IATA

SAFETY REPORT 2012

Issued April 2013

49th Edition


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International Air Transport Association
Montreal—Geneva

49th Edition

Senior Vice President
Safety, Operations & Infrastructure
International Air Transport Association
800 Place Victoria
P.O. Box 113
Montreal, Quebec
CANADA H4Z 1M1

Safety Report 2012
Material No: 9049-19
ISBN 978-92-9252-115-8

Montreal—Geneva

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"IATA will continue to strengthen our data driven approach to lead industry initiatives towards safety and efficiency improvements."

Foreword

Günther Matschnigg
Senior Vice President
Safety, Operations & Infrastructure

Dear Colleagues,

Safety is our number one priority. I am very pleased to inform you that the industry has improved their safety performance in 2012. The Western-built jet hull loss rate was 0.20 per million flights, the lowest in history and nearly half that of the 2011 rate (0.37 per million flights). This marks the fourth consecutive year of improved performance. Furthermore, IATA Member airlines had no accidents in this category - a truly remarkable achievement.

Going forward, IATA will continue to strengthen our data driven approach to lead industry initiatives towards safety and efficiency improvements. These initiatives are based on sharing data to identify trends that could indicate a potential safety risk. Information from this annual report continues to be used by many key industry stakeholders, including airlines and regulators. I invite you to use the results of this 49th edition of the IATA Safety Report to understand and help mitigate accident risks in your operations.

Our cooperative work with the International Civil Aviation Organisation (ICAO), airlines, airports, air navigation service providers, manufacturers and safety regulators have led to clear improvements in safety rates. However, there is still quite a lot of work to do in some regions. Safety in Africa is still an issue and IATA has committed to work with key stakeholders on an African safety plan to improve the safety performance in Africa.

IATA will continue to work together with the industry to improve safety. I wish to thank the IATA Operations Committee (OPC), the Safety Group (SG), the Accident Classification Task Force (ACTF) and all IATA staff involved for their cooperation and expertise essential for the creation of this report.

Safety Report 2012 Executive Summary

The goal of the annual IATA Safety Report is to collate and analyze accident data to identify trends, and then develop prevention strategies to enhance safety. This report is focused only on the air transport industry, and therefore uses more restrictive criteria than ICAO annex 13 accident definitions. In total, 75 accidents met the IATA accident criteria in 2012. For the first time, five year trends are shown. Compared to 2011 and the five-year average for 2008-2012, the breakdown is as follows:

	Jet	Turboprop	Western-built Jet Hull Loss Rate	Fatal Accidents	Fatalities
2012	29	46	0.20	15	414
2011	55	37	0.37	22	486
Five year average	54	38	0.54	20	575

Summary data for 2012 provides the following conclusions:

- The total number of all types of accidents decreased by 18% (75 vs. 92 in 2011)
- The number of Western-built jet hull losses decreased by 45% (6 vs. 11 in 2011)
- Total flights increased by 5%, contributing to the overall reduction in accident rates
- The total number of fatal accidents decreased by 32%
- Total fatalities decreased by 16%
- All categories in the table above show improvement except for turboprop accidents, both year over year and on a five-year average

The industry Western-built jet hull loss rate was 0.20 per million flights, a 46% improvement over 2011. IATA Member carriers had no accidents in this category. This was the fourth year of consecutive improvement for the industry accident rate. From a regional perspective, the Western-built jet hull loss rate decreased in all IATA regions except Asia Pacific (ASPAC) and Europe (EUR).

The IATA Operational Safety Audit (IOSA) is recognized as the global standard for airline operators. In 2009, IOSA certification was made a requirement for all 240+ IATA members and there are now over 380 airlines worldwide on the IOSA registry. In 2012, IOSA certified operators:

- Had an accident rate 4.3 times better than non-IOSA carriers
- Represented approximately 21% of all airline operators (passenger and cargo) worldwide
- Accomplished approximately 67% of all international and domestic passenger and cargo flights worldwide

During 2012, IATA continued working with the IOSA Oversight Council (IOC) and its Task Forces to develop Enhanced IOSA, which further promotes the adoption of the IOSA culture by operators. Enhanced IOSA will further focus the airline's internal quality assurance program in order to provide a greater focus on implementation. Safety Management Systems (SMS) provisions were added to IOSA in 2010, and all SMS standards will become standards by 2016, making IOSA the first global SMS standard.

IATA Global Safety Information Center and Operational Data Management

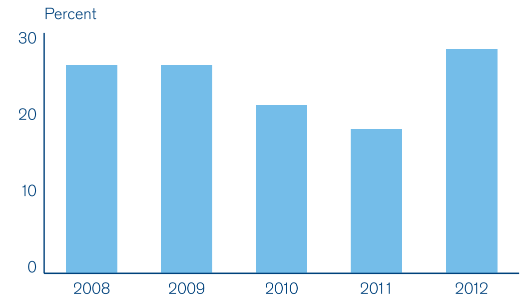
In 2009, IATA launched the Global Safety Information Center (GSIC), now providing its members with unprecedented access to safety information in seven different safety databases. These databases include the IATA accident database, operational safety reports (STEADES), IOSA and IATA Safety Audit for Ground Operations (ISAGO) audit findings, Flight Data eXchange (FDX), an aircraft Ground Damage Database (GDDB) and a new Cabin Safety operational report database. More than 460 different organizations around the globe are already submitting safety data into the GSIC, and over 90% of IATA member carriers are participating. In 2013, a major expansion of industry data management is planned thru the new Operational Data Management (ODM) program, expanding data management into other arenas such as operations and infrastructure.

Global Safety Information Exchange

In September 2010, IATA joined ICAO, the European Union, and the US Department of Transportation in signing the landmark "Global Safety Information Exchange (GSIE)" agreement. Following this agreement, IATA and ICAO have agreed to a common set of criteria to be used in calculating an industry accident rate presented in section three of this report. Many industry safety initiatives are being driven by this information exchange, with a continuing focus on simultaneous improvements in safety, regulatory harmonization, and efficiency.

Runway Excursions

Runway excursions were the most common type of accident every year in the five years analyzed in this report. A runway excursion may occur during takeoff or landing, but are most common on landing. The trend for runway excursions as a percentage of the total number of accidents has shown no significant improvement over this period as seen in the graph below:



Runway Excursions

- Most (82%) of runway excursions occur following a stable approach, where the pilot failed to activate braking devices in a timely fashion, allowed the aircraft to float beyond the normal touchdown point, or failed to maintain directional control after touchdown
- Over the last five years 38% of runway excursions during landing occurred following a long, floated, bounced, off-center or crabbed landing
- Unstable approaches were a factor in many (18%) runway excursions
  - The IATA Flight Data eXchange (FDX) program provides participating carriers with the unstable approach performance and excessive tailwind events for every runway in the database

Runway excursions have many other precursors than unstable approach that should be understood and managed by operators. Airlines can use their internal Flight Data Analysis (FDA) program to understand the precursors to runway excursions; these programs now required by the IATA Operational Safety Audit (IOSA).

In 2013, IATA will continue to work with industry partners to support regional runway safety seminars and to update the IATA Runway Excursion Risk Reduction (RERR) toolkit, available at www.iata.org/gsic

Loss of Control In-flight

Loss of Control In-flight (LOC-I) was the accident category with the most fatal accidents, representing 43% of all fatal accidents from 2008-2012 and 60% of all fatalities. LOC-I accidents include aerodynamic stall events and failures of aircraft systems; they are often preventable with adequate pilot training. While the number of LOC-I accidents has been falling in recent years, there is still need for industry focus to understand and prevent these accidents.

In 2013 IATA will work with industry partners to develop a Loss of Control In-flight toolkit. This comprehensive toolkit is expected to be launched in collaboration with ICAO in 2014.

Ground Operations and Ground Damage Prevention

Ground damage was the third most common type of accident after gear-up landings or gear collapse, representing 13% of accidents during the period of 2008 to 2012. These accidents include events such as damage resulting from ground handling operations, collisions during taxi and incidents of fire on the ground.

As a method to address aircraft ground operations incidents, IATA is continuing to develop the Ground Damage Database (GDDB) to collect and analyze reports of ground damage from participating operators and ground service providers. This will allow for the publishing of a global baseline of ground damage and aid operators and providers in prioritizing their accident and incident reduction strategies.

Information from the GDDB will be used to support IATA ground operations programs and the IATA Safety Audit for Ground Operations (ISAGO) working groups. In 2012, IATA completed the IATA Ground Operations Manual (IGOM) which now provides industry standard aircraft handling and servicing procedures.

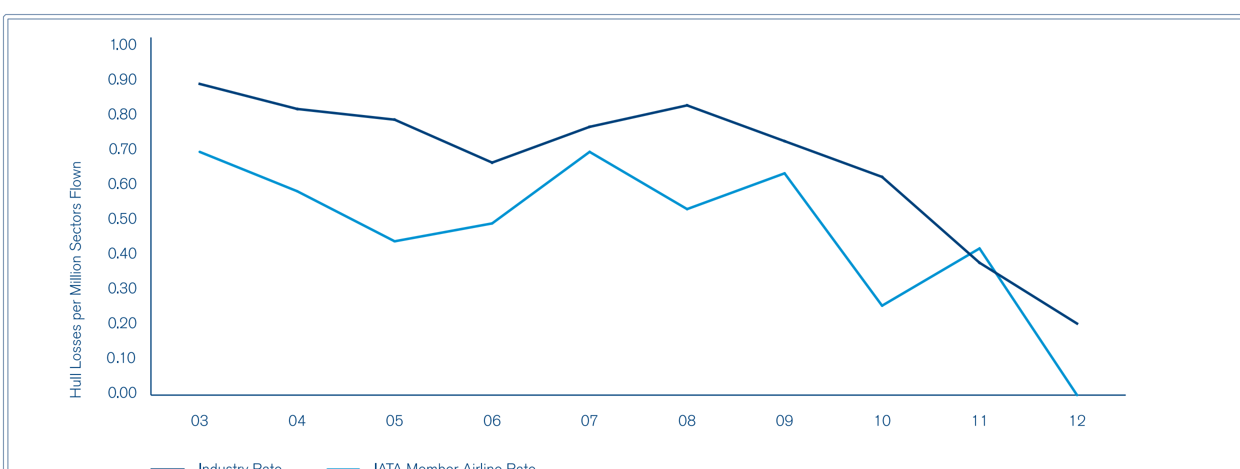
Regional Factors

Globally, IATA carriers represented 17% of all accidents while flying 52% of all sectors in 2012.

- All regions except Africa (AFI), Asia Pacific (ASPAC) and Latin America (LATAM) had lower rates of Western-built Jet Hull Losses than the world average of 0.20.
- Western-built jet hull loss accident rates in all regions except Asia Pacific (ASPAC) and Europe (EUR) improved relative to 2011.

In 2013, IATA will continue to work with its members to maintain safety as a priority. Through the Global Safety Information Center, the Global Safety Information Exchange agreement and other initiatives, IATA is continuing its work with airlines, regulatory authorities and other industry stakeholders to enhance existing safety programs and improve industry safety performance.

Western-built Jet Hull Loss Rate (2003-2012)




SAFETY IS ALWAYS OUR FIRST DESTINATION.


As an industry, flight safety is the first and most important commitment we make to any passenger. Boeing is proud to work with our airline, industry and government partners to support that unwavering commitment every day.
BOEING

"The 2012 Western-built jet hull loss rate was the lowest ever."

Section 1

IATA Annual Safety Report

Founded in 1945, IATA represents, leads and serves the airline industry. IATA's membership includes some 240 airlines comprising approximately 84% of total air traffic. IATA's global reach extends to 118 nations through 66 offices in 60 countries.

IATA works closely with experts from its member airlines, manufacturers, professional associations and federations, international aviation organizations and other industry stakeholders to develop and improve safety strategy and to determine lessons learned from aircraft accidents.

PURPOSE OF THE SAFETY REPORT 2012

The purpose of the Safety Report 2012 is to assist the airline industry in managing safety by identifying areas of concern and issues arising from the analysis of accidents that occurred during the year 2012 with trends identified from the previous five years.

The Safety Report 2012 was produced at the beginning of 2013. The report presents a detailed summary of statistics, trends and contributing factors involved in 2012's accidents and a focus on trends from the previous five years. Based on these findings, prevention strategies are developed, with the goal of enhancing operational safety.

In addition to the annual report, a mid-year update is produced in electronic format that is available to all who subscribe to or purchase a copy of the IATA Safety Report.

SAFETY REPORT FORMAT

In addition to presenting areas of concern and prevention strategies, the Safety Report also provides safety management tools. The enclosed CD-ROM is divided into the following sections:

- Safety Report, containing an electronic version of the report
- Supporting documents, containing additional material supporting issues covered in the report
- Safety Manager's Toolkit, containing useful and practical material
- CEO/COO Brief, containing an executive summary and a PowerPoint presentation on the report findings
- Graphic material including all the Safety Report's charts, graphs and illustrations available in electronic format

Image courtesy of Embraer

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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, some assumptions must be made. It is important for the reader to understand these assumptions when working with the results of this report.

- Accidents analyzed and the categories and contributing factors assigned to those accidents, are based on the best available information at the time of classification
- Sectors used to create the 2012 rates are the most up-to-date available at the time of production
- Where an accident rate has been published in previous editions of the Safety Report , that number is presented in current edition of the report

The implementation of further advanced data processing will enable IATA to improve the sector information available for the current year and previous years. Therefore, it will be possible to provide even more accurate accident rates for previous years. This change will be introduced in 2013 and fully incorporated in the next edition of this report.

ACCIDENT CLASSIFICATION TASK FORCE

The IATA Operations Committee (OPC) and its Safety Group (SG) created the Accident Classification Task Force (ACTF) in order to analyze accidents, identity contributing factors, determine trends and areas of concern relating to operational safety and to develop prevention strategies related thereto, which are incorporated into the annual IATA Safety Report.

It should be noted that many accident investigations are not complete at the time the ACTF meets to classify the year's events and additional facts may present themselves in the course of the investigation which affect the currently assigned classifications.

The ACTF is composed of safety experts from IATA, member airlines, original equipment manufacturers, professional associations and federations and other industry stakeholders. The group is instrumental in the analysis process, in order to produce a safety review based on subjective evaluations for the classification of accidents. The data analyzed and presented in this report is extracted from a variety of sources, including Ascend Worldwide and States' accident investigation boards. Once assembled, the ACTF validates each accident report using their expertise to develop an accurate assessment of the events.

ACTF 2012 participants:

Capt. Jorge Robles AERO REPUBLICA (COPA COLOMBIA)	Ms. Suzanne Acton-Gervais IATA (Cabin Safety)
Mr. Marcel Comeau AIR CANADA	Mr. Gordon Margison IATA (Secretary)
Mr. Frédéric Combes AIRBUS SAS	Mr. Michael Goodfellow ICAO
Dr. Dieter Reisinger AUSTRIAN AIRLINES (Chairman)	Capt. Hideaki Miyachi JAPAN AIRLINES
Capt. Robert Aaron Jr. THE BOEING COMPANY	Mr. Richard Fosnot JEPPESEN
Mr. David Fisher BOMBARDIER AEROSPACE	Mr. Florian Bartsch LUFTHANSA GERMAN AIRLINES
Mr. Torsten Roeckrath (Vice-chairman) CARGOLUX AIRLINES INTERNATIONAL	Capt. Ayedh Almotairy SAUDI ARABIAN AIRLINES
Mr. Luis Savio dos Santos EMBRAER AVIATION INTERNATIONAL	Capt. Pete Eggler SWISS INTERNATIONAL AIR LINES
Mr. Don Bateman HONEYWELL	Capt. João Romão TAP AIR PORTUGAL

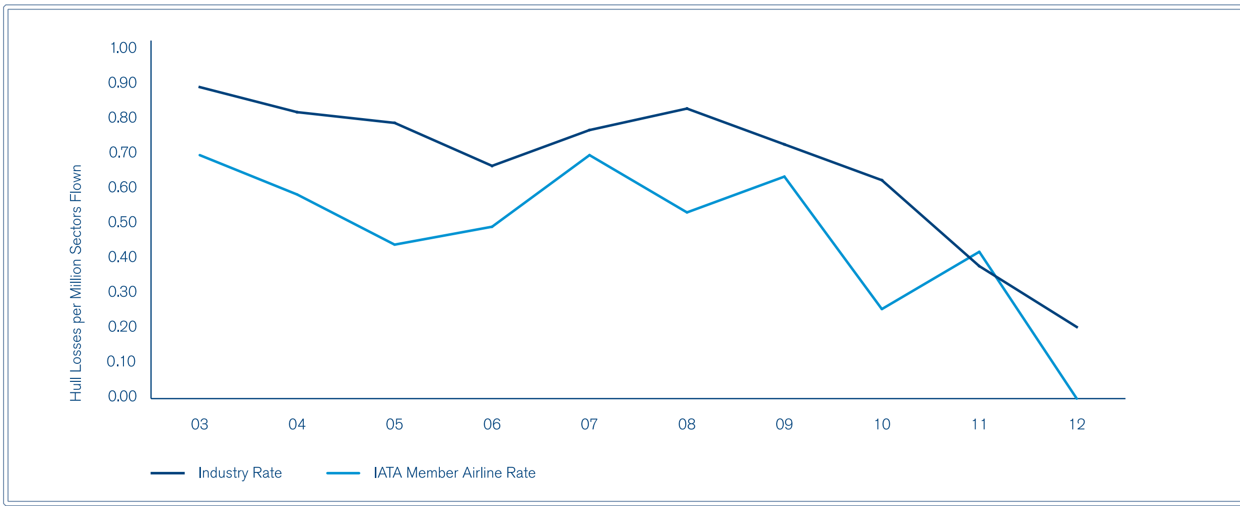
Section 2

2

Decade in Review

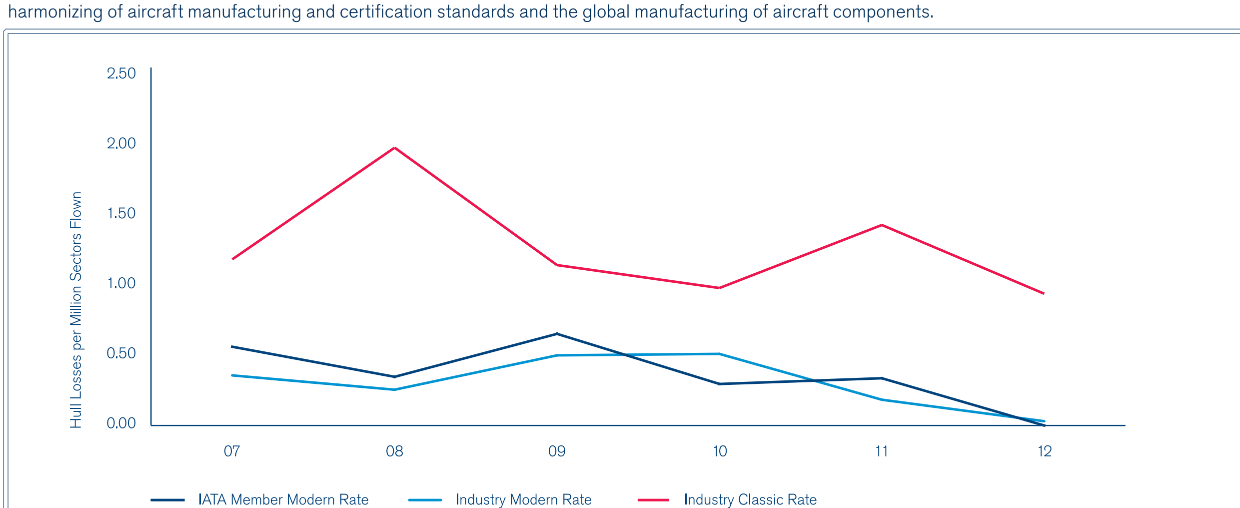
ACCIDENT/FATALITY STATISTICS AND RATES

Western-built Jet Aircraft Hull Loss Rate: IATA Member Airlines vs. Industry (2003-2012)

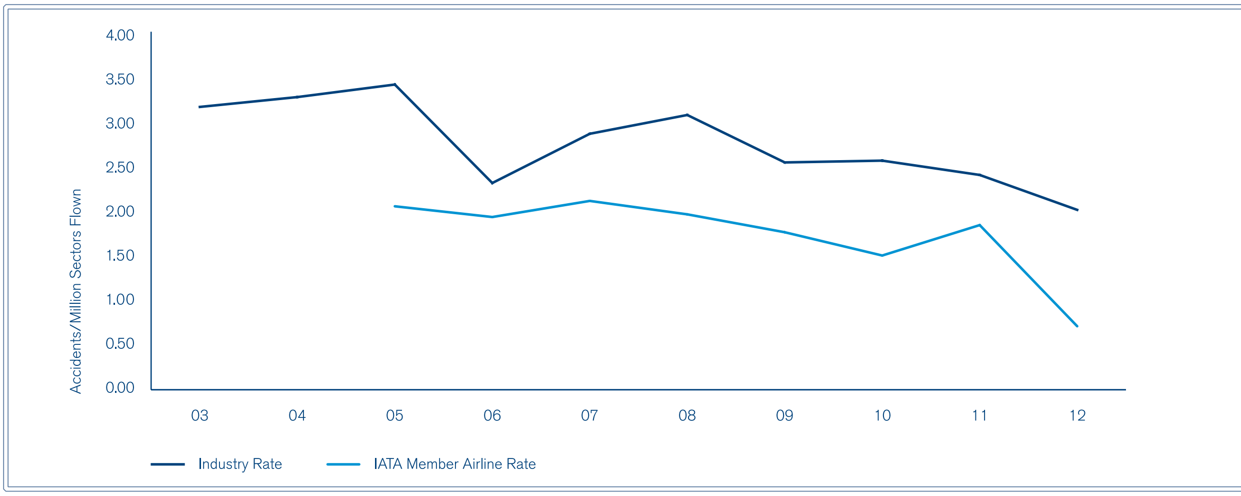


Modern Jet Hull Loss Rate (2003-2012)

IATA has introduced a new measure for accidents, the "Modern Jet Hull Loss" rate. This includes aircraft initially certified after 1985 and equipped with a glass cockpit and Flight Management System (FMS) at initial certification. Aircraft using older technologies are considered "Classic". This definition reflects the harmonizing of aircraft manufacturing and certification standards and the global manufacturing of aircraft components.

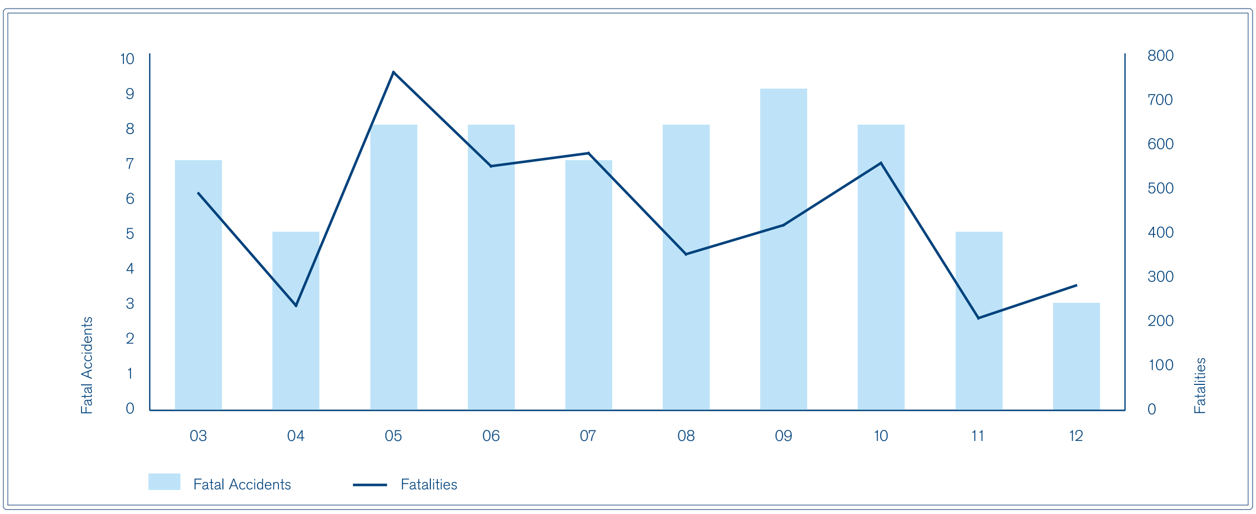


All Aircraft Accident Rate (2003-2012)

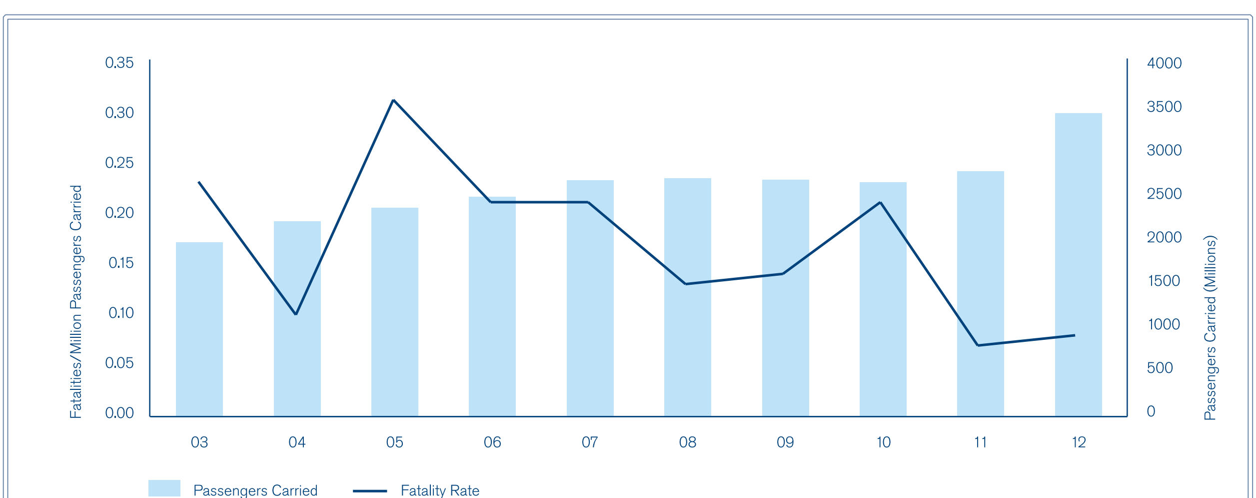


Note: Includes all Eastern-built and Western-built aircraft, including jets and turboprops substantial damage and hull loss accidents.

