IATA

SAFETY REPORT 2010

Issued April 2011

47th | Edition

"IATA is committed to leading the industry in the global effort to enhance safety."

SAFETY REPORT 2010

Issued April 2011

International Air Transport Association
Montreal — Geneva

47th Edition

NOTICE

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"Our priority remains on safety."

Foreword

Dear Colleagues,

Safety is, as always, our number one priority. In 2010, the Western-built jet accident rate was at its lowest level in 10 years and this achievement was earned while operators worldwide were still recovering from the economic crisis that is still impacting many parts of the world. The accident rate was 0.61 Western-built jet hull losses per million sectors flown in 2010. IATA member airlines greatly surpassed the industry's performance in terms of safety with an accident rate of only 0.25 Western-built jet hull losses per million sectors flown, representing a 59% differential.

IATA remains committed to addressing the safety issues within this Safety Report. The second edition of the IATA Runway Excursion Reduction Toolkit will be released in 2011 to continue to address the relatively high number of runway excursions each year. The Evidence Based Training (EBT) program, as part of the IATA Training and Qualification Initiative, feeds off data provided through the Safety Report to better align airline training with industry reality. Furthermore, IATA continues to lead cooperative industry efforts such as the Global Safety Information Center and the recently launched Global Safety Information Exchange initiative.

This 47th edition of the IATA Safety Report includes valuable information about safety performance in 2010 as well as preventative strategies for both operators and industry. The progress seen in recent years are a true attestation to our industry's commitment to safety and continuous improvement. However, it is important to exercise caution and not to rest on our achievements. Moreover, we need to continue to challenge processes and procedures, identify and adopt innovative technologies and communicate with each other to further increase safety levels. The Safety Report is an indispensable asset to airlines, airspace service providers, airport authorities and regulators to coordinate efforts towards improving safety on a global scale.

I sincerely 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 2010 Executive Summary

The goal of the annual IATA Safety Report is to collate and analyze accident data to identify trends, and then develop prevention strategies to enhance safety. This report is focused only on the air transport industry, and therefore uses more restrictive criteria than ICAO annex 13 accident definitions. In total, 94 accidents met the IATA accident criteria in 2010. Compared to 2009, the breakdown is as follows:

	Jet	Turboprop	Western-built Jet Hull Loss Rate	Fatal Accidents	Fatalities
2010	59	35	0.6	23	786
2009	59	31	0.7	18	685

Summary data for 2010 provides the following conclusions:

- The total number of all types of accidents increased by 4% (94 vs. 90 in 2009)
- The number of western built jet hull losses decreased by 11% (17 vs. 19 in 2009)
- Western-built jet hull loss rate decreased by 14%
- The total number of fatal accidents increased by 28%
- Total fatalities increased by 15%

The total number of industry flights flown in 2010 was 6% higher than in 2009, contributing to an overall decrease in the accident rates. From a regional perspective, the western-built jet hull loss rates remained the same or decreased in all IATA regions except North Asia and Latin America and the Caribbean. Overall, IATA member airlines greatly surpassed the industry in terms of safety, with an accident rate of 0.25 Western-built jet hull losses per million sectors flown. This was the lowest rate ever recorded for IATA carriers.

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 230+ IATA members and there are now over 350 airlines worldwide on the IOSA registry (www.iata.org). In 2010, IOSA certified operators:

- Had an accident rate 53% better than non-IOSA carriers
- Represented approximately 21% of all airline operators (passenger and cargo) worldwide
- Accomplished approximately 61% of all international and domestic passenger and cargo flights worldwide

IATA continues to enhance the IOSA audit program, and in October 2010 released a new audit standard that, for the first time, incorporated comprehensive Safety Management Systems (SMS) standards for operators. SMS is considered an essential component of airline operator safety programs and was made mandatory by ICAO in 2006.

IATA Global Safety Information Center (GSIC)

In 2010, IATA launched the Global Safety Information Center (GSIC), providing its members with unprecedented access to safety information (https://gsic.iata.org) in five different safety databases. These databases include the IATA accident database, operational safety reports, IOSA and IATA Safety Audit for Ground Operations (ISAGO) audit findings, flight data analysis results, animations of inflight events and the aircraft ground damage database, along with industry trending and benchmarking analyses. More than 430 different organizations around the globe are already submitting safety data into the GSIC and over 50% of IATA member carriers are participating. Substantial GSIC expansion is planned over the next few years.

In September 2010, IATA joined ICAO, the European Union, and the US Department of Transportation in signing the Global Safety Information Exchange (GSIE) agreement. This new agreement will begin unprecedented international cooperation in sharing safety information on a global basis.

Runway Excursions

Runway excursions were once again the most common type of accident in 2010. A runway excursion may occur during takeoff or landing, but are most common on landing. There is an improving trend in this category, as shown in the table below:

Runway Excursions	2008	2009	2010
Total excursion accidents	**28**	**23**	**20**
IATA member accidents	**7**	**6**	**4**
Percent of annual total	**27%**	**26%**	**21%**

- Approximately 35% of runway excursions on landing occurred on wet runways
- 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 was reduced by 39% since 2008 (20 vs. 28)
- IATA members reduced seven runway excursion accidents by 43% in two years (four in 2010 vs. seven in 2008)

- A leading cause of runway excursions on landing is an unstable approach, where the aircraft is approaching 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
- Airlines can use their internal Flight Data Analysis (FDA) program to understand why unstable approaches occur; these programs are strongly recommended by IOSA
- In 2011, a new Flight Data eXchange (FDX) system within the GSIC will provide participating IATA carriers with the unstable approach performance for every runway in the database

IATA is participating in a number of international runway safety efforts and is a sponsor of the ICAO 2011 Global Runway Safety Symposium. In 2009, IATA released the Runway Excursion Risk Reduction (RERR) toolkit and distributed more than 8,100 copies worldwide. As part of the effort to eliminate runway excursions, IATA hosted 12 global runway excursion prevention workshops in 2009 and 2010, with more planned for 2011.

A major update to the RERR toolkit is planned for the spring of 2011. The second edition of the RERR toolkit will include information for Air Navigation Service Providers (ANSPs), airports, and improved information for operators. This update brings together all major international safety organizations in a collaborative effort to eliminate these types of accidents.

Aircraft Technical Faults and Maintenance Safety

The second most frequent category of contributing factors to accidents in 2010 was aircraft technical faults and maintenance issues. 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	2008	2009	2010
Maintenance issues as primary cause	14	10	11
Percent of annual total	13%	11%	12%
Total number of accidents with technical faults	40	26	36

- IATA accident statistics exclude post-maintenance test flight accidents
- A large percentage of maintenance related accidents involve landing gear malfunctions

Automation and Crew Decision Making

Pilot handling was noted as a contributing factor in 30% of all accidents

IATA's Training & Qualification Initiative (ITQI) is pushing for harmonizing a competency-based approach focused on training real skills while addressing threats presented by accident/incident reports and flight data collection and reporting.

IATA, in cooperation with ICAO, has developed the first Fatigue Risk Management System (FRMS) Implementation Guide for operators as part of their SMS. FRMS is a new process to systematically manage crew fatigue taking into account changes in aircraft capabilities and airline operations. This new FRMS guide will be released to the industry in mid-2011.

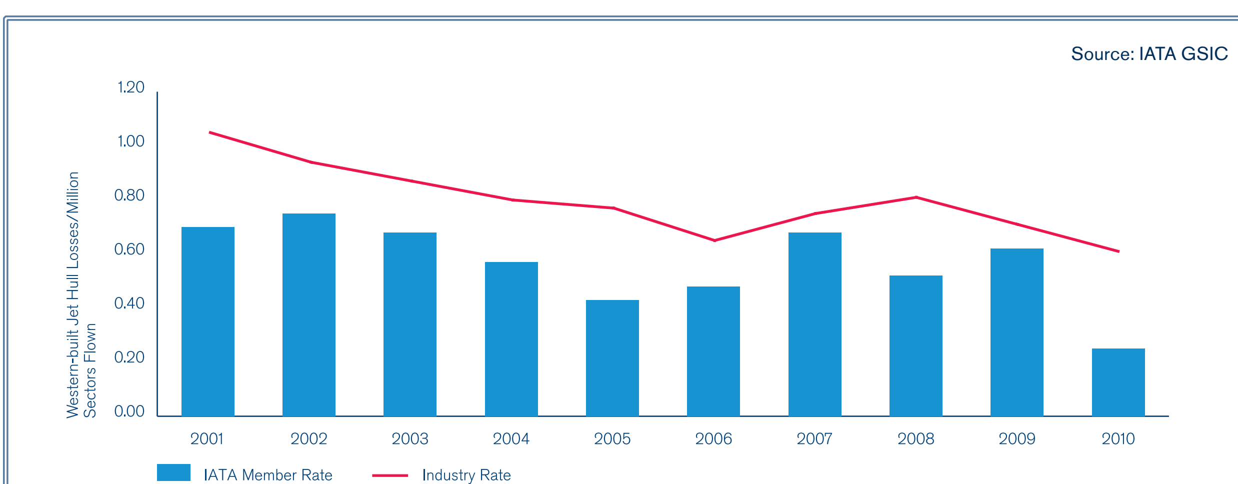
Regional Factors

IATA carriers experienced four Western-built hull losses in 2010 (versus nine in 2009). The number of industry Western-built jet hull losses decreased by 11% in 2010 (17 vs. 19 in 2009).

- The Commonwealth of Independent States (CIS) was the only region to achieve zero Western-built jet hull losses in 2010
- North America (0.10 versus 0.41 in 2009), North Asia (0.34 versus 0 in 2009), and Europe (0.45 with no change over 2009) performed better than the global average of 0.61
- Accident rates in Asia/Pacific (0.80 vs 0.86 in 2009), Africa (7.41 vs 9.94 in 2009) and the Middle East & North Africa (0.72 vs 3.32 in 2009) regions all improved
- The Latin America & the Caribbean region saw its accident rate rise to 1.87 (versus 0 in 2009)

In 2011, IATA will continue to work with its members to maintain safety as a priority. Through the new GSIC, the GSIE agreement, ITQI program 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 (2001-2010)



"The 2010 IATA member airline accident 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 230 airlines comprising approximately 93% of scheduled international air traffic. IATA's global reach extends to 115 nations through 73 offices in 67 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 2010

The purpose of the Safety Report 2010 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 2010.

The Safety Report 2010 was produced at the beginning of 2011. The report presents a detailed summary of statistics, trends and contributing factors involved in 2010'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 Bombardier

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 2010 participants:

Mr. Marcel Comeau
AIR CANADA

Capt. Marc Villeneuve
AIR FRANCE

Mr. Frédéric Combes
AIRBUS INDUSTRIE

Dr. Dieter Reisinger
AUSTRIAN AIRLINES (Chairman)

Capt. David Carbaugh
THE BOEING COMPANY

Capt. Robert Aaron Jr.
THE BOEING COMPANY

Mr. David Fisher
BOMBARDIER AEROSPACE

Capt. Mattias Pak
CARGOLUX AIRLINES INTERNATIONAL

Mr. Savio dos Santos
EMBRAER AVIATION INTERNATIONAL

Mr. Don Bateman
HONEYWELL

Mr. Michael Goodfellow
IATA

Mr. Bert Ruitenberg
IFATCA

Capt. Karel Mündel
IFALPA

Mr. Richard Fosnot
JEPPESEN

Mr. Florian Bartsch
LUFTHANSA GERMAN AIRLINES

Capt. Peter Krupa
LUFTHANSA GERMAN AIRLINES

Capt. Carlos dos Santos Nunes
TAP AIR PORTUGAL

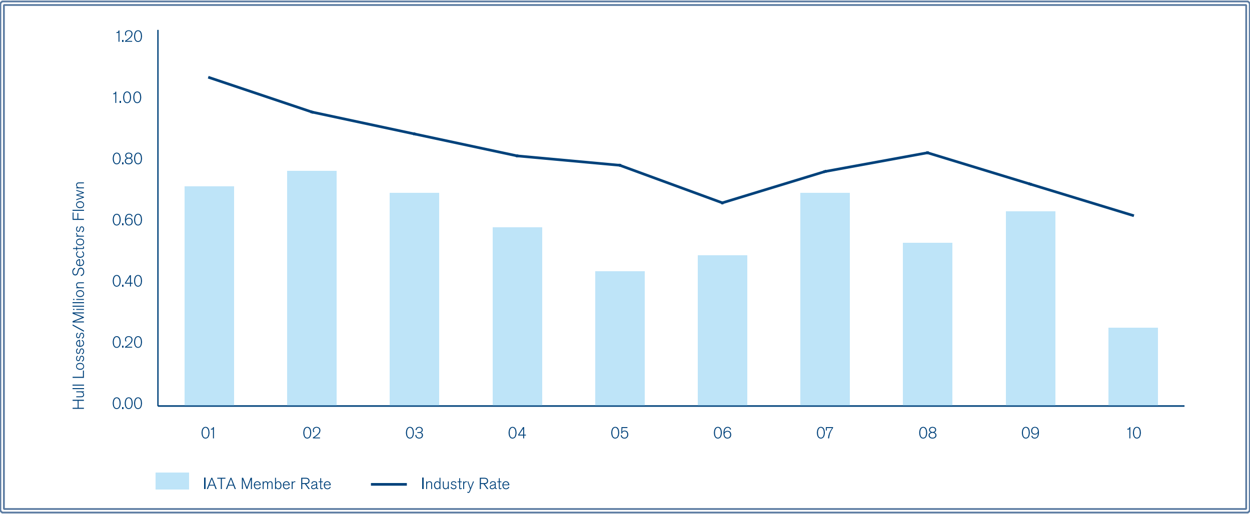
Section 2

2

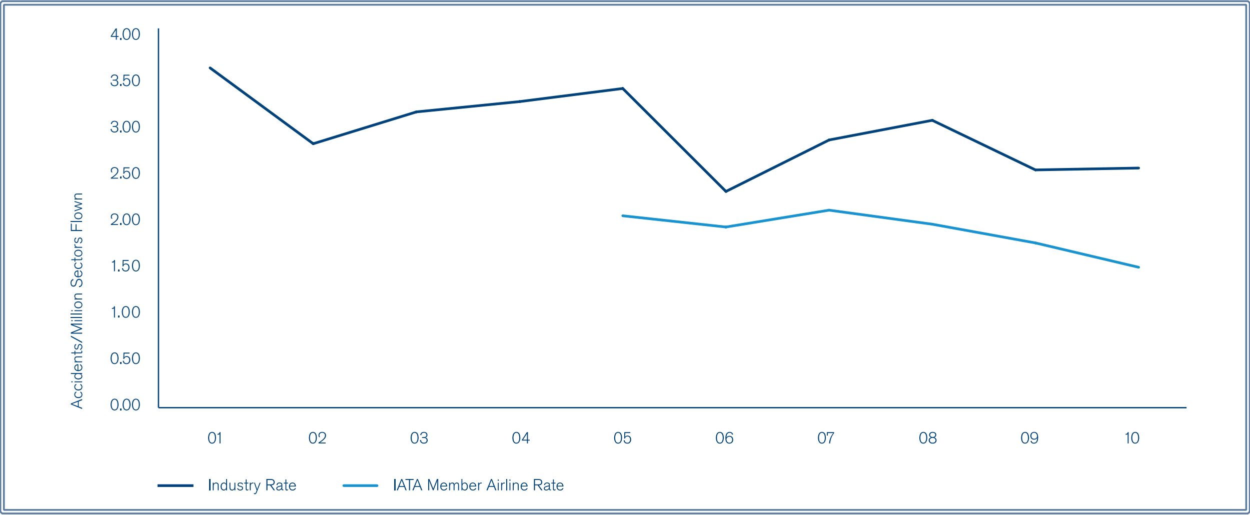
Decade in Review

ACCIDENT/FATALITY STATISTICS AND RATES

Western-built Jet Aircraft Hull Loss Rate: IATA Member Airlines vs. Industry (2001-2010)

