%
Flight Operations	13%
Design	10%
Management Decisions	10%
Maintenance Operations	10%
Maintenance Ops: SOPs & Checking	10%
Flight Ops: SOPs & Checking	8%
Technology & Equipment	8%
Maintenance Ops: Training Systems	6%
Safety Management	6%
Flight Ops: Training Systems	2%
Change Management	2%
Operations Planning & Scheduling	2%
Ground Operations	2%
Ground Ops: Training Systems	2%
Selection Systems	2%
Ground Ops: SOPs & Checking	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	25%
SOP Adherence/SOP Cross-verification	19%
Callouts	6%
Pilot-to-Pilot Communication	4%
Automation	4%
Normal Checklist	4%
Ground Navigation	2%
Briefings	2%
Systems/Radios/Instruments	2%

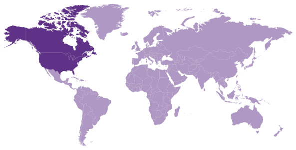
North America Aircraft Accidents



THREATS

	Percentage Contribution
Aircraft Malfunction	38%
Meteorology	33%
Wind/Wind shear/Gusty wind	23%
Gear/Tire	23%
Lack of Visual Reference	15%
Poor visibility/Instrument Meteorological Conditions	15%
Maintenance Events	10%
Ground-based nav aid malfunction or not available	10%
Nav Aids	10%
Wildlife/Birds/Foreign Object	8%
Optical Illusion/visual misperception	8%
Contaminated runway/taxiway - poor braking action	6%
Fatigue	6%
Airport Facilities	6%
Terrain/Obstacles	6%
Air Traffic Services	6%
Thunderstorms	4%
Fire/Smoke (Cockpit/Cabin/Cargo)	4%
Extensive/Uncontained Engine Failure	4%
Icing Conditions	4%
Ground Events	2%
Traffic	2%
Operational Pressure	2%
Primary Flight Controls	2%
Flight Controls	2%
Dispatch/Paperwork	2%
Structural Failure	2%
Spatial Disorientation/somatogravic illusion	2%

North America Aircraft Accidents



UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Vertical/Lateral/Speed Deviation	19%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	13%
Unstable Approach	8%
Continued Landing after Unstable Approach	8%
Unnecessary Weather Penetration	6%
Controlled Flight Towards Terrain	4%
Rejected Takeoff after V1	4%
Abrupt Aircraft Control	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Flight Controls/Automation	4%
Loss of Aircraft Control while on the Ground	2%
Wrong taxiway/ramp/gate/hold spot	2%
Operation Outside Aircraft Limitations	2%
Engine	2%

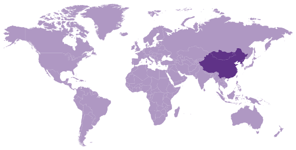
COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	13%
Overall Crew Performance	10%
Captain Should Show Leadership	6%
Workload Management	6%
Communication Environment	6%
Automation Management	6%
Leadership	6%
First Officer is assertive when necessary	4%
Evaluation of Plans	2%

Note: 14 accidents were not classified due to insufficient data; these accidents were subtracted from the total accident count in the calculation of contributing factor frequency.

Top Contributing Factors – Section 5

North Asia Aircraft Accidents



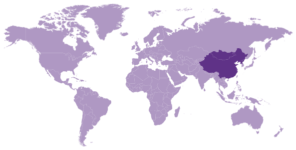
LATENT CONDITIONS

	Percentage Contribution
Flight Operations	40%
Flight Ops: Training Systems	40%
Flight Ops: SOPs & Checking	30%
Regulatory Oversight	30%
Safety Management	30%
Selection Systems	20%
Maintenance Operations	10%
Change Management	10%
Management Decisions	10%
Operations Planning & Scheduling	10%
Maintenance Ops: SOPs & Checking	10%

THREATS

	Percentage Contribution
Meteorology	60%
Wind/Wind shear/Gusty wind	50%
Aircraft Malfunction	30%
Thunderstorms	30%
Maintenance Events	10%
Poor visibility/Instrument Meteorological Conditions	10%
Secondary Flight Controls	10%
Flight Controls	10%
Contaminated runway/taxiway - poor braking action	10%
Gear/Tire	10%
Ground-based nav aid malfunction or not available	10%
Nav Aids	10%
Airport Facilities	10%

North Asia Aircraft Accidents



FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	60%
SOP Adherence/SOP Cross-verification	30%
Pilot-to-Pilot Communication	20%
Automation	10%
Abnormal Checklist	10%

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Abrupt Aircraft Control	40%
Operation Outside Aircraft Limitations	40%
Vertical/Lateral/Speed Deviation	30%
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	30%
Unstable Approach	20%
Continued Landing after Unstable Approach	10%
Controlled Flight Towards Terrain	10%
Flight Controls/Automation	10%
Engine	10%
Unnecessary Weather Penetration	10%
Loss of Aircraft Control while on the Ground	10%

COUNTERMEASURES

	Percentage Contribution
Monitor/Cross-check	70%
Overall Crew Performance	50%
Leadership	20%
Workload Management	20%
First Officer is assertive when necessary	10%
Communication Environment	10%
Evaluation of Plans	10%
Automation Management	10%
Captain Should Show Leadership	10%

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.