Western-built Jet Aircraft: Fatal Accidents and Fatalities (2003-2012)

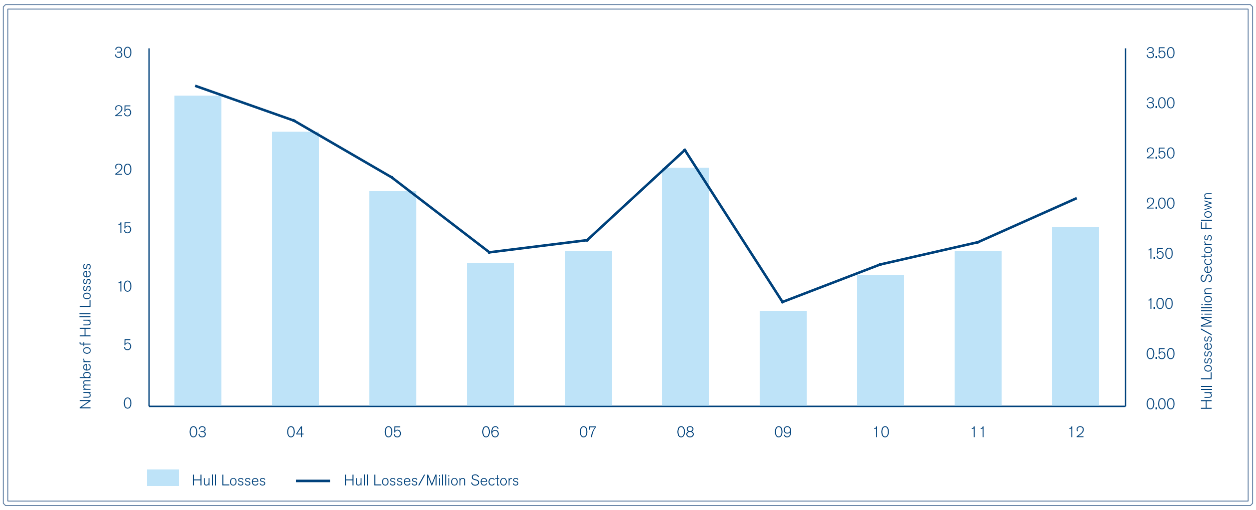


Western-built Jet Aircraft: Passengers Carried and Passenger Fatality Rate (2003-2012)

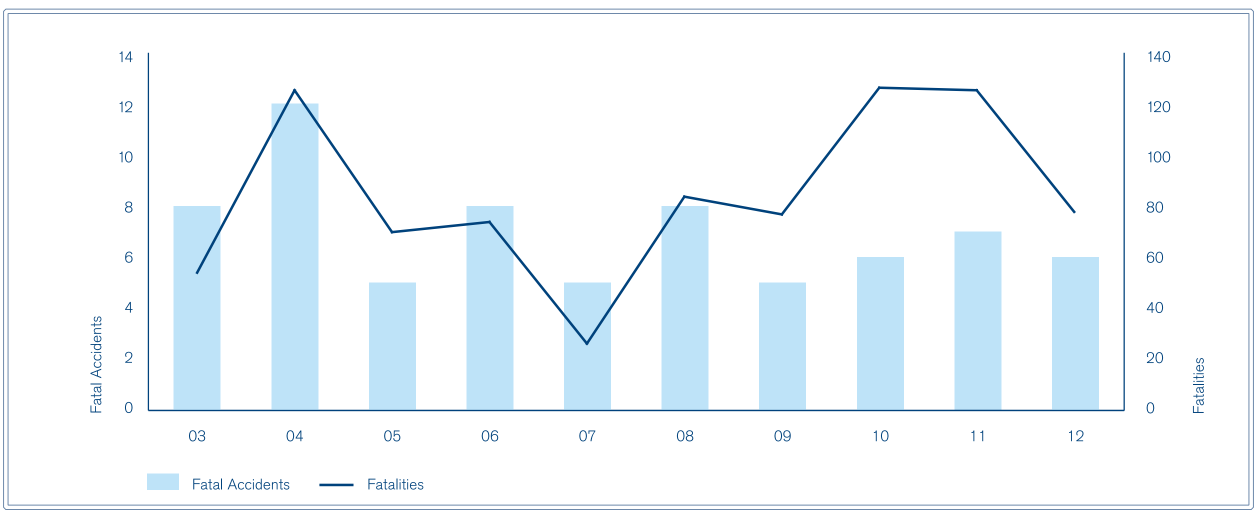


Source: IATA, Ascend - A Flightglobal Advisory Service

Western-built Turboprop Aircraft Hull Losses and Accident Rate (2003-2012)



Western-built Turboprop Aircraft: Fatal Accidents and Fatalities (2003-2012)



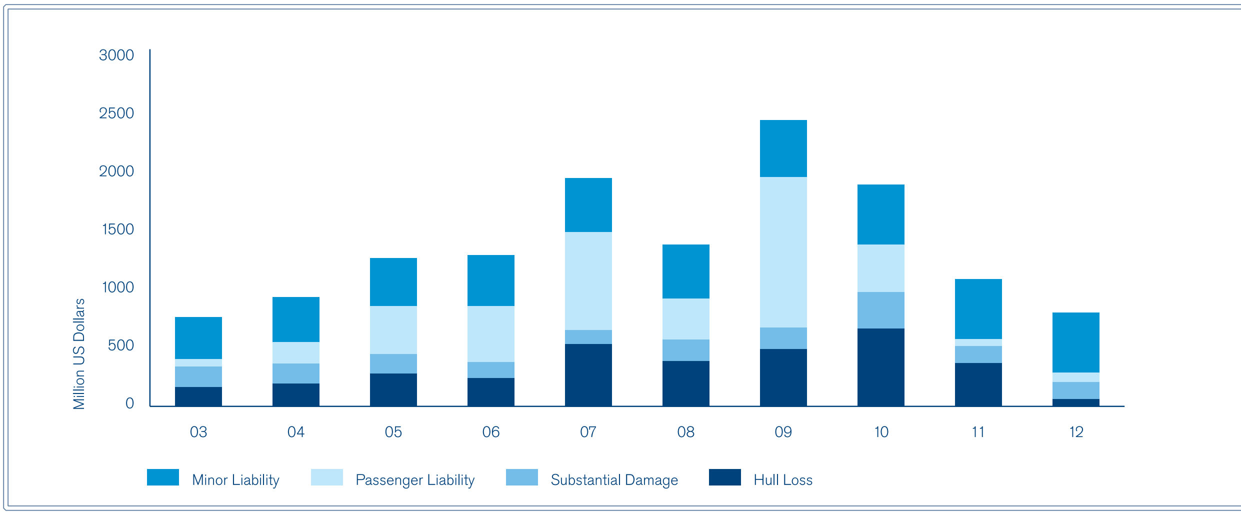
2

ACCIDENT COSTS

IATA has obtained the estimated costs for all losses involving Western-built aircraft over the last 10 years. The figures presented in this section are from operational accidents excluding security-related events and acts of violence.

2

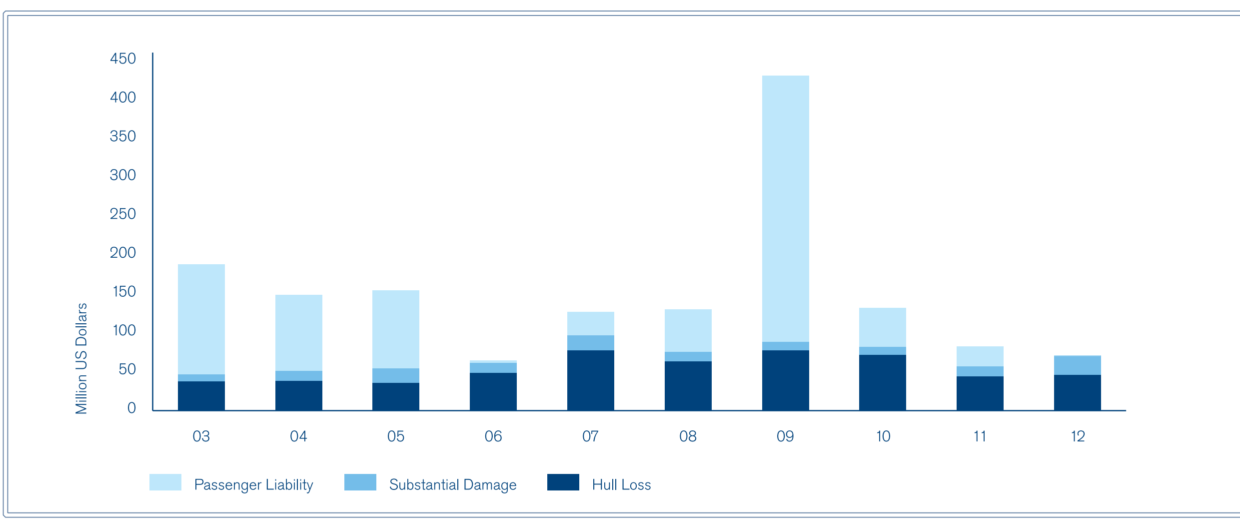
Western-built Jet Aircraft: Accident Costs (2003-2012)



Source: Ascend - A Flightglobal Advisory Service

Western-built Turboprop Aircraft: Accident Costs (2003-2012)

The sharp increase in turboprop liability in 2009 is the result of an accident in a populated area with major damage on the ground. All amounts are expressed in US dollars.



Source: Ascend - A Flightglobal Advisory Service

Section 3

3

Year 2012 in Review

AIRCRAFT ACCIDENTS

There were a total of 75 accidents in 2012. Summaries of all the year's accidents are presented in **Annex 3 - 2012 Accidents Summary**.

Fleet Size, Hours and Sectors Flown

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
World Fleet (end of year)	21,432	3,774	810	1,074
Hours Flown (millions)	59.17	6.27	0.52	0.42
Sectors (landings) (millions)	29.55	7.40	0.22	0.30

Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of 31 December 2012.

Operational Accidents

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Loss	6	15	2	9
Substantial Damage	21	20	0	2
Total Accidents	**27**	**35**	**2**	**11**
Fatal Accidents	3	6	2	4

3

Operational Hull Loss Rates

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Losses (per million sectors)	0.20	2.03	9.09	30.00
Hull Losses (per million hours)	0.10	2.39	3.85	21.43

Passengers Carried

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passengers Carried (millions)	3,391	168	12	5
Estimated Change in Passengers Carried Since 2011	9%	0%	-18%	-8%

Source: Ascend - A Flightglobal Advisory Service

Fatal Accidents per Operator Region

	AFI	ASPAC	CIS	EUR	LATAM	MENA	NAM	NASIA
Accidents	13	16	5	16	6	3	14	2
Fatal Accidents	3	4	4	0	2	1	1	0
Fatalities (crew and passengers)	160	162	53	0	6	32	1	0

Fatalities per Aircraft Type

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passenger Fatalities	269	66	1	29
Crew Fatalities	12	12	11	14
Total Fatalities	281	78	12	43

AIRCRAFT ACCIDENTS PER REGION

Western-built Aircraft Accidents per Operator Region

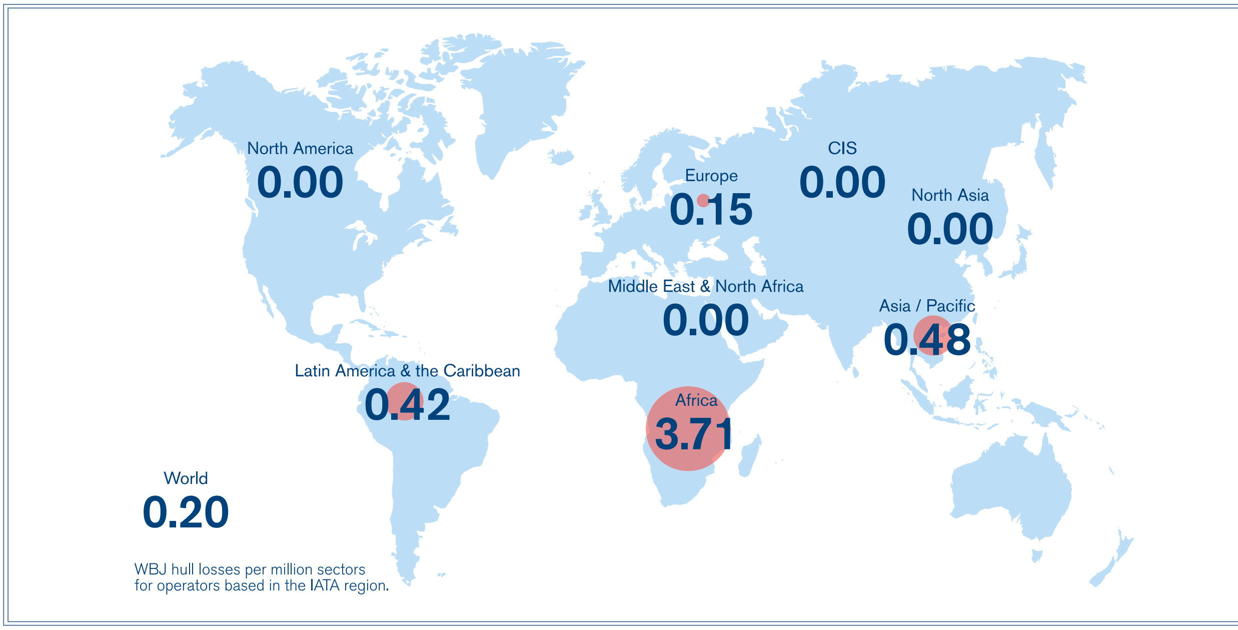
To calculate regional accident rates, IATA determines the accident region based on the operator's country. Moreover, the operator's country is specified in the operator's Air Operator Certificate (AOC).

For example, if a Canadian-registered operator has an accident in Europe, this accident is counted as a "North American" accident as far as regional accident rates are concerned.

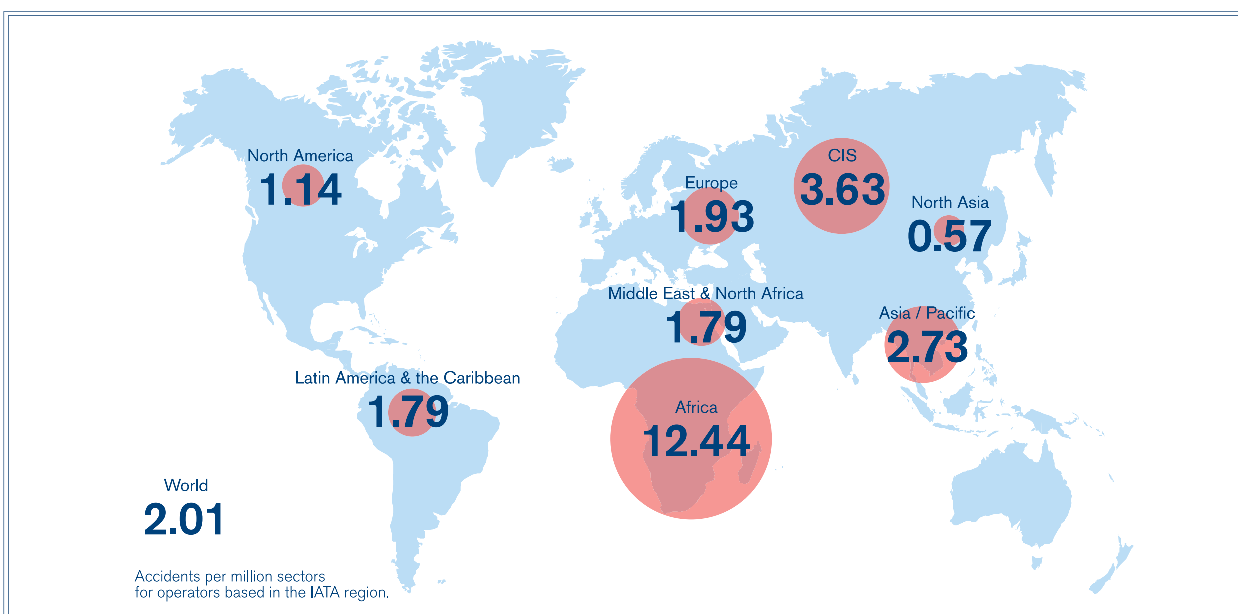
For a complete list of countries assigned per region, please consult **Annex 1**.

3

Western-built Jet Hull Loss Rate per Region of Operator



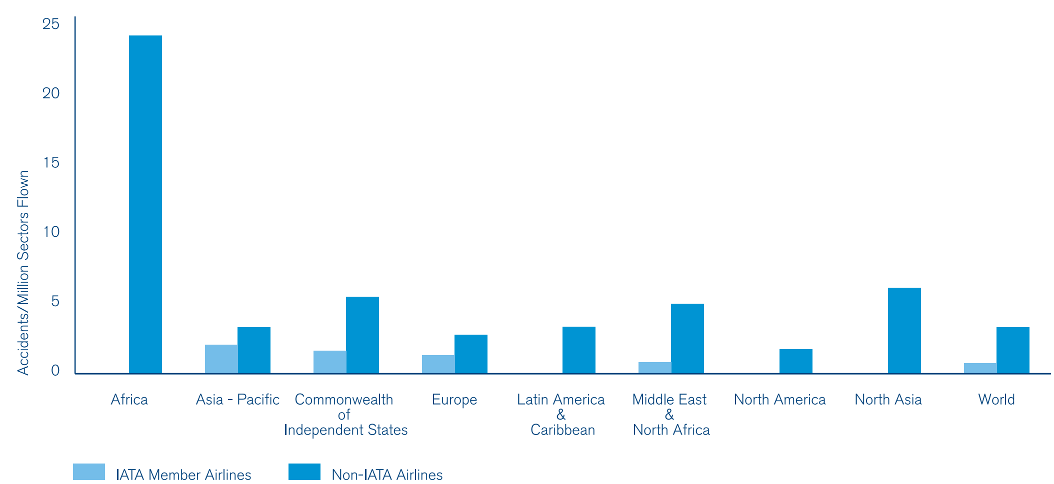
Total Accident Rate per Region (Eastern-built and Western-built aircraft)



IATA Member Airlines vs. Non-Members Total Accident Rate by Region of Operator

In an effort to better indicate the safety performance of IATA Member Airlines vs. Non-Members, IATA has determined the total accident rate for each region and globally. IATA member airlines out performed non-members in every region. IATA members exceeded the non-IATA by 78% in 2012.

IATA Member Airlines vs. Non-Members



GSIE HARMONIZED ACCIDENT RATE

Creating a Global Safety Information Exchange

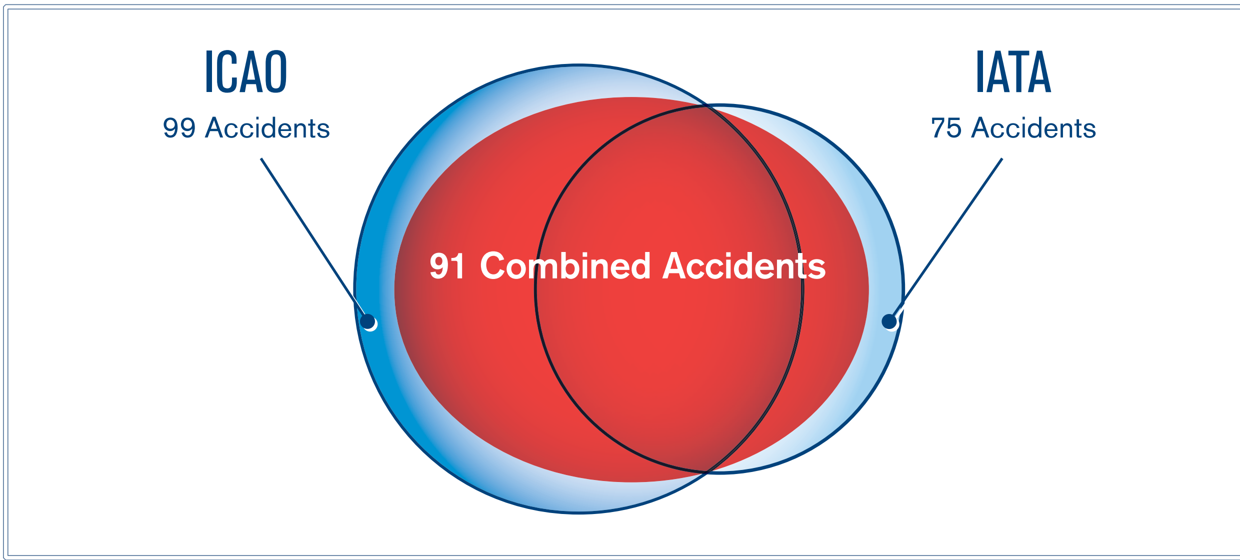
In the spirit of promoting aviation safety, the Department of Transportation of the United States, the Commission of the European Union, the International Air Transport Association (IATA) and ICAO signed a Memorandum of Understanding (MoU) on a Global Safety Information Exchange (GSIE) on 28 September 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 MoU calls for the establishment of a Steering Group which is responsible for the development and the effective functioning of the GSIE. Led by ICAO, the Steering Group has held four meetings intended to coordinate the collection, analysis and exchange of aviation safety information among the members of the GSIE as well as to disseminate pertinent information to the global aviation community.

The GSIE developed a harmonized accident rate beginning in 2011. This was accomplished through close co-operation 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.

This combined accident rate below is the result of a joint analysis of all accidents in 2012 taking into account the different accident criteria used by each organization.

The figure for the combined accidents includes accidents meeting the ICAO Annex 13 criteria for all typical commercial airline operations for scheduled and non-scheduled flights.



Through this collaborative effort, and using the common accident criteria, the GSIE harmonized accident rate for 2012 is:

2.4 accidents per million departures

This combined rate represents a 33% improvement in industry performance over 2011. ICAO and IATA will continue their efforts through the GSIE to align analysis methodologies in order to achieve greater harmonization in accident reporting with all involved industry stakeholders.

"Eighty-two percent of runway excursions occur following a stable approach, where the pilot failed to activate braking devices in a timely fashion, allowed the aircraft to float beyond the normal touchdown point, or failed to maintain directional control after touchdown"

Section 4

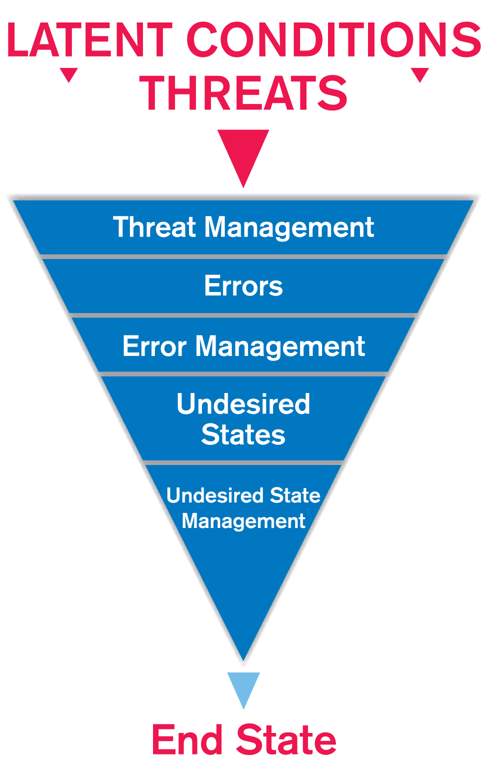
4

In-Depth Accident Analysis 2012

INTRODUCTION TO TEM FRAMEWORK

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.

Fig. 4.1 Threat and Error Management Framework



This section presents some definitions that will be helpful to understand the analysis contained in this report. The TEM framework is illustrated in Figure 4.1.

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 undesired aircraft state 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 unstable approach is recoverable. This is a UAS. A runway excursion is *unrecoverable*. Therefore, this is an End State.

4

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 Threat and Error Management (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. Hence, there is a need for Operators and States to improve their reporting cultures.

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 page.*

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 types 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 ACTF 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 overarching issues within an organization or a particular country, or involve performance of front line personnel, such as pilots or ground personnel.

Countermeasures are aimed at two levels:

- The first set is aimed at the operator or the state responsible for oversight: these countermeasures are based on activities, processes or systemic issues internal to the airline operation or state's oversight activities.
- The other set of countermeasures are aimed at the flight crews, to help them manage threats or their own errors while on the line.

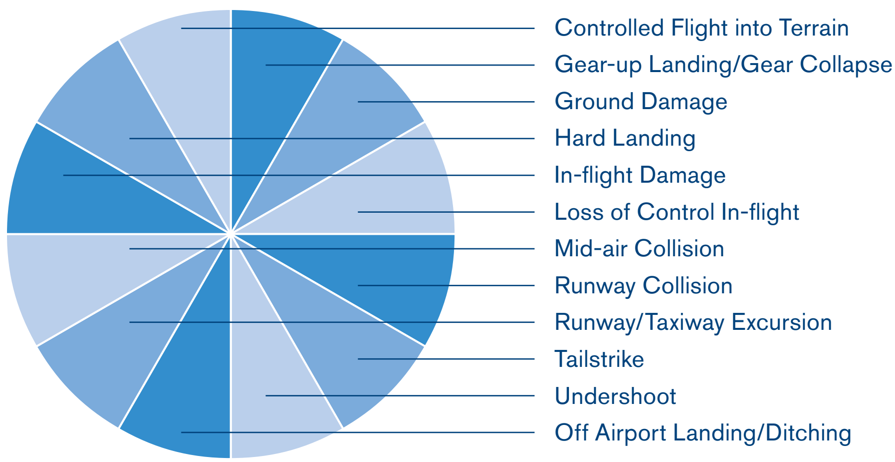
Countermeasures for other personnel, such as air traffic controllers, ground crew, cabin crew or maintenance staff, are important but they are not considered at this time.

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 top countermeasures is presented in Section 7 of this report.

ANALYSIS BY ACCIDENT CATEGORIES AND REGIONS

- This section presents an in-depth analysis of the 2012 occurrences by accident categories, as illustrated in the sample Figure 4.2
- Definitions of these categories can be found in **Annex 2**

Figure 4.2 – Accident Categories (End States)



Referring to these accident categories helps an operator to:

- Structure safety activities and set priorities
- Avoid "forgetting" 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

Section 5 displays an in-depth regional accident analysis (by region of the involved operator). Section 6 presents an in-depth analysis of accidents involving cargo aircraft.

4

Year 2012 Aircraft Accidents

75 Accidents

IATA Members	17%
Hull Losses	43%
Fatal	20%

77% Passenger

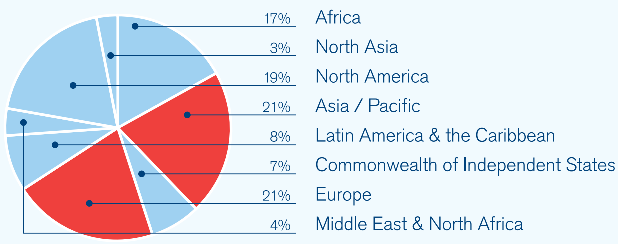
19% Cargo

4% Ferry

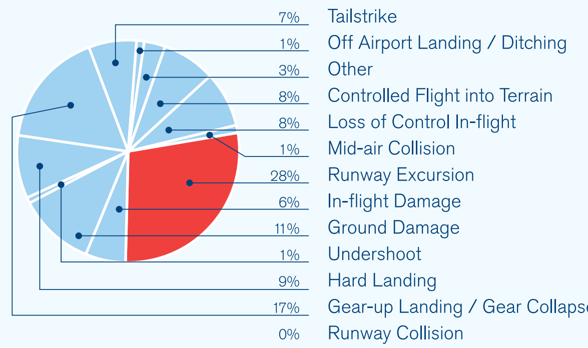
39% Jet

61% Turboprop

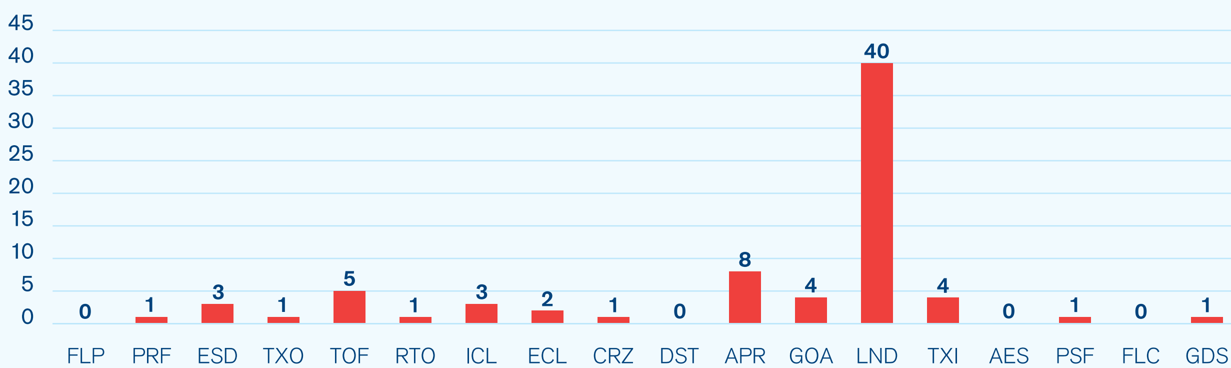
Accidents per Operator Region



Breakdown per Accident Category



Accidents per Phase of Flight*



Phase of Flight: Definitions

FLP	Flight Planning	**DST**	Descent
PRF	Pre-flight	**APR**	Approach
ESD	Engine Start/Depart	**GOA**	Go-around
TXO	Taxi-out	**LND**	Landing
TOF	Take-off	**TXI**	Taxi-in
RTO	Rejected Take-off	**AES**	Arrival/Engine Shutdown
ICL	Initial Climb	**PSF**	Post-flight
ECL	En Route Climb	**FLC**	Flight Close
CRZ	Cruise	**GDS**	Ground Servicing

Year 2012 Aircraft Accidents
Continued

Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

21% Regulatory oversight

21% Safety management

8% Flight operations: training systems

5% Technology and equipment

Threats

Environmental

33% Meteorology

- Wind/windshear/gusty wind (65% of these cases)
- Poor visibility/IMC (20% of these cases)
- Thunderstorms (20% of these cases)
- Icing conditions (5% of these cases)

23% Airport facilities

- Contaminated runway or taxiway/poor braking action (79% of these cases)
- Inadequate overrun area/trench/ditch or structures in close proximity to runway/taxiway (7% of these cases)
- Poor/faint marking/signs or runway/taxiway closure (7% of these cases)
- Airport perimeter control/fencing / wildlife control (7% of these cases)

8% Ground-based navigation aids malfunctioning or not available

Airline

15% Aircraft malfunction

- Gear/tire (56% of all malfunctions)
- Contained engine failure/powerplant malfunction (22% of all malfunctions)

7% Maintenance events

Flight Crew Errors (relating to...)