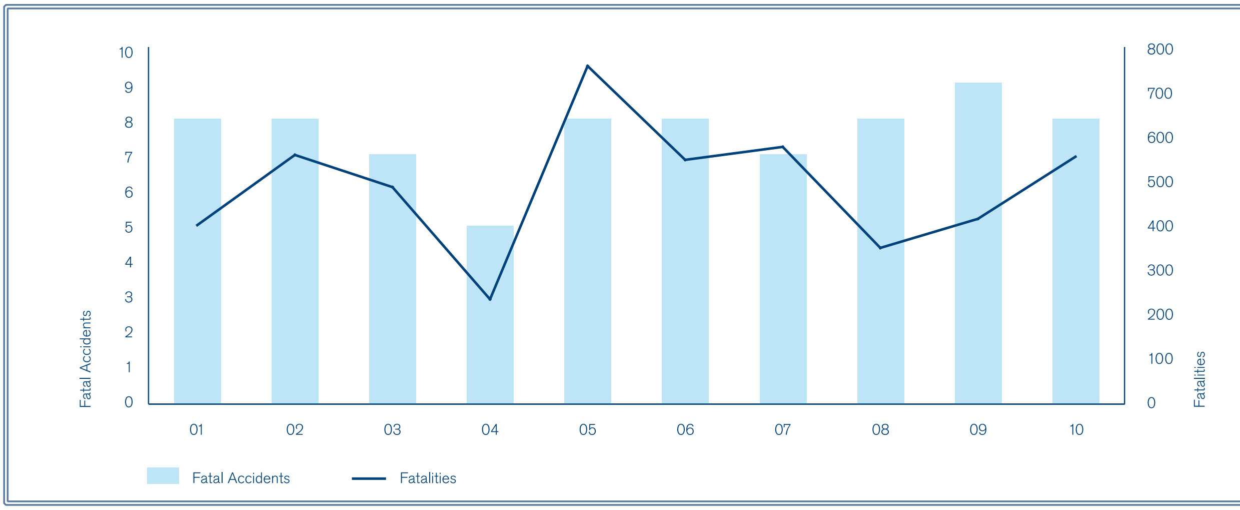


All Aircraft Accident Rate (2001-2010)

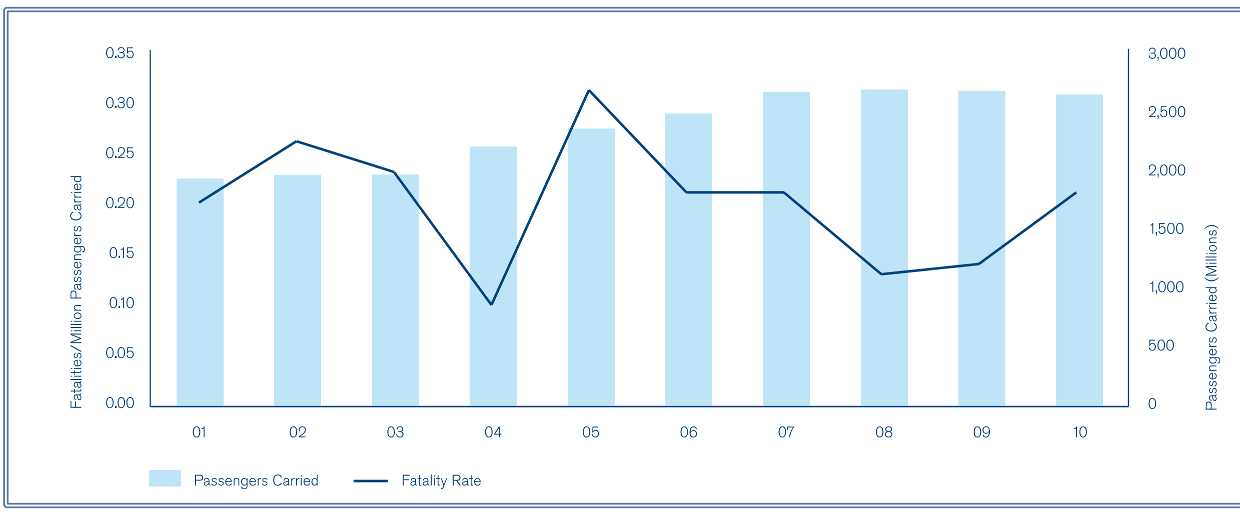


Note: Includes all Eastern-built and Western-built aircraft, including jets and turboprops.

Western-built Jet Aircraft: Fatal Accidents and Fatalities (2001-2010)

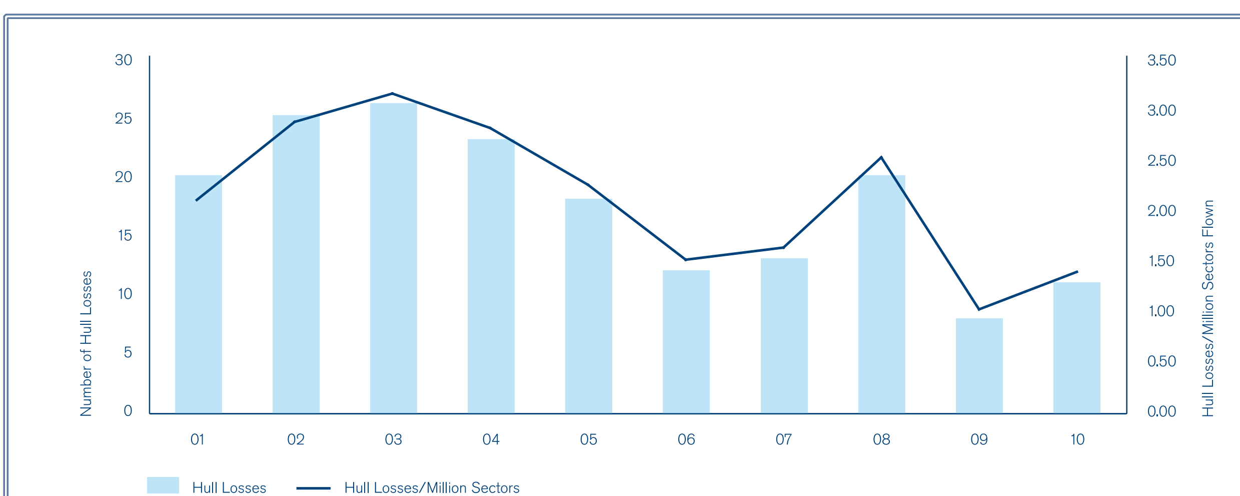


Western-built Jet Aircraft: Passengers Carried and Passenger Fatality Rate (2001-2010)

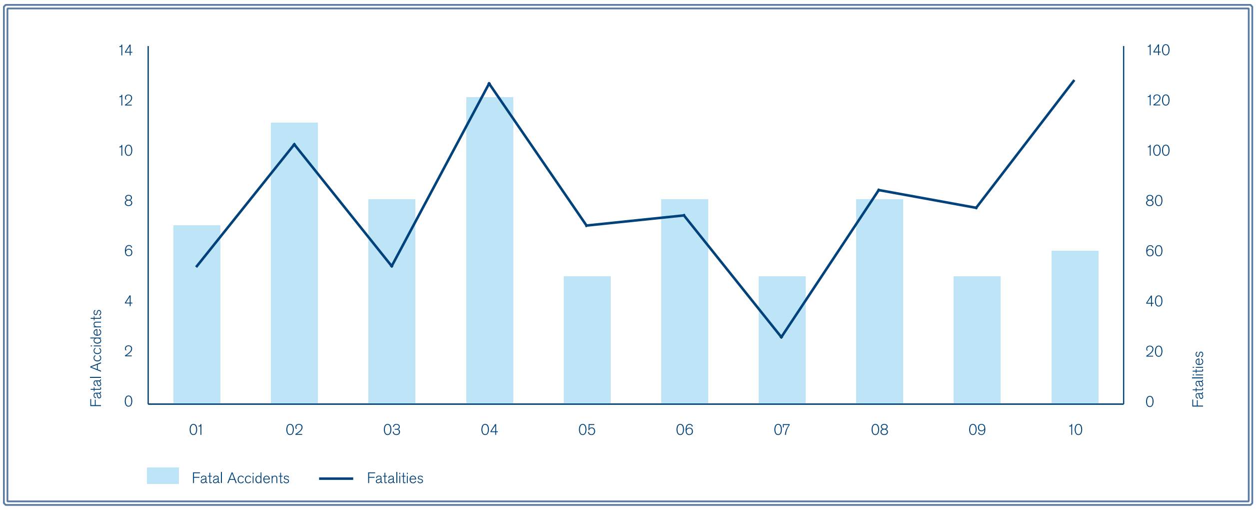


Source: IATA, Ascend Worldwide

Western-built Turboprop Aircraft Hull Losses and Accident Rate (2001-2010)



Western-built Turboprop Aircraft: Fatal Accidents and Fatalities (2001-2010)



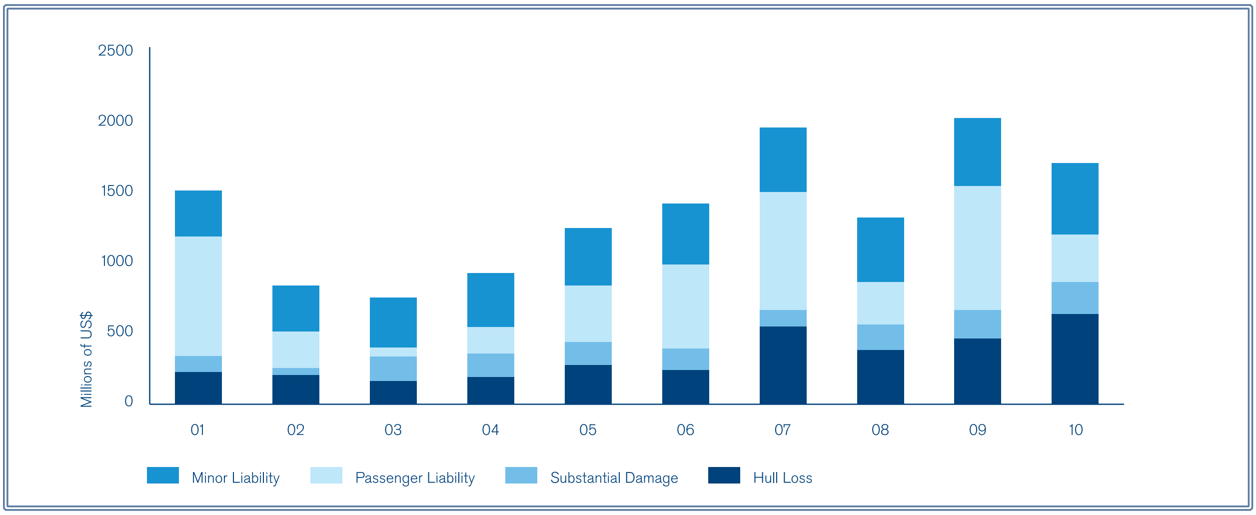
2

ACCIDENT COSTS

IATA has obtained the estimated costs for all losses involving Western-built aircraft over the last 10 years. The figures presented in this section are from operational accidents excluding security-related events and acts of violence. The sharp increase in Turboprop liability is the result of an accident in a populated area with major damage on the ground.

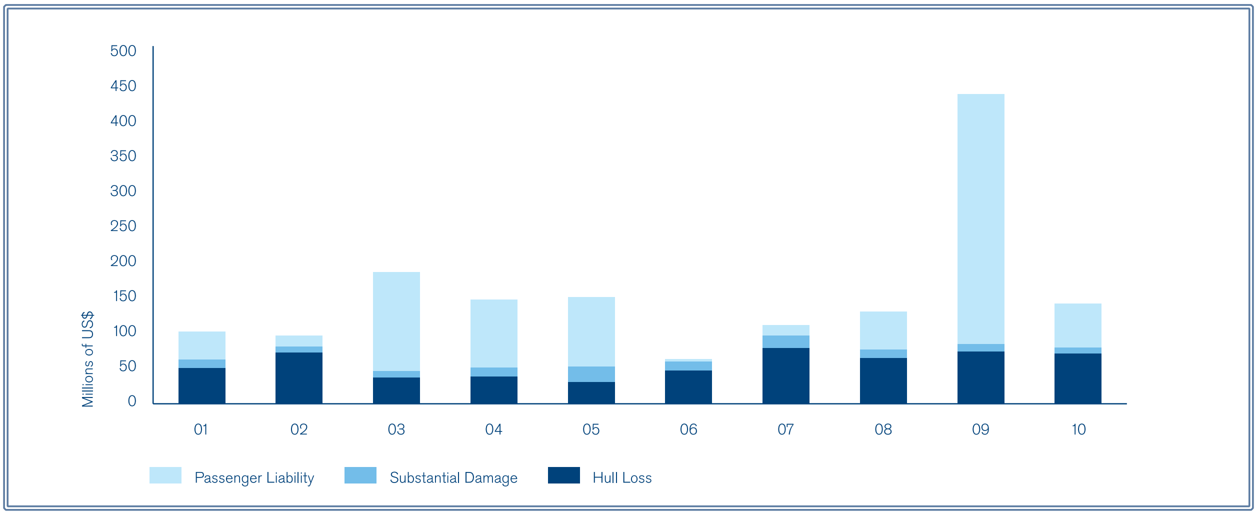
All amounts are expressed in US dollars.

Western-built Jet Aircraft: Accident Costs (2001-2010)



Source: Ascend Worldwide

Western-built Turboprop Aircraft: Accident Costs (2001-2010)



Source: Ascend Worldwide

Image courtesy of Embraer

Section 3

3

Year 2010 in Review

AIRCRAFT ACCIDENTS

There were a total of 94 accidents in 2010. Summaries of all the year's accidents are presented in **Annex 3**.

Fleet Size, Hours and Sectors Flown

	Western-build Aircraft		Eastern-build Aircraft	
	Jet	Turboprop	Jet	Turboprop
World Fleet (end of year)	21,345	5,241	1,205	1,409
Hours Flown (millions)	54.75	6.67	0.81	0.52
Sectors (landings) (millions)	28.06	7.98	0.36	0.37

Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of 31 December 2010.

