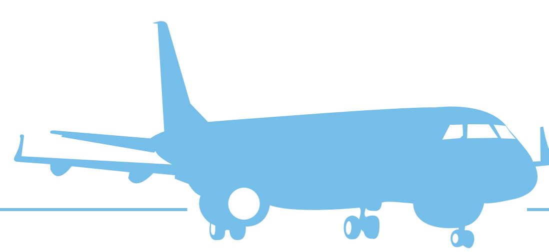
IATA

SAFETY REPORT 2011

Issued April 2012



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International Air Transport Association
Montreal—Geneva

48th | Edition

NOTICE

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"IATA will continue to lead safety initiatives designed to address contributing factors to accidents."

Foreword

Dear Colleagues,

Safety is IATA's and our member's number one priority. IATA remains committed to addressing all the safety issues by implementing its six point Safety Strategy which is explained in this Safety Report. Through collaborative industry efforts such as the Global Safety Information Center and the Global Safety Information Exchange (with the International Civil Aviation Organization, the Federal Aviation Administration and the European Commission), help to make air travel the safest means of transportation, as demonstrated by the 2011 industry Western-built jet accident rate.

2011 was the second year in a row in which the accident rate was the lowest on record. This remarkable achievement was earned despite significant global economic challenges and an industry passenger growth. The accident rate was 0.37 Western-built jet hull losses per million sectors flown in 2011. Additionally, when considering the broader measure encompassing all aircraft types, IATA members surpassed the industry's performance by 23%, with a rate of 1.84 accidents per million flights compared to 2.40 for all carriers.

IATA will continue to lead safety initiatives designed to address the contributing factors to accidents. This 48th edition of the IATA Safety Report includes valuable information about safety performance in 2011 as well as offering preventative strategies to both operators and the industry.

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.

Günther Matschnigg
Senior Vice President
Safety, Operations & Infrastructure

Safety Report 2011 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 the International Civil Aviation Organization (ICAO) Annex 13 accident definition. In total, 92 accidents met the IATA accident criteria in 2011. Compared to 2010, the breakdown is as follows:

	Jet	Turboprop	Western-built Jet Hull Loss Rate	Fatal Accidents	Fatalities
2011	55	37	0.37	22	486
2010	59	35	0.61	23	786

Summary data for 2011 provides the following conclusions:

- The total number of all types of accidents decreased by 2% (92 vs. 94 in 2010)
- The number of Western-built jet hull losses decreased by 35% (11 vs. 17 in 2010)
- Total flights increased by 6%, contributing to the overall reduction in accident rates
- The total number of fatal accidents decreased by 4%
- Total fatalities decreased by 38%

The Western-built jet hull loss rate was 0.37 per million flights, a 39 percent improvement over 2010. This was the second year in a row in which the industry accident rate was at a record low. From a regional perspective, the Western-built jet hull loss rate remained the same or decreased in all IATA regions except the Middle East and North Africa and the Commonwealth of Independent States. This year, the IATA Western-built jet hull loss rate was slightly higher than the average for the industry (0.41 accidents per million flights compared with 0.37 for the industry). When considering accidents involving all aircraft types (jet and turboprop, western and eastern), IATA members surpassed the industry's performance by 23 percent (1.84 accidents per million sectors compared to 2.40 for the industry).

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 370 airlines worldwide on the IOSA registry (www.iata.org). In 2011, IOSA certified operators:

- Had an accident rate 52% better than non-IOSA carriers
- Represented approximately 20% of all airline operators (passenger and cargo) worldwide
- Accomplished approximately 64% of all international and domestic passenger and cargo flights

IATA continues to improve the IOSA audit program, and in 2011 developed the next generation of IOSA Audit, the Enhanced IOSA. Enhancing IOSA will take into account the airline's internal quality assurance program in order to provide a greater focus on implementation.

IATA Global Safety Information Center

The 2010 launch of the Global Safety Information Center (GSIC) provides unprecedented access to existing IATA safety databases, benchmarking and trending for all IATA members. Accident data, operational safety reports, IOSA and ISAGO audit data, and Flight Data eXchange data will be provided via a single web portal. More than 415 different organizations around the globe are already submitting safety data into the GSIC, and over 80 percent of IATA member carriers are participating. The framework for the fully operational GSIC platform is under development and expected to be delivered by the end of 2012.

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 that will be presented in the next edition of this report.

Runway Excursions

Runway excursions were once again the most common type of accident in 2011. Runway excursions may occur during take-off or landing but are most common during landing. There is an improving trend in this category, as shown in the table below:

Runway Excursions	2009	2010	2011
Total excursion accidents	23	20	17
IATA member accidents	6	4	7
Percent of annual total	26%	21%	18%

- 47% of runway excursions during landing occurred following a long, floated, bounced, off-center or crabbed landing
- Some regulators are now adding a requirement for flight crews to update landing performance data immediately before each landing

- The total number of runway excursion accidents has been reduced by 26% since 2009 (17 vs. 23)
- One cause of runway excursions on landing is an “unstable approach”, where the aircraft is too fast, above the glide slope, or touches down beyond the desired touchdown point
  - The IATA Global Safety Information Center (GSIC), launched in 2010, provides IATA member carriers with global trending information regarding unstable approaches
  - In 2012, a new Flight Data eXchange (FDX) system within the GSIC will provide IATA carriers with the unstable approach performance for every runway in the database

It is important to recognize that not all runway excursions are attributable to unstable approaches or contaminated surfaces. A number of runway excursions occurred on clean runways following stable approaches. Airlines can use their internal Flight Data Analysis (FDA) program to understand the precursors to runway excursions; these programs are now required by IOSA.

Following the ICAO Global Runway Safety Symposium, held in May 2011, IATA agreed to participate in and co-host several Regional Runway Safety Seminars over the next three years. In conjunction with these seminars, IATA and the other Runway Safety Programme Partners will increase the scope and frequency of runway safety data sharing to find common solutions to common problems. This complements the work already achieved with the launch of the second edition of the Runway Excursion Risk Reduction (RERR) toolkit including information for Air Navigation Service Providers (ANSPs), airports, and improved information for operators. The new edition of the toolkit was launched in May 2011.

Ground Operations and Ground Damage Prevention

Ground damage was the third most common type of accident, representing 16 percent of accidents in 2011. 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 damage incidents, IATA has launched the Ground Damage Database 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.

Aircraft Technical Faults and Maintenance Safety

As was the case in 2010, aircraft technical faults and maintenance issues was the second most frequent category of contributing factors to accidents in 2011; the first being regulatory oversight. While a technical fault is rarely the only or most significant cause of an accident, it can be one of the first events in a sequence of events leading up to an accident.

Accidents with Technical Faults	2009	2010	2011
Maintenance issues as primary cause	10	11	8
Percent of annual total	11%	12%	9%
Total number of accidents with technical faults	26	36	26

- IATA accident statistics exclude post-maintenance test flight accidents
- 40 percent of maintenance related accidents involved landing gear malfunctions

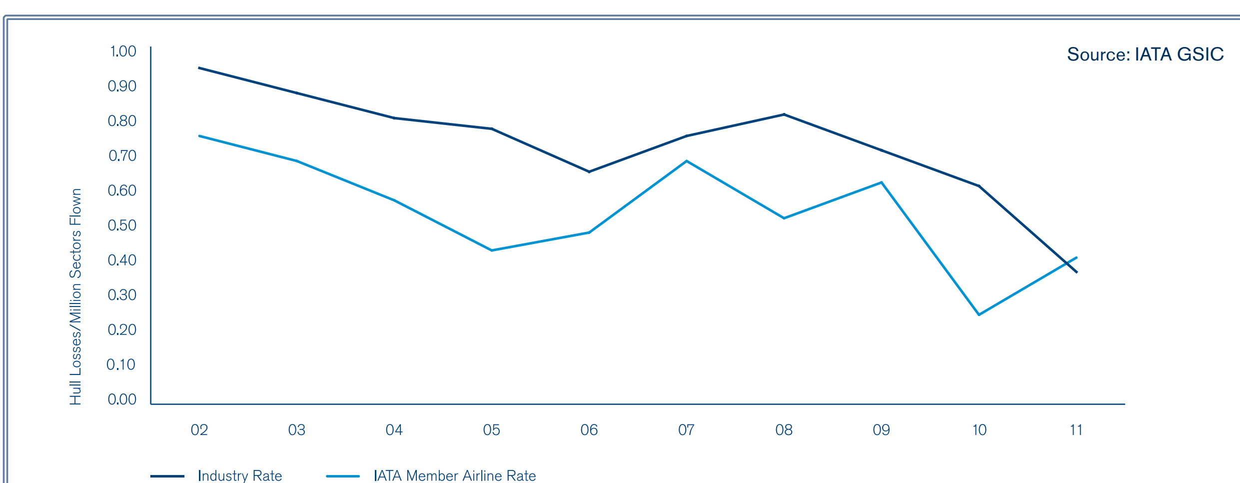
Regional Factors

Globally, IATA carriers represented 37 percent of all accidents while flying 48 percent of all sectors in 2011. The total number of Western-built jet hull losses decreased by 35 percent in 2011 (11 vs. 17 in 2010). Overall, the total number of accidents decreased by 2 percent in 2011 (92 vs. 94 in 2010).

- Asia Pacific, Europe, North America and North Asia performed better than the global average of 0.37 Western-built jet hull losses
- Western-built jet hull loss accident rates in Africa, Asia Pacific, Europe, Latin America and the Caribbean and North Asia all improved relative to 2010. The rate for North America was unchanged
- The Commonwealth of Independent States, Middle East and North Africa regions saw their accidents rates rise in 2011

In 2012, IATA will continue to work with its members to maintain safety as a priority. Through the new 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 (2002-2011)




SAFETY IS ALWAYS OUR FIRST DESTINATION.

“The 2011 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 percent of total air traffic. IATA's global reach extends to 118 nations through 63 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 2011

The purpose of the Safety Report 2011 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 2011.

The Safety Report 2011 was produced at the beginning of 2012. The report presents a detailed summary of statistics, trends and contributing factors involved in 2011's accidents. 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 Airbus

1

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 2011 participants:

Mr. Marcel Comeau AIR CANADA	Mr. Gordon Margison IATA
Capt. Marc Villeneuve AIR FRANCE	Mr. Michael Goodfellow ICAO
Capt. Antoine Roche AIR FRANCE	Capt. Karel Mündel IFALPA
Mr. Frédéric Combes AIRBUS INDUSTRIE	Capt. Hideaki Miyachi JAPAN AIRLINES
Dr. Dieter Reisinger AUSTRIAN AIRLINES (Chairman)	Mr. Richard Fosnot JEPPESEN
Capt. Robert Aaron Jr. THE BOEING COMPANY	Mr. Florian Boldt LUFTHANSA GERMAN AIRLINES
Mr. David Fisher BOMBARDIER AEROSPACE	Capt. Peter Krupa LUFTHANSA GERMAN AIRLINES
Mr. Torsten Roeckrath CARGOLUX AIRLINES INTERNATIONAL	Capt. Ayedh Almotairy SAUDI ARABIAN AIRLINES
Mr. Savio dos Santos EMBRAER AVIATION INTERNATIONAL	Capt. Carlos dos Santos Nunes TAP AIR PORTUGAL
Mr. Don Bateman HONEYWELL	Capt. João Romão TAP AIR PORTUGAL

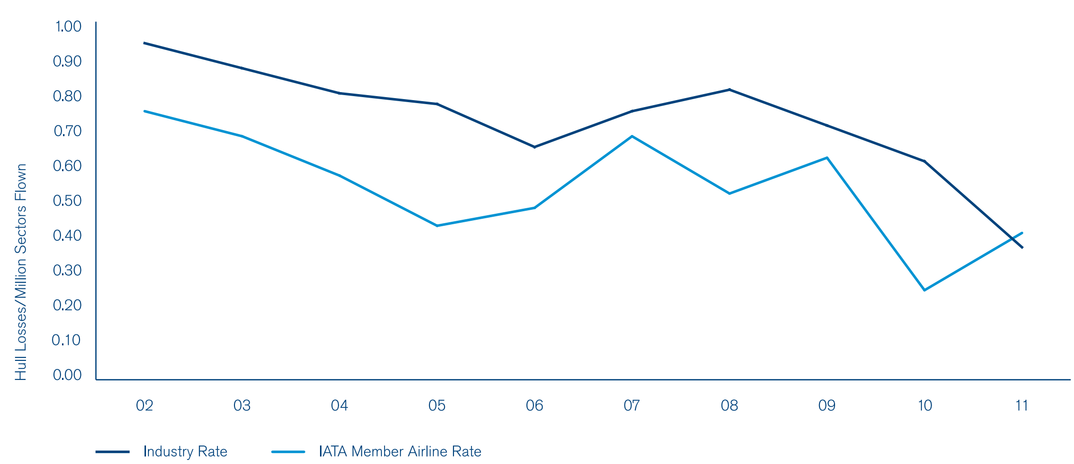
Section 2

2

Decade in Review

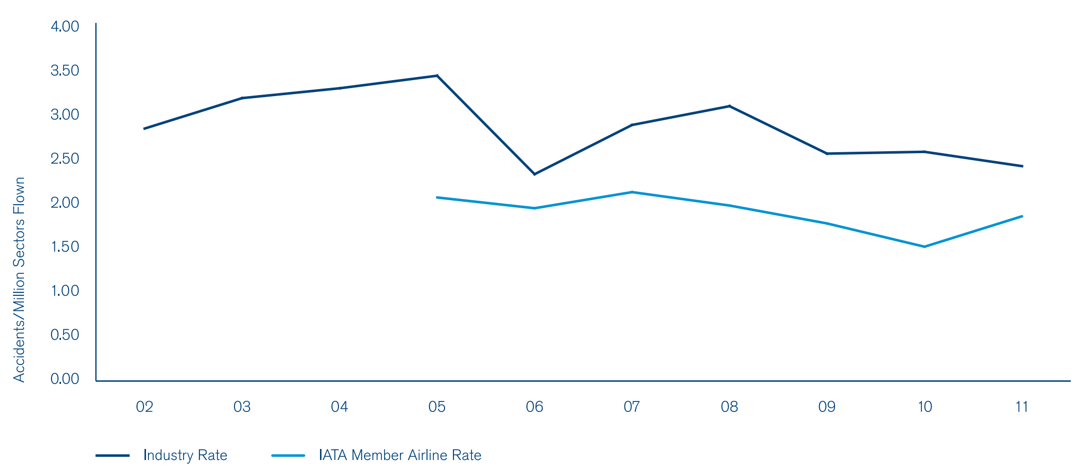
ACCIDENT/FATALITY STATISTICS AND RATES

Western-built Jet Aircraft Hull Loss Rate: IATA Member Airlines vs. Industry (2002-2011)



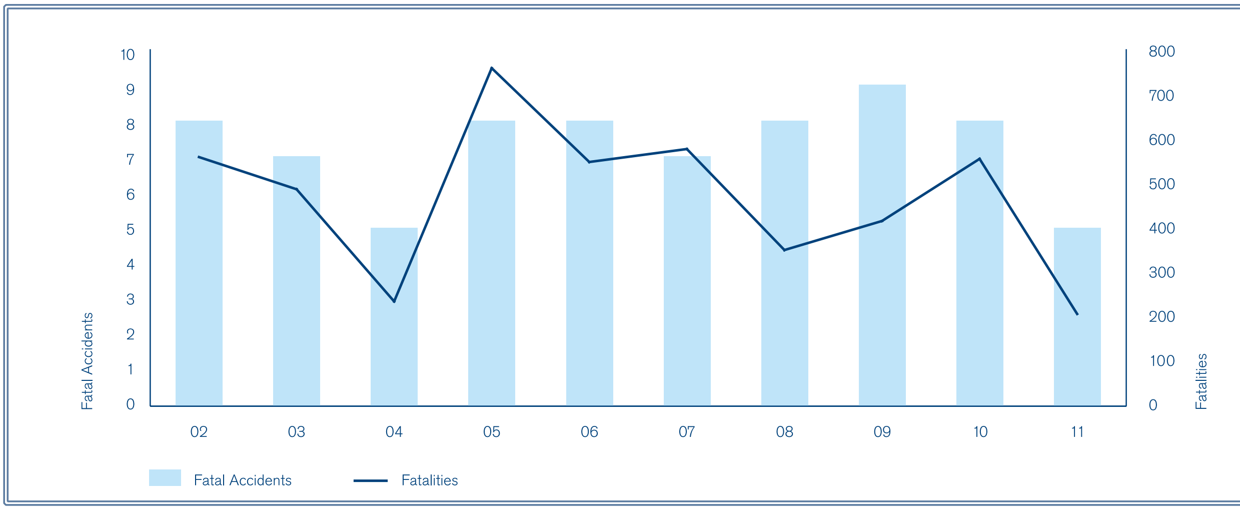
This year, the IATA Western-built jet hull loss rate was slightly higher than the average for the industry, 0.41 accidents per million flights compared with 0.37 for the industry average, however the ten year trend for IATA members remains lower than industry. This development will be monitored by IATA.