Addendum D

Top Contributing Factors – Section 6

Cargo Aircraft Accidents

LATENT CONDITIONS

	Percentage Contribution
Regulatory Oversight	37%
Safety Management	31%
Flight Operations	16%
Flight Ops: SOPs & Checking	14%
Maintenance Operations	10%
Selection Systems	10%
Maintenance Ops: SOPs & Checking	10%
Technology & Equipment	8%
Management Decisions	6%
Design	4%
Dispatch Ops: SOPs & Checking	4%
Dispatch	4%
Maintenance Ops: Training Systems	4%
Flight Ops: Training Systems	2%

FLIGHT CREW ERRORS

	Percentage Contribution
Manual Handling/Flight Controls	37%
SOP Adherence/SOP Cross-verification	25%
Callouts	8%
Automation	4%
Systems/Radios/Instruments	2%
Pilot-to-Pilot Communication	2%
Abnormal Checklist	2%

Cargo Aircraft Accidents

THREATS

	Percentage Contribution
Aircraft Malfunction	37%
Meteorology	31%
Wind/Wind shear/Gusty wind	20%
Lack of Visual Reference	20%
Gear/Tire	18%
Airport Facilities	18%
Fatigue	12%
Poor visibility/Instrument Meteorological Conditions	12%
Nav Aids	10%
Ground-based nav aid malfunction or not available	10%
Contaminated runway/taxiway - poor braking action	8%
Operational Pressure	8%
Poor/faint marking/signs for runway/taxiway closure	8%
Thunderstorms	8%
Maintenance Events	8%
Optical Illusion/visual misperception	6%
Contained Engine Failure/Powerplant Malfunction	6%
Air Traffic Services	4%
Terrain/Obstacles	4%
Airport Perimeter Control/Fencing/Wildlife Control	4%
Wildlife/Birds/Foreign Object	4%
Dispatch/Paperwork	4%
Extensive/Uncontained Engine Failure	4%
Inadequate overrun area/trench/ditch/proximity of structures	2%
Avionics/Flight Instruments	2%
Structural Failure	2%
Spatial Disorientation/somatogravic illusion	2%
Flight Controls	2%
Secondary Flight Controls	2%
Fire/Smoke (Cockpit/Cabin/Cargo)	2%

Cargo Aircraft Accidents

UNDESIRED AIRCRAFT STATE

	Percentage Contribution
Long/Floated/Bounced/Firm/Off-center/Crabbed landing	27%
Vertical/Lateral/Speed Deviation	25%
Continued Landing after Unstable Approach	18%
Unstable Approach	16%
Unnecessary Weather Penetration	10%
Abrupt Aircraft Control	8%
Controlled Flight Towards Terrain	8%
Operation Outside Aircraft Limitations	6%
Engine	4%
Brakes/Thrust Reversers/Ground Spoilers	4%
Weight & Balance	2%
Rejected Takeoff after V1	2%
Flight Controls/Automation	2%

COUNTERMEASURES

	Percentage Contribution
Overall Crew Performance	22%
Monitor/Cross-check	16%
Captain Should Show Leadership	6%
First Officer is assertive when necessary	6%
Leadership	6%
Automation Management	6%
Workload Management	4%
Taxiway/Runway Management	2%
Evaluation of Plans	2%

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.

Addendum E

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 crewmember 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 full 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 if 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 high 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).

Finally, as seen throughout the report, the aviation industry is reaching a point where the fatality risk and the fatal accident rate are converging. Much work has been done in improving aviation safety worldwide and, in most cases, the fatal accident rate has been declining over the years. The convergence of fatality risk and fatal accident rate may indicate, although it is not possible to confirm, that the accident prevention efforts have been effective in mitigating the causes of most accidents. Even as accident rates reach historic lows, the work of safety professionals across the commercial aviation industry continues to be as important today as it was in the past.

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 nonlife-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, maintenance/test flights are all excluded.
- The aircraft is turbine-powered and has a certificated Maximum Takeoff Weight (MTOW) of at least 5,700 kg (12,540 lbs.).
- 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: the process by which actions, omissions, events, conditions, or a combination thereof, which led to an accident are identified and categorized.

Aircraft: the involved aircraft, used interchangeably with airplane(s).

Air Traffic Service Unit: as defined in applicable ATS, Search and Rescue and overflight regulations.

Cabin Safety-related Event: accident involving cabin operational issues, such as a passenger evacuation, onboard fire, decompression or ditching, which requires actions by the operating cabin crew.

Captain: the involved pilot responsible for the operation and safety of the aircraft during flight time.

Commander: the involved pilot, in an augmented crew, responsible for the operation and safety of the aircraft during flight time.

Crewmember: 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 aircraft via escape slides/slide rafts, doors, emergency exits, or gaps in fuselage (usually initiated in life-threatening and/or catastrophic events).

Evacuation (Water): passengers and/or crew evacuate aircraft via escape slides/slide rafts, doors, emergency exits, or gaps in fuselage and into or onto water.