Operational Accidents

	Western-build Aircraft		Eastern-build Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Loss:	17	11	4	11
Substantial Damage:	36	10	2	3
Total Accidents:	53	21	6	14
Fatal Accidents	8	6	2	7

3

Operational Hull Loss Rates

	Western-build Aircraft		Eastern-build Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Losses (per million sectors):	0.61	1.38	11.04	29.89
Hull Losses (per million hours):	0.31	1.65	4.94	21.27

Passengers Carried

	Western-build Aircraft		Eastern-build Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passengers Carried (millions):	2,615	132	19	6
Estimated Change in Passengers Carried Since 2009:	-1%	-12%	-17%	0%

Source: Ascend Worldwide

Fatal Accidents per Operator Region

	AFI	ASPAC	CIS	EUR	LATAM	MENA	NAM	NASIA
Accidents:	19	12	9	12	12	9	18	3
Fatal Accidents:	5	4	3	0	5	2	3	1
Fatalities (crew and passengers):	129	334	22	0	100	147	12	42

Fatalities per Aircraft Type

	Western-build Aircraft		Eastern-build Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passenger Fatalities:	513	103	2	78
Crew Fatalities:	41	24	8	17
Total Fatalities	554	127	10	95

AIRCRAFT ACCIDENTS PER REGION

Western-built Aircraft Accidents per Operator Region

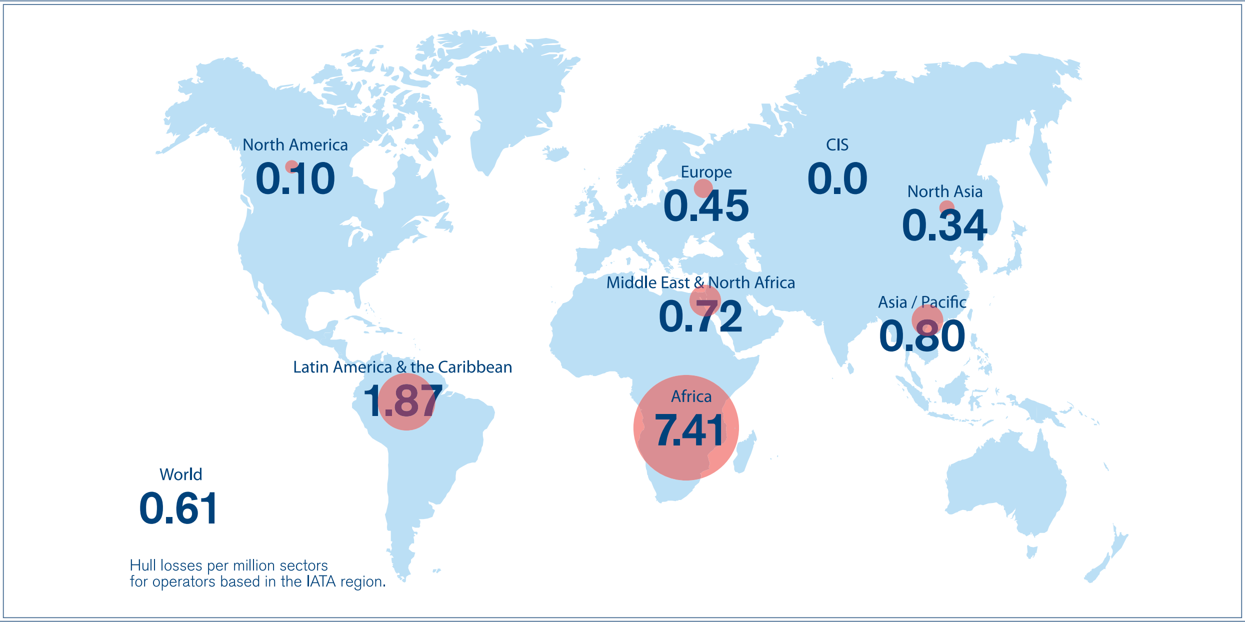
To calculate regional accident rates, IATA determines the accident region based on the operator's country. Moreover, the operator's country is specified in the operator's Air Operator Certificate (AOC).

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

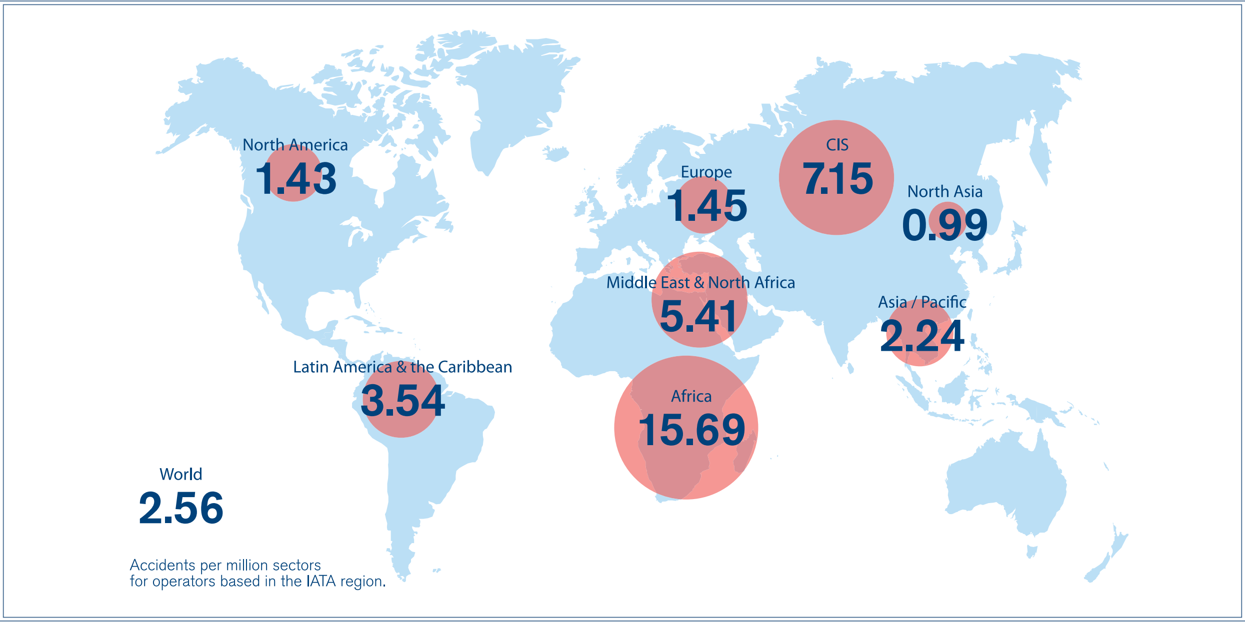
For a complete list of countries assigned per region, please consult **Annex 1**.

3

Western-built Jet Hull Loss Rate per Region of Operator



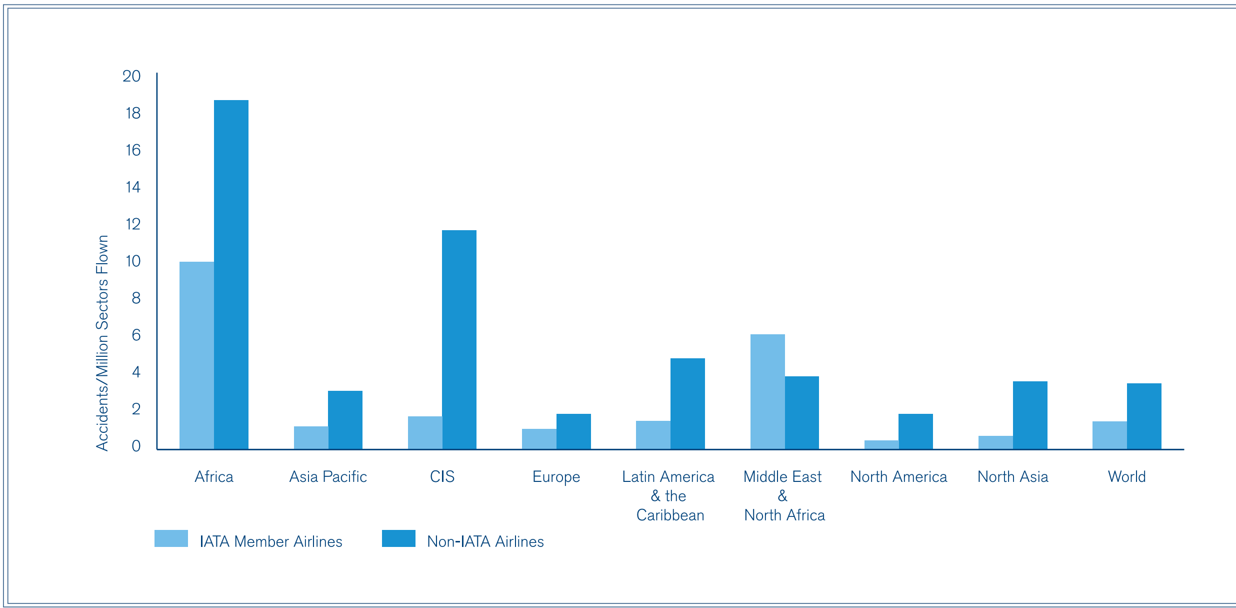
Total Accident Rate per Region (Eastern-built and Western-built aircraft)



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

In an effort to better indicate the safety performance of IATA Member Airlines vs. Non-Members, IATA has determined the total accident rate for each region and globally. IATA member airlines out performed non-members in every region except Middle East and North Africa and exceeded the global rate by 59% in 2010.

IATA Member Airlines vs. Non-Members



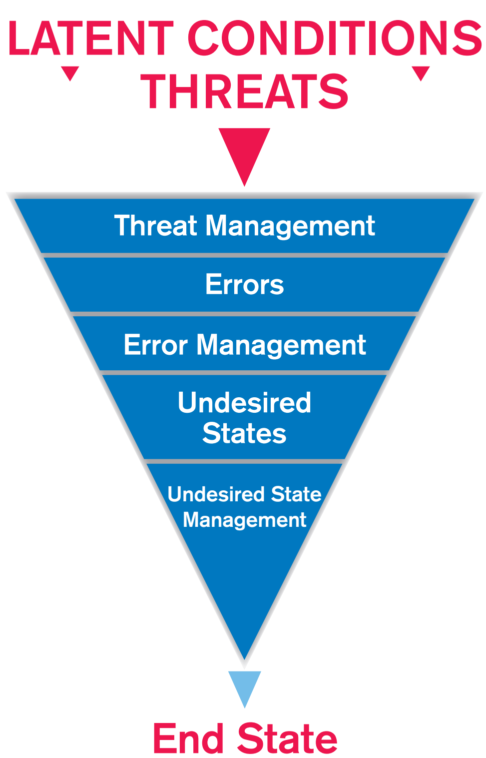
Section 4

In-Depth Accident Analysis 2010

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:

- 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. 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 7, the percentages shown with regards to contributing factors (e.g., % of threats and errors noted) are based on the number of accidents that contained sufficient information to be classified, not on the total number of events. Accidents classified as "insufficient information" are excluded from this part of the analysis.*

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 of the types of accidents and aircraft types that are included in the Safety Report analysis.

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 over arching 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

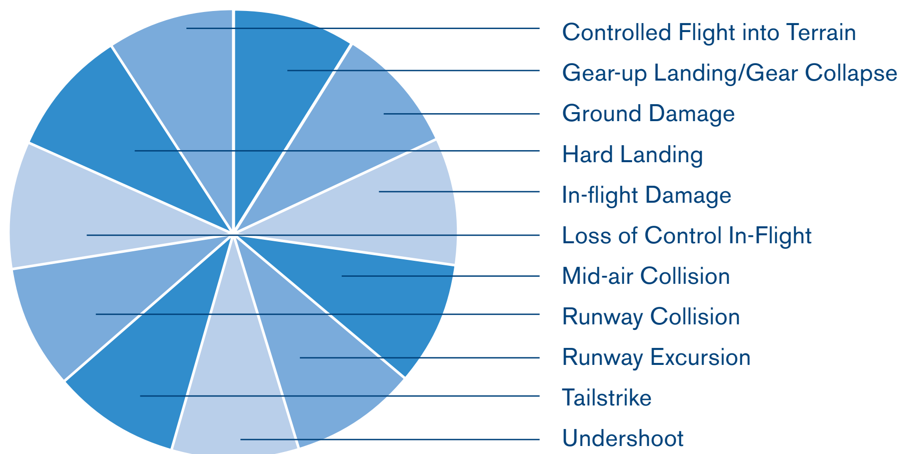
Countermeasures for other personnel, such as air traffic controllers, ground crew, cabin crew or maintenance staff, are important but they are not considered at this time.

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 2010 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 on 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

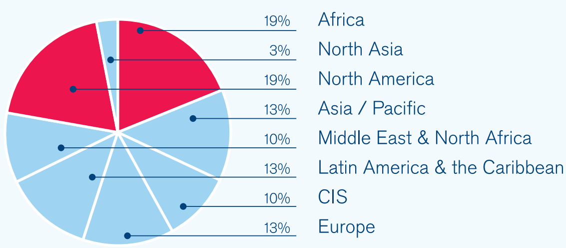
Year 2010 Aircraft Accidents

94 Accidents

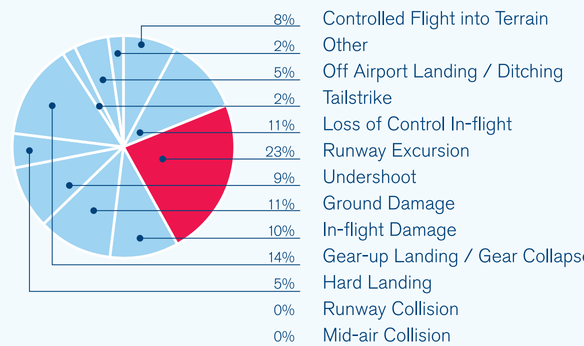
IATA Members	28%
Hull Losses	46%
Fatal	24%

73% Passenger | 25% Cargo | 2% Ferry | 63% Jet | 37% Turboprop

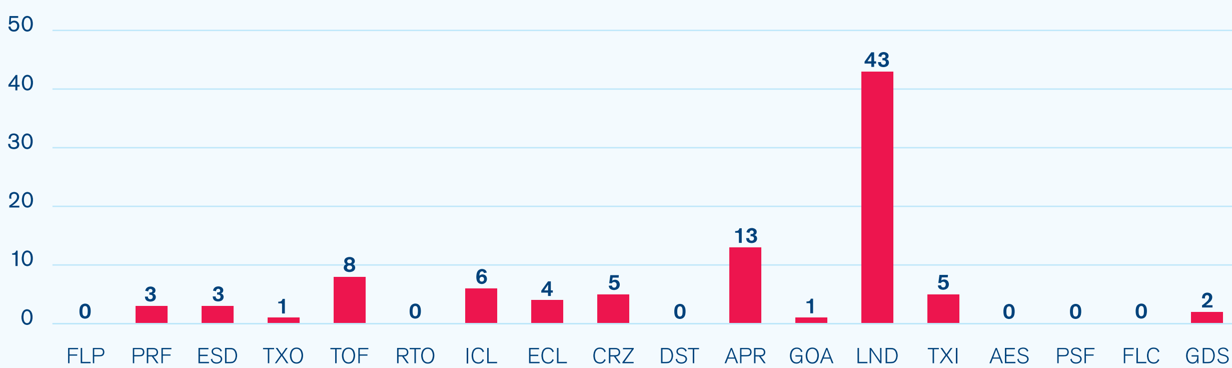
Accidents per Operator Region



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 2010 Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

17% Regulatory oversight

14% Flight operations: Training Systems

11% Safety management

7% Flight operations: SOPs & Checking

6% Maintenance operations: SOPs & checking

Threats

Environmental

23% Meteorology
- Poor visibility/IMC (50% of these events)
- Wind/windshear/gusty wind (41% of these events)
- Thunderstorms (23% of these events)
- Icing conditions (9% of these events)

13% Navigation aids
- Ground-based navigation aids malfunctioning or not available (100% of these events)

11% Airport facilities
- Contaminated runway or taxiway/poor braking action (70% of these events)
- Inadequate overrun area/trench/ditch or structures in close proximity to runway/taxiway (20% of these events)
- Poor/faint marking/signs or runway/taxiway closure (20% of these events)

6% Wildlife/birds/foreign objects

Airline

38% Aircraft malfunction
- Gear/tire (36% of all malfunctions)
- Contained engine failure/powerplant malfunction (28% of all malfunctions)
- Hydraulic system failure (8% of all malfunctions)

12% Maintenance events

5% Ground events

Flight Crew Errors (relating to...)