All Aircraft Accident Rate (2002-2011)

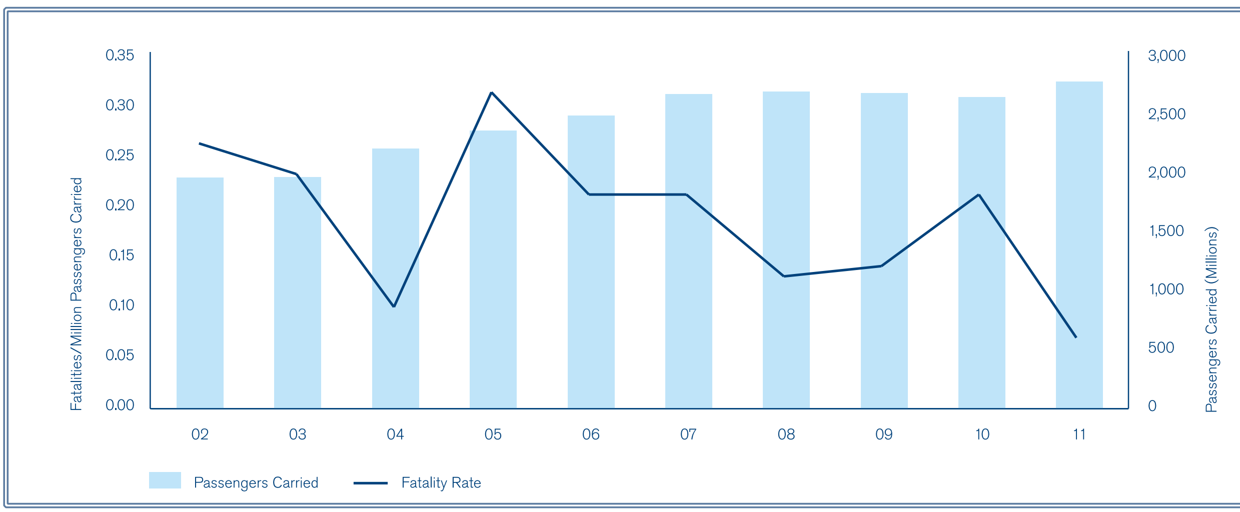


Note: Includes all Eastern-built and Western-built aircraft, including jets and turboprops.

Western-built Jet Aircraft: Fatal Accidents and Fatalities (2002-2011)

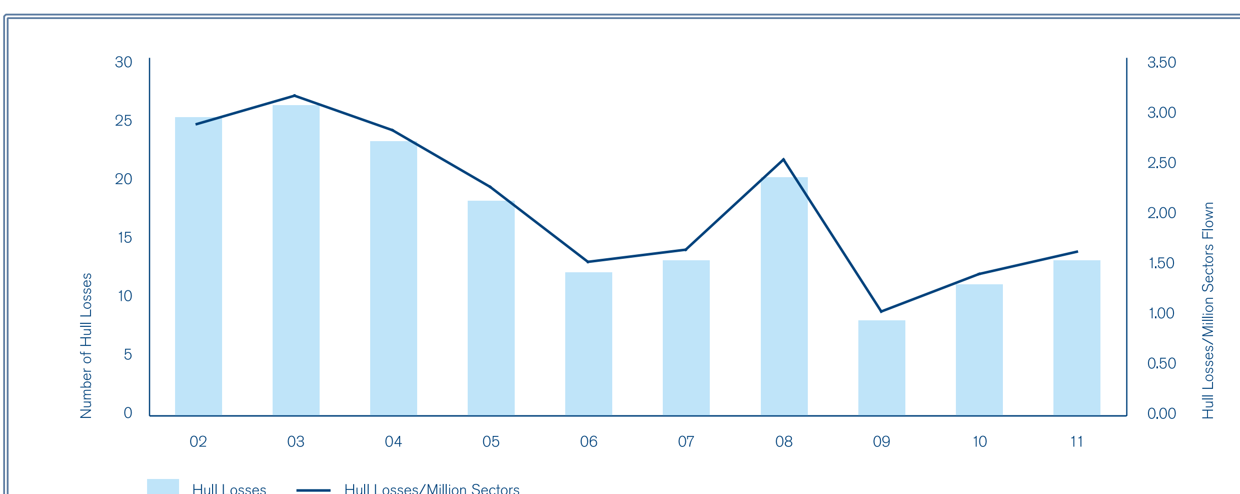


Western-built Jet Aircraft: Passengers Carried and Passenger Fatality Rate (2002-2011)

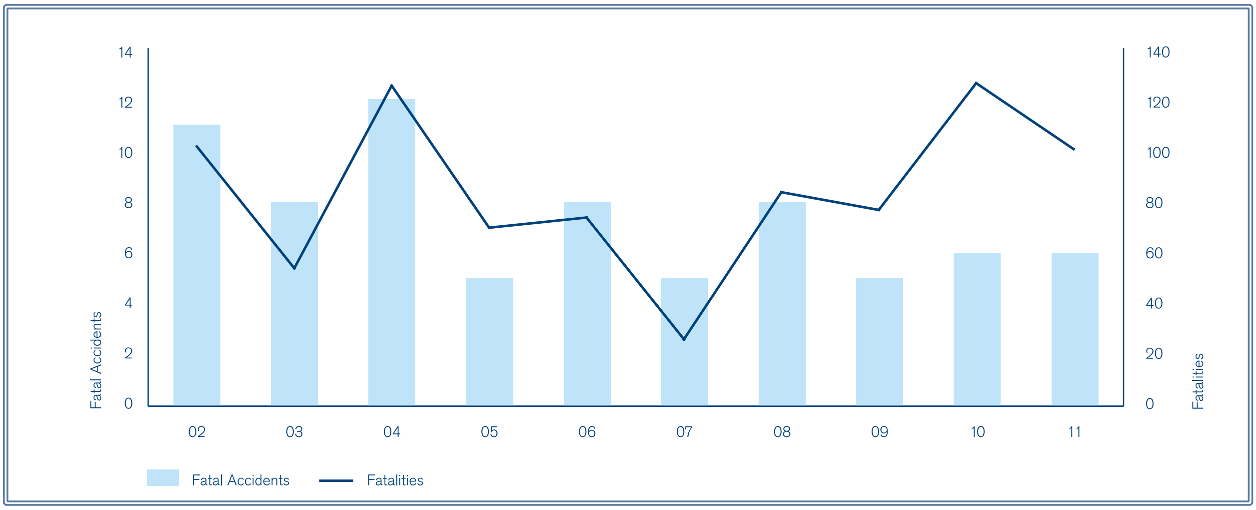


Source: IATA, Ascend Worldwide

Western-built Turboprop Aircraft Hull Losses and Accident Rate (2002-2011)



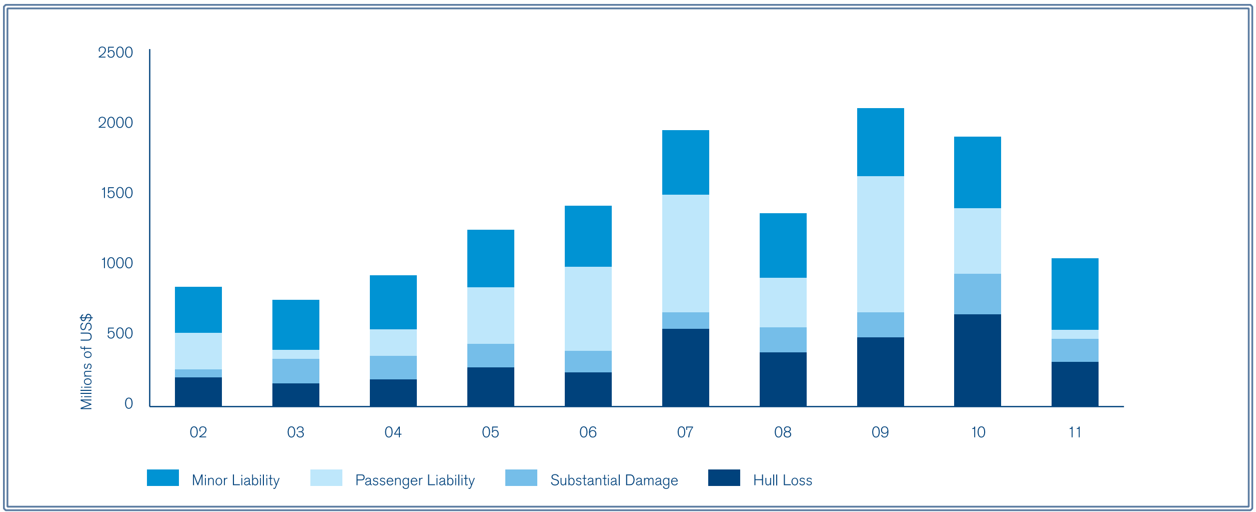
Western-built Turboprop Aircraft: Fatal Accidents and Fatalities (2002-2011)



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.

Western-built Jet Aircraft: Accident Costs (2002-2011)

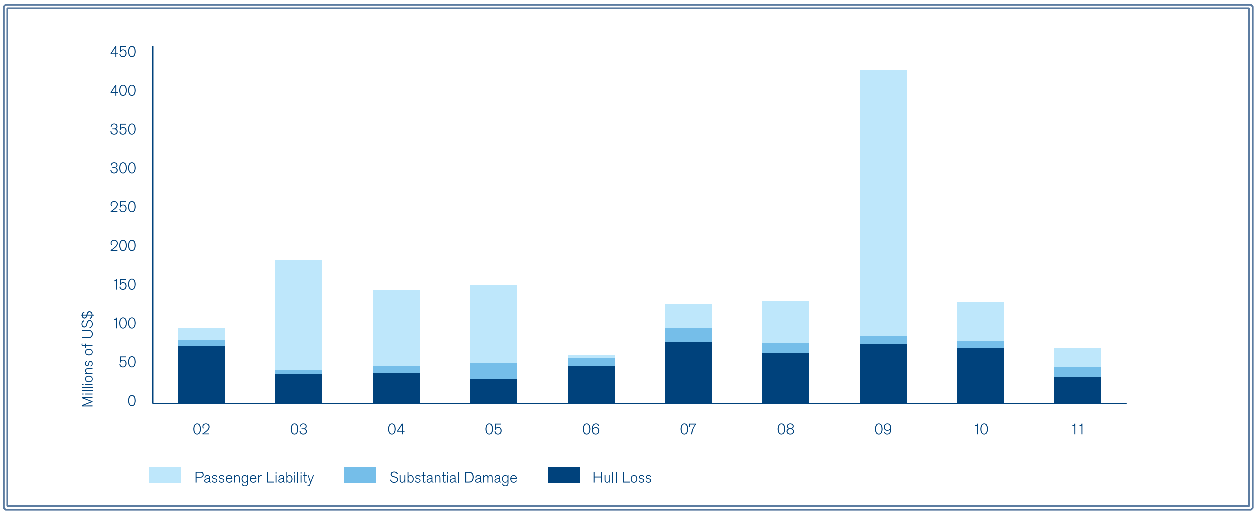


Source: Ascend Worldwide

Western-built Turboprop Aircraft: Accident Costs (2002-2011)

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.

2



Source: Ascend Worldwide

Image courtesy of Embraer

Section 3

3

Year 2011 in Review

AIRCRAFT ACCIDENTS

There were a total of 92 accidents in 2011. Summaries of all the year's accidents are presented in **Annex 3 - 2011 Accidents Summary**.

Fleet Size, Hours and Sectors Flown

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
World Fleet (end of year)	20,814	4,365	898	1,152
Hours Flown (millions)	57.89	6.81	0.71	0.50
Sectors (landings) (millions)	29.52	8.13	0.32	0.35

Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of 31 December 2011.

Operational Accidents

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Loss	11	14	5	9
Substantial Damage	37	13	2	1
Total Accidents	**48**	**27**	**7**	**10**
Fatal Accidents	5	7	4	6

3

Operational Hull Loss Rates

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Losses (per million sectors)	0.37	1.72	15.52	25.61
Hull Losses (per million hours)	0.19	2.05	7.08	17.88

Passengers Carried

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passengers Carried (millions)	2,742	140	17	6
Estimated Change in Passengers Carried Since 2010	5%	6%	-11%	-4%

Source: Ascend Worldwide

Fatal Accidents per Operator Region

	AFI	ASPAC	CIS	EUR	LATAM	MENA	NAM	NASIA
Accidents	8	13	13	15	15	8	17	3
Fatal Accidents	3	5	7	1	4	1	1	0
Fatalities (crew and passengers)	89	92	149	6	60	78	12	0

Fatalities per Aircraft Type

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passenger Fatalities	184	86	77	54
Crew Fatalities	23	15	24	23
Total Fatalities	207	101	101	77

AIRCRAFT ACCIDENTS PER REGION

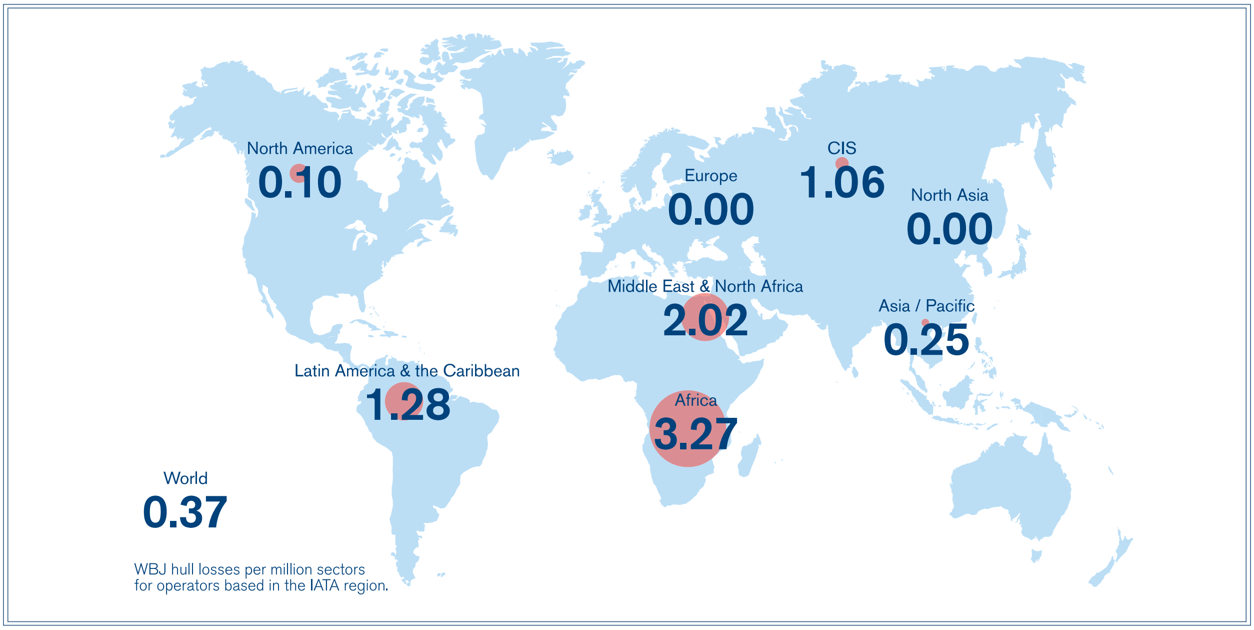
Western-built Aircraft Accidents per Operator Region

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).

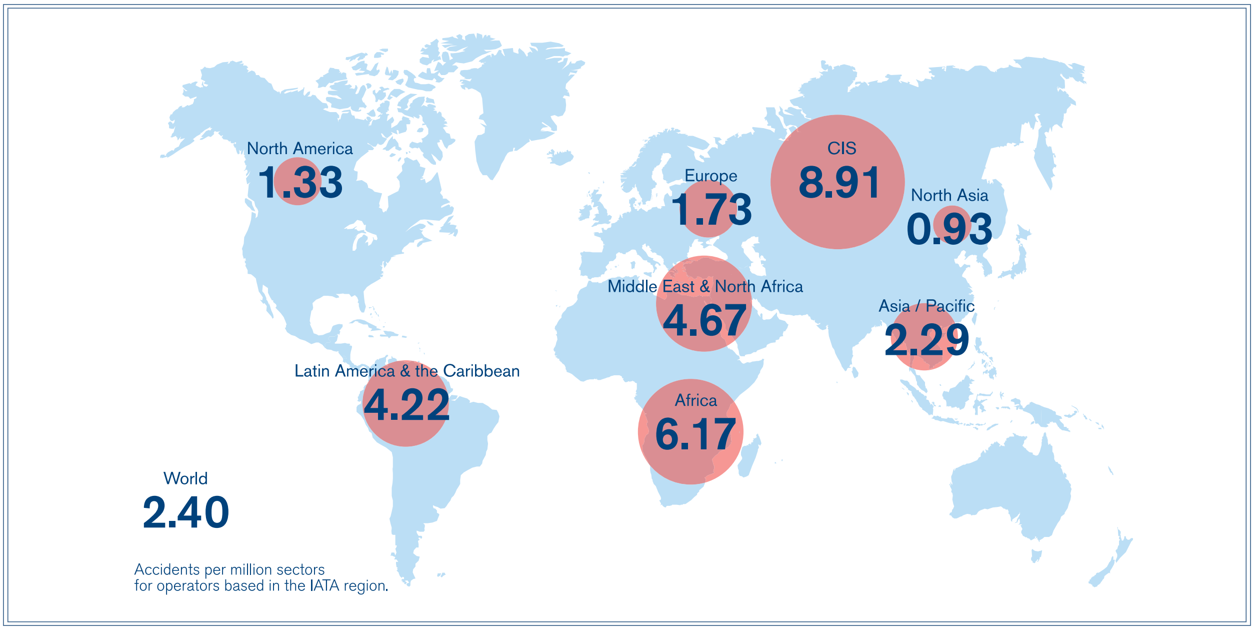
For example, if a Canadian-registered operator has an accident in Europe, this accident is counted as a "North American" accident as far as regional accident rates are concerned.