Fatal Accident: an accident where at least one passenger or crewmember is killed or later dies of their injuries resulting from an operational accident. Events such as slips and falls, food poisoning, turbulence or accidents involving onboard equipment, which may involve fatalities, but where the aircraft sustains minor or no damage, are excluded.

Fatality: a passenger or crewmember 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: the sum of full-loss equivalents per 1 million sectors.

Full-Loss Equivalent: a number representing the equivalent of a catastrophic accident where all people on board 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.

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: an 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: Aircraft impact resulted in complete hull loss and 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, please 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
	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: an 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: an 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: a 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: a person charged, based on his or her 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 mass, balance, structural strength, performance, power plant operation, flight characteristics, or other qualities affecting airworthiness.

Nonoperational Accident: this definition includes acts of deliberate violence (sabotage, war, etc.) and accidents that occur during crew training, demonstration and test flights. Sabotage is believed to be a matter of security rather than flight safety and crew training. Demonstration and test flying are considered to involve special risks inherent to these types of operations. Also included in this category are:

- Nonairline-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: an accident that is believed to represent the risks of normal commercial operation, generally accidents that occur during normal revenue operations or positioning flights.

Operator: a 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 crewmember. 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 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: the assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard, taking as reference the worst foreseeable situation.

Safety: the 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: the operation of an aircraft between takeoff at one location and landing at another (other than a diversion).

Serious Injury: an 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: an 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:

1. 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.
2. The ICAO Annex 13 definition is unrelated to cost and includes many incidents in which the financial consequences are minimal.

Unstable Approach: an approach where the IATA Accident Classification Technical Group (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 Preflight 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 Engine Start/Depart 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 liftoff; 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. Initial Climb 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 'En Route Climb' 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 'En Route Climb' or 'Cruise' 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 Approach 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 'Initial Climb').

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 "Go-around" 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 'Taxi-out' 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 'Engine Start/Depart' phase. *Note:* the Arrival/Engine Shutdown 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 'Preflight' 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 'Flight Planning' 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, etc.); 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 'Taxi-out' 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.

A2

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

1. LATENT CONDITIONS (CONT'D)

Technology and Equipment	↗ Available safety equipment not installed (EGPWS, predictive wind-shear, TCAS/ACAS, etc.)
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
	↗ 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., ILS)
	↗ NAV aids not calibrated – unknown to flight crew
Terrain/Obstacles	↗ Self-explanatory
Traffic	↗ Other aircraft striking other aircraft (e.g., during runway incursion) ↗ Ground vehicles hitting aircraft
Runway Surface Infringement	↗ 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	↗ 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 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 ↗ PF 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 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 undesired aircraft state 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 towards terrain
	↗ Other
Ground Navigation	↗ Proceeding towards 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 & 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)
Tailstrike	↗ Tailstrike 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	↗ 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

"The all accident rate for airlines on the IOSA registry was nearly four times better than that of non-IOSA airlines (0.56 vs. 2.17)."

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Annex 3 – Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	REGISTRATION	OPERATOR	LOCATION	PHASE	SERVICE	PROPULSION	SEVERITY	SUMMARY
02-01-17	Aircraft Industries (LET)	Let L-410	9Q-CZR	Doren Air Congo	Shabunda, DR Congo	LND	Cargo	Turboprop	Hull Loss	The aircraft ran off the side of the runway after directional control was lost on landing
03-01-17	Airbus	A321	VP-BES	Aeroflot Russian Airlines	Kaliningrad-Khrabrovo, Russia	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a runway excursion on landing
10-01-17	Airbus	A320	RP-C8613	Philippine Airlines	Kalibo, Philippines	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a runway excursion on landing
16-01-17	Boeing	B747-400	TC-MCL	myCARGO Airlines	Bishkek - Manas International, Kyrgyzstan	GOA	Cargo	Jet	Hull Loss	The aircraft was totally destroyed by impact and post impact fire when it crashed into a residential district
28-01-17	Boeing	B737-400	HK-5197	Aer Caribe	Leticia, Colombia	LND	Cargo	Jet	Substantial Damage	The aircraft suffered a runway excursion on landing
30-01-17	Airbus	A320	RP-C8975	Philippines AirAsia	Manila - Ninoy Aquino International, Philippines	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a hard landing
23-02-17	De Havilland (Bombardier)	Dash 8-400	G-JECP	Flybe	Amsterdam - Schiphol, Netherlands	LND	Passenger	Turboprop	Substantial Damage	The aircraft suffered a gear collapse on landing
28-02-17	Boeing	B767-300	N351AX	Omni Air International	Azraq Airbase, Jordan	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a tailstrike on landing
08-03-17	Boeing (Douglas)	MD-80-83	N786TW	Ameristar Charters	Detroit - Willow Run, MI, USA	RTO	Passenger	Jet	Substantial Damage	The aircraft overran the runway after initiating a rejected takeoff
20-03-17	ATR	ATR 42-500	PR-TTH	Total Linhas Aereas	Urucu Airport, Coari, Brazil	LND	Passenger	Turboprop	Substantial Damage	The aircraft veered off the left side of the runway on landing
20-03-17	Antonov	An-26	S9-TLZ	South Sudan Supreme Airlines	Wau, South Sudan	LND	Passenger	Turboprop	Hull Loss	The aircraft collided with a fire truck on landing
27-03-17	Boeing	B737-400	EP-TBJ	Taban Airlines	Ardabil Airport, Iran	LND	Passenger	Jet	Substantial Damage	The aircraft encountered tire burst while landing and the right-hand main landing gear retracted
28-03-17	Boeing	B737-300	OB-2036-P	Peruvian Air Line	Jauja-Francisco Carlé Airport, Peru	LND	Passenger	Jet	Hull Loss	The aircraft burst into flames following a runway veer-off and gear collapse
01-04-17	Aircraft Industries (LET)	Let L-410	5X-EIV	Eagle Air	Yei Airport, South Sudan	TOF	Passenger	Turboprop	Substantial Damage	The aircraft suffered a runway excursion after failing to lift off