20% Manual handling/flight controls

18% SOP adherence/cross-verification
- Intentional error (76% of these events)
- Unintentional error (24% of these events)

6% Failure to go-around after destabilization during approach

5% Pilot to pilot communication

5% Callouts

Undesired Aircraft States (UAS)

17% Vertical, lateral or speed deviations

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

12% Unstable approach

Additional Classifications

3% Insufficient data

3% Fatigue

2% Spatial disorientation & spatial/somatogravic illusion

Correlations of Interest

In cases where intentional non-compliance with SOPs or inadequate cross-checking lead to a vertical, lateral or speed deviation, a lack of available ground-based navigation aids was a factor in **63%** of accidents.

Deficiencies in training were noted in **54%** of accidents where intentional non-compliance to SOPs or inadequate cross-checking was noted.

Airport facilities were cited as a factor in **50%** of runway or taxiway excursion accidents.

In **50%** of accidents where long, floated, bounced, firm or off-centerline landing was noted flight crew training deficiencies and manual handling errors were noted.

Contaminated runways with poor braking action contributed to **35%** of runway excursion accidents.

In **22%** of accidents where an aircraft malfunction was cited as a contributing factor, a maintenance event was also noted.

Pilot-to-pilot communication was a factor in **20%** of all accidents involving procedural errors.

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*

4

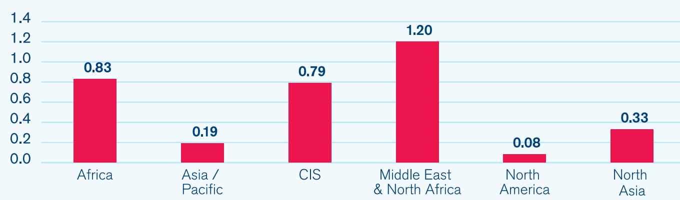
Controlled Flight into Terrain

7 Accidents

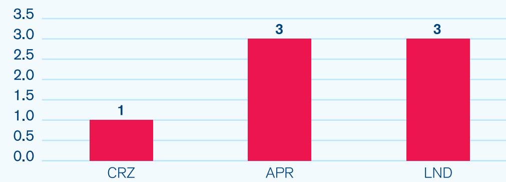
IATA Members	14%
Hull Losses	100%
Fatal	86%
Accident Rate*	0.19

72% Passenger | 14% Cargo | 14% Ferry | 57% Jet | 43% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

- **43%** Flight operations: training systems
- **29%** Regulatory oversight
- **29%** Technology & equipment
- **14%** Safety management
- **14%** Change management
- **14%** Selection systems
- **14%** Ops planning & scheduling
- **14%** Flight operations: SOPs & checking

Threats

Environmental

- **71%** Poor visibility/IMC
- **43%** Nav aids: ground-based nav aid malfunction or not available
- **29%** Lack of visual reference
- **29%** Terrain/obstacles

Airline

- **14%** Aircraft malfunction: avionics/flight instruments
- **14%** Autopilot/FMS
- **14%** Maintenance events

Flight Crew Errors (relating to...)

- **57%** SOP adherence/SOP cross-verification: Intentional non-compliance
- **43%** Manual handling/flight controls
- **43%** Callouts
- **29%** Pilot-to-pilot communication
- **29%** Automation
- **29%** Briefings
- **14%** SOP adherence/SOP cross-verification: Unintentional non-compliance
- **14%** Incorrect or missing log book entries

Undesired Aircraft States (UAS)

- **57%** Vertical, lateral or speed deviations
- **57%** Controlled flight towards terrain
- **14%** Unnecessary weather penetration
- **14%** Incorrect aircraft configuration: Flight controls

Additional Classifications

- **29%** Fatigue
- **14%** Spatial disorientation/ somatogravic illusion

Correlations of Interest

Manual handling was cited in **67%** of CFIT accidents where lack of ground based navigations aids was a factor.

Both cases where fatigue was a factor also cited deficiencies in airline training.

Regulatory oversight was a factor in **67%** of accidents where training deficiencies were also noted.

Accident Scenarios of Interest

Scenario 1:

The airline has noted deficiencies in its flight crew training system. The crew intentionally disregards SOPs, place the aircraft into a state of vertical, lateral, or speed deviation during approach or landing and consequently impact the ground.

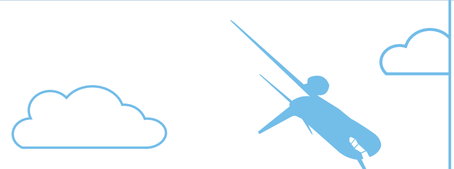
This scenario is common for 43% of all controlled flight into terrain accidents.

Scenario 2:

The flight crew are on approach to an airport with absent or non-functioning ground-based navigation aids in poor visibility or IMC conditions. SOPs are intentionally disregarded and the aircraft is flown towards the ground with vertical, lateral or speed deviations until impact.

This scenario is common for 43% 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

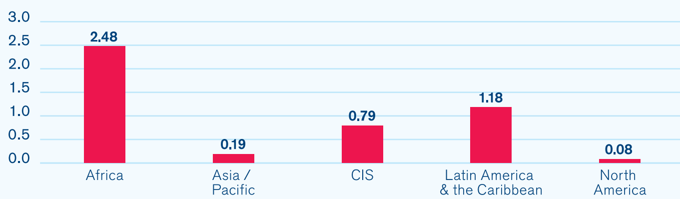
10 Accidents

IATA Members	**20%**
Hull Losses	**100%**
Fatal	**100%**
Accident Rate*	**0.27**

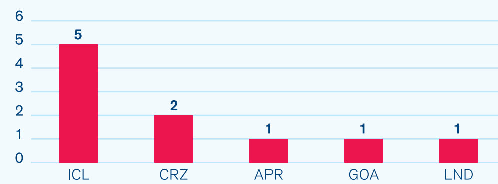
4

60% Passenger | **40%** Cargo | **0%** Ferry | **30%** Jet | **70%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

30% Flight operations: Training systems

10% Selection systems

10% Ops planning & scheduling

10% Flight operations: SOPs & checking

10% Dispatch operations: SOPs & checking

Threats

Environmental

40% Meteorology

Poor visibility/IMC (50% of these events)

Wind/windshear/gusty wind (50% of these events)

10% Lack of visual reference

10% Wildlife/birds/foreign object

10% Navigation aids: Ground-based navigation aids malfunctioning or not available

Airline

50% Aircraft malfunction

Contained engine failure/Powerplant malfunction (80% of all malfunctions)

10% Operational pressure

10% Manuals/charts/checklists

Flight Crew Errors (relating to...)

30% Manual handling/flight controls

20% SOP adherence/SOP cross-verification: Intentional non-compliance

10% Callouts

10% Automation

10% Systems/radios/instruments

Undesired Aircraft States (UAS)

20% Vertical, lateral or speed deviations

20% Incorrect aircraft configuration

10% Unnecessary weather penetration

10% Operation outside aircraft limitations

10% Unstable approach

Correlations of Interest

67% of accidents involving crew training deficiencies also cited unintentional non-compliance with SOPs.

In **67%** of accidents with vertical, lateral or speed deviations, manual handling errors were also noted.

Accident Scenarios of Interest

Scenario 1:

The Operator in question has deficiencies with regards to its flight training activities. The flight crew unintentionally deviates from SOPs or does not properly cross-check, commits manual handling errors and loses control of the aircraft.

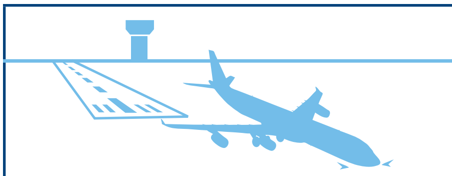
This scenario is common for 20% of all the loss of control in-flight accidents.

Scenario 2:

While operating in poor visibility or IMC conditions, the flight crew commits errors relating to manual handling/flight controls. The aircraft subsequently loses control and crashes.

This scenario is common for 20% 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*



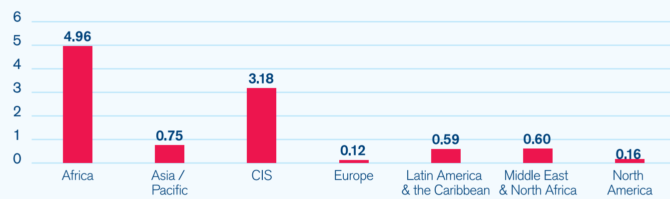
Runway Excursion

20 Accidents

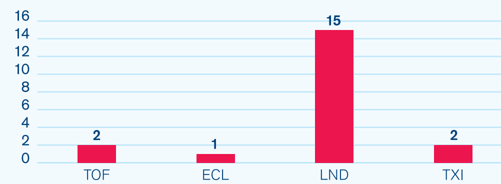
IATA Members	20%
Hull Losses	45%
Fatal	10%
Accident Rate*	0.54

80% Passenger | 20% Cargo | 0% Ferry | 75% Jet | 25% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

35% Regulatory oversight

20% Safety management

15% Flight operations: Training systems

15% Ground operations: SOPs & checking

Threats

Environmental

35% Meteorology

Wind/windshear/gusty wind (57% of these events)

Thunderstorms (57% of these events)

50% Airport facilities

Contaminated runway/ poor braking action (70% of these events)

Inadequate overrun area/trench/ditch or structures in close proximity to runway (20% of these events)

Airline

35% Aircraft malfunction

Contained engine failure/powerplant malfunction (29% of all malfunctions)

Gear/tire (29% of all malfunctions)

Brakes (29% of all malfunctions)

10% Maintenance events

Flight Crew Errors (relating to...)

25% Manual handling/ flight controls

25% Failure to go-around after destabilized approach

20% SOP adherence/ SOP cross-verification

Intentional (75% of these events)

Unintentional (25% of these events)

Undesired Aircraft States (UAS)

45% Long, floated, bounced, firm, off-centerline or crabbed landing

25% Unstable approach deviation

20% Loss of aircraft control while on the ground

15% Incorrect aircraft configuration: Brakes/thrust reversers/ground spoilers

Additional Classifications

5% Fatigue

Correlations of Interest

In **56%** of the runway excursions after a long, floated, bounced, firm, off-centerline or crabbed landing, a contaminated runway or poor braking action was also a factor.
Weather (wind/windshear/gusting wind or thunderstorms) was a factor in **71%** of runway excursions where a long, floated, bounced, firm, off-centerline or crabbed landing occurred.

Flight crew manual handling was identified as an error in **80%** of accidents where a long, floated, bounced, firm, off-centerline or crabbed landing occurred before the aircraft left the runway. Training was cited in **33%** of cases where a long, floated, bounced, firm, off-centerline or crabbed landing was a factor in the accident.

In **57%** of runway excursions where weak regulatory oversight was noted, poor airport facilities were also a factor. Within these cases of poor airport facilities, contaminated runways/ taxiways and/or poor braking action was a factor in **75%** of accidents.

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 15% of all runway excursion accidents.

Scenario 2:

The flight is operating in adverse weather conditions into an airport with contaminated runways and/or poor braking action. The flight crew lands long, lands off the centreline or bounces the landing, after which the aircraft exits the runway and is substantially damaged or destroyed.

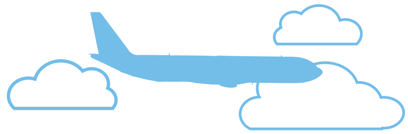
This scenario is common for 20% of all runway excursion accidents.

Scenario 3:

The destination airport in question has weak regulatory oversight and contaminated runways with poor braking action. The aircraft departs the runway without any notable error by the crew and is substantially damaged or destroyed.

This scenario is common for 15% of all runway excursion 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*



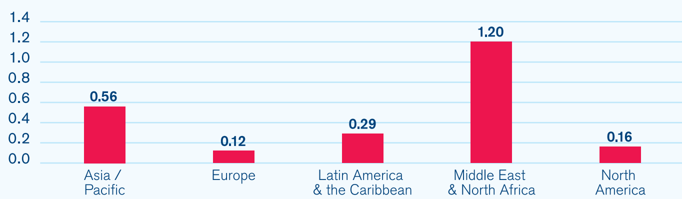
In-flight Damage

9 Accidents

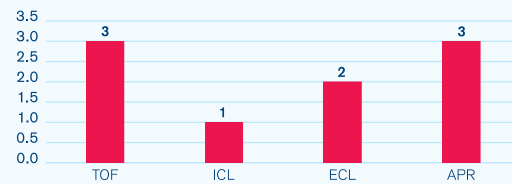
IATA Members	**67%**
Hull Losses	**0%**
Fatal	**0%**
Accident Rate*	**0.24**

67% Passenger
22% Cargo
11% Ferry
78% Jet
22% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

11% Design
11% Safety management
11% Maintenance operations: SOPs & checking and training systems

Threats

Environmental
22% Wildlife/birds/foreign object

Airline
44% Aircraft malfunction: Extensive/uncontained engine failure
33% Maintenance events

Flight Crew Errors (relating to...)

11% SOP adherence/verification
11% Pilot-to-pilot communication
11% Failure to go-around after unstable approach

Undesired Aircraft States (UAS)

11% Abrupt aircraft control
11% Vertical/lateral/speed deviations
11% Operation outside of aircraft limitations
11% Unstable approach

Correlations of Interest

50% of in-flight damage accidents that involved an uncontained engine failure also cited airline maintenance as a factor.