31% Manual handling/flight controls

23% SOP adherence/cross-verification

- Intentional error (79% of these cases)
- Unintentional error (21% of these cases)

7% Failure to go-around after destabilization during approach

Undesired Aircraft States (UAS)

26% Long/floated/bounced/firm/off-centerline/crabbed landing

11% Vertical, lateral or speed deviations

11% Operation outside of aircraft limitations

10% Unstable approach

Additional Classifications

19% Insufficient data

Correlations of Interest 2008-2012

Of the **101** fatal accidents; weak regulatory oversight was cited in **43%** of the accidents, intentional violation of SOPs was a factor in **31%** and contained engine failure a factor in **17%**.

42 fatal accidents were loss of control in-flight; meteorological threats were a factor in **51%** of these events, aircraft malfunction in **49%**, and manual handling of flight controls in **46%**; **57%** involved turboprop aircraft.

30 fatal accidents were controlled flight into terrain; lack of proper technology onboard the aircraft was a factor in **56%** of these events, lack of a precision approach a factor in **52%**.

Note: 14 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for detailed "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

4

Controlled Flight into Terrain

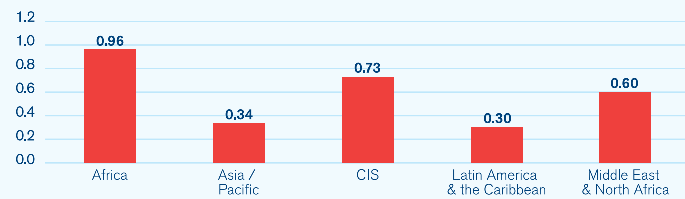
6 Accidents

IATA Members	0%
Hull Losses	100%
Fatal	100%
Accident Rate*	0.16

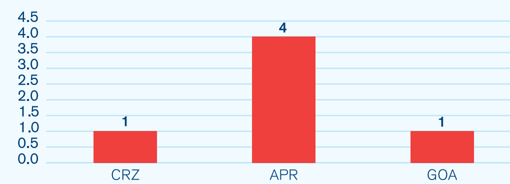
67% Passenger **33%** Cargo **0%** Ferry

17% Jet **83%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

75% Regulatory oversight

50% Technology and equipment

50% Safety management

Threats

Environmental

50% Ground-based nav aid malfunction or not available

50% Poor visibility/IMC

Airline

None noted.

Flight Crew Errors (relating to...)

50% SOP adherence/SOP cross-verification:

Intentional non-compliance (50% of these cases)

Unintentional non-compliance (50% of these cases)

25% Manual handling/ flight controls

Undesired Aircraft States (UAS)

50% Vertical, lateral or speed deviations

50% Controlled flight towards terrain

Correlations of Interest 2008-2012

Weak regulatory oversight was noted in **79%** of cases where the lack of a precision approach was contributing factor to the accident.

Deficient safety management was a factor in **56%** of accidents where crews violated SOPs.

Accident Scenarios of Interest

Scenario 1:

There are noted deficiencies in regulatory oversight of the operator, and the flight crew is flying a non-standard instrument procedure, in an aircraft not equipped with a terrain awareness warning system. The aircraft subsequently impacts terrain.

This scenario is common for 24% of all controlled flight into terrain accidents.

Scenario 2:

The operator has noted deficiencies in their safety management systems, the crew intentionally disregard SOPs and the aircraft is flown towards the ground until impact.

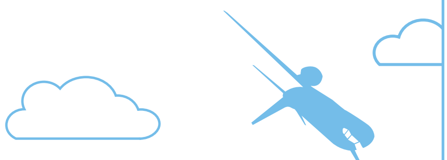
This is common for 21% of all controlled flight into terrain accidents.

Note: 2 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.

**Accidents per million sectors flown for all aircraft types*

***See Annex 1 for "Phase of Flight" definitions*

****See Annex 2 for "Contributing Factors" definitions*



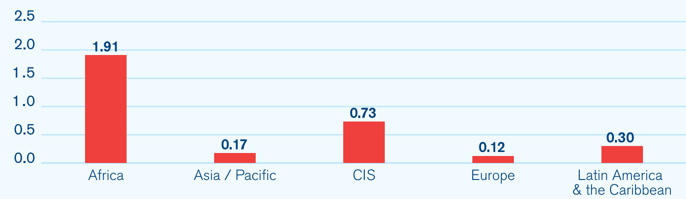
Loss of Control In-flight

6 Accidents

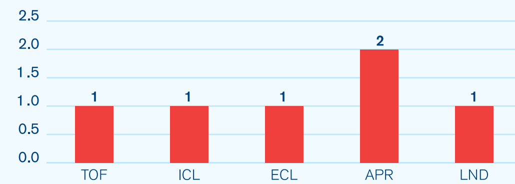
IATA Members	**17%**
Hull Losses	**83%**
Fatal	**83%**
Accident Rate*	**0.16**

83% Passenger | **17%** Cargo | **0%** Ferry | **33%** Jet | **67%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

40% Regulatory oversight

40% Safety management

Threats

Environmental

40% Meteorology

- Icing Conditions (50% of these cases)
- Thunderstorms (50% of these cases)
- Wind/wind shear/gusty winds (50% of these cases)

Airline

40% Aircraft malfunction

- Contained engine failure/ powerplant malfunction (50% of all malfunctions)
- Fire/smoke (Cockpit/Cabin/Cargo) (50% of these cases)

Flight Crew Errors (relating to...)

40% SOP adherence/SOP cross-verification:

- Intentional non-compliance

Undesired Aircraft States (UAS)

40% Operation outside aircraft limitations

Correlations of Interest 2008-2012

50% of accidents occurring during the initial climb involved a contained engine failure.

49% of loss of control in-flight accidents occur before the top of climb, of these **53%** involve an aircraft malfunction

Accident Scenarios of Interest

Scenario 1:

The flight crew intentionally deviates from SOPs or they do not properly cross-check. This results into operating the aircraft outside of its limitations and ultimately loss of control of the aircraft.

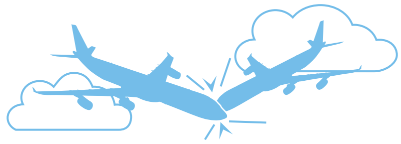
This scenario is common for 15% of all the loss of control in-flight accidents.

Scenario 2:

There are noted deficiencies in regulatory oversight and the maintenance operation of the operator. The flight suffered a malfunction of one or more system and this ultimately lead to the loss of control of the aircraft.

This scenario is common for 11% of all the loss of control in-flight accidents.

Note: 1 accident was not classified due to insufficient data; this accident was removed from the count for the contributing factors and correlations of interest.
**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*



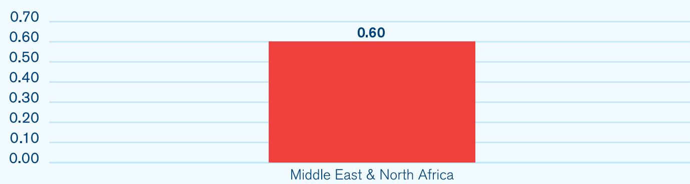
Mid-Air Collision

1 Accident

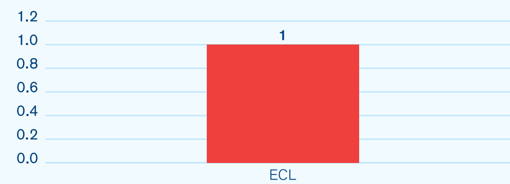
IATA Members	100%
Hull Losses	0%
Fatal	0%
Accident Rate*	0.03

100% Passenger
0% Cargo
0% Ferry
100% Jet
0% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

Note: Given that one accident does not provide a complete picture of the status of a category of accident, IATA does not publish contributing factors or correlations for those categories.

Threats

Environmental

Airline

Flight Crew Errors (relating to...)

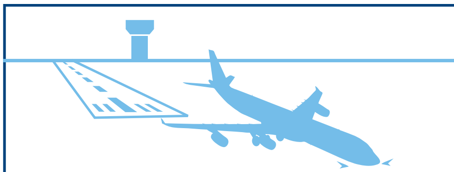
Undesired Aircraft States (UAS)

Additional Classifications

Correlations of Interest 2008-2012

Accident Scenarios of Interest

*Accidents per million sectors flown for all aircraft types
**See Annex 1 for "Phase of Flight" definitions
***See Annex 2 for "Contributing Factors" definitions



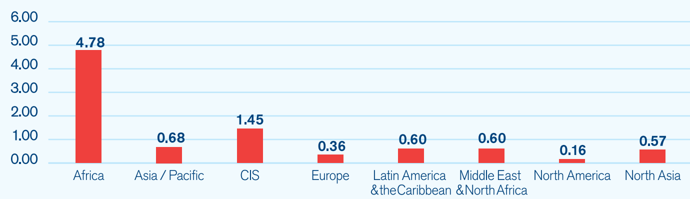
Runway Excursion

21 Accidents

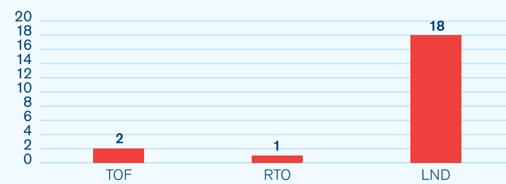
IATA Members	**14%**
Hull Losses	**57%**
Fatal	**10%**
Accident Rate*	**0.56**

81% Passenger **14%** Cargo **5%** Ferry **38%** Jet **62%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

29% Regulatory oversight

29% Safety management

Threats

Environmental

71% Airport facilities

- Contaminated runway/ poor braking action (92% of these cases)
- Poor/faint markings/ signs or runway/ taxiway closures (8% of these cases)

41% Meteorology

- Wind/windshear/gusty wind (43% of these cases)
- Thunderstorms (43% of these cases)
- Poor visibility/IMC (29% of these cases)

12% Ground-based nav-aid malfunction or not available

Airline

12% Aircraft malfunction

- Brakes (50% of these cases)
- Gear/Tire (50% of these cases)

Flight Crew Errors (relating to...)

53% Manual handling/ flight controls

24% SOP adherence/ SOP cross-verification

- Intentional (75% of these cases)
- Unintentional (25% of these cases)

12% Failure to go-around after destabilized approach

Undesired Aircraft States (UAS)

41% Long, floated, bounced, firm, off-centerline or crabbed landing

24% Loss of aircraft control while on the ground

18% Unstable approach

12% Continued landing after unstable approach

Correlations of Interest 2008-2012

In **50%** of runway excursions involving long, floated, bounced, firm or off centerline landings occurred on contaminated runways.

Crews lost control of the aircraft while on the ground in **45%** of runway excursions where wind, wind shear or gusty winds were also a factor.

Accident Scenarios of Interest

Scenario 1:

The crew are flying a stable approach to an airfield but in gusty wind conditions or the presence of wind shear. After touchdown they lose control of the aircraft on the ground and subsequently overrun or veer-off the runway resulting in substantial damage or a hull loss.

This scenario is common for 10% of all runway excursion accidents.

Scenario 2:

The flight crew commits manual handling errors, leading to an unstable approach. The aircraft lands long, bounces, or touches down off of the runway centerline. The flight departs the runway surface and is substantially damaged or destroyed.

This scenario is common for 15% of all runway excursion accidents.

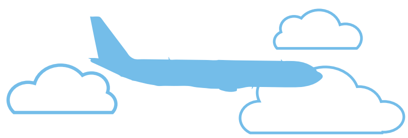
Scenario 3:

The airport in question has weak regulatory oversight and contaminated runways with poor braking action. The aircraft departs the runway surface and is substantially damaged or destroyed.

This scenario is common for 12% of all runway excursion accidents.

Note: 4 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*

4



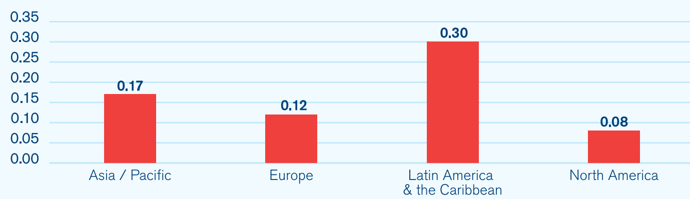
In-flight Damage

4 Accidents

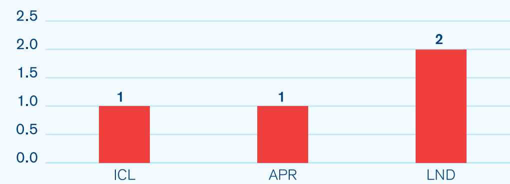
IATA Members	0%
Hull Losses	50%
Fatal	25%
Accident Rate*	0.11

100% Passenger · 0% Cargo · 0% Ferry · 75% Jet · 25% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

None noted.

Threats

Environmental

Wildlife/birds/foreign object **(2 cases)**

Ground-based nav aid malfunction or not available **(1 case)**

Wind/wind shear/gusty wind **(1 case)**

Airline

Aircraft malfunction:

- Contained engine failure / powerplant malfunction **(1 case)**
- Primary flight control **(1 case)**

Flight Crew Errors (relating to...)

None noted.

Undesired Aircraft States (UAS)

Unstable approach **(1 case)**

Continued landing after unstable approach **(1 case)**

Long/floated/bounced/firm/off-center/crabbed landing **(1 case)**

Vertical/lateral/speed deviation **(1 case)**

Correlations of Interest 2008-2012

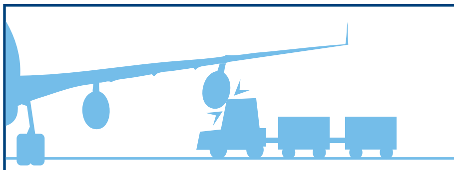
Aircraft malfunctions were a factor in **70%** of in-flight damage accidents resulting in a hull loss.

In-flight damage accidents occurred across **all** flight phases.

Accident Scenarios of Interest

No significant scenario noted.

*Accidents per million sectors flown for all aircraft types
**See Annex 1 for "Phase of Flight" definitions
***See Annex 2 for "Contributing Factors" definitions



Ground Damage

8 Accidents

IATA Members	**38%**
Hull Losses	**0%**
Fatal	**0%**
Accident Rate*	**0.21**

100% Passenger | **0%** Cargo | **0%** Ferry | **25%** Jet | **75%** Turboprop

Accident Rates per Operator Region*

Accidents per Phase of Flight**

Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

25% Regulatory oversight

Threats

Environmental

13% Air Traffic Services

Airline

75% Ground events

Flight Crew Errors (relating to...)

25% Crew to external communication: ground crew

Undesired Aircraft States (UAS)

13% Loss of aircraft control while on the ground

Correlations of Interest 2008-2012

25% of all ground damage accidents are related to an aircraft malfunction, of these **71%** involved fire or smoke.

Accident Scenarios of Interest

While maneuvering on the ground under ATC control one aircraft strikes another stationary aircraft causing substantial damage.

This scenario is common for 20% of all ground damage accidents.

**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*

4

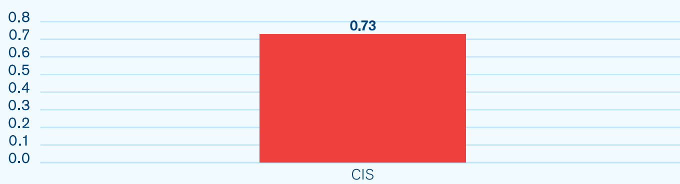
Undershoot

1 Accident

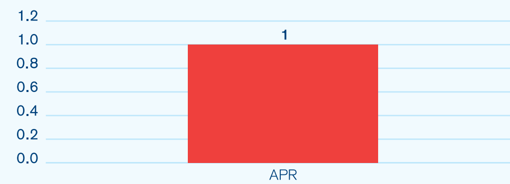
IATA Members	0%
Hull Losses	100%
Fatal	100%
Accident Rate*	0.03

0% Passenger | 100% Cargo | 0% Ferry | 100% Jet | 0% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

Note: given that one accident does not provide a complete picture of the status of a category of accident, IATA does not publish top contributing factors or correlations for those categories.

Threats

Environmental

Airline

Flight Crew Errors (relating to...)

Undesired Aircraft States (UAS)

Correlations of Interest 2008-2012

In **58%** of accidents where meteorological conditions were cited, lack of SOP adherence was also a factor.

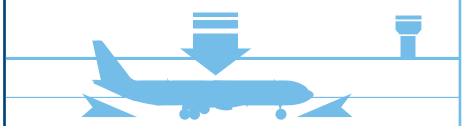
Accident Scenarios of Interest

Scenario 1:

The flight crew deviate from the planned approach path or intended speed while conducting an approach in marginal weather conditions. Subsequently the aircraft undershoots the runway, impacting the ground.

This scenario is common for 37% of all undershoot accidents.

**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*



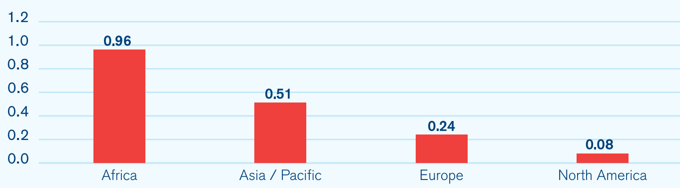
Hard Landing

7 Accidents

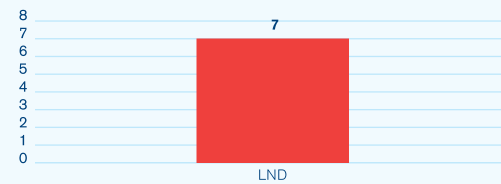
IATA Members	**14%**
Hull Losses	**14%**
Fatal	**0%**
Accident Rate*	**0.19**

86% Passenger | **14%** Cargo | **0%** Ferry | **57%** Jet | **43%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

29% Flight operations: training systems

Threats

Environmental

57% Wind/windshear/gusty wind

Airline

None noted.

Flight Crew Errors (relating to...)

43% Manual handling/flight controls

29% Failure to go around after destabilization on approach

Undesired Aircraft States (UAS)

86% Long, floated, bounced, firm, off-centreline or crabbed landing

29% Unstable approach

Correlations of Interest 2008-2012

High wind, wind shear or gusty winds were noted in **25%** of hard landings involving jet aircraft.

Deficiencies in airline training systems were noted as a contributing factor in **80%** of cases where crews violated SOPs.

Accident Scenarios of Interest

Scenario 1:

The operator has deficiencies in their flight crew training program. On the accident flight, the flight crew commit manual handling errors resulting in a long, floated, bounced, firm off-center or crabbed landing, subsequently resulting in a hard landing.

This scenario is common for 31% of all hard landing accidents.

**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*

4

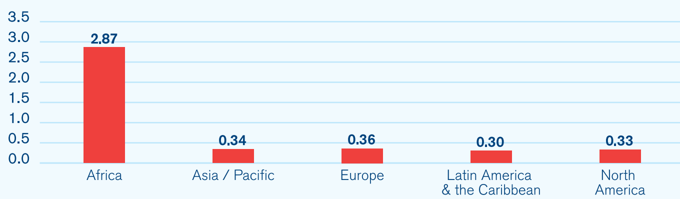
Gear-up Landing/ Gear Collapse

13 Accidents

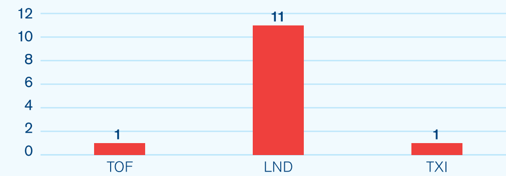
IATA Members	**8%**
Hull Losses	**31%**
Fatal	**0%**
Accident Rate*	**0.35**

46% Passenger **39%** Cargo **15%** Ferry **15%** Jet **85%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

14% Safety management

14% Flight operations: training systems

14% Maintenance operations: SOPs and checking

14% Maintenance operations: training systems

Threats

Environmental

14% Inadequate overrun area/trench /ditches /structures in close proximity to runway/taxiways

14% Wind/wind shear/gusty winds

Airline

57% Aircraft malfunction: Gear/tire

29% Maintenance events

Flight Crew Errors (relating to...)

None noted.

Undesired Aircraft States (UAS)

None noted.

Correlations of Interest 2008-2012

No fatal accidents involving gear-up landing or gear collapse were noted from 2008 to 2012.

Deficient SOPs in maintenance were a known factor in **21%** of gear-up landings or gear collapse accidents.

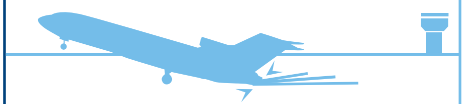
Accident Scenarios of Interest

Scenario 1:

The airline has deficiencies with regards to its maintenance SOPs and their verification. Maintenance is performed on the aircraft based on these procedures. On the day of the accident, the flight crew properly manage any threats and errors present, however the gear still collapses on landing and damages the aircraft.

This scenario is common to 21% of all the accidents involving a gear-up landing or gear collapse during landing.

Note: 6 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*



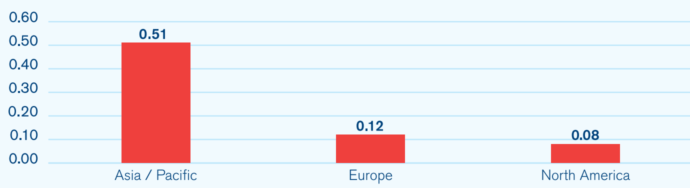
Tailstrike

5 Accidents

IATA Members	60%
Hull Losses	0%
Fatal	0%
Accident Rate*	0.13

100% Passenger | **0%** Cargo | **0%** Ferry | **80%** Jet | **20%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**

Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

Technology and equipment **(1 case)**

Threats

Environmental

Meteorology: Wind/wind shear/gusty wind **(2 cases)**

Wildlife/birds/foreign object **(1 case)**

Airline

None noted.

Flight Crew Errors (relating to...)

Manual handling **(4 cases)**

SOP adherence/SOP cross-verification: intentional non-compliance **(3 cases)**

Wrong weight and balance/fuel information **(1 case)**

Pilot to pilot communication **(1 case)**

Undesired Aircraft States (UAS)

Operation outside of aircraft limitations **(3 cases)**

Abrupt aircraft control **(1 case)**

Incorrect configuration of brakes/thrust reversers/ground spoilers **(1 case)**

Long/floated/bounced/firm/off-center/crabbed landing **(1 case)**

Weight and balance **(1 case)**

Correlations of Interest 2008-2012

Poor meteorological conditions were present in **40%** of accidents where manual handling was also a factor.

Accident Scenarios of Interest

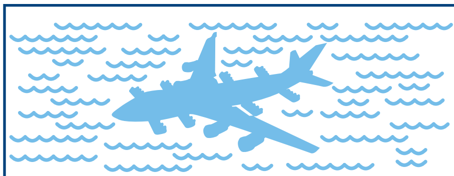
Scenario 1:

The flight crew fail to follow SOPs or fail to cross-check, and commit manual handling errors, subsequently leading to a tailstrike that substantially damages the aircraft.

This scenario is common to 41% of all the accidents involving a tailstrike accident.

**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*

4



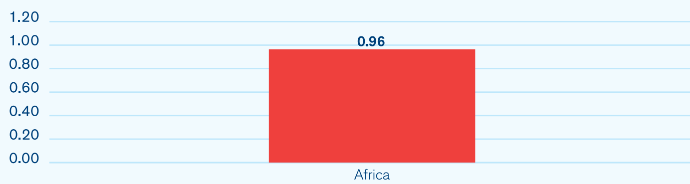
Off Airport Landing/Ditching

1 Accident

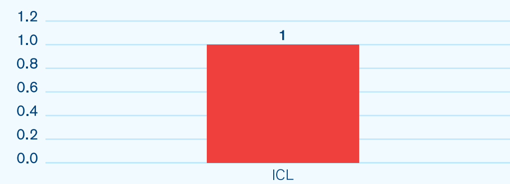
IATA Members	**0%**
Hull Losses	**100%**
Fatal	**0%**
Accident Rate*	**0.03**

100% Passenger | **0%** Cargo | **0%** Ferry | **0%** Jet | **100%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors 2012***

Latent Conditions (deficiencies in...)

Note: Given that one accident does not provide a complete picture of the status of a category of accident, IATA does not publish contributing factors or correlations for those categories.

Threats

Environmental

.

Airline

Flight Crew Errors (relating to...)

Undesired Aircraft States (UAS)

Correlations of Interest 2008-2012

Cargo operations represented **44%** of all accidents while compromising only 10% of the world fleet.

Accident Scenarios of Interest

Scenario 1:

The operator has noted deficiencies in their training systems. The crew do NOT have any systems failures and they intentionally disregard SOPs or cross-checking. This results in the aircraft being landed off airport/ditched.

This scenario is common to 25% of all off airport landing/ditching accidents.

**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*
****See Annex 2 for "Contributing Factors" definitions*
*****Off airport landing / Ditching was added as an accident category in 2010*

TREND ANALYSIS

Accidents Overview (2008-2012)

	Total Accidents	IATA Members	Hull Losses	Fatal	Fatalities	Passenger	Cargo	Ferry	Jet	Turboprop
2012	75	13	32	15	414	58	14	3	29	46
2011	92	34	39	22	486	79	10	3	55	37
2010	94	26	43	23	786	69	23	2	59	35
2009	90	28	35	18	685	66	22	2	59	31
2008	109	33	53	23	502	71	34	4	67	42

Accidents per Category (2008-2012)

	Controlled Flight into Terrain	Loss of Control In-flight	Runway Excursion	Runway Collision	Mid-air Collision	In-flight Damage	Ground Damage	Undershoot	Hard Landing	Gear-up Landing/ Gear Collapse	Tailstrike	Off Airport Landing/ Ditching
2012	6	6	21	0	1	4	8	1	8	12	5	1
2011	10	8	17	0	0	5	15	1	9	16	7	3
2010	7	10	20	0	0	9	10	8	5	13	2	5
2009	2	9	23	0	0	9	9	4	11	15	4	N/A
2008	7	14	28	0	0	16	18	6	7	8	3	N/A

Note: 14 accidents in 2012 and 43 in the last five years were not classified with contributing factors due to insufficient information.

Note: Two accidents in 2012 and five in the last five years did not fit into any of the above categories and was not included in the table.

Note: The Off Airport Landing/Ditching category was added in 2010 and data from previous years is not included in the table.

"Loss of control in-flight was the accident category with the most fatal accidents in the last five years."

Section 5

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 region of the involved operators.

The purpose of this section is to identify common issues that can be shared by operators located in the same region, in order to develop adequate prevention strategies.

Note: IATA determines the accident region based on the operator's country. Moreover, the operator's country is 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**.*

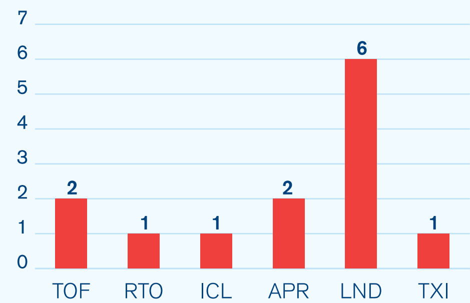
Africa

13 Accidents

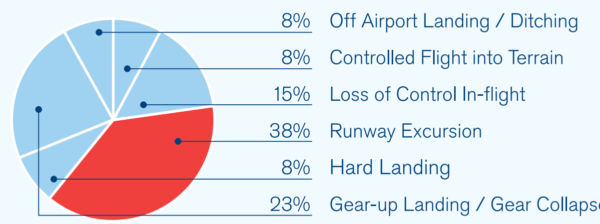
IATA Members	**0%**
Hull Losses	**85%**
Fatal	**23%**

62% Passenger | **31%** Cargo | **7%** Ferry | **15%** Jet | **85%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

29% Regulatory oversight

29% Safety management

14% Flight operations: Training systems

Threats

Environmental

43% Airport facilities

- Contaminated runway/taxiway (67% of cases)
- Airport perimeter control /fencing/ wildlife control (33% of cases)

29% Meteorology

- Thunderstorms (100% of cases)
- Wind/wind shear/gusty wind (50% of cases)

Airline

14% Aircraft malfunction

14% Maintenance events

Flight Crew Errors (relating to...)