DATE	MANUFACTURER	AIRCRAFT	REGISTRATION	OPERATOR	LOCATION	PHASE	SERVICE	PROPULSION	SEVERITY	SUMMARY
02-04-17	Airbus	A319	C-GBHN	Air Canada Jetz	Tampa International Airport, USA	PRF	Passenger	Jet	Substantial Damage	The aircraft suffered damage after a vehicle collided with it during pre-departure procedures
08-04-17	Boeing	B737-800	9M-MXX	Malaysia Airlines	Sibu, Malaysia	LND	Passenger	Jet	Substantial Damage	The aircraft ran off the side of the runway on landing
10-04-17	Boeing	B757-200	G-LSAI	Jet2	Alicante Airport, Spain	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a tailstrike on landing
05-05-17	Shorts	Shorts 330	N334AC	Air Cargo Carriers	Charleston - Yeager, WV, USA	LND	Cargo	Turboprop	Hull Loss	The aircraft impacted trees and went down the hill to the left of the runway located on top of the hill. The aircraft was destroyed.
27-05-17	Aircraft Industries (LET)	Let L-410	9N-AKY	Goma Air	Lukla-Tenzing-Hillary Airport, Nepal	APR	Cargo	Turboprop	Hull Loss	The aircraft was destroyed when it impacted trees during landing
31-05-17	Boeing	B737-300	PK-CJC	Sriwijaya Air	Manokwari-Rendani Airport, Indonesia	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a runway excursion on landing
02-06-17	Fairchild (Swearingen)	Metro	XA-UAJ	Aeronaves TSM	Tampico-Gen F Javier Mina Airport, Mexico	APR	Cargo	Turboprop	Substantial Damage	The aircraft crashed during a forced landing
03-06-17	Fokker	Fokker F27 Friendship 600	5Y-FMM	Aero-Pioneer of Africa	Garbaharey Airport, Somalia	LND	Cargo	Turboprop	Substantial Damage	The aircraft collided with a building during landing
10-06-17	Antonov	An-32	HK-4833	Aer Caribe	Tarapaca, Colombia	LND	Passenger	Turboprop	Substantial Damage	The aircraft suffered a runway excurion on landing
23-06-17	Airbus	A321	N315DN	Delta Air Lines	Hartsfield - Jackson Atlanta International, USA	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a tailstrike on landing
27-06-17	Airbus	A330-200	G-VYGL	Jet2	Tenerife Sur Reina Sofia, Spain	LND	Passenger	Jet	Substantial Damage	The aircraft became disabled on the runway after bursting two tires on landing
18-07-17	Boeing	B737-300	PK-YGG	Tri MG Airlines	Wamena, Indonesia	LND	Cargo	Jet	Hull Loss	The aircraft suffered a runway excursion on landing
27-07-17	Airbus	A320	UR-AJC	Atlasglobal Ukraine	En Route	ICL	Passenger	Jet	Substantial Damage	The aircraft suffered hail strike during initial climb
29-07-17	Antonov	An-74	UR-CKC	Cavok Air	Sao Tome and Principe	TOF	Cargo	Jet	Hull Loss	The aircraft overran the runway after a rejected takeoff due to a flock of birds
03-08-17	Boeing	B737-900	PK-LJZ	Lion Air	Kuala Namu International Airport, Indonesia	TXI	Passenger	Jet	Substantial Damage	Substantial damage in a ground collision accident
03-08-17	ATR	ATR 72	PK-WFF	Wings Air	Kuala Namu International Airport, Indonesia	TXO	Passenger	Turboprop	Substantial Damage	Substantial damage in a ground collision accident
22-08-17	Airbus	Airbus A350	ET-ATR	Ethiopian Airlines	Addis Ababa - Bole International, Ethiopia	TXO	Passenger	Jet	Substantial Damage	Substantial damage in a ground collision accident
28-08-17	Antonov	An-26	EK-26006	Coco Aviation	Maban Airstrip, South Sudan	LND	Cargo	Turboprop	Hull Loss	The aircraft caught fire after a runway excursion on landing