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*

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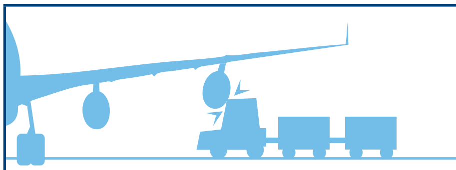


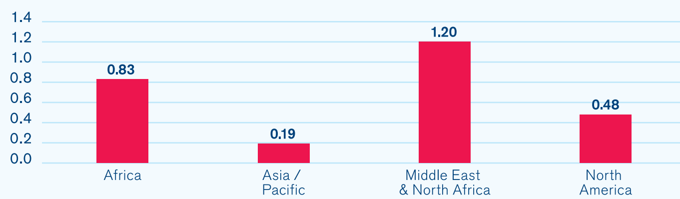
Ground Damage

10 Accidents

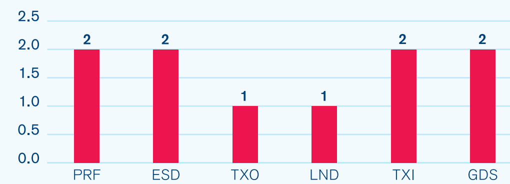
IATA Members	**40%**
Hull Losses	**0%**
Fatal	**0%**
Accident Rate*	**0.27**

100% Passenger | **0%** Cargo | **0%** Ferry | **60%** Jet | **40%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

20% Ground operations: SOPs and checking

10% Regulatory oversight

Threats

Environmental

11% Wildlife/birds/foreign object

Airline

50% Ground events

10% Aircraft malfunction: Fire/smoke

Flight Crew Errors (relating to...)

10% Ground navigation

10% Flight to ATC crew communication

Undesired Aircraft States (UAS)

40% Ground navigation:
Ramp movements
(75% of these events)
Wrong taxiway/ramp/gate/hold spot
(25% of these events)

Correlations of Interest

67% of the accidents that cited ground navigation also listed ground operations SOPs and checking as a factor.

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*

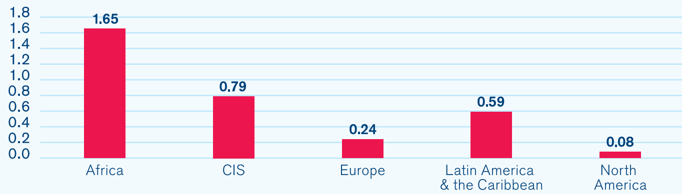
Undershoot

8 Accidents

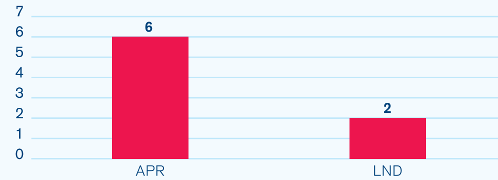
IATA Members	**13%**
Hull Losses	**75%**
Fatal	**25%**
Accident Rate*	**0.22**

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

38% Safety management
38% Regulatory oversight
25% Change management
25% Flight operations: SOPs & checking

Threats

Environmental
63% Nav aids: ground-based nav aid malfunction or not available
50% Meteorology
25% Wildlife/birds/foreign object

Airline
None noted.

Flight Crew Errors (relating to...)

50% SOP adherence/SOP cross-verification: intentional non-compliance
38% Manual handling/flight controls

Undesired Aircraft States (UAS)

75% Vertical/lateral/speed deviation
38% Unstable approach

Additional Classifications

13% Spatial disorientation/somatogravic illusion

Correlations of Interest

All undershoot accidents involving unstable approaches also cited lack of available ground-based navigation aids.

Intentional non-compliance with SOPs was noted in **33%** of cases where a vertical/lateral or speed deviation was also a factor.

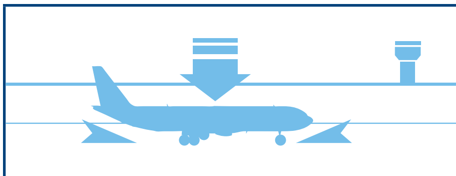
80% of accidents where lack of navigation aids was a factor also cited intentional non-compliance with SOPs.

Accident Scenarios of Interest

The flight crew comes from a rapidly growing airline. The flight is operating into an airport with unavailable or malfunctioning ground-based navigation aids. The aircraft enters a state of vertical, lateral, or speed deviation which the flight crew cannot recover from and lands short of the runway.

This scenario is common to 20% of all the undershoot accidents.

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



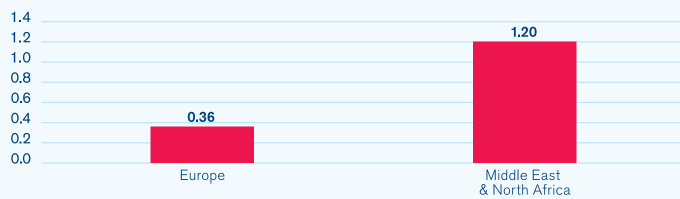
Hard Landing

5 Accidents

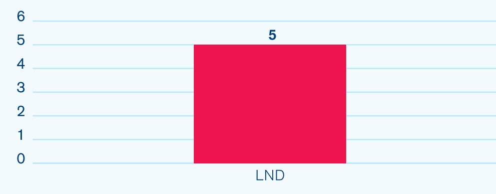
IATA Members	**60%**
Hull Losses	**40%**
Fatal	**0%**
Accident Rate*	**0.14**

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Flight operations: Training systems **(1 case)**

Safety Management **(1 case)**

Dispatch operations: SOPs & checking **(1 case)**

Threats

Environmental

Meteorology: Poor visibility/IMC or wind/windshear/gusty wind **(2 cases)**

Other: hot and high operations **(1 case)**

Airline

Gear/Tire **(1 case)**

Structural failure **(1 case)**

Flight Crew Errors (relating to...)

Manual handling/flight controls **(3 cases)**

Undesired Aircraft States (UAS)

Long, floated, bounced, firm, off-centreline or crabbed landing **(3 cases)**

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

Unstable approach **(1 case)**

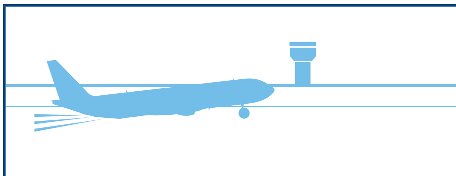
Correlations of Interest

In 2 out of 3 cases where a long, floated, firm, off-centreline or crabbed landing was cited, flight crew errors relating to manual handling/flight controls were also noted as contributing factors.

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*



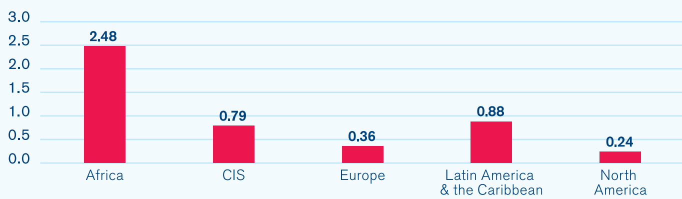
Gear-up Landing/ Gear Collapse

13 Accidents

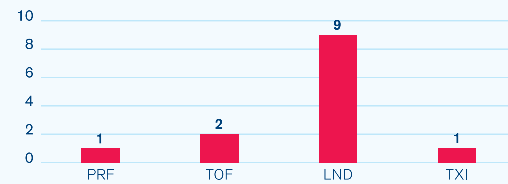
IATA Members	**8%**
Hull Losses	**15%**
Fatal	**0%**
Accident Rate*	**0.35**

77% Passenger | **23%** Cargo | **0%** Ferry | **69%** Jet | **31%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

23% Maintenance operations: SOPs and checking

15% Maintenance operations: Training systems

15% Design

Threats

Environmental
None noted.

Airline

77% Aircraft malfunction: Gear/Tire (90% of all malfunctions)

31% Maintenance Events

Flight Crew Errors (relating to...)

15% SOP adherence/SOP cross-verification

15% Manual handling/flight controls

Undesired Aircraft States (UAS)

23% Incorrect aircraft configuration: landing gear

Correlations of Interest

In **30%** of the accidents citing an aircraft malfunction, maintenance events were also noted.

Aircraft malfunction was a factor in all accidents citing airline maintenance operations SOPs and checking.

In **67%** of accidents citing incorrect landing gear configuration, non-adherence to SOPs was also a factor.

Accident Scenarios of Interest

Scenario 1:

Prior to the accident, maintenance is conducted on the landing gear and maintenance errors occur. On the day of the accident, the flight crew experience a malfunction relating to the gear and land with the gear retracted or suffer a gear collapse.

This scenario is common to 23% of all the accidents involving a gear-up landing or a gear collapse during landing.

Scenario 2:

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 15% of all the accidents involving a gear-up landing or a gear collapse during landing.

**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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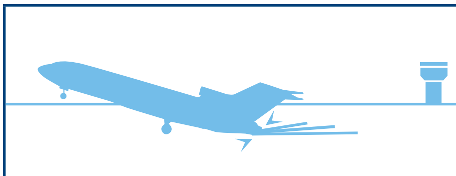


Tailstrike

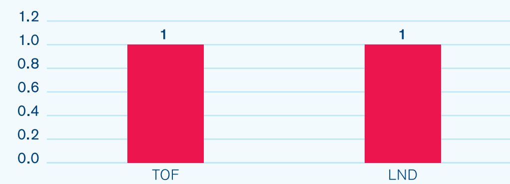
2 Accidents

IATA Members	100%
Hull Losses	0%
Fatal	0%
Accident Rate*	0.05

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

Accident Rates per Operator Region*

Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Flight operations: Training systems **(1 case)**

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

Threats

Environmental
None noted.

Airline
Dispatch/paperwork **(1 case)**

Flight Crew Errors (relating to...)

None identified.

Undesired Aircraft States (UAS)

None identified.

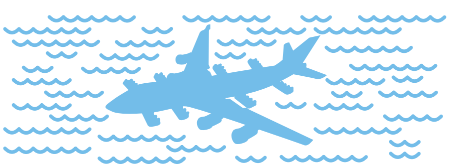
Correlations of Interest

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*



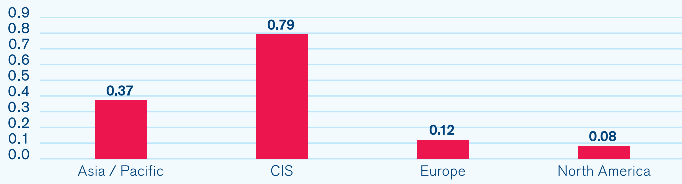
Off Airport Landing/Ditching

5 Accidents

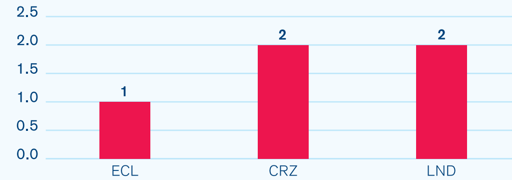
IATA Members	20%
Hull Losses	80%
Fatal	40%
Accident Rate*	0.14

40% Passenger | 60% Cargo | 0% Ferry | 40% Jet | 60% Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Regulatory Oversight **(2 cases)**

Threats

Environmental
None identified.

Airline
Contained engine failure/powerplant malfunction **(2 cases)**

Fire/Smoke (Cockpit/Cabin/Cargo) **(2 cases)**

Operational pressure **(1 case)**

Gear/Tire **(1 case)**

Electrical power generation failure **(1 case)**

Flight Crew Errors (relating to...)

None identified.

Undesired Aircraft States (UAS)

None identified.

Correlations of Interest

An aircraft malfunction was a factor in all 5 cases.

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*

4

TREND ANALYSIS

Accidents Overview (2008-2010)

	Total Accidents	IATA Members	Hull Losses	Fatal	Fatalities	Passenger	Cargo	Ferry	Jet	Turboprop
2010	94	26	43	23	786	69	23	2	59	35
2009	90	28	35	18	685	66	22	2	59	31
2008	109	33	53	23	502	71	34	4	66	43

Accidents per Category (2008-2010)

	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
2010	7	10	20	0	0	9	10	8	5	13	2	5
2009	2	9	23	0	0	9	9	4	11	15	4	N/A
2008	7	14	28	2	0	16	18	6	7	8	3	N/A

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

Note: Two 2010 accidents did not fit into any of the above categories and were 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

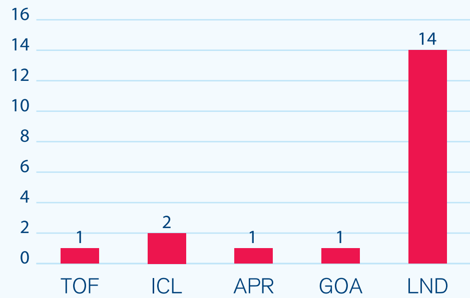
Africa

19 Accidents

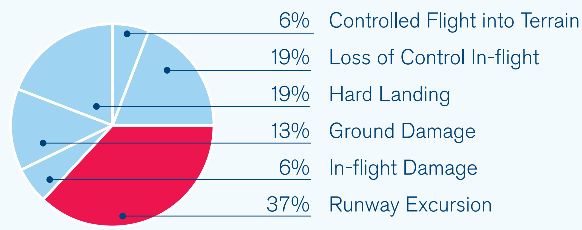
IATA Members	**21%**
Hull Losses	**58%**
Fatal	**26%**

74% Passenger | **26%** Cargo | **0%** Ferry | **47%** Jet | **53%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

26% Regulatory oversight

16% Flight operations: SOPs & checking and training systems

Threats

Environmental

29% Airport facilities

- Contaminated runway/taxiway – poor braking action (67% of these events)
- Inadequate overrun area/trench/ditch/ proximity of structures (33% of these events)

11% Ground-based navigation aids malfunctioning or not available

11% Meteorology

11% Wildlife/birds/foreign object

Airline

32% Aircraft Malfunction

- Gear/tire (50% of these events)
- Contained engine failure/powerplant malfunction (33% of these events)

Flight Crew Errors (relating to...)

16% Manual handling/flight controls

Undesired Aircraft States (UAS)

16% Vertical/lateral/speed deviation

11% Long, floated, bounced, firm, off-centerline, crabbed landing

Correlations of Interest

50% of runway excursion accidents cited deficient airport facilities as a contributing factor.

Weak regulatory oversight was noted in **40%** of all accidents where inadequate airport facilities were a factor.

Deficiencies in crew training was a factor in **18%** of hull loss accidents in Africa.

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*

Asia/Pacific

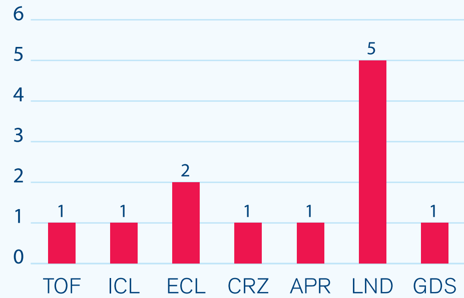
12 Accidents

IATA Members	25%
Hull Losses	50%
Fatal	33%

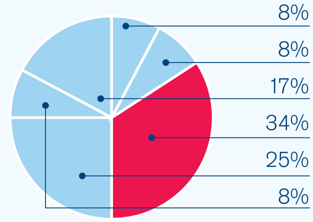
75% Passenger | 25% Cargo | 0% Ferry | 67% Jet | 33% Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

33% Regulatory oversight

33% Safety management

17% Maintenance operations: Training systems

17% Maintenance operations: SOPs & checking

Threats

Environmental

17% Meteorology

Thunderstorms (50% of these events)

Poor visibility/IMC (50% of these events)

17% Ground-based navigation aids malfunctioning or not available

8% Airport Facilities: Contaminated runway/taxiway – poor breaking action and poor/faint marking/signs or runway/taxiway closure

Airline

67% Aircraft malfunction

Extensive/uncontained engine failure (38% of all malfunctions)

Contained engine failure/powerplant malfunction (25% of all malfunctions)

Fire/smoke (cockpit/cabin/cargo) (25% of all malfunctions)

Brakes (8% of all malfunctions)

17% Maintenance events

Flight Crew Errors (relating to...)