29% SOP adherence/SOP cross-verification: Intentional

29% Manual handling/flight controls

Undesired Aircraft States (UAS)

29% Long, floated, bounced, firm, off-centerline, crabbed landing

Correlations of Interest 2008-2012

Deficiencies in airlines' flight training operations were noted in **36%** of accidents where crews deviated from SOPs.

Weak regulatory oversight was noted in **52%** of all runway excursion accidents.

39% of all hull losses involved an aircraft malfunction.

Note: 6 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.

**See Annex 1 for "Phase of Flight" definitions*

***See Annex 2 for "Contributing Factors" definitions*

Asia/Pacific

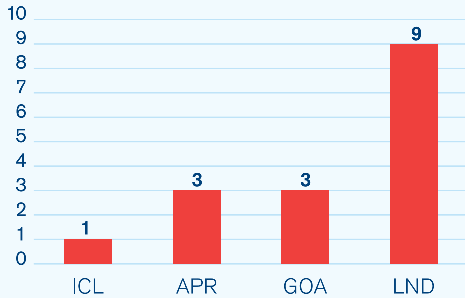
16 Accidents

IATA Members	**31%**
Hull Losses	**31%**
Fatal	**25%**

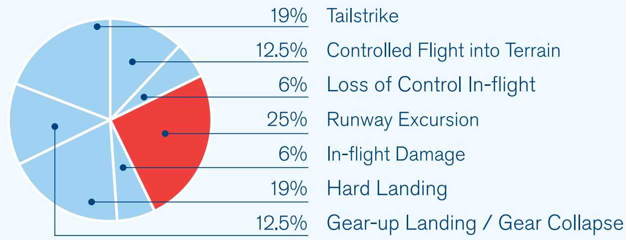
94% Passenger | **6%** Cargo | **0%** Ferry | **63%** Jet | **37%** Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

33% Regulatory oversight

27% Safety management

13% Flight operations: SOPs & checking

Threats

Environmental

60% Meteorology

- Wind/windshear/gusty wind (78% of these events)
- Thunderstorms (22% of these events)

13% Ground-based navigation aids malfunctioning or not available

13% Wildlife/birds/foreign object

Airline

13% Aircraft malfunction

- Contained engine failure/powerplant malfunction (50% of cases)
- Primary flight controls (50% of cases)
- Gear/tire (50% of cases)

Flight Crew Errors (relating to...)

60% Manual handling/flight controls

33% SOP adherence/cross-verification: intentional non-compliance

13% Failure to go-around after destabilization on approach

Undesired Aircraft States (UAS)

47% Long/floated/bounced/firm/off-center/crabbed landing

27% Vertical/lateral/speed deviation

27% Operation outside aircraft limitations

20% Unstable approach

13% Continued landing after unstable approach

Correlations of Interest 2008-2012

86% of accidents that were related to contaminated runways/taxiways also noted weak regulatory oversight.

Poor overall crew performance was a factor in **50%** of all runway/taxiway excursions.

The lack of a precision approach was a factor in **42%** of events where SOP adherence/cross-verification: intentional non-compliance was noted.

Note: 1 accident was not classified due to insufficient data; this accident was removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

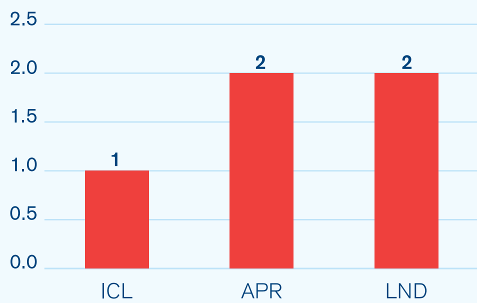
Commonwealth of Independent States (CIS)

5 Accidents

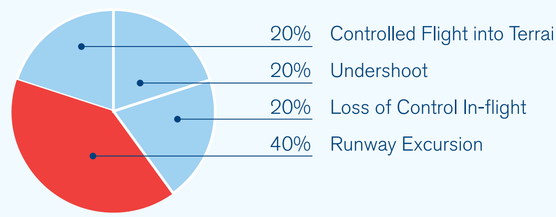
IATA Members	**20%**
Hull Losses	**100%**
Fatal	**80%**

60% Passenger | **20%** Cargo | **20%** Ferry | **40%** Jet | **60%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

Regulatory oversight **(3 cases)**

Safety management **(3 cases)**

Technology & equipment **(1 case)**

Threats

Environmental

Meterology **(2 cases)**

- Icing conditions **(1 case)**
- Wind / wind shear/gusty wind **(1 case)**

Airline

None noted.

Flight Crew Errors (relating to...)

SOP adherence/SOP cross-verification **(2 cases)**

- Intentional non-compliance **(1 case)**
- Unintentional non-compliance **(1 case)**

Undesired Aircraft States (UAS)

None noted.

Correlations of Interest 2008-2012

All of the Controlled Flight Into Terrain accidents cited a deficiency in regulatory oversight.

Safety management and meteorology were each factors in **75%** of loss of control in-flight accidents.

Inadequate technology and equipment was a factor in **83%** of controlled flight into terrain accidents.

Note: 2 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

Europe

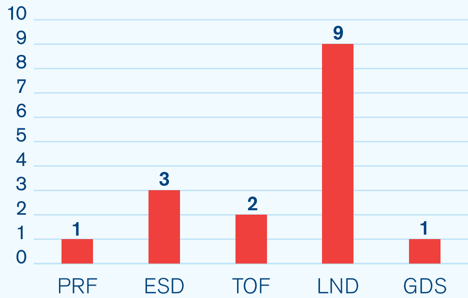
16 Accidents

IATA Members	38%
Hull Losses	13%
Fatal	0%

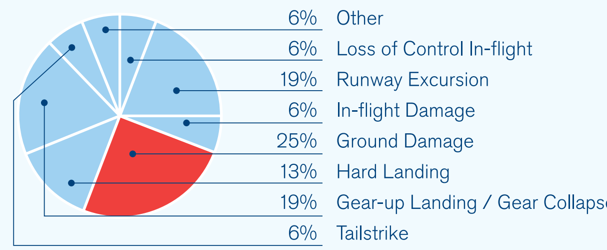
88% Passenger | **6%** Cargo | **6%** Ferry | **50%** Jet | **50%** Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

7% Flight ops: Training systems

7% Ground ops: Training systems

7% Maintenance ops: SOPs & checking

7% Regulatory oversight

7% Safety management

7% Technology & equipment

Threats

Environmental

21% Meteorology:
- wind/windshear/gusty wind (67% of cases)
- Poor visibility (33% of cases)

14% Contaminated runways/taxiways

Airline

21% Ground events

21% Aircraft malfunction
- Gear/tire (67% of cases)
- Contained engine failure/powerplant malfunction (33% of cases)
- Fire/smoke (cockpit/cabin/cargo) (33% of cases)

14% Maintenance events

Flight Crew Errors (relating to...)

36% SOP adherence/SOP cross-verification
- Intentional non-compliance (60% of these cases)
- Unintentional non-compliance (40% of these cases)

21% Manual handling/flight controls

Undesired Aircraft States (UAS)

21% Long, floated, bounced, firm, off-centerline or crabbed landing

14% Loss of aircraft control while on the ground

14% Operation outside of aircraft limitations

Correlations of Interest 2008-2012

Only **5%** of accidents were fatal.

Meteorological threats were cited as a factor in **52%** of landing accidents that involved errors in manual handling of flight controls.

Deficient training of flight crews was noted in **60%** of cases where more effective monitoring or cross checking by the flight crew could have prevented the accident.

Note: 2 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

Latin America & the Caribbean

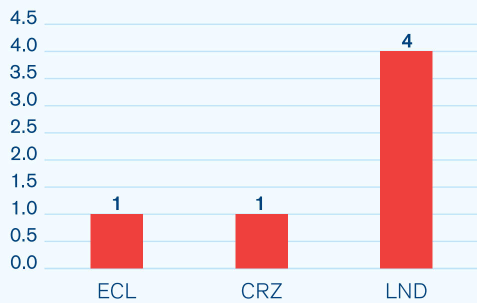
6 Accidents

IATA Members	0%
Hull Losses	50%
Fatal	33%

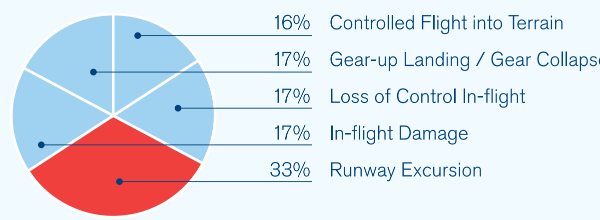
5

67% Passenger | 33% Cargo | 0% Ferry | 33% Jet | 67% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

25% Maintenance operations:

- Maintenance ops: SOPs & checking (100% of cases)
- Maintenance ops: training systems (100% of cases)

25% Safety management

Threats

Environmental

25% Airport facilities:

- Contaminated runway/taxiway – poor braking action

25% Ground-based nav aids malfunctioning or not available

Airline

50% Aircraft malfunction:

- Brakes (50% of cases)
- Gear/tire (50% of cases)

Flight Crew Errors (relating to...)

None noted.

Undesired Aircraft States (UAS)

25% Unstable approach

25% Vertical/lateral/speed deviation

25% Continued landing after unstable approach

25% Long/floated/bounced/firm/off-center/crabbed landing

25% Loss of aircraft control while on the ground

Correlations of Interest 2008-2012

The lack of a precision approach was cited in 28% of hull loss accidents, **38%** of hull losses involved deviations from SOPs.

26% of accidents were runway excursions; **47%** of these involved aircraft malfunctions and **40%** involved long, floated, bounced, firm or off-centerline landings.

Loss of control in-flight represented **53%** of all fatal accidents; of these **89%** were turboprop aircraft.

Note: 2 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

Middle East & North Africa

3 Accidents

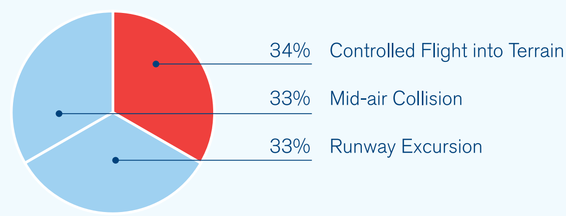
IATA Members	33%
Hull Losses	67%
Fatal	33%

5

100% Passenger	0% Cargo	0% Ferry	33% Jet	67% Turboprop

Accidents per Phase of Flight*

Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

Regulatory oversight **(1 case)**

Safety management **(1 case)**

Technology & equipment **(1 case)**

Threats

Environmental

Air traffic services **(1 case)**

Poor/faint marking/signs or runway/taxiway closure **(1 case)**

Ground-based nav aid malfunction or not available **(1 case)**

Traffic **(1 case)**

Meteorology:

- Poor visibility/IMC **(1 case)**
- Lack of visual reference **(1 case)**

Airline

None noted.

Flight Crew Errors (relating to...)

Manual handling/flight controls **(1 case)**

Undesired Aircraft States (UAS)

Controlled flight towards terrain **(1 case)**

Correlations of Interest 2008-2012

In **56%** of runway excursions deficiencies with airport facilities are cited as factor.

43% of Loss of Control In-flight accidents noted intentional violation of SOPs or inadequate cross checking by flight crews as a factor.

Manual Handling/Flight Controls were noted in **57%** of all accidents that occurred during landing. Of these **75%** also involved a long, floated, bounced, firm or off centerline landing.

**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

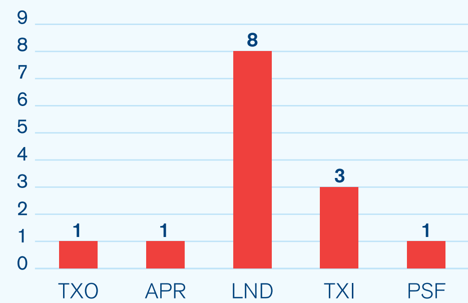
North America

14 Accidents

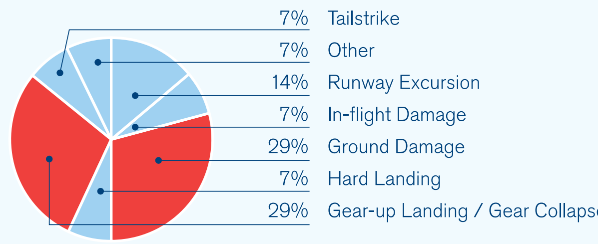
IATA Members	**0%**
Hull Losses	**21%**
Fatal	**7%**

64% Passenger · **36%** Cargo · **0%** Ferry · **21%** Jet · **79%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

8% Regulatory oversight

8% Change management

8% Flight operations: training systems

Threats

Environmental

23% Airport facilities

- Contaminated runway/taxiway or poor breaking action (67% of these cases)
- Inadequate overrun area/trench/ditch/proximity of structures (33% of these cases)

15% Meteorology:

- Wind/windshear/gusty wind (50% of these cases)
- Poor visibility/IMC (50% of these cases)

Airline

23% Grounds events

8% Aircraft malfunction: Gear/tire

Flight Crew Errors (relating to...)

15% Manual handling/flight controls

8% Crew to external communication: ground crew

Undesired Aircraft States (UAS)

15% Long/floated/bounced/firm/off-center/crabbed landing

8% Vertical/lateral/speed deviation

Correlations of Interest 2008-2012

In **73%** of accidents related to overall crew performance, errors in manual handling of flight controls and SOP adherence or SOP cross-verification were each noted to be contributing factors.

Note: 1 accident was not classified due to insufficient data; this accident was removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

North Asia

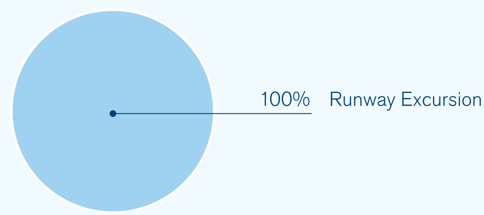
2 Accidents

IATA Members	**0%**
Hull Losses	**50%**
Fatal	**0%**

100% Passenger | **0%** Cargo | **0%** Ferry | **50%** Jet | **50%** Turboprop

Accidents per Phase of Flight*

Breakdown per Accident Category



Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

Safety management **(1 case)**

Threats

Environmental

Wind/wind shear/gusty wind **(1 case)**

Contaminated runway/taxiway **(1 case)**

Airline

None noted.

Flight Crew Errors (relating to...)

Manual handling/flight controls **(1 case)**

Briefings (1 case)

Undesired Aircraft States (UAS)

Unstable approach **(1 case)**

Long/floated/bounced/firm/off-center/crabbed landing

(1 case)

Loss of aircraft control while on the ground **(1 case)**

Brakes/thrust reversers/ground spoilers **(1 case)**

Correlations of Interest 2008-2012

Only **8%** of all accidents were fatal and **23%** of all accidents were tailstrikes.

**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

5

REGIONAL TREND ANALYSIS

Accidents Overview (2008-2012)

	Africa	Asia/Pacific	Commonwealth of Independent States (CIS)	Europe	Latin America & the Caribbean	Middle East & North Africa	North America	North Asia
2012	13	16	5	16	6	3	14	2
2011	8	13	13	15	15	8	17	3
2010	18	12	9	12	12	10	18	3
2009	15	15	2	17	10	14	14	3
2008	8	17	11	17	19	10	25	2

Image courtesy of Boeing

Section 6

6

Analysis of Cargo Aircraft Accidents

YEAR 2012 CARGO OPERATOR REVIEW

Cargo vs. Passenger Operations for Western-built Jet Aircraft

	Fleet Size End of 2012	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	1,820	1	0.55	2	3	1.65
Passenger	18,538	5	0.27	18	23	1.24
Total	20,358	6	0.29	20	26	1.28

HL = Hull Loss   SD = Substantial Damage

Note: Fleet Size includes both in-service or 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 Western-built Turboprop Aircraft

	Fleet Size End of 2012	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	990	4	4.04	2	6	6.06
Passenger	3,106	11	3.54	18	29	9.34
Total	4,096	15	3.66	20	35	8.54

HL = Hull Loss   SD = Substantial Damage

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

Cargo Aircraft Accidents

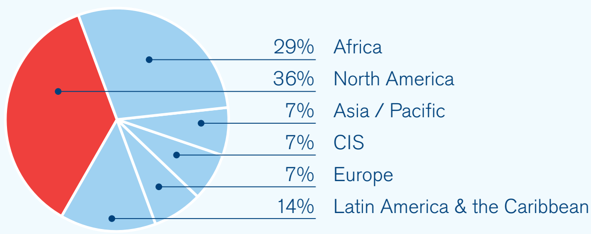
14 Accidents

29% Jet

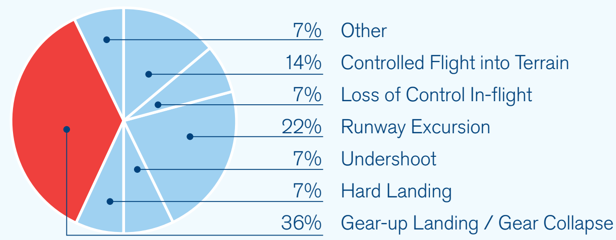
71% Turboprop

IATA Members	7%
Hull Losses	71%
Fatal	29%

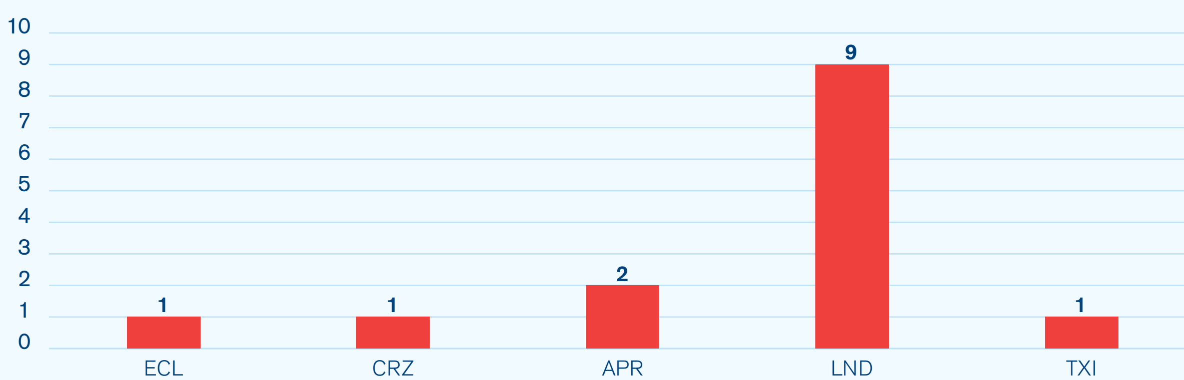
Accidents per Operator Region
(raw numbers)



Breakdown per Accident Category



Accidents per Phase of Flight*



6

Cargo Aircraft Accidents
Continued

Top Contributing Factors 2012**

Latent Conditions (deficiencies in...)

14% Regulatory oversight

14% Safety management

14% Maintenance operations: SOPs & checking

Threats

Environmental

29% Airport facilities

- Contaminated runway/taxiway – poor braking action (50% of these cases)
- Inadequate overrun area/trench/ditch/prox of structures (50% of these cases)

29% Meteorology

- Wind/wind shear/gusty wind (50% of these cases)
- Thunderstorms (50% of these cases)

Airline

29% Aircraft malfunction: Gear/tire

14% Maintenance events

Flight Crew Errors (relating to...)

None noted.

Undesired Aircraft States (UAS)

14% Vertical/lateral/speed deviation

14% Unnecessary weather penetration

14% Continued landing after unstable approach

14% Long/floated/bounced/firm/off-center/crabbed landing

14% Loss of aircraft control while on the ground

Correlations of Interest 2008-2012

28% of cargo accidents resulting in a hull loss also noted deficiencies in the airline's safety management.

40% of landing accidents by cargo jet aircraft followed a long, floated, bounced, firm or off-centerline landing.

Note: 7 accidents were not classified due to insufficient data; these accidents were removed from the count for the contributing factors and correlations of interest.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

"Runway excursion was the most frequent type of accident in 2012."

Section 7

7

Cabin Safety

CABIN SAFETY SECTION

IATA is reintroducing the Cabin Safety section to the 2012 report; this section highlights accidents that had a cabin safety element. It is important to note that only those events that were related to accidents, according to the IATA definition of an accident in Annex 1 of this report are included in this analysis.

The following definitions apply to the events in this section:

Evacuation: Passengers and/or crew evacuate aircraft via escape slides, doors, emergency exits, or gaps in fuselage, usually initiated in life threatening or catastrophic events.

Rapid Deplaning: Passengers and/or crew rapidly exit aircraft via boarding doors and via jet bridge or stairs, for precautionary measures.

SUMMARY OF FINDINGS

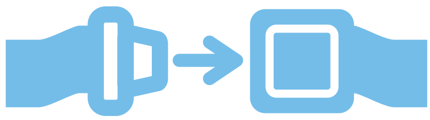
Out of the 75 total accidents in 2012, 34 contained a cabin safety dimension:

- 74% of these accidents occurred during the landing phase
- 68% of these accidents occurred on turboprop aircraft
- 47% of these accidents resulted in a hull loss
- 32% of these accidents occurred on jet aircraft
- 15% of these accidents involved IATA members
- 15% of these accidents resulted in fatalities

In terms of cabin-related events, the breakdown is as follows:

- The predominant cabin-related event was evacuation, which accounted for 94% of all cabin-related events
- One accident involved a ditching
- One accident involved a rapid deplaning

7



Year 2012 Cabin Safety Related Accidents

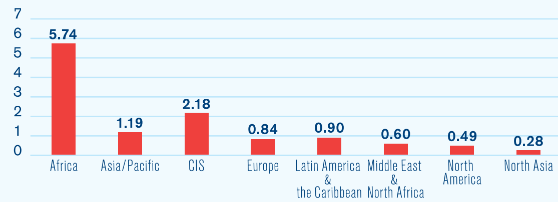
34 Accidents

IATA Members	15%
Hull Losses	47%
Fatal	15%
Accident Rate*	0.91

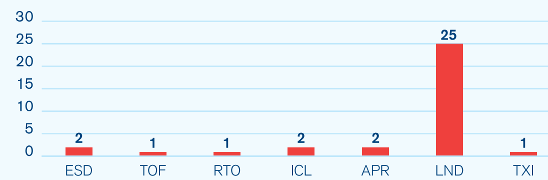
32% Jet

68% Turboprop

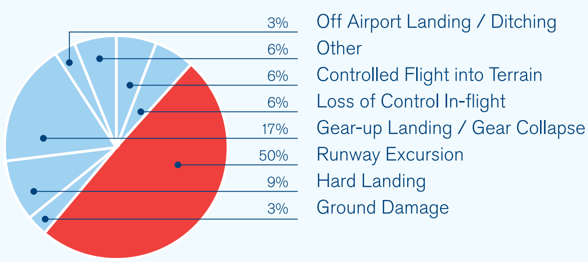
Accident Rates per Operator Region*



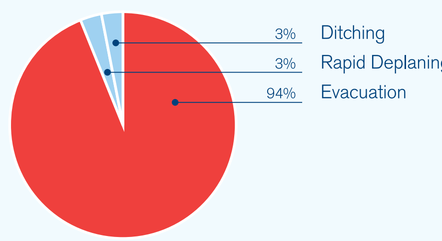
Accidents per Phase of Flight**



Breakdown per Accident Category

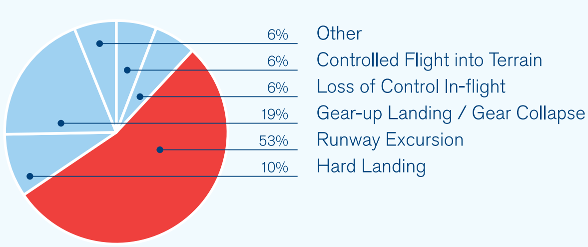


Accidents per Additional Categories

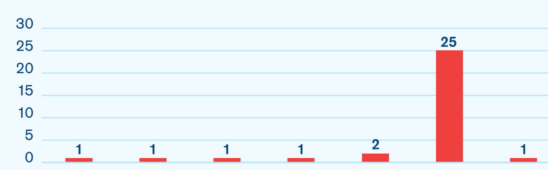


Focus on Evacuations

Breakdown per Accident Category



Accidents per Phase of Flight**



Note: 6 accidents were not classified due to insufficient data.
**Accidents per million sectors flown for all aircraft types*
***See Annex 1 for "Phase of Flight" definitions*

FOCUS ON EVACUATIONS

Evacuation was the predominant category of cabin events related to accidents during 2012. Correlations of interest related to this category include:

- In the majority (85%) of the evacuations following an accident, all of the occupants survived. However, in nearly half (47%) of these accidents, the aircraft was either destroyed or damaged beyond repair (hull loss).
- Nearly half (42%) of evacuations cited a contaminated runway/taxiway and resulting poor braking action as an environmental threat related to the occurrence. Approximately one third (31%) of evacuations cited weak safety management on the part of the operator as a relevant latent condition.
- Over half of evacuations (53%) were initiated following a runway excursion. Another 19% of evacuations resulted from gear up landings/gear collapses. More than a third (35%) of accidents involving an evacuation were preceded by a long/floated/bounced/firm/off-center/crabbed landing. Furthermore, (35%) of aircraft accidents that resulted in an evacuation involved a flight crew error related to manual handling/flight controls.
- Only a small percentage (13%) of evacuations involved IATA member airlines.

CABIN SAFETY

Cabin safety is a key area which impacts on operational safety. Historically, the role of cabin crew was seen as limited to evacuations in a post-accident scenario. Although this remains an essential duty of cabin crew, today the role of cabin crew goes beyond passenger evacuations. Cabin safety deals with all activities that cabin crew must accomplish during the operation of an aircraft to maintain safety in the cabin. Cabin crew contribute to safe, effective, and efficient operations in normal, abnormal and emergency situations. As demonstrated in numerous events, Cabin Crew play an important role in preventing serious incidents and accidents, including (but not limited to) events such as in-flight fires, unruly passengers or decompressions.

It is for this reason that IATA focuses on cabin safety and continues to develop standards, procedures and best practices to ensure safety in all aspects of cabin operations. IATA works with airlines, manufacturers and other industry partners in raising standards and implementing best practices.

Cabin safety is a critical component of aviation safety as is an airline's safety management program which includes proactive data collection and the ensuing prevention activities regarding:

- Cabin design and operation
- Equipment
- Procedures
- Crew training
- Human performance
- Passenger management

IATA seeks to continuously contribute to the reduction of incidents/accidents, and costs associated with ensuring the safe operation of commercial aircraft. This is achieved through the:

- Development and promotion of recommended practices for the industry
- Analysis of worldwide trends and the initiative of corrective actions
- Establishment of Cabin Operations Safety Toolkits which offer tangible solutions
- Cooperation with aircraft manufacturers in developing technical installations, equipment and design
- Organization of conferences and workshops to bring together a broad group of experts and stakeholders

IATA CABIN SAFETY INITIATIVES IN 2012

During 2012, IATA worked on specific issues of concern to the Industry in terms of cabin safety, such as:

Cabin Safety Guidelines

- Unruly passenger prevention and management
- Handling dangerous goods incidents and lithium battery fires in the passenger cabin
- Electronic cigarettes
- Mitigating a laser illumination in the passenger cabin
- Turbulence management (enhanced guidelines)
- Inadvertent slide deployment prevention (enhanced guidelines)

These guidelines are available at: www.iata.org/cabin-safety

Health and Safety Guidelines - Passengers and Crew

IATA also drafts guidelines specific to the health and safety of passengers and crew. The latest guidelines that were drafted in 2012 and early 2013 include:

- Death on board
- Person emitting radiation: Transport of a person who is, or may be, emitting radiation
- Insulin-treated diabetes: For assessment of fitness to work as Cabin Crew
- Suspected communicable disease - General guidelines for Cabin Crew
- Procedures for suspected food poisoning on board
- Seizure disorders: Guidelines for assessment of fitness to work as Cabin Crew

They are available at: www.iata.org/health

7

IOSA CABIN OPERATIONS

The IATA Operational Safety Audit (IOSA) manual contains a section dedicated to cabin operations which addresses key elements of cabin safety. IOSA includes standards for:

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

For more information on IOSA and to download the latest version of the IOSA Standards Manual, which includes the cabin operations standards and recommended practices, please go to: www.iata.org/iosa

CABIN OPERATIONS SAFETY TOOLKITS

IATA member airlines expressed the need to target areas in order to improve safety and efficiency in cabin operations: cabin crew and passenger turbulence-related injuries, medical emergencies and inadvertent slide deployments. These issues pose a safety risk and cost the airline industry millions of dollars every year.