DATE	MANUFACTURER	AIRCRAFT	REGISTRATION	OPERATOR	LOCATION	PHASE	SERVICE	PROPULSION	SEVERITY	SUMMARY
05-09-17	Boeing	B737-800	VT-AYB	Air India Express	Cochin International Airport, India	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a taxiway excursion after landing
10-09-17	Antonov	Antonov An-26	9S-AFL	Serve Air	Goma - International, DR Congo	LND	Cargo	Turboprop	Hull Loss	The aircraft suffered a runway excursion
15-09-17	Airbus	A321	N137AA	American Airlines	Grantley Adams, Barbados	LND	Passenger	Jet	Substantial Damage	The aircraft suffered tail damage on landing
20-09-17	Convair	Convair CV-640	XA-UNH	Aeronaves TSM	Saltillo - Plan de Guadelupe, Mexico	LND	Cargo	Turboprop	Substantial Damage	The aircraft suffered a gear-up landing
30-09-17	Airbus	A380-800	F-HPJE	Air France	En Route	CRZ	Passenger	Jet	Substantial Damage	The aircraft suffered an engine failure and engine inlet separation
13-10-17	Airbus	A320	RP-C3237	Cebu Pacific Air	Iloilo, Philippines	LND	Passenger	Jet	Substantial Damage	The aircraft suffered a runway excursion on landing
14-10-17	Antonov	An-26	ER-AVB	Valan International Cargo Charter	Abidjan, Ivory Coast	APR	Cargo	Turboprop	Hull Loss	The aircraft was destroyed after it came to a stop in the sea
08-11-17	BAE Systems	BAE 146-200	ZS-ASW	Airlink	En Route	DST	Passenger	Jet	Substantial Damage	The aircraft suffered an uncontained engine failure
10-11-17	De Havilland (Bombardier)	Dash 8-400	G-JEDU	Flybe	Belfast, Northern Ireland	ICL	Passenger	Turboprop	Substantial Damage	The aircraft suffered a nose gear problem during initial climb
15-11-17	Aircraft Industries (LET)	Let L-410	RA-67047	Khabarovsk Airlines	Nelkan, Russia	APR	Passenger	Turboprop	Hull Loss	The aircraft impacted the ground short of runway
19-11-17	ATR	ATR 72	VH-FVZ	Virgin Australia	Canberra, Australia	LND	Passenger	Turboprop	Substantial Damage	The aircraft suffered a hard landing accident
25-11-17	ATR	ATR 72	9G-SBF	Starbow	Accra - Kotoka International, Ghana	TOF	Passenger	Turboprop	Substantial Damage	The aircraft suffered a runway excursion during takeoff
13-12-17	ATR	ATR 42-300	C-GWEA	West Wind Aviation	Fond-du-Lac, SK, Canada	ICL	Passenger	Turboprop	Hull Loss	The aircraft suffered an impact with terrain shortly after takeoff

"Turboprop operations accounted for 20% of all sectors flown last year, yet represented 44% of all accidents and 83% of all fatal accidents."

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Annex 4 – Table of Sectors

This table provides a breakdown of the sectors used in the production of rates for this report by aircraft type and year. It is up-to-date as at the time of report production.

MANUFACTURER	MODEL	2013	2014	2015	2016	2017
Aerospatiale	262	670	-	-	-	-
Airbus	A300	180,019	158,134	143,185	144,730	144,512
Airbus	A310	57,431	53,113	43,018	33,672	24,333
Airbus	A318	107,144	107,726	99,492	93,341	97,596
Airbus	A319	2,259,530	2,324,184	2,354,105	2,330,692	2,261,704
Airbus	A320	5,208,440	5,681,627	6,261,586	6,754,887	6,910,849
Airbus	A321	1,169,492	1,330,011	1,547,023	1,838,889	2,127,029
Airbus	A330	830,472	908,831	985,090	1,023,167	1,082,471
Airbus	A340	171,823	148,458	130,867	117,029	103,876
Airbus	A350	-	49	5,009	31,847	117,280
Airbus	A380	56,136	71,207	89,214	107,284	119,868
Aircraft Industries (LET)	410	116,155	121,446	121,400	118,875	115,331
Antonov	An-12	5,500	4,626	3,676	3,485	4,574
Antonov	An-124	6,242	5,970	5,909	6,477	7,210
Antonov	An-140	3,891	1,876	864	555	552
Antonov	An-148	14,932	14,879	20,638	22,188	25,506
Antonov	An-158	2,462	7,332	8,285	10,370	6,920
Antonov	An-22	-	-	-	33	76
Antonov	An-225	47	30	48	48	48
Antonov	An-24	38,086	33,825	32,378	31,893	29,428
Antonov	An-26	20,623	19,627	19,698	20,428	20,602