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

Western-built Jet Hull Loss Rate per Region of Operator



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

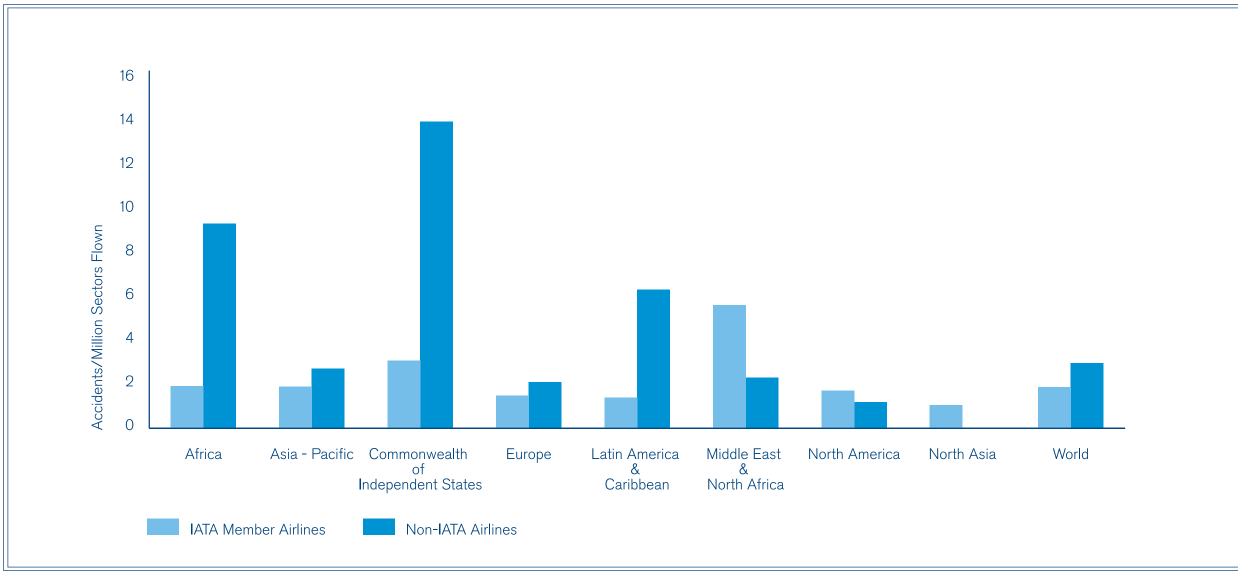


IATA Member Airlines vs. Non-Members Total Accident Rate by Region of Operator

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 except Middle East and North Africa, North America and North Asia. IATA members exceeded the non-IATA by 37 percent in 2011.

3

IATA Member Airlines vs. Non-Members



Section 4

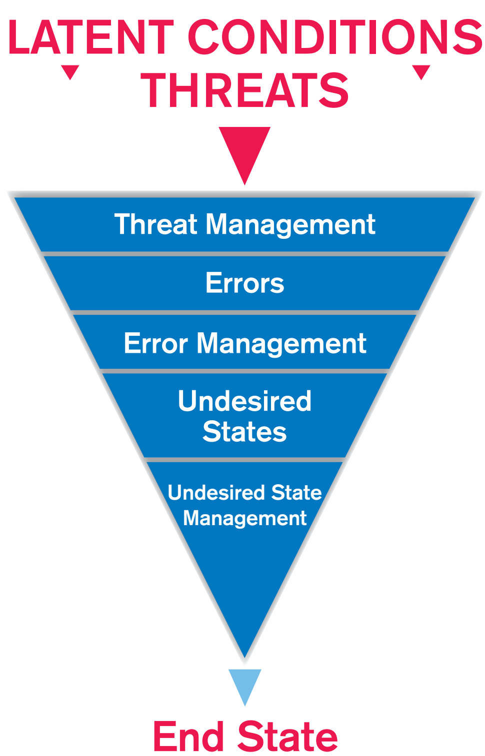
4

In-Depth Accident Analysis 2011

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" do not have additional classifications assigned. 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.

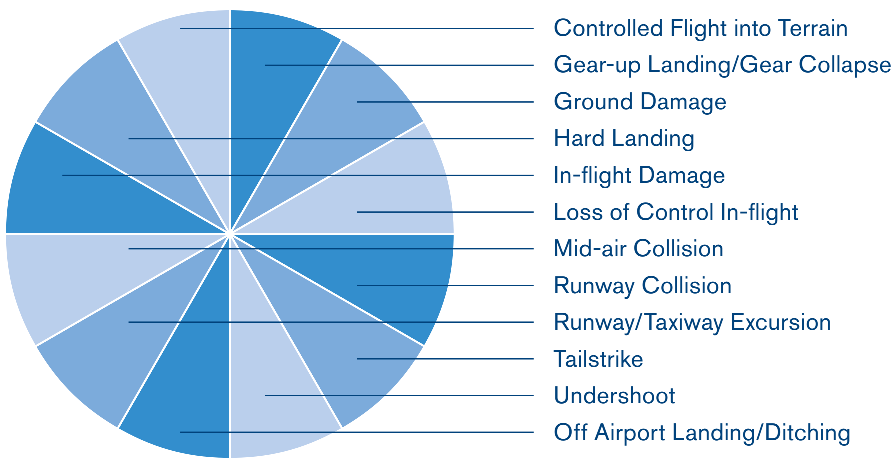
Countermeasures for other personnel, such as air traffic controllers, ground crew, cabin crew or maintenance staff, are important but they are not considered at this time.

Each event was coded with potential counter-measures 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 2011 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 2011 Aircraft Accidents

92 Accidents

IATA Members	37%
Hull Losses	42%
Fatal	24%

86% Passenger

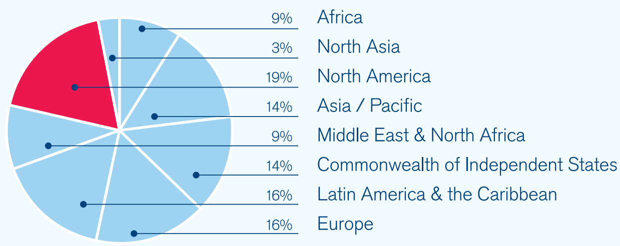
11% Cargo

3% Ferry

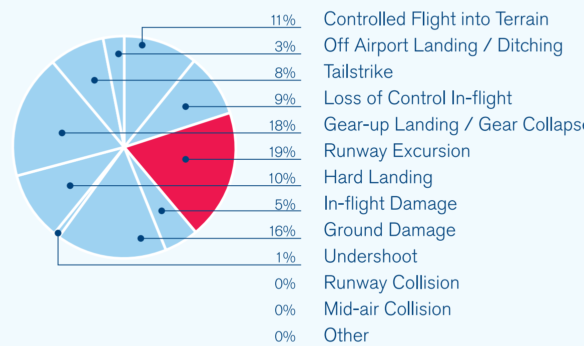
60% Jet

40% Turboprop

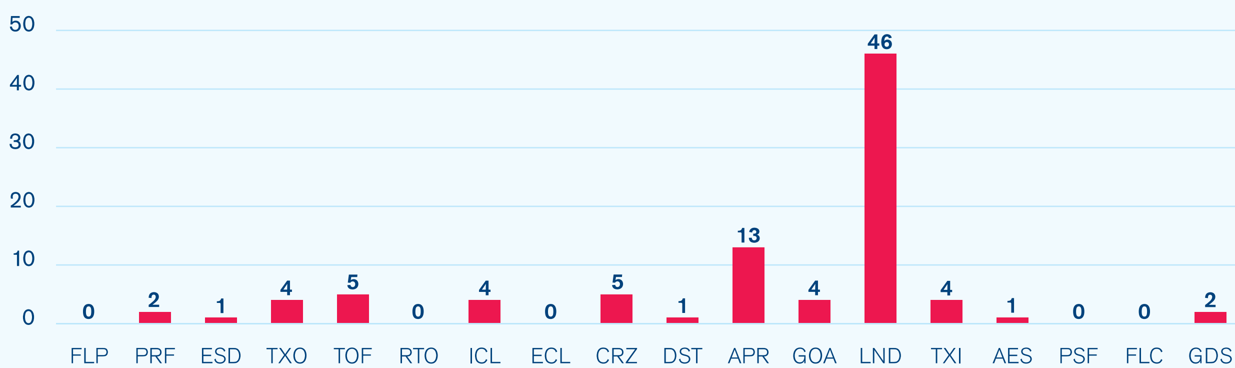
Accidents per Operator Region



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 2011 Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

29% Regulatory oversight

23% Safety management

13% Technology and equipment

12% Flight operations: training systems

10% Flight operations: SOPs & checking

8% Maintenance operations: SOPs & checking

Threats

Environmental

24% Meteorology

- Wind/windshear/gusty wind (50% of these events)
- Poor visibility/IMC (45% of these events)
- Icing conditions (18% of these events)
- Thunderstorms (14% of these events)

14% Air traffic services

13% Airport facilities

- Inadequate overrun area/ trench/ditch or structures in close proximity to runway/ taxiway (42% of these events)
- Poor/faint marking/signs or runway/taxiway closure (25% of these events)
- Contaminated runway or taxiway/poor braking action (25% of these events)

12% Ground-based navigation aids malfunctioning or not available

Airline

27% Aircraft malfunction

- Gear/tire (40% of all malfunctions)
- Fire/Smoke (Cockpit/Cabin/ Cargo) (28% of all malfunctions)
- Contained engine failure/ powerplant malfunction (16% of all malfunctions)
- Extensive / Uncontained Engine Failure (8% of all malfunctions)

9% Maintenance events

Flight Crew Errors (relating to...)

21% SOP adherence/cross-verification

- Intentional error (68% of these events)
- Unintentional error (37% of these events)

20% Manual handling/flight controls

8% Failure to go-around after destabilization during approach

5% Callouts

Undesired Aircraft States (UAS)

16% Vertical, lateral or speed deviations

12% Long/floated/bounced/firm/off-centerline/ crabbed landing

9% Continued landing after unstable approach

Additional Classifications

3% Optical illusion/visual misperception

18% Insufficient data

Correlations of Interest

41% runway excursions involved a long/floated/bounced/firm/off-center/ crabbed landing.

Regulatory oversight was sighted as a factor in all controlled flight into terrain accidents.

Weather-related threats were a factor in **62%** of accidents where the crew intentionally deviated from SOPs or did not adequately cross check.

50% of cases where manual handling of flight control was a factor cited deficiencies in safety management.

Poor visibility or instrument meteorological conditions were cited in **38%** of cases where the crew continued landing following an unstable approach.

The lack of navigation aids or navigation aid malfunction was a noted in **60%** of controlled flight into terrain accidents.

Note: 17 accidents were not classified due to insufficient data.
1 accident could not be assigned an end state.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

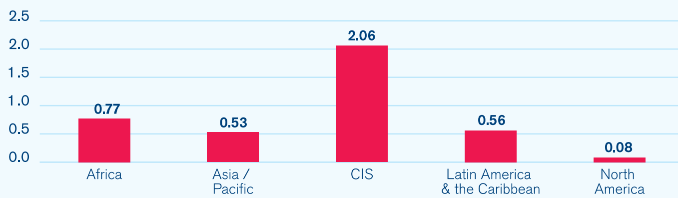
Controlled Flight into Terrain

10 Accidents

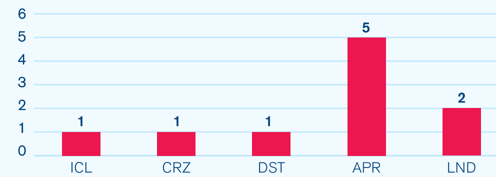
IATA Members	**0%**
Hull Losses	**100%**
Fatal	**90%**
Accident Rate*	**0.26**

80% Passenger | **20%** Cargo | **0%** Ferry | **30%** Jet | **70%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

100% Regulatory oversight
90% Technology and equipment
60% Safety management
20% Flight operations: SOPs & checking

Threats

Environmental
60% Nav aids: ground-based nav aid malfunction or not available
40% Poor visibility/IMC
40% Air traffic services
20% Terrain/obstacles

Airline
10% Operational pressure

Flight Crew Errors (relating to...)

30% SOP adherence/SOP cross-verification: Intentional non-compliance
20% Handling of systems/ radio/instruments
10% Callouts

Undesired Aircraft States (UAS)

40% Vertical, lateral or speed deviations
40% Controlled flight towards terrain

Additional Classifications

10% Optical illusion/ visual mis-perception
10% Crew incapacitation

Correlations of Interest

In **50%** of cases where poor visibility or instrument conditions were identified, lack of sufficient navigation aids was a factor.

All CFIT accidents where physiological threats were noted involved intentional non-compliance with SOPs.

In accident where no ground based navigation aid was available, lack of technology was cited in **83%** of cases.

Accident Scenarios of Interest

Scenario 1:

The operator has noted deficiencies in their safety management systems. The crew is operating in adverse weather in an aircraft not equipped with a terrain awareness warning system. The aircraft is flown on a non-standard approach and subsequently impacts terrain.

This scenario is common for 60% of all controlled flight into terrain accidents.

Scenario 2:

The flight crew are on approach to an airport with no precision approach available and in poor visibility or IMC conditions. SOPs are disregarded and the aircraft is flown towards the ground until impact.

This scenario is common for 30% of all controlled flight into terrain 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

Loss of Control In-flight

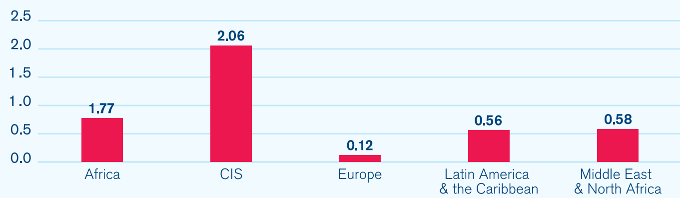
8 Accidents

IATA Members	25%
Hull Losses	100%
Fatal	100%
Accident Rate*	0.21

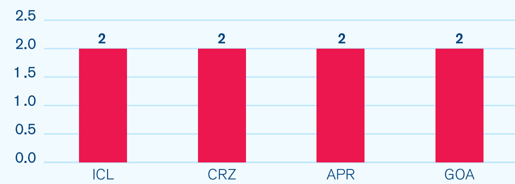
4

75% Passenger | 25% Cargo | 0% Ferry | 37% Jet | 63% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

63% Safety management

38% Regulatory oversight

25% Flight operations: training systems

25% Flight operations: SOPs & checking

Threats

Environmental

63% Meteorology

Poor visibility/IMC (40% of these events)

Icing Conditions (40% of these events)

Thunderstorms (20% of these events)

13% Lack of visual reference

Airline

50% Aircraft malfunction

Contained engine failure/powerplant malfunction (75% of all malfunctions)

13% Operational pressure

13% Maintenance events

Flight Crew Errors (relating to...)

50% Manual handling/flight controls

25% SOP adherence/SOP cross-verification: intentional non-compliance

13% Failure to go-around after unstable approach

Undesired Aircraft States (UAS)

25% Vertical, lateral or speed deviations

25% Unnecessary weather penetration

25% Unstable approach

13% Abrupt aircraft control

13% Incorrect aircraft configuration

13% Operation outside aircraft limitations

Correlations of Interest

In **50%** of accidents involving aircraft malfunctions deficiencies in maintenance SOPs and checking were also noted.

60% of accidents where inadequate safety management was cited also noted manual handling errors.

Accident Scenarios of Interest

Scenario 1:

The flight crew intentionally deviates from SOPs or does not properly cross-check while conducting an approach in marginal weather conditions. Subsequently the approach becomes unstable, the crew commit manual handling errors and loses control of the aircraft.

This scenario is common for 25% of all the loss of control in-flight accidents.

Scenario 2:

There are noted deficiencies in the regulatory oversight and maintenance SOPs of the operator. An engine failure results in the aircraft losing control and subsequently crashing.