To help the industry, IATA developed the Cabin Operations Safety Toolkits.

- Turbulence management toolkit (Edition3/2010)
- Inadvertent slide deployment prevention toolkit (Edition3/2010)
- Medical emergencies toolkit (Edition2/2010)

These toolkits contain information, derived from the input of safety experts from IATA member airlines, manufacturers and industry associations. They include: training material, procedures, incident analysis and other useful tools to assist airlines target these issues.

For information on how to order the toolkit or to view current guidance material please go to: www.iata.org/cabin-safety

Global Safety Information Center: A key driver for safety improvements is data and information sharing. The Global Safety Information Center (GSIC) was created to enable IATA member airlines and other authorized users to access multiple sources of industry safety data. GSIC Cabin Safety will provide a vast range of cabin safety materials, which will continue to evolve over time. For more information please go to: www.iata.org/gsic

Section 8

Five Year Review

IATA is introducing a five year review section to the 2012 report. This section looks beyond the traditional one year focus to look for trends over the five year period from 2008 to 2012. It is designed to give an overview of critical accident categories and to allow for a better understanding of the accidents in each IATA region. Data presented here is based on the best knowledge of the industry at the time of the classification.

Image courtesy of Bombardier

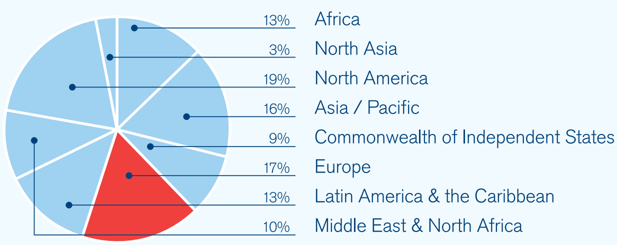
2008 - 2012 Aircraft Accidents

460 Accidents

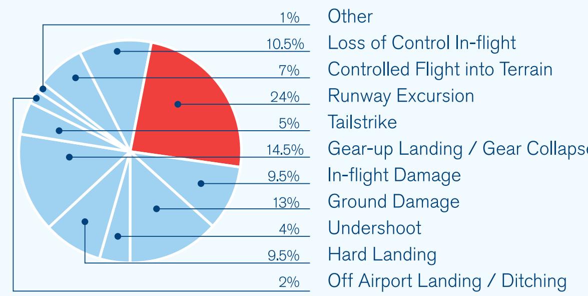
IATA Members	**29%**
Hull Losses	**44%**
Fatal	**22%**

75% Passenger | **22%** Cargo | **3%** Ferry | **58%** Jet | **42%** Turboprop

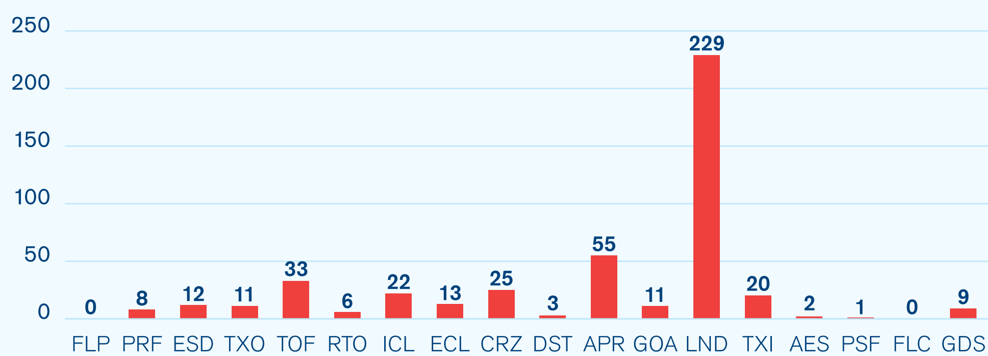
Accidents per Operator Region



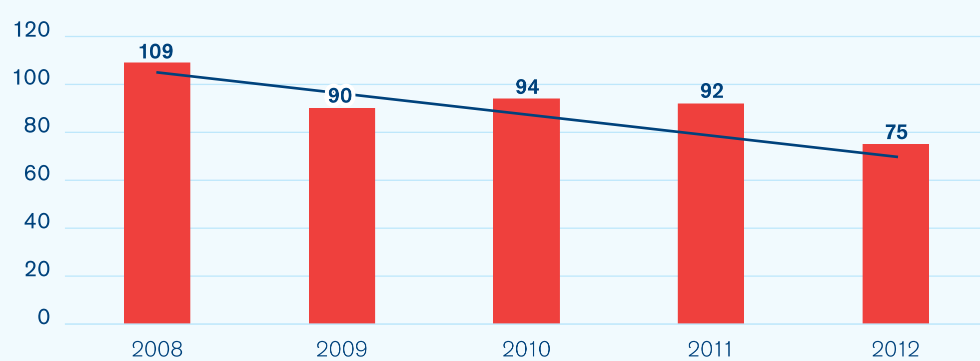
Breakdown per Accident Category



Accidents per Phase of Flight*



Accident Breakdown per Year

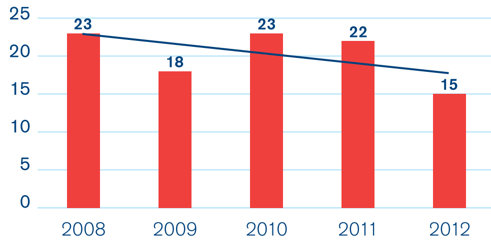


FIVE YEAR REVIEW
FATAL ACCIDENT CATEGORY TRENDS

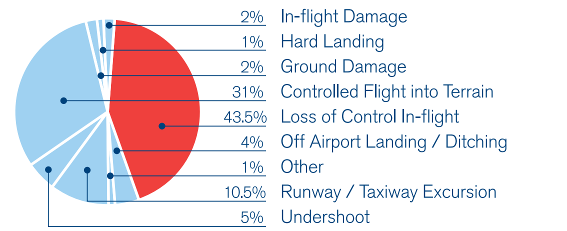
8

Fatal Accident Analysis – **101 Total Fatal Accidents**

Fatal Accident Breakdown per Year

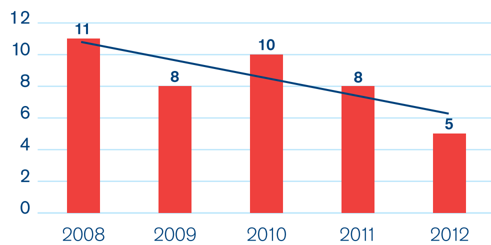


Breakdown by Accident Category

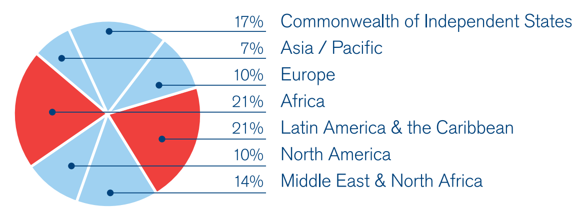


Loss of Control In-flight – **42 Fatal Accidents**

Accident Breakdown per Year

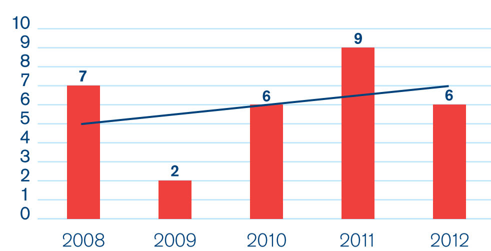


Breakdown per Region

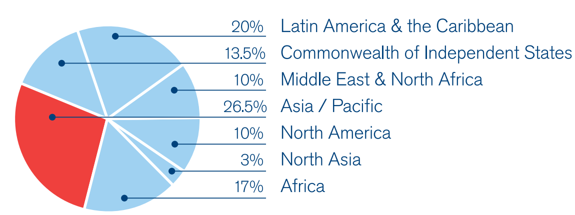


Controlled Flight into Terrain – **30 Fatal Accidents**

Accident Breakdown per Year

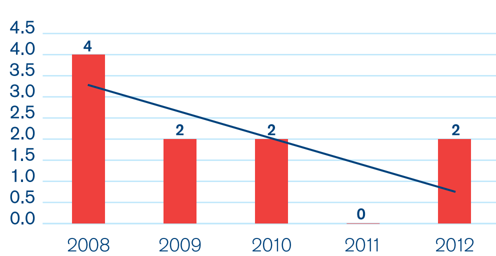


Breakdown per Region

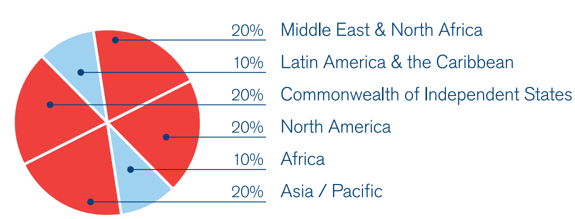


Runway Excursion – **10 Fatal Accidents**

Accident Breakdown per Year



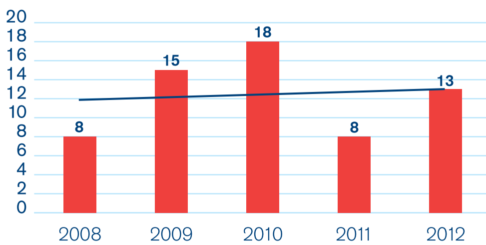
Breakdown per Region



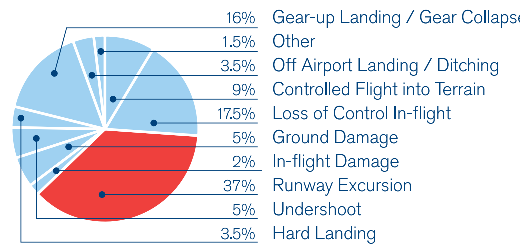
FIVE YEAR REVIEW
REGIONAL TRENDS

AFI – 62 Total Accidents

Accident Breakdown per Year



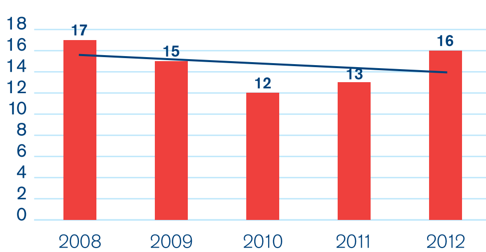
Accident Category



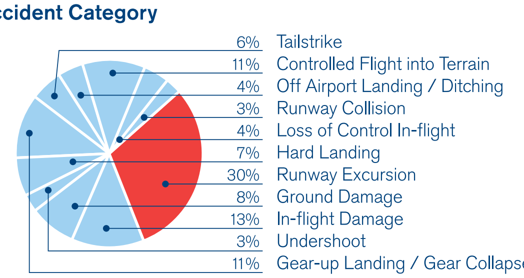
Note: 5 accidents could not be assigned an accident category due to insufficient information.

ASPAC – 73 Total Accidents

Accident Breakdown per Year



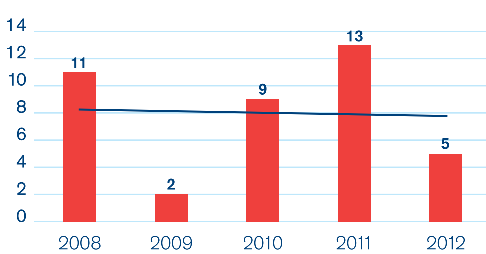
Accident Category



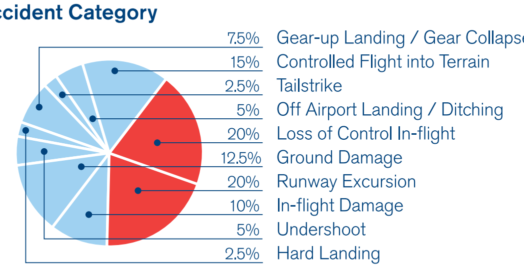
Note: 1 Accident could not be assigned an accident category due to lack of information.

CIS – 40 Total Accidents

Accident Breakdown per Year

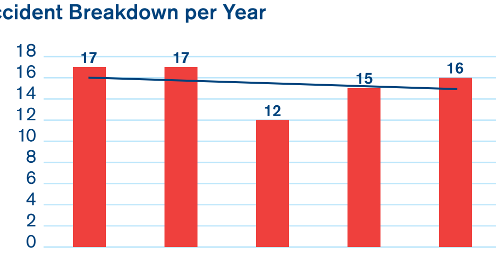


Accident Category

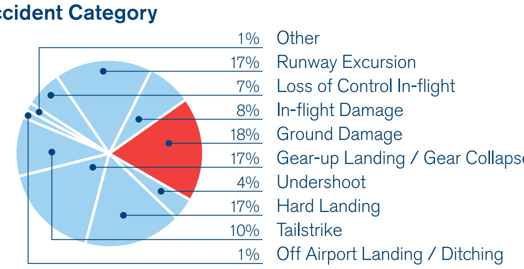


EUR – 77 Total Accidents

Accident Breakdown per Year



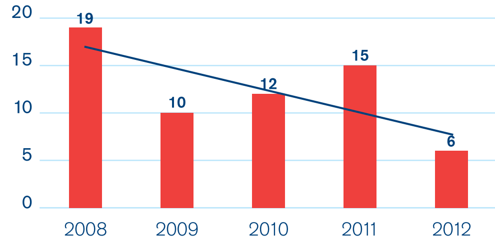
Accident Category



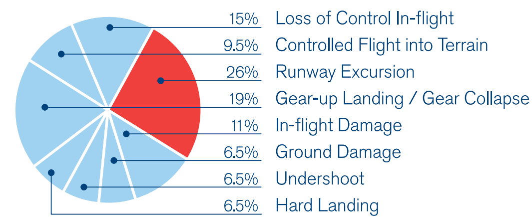
FIVE YEAR REVIEW
REGIONAL TRENDS

LATAM – **62 Total Accidents**

Accident Breakdown per Year

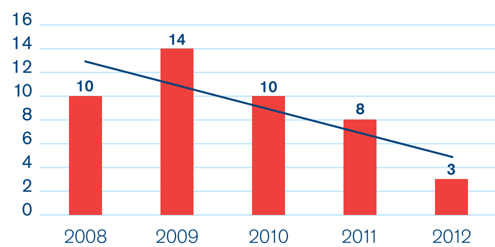


Accident Category

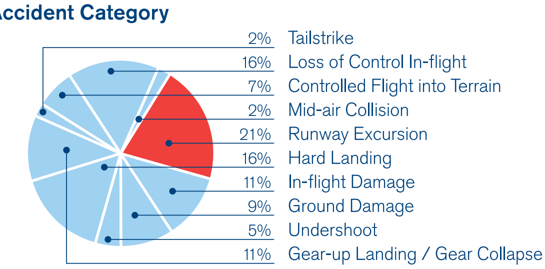


MENA – **45 Total Accidents**

Accident Breakdown per Year



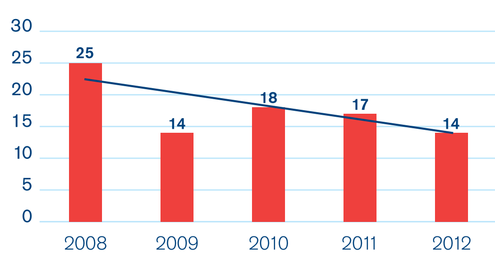
Accident Category



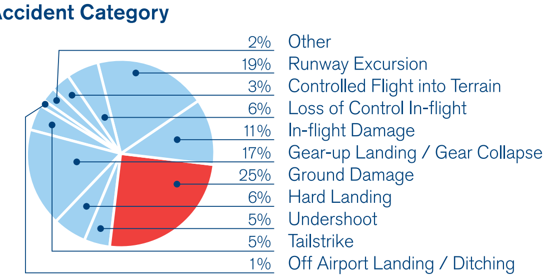
Note: 1 Accident could not be assigned an accident category due to lack of information.

NAM – **88 Total Accidents**

Accident Breakdown per Year

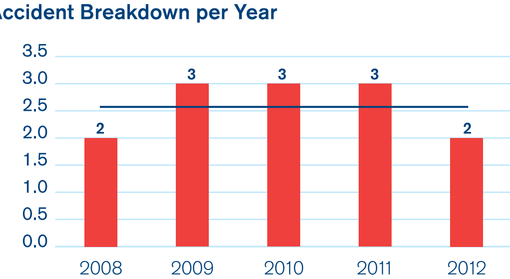


Accident Category

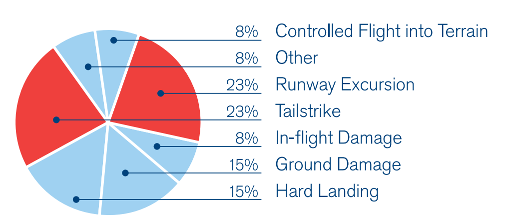


NASIA – **13 Total Accidents**

Accident Breakdown per Year



Accident Category



“Increasingly automated flight decks have proven to be both a contributor to a better safety performance as well as a new factor in accidents.”

Section 9

Report Findings and IATA Prevention Strategies

9

TOP FINDINGS

- 75 accidents in 2012: 17% involved IATA members
- 20% of all accidents were fatal
- 77% involved passenger aircraft, 19% involved cargo aircraft and 4% involved ferry flights
- 39% on jet aircraft and 61% on turboprops
- 43% of accidents resulted in a hull loss and 57% in substantial damage
- 53% of the accidents occurred during landing

	Top 3 Contributing Factors
Latent conditions (deficiencies in...)	1. Regulatory oversight 2. Safety management 3. Flight Operations: Training Systems
Threats	1. Meteorology 2. Airport Facilities 3. Aircraft malfunction
Flight crew errors relating to latent conditions (deficiencies in...)…	1. Manual handling/ flight controls 2. SOP adherence/ cross-verification 3. Failure to go-around after destabilized approach
Undesired aircraft states	1. Long, floated, bounced, firm, off-centerline or crabbed landing 2. Operation outside of aircraft limitations 3. Vertical, lateral or speed deviation
End states	1. Runway excursion 2. Gear-up landing/gear collapse 3. Ground damage

PROPOSED COUNTERMEASURES

Every year, the ACTF 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 particular country, or involve performance of front line personnel, such as pilots or ground personnel. They are valid for accidents involving both Eastern and Western-built jet and turboprop aircraft.

Based on the statistical analysis, this section presents some countermeasures that can help airlines enhance safety, in line with the ACTF analysis of all accidents in 2012.

The following tables present the top five countermeasures, which should be addressed along with a brief description for each.

The last column of each table presents the percentage of accidents where countermeasures could have been effective, according to the analysis conducted by the ACTF.

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 the airline operation or state's oversight activities
- Another set of countermeasures are aimed at flight crew, to help them manage threats or their own errors during operations

Countermeasures for other areas, such as ATC, ground crew, cabin crew or maintenance staff, are important but are not considered at this time.

9

Countermeasures for the Operator and the State

Subject	Description	% of accidents where countermeasures could have been effective
Overall crew performance	Overall, crew members should perform well as risk managers. Includes flight, cabin, ground crew as well as their interactions with ATC.	**31%**
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	**21%**
Safety management (Operator)	The operator should implement a safety management system 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	**21%**
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.	**11%**
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.	**8%**

Countermeasures for the Flight Crews

Subject	Description	% of accidents where countermeasures could have been effective
Contingency management	Crew members should develop effective strategies to manage threats to safety.	**11%**
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.	**11%**

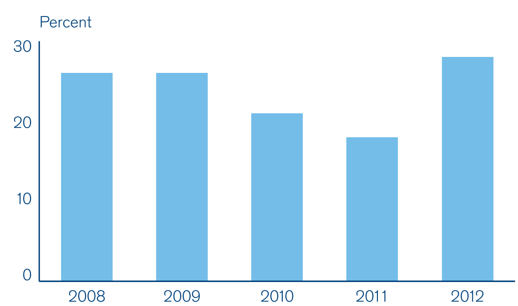
ACTF DISCUSSION & STRATEGIES

9

Runway Excursions

Background:

For the fifth year running runway excursions are the most frequent type of accident; this year they represented 21 accidents out of 75, or 28% of all accidents in 2012. The graph below indicates the percentage of accidents classified as runway excursion over the previous five years. In this context, runway excursions include landing overruns, takeoff overruns, landing veer-offs, takeoff veer-offs and taxiway excursions that meet the IATA definition of an accident. It is worth noting that not all runway excursions meet this definition, therefore other studies that include serious incident will indicate a higher number of events.



Runway Excursions

Eighty-four percent of runway excursions occurred during the landing phase. There are many factors that were noted to have contributed to runway excursions in the last five years, from 2008 to 2012. Long, floated or bounced landings were noted in 38% of all landing-related runway excursion accidents during this period. Known or suspected unstable approaches were a factor for 18% of landing-related runway excursions, indicating that a large majority of these events are occurring after stable approaches. Errors in the manual handling of the aircraft were noted to have contributed to 47% of excursions.

External threats are also a factor that should be noted. Contamination of runways, such as that resulting from standing water, ice or rubber deposits, contributed to 33% of all runway excursions. High or gusty winds and crosswinds were noted as a factor in 20% of accidents. This can include cases where incorrect wind information is communicated to the flight crew. Given the fact that the occurrence rates of aircraft flying unstable approach or landing on contaminated runways are quite low, the proportion of runway excursions from those precursors is high.

While there was a correlation between runway excursions and wet or contaminated runways there is also need for flight crews to be conscious of the risk of excursion even in favorable conditions. Sixty-eight percent of the excursions occurred in dry runway conditions. This underscores the need for crews to be vigilant at this stage of flight, regardless of the runway conditions.

Discussion:

Runway excursions are an issue worldwide and many organizations are working to understand the causes of these events and develop prevention strategies. The European Commercial Aviation Safety Team (ECAST) has released a final draft of a study ‘Risk Factors and Safety Initiatives’ (draft version December 2011, published by ECAST). The main conclusions support the analysis done by the Accident Classification Task Force (ACTF), noting that wet or contaminated runways, long landings, and the presence of significant cross wind were the top contributors to runway excursions. The data sets used for the two analyses differ in that the IATA ACTF only uses accidents that resulted in a hull loss or substantial damage and analyzes data on an annual basis, while the above-mentioned study considered the period from 2004 until 2009. An overrun that does not meet IATA ACTF criteria will not be considered. As a result, the IATA numbers are significantly lower but they do provide insight about the number of high risk excursions.

The NLR Air Transport Safety Institute released a report in 2011 year on the causes of long landings, a major contributor to runway excursions, titled ‘Landing Long: Why does it happen?’. The report, which studied flight data and video recordings of landings found correlation between aircraft flying too high and too fast on approach as well as the selection of a runway exit far along the runway with long landings. The study found that there was no strong correlation with the runway length, noting that long landings occur as frequently on short runways as they do on long.

The FAA’s Take-off and Landing Performance Assessment (TALPA) ARC developed a runway condition matrix in October of 2010 to estimate the braking action during various runway contamination scenarios. Manufacturers are integrating this matrix in their documentation for new aircraft to improve pilot decision making on runway conditions and required stopping distance. Implementation of the principles of the standardized reporting has yet to be completed at all airports and AIS facilities.

ATC can be a major contributor to destabilized approaches due to excessive speed restrictions on landings. This is further exacerbated by crews who habitually accept ATC instructions rather than refusing unacceptable instructions or requesting alternative instructions.

Airlines can better use Flight Data Analysis (FDA) programs to understand the root causes of unstable approaches:

- FDA can help the airline determine correlations of interest between unstable approaches and specific airports (e.g., ATC restrictions), individual pilots, specific fleets, etc.
- Personal FDA debriefs (on the request) of a crew member should be encouraged

For details concerning the various types of FDA programs that an operator can implement, please refer to the ACTF Discussion of FDA Programs document included in the accompanying CD-ROM.

Airlines should address not only unstable approaches but also destabilization after being stabilized, especially at low altitude (below MDA/DH) and consequently go-arounds / rejected landings:

- Being stable at 500 feet does not guarantee that the landing will occur -– a go-around may still be necessary

Auto-land and other automation tools only work within certain limitations which need to be well understood by the crew.

Recommendations to Operators:

These highlights could work as defenses for avoiding runway excursions:

1. Landing in the touchdown zone
2. Defining the aiming point as the target
3. Parameters of stable approach based on the manufacturer information
4. Deviation call outs by the PM
5. Rejected landings

Stable approaches are the first defense against runway excursions. The final, more important, defense is landing in the touchdown zone.

Airlines are recommended to modify their approach procedures to call out "STABILIZED" or "NOT STABILIZED" at a given point on the approach to ensure that a timely go-around is carried out when necessary. This type of callout is especially useful in situations where a high crew social gradient (social power distance from a new or unassertive first officer to a domineering or challenging captain) conditions exist. Note: some companies prefer the use of the callout "GO AROUND" if stabilization criteria are not met at their respective gates. Bear in mind that, even when stabilization criteria are met at certain points, destabilization can require a go-around at any time. In this context, a "no fault" go-around policy would help crews be more confident about making the decision to go-around if necessary.

Airlines are encouraged to set windows in the approach at specific points (e.g. "Plan to be at X feet and Y knots at point Z"). This is especially useful at airports with special approaches. Brief key points in each window and how it is different from the standard approach procedure.

Pilots should make an early decision to use maximum available braking capability of the aircraft whenever the landing performance is compromised, seems to be compromised or any doubt exists that the aircraft can be stopped on the runway. In this context, pilots should also be mindful of what is called 'procedural memory'. It is recommended that training departments address the issue. It should be noted that the late application of reverse thrust is less effective than early application on account of the time required for the engines to spool up and produce maximum thrust.

Investigate technology to help crews determine the actual touchdown point and estimate the point where the aircraft is expected to stop. Various manufacturers offer or are developing these systems, information has been included in the Safety Manager Toolkit on the CD-ROM. Work is ongoing to enhance runway remaining displays on both HUD displays and PFD panels. We should monitor the validity of predicted stopping indicators especially in situations of contaminated surfaces or less than optimum performance of brakes, spoilers, and thrust reversers. While a display can give a prediction based upon deceleration rate, it cannot anticipate changes of surface friction that will result in actual performance that is less than that predicted.

Operators are advised to conduct a field survey to determine the actual landing distances (and take-off distances) in comparison to their predicted (calculated) values. Consideration for runway conditions at the time of the survey should also be incorporated. This data may also be obtainable from the operator's FDA program.

Operators should encourage flight crews / dispatchers to calculate stopping distances on every landing using charts/ tools etc. as recommended by the NTSB and described by the FAA in their Safety Alert for Operators (SAFO) 06012, and understand and build margins to these numbers.

Operators are encouraged to set a safety focus where actual takeoff/landing distances are compared with calculated takeoff / landing distance to give pilots a feel on how big a bias there is between data from the manufacturer and the average pilot. For example, if the calculation shows a stop margin of XX meters at V1, then use FODA data and compare what the actual stop margin at V1 at this particular flight really was.

Recommendations to Industry:

Technology to assist in landing during severe weather is available but is not widely installed. Airports authorities are encouraged to cooperate with other industry stakeholders to see if a viable safety and business case can be created to install such facilities.

Regulators are encouraged to use RESA (Runway End Safety Area), EMAS (Engineered Material Arrestor System), and similar runway excursion prevention technologies and infrastructure to help reduce the severity of runway excursions. Where these systems are in place, their presence should be communicated to crews such as by indicating them on charts or, possibly, including signage that indicates EMAS ahead. Regulators should also investigate standardizing their runway condition reporting in an effort to simplify the decisions faced by flight crews when determining required runway length for landing. This standardized reporting must be harmonized with the airplane performance information supplied by airplane manufacturers.

Airports are encouraged to improve awareness of the touch-down zone. Borrowing military concepts, such as touch-down zone markings every 1000 feet, can greatly improve a flight crew's situational awareness during landing

Scientific communities are encouraged to evaluate the usefulness of current technologies with regards to accurate and timely measurement of gusty winds and how such information can be quickly relayed to flight crews to increase situational awareness.