MANUFACTURER	MODEL	2013	2014	2015	2016	2017
Antonov	An-28	4,147	3,762	3,725	3,512	3,195
Antonov	An-3	700	695	692	697	695
Antonov	An-30	842	942	860	782	780
Antonov	An-32	5,114	5,500	5,122	4,754	5,428
Antonov	An-38	3,056	2,445	1,600	1,584	994
Antonov	An-72 / An-74	3,365	3,854	3,644	3,611	3,625
ATR	ATR 42	350,192	354,614	334,467	342,366	345,593
ATR	ATR 72	997,084	1,186,989	1,196,735	1,323,089	1,425,175
Avro	RJ100	136,494	151,011	145,960	139,044	113,083
BAE Systems	146	53,879	50,997	44,974	38,925	45,029
BAE Systems	ATP	25,617	29,607	27,288	20,055	19,816
BAE Systems	Jetstream 31	267,886	276,864	275,839	257,096	245,815
BAE Systems	Jetstream 41	96,550	95,733	79,936	79,806	89,083
BAE Systems (Hawker Siddeley)	748	13,032	12,637	11,431	11,569	11,658
Boeing	707	68	-	-	-	-
Boeing	717	276,326	266,898	264,908	296,841	297,770
Boeing	727	59,819	42,357	37,502	35,626	28,359
Boeing	737	8,711,945	9,120,978	9,557,600	10,250,149	10,953,200
Boeing	747	369,840	340,625	326,334	307,544	300,207
Boeing	757	761,006	708,178	623,897	621,925	623,098
Boeing	767	798,008	809,573	663,517	707,923	887,704
Boeing	777	815,441	863,851	922,483	995,245	1,071,469
Boeing	787	43,580	122,504	218,003	313,032	403,149
Boeing (Douglas)	DC-10	49,694	44,784	40,015	34,451	29,409
Boeing (Douglas)	DC-3	7,028	8,181	9,453	10,065	9,300
Boeing (Douglas)	DC-8	2,184	981	455	205	233
Boeing (Douglas)	DC-9	74,046	33,955	32,151	32,564	30,644
Boeing (Douglas)	MD-11	104,291	95,002	79,684	75,043	75,108
Boeing (Douglas)	MD-80	701,594	612,615	586,866	580,088	593,900
Boeing (Douglas)	MD-90	107,591	108,547	109,502	103,160	94,342
Bombardier	C Series	-	-	-	2,757	31,500

MANUFACTURER	MODEL	2013	2014	2015	2016	2017
Canadair (Bombardier)	CRJ	2,479,228	2,381,484	2,322,681	2,371,668	2,389,183
Canadair (Bombardier)	CL-415	2,592	2,796	2,917	2,925	2,919
CASA / IAe	212	36,510	30,305	30,523	33,089	31,562
CASA / IAe	235	5,910	6,525	7,090	7,102	7,092
Comac	ARJ21	-	-	226	3,168	5,859
Convair	580	37,699	37,324	36,189	32,124	27,904
Convair	640	4,180	4,849	4,920	4,859	4,744
De Havilland (Bombardier)	DHC-6	775,401	790,750	821,902	844,605	844,838
De Havilland (Bombardier)	DHC-7	48,320	44,708	35,836	25,325	22,739
De Havilland (Bombardier)	DHC-8	1,759,579	1,733,225	1,731,313	1,718,466	1,768,818
De Havilland (Bombardier)	DHC-5	1,281	1,547	1,084	986	-
Embraer	110 Bandeirante	53,152	52,231	54,894	55,650	53,692
Embraer	120 Brasilia	186,468	176,733	94,985	94,327	96,769
Embraer	135	200,214	206,515	225,922	234,443	225,591
Embraer	140	169,317	111,320	40,591	31,126	14,404
Embraer	145	1,181,763	1,073,134	846,029	739,647	708,784
Embraer	170	339,713	326,566	321,732	293,214	277,377
Embraer	175	310,485	389,442	476,608	626,154	760,991
Embraer	190	814,416	892,461	922,952	883,642	860,921
Embraer	195	207,588	217,987	245,064	281,331	299,819
Evektor EV-55 Outback	EV55	-	-	-	-	3,302
Fairchild (Swearingen)	Metro	809,564	774,333	757,614	748,054	710,714
Fairchild Dornier	228	184,945	185,027	180,332	183,246	190,735
Fairchild Dornier	328	70,147	66,788	61,899	60,867	56,386
Fairchild Dornier	328JET	45,636	54,767	55,419	53,572	53,624
Fokker	100	198,592	182,038	156,617	136,843	125,055
Fokker	50	110,013	78,348	66,457	70,025	43,299
Fokker	70	69,988	56,567	54,868	48,010	22,304
Fokker	F27	9,376	6,502	4,015	3,184	3,571
Fokker	F28	2,392	457	357	357	-
Gippsland Aeronautics	N22B / N24A Nomad	306	306	417	441	440