This scenario is common for 25% of all the loss of control in-flight 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*

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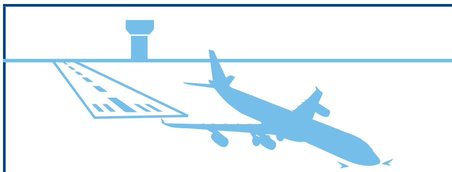


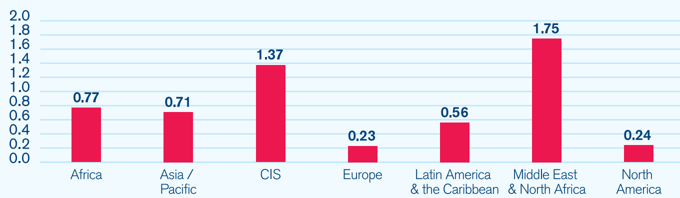
Runway Excursion

17 Accidents

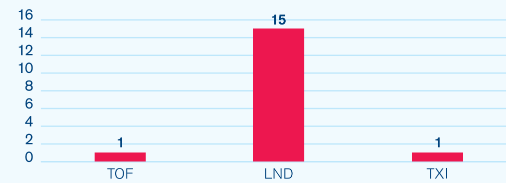
IATA Members	**41%**
Hull Losses	**29%**
Fatal	**0%**
Accident Rate*	**0.44**

94% Passenger | **6%** Cargo | **0%** Ferry | **71%** Jet | **29%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

- **24%** Regulatory oversight
- **18%** Safety management
- **18%** Flight operations: training systems
- **6%** Change management

Threats

Environmental

- **41%** Airport facilities
  - Contaminated runway/poor braking action (43% of these events)
  - Inadequate overrun area/trench/ditch or structures in close proximity to runway (43% of these events)
- **29%** Meteorology
  - Wind/windshear/gusty wind (80% of these events)
  - Poor visibility/IMC (40% of these events)
- **18%** Ground-based nav-aid malfunction or not available

Airline

- **18%** Aircraft malfunction
  - Contained engine failure/powerplant malfunction (33% of all malfunctions)
  - Secondary flight controls (33% of all malfunctions)

Flight Crew Errors (relating to...)

- **35%** SOP adherence/SOP cross-verification
  - Intentional (67% of these events)
  - Unintentional (33% of these events)
- **29%** Manual handling/flight controls
- **18%** Failure to go-around after destabilized approach

Undesired Aircraft States (UAS)

- **41%** Long, floated, bounced, firm, off-centerline or crabbed landing
- **29%** Vertical/lateral/speed deviations
- **29%** Continued landing after unstable approach
- **18%** Loss of aircraft control while on the ground
- **18%** Incorrect aircraft configuration: brakes/thrust reversers/ground spoilers

Additional Classifications

- **6%** Fatigue
- **6%** Optical Illusion/visual mis-perception
- **18%** Insufficient data

Correlations of Interest

57% of accidents where the aircraft landed off-center, long, floated or bounced were identified to have occurred after the flight crew continued the landing following an unstable approach. Within these cases flight crew manual handling was noted as a factor in **50%** of the accidents.

In **33%** of cases when the crew lost control of the aircraft while on ground, non-compliance with SOP or lack of cross-verification was cited as a factor.
All accidents where weak regulatory oversight was cited, poor airport facilities were also a factor. Of these accidents, **75%** involved a contaminated runway or one with poor breaking action.

Meteorology threats were noted to be a factor in **60%** of runway excursions where flight crew manual handling was also noted.

Accident Scenarios of Interest

Scenario 1:

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

This scenario is common for 18% of all runway excursion accidents.

Scenario 2:

The flight is operating in a thunderstorm or wind / windshear or gusty wind conditions. The crew continues landing despite an unstable approach, after which the aircraft exits the runway and is substantially damaged or destroyed.

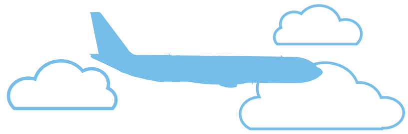
This scenario is common for 18% of all runway excursion accidents.

Scenario 3:

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

This scenario is common for 18% of all runway excursion accidents.

Note: 3 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* ****See Annex 2 for "Contributing Factors" definitions*



In-flight Damage

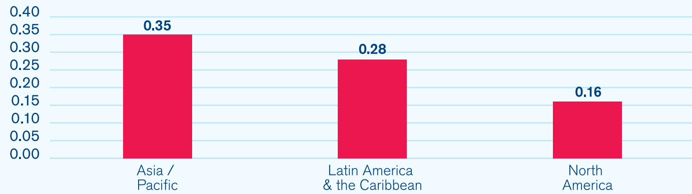
5 Accidents

IATA Members	60%
Hull Losses	20%
Fatal	20%
Accident Rate*	0.13

60% Passenger | 40% Cargo | 0% Ferry

80% Jet | 20% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**

Top Contributing Factors***

Latent Conditions (deficiencies in...)

Maintenance operations: SOPs & checking **(2 cases)**

Regulatory oversight **(1 case)**

Change management **(1 case)**

Threats

Environmental

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

Airline

Aircraft malfunction:

- Fire/smoke (cockpit/cabin/cargo) **(2 cases)**
- Extensive/uncontained engine failure **(1 cases**
- Gear/tire **(1 case)**

Maintenance events **(2 cases)**

Dangerous goods **(1 case)**

Flight Crew Errors (relating to...)

None identified.

Undesired Aircraft States (UAS)

None identified.

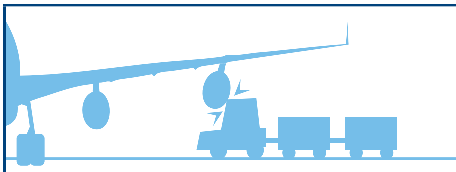
Correlations of Interest

No significant correlations noted.

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*



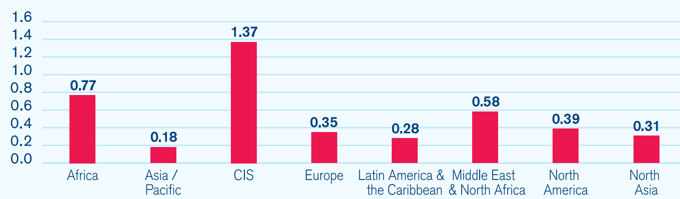
Ground Damage

15 Accidents

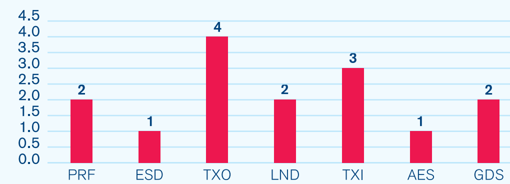
IATA Members	47%
Hull Losses	27%
Fatal	7%
Accident Rate*	0.39

87% Passenger | 0% Cargo | 13% Ferry | 73% Jet | 27% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

13% Regulatory oversight

Threats

Environmental

33% Airport facilities

Poor/faint marking/signs or runway/taxiway closure (40% of these events)

Inadequate overrun area/trench/ditch/proximity of structures (40% of these events)

Airport perimeter control/fencing/wildlife control (20% of these events)

27% Air Traffic Services

13% Traffic

Airline

20% Aircraft malfunction: fire/smoke

13% Ground events

Flight Crew Errors (relating to...)

7% Aircraft handling: ground navigation

7% SOP adherence/SOP cross-verification: intentional non-compliance

Undesired Aircraft States (UAS)

20% Ground navigation:

Ramp movements (100% of these events)

Wrong taxiway/ramp/gate/hold spot (33% of these events)

Loss of aircraft control while on the ground (33% of these events)

Additional Classifications

20% Insufficient data

Correlations of Interest

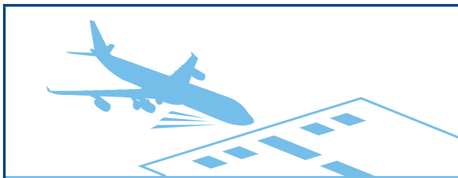
In **60%** of ground damage accidents where inadequate airport facilities were a factor, issues with Air Traffic Services were noted.

Accident Scenarios of Interest

While maneuvering on the ground under ATC control the wingtip of one aircraft strikes and causes substantial damage to the horizontal stabilizer of another.

This scenario is common to 27% of ground damage accidents.

Note: 3 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*
****See Annex 2 for "Contributing Factors" definitions*



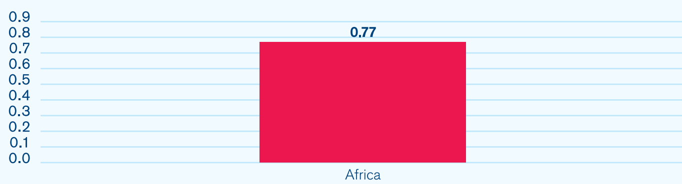
Undershoot

1 Accident

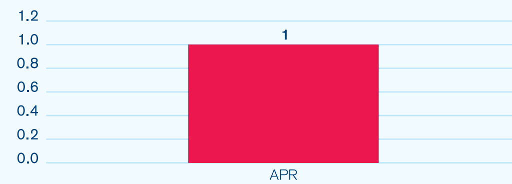
IATA Members	0%
Hull Losses	100%
Fatal	100%
Accident Rate*	0.03

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



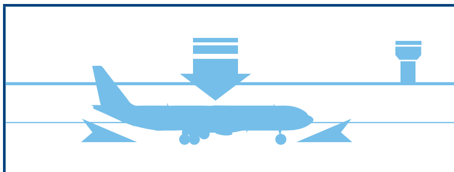
Top Contributing Factors***

Latent Conditions (deficiencies in...)	Threats	Flight Crew Errors (relating to...)	Undesired Aircraft States (UAS)
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.	Environmental Airline		

Correlations of Interest

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



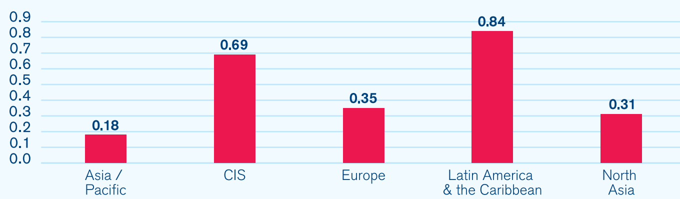
Hard Landing

9 Accidents

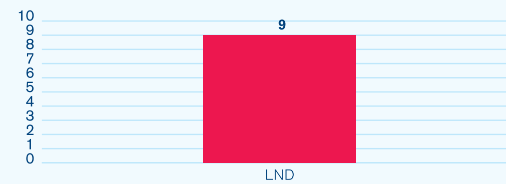
IATA Members	33%
Hull Losses	33%
Fatal	0%
Accident Rate*	0.23

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

33% Flight operations: training systems

22% Safety management

Threats

Environmental

33% Meteorology

Wind/windshear/gusty wind (66% of these events)

Icing conditions (66% of these events)

Poor visibility/IMC (33% of these events)

22% Air traffic services

Airline

11% Operational pressure

Flight Crew Errors (relating to...)

56% Manual handling/flight controls

22% SOP adherence/SOP Cross-verification:

Intentional non-compliance (50% of these events)

Unintentional non-compliance (50% of these events)

Undesired Aircraft States (UAS)

33% Vertical/lateral/speed deviation

33% Long, floated, bounced, firm, off-centreline or crabbed landing

22% Operation outside of aircraft limitations

22% Continued landing after unstable approach

Additional Classifications

33% Insufficient data

Correlations of Interest

In cases where manual handling was cited as a factor **60%** of accidents noted deficiencies in flight training.

67% of accidents that noted operation outside of aircraft limits as a factor occurred following a long, floated, bounced, off center or crabbed landing.

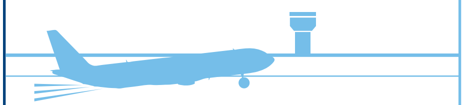
Accident Scenarios of Interest

Scenario 1:

The operator has deficiencies in their flight crew training program. One the day of the accident, the crew commits errors relating to manual handling resulting in a long, floated, bounced, firm off-center or crabbed landing and the aircraft being operated outside of its limitations subsequently resulting in substantial damage.

This scenario is common for 22% of all the hard landings.

Note: 3 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*
****See Annex 2 for "Contributing Factors" definitions*



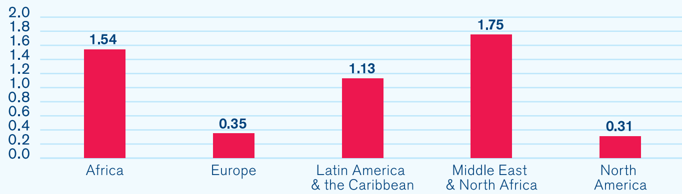
Gear-up Landing/ Gear Collapse

16 Accidents

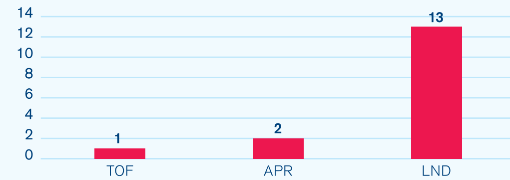
IATA Members	**31%**
Hull Losses	**25%**
Fatal	**0%**
Accident Rate*	**0.42**

94% Passenger **0%** Cargo **6%** Ferry **44%** Jet **56%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

25% Regulatory oversight

19% Maintenance operations: SOPs and checking

13% Safety management

Threats

Environmental

6% Wildlife/birds/foreign object

Airline

63% Aircraft malfunction: Gear/tire (90% of all malfunctions)

19% Maintenance events

Flight Crew Errors (relating to...)

6% SOP adherence/SOP cross-verification: unintentional non-compliance

6% Manual handling/flight controls

Undesired Aircraft States (UAS)

13% Incorrect aircraft configuration: landing gear

Additional Classifications

19% Insufficient data

Correlations of Interest

In **67%** of the accidents citing deficiencies in maintenance operations SOPs and checking resulted in a malfunction of aircraft gear or tires.

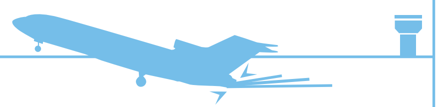
Accident Scenarios of Interest

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 19% of all the accidents involving a gear-up landing or a gear collapse during landing.

Note: 3 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*
****See Annex 2 for "Contributing Factors" definitions*



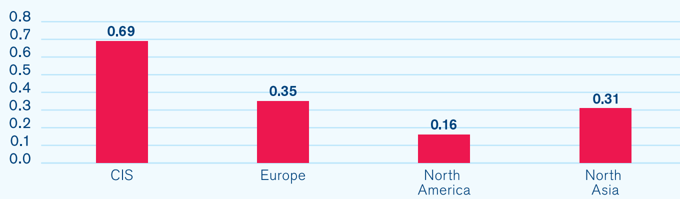
Tailstrike

7 Accidents

IATA Members	**86%**
Hull Losses	**0%**
Fatal	**0%**
Accident Rate*	**0.18**

71% Passenger | **29%** Cargo | **0%** Ferry | **100%** Jet | **0%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**

Top Contributing Factors***

Latent Conditions (deficiencies in...)

14% Technology and equipment

Threats

Environmental

29% Meteorology: wind/windshear/gusty wind

Airline

None noted.

Flight Crew Errors (relating to...)

14% Manual handling

14% SOP adherence/SOP cross-verification: unintentional non-complience

Undesired Aircraft States (UAS)

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

14% Weight and balance

Additional Classifications

43% Insufficient data

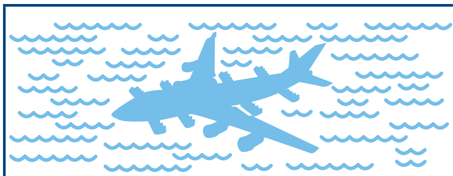
Correlations of Interest

No significant correlations noted.

Accident Scenarios of Interest

No significant scenario noted.

Note: 3 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*
****See Annex 2 for "Contributing Factors" definitions*



Off Airport Landing/Ditching

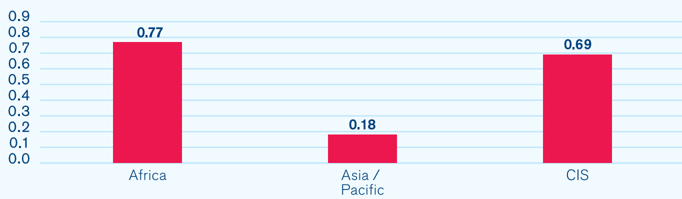
3 Accidents

IATA Members	**0%**
Hull Losses	**100%**
Fatal	**67%**
Accident Rate*	**0.08**

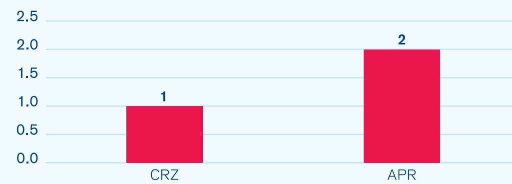
67% Passenger | **33%** Cargo | **0%** Ferry | **0%** Jet | **100%** Turboprop

4

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Regulatory oversight **(1 case)**

Safety management **(1 case)**

Flight operations: SOPs and checking **(1 case)**

Training systems **(1 case)**

Threats

Environmental
None identified.

Airline
Extensive/uncontained engine failure **(1 case)**

Fire/smoke (cockpit/cabin/cargo) **(1 case)**

Maintenance events **(1 case)**

Flight Crew Errors (relating to...)