Airports should refrain from publishing requirements limiting the use of reverse thrust. This is particularly true at airports with high intensity operations.

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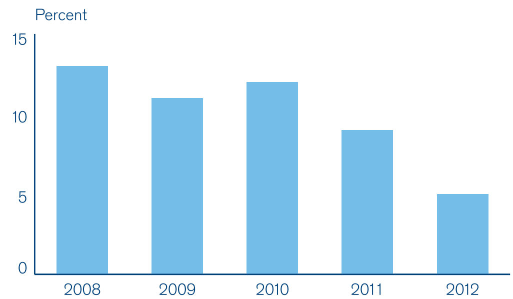
Aircraft Technical Failures and Maintenance Safety

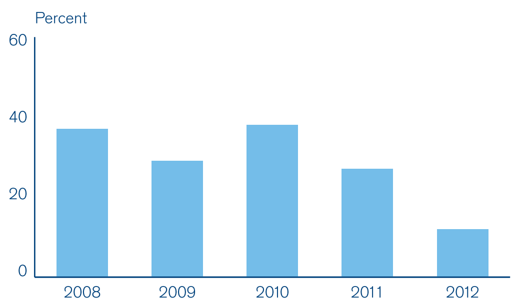
Background:

Data analyzed following the accident classification indicates a marked improvement and a positive trend. However, deficient maintenance practices continue to contribute to accidents. The graphs below indicate the percentage of accidents citing known errors in maintenance operations or technical malfunctions of the aircraft:

- In 2012, four accidents (5%) had maintenance related issues while 12% of accidents cited technical problems.



Maintenance Issues



Technical Problems

Discussion:

Commercial pressures have forced virtually all airlines to outsource at least a portion of their heavy and/or routine maintenance operations.

The capability of any maintenance and repair organization (MRO) chosen to perform an airline's maintenance must match the airline's size (both number of aircraft and number of flights) and their normal maintenance practices.

After a heavy maintenance check, many larger airlines will have a "shakedown cruise" to gauge the quality of work performed by the MRO as well as monitor the short-term reliability (e.g. 30 day) of the aircraft following MRO work. This helps to identify issues to improve overall quality.

In many cases, excess effort and legislation is put into maintaining oversight of the documentation trail, rather than the work physically performed on the aircraft. For example, whoever certifies an aircraft as airworthy must be certificated, however those who perform the work do not necessarily have to possess any credentials.

The concept of inappropriate parts was discussed. This ties into both bogus parts and what are termed as "rogue parts". A rogue part may be written-up in a crew report, however after a clean bench check it is placed back onto the shelf for re-use at a later date. Another interpretation of rogue parts is an old part (sometimes as much as 30 years old) being inappropriately refurbished and then certified. Parts need to be checked for serviceability regardless of age or certification status.

Maintenance configuration control was also discussed. Specifically, are the installed parts in the aircraft supposed to be there according to the documentation? This issue is not limited to older aircraft as recent models can also be affected by similar lapses. There are also anecdotes regarding operations replacing parts as a means to extend MEL periods due to financial constraints.

Maintenance human error continues to be a leading factor in maintenance events, to address these errors the industry needs to identify the root cause of such events, Maintenance Departments should adopt the same safety programs/tools as for Flight Operations. For example, the principles of Crew Resource Management (CRM) for flight operations can be applied to Maintenance Resource Management, Line Oriented Safety Audits (LOSA) can be developed for maintenance and ramp operations, and Fatigue Risk Management Systems (FRMS) can be implemented for Maintenance. All these programs and tools can help identify proactively the root cause of errors so that proper mitigation steps can be taken to prevent these errors from becoming significant events.

Flight crews also have a role in maintenance-related safety. The number and combination of MEL items, combined with other factors (e.g. weather) can lead to degraded safety levels. Also, temporary revisions to procedures are affected depending on the MEL items. Operators are reminded that MELs are meant as a way to legally fly the aircraft to a location where it can be repaired, and not as a maximum time limit on how long the aircraft can remain in service before maintenance must be performed.

Recommendations to Operators:

Check flights or shakedown cruises for a period of time after heavy aircraft maintenance are recommended to verify that the aircraft is operating normally.

The Flight Safety Foundation (FSF) has published a Function Check Flow (FCF) Compendium document; containing information that can be used to reduce the risk of functional check flights. The information contained in the guidance document is generic, and may need to be adjusted to apply to your specific aircraft. This is information only and operators are encouraged to retrieve this material.

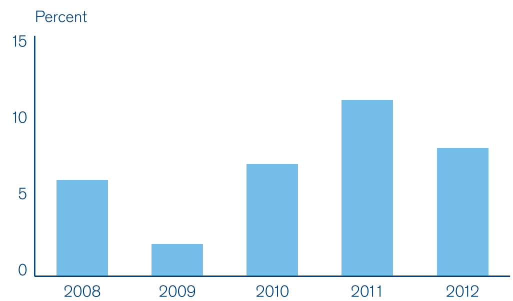
MRO/Airline Maintenance departments should consider a LOSA system for their Maintenance activity.

Encourage crews to write-up maintenance anomalies rather than giving a verbal debrief. This allows for precise tracking of maintenance issues.

Controlled Flight into Terrain

Background:

While the number of Controlled Flight into Terrain (CFIT) accidents was lower in 2012 than in 2011, the percent of the total accident continues to increase. This is despite a large number of aircraft being equipped with safety equipment to prevent them. Six CFIT accidents occurred in 2012; equivalent to 8% of all accidents. The graph below indicated the rates of CFIT over the previous five years.



Controlled Flight into Terrain

In the period from 2008 to 2012, 48% of CFIT accidents were known to involve the lack of a precision approach. There is a very strong correlation between the lack of ILS or state-of-the-art approach procedures, such as performance based navigation (PBN) and CFIT accidents.

Fifty-five percent of aircraft were not equipped with enhanced ground proximity warning systems (EGPWS).

Several accidents in this period involved aircraft that were retrofitted with GPS equipment or crews that used unapproved navigation equipment. With retrofits the navigation source switching can become more complex and an incorrect switch position can be overlooked easily by the crew. In one case an unapproved GPS navigation system was used. The database of the unapproved system used a different geodetic coordinates system so the final approach path was off by more than 100 m.

Discussion:

The lack of precision approaches has been noted as a major contributing factor to CFIT accidents. The implementation of precision approaches or Performance Based Navigation approaches is seen as a method to reduce the risk of CFIT accidents. Where this is impractical, the use of Continuous Angle Non-Precision Approaches (CANPA) can help with the transition from approach to landing by providing a more stable descent profile than traditional "dive and drive" methods used for non-precision approaches.

Some airlines are prohibiting circling approaches in favor of using RNAV or RNP approaches instead. Some airlines discuss the operational impact of circling approaches and perform a risk evaluation. A draft paper from FSF-EAC "Circling Approach Part II – Issues Identified" from 24 January 2011 was reviewed by the ACTF. The study shows that circling approaches have a 25 times higher risk of CFIT compared to straight-in approaches guided by basic navigation only. With vertical guidance the safety margin increases by another 8 times (please refer to the material included on the accompanying CD-ROM).

Forward knowledge of terrain through prior experience does not eliminate the need to adhere to EGPWS warnings. It was predicted that at some point a pilot will ignore a valid EGPWS warning, believing to know their actual position relative to the ground, and that this would lead to a CFIT accident.

Most pilots do not appreciate how close the approaching terrain is when the EGPWS alarm is sounded. There is often little or no visual reference available and a very short time to react. Please refer to the Honeywell video included on the accompanying CD-ROM

Be mindful of operational pressures and manage them properly. Trust the safety equipment provided in the aircraft. Ensure proper QNH settings on early-generation EGPWS units to avoid result in false warnings, that could lead crews to suppress alarms (e.g. placing the system into "TERRAIN" mode). Modern EGPWS systems use GPS altitude to reduce the rate of these instances.

Recommendations to Operators:

Operators should support the concept of CANPA to reduce the risk of approach and landing CFITs, and train their pilots to select CANPA instead of "Dive and Drive".

Airlines should ensure that as many aircraft as possible are equipped with approved GPS so that accurate positioning and altitude data is available. In the case of retrofitted navigation systems (through supplemental type certificates (STC), airlines should pay particular attention to the man-machine interface requirements, so that navigation source switching does not become a hazard. A proper change management process can help identify and mitigate risks that are created by the introduction of the new hardware (e.g. by making the appropriate changes to SOPs).

Crews are encouraged to use approved navigation equipment only. Unapproved equipment can lead to a false impression of high navigation accuracy. All crewmembers should be aware of the nature and limitations of the safety systems installed. For example, it is important to understand the difference between terrain information derived from a navigation-database and that which is derived from a direct reading sensor such as radar altimeter. Effective procedures, and individual discipline, also need to address the issue of which approach procedure and track to choose, what data to follow, and how to handle being off track. Effective CRM training and drills should mitigate errors, fatigue, and enhance the escape from dangerous situations. With modern NAV displays driven by GPS and FMS, it is easy to assume that the desired track line is correct and safe.

Airlines are encouraged to maintain their equipment and ensure that the terrain/obstacle data being used by the system is current. Airlines should develop procedures to ensure that the EGPWS database is kept as up-to-date as possible.

Flight operations departments are encouraged to review their circling approach policies and are encouraged to reduce the number of circling approaches, possibly

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through increasing the visibility requirements. They are also encouraged to conduct a risk analysis of the various approach options. Operators are advised to use published GNSS approaches rather than "circle to land" when a certified GPS is installed on board and the crew is trained for the procedures.

Airlines are encouraged to familiarize theirs crews with the proximity of terrain once the EGPWS has triggered an alarm (perhaps use a simulator with a very high fidelity visual system). Many crews falsely believe that there is ample time to react once an EGPWS alert is sounded.

Remind crews that if an EGPWS alert triggers at night or during an instrument approach, the alert should be respected at all times. Incorrect altimeter settings, incorrect or missing low temperature adjustment, radio altimeter failures, etc… can all lead to cases where the true altitude of the aircraft is not known by the crew.

Recommendations to Industry:

The industry is encouraged to further their work on implementing PBN approaches in areas where a precision approach is not practical. Where these are not available, it is recommended to review the adoption of Continuous Angle Non-Precision Approaches (CANPA) for non-precision approaches.

CFIT accidents are occurring mainly in areas of the world where the use of Terrain Awareness Warning Systems (TAWS) is not mandatory. It is recommended that these states mandate the use of TAWS in air transport aircraft as it demonstrates a clear benefit for CFIT reduction. These aircraft will need to be fitted with accurate navigation features (i.e. GPS stand alone or better dual GPS for both Navigation and terrain surveillance benefit). Most air transport aircraft are fitted or could be fitted with such systems. Without an accurate position it's more difficult to have an appropriate TAWS functioning.

Authorities are recommended to investigate mandating procedures that ensure EGPWS databases are kept accurate and up-to-date. This has to be emphasized in light of two cases in 2011 where the EGPWS data base was NEVER updated. These updates are critical as they include terrain and runway ends.

In some countries an EGPWS supplier has to contact the state to get access to terrain data. Governments are encouraged to automatically provide to manufacturers the respective terrain data in cases where a new airport opens.

Authorities are encouraged to comply with ICAO recommendations and guidelines regarding PBN implementation.

Non-technical Skills Training

Background:

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.

Discussion:

Although 2012 was a great year with respect to accident and fatalities rates we should not use these numbers to deviate from proven risk mitigation processes. In some airlines the reduction or even abolishment of non-technical skills, otherwise known as crew resource management (CRM), training is seen as an opportunity to reduce cost. Non-technical skills training continues to be an important factor in aviation safety, especially in more conservative social environments. While implemented at many operators, non-technical skills training is not universally applied and many airlines have ineffective or no formalized non-technical skills training programs in place.

In cultural environments where a high social gradient exists, strict standard operating procedures 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". In 2012 we saw accidents where First Officers asked for a go-around multiply times and were ignored by their Captains. Members of the team have seen situations in simulator observations were the less senior ex-pat instructor pilot would not point out and correct performance flaws of a more senior local pilot.

Effective crew pairing with respect to seniority and experience can promote optimal conditions for crew performance.

Recommendations to Operators:

Non-technical skills 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. Airlines should review their crew compositions, hierarchy gradients and other local attributes and then custom-tailors their non-technical skills training program to their specific needs. An off-the-shelf solution will likely not provide any value and management will potentially be motivated to eliminate such solutions all together.

Encourage captains to allow first officers to demonstrate assertiveness and leadership. Communicate that despite rank or position, the captain is still human and is capable of making mistakes. Ensure that the captain understand they are not infallible.

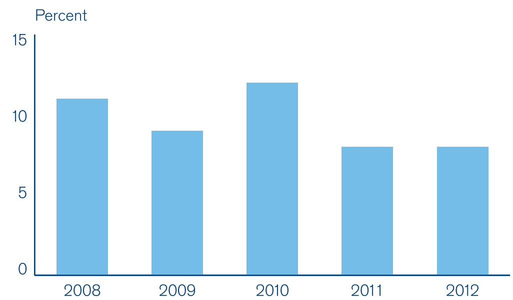
Specific call-outs of information or decision requirements at critical points in the flight and may help the first officer to overcome the social gradient between the crew members. Properly developed SOPs with clear instructions may empower them to take over the flight controls when the situation requires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

A process for de-briefing non-technical skills issues that arose during line operation will give the individual pilot essential feedback on his/her performance.

Go-Arounds

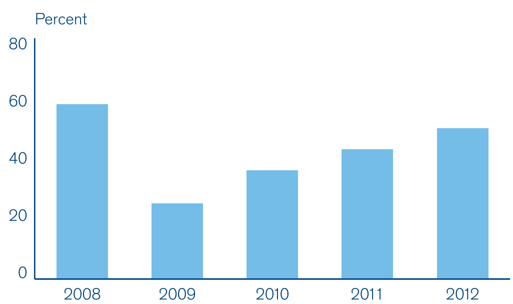
Background:

Eight percent of accidents in 2012 cited an unstable approach as a factor. A graph of the previous five years percentage of accidents with unstable approaches as a factor is included below.



Unstable Approach

The ACTF noted a correlation between unstable approaches and accidents due to crews not performing a go-around when required. The graph of the previous five years percentage of accidents where it was noted that the crew continued for landing following an unstable approach as a factor is included below.



Continued Landing following Unstable Approach

Discussion:

The go-around procedure is rarely-flown and is 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.

Airlines should not limit training scenarios to the initiation of a go-around at 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 1000 feet or 500 feet above touchdown, the “GO-AROUND” command can and must be made at any time prior to deployment of thrust reversers.

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.

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.

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

It has often been said that failure to execute a go-around is usually associated with a mind set to land. There are very few situations where a go-around is not an option and it is important for crews to have an understanding of when they must land and when to leave themselves an out.

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 on the head-up illusion.

Airlines should consider the time loss due to go around as necessary for safe operations. Therefore, commercial pressure should not be imposed on flight crews. Pilots may be reluctant to go-around if they feel the fuel state does not support it. A go-around should be considered as potentially occurring on every flight and so the flight must be fueled to allow for a go-around without resulting in a low fuel situation. A no fault go- around policy should be promoted by the operators. If pilots are fearful of disciplinary action they will be less likely to go-around when they should.

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 operational feasible simulators which can generate sustained g-forces for a generic go around training with regard to somatogravic illusions.

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Air traffic controllers, are reminded that any aircraft might execute a balked landing or missed approach. This will involve startle and surprise just as it might for the flight crew involved. They 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, 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 be without undue delay.

Loss of Control In-Flight

Background:

The generally high-reliability and usefulness of automated systems poses the question of whether the high amount of flight hours spent in fully automated flight is responsible for pilots being increasingly reluctant to revert to manual flying skills when needed – while aircraft are highly automated, the automation is not designed to recover an aircraft from an unusual attitude. Therefore, flight crews must still be capable of manually operating the aircraft, especially in edge of the envelope situations.

Flight crews are seemingly becoming increasingly reluctant to revert to manual flying when automated systems fail, when aircraft attitudes reach unusual positions, or when airspeeds are not within the appropriate range.

Discussion:

The last years have seen an average of approximately ten loss of control in-flight (LOC-I) accidents per year, although the number was less in 2012. These accidents come from a variety of scenarios and it is difficult to single out the most critical scenario. However, looking at accident data LOC-I is often linked to an operation of the aircraft well below stall speed. Even with fully protected aircraft, stall awareness and stall recovery training, as well as approach to stall recovery training needs to be addressed on a regular basis. It is recommended that the airline training departments pay attention to the contents of the Upset Recovery Toolkit, which is still valid and which still contains very useful information. Upset recovery training - as with any other training - largely depends on the skills and knowledge of the instructor. It is therefore recommended that the industry places a particular emphasis on instructor training. There was one accident in 2012 which resulted in a considerable portion of the vertical stabilizer being sheared from the airframe, yet the flight crew managed to maintain control of the aircraft and perform a safe landing.

Upset recovery training, aerobatics and unusual attitude training included as part of an operator's flight crew training syllabus gives crew a chance to experience potentially dangerous situations in a safe and controlled environment, which better prepares them if they should encounter a similar situation while flying on the line. Regrettably, current flight simulator technology is limited in how accurately it can reproduce these scenarios.

Somatogravic illusion (the feeling where the perceived and actual acceleration vectors differ considerably) can create spatial disorientation and lead to catastrophic events such as CFITs. Training is available to assist crews facing spatial disorientation situations as discussed in the section below on limitations of simulators.

In modern aircraft, failure of a relatively simple system (e.g. radio altimeter) may have a cascade effect that can result in a catastrophic outcome. Crew training should emphasize solving complex, cascading failures that originate from a single source.

Automation is a tool that can be helpful to flight crew, however it is never a replacement for the airmanship skills required to operate the aircraft. Training for scenarios that could lead to an upset (e.g. low-energy approaches, engine failures, etc…) must be continuously reinforced to address areas of safety concern, as well as the usual training protocols which achieve a baseline proficiency in aircraft handling.

Recommendations to Operators:

Operators are encouraged to follow up on current research activities, such as the SUPRA-Project (Simulation of Upset Recovery in Aviation) by NLR/TNO in The Netherlands and activity by the International Committee for Aviation Training in Extended Envelopes (ICATEE), established by the Flight Simulation Group of RAeS. ICAO and SkyBrary also have materials dealing with loss of control in-flight.

Airlines should consider the introduction of upset recovery training, aerobatic training or other unusual attitude recovery training into their syllabus to better prepare flight crews for similar events in routine operations. Training should be designed to take pilots to the edge of the operating envelope in a safe environment so that they are better prepared to deal with real-life situations.

Training syllabi should be updated to include abnormal events that flight crew may routinely face (e.g., stalls and icing) as well as conventional training such as engine failure on take-off.

Operators should consider incorporating procedures to allow for manual flying of the airplane in line operations, under some circumstances. Such operations should be encouraged to get flight crews comfortable with manual control and to exercise these skills on a regular basis. Periodic unusual attitude exercises should be realistic to include extremes of CG, weight, altitude, and control status.

Training should also not over-rely on certain aircraft flight control protections too much. Increased focus on training scenarios under degraded flight control protection should be considered.

Crew training

Key Issues

- Automation management
- Decision making
- Simulator- and ability bias

- SOP compliance and professionalism
- Evidence based training

Discussion:

Increasingly automated flight decks have proven to be both a contributor to a better safety performance in general as well as a new factor in accidents. One highlight in crew training should therefore be to provide crews with a better understanding of different levels of automation as well as to become proficient in operating at all different levels of automation.

Some training regulations and training practices have the potential to create a simulator and/or ability bias. Repetitive and foreseeable training events, while leading to proficiency in handling the event itself, can have the unintended effect that pilots apply the learned process to an actual event without a sound decision making process. That is because a similar, yet maybe not the same, event was always handled like this on the simulator. Example: there is reason to believe that crews in general are "stop-minded" in training details involving events during takeoff, leading to a less than ideal "go/no-go decision making training.

It is also observable that it is sometimes not the maneuver itself that poses the challenge, but rather the decision to execute this maneuver. Example: An airline may find that their crews are reasonable proficient in executing a terrain avoidance maneuver triggered by an EGPWS warning on the simulator. During actual operation, however, the warning will typically come as a surprise and the current mental model of the pilots must be left behind to cognitively decide to execute the maneuver. Without a certain element of surprise during training, the execution, yet not the decision-making is typically trained. Crew decision-making process training, such as the decision to reject or to go-around, should be reinforced as well as training for abnormal situations such as bounced landings.

Allowing crews to operate the simulator outside the aircraft operating limitations might additionally generate an ability bias. Crews that demonstrate that they can handle such situations might be more apt to accept operating the aircraft beyond operating limitations as well.

It was noted in several accidents in 2011 that the crew workload increased significantly during incidents of smoke in the cockpit.

Recommendations to Operators:

Simulator training should allow for sufficient time for crews to become proficient at all levels of automation, from fully automated to not automated. In addition, the highlight should be on the appropriate level of automation. Aircraft familiarity and expected values and aircraft behavior should be an integral part of crew training for pilots to become able to detect deviations.

- In addition to legal requirements, include more recurrent training

Crews should be well trained on manually flying the aircraft and not over-rely on automation.

Rules of thumb and average or expected values for various parameters that have been learned through experience should be passed on from more experienced pilots to trainees at every occasion – these rules assist crews in detecting data or calculation errors.

With respect to simulator limitations and possible negative training, simulator training should be as realistic as possible. Continuously allowing crews to disrespect stabilized approach criteria or operating limitations on the simulator will create an equivalent behavior during line operation. The same applies for other non-routine events. Example: Maneuvers such as wind shear escape are critical to train. On the other hand it has to be understood by all crews that the foremost barrier against a wind shear accident is wind shear avoidance. While negative training is clearly undesirable, the possible ability bias created by successful recoveries must be monitored. In other words the pilot should be trained to be proficient in the recovery maneuver, but should also develop sufficient respect for the phenomenon not to overestimate his/her own ability or aircraft performance.

Evidence based training and a less foreseeable training conduct will provide better decision-making training for flight crews.

Subject to simulator limitations, maneuvers such as go-arounds should be trained from altitudes other than approach minimum (e.g. from above go around altitude, or in conjunction with a bounced landing).

Airlines should be aware of and monitor common deviations from SOPs and take corrective actions.

As time and workload management is critical in case of inflight fires, crew familiarization with inflight fire/smoke checklists should be regularly reinforced. In addition, familiarization training with oxygen equipment in a smoke-filled environment aids crews in performing this critical step in the event of an on-board fire. Airlines are advised to provide crews with effective ground training so that crews are aware of the impact of smoke on the flight deck.

Limitations of Simulators

Background:

While simulators clearly have known limits, more can be done to enhance their fidelity – that is a long term, new generation of full motion devices that are going to require advances in a number of areas.

At this time, simulators enable a crew to grasp the training basics, yet do not provide a full sense of what is being trained. The industry needs to recognize and advance the need for simulators to be used for testing improved and safer ways of flying our aircraft.

There is an abundance of industry data which can provide more accurate and abundant industry data on a variety of events. Events such as wind shear can be uploaded into today's simulators. Such applications of data should be encouraged and the industry should continue to work with all parties to use verifiable data to enhance flight crew training across the board.

Besides normal training, simulators are occasionally used for applications that they were not necessarily designed to handle. This includes maneuvers outside of the certification envelope of the aircraft/simulator or maneuvers for which none or only limited performance data is available for the simulator to realistically represent aircraft behavior.

Discussion:

Simulators are limited in reproducing certain situations such as stalls and bounced landings. Also, conventional simulators are very limited for training upset recovery techniques. These are better accomplished in a real aircraft where available.

Current simulator technology is likewise limited in how accurately it can reproduce the sensations that lead to spatial disorientation and somatogravic illusion.

IATA has developed guidance materials for simulator design and performance data requirements – see the IATA Flight Simulation Training Device Design & Performance Data Requirements, 7th Edition.

Recommendations to Operators:

Understand that flight simulators will never be a true substitute for experience in a real aircraft.

Operators are encouraged to follow up on current research activities, such as the SUPRA-Project (Simulation of Upset Recovery in Aviation) by NLR/TNO in the Netherlands and activities by "The International Committee for Aviation Training in Extended Envelopes" (ICATEE), established by the Flight Simulation Group of RAeS

Know the limitations of simulators and adapt a training syllabus to minimize these weaknesses. Until the fidelity of simulators allows for a realistic reproduction of aircraft out-of-control situations, the simulator training focus should be on the avoidance of these undesirable states (such as stall or unusual attitude) rather than on the recovery from it. Example: While the approach-to-stall maneuver can be reproduced on simulators with reasonable accuracy, an actual stall cannot. In addition, it should be the pilots' objective to react on the first indication of an impending out-of-control situation in order to prevent any escalation.

Recommendations to Industry:

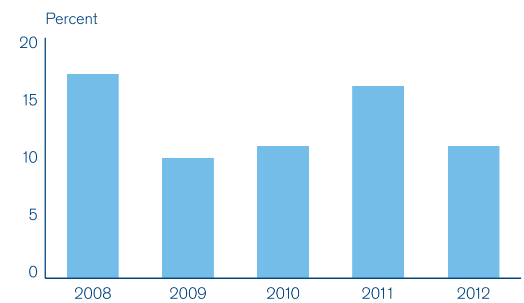
Flight simulators have certain inherent limitations that prevent them from accurately reproducing sensations that can lead to catastrophic events such as I-LOC. Manufacturers are encouraged to research new ways to accurately reproduce sensations related to somatogravic illusion and spatial disorientation that crews may face in real flight.

Operators, industry partners and manufacturers should cooperate to develop better simulation models and equipment capable of more accurately reproducing bounced landings, stalls and somatogravic illusion. The edge of the aerodynamic envelope should be exploited by aircraft manufacturers. Flight test / engineering data should then be made available for simulator manufacturers.

Ground Operations & Ground Damage Prevention

Background:

Ground damage continued to be one of the primary categories of accident this year, representing 11% of 2012 accidents. The graph below indicates the percentage of ground damage accidents over the previous five years. 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.



Ground Damage

Discussion:

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 or near challenging gates or stands in close proximity to 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 made more aware and informed to respect lines and other marking depicting protected zones. As surface markings can differ from one airport to another, the ground crew is better positioned to assure 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, 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 through the use of 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, air traffic service providers and aerodrome operators need to be compliant with ICAO SMS Doc 9859 to strengthen the concept of proactive and predictive approach to reduce ground damage events.

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

Recommendations to Operators:

Ensure crews receive taxi training that includes time spent in real aircraft (with wing walking 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 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 similar to those used while leaving ramp areas. Stop locations should ensure adequate clearance from movement areas while transitioning from ground control.

Lapses in SOPs such as not setting the parking brake can lead to ground damage and even ramp injuries or fatalities. Crew training with regards to effective communication during the taxi 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. The crews must be aware of their surroundings and know to request assistance when in doubt; particular attention must be paid to wingtip clearances.

Ensure compliance with ICAO Safety Management System (SMS) Document 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:

Lack of information on charts, in particular airport taxi charts, can lead to ground damage. 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 using technology to assist crews in determining the proximity of aircraft to obstacles. Similar technology has been available in automobiles for several years and would be extremely useful in low-visibility situations or when the pilot's view is obstructed.

While a flight crew can be expected to avoid collisions with fixed structures and parked aircraft by maintaining the correct relationship with taxi lane markings, the situation will be improved with enhancements that provide both moving real time ground mapping as well as real time traffic display. Technology exists for every aircraft and ground vehicle to emit position information. It is expected that ADS-B out and in will provide the necessary ground collision prevention in conjunction with well-engineered ramps and taxi lanes.

Continuation of Airline Operation During Severe Weather

Background:

Airline operations may be completely suspended by severe weather in some parts of the world. Meteorological threats were identified as factors in 20 accidents in 2012 or 27% of all accidents. Aerodromes are encouraged to provide aviation weather services to Air Traffic Services (ATS) units, airline operators, flight crew members, dispatchers and airport management by supplying the necessary meteorological information.

Discussion:

Weather has a large-scale effect on operations. Operators need to be aware of commercial factors relating to weather delays such as public expectations and passenger compensation criteria (where in effect).