MANUFACTURER	MODEL	2013	2014	2015	2016	2017
Grumman	G73 Turbo Mallard	5,945	5,946	5,945	5,966	5,946
Gulfstream Aerospace (Grumman)	G-I	7,329	6,576	5,471	5,258	5,237
Harbin	Y12	16,550	16,246	17,319	17,100	18,077
Hawker Beechcraft	1900	1,061,194	1,073,525	1,050,529	1,006,076	983,231
Hawker Beechcraft	C99	208,940	205,171	204,479	201,499	198,779
Ilyushin	Il-114	1,219	1,292	1,292	1,296	1,293
Ilyushin	Il-18	2,366	2,192	2,036	2,282	1,801
Ilyushin	Il-62	3,322	2,819	2,198	2,284	2,489
Ilyushin	Il-76	22,309	21,703	20,527	19,466	19,928
Ilyushin	Il-96	6,551	3,934	3,854	4,204	4,213
Lockheed Martin	L-1011 Tristar	790	-	-	-	-
Lockheed Martin	L-182 / L-282 / L-382 (L-100) Hercules	28,659	25,121	25,593	24,572	24,147
Lockheed Martin	L-188	347	962	1,132	1,896	2,137
NAMC	YS-11	4,958	3,720	3,721	3,452	4,276
Saab	2000	50,969	53,744	52,346	44,927	45,851
Saab	340	333,776	306,297	294,106	283,533	299,391
Shorts	330	13,927	12,662	9,767	5,869	4,152
Shorts	360	64,915	63,555	59,135	60,970	63,748
Shorts	Skyvan (SC-7)	10,182	8,711	8,755	8,253	8,090
Sukhoi	Superjet 100	13,226	33,615	61,979	86,985	116,543
Tupolev	Tu-134	17,550	14,473	14,066	12,469	10,916
Tupolev	Tu-154	28,242	18,871	13,191	10,022	6,457
Tupolev	Tu-204 / Tu-214	12,212	11,770	10,980	9,616	10,573
Xian	MA-60	8,014	9,277	9,527	10,042	11,343
Yakovlev	Yak-40	31,592	27,099	24,105	22,864	23,137
Yakovlev	Yak-42 / Yak-142	20,801	20,580	19,905	16,079	13,734

Source: Ascend - A Flightglobal Advisory Service

LIST OF ACRONYMS/ABBREVIATIONS

Accident Category Abbreviation

Abbreviation	Full Name
RWY/TWY EXC	Runway/Taxiway Excursion
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
CFIT	Controlled Flight into Terrain
TAILSTRIKE	Tailstrike
UNDERSHOOT	Undershoot
OTHER	Other End State
OFF AIRP LDG	Off-Airport Landing
MID-AIR COLL	Mid-Air Collision
RWY COLL	Runway Collision

List of Acronyms

Acronym	Meaning
ARC	Abnormal Runway Contact
ACTG	Accident Classification Technical Group
AFI	Africa
ANSPs	Air Navigation Service Providers
AOC	Air Operator Certificate
ATC	Air Traffic Control
ATM	Air Traffic Management
ATS	Air Traffic Services
ACAS	Airborne Collision Avoidance System
ACTF	Aircraft
A4E	Airlines for Europe
ACI	Airports Council International
APR	Approach (IATA Phase of Flight)
APV	Approaches with Vertical Guidance

List of Acronyms (Cont'd)

Acronym	Meaning
ATOs	Approved Training Organizations
RNAV	Area Navigation
AES	Arrival/Engine Shutdown (IATA Phase of Flight)
ASPAC	Asia-Pacific
ATIS	Automatic Terminal Information System
ACRS	Aviation Confidential Reporting System
ACSTF	Aviation Cyber Security Task Force
AVSEC	Aviation Security
BAST	Brazilian Aviation Safety Team
CAB	Cabin Operations
COSC	Cabin Operations and Safety Conference
COSTG	Cabin Operations Safety Technical Group
CABIN	Cabin Safety Events
CSSG	Cargo Safety Sub-Group
CICTT	CAST/ICAO Common Taxonomy Team
CEO	Chief Executive Officer
CANSO	Civil Air Navigation Services Organization
CAAS	Civil Aviation Authority of Singapore
CTOL	Collision with obstacle(s) during takeoff and landing
CAST	Commercial Aviation Safety Team
CIS	Commonwealth of Independent States
CBTA-TF	Competency-based Training and Assessment Task Force
CBT	Competency based Training
Cont'd	Continued
CANPA	Continuous Angle Non-Precision Approaches
CDFA	Continuous Descent Final Approach
CFIT	Controlled Flight Into Terrain
CRM	Crew Resource Management
CRZ	Cruise (IATA Phase of Flight)
DAQCP	Deicing/Anti-Icing Quality Control Pool
DH	Decision Height
DfT	Department for Transport
DHS	Department of Homeland Security
DST	Descent (IATA Phase of Flight)
DAA	Detect and Avoid
ECL	En Route Climb (IATA Phase of Flight)
ESD	Engine Start/Depart (IATA Phase of Flight)

List of Acronyms (Cont'd)

Acronym	Meaning
E&M	Engineering and Maintenance
EGPWS	Enhanced Ground Proximity Warning System
E-GPWS	Enhanced Ground Proximity Warning System
EUR	Europe
EAPPRI	European Action Plan for the Prevention of Runway Incursions
EASA	European Aviation Safety Agency
ECA	European Cockpit Association
EHA	European Helicopter Association
EBT	Evidence-based Training
FMTF	Fatigue Management Task Force
FRMS	Fatigue Risk Management System
FAA	Federal Aviation Administration (U.S.)
FO	First Officer
FLC	Flight Close (IATA Phase of Flight)
FDA	Flight Data Analysis
FDM	Flight Data Monitoring
FMS	Flight Management System
FLTOPS-CSSG	Flight Operations Panel Cargo Safety Sub-Group
FOQA	Flight Operations Quality Assurance
FLP	Flight Planning
FSTD	Flight Simulation Training Devices
FOD	Foreign Object Debris
FLE	Full-Loss Equivalents
FCF	Functional Check Flights
G UP LDG/CLPSE	Gear Up Landing/Gear Collapse
GADM	Global Aviation Data Management
GASeP	Global Aviation Security Plan
GPS	Global Positioning System
GRSAP	Global Runway Safety Action Plan
GSIE	Global Safety Information Exchange
GOA	Go-around (IATA Phase of Flight)
G-COL	Ground Collision
GND DAMAGE	Ground Damage
RAMP	Ground Handling
GS	Ground Safety
GSPs	Ground Service Providers
GDS	Ground Servicing (IATA Phase of Flight)