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

Manual handling **(1 case)**

Systems/radios/instruments **(1 case)**

SOP adherence/SOP cross verification: intentional non-compliance **(1 case)**

Callouts **(1 case)**

Undesired Aircraft States (UAS)

Operation outside of aircraft limitations **(1 case)**

Incorrect aircraft configuration: engine **(1 case)**

Additional Classifications

33% Insufficient data

Correlations of Interest

No significant correlations noted.

Accident Scenarios of Interest

No significant scenario noted.

Note: 1 accident was not classified due to insufficient data
**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

TREND ANALYSIS

Accidents Overview (2009-2011)

	Total Accidents	IATA Members	Hull Losses	Fatal	Fatalities	Passenger	Cargo	Ferry	Jet	Turboprop
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

Accidents per Category (2009-2011)

	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
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

Note: 17 accidents were not classified due to insufficient information.

Note: One accident 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.

Section 5

In-Depth Regional Accident Analysis

5

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**.*

5

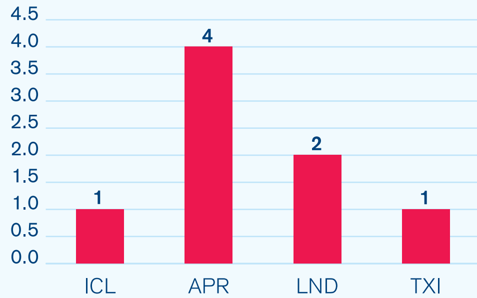
Africa

8 Accidents

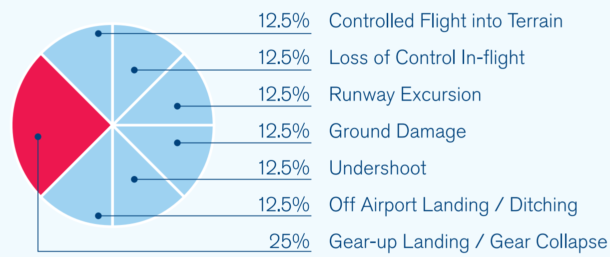
IATA Members	13%
Hull Losses	75%
Fatal	38%

38% Passenger | 38% Cargo | 25% Ferry | 37% Jet | 63% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

63% Regulatory oversight

38% Safety management

25% Flight operations: SOPs & checking and training systems

Threats

Environmental

38% Air traffic services

25% Airport facilities: inadequate overrun area/trench/ditch/ proximity of structures

25% Meteorology

Thunderstorms (100% of these events)

Poor visibility/IMC (100% of these events)

Airline

38% Aircraft malfunction

Gear/tire (67% of these events)

Contained engine failure/powerplant malfunction (33% of these events)

Flight Crew Errors (relating to...)

38% Aircraft handling errors

Manual handling/flight controls (67% of these events)

38% Procedural errors

SOP adherence/SOP cross-verification (67% of these events)

Undesired Aircraft States (UAS)

25% Continued landing after unstable approach

13% Vertical/lateral/speed deviation

13% Long, floated, bounced, firm, off-centerline, crabbed landing

Additional Classifications

13% Insufficient data

Correlations of Interest

50% of gear-up landing / gear collapse accidents cited deficient regulatory oversight as a contributing factor.

Weak regulatory oversight was noted in **63%** of all accidents where inadequate airport facilities were a factor.

Deficiencies in regulatory oversight was a factor in **67%** of hull loss accidents in Africa.

Note: 1 accident was not classified due to insufficient data.
**See Annex 1 for “Phase of Flight” definitions*
***See Annex 2 for “Contributing Factors” definitions*

Asia/Pacific

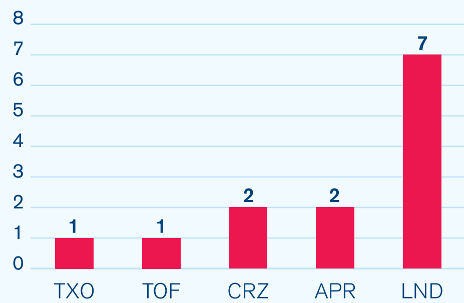
13 Accidents

IATA Members	**38%**
Hull Losses	**38%**
Fatal	**38%**

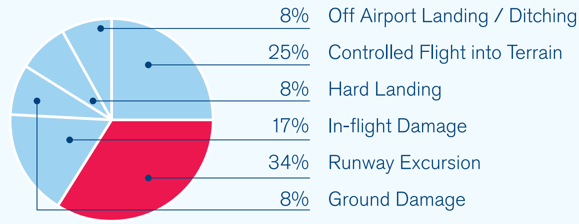
5

85% Passenger | **15%** Cargo | **0%** Ferry | **38%** Jet | **62%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

54% Regulatory oversight

46% Safety management

15% Technology and equipment

15% Flight operations: SOPs & checking

Threats

Environmental

31% Ground-based navigation aids malfunctioning or not available

23% Meteorology
- Poor visibility/IMC (100% of these events)
- Wind/windshear/gusty wind (33% of these events)

15% Airport facilities: contaminated runway/taxiway – poor breaking action and poor/faint marking/signs or runway/taxiway closure

Airline

15% Aircraft malfunction
- Fire/smoke (cockpit/cabin/cargo) (50% of all malfunctions)
- Gear/tire (50% of all malfunctions)

8% Maintenance events

Flight Crew Errors (relating to...)

23% SOP adherence/cross-verification: intentional non-compliance

15% Manual handling/flight controls

8% Pilot-to-pilot communication

Undesired Aircraft States (UAS)

23% Vertical/lateral/speed deviation

15% Continued landing after unstable approach

15% Controlled flight towards terrain

Additional Classifications

31% Insufficient data

Correlations of Interest

50% of runway excursions also cited that ground-based nav aid malfunctioned or was not available.

Poor overall crew performance was a factor in **57%** of accidents where inadequate regulatory oversight was noted.

Aircraft malfunction was a factor in **86%** of events where flight crew error was also a factor.

Note: 4 accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

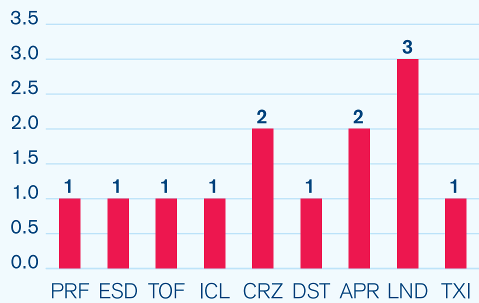
Commonwealth of Independent States (CIS)

13 Accidents

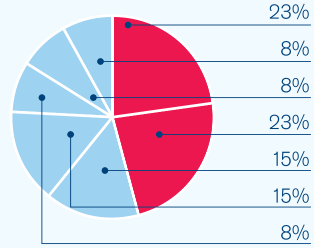
IATA Members	**15%**
Hull Losses	**69%**
Fatal	**54%**

85% Passenger **15%** Cargo **0%** Ferry **77%** Jet **23%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

46% Regulatory oversight

46% Safety management

23% Flight operations: training systems

23% Flight operations: SOPs & checking

Threats

Environmental

38% Meterology

Poor visibility/IMC (60% of these cases)

Wind/windshear/gusty wind (40% of these cases)

Airline

23% Aircraft malfunction: fire/smoke (cockpit/cabin/cargo)

23% Maintenance events

Flight Crew Errors (relating to...)

38% SOP adherence/SOP cross-verification: intentional non-compliance

31% Manual handling/flight controls

23% Failure to go-around after destabilized approach

Undesired Aircraft States (UAS)

38% Vertical/lateral/speed deviation

23% Unstable approach

Additional Classifications

15% Insufficient data

Correlations of Interest

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

Manual Handling / Flight Controls was a factor in **67%** of loss of control in-flight accidents.

Safety management was noted in **83%** the accidents where regulatory oversight was a factor.

Note: 2 accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

Europe

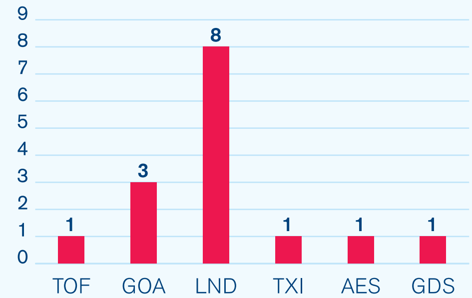
15 Accidents

IATA Members	**47%**
Hull Losses	**20%**
Fatal	**7%**

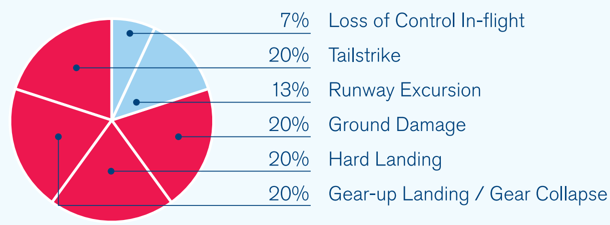
100% Passenger | **0%** Cargo | **0%** Ferry | **53%** Jet | **47%** Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

13% Safety management

13% Flight operations: training systems

13% Technology and equipment

Threats

Environmental

33% Meteorology: wind/windshear/gusty wind

Airline

13% Ground events

Flight Crew Errors (relating to...)

40% Manual handling/flight controls

20% SOP adherence/SOP cross-verification

Unintentional non-compliance (67% of these events)

Intentional non-compliance (33% of these events)

Undesired Aircraft States (UAS)

20% Vertical/lateral/speed deviation

13% Unstable approach

13% Long, floated, bounced, firm, off-centerline or crabbed landing

Additional Classifications

7% Insufficient data

Correlations of Interest

A gear up landing/gear collapse resulted in **67%** of cases where aircraft malfunctions were noted.

Team climate was a factor in **83%** of events where manual handling errors were noted.

33% of the accidents involving aircraft malfunctions also noted maintenance as a factor.

Note: 1 accident was not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

Latin America & the Caribbean

15 Accidents

IATA Members	**13%**
Hull Losses	**67%**
Fatal	**27%**

5

93% Passenger

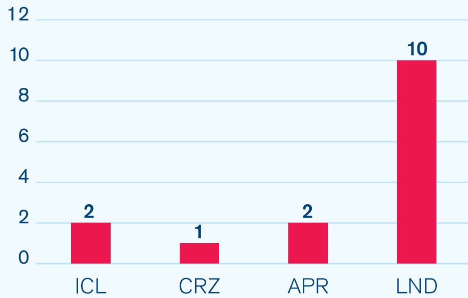
7% Cargo

0% Ferry

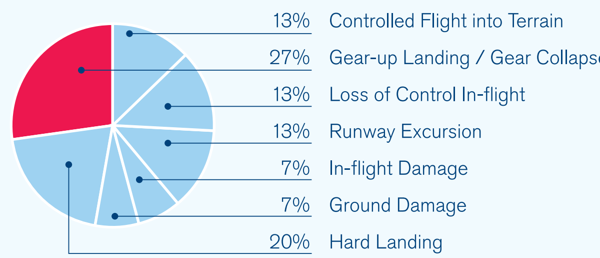
33% Jet

67% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

33% Regulatory oversight

20% Safety management

13% Technology and equipment

Threats

Environmental

27% Nav aids: ground-based nav aids malfunctioning or not available

13% Wildlife/birds/foreign objects

Airline

20% Aircraft malfunction: gear/tire

Flight Crew Errors (relating to...)

13% Manual handling/flight controls

13% SOP adherence/SOP cross-verification: unintentional non-compliance

Undesired Aircraft States (UAS)

13% Vertical/lateral/speed deviation

13% Long/floated/bounced/firm/off-center/crabbed landing

Additional Classifications

13% Insufficient data

Correlations of Interest

In **75%** of gear-up landing or gear collapse accidents, aircraft malfunctions of the landing gear or tires were a factor.

In **60%** of accidents where deficiencies in regulatory oversight was a factor, inadequate in safety management by the operator was cited.

Note: 2 accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

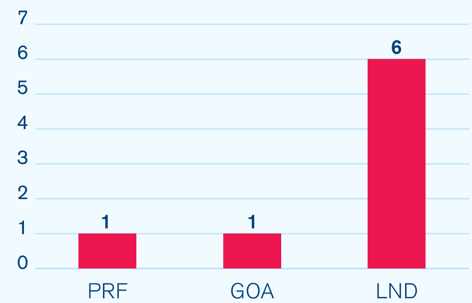
Middle East & North Africa

8 Accidents

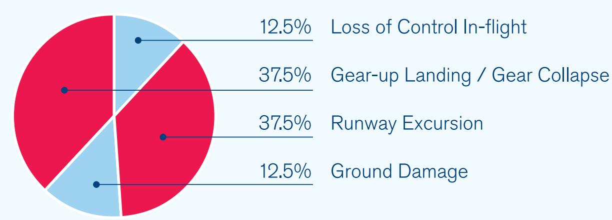
IATA Members	88%
Hull Losses	50%
Fatal	13%

100% Passenger | 0% Cargo | 11% Ferry | 87% Jet | 13% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

13% Design

13% Safety management

13% Regulatory oversight

Threats

Environmental

25% Meteorology

- Wind/windshear/gusty wind (50% of cases)
- Icing conditions (50% of cases)

25% Airport facilities

- Poor/faint marking/signs or runway/taxiway closure (50% of cases)
- Inadequate overrun area/trench/ditch/prox of structures (50% of cases)

Airline

25% Aircraft malfunction: contained engine failure/powerplant malfunction

13% Maintenance events

Flight Crew Errors (relating to...)

25% Aircraft handling errors

- Manual handling/flight controls (50% of cases)
- Ground navigation (50% of cases)

13% SOP adherence/SOP cross-verification: inintentional

Undesired Aircraft States (UAS)

13% Long, floated, bounced, firm, off-center, crabbed landing

13% Vertical/lateral/speed deviation

13% Unstable approach

Additional Classifications

25% Insufficient data

Correlations of Interest

In **67%** of runway excursions airport facilities are cited as factor.

Note: 2 accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

5

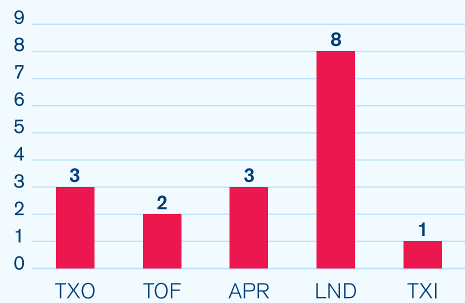
North America

17 Accidents

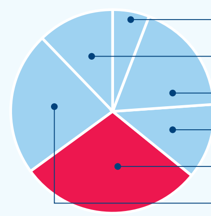
IATA Members	**41%**
Hull Losses	**12%**
Fatal	**6%**

88% Passenger · **6%** Cargo · **6%** Ferry · **82%** Jet · **18%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



6% Controlled Flight into Terrain
12% Tailstrike
18% Runway Excursion
12% In-flight Damage
29% Ground Damage
23% Gear-up Landing / Gear Collapse

Top Contributing Factors**

Latent Conditions (deficiencies in...)

18% Maintenance operations: SOPs & checking

12% Regulatory oversight

12% Flight operations: training systems

Threats

Environmental

24% Air traffic services

18% Meteorology: Wind/windshear/gusty wind (67% of these cases)

Poor visibility/IMC (33% of these cases)

18% Airport facilities

Poor/faint marking/signs or runway/taxiway closure (33% of these cases)

Contaminated runway/taxiway or poor breaking action (33% of these cases)

Inadequate overrun area/trench/ditch/proximity of structures (33% of these cases)

Airline

35% Aircraft malfunction

Gear/tire (33% of all malfunctions)

Fire/smoke (cockpit/cabin/cargo) (33% of all malfunctions)

Extensive/uncontained engine failure (17% of all malfunctions)

18% Maintenance events

Flight Crew Errors (relating to...)

12% SOP adherence/SOP cross-verification

Intentional (50% of these cases)

Unintentional (50% of these cases)

Undesired Aircraft States (UAS)

18% Ground navigation

Ramp movements (33% of all ground navigation UAS)

Loss of control on ground (67% of all ground navigation UAS)

Additional Classifications

6% Optical illusion/visual mis-perception

18% Insufficient data

Correlations of Interest

In **60%** of ground damage accidents, deficiencies in air traffic services or airport facilities were cited.

Inadequate maintenance operations SOPs and checking were a factor in **50%** of gear collapses.

Note: 3 accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

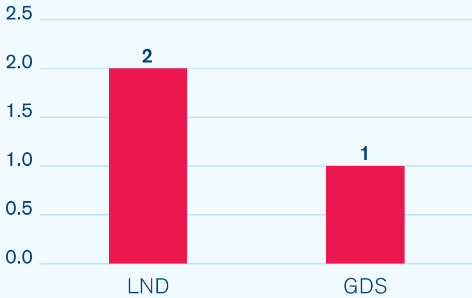
North Asia

3 Accidents

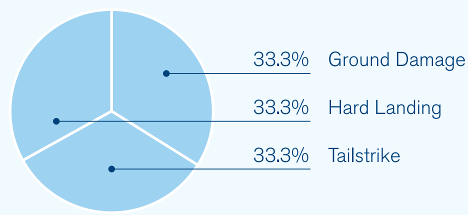
IATA Members	**100%**
Hull Losses	**0%**
Fatal	**0%**

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

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

Threats

Flight Crew Errors (relating to...)