Aerodrome's ATS observations and forecasts are to be disseminated to aircraft pilots and flight dispatchers, for pre-flight planning and to local users operating helicopters and light aircraft.

Auto-land and other automation tools only work within certain limitations. Technology to assist in landing during severe weather is available but is not widely installed.

All aerodromes need to issue alerts of low-level wind-shear and turbulence within 3 nautical miles of the runway thresholds for relay by air traffic controllers to approaching and departing aircraft.

Continuous improvement of various warning services need to develop capabilities for real-time downlink of weather data obtained by aircraft and uplink of weather information required in the cockpit.

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Recommendations to Operators:

Operators should consider tools that allow dispatch offices to provide crews with the most up-to-date weather information possible.

Ensure that Aerodromes ATS observations and forecasts are disseminated to aircraft pilots and flight dispatchers for pre-flight planning.

Airlines should develop a contingency plan, involving dispatch and crew support that clearly defines guidance at an organizational level on who is responsible to cease operations.

The applicability of limits for wind and gusts should be clearly defined in the Operation Manuals.

All aerodromes need to have a meteorological office that issue alerts of low-level wind-shear and turbulence within 3 nautical miles of the runway thresholds for relay by air traffic controllers to approaching and departing aircraft.

Recommendations to Industry:

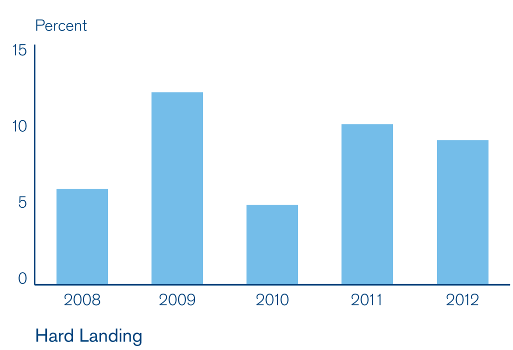
Scientific communities are encouraged to evaluate the usefulness of current technologies with regards to accurate and timely measurement of gusty winds and how such information can be quickly relayed to flight crews to increase situational awareness.

Develop capabilities for real-time downlink of weather data obtained by aircraft and uplink of weather information required in the cockpit.

Hard Landings

Background:

Nine percent of the accidents in 2012 involved hard landings. A graph of the previous five years' percentage of accidents with hard landings as a factor is included below.



Frequent contributing factors to hard landings in the last five years were identified as meteorological factors (42%) and continued landings out of unstable approaches (11%).

Discussion:

During the course of the classification, meteorological phenomena and other factors that lead to a destabilization of the final approach have again been identified as typical precursors of hard landings that led to accidents. Additionally, hard landings often occur hand in hand with bounced landings and the recovery of the latter remains a critical crew training issue.

With the above information, and some other topics discussed in this publication in mind, there are still limitations in the ability of simulators to generate occurrences such as a bounced landing at a high level of fidelity.

Recommendations to Operators:

Bounced landing recovery remains a challenging maneuver for crews and thus continues to be a critical simulator training issue. At the same time limitations of training devices have to be respected. When designing training programs to address hard landings, operators are encouraged to be mindful of the risk of "negative training". It is not recommended to simply ask the trainee to try a hard landing and to see what happens and how to recover from it. Inducing scenarios that are common precursors to hard landings (e.g. bounced landings) in the training environment remains a challenge. In the short term the challenge could possibly be overcome by workarounds such as inducing very low altitude wind shear on approach. However, operators are encouraged to work with simulator manufacturers to overcome the challenges more systematically in longer terms.

In addition to the above, airlines are recommended to modify their approach procedures to call out "STABILIZED" or "NOT STABILIZED" at a certain gate to ensure a timely go-around is carried out. Emphasis is also to be put for 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. To better prepare pilots for this, it is recommended to include training of go-arounds from very low altitudes, long flares and bounced landings (as possible) to the recurrent training program.

Operators are also encouraged to train pilots on landing in real aircraft whenever possible and ensure their FDA programs monitor landing performance.

Recommendations to Industry:

Aircraft manufacturers are encouraged to provide better guidelines to be used in determining when a hard landing has occurred. These guidelines should be based on measurable factors. As noted above, simulator manufacturers, operators and industry partners are encouraged to work together to develop training devices that are better able to recreate the precursors to a hard landing.

Regulators are encouraged to evaluate landing training requirements.

FINAL STATEMENTS – Recommendation to Operators

With accident rates at a historic low, questions now need to be asked on how safety can be improved with such a limited number of accidents. The answer is common industry knowledge: focus on incidents.

The group recommends that operators focus on the development of "transfer probability" functions and compare these with industry average. The "transfer probability" is simply a statement on how likely it is that an incident will become an accident.

Example:

Airline ABC has one million flights per year. Assume that out of these flights this airline has had ten hard landings and that one hard landing resulted severe damage. This would mean that the airline has one hard landing for every 100,000 flights and one severe damage caused by a hard landing for every ten hard landings. The transfer probability for a damage caused by a hard landing is then one per million.

This benchmark could then be compared with another airline:

Airline ABC – 1 severe damage accident caused by hard landing for every million flights.

Airline XYZ – 0.65 severe damage accident caused by hard landing for every million flights.

So airline XYZ would appear to be at lesser risk with respect to damage caused by hard landings and it would have to be investigated where these differences come from (aircraft types, operational environment etc.).

Airline's Flight Data Analysts are encouraged to move away from looking at exceedances (i.e. incidents) only. It would be useful to look at any discrepancy that elevates the risk level:

Examples:

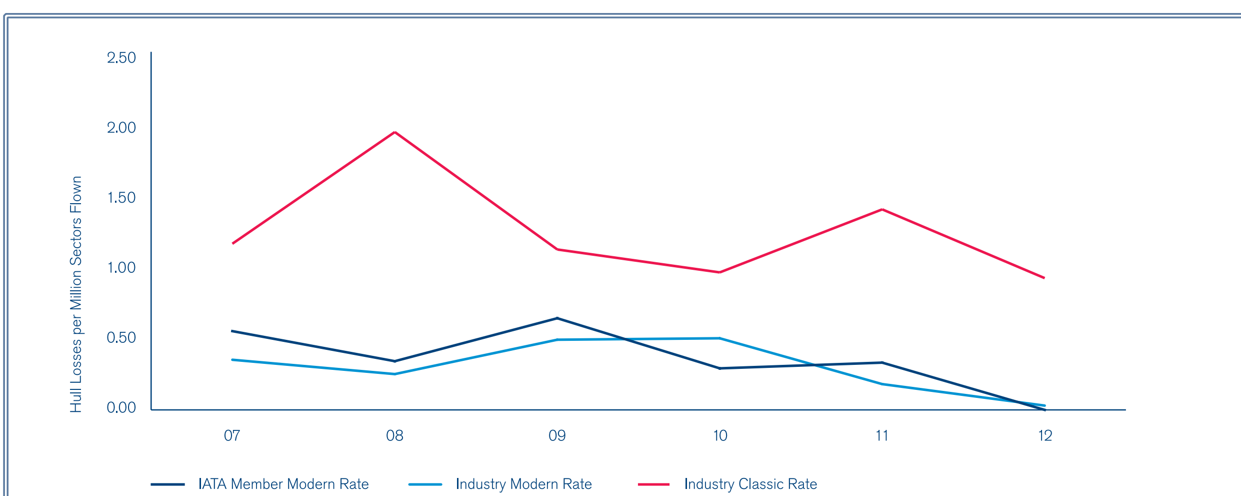
- If takeoff distance is calculated, it would be wise to compare actual takeoff distance with the calculated takeoff distance (and same for landing distance). Over time the airline will get some idea on how big the discrepancies are (and thus, by how much a margin is reduced)
- Look at the specific energies (kinetic plus potential energy divided by weight), plotted over track miles from touchdown. High energies will require crew action (e.g. use of speed brakes) – the way this energy is managed (or rather not managed) will give you insight on how and where unstabilized approaches are created. In other words, do not wait to analyze the unstabilized approach. Rather, chart how crews handle excessive energy during descent.
- Encourage systems which allow pilots to "self-correct" his or her skills as mentioned in earlier reports. As an example, give pilots pitch rate on takeoff vs. target pitch rate, pitch attitudes on lift off, touchdown points etc. Pilots can then retrieve the information at his or her convenience and use their flight data to tune their skills.

SUMMARY OF MAIN FINDINGS AND IATA PREVENTION STRATEGIES

In 2012, the global Western-built jet hull loss rate was once again the lowest recorded. From a regional perspective, industry Western-built jet hull loss rates remained the same or decreased in all IATA regions except Europe and Asia-Pacific. In 2012, no IATA member airlines suffered Western-built jet hull losses.

IATA has introduced a new measure for accidents, the "Modern Jet Hull Loss" rate. Modern jet aircraft include aircraft initially certified after 1985 and equipped with a glass cockpit and Flight Management System (FMS) at initial certification; aircraft using older technologies are considered "Classic". This definition reflects the harmonizing of aircraft manufacturing and certification standards and the global manufacturing of aircraft components. This "Modern Jet" definition will be reviewed annually and revised as technology evolves.

There is a clear distinction between the Modern and Classic aircraft performance as seen in the chart below. Based on the six year average, Modern aircraft are four times less likely to be involved in a hull loss accident than classic.



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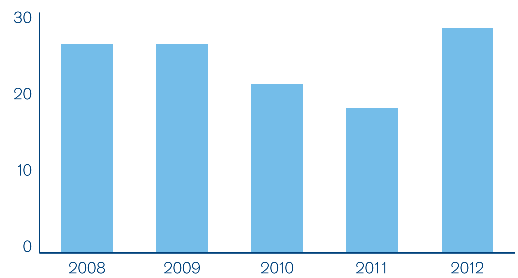
Runway Excursions

Runway excursions were the most common type of accident every year in the five years analyzed in this report. A runway excursion may occur during takeoff or landing, but are most common on landing. The trend for runway excursions as a percentage of the total number of accidents has shown no significant improvement over this period as seen in the graph below:



Runway Excursions

- Most (82%) of runway excursions occur following a stable approach, where the pilot failed to active braking devices in a timely fashion, allowed the aircraft to float beyond the normal touchdown point, or failed to maintain directional control after touchdown
- Over the last five years 38% of runway excursions during landing occurred following a long, floated, bounced, off-center or crabbed landing
- Unstable approaches were a factor in many (18%) runway excursions
    - The IATA Flight Data eXchange (FDX) program provides participating carriers with the unstable approach performance and excessive tailwind events for every runway in the database

Runway excursions have many other precursors than unstable approach that should be understood and managed by operators. Airlines can use their internal Flight Data Analysis (FDA) program to understand the precursors to runway excursions; these programs now required by the IATA Operational Safety Audit (IOSA).

In 2013, IATA will continue to work with industry partners to support regional runway safety seminars and to update the IATA Runway Excursion Risk Reduction (RERR) toolkit, available at www.iata.org/gsic

Loss of Control In-flight

Loss of Control In-flight (LOC-I) was the accident category with the most fatal accidents, representing 43% of all fatal accidents from 2008-2012 and 60% of all fatalities. LOC-I accidents include aerodynamic stall events and failures of aircraft systems, and are often preventable with adequate pilot training. While the number of LOC-I accidents has been falling in recent years, there is still need for industry focus to understand and prevent these accidents.

In 2013 IATA will work with industry partners to develop a Loss of Control In-flight toolkit. This comprehensive toolkit is expected to be launched in collaboration with ICAO in 2014.

Ground Operations and Ground Damage Prevention

Ground damage was the third most common type of accident after gear-up landings or gear collapse, representing 13% of accidents during 2008-2012. These accidents include events such as damage resulting from ground handling operations, collisions during taxi and incidents of fire on the ground.

As a method to address aircraft ground operations incidents, IATA is continuing to develop the Ground Damage Database (GDDB) to collect and analyze reports of ground damage from participating operators and ground service providers. This will allow for the publishing of a global baseline of ground damage and aid operators and providers in prioritizing their accident and incident reduction strategies.

Information from this database will be used to support IATA ground operations programs and the IATA Safety Audit for Ground Operations (ISAGO) working groups. In 2012, IATA completed the IATA Ground Operations Manual (IGOM) which now provides industry standard aircraft handling and servicing procedures.

Regional Factors

Globally, IATA carriers represented 17% of all accidents while flying 52% of all sectors in 2012.

The total number of Western-built jet hull losses decreased by 45% in 2012 (6 vs. 11 in 2011). Overall, the total number of accidents decreased by 18% in 2012 (75 vs. 92 in 2011).

- All regions except Africa (AFI), Asia Pacific (ASPAC) and Latin America (LATAM) had lower rates of Western-built Jet Hull Losses than the world average of 0.20.
- Western-built jet hull loss accident rates in all regions except Asia Pacific (ASPAC) and Europe (EUR) improved relative to 2011.

In 2013, IATA will continue to work with its members to maintain safety as a priority. Through the Global Safety Information Center, the Global Safety Information Exchange agreement and other initiatives, IATA is continuing its work with airlines, regulatory authorities and other industry stakeholders to enhance existing safety programs and improve industry safety performance.

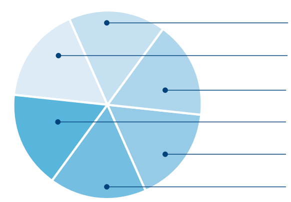
“No IOSA registered carriers had accidents in Africa in 2012. IOSA registered carriers had only 15 percent of accidents in the region in the last 5 years.”

Section 10

10

IATA Safety Strategy

The IATA Six-point Safety Program reflects the strategic direction that IATA has taken to ensure the continuous improvement of the industry's safety record. It includes a quality approach and focuses on all aspects that impact operational safety. IATA will increase effort in safety through these initiatives:



The IATA Six-point Safety Program addresses areas of global concern and targets specific regional challenges.

The six points of the program are described below. More information on this program can be found at: www.iata.org/safety

Auditing

IATA Operational Safety Audit (IOSA)

The IATA Operational Safety Audit (IOSA) is the worldwide recognized airline safety audit program based on internationally harmonized standards. The program is designed to improve the safety levels throughout the entire airline industry and provide efficiency by reducing the number of audits performed. IOSA standards are upgraded routinely, raising the level of operational standards required. As a result, the safety performance of IOSA carriers is measurably better than non-IOSA carriers.

The sixth edition of the IOSA Standards Manual (ISM) became effective as of 1 September 2012, incorporating a large number of new standards and upgrading several recommended practices to standards.

IATA oversees the accreditation of audit and training organizations and manages the central database of IOSA audit reports.

In 2009, IOSA registration became mandatory for all IATA member carriers.

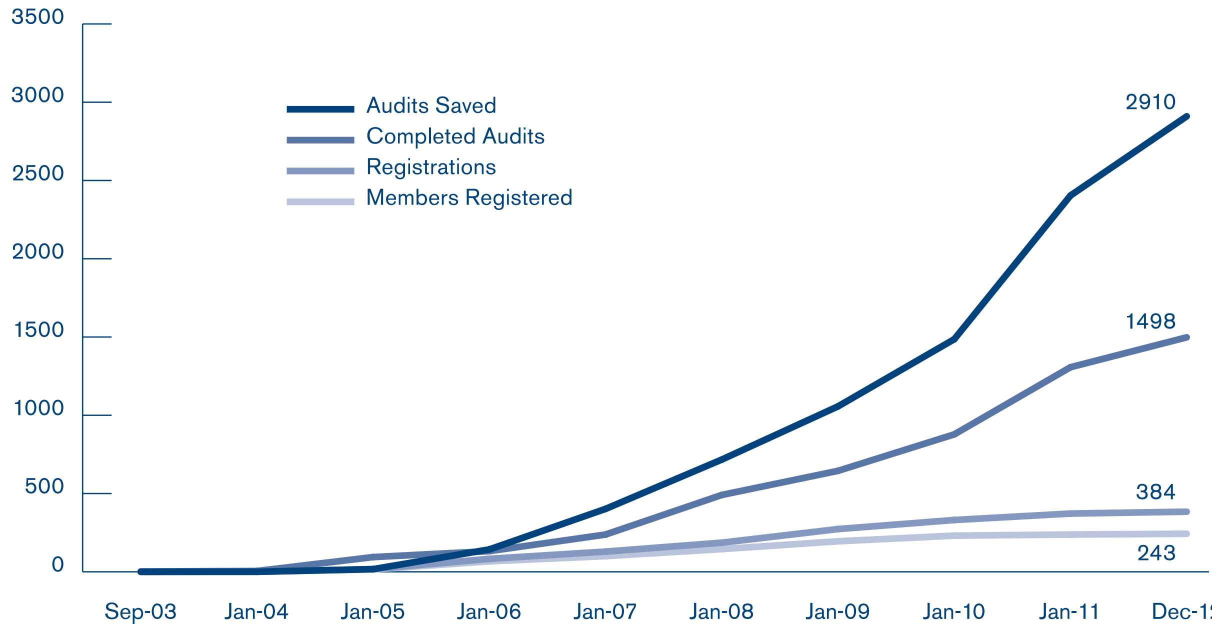
During 2012, IATA continued working with the IOSA Oversight Council (IOC) and its Task Forces to develop Enhanced IOSA, which further promotes the adoption of the IOSA culture by operators. Enhanced IOSA will further focus the airline's internal quality assurance program in order to provide a greater focus on implementation.

Ten Trial audits were performed between 2011 and 2012 and the Enhanced IOSA process will become mandatory in 2015. The concept has received full support from the different stakeholders including the IATA Board of Governors.

The IOSA program is ISO 9001:2008 and European CEN certified and quality assurance is implemented to ensure that airline needs are met effectively.

More information on this program can be found at: www.iata.org/iosa

IOSA Program/Audit Status as of 31 December 2012



IATA Safety Audit for Ground Operations

IATA Safety Audit for Ground Operations (ISAGO) covers more than 400 standards and recommended practices that encompass organization and management, load control, passenger and baggage handling, aircraft ground movement, aircraft handling and loading and cargo operations. ISAGO provides guidance and certification for providers in the ground service industry. As of December 2012, over 110 ground service providers (GSP) are on the ISAGO Registry, operating at 133 different airports worldwide covering 173 stations.

ISAGO stakeholders developed a new ISAGO Strategy and audit approach in 2012; focusing on simplification, alignment with IGOM and making the program more relevant to the best/current industry practices. IATA Operational Committee members also encouraged ISAGO Pool members and GSPs to report the ground damage data to GDDB in order to have enough data for measuring the success of the program.

More information on this program can be found at: www.iata.org/isago

IATA Fuel Quality Pool

The IATA Fuel Quality Pool (IFQP) is a group of airlines that actively share fuel inspection reports and workload at locations worldwide. In addition to the promotion of fuel quality results, the sharing of inspection reports by the pool member airlines has demonstrated significant bottom line savings for the participants, which are being achieved whilst remaining in full compliance with regulatory requirements concerning airlines' provision of quality control and management oversight of airport fuelling services. For the year 2012, there were 850 IFQP reports shared with the pool members. The Pool is using the Global Fuel Handling Standard SAE AS6401 developed under the umbrella of G-16.

More information on this program can be found at: www.iata.org/ifqp

IATA De-Icing/Anti-Icing Quality Control Pool

The main goal of the IATA De-Icing/Anti-Icing Quality Control Pool (DAQCP) is to ensure the safety guidelines, quality control recommendations and standards of the De-icing/Anti-icing procedures at all airports are followed. Several airlines established an audit pool to share the audit results - thus avoiding multiple audits of the same provider at the same location, while improving the quality of inspections as fewer and more effective audits are carried out by accredited DAQCP inspectors in accordance with stringent evaluation criteria established by the Pool.

In the 2011-2012 winter season, the inspectors have visited 727 de-icing/anti-icing service providers at 377 airports. This season more than eighty percent of all safety related findings have been satisfactorily addressed by providers. This is a thirteen percent increase from the past season and reflects the influence that the pool is having on the safety performance of handling agents and their commitment to comply with high safety standards.

More information on this program can be found at: www.iata.org/daqcp

Safety Management Systems

The theories, concepts and individual elements of a Safety Management System (SMS) are well understood by the industry. IOSA has introduced SMS standards and recommended practices and members are currently being audited to these requirements.

However to develop an effective SMS program, elements cannot be implemented as separate requirements. The interdependencies of these elements, and how they interact within the organizational system as a whole, must be known and taken into account. The absence of this understanding causes confusion and, understandably, makes a carrier feel that implementing SMS is overwhelming.

The IATA SMS strategy is focused on providing this next level of understanding to assist the industry in implementing the foundation of an effective SMS Program, through the delivery of enhanced guidance aligned with ICAO requirements and measured through IOSA. IATA's SMS strategy will systemically upgrade all 68 IOSA SMS requirements from recommended practices to required "standards" by the end of 2016. IATA provides considerable support for airline SMS implementation thru training programs in the IATA Training and Development Institute (ITDI).

More information is available at www.iata.org/training

Safety Data Management and Analysis

The 2009 launch of the Global Safety Information Center (GSIC) provided unprecedented access to existing IATA safety databases for all IATA members. Accident data, operational safety reports, IOSA and ISAGO audit data, and Flight Data eXchange (FDX) data are provided via a single web portal. The development of the GSIC provides IATA members with essential SMS hazard identification and monitoring capabilities. In 2013, IATA will expand the GSIC program into a broader "Operational Data Management (ODM)" arena, including additional operational and infrastructure forms of industry data.

Programs established in GSIC include:

STEADES

The Safety Trend, Evaluation, Analysis and Data Exchange System (STEADES) program receives more than 150,000 operational safety reports per year, representing 34% of annual industry flights. From this vast data, IATA produces in-depth analysis on precursors to accident categories and emerging safety issues. In 2012, STEADES published analysis covering topics such Flight Crew Incapacitation, Wing-tip Clearance Hazards, Airprox – TCAS in Southern California (LAX, SAN, LAS, ONT), Engine Failures and Inflight Shutdowns, Runway/Taxiway Confusion, Wake Turbulence Encounters, FMS Data Entry Errors, Airspeed Anomalies, Level Busts during SID and STAR, Cargo Safety Issues and more. STEADES now includes a separate database to address cabin safety issues.

The analysis and benchmarking are available to all STEADES participating airlines. Membership in STEADES is free to IATA members.

More information is available at www.iata.org/steades

Flight Data eXchange

The launch of on-line Flight Data eXchange (FDX) in 2012 now allows airlines to benchmark themselves against global event statistics. Flight data from participating airlines is processed to identify events of interest using standard event definitions, and users of FDX are able to identify areas of risk down to airport and runway level. This will prove to be an invaluable safety and training aid, and proactively allows operators to review and monitor actual system performance at any airport with FDX data. All data is processed in a de-identified manner so source airlines can never be identified.

The FDX program also includes a Global Animation Archive which contains a library of flight event animations from a wide variety of aircraft types. Event scenarios such as Unstable Approaches, Runway Excursions or GPWS are animated to better understand the conditions leading to events. These animations can be shown to flight crews to assist in training.

Ground Damage Database

For the Ground Damage Database (GDDB), 2012 saw a radical improvement in data quality from submitting participants, and the industry aircraft damage rate baseline was established. Aircraft ground damage analysis has now been integrated within a new IATA Ground Operations department which will fully integrate this damage with the IATA Ground Operations Manual (IGOM) and the ISAGO audit program, providing the industry with a fully integrated process for improving efficiency and safety in ground operations.

Participation in GSIC is free for IATA member airlines. More information on this program can be found at www.iata.org/gsic

Operations

Hazard identification and risk management are important tools available to airline managers in their quest to maintain an acceptable level of safety within their operations. Data is used to both identify and understand trends focusing on the potential causes of perceived threats which can result from changing (or not adapting) operational practice and procedures. These results are used in both a reactive and, better still, a proactive manner whenever possible.

One such observable trend has been Loss of Control In-flight (LOC-I) and it is now an industry priority to deliver recommendations for changes to pilot training, flight simulation within airlines and aircraft training at the initial license level. IATA is working with multiple industry partners in developing and collating LOC-I best practices and identifying potential improvements to eliminating this category of accidents.

Although improve has been noted, runway safety continues to challenge the industry, especially in the runway excursion category. IATA has partnered with many organizations including ICAO to support industry training and process changes, including the standardization of runway incursion and runway excursion incident reporting metrics. IATA has produced the 2nd edition of the Runway Excursion Risk Reduction (RERR) toolkit, available at www.iata.org/gsic

IATA's Cabin Safety program has been significantly expanded in 2012 to cover operational issues in the passenger cabin, and many different cabin safety guidance documents are now provided at www.iata.org/gsic

Maintenance

The IATA maintenance strategy is focused on the training of maintenance personnel. In 2011 ICAO published a revision to the PANS-TRG document, which now includes a chapter on competency based training (CBT) in maintenance. Based on the ICAO document IATA published the Guidance Material and Best Practices for the Implementation of Competency-Based Training in Maintenance in November 2011.

To meet the growing demand for aviation professionals over the next decade, it will be necessary to ensure that the right individuals are hired, trained properly and that their competence to perform the necessary tasks is thoroughly assessed by the instructor. In order to be as efficient as possible, the current process has been streamlined with a focus on reducing the maintenance factors that contribute to accidents and incidents.

The information in the IATA Guidance Material will assist any maintenance and training organization from the first steps of hiring new maintenance and engineering personnel, through all aspects of their training from ab-initio to recurrent and finally to the assessment of their abilities. Competency-based training solutions continue to focus on real needs of the industry and are poised to become an integral part of harmonized standards.

Infrastructure

Working closely with IATA members; strategic partners such as ICAO, CANSO and ACI; States and ANSPs, Infrastructure strives to ensure that ATM and CNS infrastructures around the world are best aligned to provide harmonized and interoperable services to the aviation industry.

Infrastructure has been and continues to be very involved in Performance-based Navigation (PBN), Civil-Military Collaboration and the harmonization of major projects such as the FAA's NextGen and Europe's SESAR.

Multiple ATM safety and efficiency metrics are being programed into the Flight Data eXchange (FDX), and are available for FDX members. These events include:

- Unstable approach performance (by airport and runway)
- Landings with excessive tailwinds (by airport and runway)
- Go-around rate (by airport and runway)
- Traffic Collision Avoidance System (TCAS) events
- Ground Proximity Warning System (GPWS) events

More information is available at: www.iata.org/gsic

Annex 1

A1

Definitions

Accident: an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which:

- a person is fatally injured as a result of:

  (a) being in the aircraft;

  (b) direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or

  (c) direct exposure to jet blast

except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers and crew;

- the aircraft sustains damage or structural failure which:

  (a) adversely affects the structural strength, performance or flight characteristics of the aircraft; and

  (b) would normally require major repair or replacement of the affected component

except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennae, tires, brakes, fairings, small dents or puncture holes in the aircraft skin; or the aircraft is still missing or is completely inaccessible.

Notes

1. For statistical uniformity only, an injury resulting in death within thirty days of the date of the accident is classified as a fatal injury by ICAO.

2. An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.

For purposes of this Safety Report, only operational accidents are classified.

The following types of operations are excluded:

- Private aviation
- Business aviation
- Illegal flights (e.g., cargo flights without an airway bill, fire arms or narcotics trafficking)
- Humanitarian relief
- Crop dusting/agricultural flights
- Security-related events (e.g., hijackings)
- Experimental/Test flight

Accident classification: the process by which actions, omissions, events, conditions, or a combination thereof, which led to the accident are identified and categorized.

Aerodrome manager: as defined in applicable regulations and includes the owner of aerodrome.

A1

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

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

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

Captain: the involved pilot responsible for operation and safety of the aircraft during flight time.

Commander: the involved pilot, in an augmented crew, responsible for operation and safety of the aircraft during flight time.

Commonwealth of Independent States (CIS): regional organization whose participating countries are Azerbaijan, Armenia, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, the Russian Federation, Tajikistan, Turkmenistan, Uzbekistan and Ukraine.

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).

Eastern-built Jet aircraft: commercial Jet transport aircraft designed in CIS countries or the People's Republic of China.

Eastern-built Turboprop aircraft: commercial Turboprop transport aircraft designed in CIS countries or the People's Republic of China.

Evacuation: Passengers and/or crew evacuate aircraft via escape slides, doors, emergency exits, or gaps in fuselage, usually initiated in life threatening or catastrophic event.

Fatal accident: an accident where at least one passenger or crewmember is killed or later dies of their injuries as a result of an operational accident.

Events such as slips and falls, food poisoning, turbulence or accidents involving on board 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 the accident are excluded.