List of Acronyms (Cont'd)

Acronym	Meaning
HARD LDG	Hard Landing
HITG	Hazard Identification Technical Group
HL	Hull Loss
I-ASC	IATA Aviation Safety Culture
IDQP	IATA Drinking Water Quality Pool
IFQP	IATA Fuel Quality Pool
IOSA	IATA Operational Safety Audit
ISAGO	IATA Safety Audit for Ground Operations
ISSA	IATA Standard Safety Assessment
ISARPs	IATA Standards and Recommended Practices
ISM	IATA Standards Manual
IN-F DAMAGE	In-flight Damage
ISDs	Inadvertent Slide Deployments
IFBP	In-flight Broadcast Procedure
ICL	Initial Climb (IATA Phase of Flight)
MED	Injuries to and/or Incapacitation of Persons
IEs	Instructors and Evaluators
ILS	Instrument Landing Systems
IMC	Instrument Meteorological Conditions
IMX	Integrated Management Solution
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IFALPA	International Federation of Air Line Pilots' Association
IFATCA	International Federation of Air Traffic Controllers' Associations
ISO	International Standards Organization
IRM	Issue Review Meeting
KSAs	Knowledge, Skills and Attitudes
LND	Landing (IATA Phase of Flight)
LATAM/CAR	Latin-America and Caribbean
LOSA	Line Operations Safety Audit
LOFT	Line Oriented Flight Training
LOC-G	Loss of Control – Ground
LOC-I	Loss of Control – In Flight
MRO	Maintenance Repair Operator
MTOW	Maximum Takeoff Weight
MoC	Memorandum of Collaboration
MoU	Memorandum of Understanding

List of Acronyms (Cont'd)

Acronym	Meaning
MID-AIR COLL	Mid-Air Collision
MENA	Middle Eastern and North Africa
MDA	Minimum Decent Altitude
MEL	Minimum Equipment List
MPL	Multi-Crew Pilot License
NTSB	National Transportation Safety Board (U.S.)
NavAids	Navigational Aids
NAM	North America
NASIA	North Asia
OFF AIRP LDG	Off Airport Landing
OD	Operational Damage
OPS	Operations
OPC	Operations Committee
OEMs	Original Equipment Manufacturers
OTH	Other
PBN	Performance-based Navigation
PED	Personal Electronic Device
PAT	Pilot Aptitude Testing
PTTF	Pilot Training Task Force
PSF	Post-Flight (IATA Phase of Flight)
PRF	Preflight (IATA Phase of Flight)
PANS-TRG	Procedures for Air Navigation Services - Training
RF	Radio-frequency
RTO	Rejected Takeoff (ATA Phase of Flight)
RNP	Required Navigation Performance
RAAS	Runway Awareness and Advisory System
RWY COLL	Runway Collision
RESA	Runway End Safety Area
RE	Runway Excursion
RI	Runway Incursion
ROPS	Runway Overrun Protection Systems
RS	Runway Safety
RST	Runway Safety Team
RWSL	Runway Status Lights
RWY/TWY EXC	Runway/Taxiway Excursion
SAFO	Safety Alerts for Operators
SFO	Safety and Flight Operations

List of Acronyms (Cont'd)

Acronym	Meaning
SG	Safety Group
SISG	Safety Improvement Sub-Group
SMI	Safety Management Implementation
SMS	Safety Management System
SPIs	Safety Performance Indicators
SPARC	Safety Predictive Analytics Research Center
STEADES	Safety Trends Evaluation, Analysis and Data Exchange System
SEG	Security Group
SAE G-27	Society of Automotive Engineers
SOP	Standard Operating Procedure
SARPs	Standards and Recommended Practices
SSP	State Safety Program
SD	Substantial Damage
SCF-NP	System/Component Failure or Malfunction (Non-Powerplant)
SCF-PP	System/Component Failure or Malfunction (Powerplant)
TAILSTRIKE	Tails Strike
TOF	Takeoff (IATA Phase of Flight)
TXI	Taxi-in (IATA Phase of Flight)
TXO	Taxi-out (IATA Phase of Flight)
TAWS	Terrain Awareness Warning System
TEM	Threat and Error Management
TCAS	Traffic Alert and Collision Avoidance System
TCAS RA	Traffic Alert and Collision Avoidance System Resolution Advisory
TSA	Transport Security Administration
TURB	Turbulence Encounter
USOS	Undershoot/Overshoot
UAS	Undesired Aircraft State
UNK	Unknown
UK	United Kingdom
UAS	Unmanned Aircraft Systems
UPRT	Upset Prevention and Recovery Training

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