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

Undesired Aircraft States (UAS)

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

Additional Classifications

67% Insufficient data

Correlations of Interest

No significant correlations noted.

Note: 2 accidents were not classified due to insufficient data
**See Annex 1 for "Phase of Flight" definitions*
***See Annex 2 for "Contributing Factors" definitions*

REGIONAL TREND ANALYSIS

5

Accidents Overview (2009-2011)

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

Image courtesy of Boeing

Section 6

Analysis of Cargo Aircraft Accidents

YEAR 2011 CARGO OPERATOR REVIEW

Cargo vs. Passenger Operations for Western-built Jet Aircraft

	Fleet Size End of 2011	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	1,853	1	0.54	2	3	1.62
Passenger	18,961	10	0.53	35	45	2.37
Total	20,814	11	0.53	37	48	2.31

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 2011	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	921	0	0.00	2	2	2.17
Passenger	3,444	14	4.07	11	25	7.26
Total	4,365	14	3.21	13	27	6.19

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.

6

Cargo Aircraft Accidents

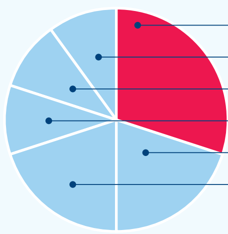
10 Accidents

40% Jet

60% Turboprop

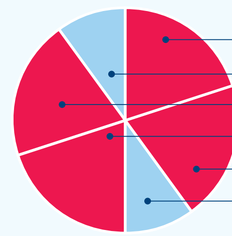
IATA Members	30%
Hull Losses	60%
Fatal	55%

Accidents per Operator Region
(raw numbers)



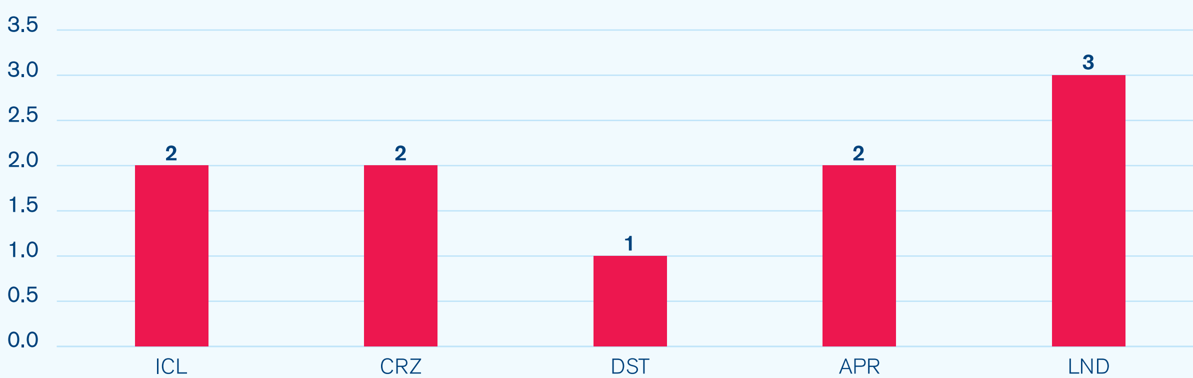
30%	Africa
10%	North Asia
10%	North America
10%	Latin America & the Caribbean
20%	Asia / Pacific
20%	CIS
0%	Europe
0%	Middle East & North Africa

Breakdown per Accident Category



20%	Controlled Flight into Terrain
10%	Off Airport Landing / Ditching
20%	Tailstrike
20%	In-flight Damage
20%	Loss of Control In-flight
10%	Runway Excursion
0%	Ground Damage
0%	Undershoot
0%	Hard Landing
0%	Gear-up Landing / Gear Collapse
0%	Runway Collision
0%	Mid-air Collision

Accidents per Phase of Flight*



Cargo Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

50% Regulatory oversight
30% Safety management
20% Technology and equipment

Threats

Environmental
20% Air traffic services
10% Meteorology: poor visibility/IMC
10% Navigation aids: ground-based navigation aids malfunctioning or not available

Airline
30% Aircraft malfunction
Fire/smoke (cockpit/cabin/cargo) (67% of all malfunctions)
Contained engine failure/powerplant malfunction (33% of all malfunctions)
10% Maintenance events
10% Dangerous goods

Flight Crew Errors (relating to...)

None identified.

Undesired Aircraft States (UAS)

None identified.

Additional Classifications

40% Insufficient data

Correlations of Interest

Poor regulatory oversight was a factor in **60%** of accidents where an aircraft malfunction was a contributing factor.

27% of accidents where an aircraft malfunction was a factor resulted in a loss of control in-flight.

Note: 4 accidents were not classified due to insufficient data
** 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 2011."

7

Section 7

Report Findings and IATA Prevention Strategies

TOP FINDINGS

- 92 accidents in 2011: 37% involved IATA members
- 24% of all accidents were fatal
- 86% involved passenger aircraft, 11% involved cargo aircraft and 3% involved ferry flights
- 60% on jet aircraft and 40% on turboprops
- 42% of accidents resulted in a hull loss and 58% in substantial damage
- Half of the accidents occurred during landing

	Top 3 Contributing Factors
Latent conditions (deficiencies in...)	1. Regulatory oversight 2. Safety management 3. Technology and equipment
Threats	1. Aircraft malfunction 2. Meteorology 3. Air traffic services
Flight crew errors relating to latent conditions (deficiencies in...)...	1. SOP adherence/ cross-verification 2. Manual handling/ flight controls 3. Failure to go-around after destabilized approach
Undesired aircraft states	1. Vertical, lateral or speed deviation 2. Long, floated, bounced, firm, off-centerline or crabbed landing 3. Continued landing after unstable approach
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 2011.

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.

Countermeasures for the Operator and the State

Subject	Description	% of accidents where countermeasures could have been effective
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	**29%**
Overall crew performance	Overall, crew members should perform well as risk managers. Includes flight, cabin, ground crew as well as their interactions with ATC.	**26%**
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	**23%**
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.	**18%**
Technology and equipment	Available safety equipment is not installed (EGPWS, predictive wind-shear, TCAS/ACAS, etc.)	**13%**

Countermeasures for the Flight Crews

Subject	Description	% of accidents where countermeasures could have been effective
Flight Operations: SOPs & checking (Operator)	Ensure the operator addresses clearly: SOPs, operational instructions and/or policies, company regulations, and controls to assess compliance with regulations and SOPs.	**10%**
Taxiway/runway management	Crew members use caution and keep watch outside when navigating taxiways and runways.	**9%**
Maintenance Operations: SOPs & checking (Operator)	Ensure the operator addresses clearly: SOPs with respect to maintenance activities (in-house or outsourced), operational instructions and/or policies, company regulations, and controls to assess compliance with regulations and SOPs.	**8%**
Communication environment	Environment for open communication is established and maintained.	**7%**

Image courtesy of Bombardier

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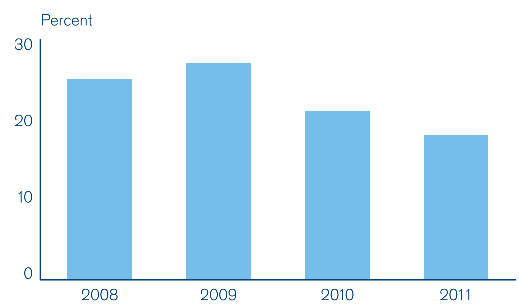
ACTF DISCUSSION & STRATEGIES

Runway Excursions

Background:

Runway excursions are again the most common type of accidents; they represented 17 accidents out of 92, or 18 percent of 2011 accidents. The graph below indicates the percentage of accidents classified as runway excursion over the previous four years. In this context, runway excursions include landing overruns, take-off overruns, landing veer-offs, take-off veer-offs and taxiway excursions.



Runway Excursions

Long, floated or bounced landings were noted as a contributing factor in 47 percent of all landing-related runway excursion accidents. Known or suspected unstable approaches were a factor for 40 percent of landing-related runway excursions. Contaminated runways contributed to 18 percent of all runway excursions. 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. Eighty-two percent of the excursions occurred in dry runway conditions. This underscores the need for crews to be vigilant at this stage of flight, no matter the runway conditions.

Discussion:

This is an issue that affects landing more than take-off. There is clear guidance to flight crews on when to abort take-offs, however the guidance for when to reject a landing is less clear among operators.

The NLR Air Transport Safety Institute released a report in 2011 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.

Another study, 'Risk Factors and Safety Initiatives' (draft version December 2011, published by ECAST) indicates a much higher number of runway excursions and a stronger correlation with wet or contaminated runways (59 percent of overruns were on wet or contaminated runways) than found in the ACTF analysis. The data sets used for the two analyses differ in that 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 would 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 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 actively integrating this matrix in their documentation to improve pilot decision making on runway conditions and required stopping distance.

The ICAO Aerodrome Panel meeting of November 2010 concluded that pilot reports should be more frequently used rather than surface friction measurements in assessment, measurement and reporting of runway braking action. This supported by the TALPA matrix.

ATC can be a major contributor to destabilized approaches due to excessive speed requests during approach. This is further exacerbated by crews who are accustomed to accepting 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 a safe landing will occur -– a go-around may still be necessary.

Long flare and bounced landings should also be addressed as they can be a precursor to runway excursions.

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

Recommendations to Operators:

Airlines are recommended to modify their approach procedures to call out "STABILIZED" or "NOT STABILIZED" at a given point to ensure 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.

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.

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.

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.

Operators should encourage flight crews / dispatchers to calculate stopping distances on every landing using charts/ tools etc. as recommended by the NTSB and understand and build margins to these numbers.

Operators are encouraged to compare actual take-off/ landing distances with calculated take-off/landing distance so 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 FDA 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. 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.

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 thrust reverser.

Aircraft Technical Failures and Maintenance Safety

Background:

Data analyzed following the accident classification indicates that poor maintenance practices continue to contribute to accidents:

- In 2011, eight accidents (9%) had maintenance related issues while 28 percent of accidents cited technical problems.
- In 2010, 11 accidents (12%) had maintenance related issues while 38 percent of accidents cited technical problems.
- In 2009, nine accidents (11%) cited maintenance and 29 percent indicated 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. Very few MROs are capable of completing a large work package (due to delayed maintenance on minimum equipment list (MEL) items) to a high standard under normal airline time pressures. MRO certification is not a guaranty of work quality.

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 determine the short-term reliability (e.g. 30 day) of the aircraft. This helps to identify issues before the aircraft goes back into service.

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. There are some anecdotal cases where the primary concern was that the paperwork for a work-package was not done, where the reality was the work itself had not been completed.

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, whether the installed parts in the aircraft are 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.

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.

- Recommendations have been discussed during IATA Incident Review Meetings (IRM) on how to perform a check flight, as well as manufacturer recommendations and ongoing industry efforts.
- The Flight Safety Foundation (FSF) will publish guidelines later this year on how to conduct functional check flights. This is information only and operators are encouraged to retrieve this material.

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

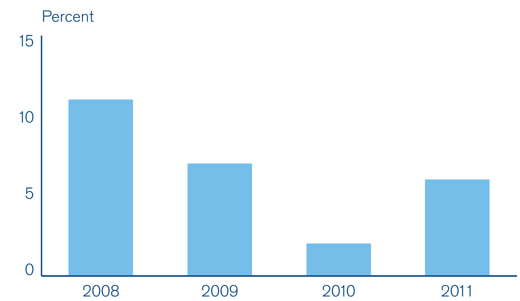
Recommendations to Industry:

Manufacturers are asked to determine the feasibility of setting lifetime limits on some parts, or at least providing guidance to operators. For example, in one event a main gear strut fractured 14 days after installation, however the part was manufactured 36 years ago.

Controlled Flight into Terrain

Background:

2011 saw an increase in the number of Controlled Flight into Terrain (CFIT) accidents, despite a large number of aircraft being equipped with safety equipment to prevent them. A total of 10 CFIT accidents occurred in 2011; equivalent to 11 percent of all accidents. The graph below indicated the rates of CFIT over the previous four years.



Controlled Flight into Terrain

In six out of ten cases (60 percent of all accidents) we see a correlation between a lack of precision approaches and CFIT. The number increased from 43 percent of all accidents in 2010. In other words, 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.

Nine aircraft were not equipped with enhanced ground proximity warning systems (EGPWS). In other words 90 percent of this year’s CFIT accidents are related to aircraft not being equipped in accordance with ICAO recommendations.

In two CFIT accidents the terrain/obstacle data base had NEVER been updated!

In 2010, spatial disorientation was an identified factor in one CFIT accident, while fatigue was a factor in two CFIT accidents. While spatial disorientation or fatigue was not obvious in the 2011 CFIT accidents this does not imply that fatigue and spatial disorientation has been mitigated.

Several accidents in 2011 appear to have involved aircraft that were retrofitted with GPS equipment or crews used unapproved navigation equipment. With retrofits the navigation source switching can become more complex and a correct 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:

Some airlines are prohibiting circling approaches and use 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 group. The study shows that circling approaches have a 25 times higher risk 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. Disregarding an EGPWS warning and going below minimums has contributed to CFITs in 2010 as well as 2011.

As mentioned in last year's report improper QNH settings on early-generation EGPWS units can result in false warnings, leading 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.

Be aware that the Shuttle Radar Topography Mission is terrain radar mapping data only. No airport and/or runway positional data is captured.

Recommendations to Operators:

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.

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.

Flight operations departments are encouraged to review their circling approaches policies and are encouraged to reduce the number of circling approaches, possibly 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 approach 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 their crews with the proximity of terrain once the system EGPWS has triggered an alarm (perhaps use a simulator with a very high-quality 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 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:

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 were the EGPWS database 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.

Crew resource management

Background:

Social and communication skills are a vital part of overall crew performance. Ultimately, an electronic system or "box" cannot be designed for every possible threat and efficient crew interaction is critical.

Discussion:

Crew Resource Management (CRM) continues to be an important factor in aviation safety, especially in more conservative social environments. While implemented at many operators, CRM is not universally applied and many airlines have no or ineffective formalized CRM training programs in place.

In cultural environments where a high social gradient exists, strict standard operating procedures help establish clear lines of communications and allow for first officers to pass critical situational information to the captain without compromising their position or causing the captain to "lose face".

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

Recommendations to Operators:

CRM training should include and emphasize assertiveness and identify specific cases where the social gradient or

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rank distance between the captain and first officer is high enough to impede effective communications. Focus on specific cultural factors when applicable.

Captains should encourage 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 understands he/she is not infallible.

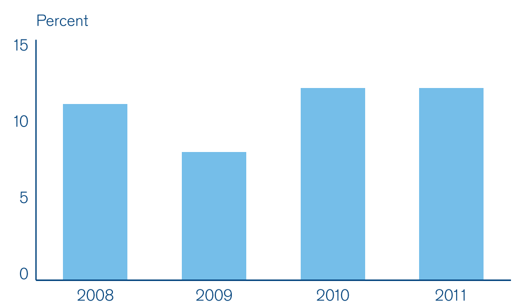
Specific call-outs of information or decision requirements at critical points in the flight and may help the first officer to overcome the social gradient between the crew members. Properly developed SOPs with clear instructions may empower first officers to take over the flight controls when the situation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

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

Go-Arounds

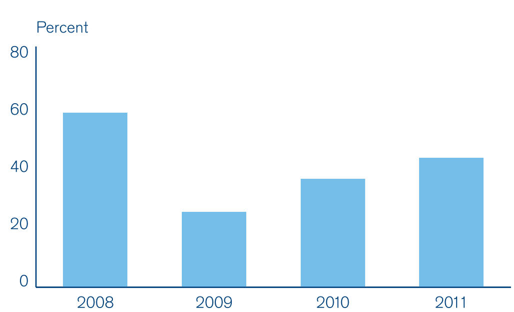
Background:

Twelve percent of accidents in 2011 cited an unstable approach as a factor. A graph of the previous four years' percentage of accidents with unstable approach as a factor is included below.



Unstable Approach

The ACTF noted a correlation between unstable approaches and accidents due to flight crews not performing a go-around when required. The graph of the previous four 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 recurrent training.

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 "NOT STABILIZED" at a given point to ensure a timely go-around is carried out.

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.

Include training on go-around execution with all engines operating, including level-off at a low altitude.

Also include training on go-arounds from long flares and bounced landings.

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.

Airlines should consider that time lost due to executing a go-around is a necessary part of safe operations and therefore, commercial pressure should not be imposed on flight crews following these events.

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.

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 circumstances.

Flight crews are seemingly becoming more and more 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.

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Discussion:

The last years have seen an average of approximately ten loss of control in-flight (LOC-I) accidents per year. 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.

Upset recovery training, aerobatics and unusual attitude training included as part of an operator's flight crew training syllabus gives flight crews 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.

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.

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.

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 crews may routinely face (e.g., stalls and icing) as well as conventional training such as engine failure on take-off.

Crew training

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

Crew decision-making process training, especially the decision to go-around, should be reinforced as well as training for abnormal situations such as bounced landings.

Following SOPs is a matter of discipline that must be reinforced during initial and recurrent training. This is also directly correlated to the initial pilot selection process and ensuring the right candidates are chosen prior to beginning ab-initio training.