17% Manual handling/flight controls

17% Pilot-to-pilot communication

17% SOP adherence/cross-verification: Intentional non-compliance

Undesired Aircraft States (UAS)

25% Long, floated, bounced, firm, off-centerline or crabbed landing

17% Incorrect aircraft configuration: Brakes/thrust reversers/ground spoilers

Correlations of Interest

67% of long/floated/bounced/firm/off-centerline/crabbed landings also cited incorrect aircraft configuration as a factor.

Poor safety management was a factor in **75%** of accidents where inadequate regulatory oversight was noted.

Poor regulatory oversight was a factor in **50%** of events where maintenance operations was also a factor.

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

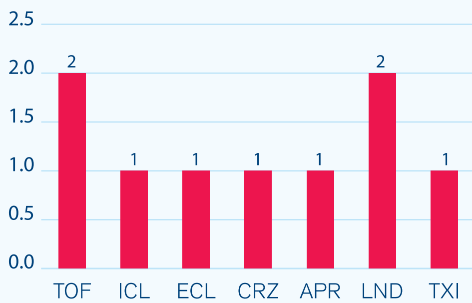
Commonwealth of Independent States (CIS)

9 Accidents

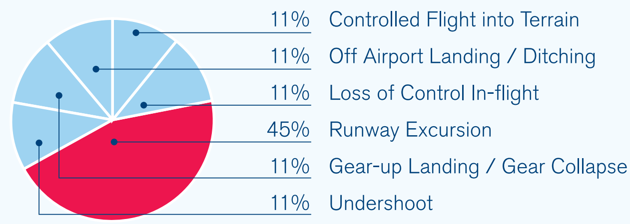
IATA Members	11%
Hull Losses	56%
Fatal	33%

67% Passenger | 22% Cargo | 11% Ferry | 67% Jet | 33% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

33% Flight operations: training systems

22% Regulatory oversight

Threats

Environmental

22% Airport Facilities

22% Methodology: Poor visibility/IMC

Airline

33% Aircraft malfunction: contained engine failure/powerplant malfunction

Flight Crew Errors (relating to...)

33% Manual handling/flight controls

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

22% SOP adherence/SOP cross-verification: Unintentional non-compliance

Undesired Aircraft States (UAS)

22% Vertical/lateral/speed deviation

22% Unstable approach

Additional Classifications

11% Fatigue

Correlations of Interest

No significant correlations noted.

*See Annex 1 for "Phase of Flight" definitions

**See Annex 2 for "Contributing Factors" definitions

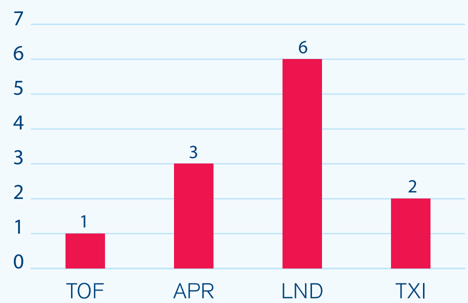
Europe

12 Accidents

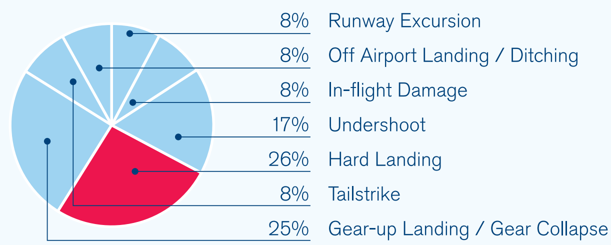
IATA Members	**42%**
Hull Losses	**33%**
Fatal	**0%**

50% Passenger | **50%** Cargo | **0%** Ferry | **58%** Jet | **42%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

17% Flight operations: Training systems

8% Maintenance operations: SOPs & checking and training systems

Threats

Environmental

25% Meteorology: Wind/windshear/gusty wind

Airline

25% Aircraft malfunction: Gear/tire

Flight Crew Errors (relating to...)

25% Manual handling/flight controls

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

17% Failure to go-around after destabilized approach

Undesired Aircraft States (UAS)

25% Unstable approach

25% Long, floated, bounced, firm, off-centerline or crabbed landing

25% Vertical/lateral/speed deviation

17% Abrupt aircraft control

Correlations of Interest

An unstable approach resulted in **67%** of cases where procedural errors were noted.

Flight crew training was a factor in **67%** of events where manual handling errors were noted and **33%** where intentional non-adherence to SOPs was cited.

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

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

5

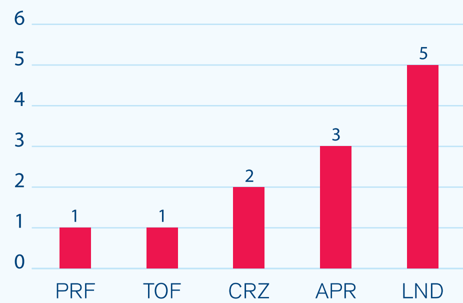
Latin America & the Caribbean

12 Accidents

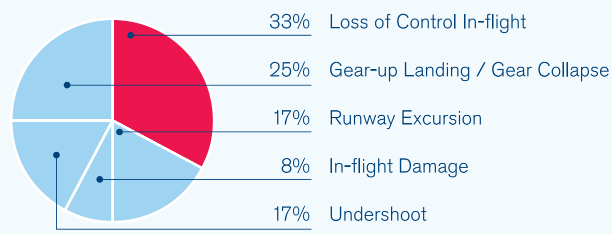
IATA Members	**17%**
Hull Losses	**67%**
Fatal	**42%**

92% Passenger | **8%** Cargo | **0%** Ferry | **67%** Jet | **33%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

25% Flight operations: Training systems

25% Flight operations: SOPs & checking

17% Safety management

17% Change management

Threats

Environmental

33% Nav aids: Ground-based nav aids malfunctioning or not available

17% Airport facilities: Contaminated runway/taxiway – poor braking action

17% Meteorology: Poor visibility/IMC

17% Meteorology: Wind/Windshear/Gusty wind

Airline

33% Aircraft malfunction

25% Maintenance events

Flight Crew Errors (relating to...)

33% Manual handling/flight controls

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

Undesired Aircraft States (UAS)

25% Vertical/lateral/speed deviation

25% Unstable approach

17% Long, floated, bounced, firm, off-center, crabbed landing

Correlations of Interest

When lack of available ground-based navigation aids was a factor, **75%** of accidents cited intention non-compliance with SOPs and vertical/lateral/speed deviations as factors as well.

Deficiencies in SOPs and checking were noted in **75%** of accidents where manual handling was a factor.

The operator's safety management was cited as a factor in **67%** of unstable approaches.

*See Annex 1 for "Phase of Flight" definitions

**See Annex 2 for "Contributing Factors" definitions

Middle East & North Africa

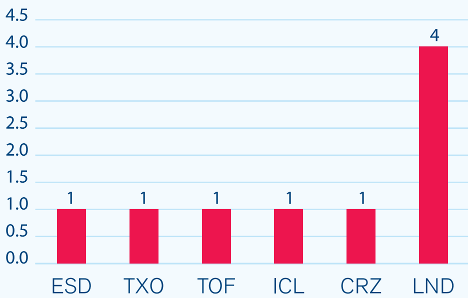
9 Accidents

IATA Members	78%
Hull Losses	33%
Fatal	22%

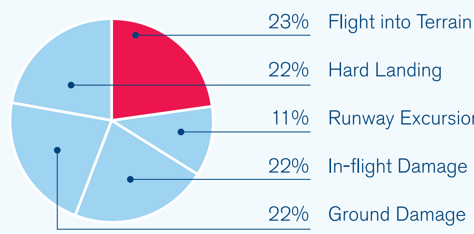
5

89% Passenger | 0% Cargo | 11% Ferry | 89% Jet | 11% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

22% Safety management

11% Regulatory oversight

Threats

Environmental

44% Meteorology

Thunderstorms (25% of cases)

Poor visibility/IMC (75% of cases)

Airline

22% Aircraft malfunction

Flight Crew Errors (relating to...)

33% Manual handling/flight controls

Undesired Aircraft States (UAS)

22% Long, floated, bounced, firm, off-centreline or crabbed landing

22% Vertical/lateral/speed deviation

Additional Classifications

11% Fatigue

11% Spatial disorientation/ somatogravic illusion

Correlations of Interest

44% of all accidents in the region involved Iranian operators.

*See Annex 1 for "Phase of Flight" definitions

**See Annex 2 for "Contributing Factors" definitions

North America

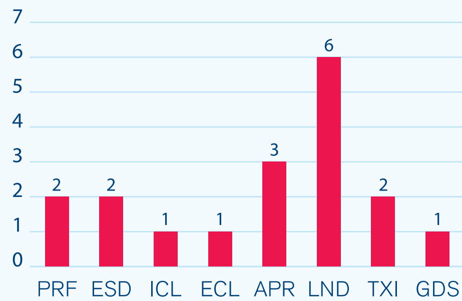
18 Accidents

IATA Members	**11%**
Hull Losses	**28%**
Fatal	**17%**

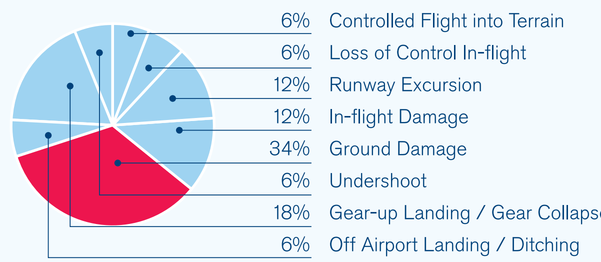
5

72% Passenger | **28%** Cargo | **0%** Ferry | **56%** Jet | **44%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Note: one accident was not placed into any of the above categories

Top Contributing Factors**

Latent Conditions (deficiencies in...)

11% Design

11% Ground operations: SOPs & checking

6% Maintenance operations: SOPs & checking and training systems

Threats

Environmental

11% Meteorology: Wind/Windshear/Gusty wind and poor visibility/IMC

Airline

39% Aircraft malfunction

Gear/tire (57% of all malfunctions)

Hydraulic system failure (29% of all malfunctions)

Fire/smoke (14% of all malfunctions)

Contained engine failure/powerplant malfunction (14% of all malfunctions)

17% Ground events

11% Maintenance events

Flight Crew Errors (relating to...)

6% Manual handling/flight controls

Undesired Aircraft States (UAS)

22% Ground navigation

Ramp movements (75% of these events)

Loss of control on ground (25% of these events)

Additional Classifications

6% Spatial disorientation/ somatogravic illusion

Correlations of Interest

29% of accidents where an aircraft malfunction was a factor also noted design deficiencies.

Ground operations SOPs and checking was noted in **33%** of ground damage events.

Latent factors in maintenance operations were a factor in **33%** of gear collapses.

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

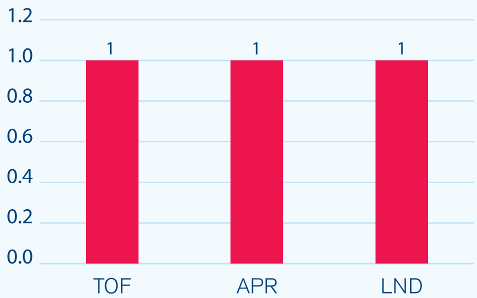
North Asia

3 Accidents

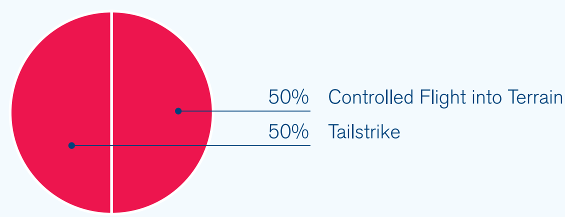
IATA Members	67%
Hull Losses	33%
Fatal	33%

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

Accidents per Phase of Flight*



Breakdown per Accident Category



Note: one accident was not placed into any of the above categories

Top Contributing Factors**

Latent Conditions (deficiencies in...)

Regulatory oversight
(2 cases)

Flight Operations: Training Systems
(2 cases)

Change management
(1 case)

Threats

Environmental

Ground-based navigation aids malfunctioning or not available
(1 case)

Meteorology
(1 case)

Lack of visual reference
(1 case)

Airline

Aircraft malfunction: Contained engine failure/powerplant malfunction
(1 case)

Dispatch/paperwork
(1 case)

Flight Crew Errors (relating to...)

SOP adherence/cross-verification: Intentional
(1 case)

Undesired Aircraft States (UAS)

Vertical/lateral/speed deviation
(1 case)

Controlled flight towards terrain
(1 case)

Correlations of Interest

No significant correlations noted.

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

5

REGIONAL TREND ANALYSIS

Accidents Overview (2008-2010)

	Africa	Asia/Pacific	Commonwealth of Independent States (CIS)	Europe	Latin America & the Caribbean	Middle East & North Africa	North America	North Asia
2010	19	12	9	12	12	9	18	3
2009	14	15	2	17	10	15	14	3
2008	7	19	10	17	19	12	24	1

Image courtesy of Boeing

Section 6

6

Analysis of Cargo Aircraft Accidents

YEAR 2010 CARGO OPERATOR REVIEW

Cargo vs. Passenger Operations for Western-built Jet Aircraft

	Fleet Size End of 2010	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	1,940	5	2.58	5	10	5.15
Passenger	19,405	12	0.62	31	43	2.22
Total	21,345	17	0.80	36	53	2.48

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 2010	HL	Hl per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	927	3	3.24	1	4	4.31
Passenger	4,314	8	1.85	9	17	3.94
Total	5,241	11	2.10	10	21	4.01