Hazard: condition, object or activity with the potential of causing injuries to personnel, 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.

IATA accident classification system: refer to Annexes 2 and 3.

IATA regions: IATA determines the accident region based on the operator's country. Moreover, the operator's country is 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, Republic of
	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

Region	Country
	South Sudan
	Swaziland
	Tanzania
	Togo
	Uganda
	Zambia
	Zimbabwe
ASPAC	Australia[1]
	Bangladesh
	Bhutan
	Brunei Darussalam
	Burma
	Cambodia
	East Timor
	Fiji Islands
	India
	Indonesia
	Japan
	Kiribati
	Laos
	Malaysia
	Maldives
	Marshall Islands
	Micronesia
	Nauru
	Nepal
	New Zealand[2]
	Pakistan
	Palau
	Papua New Guinea
	Philippines
	Samoa
	Singapore
	Solomon Islands
	South Korea
	Sri Lanka
	Thailand
	Tonga
	Tuvalu, Ellice Islands
	Vanuatu
	Vietnam

Region	Country
CIS	Armenia
	Azerbaijan
	Belarus
	Georgia
	Kazakhstan
	Kyrgyzstan
	Moldova
	Russia
	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
	Hungary
	Iceland
	Ireland
	Italy
	Israel
	Kosovo
	Latvia
	Liechtenstein
	Lithuania
	Luxembourg
	Macedonia
	Malta
	Monaco
	Montenegro
	Netherlands[5]

Region	Country
	Norway
	Poland
	Portugal
	Romania
	San Marino
	Serbia
	Slovakia
	Slovenia
	Spain
	Sweden
	Switzerland
	Turkey
	United Kingdom[6]
	Vatican City
LATAM	Antigua and Barbuda
	Argentina
	Bahamas
	Barbados
	Belize
	Bolivia
	Brazil
	Chile
	Colombia
	Costa Rica
	Cuba
	Dominica
	Dominican Republic
	Ecuador
	El Salvador
	Grenada
	Guatemala
	Guyana
	Haiti
	Honduras
	Jamaica
	Mexico
	Nicaragua
	Panama
	Paraguay
	Peru
	Saint Kitts and Nevis
	Saint Lucia

Region	Country
	Saint Vincent and the Grenadines
	Suriname
	Trinidad and Tobago
	Uruguay
	Venezuela
MENA	Afghanistan
	Algeria
	Bahrain
	Egypt
	Iran
	Iraq
	Jordan
	Kuwait
	Lebanon
	Libya
	Morocco
	Oman
	Qatar
	Saudi Arabia
	Sudan
	Syria
	Tunisia
	United Arab Emirates
	Yemen
NAM	Canada
	United States of America[7]
NASIA	China[8]
	Mongolia
	North Korea

[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 Polynesia New Caledonia Saint-Barthélemy Saint Martin Saint Pierre and Miquelon Wallis and Futuna French Southern and Antarctic Lands

[5]Netherlands include:
Aruba Netherlands Antilles

[6]United Kingdom includes:
England Scotland Wales Northern Ireland Akrotiri and Dhekelia Anguilla Bermuda British Indian Ocean Territory British Virgin Islands Cayman Islands Falkland Islands Gibraltar Montserrat Pitcairn Islands Saint Helena 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 United States Virgin Islands

[8]China includes:
Hong Kong Macau Taiwan

Incident: an occurrence, other than an accident, associated with the operation of an aircraft which 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 the purpose of 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, on the basis of 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 a level of 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 which, if improperly done, might appreciably affect mass, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness.

Non-operational 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:

- Non-airline operated aircraft (e.g., military or government operated, survey, aerial work or parachuting flights);
- Accidents where there has been no intention of flight

Occurrence: any unusual or abnormal event involving an aircraft, including but not limited to an incident.

Operational accident: an accident which is believed to represent the risks of normal commercial operation, generally accidents which occur during normal revenue operations or positioning flights.

Operator: a person, organization or enterprise engaged in or offering to engage in aircraft operation.

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 staff are included as passengers as their duties are not concerned with the operation of the flight.

Person: any involved individual, including an aerodrome manager and/or a member of an air traffic services unit.

Phase of flight: the phase of flight definitions applied by IATA were developed by the Air Transport Association (ATA). They are presented in the following table.

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 an airplane; it ends when the crew arrives at the aircraft for the purpose of the planned flight or the crew initiates a "Flight Close" phase.

Pre-flight (PRF) This phase begins with the arrival of the flight crew at an aircraft for the purpose of flight; it ends when a dedication 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 Pre-flight 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 in this phase, it is done without any engines operating. Boarding with any engine 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 forward 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 for the purpose of positioning 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 the purpose of Take-off or the crew initiates a "Taxi-in" phase.

Note: This phase includes taxi from the point of moving under its own power, up to and including entering the runway and reaching the Take-off position.

Take-off (TOF) This phase begins when the crew increases the thrust for the purpose of lift-off; it ends when an Initial Climb is established or the crew initiates a "Rejected Take-off" phase.

Rejected Take-off (RTO) This phase begins when the crew reduces thrust for the purpose of stopping the aircraft prior to the end of the Take-off 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 ft above the runway elevation; it ends after the speed and configuration are established at a defined maneuvering altitude or to continue the climb for the purpose of cruise. It may also end by the crew initiating an "Approach" phase.

Note: Maneuvering altitude is based upon such an altitude to safely maneuver the aircraft after an engine failure occurs, or pre-defined 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 the purpose of cruising; it ends with the aircraft established at a predetermined constant initial cruise altitude at a defined speed or by the crew initiating a "Descent" phase.

Cruise (CRZ) The cruise 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 Descent for the purpose of 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 the purpose of an approach at a particular destination; it ends when the crew initiates changes in aircraft configuration and/or speeds to facilitate a landing on a particular 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 for the purpose of landing on a particular 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 an "Initial Climb" or "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 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 the purpose of arriving 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 the purpose of 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 shutdown the engine(s); it ends with a dedication to shutting down ancillary systems for the purpose of securing 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 for the purpose of leaving the flight deck; it ends when the cockpit and cabin crew leaves the aircraft. It may also end by the crew initiating a "Pre-flight" 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, 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: This phase was identified by the need for information that may not directly require the input of cockpit or cabin crew. It is acknowledged as an entity to allow placement of the tasks required of personnel assigned to service the aircraft.

Products: refer, in terms of accident costs, to those liabilities which fall on parties other than the involved operator.

Rapid Deplaning: Passengers and/or crew rapidly exit aircraft via boarding doors and via jet bridge or stairs, for precautionary measures.

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 damage 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 take-off at one location and landing at another (other than a diversion).

Serious Injury: an injury which is sustained by a person in an accident and which:

- Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or
- Results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- Involves lacerations which cause severe haemorrhage, or nerve, muscle or tendon damage;
- Involves injury to any internal organ; or
- Involves second or third-degree burns, or any burns affecting more than five percent of the surface of the body; or
- 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).

Sky Marshal: see In-flight Security Personnel.

Substantial Damage: means 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: Approach where the ACTF 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.

Western-built Jet: Commercial Jet transport aircraft with a maximum certificated take-off mass of more than 15,000 kg, designed in Western Europe, the Americas or Indonesia.

Western-built Turboprop: Commercial Turboprop transport aircraft with a maximum certificated take-off mass of more than 5,700 kg, designed in Western Europe, the Americas or Indonesia. Single-engine aircraft are excluded.

Annex 2

A2

Accident Classification Taxonomy Flight Crew

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

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1 Latent Conditions (cont'd)

Technology and Equipment	↗ Available safety equipment not installed (E-GPWS, 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) Standard Operating Procedures (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) Standard Operating Procedures (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) Standard Operating Procedures (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) Standard Operating Procedures (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
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/IMC
	↗ Wind/wind shear/gusty wind
	↗ Icing conditions
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 Object	↗ 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
	↗ Airport perimeter control/fencing ↗ 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	↗ Self-explanatory
Other	↗ Not clearly falling within the other environmental threats

Airline Threats	Examples
Aircraft Malfunction	↗ Technical anomalies/failures 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 ↗ Cabin crew errors ↗ Distractions/interruptions
Ground Events	↗ Aircraft loading events ↗ Fueling errors ↗ Agent interruptions ↗ Improper ground support ↗ Improper de-icing/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, take-off or landing
Brakes	↗ Failure affecting parking, taxi, take-off 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 (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.

A2

Aircraft Handling Errors	Examples
Manual Handling/ Flight Controls	↗ Hand flying vertical, lateral, or speed deviations ↗ Approach deviations by choice (e.g., flying below the GS) ↗ 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 SOP ↗ 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 take-off, descent, or approach callouts
Briefings	↗ Omitted departure, take-off, approach, or handover briefing; items missed ↗ Briefing does not address expected situation

A2

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 after destabilisation during approach	↗ Flight crew does not execute a go-around after stabilization requirements are not met
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 ↗ Lack of communication
With Maintenance	↗ Errors in Flight to Maintenance Crew ↗ Lack of communication
Pilot-to-Pilot Communication	↗ Within-crew miscommunication ↗ Misinterpretation

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.

A2

Undesired Aircraft States	Breakdown
Aircraft Handling	↗ Abrupt Aircraft Control
	↗ Vertical, Lateral or Speed Deviations
	↗ Unnecessary Weather Penetration
	↗ Unauthorised Airspace Penetration
	↗ Operation Outside Aircraft Limitations
	↗ Unstable Approach
	↗ Continued Landing after Unstable Approach
	↗ Long, Floated, Bounced, Firm, Off-Centreline Landing ↗ Landing with excessive crab angle
	↗ Rejected Take-off 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

A2

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 (CFIT)	↗ 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 aerodrome involving the incorrect presence of an aircraft, vehicle, person or wildlife on the protected area of a surface designated for the landing and take-off of aircraft and resulting in a collision
Mid-air Collision	↗ Collision between aircraft in flight
Runway 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 in 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

A2

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 coordinated flight deck activities	In command, decisive, and encourages crew participation
	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 kept watch outside when navigating taxiways and runways	Clearances are verbalised 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 analysed 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

Image courtesy of Airbus

A3

Annex 3 2012 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2012-01-09	Xian	MA-60	TAM - Transporte Aereo Militar	Cap Av Emilio Beltran Airport, Guayaramerin, Bolivia	LND	Passenger	Eastern	Turboprop	Substantial Damage	Wheels up landing
2012-01-16	Bombardier	Dash 8	FlyBe	Southampton, United Kingdom	ESD	Passenger	Western	Turboprop	Substantial Damage	Ground collision on push-back
2012-01-16	Bombardier	Dash 8	Piedmont Airlines	Huntington, WV, USA	TXO	Passenger	Western	Turboprop	Substantial Damage	Collided with deicing truck
2012-01-21	ATR	ATR 72	Air Nostrum	San Sebastian - Hondarribia, Spain	ESD	Passenger	Western	Turboprop	Substantial Damage	Prop struck a GPU following start up
2012-01-24	Boeing	MD-80	Swiftair	Kandahar, Afghanistan	LND	Passenger	Western	Jet	Hull Loss	Sustained damage on landing
2012-01-30	Antonov	An-28	Tracep Congo Aviation	Namoya, DR Congo	APR	Cargo	Eastern	Turboprop	Hull Loss	Crashed into trees on approach
2012-02-05	Airbus	A320	ANA - All Nippon Airways	Sendai, Japan	GOA	Passenger	Western	Jet	Substantial Damage	Bounced Landing
2012-02-13	Saab	2000	Carpatair	Craiova, Romania	TOF	Passenger	Western	Turboprop	Hull Loss	Runway veer-off on take-off
2012-02-14	Airbus	A319	easyJet	Luton Airport, Luton, United Kingdom	LND	Passenger	Western	Jet	Substantial Damage	Landed hard
2012-02-17	ATR	ATR 72	Air KBZ	Thandwe, Myanmar	LND	Passenger	Western	Turboprop	Substantial Damage	Nose-gear collapse and resultant runway excursion
2012-03-05	Lockheed	L-188 Electra	Buffalo Airways	Yellowknife, NT, Canada	LND	Cargo	Western	Turboprop	Hull Loss	Right main undercarriage failed to extend
2012-03-08	BAE Systems	Jetstream 31	Linksair	Isle of Man - Ronaldsway, United Kingdom	LND	Passenger	Eastern	Turboprop	Substantial Damage	Gear collapse on landing
2012-03-12	Airbus	A319	Air India	Mumbai, India	GOA	Passenger	Western	Jet	Substantial Damage	Tailstrike during go-around
2012-03-17	Hawker Beechcraft	1900	Northern Thunderbird Air	Blue River, BC, Canada	LND	Passenger	Western	Turboprop	Substantial Damage	Runway excursion on landing
2012-03-29	Fokker	F.50	Feeder Airlines	Wau, Sudan	LND	Passenger	Western	Turboprop	Hull Loss	Runway excursion on landing
2012-03-30	Fokker	F.50	Aero Mongolia	Oyu Tolgoi, Mongolia	TOF	Passenger	Western	Turboprop	Hull Loss	Runway excursion on take-off

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2012-03-31	Boeing	777	Japan Airlines	Tokyo Haneda, Japan	GOA	Passenger	Western	Jet	Substantial Damage	Tailstrike on go-around
2012-04-02	ATR	ATR 72	UTAir	(near) Tyumen, Russia	ICL	Passenger	Western	Turboprop	Hull Loss	Impacted terrain after take-off
2012-04-07	Bombardier	Dash 8	Colgan Air	Houston - Intercontinental Airport, TX, USA	LND	Passenger	Western	Turboprop	Substantial Damage	Nose-gearless landing
2012-04-09	Bombardier	Dash 8	Air Tanzania	Kigoma, Tanzania	RTO	Passenger	Western	Turboprop	Hull Loss	Runway overrun during rejected take-off
2012-04-14	Boeing	737	Titan Airways	Chambery, France	TOF	Passenger	Western	Jet	Substantial Damage	Tailstrike on take-off
2012-04-15	Fokker	F.27	Sky Relief (Kenya)	Yida, South Sudan	LND	Cargo	Western	Turboprop	Hull Loss	Nose undercarriage
2012-04-20	Boeing	737	Bhoja Air	(near) Islamabad, Pakistan	APR	Passenger	Western	Jet	Hull Loss	Impacted ground on approach
2012-04-22	Boeing	737	Shaheen Air	Karachi, Pakistan	LND	Passenger	Western	Jet	Substantial Damage	Left main gear collapse during landing
2012-04-28	Antonov	An-24	Jubba Airways	Galkayo, Somalia	LND	Passenger	Eastern	Turboprop	Hull Loss	Bounced landing leading to runway excursion
2012-05-01	Airbus	A300	Onur Air	King Abdul Aziz Int'l Airport, Jeddah, Saudi Arabia	LND	Ferry	Western	Jet	Substantial Damage	Landed without nose-gear
2012-05-02	Hawker Beechcraft	1900	Keewatin Air	Dewar Lakes, Nunavut, Canada	LND	Cargo	Western	Turboprop	Substantial Damage	Right main gear collapse during landing roll
2012-05-11	Convair	580	Gulf & Caribbean Air	Guatemala City Airport- La Aurora, Guatemala	LND	Cargo	Western	Turboprop	Hull Loss	Nose-gear collapse during landing roll
2012-05-13	ATR	ATR 72	Aer Arann	Cork, Ireland	LND	Passenger	Western	Turboprop	Substantial Damage	Hard landing in cross-wind
2012-05-14	Fairchild Dornier	Do-228	Agni Air	Jomsom, Nepal	APR	Passenger	Western	Turboprop	Hull Loss	Impacted terrain on approach
2012-05-17	ATR	ATR 72	Air Dolomiti	Munich Airport, Germany	LND	Passenger	Western	Turboprop	Substantial Damage	Smoke in aircraft, veer-off on landing

Annex 3 2012 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2012-05-17	Shorts	360	Air Cargo Carriers	Houston Intercontinental Airport, TX, USA	TXI	Cargo	Western	Turboprop	Substantial Damage	Brake fire on taxi
2012-05-26	Bombardier	Dash 8	FlyBe	Isle of Man, United Kingdom	GDS	Passenger	Western	Turboprop	Substantial Damage	Struck by ambulift
2012-05-30	Embraer	ERJ-140	American Eagle Airlines Inc.	O'Hare International Airport, Chicago, Illinois, USA	TXI	Passenger	Western	Jet	Substantial Damage	Tail struck by widebody aircraft wingtip
2012-06-01	Boeing	737	Sriwijaya Air	Pontianak, Indonesia	LND	Passenger	Western	Jet	Substantial Damage	Veered off runway
2012-06-02	Boeing	727	Allied Air Cargo	Accra, Ghana	LND	Cargo	Western	Jet	Hull Loss	Veered off runway and struck bus
2012-06-03	Boeing	MD-80	Dana Air	(near) Lagos, Nigeria	APR	Passenger	Western	Jet	Hull Loss	Loss of power in both engines
2012-06-06	Fairchild (Swearingen)	Metro	Air Class Lineas Aereas	(in lake, near) Isla de Flores, Uruguay	ECL	Cargo	Western	Turboprop	Hull Loss	Aircraft missing, presumed crashed
2012-06-11	Let	L-410 Turbolet	Air-Tec Africa ACMI Leasing	Entebbe, Uganda	TOF	Passenger	Eastern	Turboprop	Substantial Damage	Nose-gear collapse during take-off
2012-06-16	ATR	ATR 42	Blue Islands	Jersey, Channel Islands, United Kingdom	LND	Passenger	Western	Turboprop	Substantial Damage	Gear collapse
2012-06-20	Boeing	767	ANA - All Nippon Airways	Narita International Airport, Tokyo, Japan	LND	Passenger	Western	Jet	Substantial Damage	Bounced landing resulting in substantial damage
2012-06-22	Hawker Beechcraft	1900	Sahel Aviation Service	Beyla, Guinea	TXI	Ferry	Western	Turboprop	Substantial Damage	Soft runway resulting in gear collapse
2012-07-18	Boeing	737	Sky Airline	La Florida Airport, LA Serena, Chile	LND	Passenger	Western	Jet	Substantial Damage	Struck wing during landing
2012-07-31	Fairchild Dornier	Do-228	Island Transvoyager Inc	El Nido, Palawan, Philippines	LND	Passenger	Western	Turboprop	Substantial Damage	Landed hard followed by gear failure
2012-08-10	Bombardier	Dash 8	Colgan Air	Dulles International Airport, Washington, DC, USA	TXI	Passenger	Western	Turboprop	Substantial Damage	Tail struck by A330 on taxi-in
2012-08-17	Embraer	EMB-190	Mandarin Airlines	Makung, Taiwan	LND	Passenger	Western	Jet	Substantial Damage	Nose-gear collapsed after overrun

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2012-08-19	Antonov	An-26	Alfa Airlines	(near) Talodi, Sudan	GOA	Passenger	Eastern	Turboprop	Hull Loss	Impacted terrain during go-around
2012-08-22	Let	L-410 Turbolet	Mombasa Air Safari	Ngerende (Mara Lodges), Kenya	TOF	Passenger	Eastern	Turboprop	Hull Loss	Failed to climb on take-off
2012-08-24	Boeing	MD-80	Aserca Airlines	Santo Domingo del Tachira, Venezuela	LND	Passenger	Western	Jet	Hull Loss	Runway excursion in heavy rain
2012-08-31	ATR	ATR 42	Pakistan International Airlines	Lahore, Pakistan	LND	Passenger	Western	Turboprop	Substantial Damage	Runway excursion on landing
2012-09-06	Bombardier	CRJ	Air Nostrum	Seville, Spain	PRF	Passenger	Western	Jet	Substantial Damage	Aircraft struck by baggage truck
2012-09-10	Bombardier	Dash 8	Jazz	Gaspe, QC, Canada	LND	Passenger	Western	Turboprop	Substantial Damage	Tailstrike in downdraft
2012-09-12	Antonov	An-28	Petropavlovsk-Kamchatsky Air Enterprise	(near) Palana, Russia	APR	Passenger	Eastern	Turboprop	Hull Loss	Impacted mountain on approach
2012-09-20	Airbus	A320	Syrianair	Damascus, Syria	ECL	Passenger	Western	Jet	Substantial Damage	Mid-air collision with military helicopter
2012-09-28	Fairchild Dornier	Do-228	Sita Air	Kathmandu, Nepal	ICL	Passenger	Western	Turboprop	Hull Loss	Impacted ground after bird strike during initial climb
2012-10-13	Boeing	MD-11	Centurion Air Cargo	Sao Paulo Campinas, Brazil	LND	Cargo	Western	Jet	Substantial Damage	Gear collapse on landing
2012-10-14	Boeing	737	Corendon Airlines	Antalya, Turkey	ESD	Passenger	Western	Jet	Substantial Damage	Cockpit fire
2012-10-15	Bombardier	Dash 8	Air Creebec	Wemindji, QC, Canada	PSF	Passenger	Western	Turboprop	Substantial Damage	Aircraft struck by baggage truck
2012-10-16	Bombardier	CRJ	Britair	Lorient, France	LND	Passenger	Western	Jet	Substantial Damage	Overran runway
2012-10-19	Antonov	An-12	AirMark Asia (Singapore)	Shindand Air Base, Sabzwar, Afghanistan	LND	Cargo	Eastern	Turboprop	Hull Loss	Caught fire after nose gear collapse
2012-10-19	Boeing	737	Sriwijaya Air	Pontianak, Indonesia	LND	Passenger	Western	Jet	Substantial Damage	Overran runway
2012-10-19	Fokker	F.100	Network Aviation Australia	Nifty, WA, Australia	LND	Passenger	Western	Jet	Substantial Damage	Encountered windshear on final

Annex 3 2012 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2012-10-30	Let	Let 410	Cetraca Air Service	Butembo Airport, Butembo, DR Congo	LND	Passenger	Eastern	Turboprop	Hull Loss	Runway veer-off leading to gear collapse
2012-11-14	Antonov	An-26	Ultimate Air	Yida, South Sudan	LND	Cargo	Eastern	Turboprop	Hull Loss	Runway excursion leading to gear collapse
2012-11-15	Fokker	F.50	Skyward International Aviation Ltd	Aweil Airport, Aweil, South Sudan	LND	Passenger	Western	Turboprop	Hull Loss	Landing accident
2012-11-16	Airbus	A300	DHL	Ivanka Airport, Bratislava, Slovakia	LND	Cargo	Western	Jet	Substantial Damage	Runway excursion leading to nose-gear collapse
2012-11-21	Antonov	AN-26	Polar Airlines	Deputatskiy, Sakha Republic, Russia	LND	Passenger	Eastern	Turboprop	Hull Loss	Overran runway on landing
2012-11-27	Embraer	EMB-120	Inter Iles Air	(in sea near) Moroni, Comoros	ICL	Passenger	Western	Turboprop	Hull Loss	Ditched in sea
2012-11-30	Ilyushin	Il-76	Air Highnesses	(near) Brazzaville, Congo	APR	Cargo	Eastern	Jet	Hull Loss	Undershoot
2012-12-05	Bombardier	CRJ	Air Wisconsin	(near) New York, NY, USA	APR	Passenger	Western	Jet	Substantial Damage	Birdstrike on approach
2012-12-17	Antonov	An-26	Amazon Sky	(near) Tomas, Peru	CRZ	Cargo	Eastern	Turboprop	Hull Loss	Impacted terrain enroute
2012-12-22	Fairchild (Swearingen)	Metro	Perimeter Airlines	Sanikiluaq, Nunavut, Canada	LND	Passenger	Western	Turboprop	Hull Loss	Overran runway
2012-12-25	Fokker	F100	Air Bagan	Heho, Myanmar	APR	Passenger	Western	Jet	Hull Loss	Undershoot impacting power lines
2012-12-29	Tupolev	TU-204	Red Wings Airlines	Vnukovo Airport, Moscow, Russia	LND	Ferry	Eastern	Jet	Hull Loss	Overran runway
2012-12-31	BAE Systems	Jetstream 31	EasySky	Ramon Villeda Morales Airport, San Pedro Sula, Honduras	LND	Passenger	Eastern	Turboprop	Substantial Damage	Runway veer-off on landing

LIST OF ACRONYMS

ACAS	Airborne Collision Avoidance Systems
ACTF	IATA Accident Classification Task Force
AES	Arrival/Engine Shutdown (ATA Phase of Flight)
AFI	Africa (IATA Regions)
AIP	Aeronautical Information Publication
ANSP	Aviation Navigation Service Provider
AOC	Air Operator's Certificate
APR	Approach (ATA Phase of Flight)
ASPAC	Asia/Pacific (IATA Regions)
ATA	Air Transport Association
ATC	Air Traffic Control
CA	Captain
CBT	Computer Based Training
CEO	Chief Executive Officer
CFIT	Controlled Flight Into Terrain
CIS	Commonwealth of Independent States (IATA Regions)
COO	Chief Operating Officer
CRM	Crew Resource Management
CRZ	Cruise (ATA Phase of Flight)
CSWG	IATA Cabin Safety Working Group
CVR	Cockpit Voice Recorder
DFDR	Digital Flight Data Recorder
DGB	IATA Dangerous Goods Board
DGR	Dangerous Goods Regulations
DH	Decision Height
DST	Descent (ATA Phase of Flight)
ECL	En Route Climb (ATA Phase of Flight)
E-GPWS	Enhanced Ground Proximity Warning System
ERPTF	IATA Emergency Response Planning Task Force
ESD	Engine Start/Depart (ATA Phase of Flight)
ETOPS	Extended-Range Twin-Engine Operations
EUR	Europe (IATA Regions)
FAA	Federal Aviation Administration
FDA	Flight Data Analysis
FLC	Flight Close (ATA Phase of Flight)
FLP	Flight Planning (ATA Phase of Flight)
FMS	Flight Management System
FO	First Officer
FOQA	Flight Operations Quality Assurance

FSF	Flight Safety Foundation
GDS	Ground Servicing (ATA Phase of Flight)
GOA	Go-around (ATA Phase of Flight)
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
GSIC	Global Safety Information Center
HL	Hull Loss
ICAO	International Civil Aviation Organization
ICL	Initial Climb (ATA Phase of Flight)
IFALPA	International Federation of Air Line Pilots' Associations
IFATCA	International Federation of Air Traffic Controllers' Associations
INOP	Inoperative
IOSA	IATA Operational Safety Audit
IRM	Incident Review Meeting
ISAGO	IATA Safety Audit for Ground Operations
ITDI	IATA Training and Development Institute
ITQI	IATA Training and Qualification Initiative
LATAM	Latin America and the Caribbean (IATA Regions).
LND	Landing (ATA Phase of Flight)
LOSA	Line Operations Safety Audit
MDA	Minimum Descent Altitude
MEL	Minimum Equipment List
MENA	Middle East and North Africa (IATA Regions)
MSTF	IATA Multidivisional Safety Task Force
NAM	North America (IATA Region)
NASIA	North Asia (IATA Regions)
NAVaids	Navigational Aids
NOTAM	Notices to Airmen
OPC	IATA Operations Committee
PCMCIA	Personal Computer Memory Card International Association
PED	Portable Electronic Device
PF	Pilot Flying
PFS	IATA Partnership for Safety Program
PM	Pilot Monitoring
PRF	Pre-Flight (ATA Phase of Flight)
PSF	Post-flight (ATA Phase of Flight)
QAR	Quick Access Recorder
RA	Resolution Advisory

LIST OF ACRONYMS (Cont'd)

RAAS	Runway Awareness and Advisory System
RTO	Rejected Take-off (ATA Phase of Flight)
SD	Substantial Damage
SG	IATA Safety Group
SMS	Safety Management System
SOP	Standard Operating Procedures
STEADES	Safety Trend Evaluation, Analysis and Data Exchange System
TAWS	Terrain Awareness Warning System
TCAS	Traffic Alert and Collision Avoidance System
TCAS RA	Traffic Alert and Collision Avoidance System Resolution Advisory
TEM	Threat and Error Management
TIPH	Taxi into Position and Hold
TOF	Take-off (ATA Phase of Flight)
TXI	Taxi-in (ATA Phase of Flight)
TXO	Taxi-out (ATA Phase of Flight)
UAS	Undesired Aircraft State
WGS-84	World Geodetic System 1984

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custserv@iata.org

+1 800 716 6326

+1 (514) 874 9659

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Material No: 9049-19
ISBN 978-92-9252-115-8

Printed in Canada