Certain aircraft (e.g. MD-11) are known to be a challenge to land. Type-specific bounced/hard landing training is essential with proper emphasis on system knowledge to minimize the risk of an accident.

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

Recommendations to Operators:

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.

Crew familiarization with inflight fire/smoke checklists should be regularly reinforced. In addition, familiarization training with oxygen equipment in a smoke-filled environment aid 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

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 full flight simulators will never be a true substitute for experience in a real aircraft. Training programs should include as much actual flying time as is possible for ab-initio pilots.

Know the limitations of simulators and adapt training syllabus to minimize these weaknesses.

Recommendations to Industry:

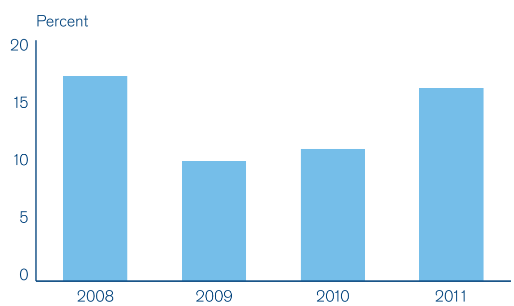
Flight simulators have certain inherent limitations that prevent them from accurately reproducing sensations that can lead to catastrophic events such as CFITs. Manufacturers are encouraged to research new ways to accurately reproduce sensations related to somatogravic illusion and spatial disorientation 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 has become one of the principal categories of accident this year with 16 percent of 2011 accidents. The graph below indicated the percentage of ground damage accidents over the previous four years. Ground damage continues to be a major cost to operators and requires a cooperative safety approach with all involved parties including airlines, ground service providers, airport authorities and government.



Ground Damage

Discussion:

Simulator-based training for aircraft taxiing is not effective. 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:

- Do not solely rely 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 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.

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.

Poor English language proficiency, especially with ground staff, can lead to communication lapses and degrade safety margins significantly.

Training in accident prevention for ground staff may be beneficial.

Composite materials do not necessarily show any visible signs of distress or damage. Engineering and maintenance must remain on constant vigilance when dealing with newer aircraft that contain major composite structures.

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.

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.

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.

Ensure that ground crew English proficiency is adequate and does not lead to communications difficulties.

Continuation of Airline Operation During Severe Weather

Background:

Airline operations may be completely suspended by severe weather in some parts of the world (e.g., snowstorms on east coast of USA). Unnecessary weather penetration was identified as factor in four accidents in 2011. Meteorological threats were identified as factors in 23 accidents in 2011 or 25 percent of all accidents.

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).

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.

Recommendations to Operators:

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

Airlines should develop a contingency plan, involving dispatch, crew support and clearly defined 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.

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.

Hard Landings

Background:

There were a large number of hard landings in 2011; this category represented 10 percent of the 92 accidents. In 2009, only one hard landing out of ten was preceded by an unstable approach. In 2010, the industry had five hard landings, of which one followed an unstable approach. In 2011, three hard landings were preceded by unstable approaches.

Discussion:

The group discussed transition probability, being the likelihood of having a hull loss or substantial damage resulting from a particular event, in this case a hard landing for a given number of flights. Data from different sources, such as FDA and pilot reports are, at first look in agreement, however the industry needs to drive towards the publication of transition probabilities.

Over the course of the classification process a link was noted between late destabilization during approach as well as during bounced landing recoveries and hard landing accidents.

Similar to the topics discussed above, there is a limitation in the ability of simulators to fully recreate the sensations experienced on landing.

Recommendations to Operators:

When designing training programs to address hard landings, operators are encouraged to be mindful of the risk of "negative training". They should not simply ask the trainee to try a hard landing and see what happens. Inducing scenarios that are common precursors to hard landings (e.g. bounced landings) in the training environment remains a challenge. Operators are encouraged to work with simulator manufacturers to overcome these challenges. Operators are also encouraged to train pilots on landing in real aircraft.

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.

7

FINAL STATEMENTS – Recommendation to Operators

With the accident rates at a historic low, questions now need to be asked on how safety can be improved with limited number of accidents. The answer, of course, is well known and is common industry knowledge: to 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.).

As a second thought, the 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 take-off distance is calculated it would be wise to compare actual take-off distance with calculated take-off 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 take-off 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 2011, the global Western-built jet hull loss rate was once again the lowest recorded, with a 39 percent improvement over 2010. From a regional perspective, the Western-built jet hull loss rates remained the same or decreased in all IATA regions except the Commonwealth of Independent States and the Middle East and North Africa. This year, the IATA Western-built jet hull loss rate was slightly higher than the average for the industry, 0.41 accidents per million flights compared with 0.37 for the industry average. While no trend can be established from a single data point and the ten year trend for IATA remains better than industry, this development requires monitoring by IATA. When considering accidents involving all aircraft types, IATA members surpassed the industry's performance with a rate of 1.84 accidents per million flights compared to 2.92 for non-IATA members.

Starting in the 2012 Safety Report, IATA will introduce the result of two years of work by the ACTF to replace the Western-built jet hull loss rate with a more comprehensive modern jet accident rate. This rate will reflect the global nature of aircraft production and the influence of new technologies on aircraft operations and safety performance.

Runway Excursions

Runway excursions were once again the most common type of accident in 2011. Runway excursions may occur during take-off or landing, but are most common on landing. There is an improving trend in this category, as shown in the table below:

Runway Excursions	2009	2010	2011
Total excursion accidents	**23**	**20**	**17**
IATA member accidents	**6**	**4**	**7**
Percent of annual total	**26%**	**21%**	**18%**

- 47 percent of runway excursions during landing occurred following a long, floated, bounced, off-center or crabbed landing.
- Some regulators are now adding a requirement for flight crews to update landing performance data immediately before each landing.
- The total number of runway excursion accidents has been reduced by 26 percent since 2009 (17 vs. 23).
- One cause of runway excursions on landing is an "unstable approach", where the aircraft is too fast, above the glide slope, or touches down beyond the desired touchdown point.
    - The IATA Global Safety Information Center (GSIC), launched in 2010, provides IATA member carriers with global trending information regarding unstable approaches.
    - In 2012, a new Flight Data eXchange (FDX) system within the GSIC will provide IATA carriers with the unstable approach performance for every runway in the database.
    - The IATA Runway Excursion Risk Reduction (RERR) toolkit has a self assessment checklist for airline FDA programs.

Runway excursions have many other precursors than unstable approach that should be understood by operators, it has been noted that a number of runway excursions occurred on clean runways following stable approaches. Airlines can use their internal Flight Data Analysis (FDA) program to understand the precursors to runway excursions; these programs are now required by the IATA Operational Safety Audit (IOSA).

Following the ICAO Global Runway Safety Symposium, held in May 2011, IATA agreed to participate in and co-host several Regional Runway Safety Seminars over the next three years. In conjunction with these seminars, IATA and the other Runway Safety Programme Partners will increase the scope and frequency of runway safety data sharing to find common solutions to common problems. This complements the work already achieved in the launch of the second edition of the Runway Excursion Risk Reduction (RERR) toolkit including information for Air Navigation Service Providers (ANSPs), airports, and improved information for operators. The new edition of the toolkit was launched in May 2011. The IATA Safety Trend, Evaluation, Analysis and Data Exchange System (STEADES) has performed in-depth analysis on several runway excursion precursors including long and off-centerline landings and unstable approaches.

Ground Operations and Ground Damage Prevention

Ground damage was the third most common type of accident, representing 16 percent of accidents in 2011. 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 damage incidents, IATA has launched the Ground Damage Database 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.

7

Aircraft Technical Faults and Maintenance Safety

As was the case in 2010, aircraft technical faults and maintenance issues was the second most frequent category of contributing factors to accidents in 2011; the first was regulatory oversight. While a technical fault is rarely the only or most significant cause of an accident, it can be one of the first events in a sequence of events leading up to an accident.

Accidents with Technical Faults	2009	2010	2011
Maintenance issues as primary cause	10	11	8
Percent of annual total	11%	12%	9%
Total number of accidents with technical faults	26	36	26

- IATA accident statistics exclude post-maintenance test flight accidents.
- 38% of maintenance related accidents involve landing gear malfunctions.

Loss of Control In-flight

The last years have seen an average of approximately ten loss of control in-flight (LOC-I) accidents per year and in the last two years these accidents have been fatal 100 percent of the time. The accident data shows that LOC-I is often linked to an operation of the aircraft well below stall speed. IATA STEADES analysis of stall warning events showed that the majority of stalls warnings occurred during phases of flight where the autopilot is engaged, however in a subsequent survey of airlines it was noted that less than half of the airlines surveyed train for such a scenario.

IATA will work with a broad range of industry groups, including GSIE, to elevate LOC-I and implement global solutions including enhanced pilot training capabilities.

Regional Factors

Globally, IATA carriers represented 37 percent of all accidents while flying 48 percent of all sectors in 2011. The total number of Western-built jet hull losses decreased by 35 percent in 2011 (11 vs. 17 in 2010). Overall, the total number of accidents decreased by 2 percent in 2011 (92 vs. 94 in 2010).

- Asia Pacific, Europe, North America and North Asia performed better than the global average of 0.37 Western-built jet hull losses.
- Western-built jet hull loss accident rates in Africa, Asia Pacific, Europe, Latin America and the Caribbean and North Asia all improved relative to 2010. The rate for North America is unchanged.
- The Commonwealth of Independent States and Middle East and North Africa regions saw their accidents rates rise in 2011.

In 2012, IATA will continue to work with its members to maintain safety as a priority. Through the new 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.


A new hands-on approach to implement safety management systems

“FDX will allow airlines to benchmark themselves against global event statistics.”

Section 8

8

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)

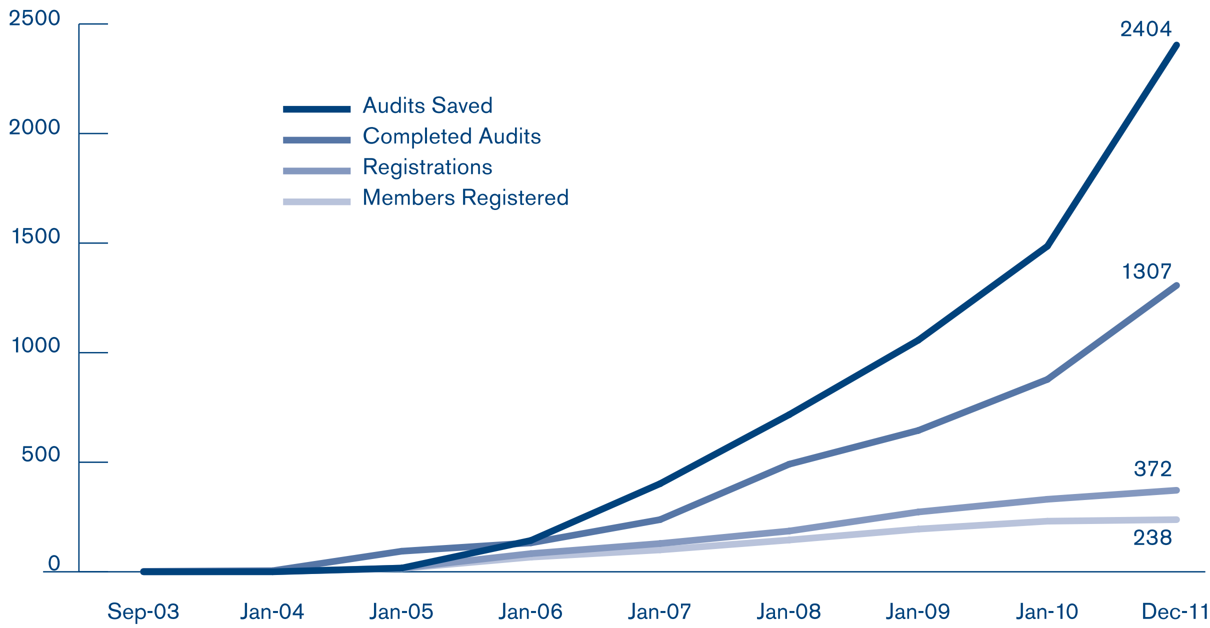
IATA Operational Safety Audit (IOSA) is the worldwide recognized airline safety audit program based on internationally harmonized standards. The program is designed to improve the safety levels throughout the entire airline industry and provide efficiency by reducing the number of audits performed. IOSA standards are upgraded routinely, raising the level of organizational standards required. As a result, the safety performance of IOSA carriers is measurably better than non-IOSA carriers. The fourth edition of the IOSA Standards Manual (ISM) became effective as of 1 December 2011, 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 and this goal was achieved in April 2009.

During 2011 IATA worked with the IOSA Oversight Committee (IOC) and its task forces to develop an Enhanced IOSA, which further promotes the adoption of the IOSA culture by operators. Enhanced IOSA will take into account the airline's internal quality assurance program in order to provide a greater focus on implementation. The first three Enhanced audits took place during the fourth quarter of 2011 and more will take place throughout 2012. The concept has received full support from the different stakeholders and today it is at the stage of defining the plan for full implementation.

The IOSA program is ISO 9001 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 2011



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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 2011, 83 ground service providers (GSP) are on the ISAGO Registry, operating at 108 different airports worldwide covering 123 stations. The ISAGO Audit Pool is composed of almost 50 airlines.

An industry need for a standard ground operation manual was identified as ground handlers have been faced with the challenge of handling the same aircraft type in many different ways for their various airline customers. These multiple SOPs lead to confusion on the ramp and difficulty in assessing service providers to a common level of compliance. IATA and industry partners have come together to address this challenge through the IATA Ground Operations Manual (IGOM).

The IGOM is focused on ramp operations that are directly related to what goes on around the aircraft itself. It is designed to be a minimum standard for the operations required for that aircraft type, and it is understood that some airlines and GSPs will exceed these standards. The IGOM Development Task Force is composed of members of the ground handling community, both from Airlines and GSPs. In 2011, the IGOM gained the support of the ECAST group at a meeting at the UK CAA. This degree of regulatory support at this early stage is indicative of the importance EASA places to a safer ground operating environment.

Following its publication, IATA will incorporate IGOM SOPs into the ISAGO standards. Once these two are harmonized, it will have a significant impact on the industry, improving the safety of ground handling through standardization of standard practices across airlines. It will also give airlines benefit through further reducing ground service provider audits with an identified audit savings between 9% and 45%.

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 2011, there were 800 IFQP reports shared with the pool members.

The work on the global fuel handling standards development has been completed under the umbrella of G-16 in 2011. The global fuel handling standard SAE AS6401willbe issued in the first quarter of 2012.

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 2011 the inspectors have visited 666 de-icing/anti-icing service providers at 334 airports. The number of deficiencies noted by inspectors went down by eight percent this past season and ten percent more safety related findings have been satisfactorily addressed by providers. This is an indication of the influence that the pool is having on the safety performance of handling agents and that the handling agents are becoming more conscientious to comply with the high standards.

ISAGO and IFQP audit programs are certified under ISO-CEN 9001-2008, DAQCP will undergo ISO certification audit in 2012.

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.

Safety Data Management and Analysis

The 2010 launch of the Global Safety Information Center (GSIC) provides 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 data will be provided via a single web portal. The development of the GSIC will provide IATA members with essential SMS hazard identification and monitoring capabilities. Specific initiatives for 2011 included the following:

Steades

Safety Trend, Evaluation, Analysis and Data Exchange System (STEADES) receives upwards of 100,000 operational safety reports per year. From this vast data, IATA produces in-depth analysis on precursors to accident categories and emerging safety issues. In 2011, STEADES celebrated its 10th anniversary and published analysis covering topics such as low fuel aircraft state, laser pointing at aircraft, pilot incapacitation, encounters with airborne objects, portable electronic devices, unstable approaches, NOTAM issues and more.

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) will allow airlines to benchmark themselves against global event statistics. Flight data from participating airlines is processed to identify events of interest using standard event definitions. Users of FDX will be able to identify areas of risk down to airport and runway level. This will prove to be a most invaluable safety and training aid. 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

Over the course of a successful Ground Damage Database (GDDB) work-out session in London in 2011, the participating airlines and ground service providers set out the framework for the future of this new database. All participants agreed on the fields that will be submitted as well as the definitions and assumptions for the data. Transparent governance and parameters on what and how to report, will enable IATA to consistently integrate all of the received data for an industry-wide perspective. All can then have confidence in the results of the analysis and any decisions derived from it.

IATA will collate this data and prepare quarterly reports which will include statistical analysis for the purpose of identifying trends and performance benchmarks for all participants. Participants will also have access to de-identified data to conduct their own analysis from which they can benchmark their own performance to industry averages. The analysis will also feed the various working groups/task forces so they may develop and implement changes to measurably improve ground damage performance.

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

8

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 and it is now an industry priority to deliver recommendations for changes to flight simulation within airlines and aircraft training at the initial license level.

Data is a key aspect in the regulatory process, frequently used to determine the need, or otherwise, for new or revised rule-making. The data can provide valuable insight; it played a vital part in the recent rulemaking changes to fuel and extended diversion time operations and will no doubt play a significant factor in upcoming issues such as cargo fire suppression, lithium batteries, minimum descent altitudes and so on.