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

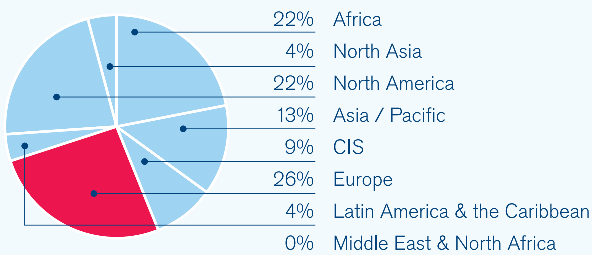
22 Accidents

68% Jet

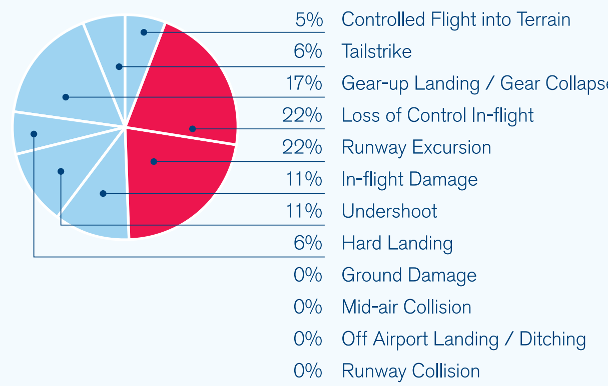
32% Turboprop

IATA Members	18%
Hull Losses	45%
Fatal	36%

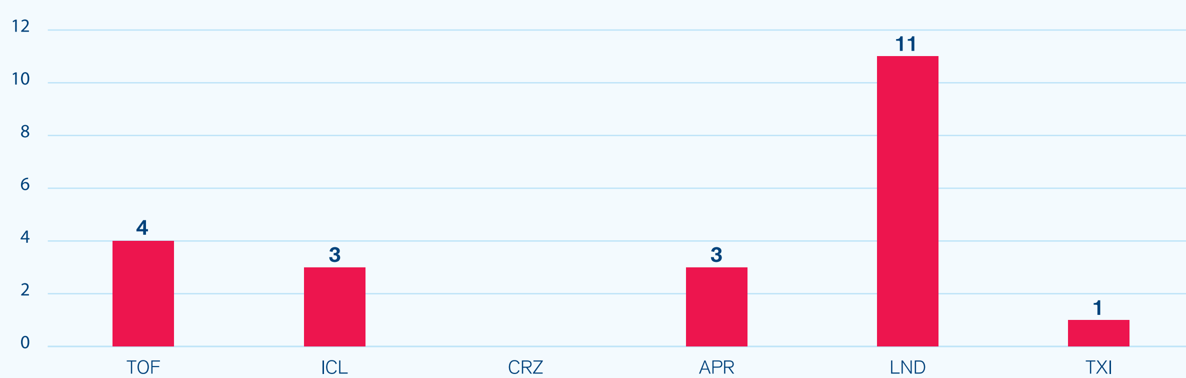
Breakdown per Accident Category



Accidents per Operator Region
(raw numbers)



Accidents per Phase of Flight*



Cargo Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

17% Flight operations: Training Systems

13% Maintenance operations

13% Regulatory Oversight

9% Ground operations: SOPs & checking

9% Safety management

Threats

Environmental

13% Meteorology

Poor visibility/IMC
(67% of all these events)

9% Navigation aids: Ground-based navigation aids malfunctioning or not available

9% Airport facilities: inadequate overrun area/ trench/ditch/proximity of structures

Airline

48% Aircraft malfunction

Contained engine failure/ powerplant malfunction
(36% of all malfunctions)

Gear/Tire
(27% of all malfunctions)

Fire/Smoke (Cockpit/Cabin/ Cargo)
(18% of all malfunctions)

13% Maintenance events

Flight Crew Errors (relating to...)

17% Manual handling/flight controls

9% SOP adherence/ SOP cross-verification: Intentional non-compliance

Undesired Aircraft States (UAS)

9% Vertical, lateral or speed deviations

9% Long/floated/bounced/firm/off-centerline/ crabbed landing

9% Unstable approach

Correlations of Interest

Poor regulatory oversight was a factor in **27%** of accidents where an aircraft malfunction was a contributing factor.

In accidents involving European operators, deficiencies in flight training were a factor in **33%** of accidents.

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

Note: 9% of accidents were not classified due to insufficient data.
** See Annex 1 for "Phase of Flight" definitions*
*** See Annex 2 for "Contributing Factors" definitions*

6

"Runway excursion was the most frequent type of accident in 2010."

Section 7

Report Findings and IATA Prevention Strategies

TOP FINDINGS

- 94 accidents in 2010: 31% involved IATA members
- 24% of all accidents were fatal
- 73% involved passenger aircraft, 25% involved cargo aircraft and 2% involved ferry flights
- 63% on jet aircraft and 37% on turboprops
- 46% of accidents resulted in a hull loss and 54% in substantial damage
- The majority (46%) of accidents occurred during landing

	Top 3 Contributing Factors
Latent conditions (deficiencies in...)	1. Regulatory oversight 2. Flight operations 3. Safety management
Threats	1. Aircraft malfunction 2. Meteorology 3. Navigation aids
Flight crew errors relating to latent conditions (deficiencies in...)…	1. Manual handling/ flight controls 2. SOP adherence/ cross-verification 3. Failure to go-around after destabilized approach
Undesired aircraft states	1. Vertical, lateral or speed deviation 2. Long, floated, bounced, firm, off-centerline or crabbed landing 3. 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 2010.

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	**17%**
Flight Operations: Training systems (Operator)	Adequate training must be in place including: language skills, a set minimum qualification of flight crews, continual assessment of training and training resources including training manuals or computer-based training (CBT) devices.	**14%**
Overall crew performance	Overall, crew members should perform well as risk managers. Includes flight, cabin, ground crew as well as their interactions with ATC.	**13%**
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	**11%**
Monitor/ cross-check	Crew members should actively monitor and cross-check flight path, aircraft performance, systems and other crew members. Aircraft position, settings and crew actions are verified.	**10%**
Contingency management	Crew members should develop effective strategies to manage threats to safety (i.e., threats and their consequences are anticipated; use all available resources to manage threats).	**10%**

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.	**7%**
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.	**6%**
Captain should show leadership	The captain should show leadership and coordinated flight deck activities. They should be in command, decisive, and encourage crew participation.	**6%**
Evaluation of plans	Existing plans should be reviewed and modified when necessary (e.g., crew decisions and actions are openly analyzed to make sure the existing plan is the best plan).	**4%**

Image courtesy of Airbus

7

ACTF DISCUSSION & STRATEGIES

Runway Excursions

Background:

Runway excursions are the most common type of accidents (21% in 2010, 27% in 2009, 25% in 2008).

There is a high correlation between runway excursions and wet or contaminated runways (approximately 33% of runway excursions cited a wet or contaminated runway (versus 26% in 2009).

Discussion:

The FAA's Take-off and Landing Performance Assessment (TALPA) ARC has developed a runway condition matrix in October 2010 to estimate the braking action during various runway contamination scenarios.

The ICAO Aerodrome Panel meeting of November 2010 concluded that pilot reports will be more frequently used rather than surface friction measurements in assessment, measurement and reporting of runway braking action.

Crews should be mindful of unusual autoflight configurations (e.g., autopilot on/autothrottle off) which can occur unintentionally.

ATC can be a major contributor to destabilized approaches (e.g., due to late descent clearances, inadequate ILS interception vectors and/or requests to maintain high speed during the approach - and in particular the final approach). This is further exacerbated by crews who are habitually used to accepting ATC instructions rather than refusing instructions or requesting alternative instructions.

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

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

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

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

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

Long flare and bounced landings should also be addressed.

Auto-land and other automation tools only work within certain limitations.

Recommendations to Operators:

Airlines are recommend 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.

Investigate technology to help crews determine the actual touchdown point and estimate the point where the aircraft is expected to stop (see Airbus ROW/ROP document on the enclosed 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.

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 challenging approaches. Brief key points in each window and how they are different from the standard approach procedure.

Recommendations to Industry:

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.

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.

Aircraft Technical Failures and Maintenance Safety

Background:

Data indicates that poor maintenance practices continue to contribute to accidents:

- In 2010, 11 accidents (12%) had maintenance related issues while 38% of accidents cited technical problems
- In 2009, 11% of accidents cited maintenance and 29% indicated technical problems
- In 2008, 13% of events involved maintenance with 37% citing technical problems

To the best knowledge of the ACTF, no accidents in 2010 involved aircraft with systems on MEL.

59% of accidents in 2010 due to aircraft malfunction involved western-built jets.

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 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", also referred to as a functional flight test, to gauge the quality of work performed by the MRO as well as determine the short-term reliability (e.g., 30 day period) 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 certified, 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 relates to 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 reuse 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. When combined with poor maintenance practices (e.g., mis-rigged flaps, hydraulic lines not capped, cross-wired brakes, etc…) this creates a potentially dangerous situation. Parts need to be checked for serviceability regardless of age or certification status.

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

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 functional flight tests 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.

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

Recommendations to Industry:

Recommend that the IATA Safety Group approve development of a toolkit to assist both airlines and MROs.

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.

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Controlled Flight into Terrain

Background:

2010 saw an increase in the number of CFIT accidents, despite a large number of aircraft being equipped with safety equipment to prevent them (7% of all accidents compared with 2% in 2009 and 6% in 2008).

There is a strong correlation between a lack of ground-based navigation aids and CFIT accidents (43% of all accidents in 2010).

Spatial disorientation was an identified factor in one CFIT accident, while fatigue was a factor in two CFIT accidents.

Discussion:

Forward knowledge of terrain through prior experience does not eliminate the need to adhere to TAWS warnings.

Most pilots do not appreciate how close the approaching terrain is when the TAWS 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 TAWS warning and going below minimums has contributed to CFITs in 2010.

Improper QNH settings on early-generation TAWS units can result in false warnings, leading crews to suppress alarms (e.g. placing the system into "TERRAIN" mode). Modern TAWS 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 GPS equipped so that accurate positioning and altitude data is available.

Airlines are encouraged to familiarize theirs crews with the proximity of terrain once the system TAWS 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 a TAWS alert is sounded.

Make crews aware that if a TAWS 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.

Operators are advised to use published GNSS approach rather than "circle to land" when a GPS is installed on board.

Airlines should develop procedures to ensure that the TAWS database is kept as up-to-date as possible.

Recommendations to Industry:

Authorities are recommended to investigate mandating procedures that ensure TAWS databases are kept accurate and up-to-date.

In some countries a TAWS 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.

Crew Resource Management (CRM)

Background:

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

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

Some specific automated call-outs and/or properly developed SOPs may help the first officer to overcome the social gradient between the crew members and empower them to take over the flight controls.

Go-Arounds

Background:

12% of accidents in 2010 cited an unstable approach as a factor (versus 8% in 2009 and 11% in 2008).

In 36% of unstable approaches, the flight crew chose to continue the approach rather that perform a go-around (versus 25% in 2009 and 58% in 2008).

Discussion:

The go-around procedure is rarely-flown and is a challenging process. 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

The French Bureau Enquêtes Accidents (BEA) is conducting research on go-arounds through its PARG (Perte de contrôle de trajectoire – remise de gaz) program.

Recommendations to Operators:

Airlines are recommend 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.

Operators are encouraged to familiarize themselves with the BEA's PARG research on go-arounds.

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.

Crew Training

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, they are not automatic and the flight crew must still be capable of manually operating the aircraft under many circumstances.

Flight crews are seemingly becoming increasingly reluctant to revert to manual flying when automated systems fail.

Discussion:

Upset recovery training, aerobatics and unusual attitude training included as part of an operators flight crew training syllabus give crews a chance to experience potentially dangerous situations in a safety 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 loss of control or CFIT. Training is available to assist crews facing spatial disorientation situations (see section below on limitations of simulators).

Airlines should be aware of 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.

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

Certain aircraft 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.

Automation is a tool that can be helpful to flight crew, however it is never a replacement for the airmanship skills required to actually operate the aircraft.

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

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.

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Recommendations to Operators:

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, as well as system management training focused on proper use of automation modes and recognizing and/or handling system failures.

Familiarization training with oxygen equipment in a smoke-filled environment can potentially give crews extra protection 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.

Crew familiarization with inflight fire/smoke checklists should be regularly reinforced.

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. However, emphasis should be placed on avoiding situations that could place the aircraft into an upset.

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.

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.

Limitations of Simulators

Discussion:

Simulators are limited in reproducing certain situations such as full stalls, bounced landings, and gusty crosswinds. Also, conventional simulators have limits that instructors need to be aware of for training upset recovery techniques. These are better accomplished in airplanes designed for these maneuvers when feasible.

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:

It is important to 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.

Ground Operations and Ground Damage Prevention

Background:

While trending positively (11% in 2010 compared with 10% in 2009 and 17% in 2008), ground damage nonetheless is a major cost to operators and requires a cooperative safety approach with all involved parties (ground service providers, airport authorities and government).

Discussion:

Simulator-based training for aircraft taxiing is not effective. Actual hand-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.

Crews need to exercise increased vigilance during taxi operations in congested airports or near challenging gates or stands where obstacles are nearby:

- 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.

Both ground staff and flight crew 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.

A standardized training program 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.

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

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 or poor communication with the ground crew can lead to ground damage and even ramp 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.

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 and clearly identify potential hazards and areas of confusion. Global standardization of markings and signs is highly encouraged.

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.

Standardized communication procedures for push-back and/or tow-in should be developed to enhance safety.

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).

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.

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.

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SUMMARY OF MAIN FINDINGS AND IATA PREVENTION STRATEGIES

In 2010, the global Western-built jet hull loss rate was the lowest recorded. From a regional perspective, the western-built jet hull loss rates remained the same or decreased in all IATA regions except North Asia and Latin America and the Caribbean. Overall, IATA member airlines greatly surpassed the industry in terms of safety, with an accident rate of 0.25 western-built jet hull losses per million sectors flown. This was the best rate ever recorded for IATA carriers.

Runway Excursions

Runway excursions were once again the most common type of accident in 2010. A runway excursion 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	2008	2009	2010
Total excursion accidents	**28**	**23**	**20**
IATA member accidents	**7**	**6**	**4**
Percent of annual total	**27%**	**26%**	21%

- Approximately 35% of runway excursions on landing occurred on wet runways
- 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 39% since 2008 (20 vs. 28)
- IATA members reduced their runway excursion accidents by 43% in two years (4 in 2010 vs. 7 in 2008)
- A leading 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
- Airlines can use their internal Flight Data Analysis (FDA) program to understand why unstable approaches occur; these programs are strongly recommended by IATA IOSA
- The IATA Global Safety Information Center (GSIC), launched in 2010, provides IATA member carriers with global trending information regarding unstable approaches
- In 2011, a new Flight Data eXchange (FDX) system within the GSIC will provide participating IATA carriers with the unstable approach performance for every runway in the database

IATA is participating in a number of international runway safety efforts and is a sponsor of the ICAO 2011 Global Runway Safety Symposium. In 2009, IATA released the Runway Excursion Risk Reduction (RERR) toolkit, with more than 8,100 copies distributed worldwide. As part of the effort to eliminate runway excursions, IATA hosted 12 global runway excursion prevention workshops in 2009 and 2010, with more planned for 2011.

A major update to the RERR toolkit is planned for the spring of 2011. The second edition of the RERR toolkit will include information for Air Navigation Service Providers (ANSPs), airports, and improved information for operators. This update brings together all major international safety organizations in a collaborative effort to eliminate these types of accidents.

Aircraft Technical Faults and Maintenance Safety

The second most frequent category of contributing factors to accidents in 2010 was aircraft technical faults and maintenance issues. 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	2008	2009	2010
Maintenance issues as primary cause	14	10	11
Percent of annual total	13%	11%	12%
Total number of accidents with technical faults	40	26	36

- IATA accident statistics exclude post-maintenance test flight accidents
- A large percentage of maintenance related accidents involve landing gear malfunctions

Automation and Crew Decision Making

Pilot handling was noted as a contributing factor in 30% of all accidents.

IATA's Training & Qualification Initiative (ITQI) is pushing for harmonizing a competency-based approach focused on training real skills while addressing threats presented by accident/incident reports and flight data collection and reporting.

IATA, in cooperation with ICAO, has developed the first Fatigue Risk Management System (FRMS) Implementation Guide for operators as part of the Safety Management System. FRMS is a new process to systematically manage crew fatigue taking into account changes in aircraft capabilities and airline operations. This new FRMS guide will be released to the industry in mid-2011.