The data and analysis is available to the industry and IATA encourages the industry to advance data analysis in the development of a fully closed-loop system for risk mitigation and training scenarios.

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.

Cabin Safety

Cabin safety impacts operational safety and plays an important role in maintaining safe aircraft operations. It contributes to the reduction of both incidents and accidents and to the costs associated with the operation of commercial passenger aircraft. The goal of IATA Cabin Safety is to develop and review all aspects of cabin operations to improve safety and operational efficiency.

Specific work planned for 2012 includes:

- Reintroducing the Cabin Operations Safety section in the Safety Report.
- Developing new toolkits and/or recommended practices related to cabin operations.
- Working with ICAO on the update of the ICAO Cabin Crew Safety Training Manual and producing complementary guidance material for cabin crew safety training in 2013.

For more information, please visit: www.iata.org/cabin-safety

“Aircraft technical faults and maintenance issues were the second most frequent category of contributing factors to accidents in 2011.”

Annex 1

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.

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.

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
	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
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]

A1

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.

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

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.

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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

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.

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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

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.

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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

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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

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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	

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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

Annex 3 2011 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-01-01	Tupolev	Tu-154	Kolavia	Surgut, Russia	ESD	Passenger	Eastern-built	Jet	Hull Loss	Destroyed by fire on ground
2011-01-03	Boeing	737	American Airlines	Los Angeles, CA, USA	TOF	Passenger	Western-built	Jet	Substantial Damage	Tailstrike
2011-01-09	Boeing	727	Iran Air	Orumieh, Iran	GOA	Passenger	Western-built	Jet	Hull Loss	Loss of engine power, impacted terrain
2011-01-10	Airbus	A320	AirAsia	Kutching, Malaysia	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion - veer-off
2011-01-11	Boeing	737	Africa Charter Airline	Hoedspruit, South Africa	TXI	Ferry	Western-built	Jet	Hull Loss	Damaged by fall off embankment
2011-01-22	Hawker Beechcraft	1900	Sahel Aviation Service	Conakry, Guinea	APR	Ferry	Western-built	Turboprop	Substantial Damage	Gear-up landing
2011-02-09	Hawker Beechcraft	1900	Wasaya Airways	Kasabonika, ON, Canada	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion - veer-off
2011-02-10	Fairchild (Swearingen)	Metro	Manx2	Cork, Ireland	GOA	Passenger	Western-built	Turboprop	Hull Loss	Loss of control in-flight
2011-02-11	ATR	ATR 72	Kingfisher Airlines	Maduri, India	LND	Passenger	Western-built	Turboprop	Substantial Damage	Hard landing
2011-02-13	BAE SYSTEMS	Jetstream 31	Salsa d'Haiti	Port-au-Prince, Haiti	LND	Passenger	Western-built	Turboprop	Hull Loss	Gear-up landing
2011-02-14	Let	L-410 Turbolet	African Air Service Commuter	(near) Muhinga, DR Congo	ICL	Cargo	Eastern-built	Turboprop	Hull Loss	CFIT on climb
2011-02-14	Let	L-410 Turbolet	Central American Airways	(near) Les Mesitas, Honduras	APR	Passenger	Eastern-built	Turboprop	Hull Loss	CFIT on approach
2011-02-16	Boeing	747	Saudi Arabian Airlines	Madinah, Saudi Arabia	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion - veer-off
2011-02-21	ATR	ATR 72	TRIP	Altamira, Para, Brazil	LND	Passenger	Western-built	Turboprop	Hull Loss	Gear collapse during landing
2011-02-24	Airbus	A320	easyJet	Lisbon, Portugal	GOA	Passenger	Western-built	Jet	Substantial Damage	Tailstrike during go-around
2011-02-27	Fairchild (Swearingen)	Metro	Amaszonas	La Paz, Bolivia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Gear-up landing

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-03-02	Fairchild (Swearingen)	Metro	North Flying	Oslo, Norway	LND	Passenger	Western-built	Turboprop	Hull Loss	Runway excursion - veer-off
2011-03-04	Bombardier	Dash 8	Air Iceland	Nuuk, Greenland	LND	Passenger	Western-built	Turboprop	Hull Loss	Landed hard and slid off runway
2011-03-18	Xian	MA60	TAM - Transporte Aereo Militar	Rurrenabaque, Bolivia	LND	Passenger	Eastern-built	Turboprop	Substantial Damage	Gear-up landing
2011-03-21	Antonov	An-12	Trans Air Congo	Pointe Noire, Congo	APR	Cargo	Eastern-built	Turboprop	Hull Loss	Loss of control in-flight
2011-03-22	Airbus	A300	UPS Airlines	Albuquerque, NM, USA	LND	Ferry	Western-built	Jet	Substantial Damage	Tailstrike on go-around
2011-04-02	Bombardier	CRJ Regional Jet	Mesa Airlines	Des Moines, Iowa, USA	APR	Passenger	Western-built	Jet	Substantial Damage	APU fire on approach
2011-04-04	Bombardier	CRJ Regional Jet	Georgian Airways	Kinshasa, DR Congo	APR	Passenger	Western-built	Jet	Hull Loss	Loss of control on approach
2011-04-04	Airbus	A320	United Airlines	New Orleans, LA, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion - veer off
2011-04-11	Airbus	A380	Air France	JFK International Airport, New York, NY, USA	TXI	Passenger	Western-built	Jet	Substantial Damage	Collision with aircraft during taxi
2011-04-11	Bombardier	CRJ Regional Jet	Comair	JFK International Airport, New York, NY, USA	TXI	Passenger	Western-built	Jet	Substantial Damage	Struck by aircraft taxiing
2011-04-13	Airbus	A330	Air France	Caracas, Venezuela	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2011-04-15	Fairchild (Swearingen)	Metro	Baires Fly	(near) Rio Grande, Argentina	ICL	Cargo	Western-built	Turboprop	Substantial Damage	Airborne object caused windshield failure
2011-04-16	Yakovlev	Yak-40	Petropavlovsk-Kamchatsky Air Enterprise	Ust-Katchatsk, Russia	TOF	Passenger	Eastern-built	Jet	Substantial Damage	Runway overrun into deep snow
2011-04-17	Boeing	B777	China Cargo Airlines	Copenhagen, Denmark	LND	Cargo	Western-built	Jet	Substantial Damage	Tailstrike during go-around
2011-04-20	Bombardier	CRJ Regional Jet	Shanghai Airlines	Xian, China	LND	Passenger	Western-built	Jet	Substantial Damage	Nose first landing

Annex 3 2011 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-04-28	Embraer	ERJ-145	Dniproavia	Sheremetyevo Airport, Moscow, Russia	TXI	Passenger	Western-built	Jet	Substantial Damage	Runway excursion - veer-off
2011-05-06	Boeing	B737	Continental Airlines	Greenville, MS, USA	TXO	Ferry	Western-built	Jet	Substantial Damage	Damaged by taxiway collapse
2011-05-07	Construcciones Aeronauticas	MA60	Merpati Nusantara Airlines	Kaimana, Indonesia	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Impacted water short of runway
2011-05-17	Hawker Beechcraft	1900	Great Lakes Airlines	Denver, CO, USA	LND	Passenger	Western-built	Turboprop	Substantial Damage	Gear collapse on landing
2011-05-18	Saab	340	Sol Lineas Aereas	(near) Los Menucos, Rio Negro, Argentina	CRZ	Passenger	Western-built	Turboprop	Hull Loss	Loss of control in-flight
2011-05-20	Boeing	767	Santa Barbara Airlines	Tenerife, Canary Islands, Spain	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2011-05-28	Boeing	MD-80	Delta Air Lines	Atlanta, GA, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Undercarriage fire
2011-06-05	Boeing	737 (NG)	UTAir	Vnukovo Airport, Moscow, Russia	LND	Passenger	Western-built	Jet	Substantial Damage	Tailstrike during landing
2011-06-06	Antonov	An-26	Solenta Aviation Gabon	In sea, off Libreville, Gabon	APR	Cargo	Eastern-built	Turboprop	Hull Loss	Ditched in sea
2011-06-06	Bombardier	CRJ Regional Jet	SkyWest Airlines	Milwaukee, WI, USA	APR	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2011-06-20	Tupolev	Tu-134	Rusair	(near) Petrozavodsk, Russia	APR	Passenger	Eastern-built	Jet	Hull Loss	Impacted ground on approach
2011-06-23	Fairchild (Swearingen)	Do-228	Tara Air	Simikot, Nepal	LND	Cargo	Western-built	Turboprop	Substantial Damage	Runway excursion - veer-off
2011-06-25	Boeing	737 (NG)	MALEV Hungarian Airlines	Heraklion, Crete, Greece	LND	Passenger	Western-built	Jet	Substantial Damage	Tailstrike
2011-06-27	Airbus	A320	Kingfisher Airlines	Bagdogra	LND	Passenger	Western-built	Jet	Substantial Damage	Accident on landing
2011-07-06	Ilyushin	Il-76	Silk Way Airlines	(near) Bagram, Afghanistan	DST	Cargo	Eastern-built	Jet	Hull Loss	Collided with high ground
2011-07-08	Boeing	727	Hewa Bora Airways	Kisangani, Congo (Democratic Republic)	APR	Passenger	Western-built	Jet	Hull Loss	Undershoot

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-07-11	Antonov	An-24	Angara Airlines	(near) Strezhevoy, Russia	CRZ	Passenger	Eastern-built	Turboprop	Hull Loss	Ditched following engine fire
2011-07-13	Let	L-410 Turbolet	Noar Linhas Aereas	(near) Reciife, PE, Brazil	ICL	Passenger	Eastern-built	Turboprop	Hull Loss	Loss of control in-flight
2011-07-14	Bombardier	CRJ	Atlantic Southeast Airlines	Boston, MA, USA	TXO	Passenger	Western-built	Jet	Substantial Damage	Taxi collision
2011-07-14	Boeing	767	Delta Air Lines	Boston, MA, USA	TXO	Passenger	Western-built	Jet	Substantial Damage	Taxi collision
2011-07-14	ATR	ATR 72	EuroLOT	Warsaw, Poland	AES	Passenger	Western-built	Turboprop	Substantial Damage	Ground damage
2011-07-17	ATR	ATR 72	Aer Arann	Shannon, Ireland	LND	Passenger	Western-built	Turboprop	Substantial Damage	Hard landing on nose-gear
2011-07-28	Boeing	747	Asiana Airlines	East China Sea, off Jeju Island, South Korea	CRZ	Cargo	Western-built	Jet	Hull Loss	In-flight fire
2011-07-28	Tupolev	Tu-154	Tartastan Airlines	Istanbul, Turkey	PRF	Passenger	Eastern-built	Jet	Substantial Damage	Dammaged by ground vehicle
2011-07-29	Boeing	777	EgyptAir	Cairo, Egypt	PRF	Passenger	Western-built	Jet	Hull Loss	Cockpit fire on ground
2011-07-30	Boeing	737 (NG)	Caribbean Airlines	Georgetown, Guyana	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion - overrun
2011-08-02	ATR	ATR 72	BorasJet	Ankara, Turkey	GDS	Passenger	Western-built	Turboprop	Substantial Damage	Damaged by weather
2011-08-03	Convair	580	Nolinor Aviation	Kasba Lake, NWT, Canada	LND	Passenger	Western-built	Turboprop	Hull Loss	Gear collapse during landing roll
2011-08-06	Boeing	DC-9	Delta Air Lines	Atlanta, GA, USA	TOF	Passenger	Western-built	Jet	Substantial Damage	Uncontained engine failure
2011-08-08	Antonov	An-24	IrAero	Blagoveshchensk, Russia	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Impacted trees short of runway
2011-08-09	Antonov	An-12	Avis-Amur	(near) Omsukchan, Magadan, Russia	CRZ	Cargo	Eastern-built	Turboprop	Hull Loss	Engine fire in-flight
2011-08-10	Boeing	737 (CFMI)	AeroSur	La Paz, Bolivia	LND	Passenger	Western-built	Jet	Substantial Damage	Damaged undercarriage during landing

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Annex 3 2011 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-08-14	Boeing	747	Qantas	Changi - International, Singapore	TOF	Passenger	Western-built	Jet	Substantial Damage	Damaged by burst tyre on take-off
2011-08-20	Boeing	737 (JT8D)	First Air	(near) Resolute Bay, NU, Canada	APR	Passenger	Western-built	Jet	Hull Loss	Impacted terrain on approach
2011-08-29	Airbus	A320	Gulf Air	Kochi, India	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion
2011-09-01	Bombardier	CRJ Regional Jet	Atlantic Southeast Airlines	Baton Rouge, LA, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Single main gear-up landing
2011-09-02	Airbus	A340	Turkish Airlines	Mumbai, India	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion - overrun
2011-09-03	Airbus	A300	Mahan Air	Mashad, Iran	LND	Passenger	Western-built	Jet	Substantial Damage	Burst tires leading to runway excursion
2011-09-04	Embraer	ERJ-145	Trans States Airlines	Ottawa, ON, Canada	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion resulting in gear collapse
2011-09-06	Fairchild (Swearingen)	Metro	AeroCon	(near) Trinidad, Bolivia	APR	Passenger	Western-built	Turboprop	Hull Loss	Crash during non-precision approach
2011-09-07	Yakovlev	Yak-42	Yak Service	(near) Yaroslavl, Russia	ICL	Passenger	Eastern-built	Jet	Hull Loss	Failure to climb after take-off
2011-09-16	Let	L-410 Turbolet	Aerolineas SOSA	Isla de Utila, Honduras	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Aircraft collision with cow
2011-09-16	Embraer	EMB-190	TAME Ecuador	Quito, Ecuador	LND	Passenger	Western-built	Jet	Hull Loss	Runway overrun in poor weather
2011-09-25	Hawker Beechcraft	1900	Buddha Air	(near) Kathmandu, Nepal	APR	Passenger	Western-built	Turboprop	Hull Loss	Impacted terrain on approach
2011-09-26	Boeing	DC-9	Aeropostal	Puerto Ordaz, Venezuela	LND	Passenger	Western-built	Jet	Hull Loss	Hard landing
2011-09-29	Construcciones Aeronauticas	C-212	Nusantara Buana	(near) Bohorok, Indonesia	CRZ	Passenger	Western-built	Turboprop	Hull Loss	Crashed in mountainous area
2011-10-02	Fokker	F.50	Sudan Airways	Khartoum, Sudan	LND	Passenger	Western-built	Turboprop	Hull Loss	Single main gear-up landing
2011-10-10	Boeing	737 (CFMI)	Sky Airlines	Antalya, Turkey	LND	Passenger	Western-built	Jet	Substantial Damage	Gear collapse on landing

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2011-10-12	Embraer	EMB-120 Brasilia	Nationale Regionale Transport	Port Gentil, Gabon	LND	Passenger	Western-built	Turboprop	Hull Loss	Overran runway
2011-10-13	Bombardier	Dash 8	Airlines PNG	(near) Madang, Papua New Guinea	APR	Passenger	Western-built	Turboprop	Hull Loss	Aircraft impacted terrain
2011-10-18	Boeing	727	Iran Air	Tehran, Iran	LND	Passenger	Western-built	Jet	Substantial Damage	Nose-gear failed to extend
2011-11-01	Boeing	767	LOT - Polish Airlines	Warsaw, Poland	LND	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2011-11-10	BAE SYSTEMS	RJ Avroliner	Airlink - SA Airlink	Johannesburg, South Africa	LND	Passenger	Western-built	Jet	Substantial Damage	Landed without nosegear
2011-11-11	Boeing	737 (NG)	Shandong Airlines	Xiamen - Gaoqi, China	GDS	Passenger	Western-built	Jet	Substantial Damage	Damaged by ground vehicle
2011-12-03	Construcciones Aeronauticas	C-212	Merpati Nusantara Airlines	Larat - Watidar, Indonesia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion - veer-off
2011-12-05	Bombardier	360	Tiara Air	Las Piedras, Venezuela	TOF	Passenger	Western-built	Turboprop	Substantial Damage	Struck donkey on take-off
2011-12-17	ATR	ATR 72	Bangkok Airways	Koh Samui, Thailand	TXO	Passenger	Western-built	Turboprop	Substantial Damage	Aircraft damaged on ground
2011-12-20	Boeing	737 (CFMI)	Sriwijaya Air	Yogyakarta - Adisutjipto, Indonesia	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion - overrun
2011-12-23	Airbus	A321	Austrian	Manchester, United Kingdom	GOA	Passenger	Western-built	Jet	Substantial Damage	Tailstrike during go-around
2011-12-25	Boeing	MD-80	AMC Airlines	Karachi, Pakistan	LND	Passenger	Western-built	Jet	Substantial Damage	Landed without nosegear
2011-12-28	Tupolev	Tu-134	AK Kyrgyzstan	Osh, Kyrgyzstan	LND	Passenger	Eastern-built	Jet	Hull Loss	Hard landing then roll over

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
RAAS	Runway Awareness and Advisory System
RTO	Rejected Take-off (ATA Phase of Flight)
SD	Substantial Damage

LIST OF ACRONYMS (Cont'd)

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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