Regional Factors

IATA carriers experienced four western built jet hull losses in 2010 (versus nine in 2009). The number of industry western built jet hull losses decreased by 11% in 2010 (17 vs. 19 in 2009).

- The Commonwealth of Independent States (CIS) was the only region to achieve zero Western-built jet hull losses in 2010
- North America (0.10 versus 0.41 in 2009), North Asia (0.34 versus 0 in 2009), and Europe (0.45 with no change over 2009) performed better than the global average of 0.61
- Accident rates in the Asia/Pacific (0.80 vs 0.86 in 2009), Africa (7.41 vs 9.94 in 2009), and the Middle East & North Africa (0.72 vs 3.32 in 2009) regions all improved
- The Latin America and the Caribbean region saw its accident rate rise to 1.87 (versus 0 in 2009)

In 2011, IATA will continue to work with its members to maintain safety as the number one priority. Through the new Global Safety Information Center, the Global Safety Information Exchange agreement, ITQI program 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.

"The GSIC will provide unprecedented access to safety information."

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)

IOSA is the world's first airline safety audit program based on internationally harmonized standards.

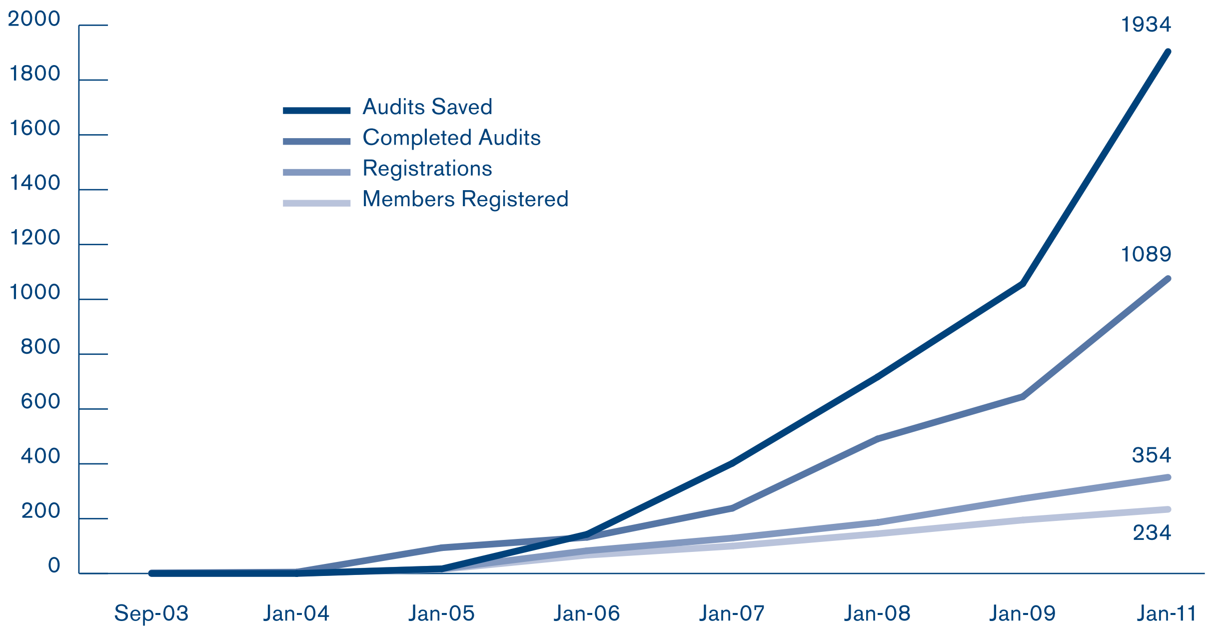
The program is designed to improve the safety levels throughout the entire airline industry and provide efficiency by reducing the number of audits performed. IOSA standards are upgraded routinely, raising the level of organizational standards required. As a result, the safety performance of IOSA carriers is measurably better than non-IOSA carriers. The third edition of the IOSA Standards Manual (ISM) was effective as of 1 October 2010, incorporating the first ICAO-recognized SMS auditing standards as recommended practices.

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 by April 2009.

IATA is currently working on the concept of an enhanced audit scope for IOSA, which will further promote the adoption of the IOSA culture by the operators. The first audits of this kind should take place during the latter part of 2011.

The IOSA program is ISO 9001certified and effective quality assurance is implemented to ensure that airline needs are effectively met. More information on this program can be found at: www.iata.org/iosa

IOSA Program/Audit Status as of 25 February 2011



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IATA Safety Audit for Ground Operations (ISAGO)

ISAGO is the global audit program for ground handling companies serving airlines at airports. It aims to improve operational safety in the airport ground operations environment in terms of fewer injuries to personnel, reduced damage to aircraft and equipment and the elimination of redundant audits. ISAGO enhances regulatory safety oversight. ISAGO is intended to bring the same improvement in safety and efficiency for ground handlers as IOSA achieves for airlines. The primary aim of the program is to drastically reduce aircraft damage and injuries in the ground environment, while also driving down the number of redundant audits.

The IATA Safety Audit for Ground Operations (ISAGO) has conducted 135 audits in 2010, exceeding expectations and the annual target of 120 audits. More importantly, 111 ground service providers (GSPs) worldwide have been audited and the ISAGO Registry is gaining momentum.

ISAGO is built upon a backbone of audit standards applicable to all ground handling companies worldwide, coupled with uniform sets of standards tailored to the specific activities of any ground handler. ISAGO audits are conducted at both corporate and station levels of ground handling companies, mainly using existing airline audit resources managed by IATA through an Audit Pool.

The ISAGO Audit Pool comprises almost 50 airlines. For more information about ISAGO, visit www.iata.org/isago

Operations

Hazard identification and risk management are required to maintain an acceptable level of safety across operations. IATA works on sharing safety data in order to reduce the occurrence of safety events, serious incidents and accidents including runway incursions, runway excursions, level busts and miscommunication. IATA also encourages airlines to collect data on threats perceived in their operations and successful threat management strategies. This includes non-punitive voluntary crew reporting systems and flight data analysis programs. This area also covers aspects related to cabin operations.

Infrastructure Safety

Working closely with states to implement new technology for enhanced situational aware such as of Performance Based Navigation (PBN) is the key focus for infrastructure. However, another important aspect includes airports. The strategic approach is based on harmonization efforts and includes working and building strategies with various stakeholders to modernise the ATM landscape.

A primary objective is to ensure that the maximum increase in safety performance is achieved through globally harmonized design standards for the new US and European Community (EC) ATM systems is a key focus. Increase IATA relevance on the rule making process to guarantee the main players ensure that NextGen and SESAR are harmonized while avoiding different concepts for the same operational application and ensuring adherence to ICAO SARPs.

IATA Infrastructure is working with airports to ensure compliance with ICAO safety standards and SARPs is a primary focus, along with developing airport capacity where necessary to support industry growth.

Another key area of infrastructure safety is to ensure a globally harmonized process for ground handling. The IATA Ground Operations Manual (IGOM) will be released in early 2012 and will contain the first set of globally harmonized procedures for ground handlers.

Safety Management Systems

A Safety Management System (SMS) is a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. As per ICAO requirements, service providers are responsible for establishing an SMS, which is accepted and overseen by their State. Service providers include: aircraft operators, maintenance organizations, Air Navigation Service Providers (ANSPs) and certified aerodromes. Under the requirements, the service provider must implement an SMS accepted by their 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 (e.g., continuous monitoring of safety indicators, implementing management review) of the safety level achieved
- Aims to make continuous improvement to the overall level of safety

Working with ICAO, IATA has been assisting airlines and other service providers with the SMS ICAO requirements, which came into effect on 1 January 2009.

IATA also provides SMS training courses through its Training and Development Institute. Course schedules can be obtained at: www.iata.org/training/calendar

Safety Data Management and Analysis

The launch of the Global Safety Information Center (GSIC) will provide unprecedented access to existing IATA safety databases for all IATA members. Accident information, operational safety reports, IOSA and ISAGO audit analysis, and Flight Data Analysis (FDA) information will be provided via a web portal. The development of the GSIC will provide IATA members with essential SMS hazard identification and monitoring capabilities. Specific accomplishments for 2010 included the following:

- Safety Trending Evaluation Analysis Data Exchange System (STEADES) is now collecting upwards of 120,000 operational safety reports per year. From this vast data, IATA produces in depth analysis on precursors to accident categories, emerging safety issues. The analysis and benchmarking is available to all STEADES participating airlines. Membership in STEADES is free to IATA members. More information is available at www.iata.org/steades
- The launch of on-line global benchmarking for flight, cabin, and maintenance safety
- The launch of on-line benchmarking for FDA and the launch of a global FDA data sharing exchange (FDX). IATA provides a Flight Data Analysis Service and additional information on this service available at fda@iata.org
- The launch of a ground damage/incident database to enhance ground safety and support the ISAGO program
- Enhanced analysis and display of global accident data, IOSA and ISAGO audit data, and operational safety reports

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

Maintenance

The IATA maintenance strategy focusses on three major areas: maintenance SMS, enhancing the training of maintenance personnel and auditing.

The implementation of SMS throughout airline and MRO organizations is an essential component of effective maintenance organizations. The 2010 IOSA standard supports organizational implementation of SMS for airline organizations. IATA supports the ICAO Global Aviation Safety Roadmap (GASR) SMS focus area 7 regarding the need for the implementation of SMS by maintenance organizations.

The ICAO USOAP audit program has identified the training of maintenance personnel as the area with the greatest number of deficiencies, and the GASR focus area 11 identifies the lack of qualified personnel as a significant impediment to safety. The IATA ITQI program will provide a roadmap for the training of maintenance technicians when completed in 2011.

Audit programs form the foundation of an SMS safety assurance system, and IOSA provides the foundation for air carrier maintenance program audits.

"Gear collapse was the second most predominant type of accident, following runway excursion."

A1

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

Region	Country
	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

Region	Country
	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]

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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
	Sudanthe
	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.

Western-built Jet: Commercial Jet transport aircraft with a maximum certificated takeoff 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 takeoff 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.

A2

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

2 Threats (cont'd)

Navigational Aids	See the following breakdown
	↗ Ground navigation aid malfunction ↗ Lack or unavailability (e.g., ILS)
	↗ NAV aids not calibrated – unknown to flight crew
Terrain/ Obstacles	↗ Self-explanatory
Traffic	↗ Self-explanatory
Other	↗ Not clearly falling within the other environmental threats
Airline Threats	Examples
Aircraft Malfunction	↗ Technical anomalies/failures See breakdown (on the next page)
MEL item	↗ MEL items with operational implications
Operational Pressure	↗ Operational time pressure ↗ Missed approach/diversion ↗ Other non-normal operations
Cabin Events	↗ Cabin events ↗ Cabin crew errors ↗ Distractions/interruptions
Ground Events	↗ Aircraft loading events ↗ Fueling errors ↗ Agent interruptions ↗ Improper ground support ↗ Improper de-icing/anti-icing
Dispatch/ Paperwork	↗ Load sheet errors ↗ Crew scheduling events ↗ Late paperwork changes or errors
Maintenance Events	↗ Aircraft repairs on ground ↗ Maintenance log problems ↗ Maintenance errors
Dangerous Goods	↗ Carriage of articles or substances capable of posing a significant risk to health, safety or property when transported by air
Manuals/ Charts/ Checklists	↗ Incorrect/unclear chart pages or operating manuals ↗ Checklist layout/design issues
Other	↗ Not clearly falling within the other airline threats

A2

Aircraft Malfunction Breakdown (Technical Threats)	Examples
Extensive/ Uncontained Engine Failure	↗ Damage due to non-containment
Contained Engine Failure / Power plant Malfunction	↗ Engine overheat ↗ Propeller failure ↗ Failure affecting power plant components
Gear/Tire	↗ Failure affecting parking, taxi, take-off or landing
Brakes	↗ Failure affecting parking, taxi, take-off or landing
Flight Controls	See the following breakdown
Primary Flight Controls	↗ Failure affecting aircraft controllability
Secondary Flight Controls	↗ Failure affecting flaps, spoilers
Structural Failure	↗ Failure due to flutter, overload ↗ Corrosion/fatigue ↗ Engine separation
Fire/Smoke (Cockpit/ Cabin/Cargo)	↗ Fire due to aircraft systems ↗ Other fire causes
Avionics, Flight Instruments	↗ All avionics except autopilot and FMS ↗ Instrumentation, including standby instruments
Autopilot/FMS	↗ Self-explanatory
Hydraulic System Failure	↗ Self-explanatory
Electrical Power Generation Failure	↗ Loss of all electrical power, including battery power
Other	↗ Not clearly falling within the other aircraft malfunction threats

3 Flight Crew Errors

Definition: An observed flight crew deviation from organizational expectations or crew intentions.

Mismanaged error: An error that is linked to or induces additional error or an undesired aircraft state.

A2

Aircraft Handling Errors	Examples
Manual Handling/ Flight Controls	↗ Hand flying vertical, lateral, or speed deviations ↗ Approach deviations by choice (e.g., flying below the GS) ↗ Missed runway/taxiway, failure to hold short, taxi above speed limit ↗ Incorrect flaps, speed brake, autobrake, thrust reverser or power settings
Ground Navigation	↗ Attempting to turn down wrong taxiway/runway ↗ Missed taxiway/runway/gate
Automation	↗ Incorrect altitude, speed, heading, autothrottle settings, mode executed, or entries
Systems/ Radio/ 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 takeoff, descent, or approach callouts
Briefings	↗ Omitted departure, takeoff, approach, or handover briefing; items missed ↗ Briefing does not address expected situation

3 Flight Crew Errors (cont'd)

Documentation	See the following breakdown
	↗ Wrong weight and balance information, wrong fuel information
	↗ Wrong ATIS, or clearance recorded
	↗ Misinterpreted items on paperwork
	↗ Incorrect or missing log book entries
Failure to go-around 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

A2

4 Undesired Aircraft States (UAS)

Definition: A flight-crew-induced aircraft state that clearly reduces safety margins; a safety-compromising situation that results from ineffective error management. An undesired aircraft state is **recoverable**.

Mismanaged UAS: A UAS that is linked to or induces additional flight crew errors.

Undesired Aircraft States	Breakdown
Aircraft Handling	↗ Abrupt Aircraft Control
	↗ Vertical, Lateral or Speed Deviations
	↗ Unnecessary Weather Penetration
	↗ 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

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 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

6 Flight Crew Countermeasures

The following list includes countermeasures that the flight crew can take. Countermeasures from other areas, such as ATC, ground operations personnel and maintenance staff, are not considered at this time.

Team Climate		
Countermeasure	Definition	Example Performance
Communication Environment	Environment for open communication is established and maintained	Good cross talk – flow of information is fluid, clear, and direct No social or cultural disharmonies. Right amount of hierarchy gradient Flight Crew member reacts to assertive callout of other crew member(s)
Leadership	See the following breakdown	
	Captain should show leadership and coordinated flight deck activities	In command, decisive, and encourages crew participation
	FO is assertive when necessary and is able to take over as the leader	FO speaks up and raises concerns
Overall crew performance	Overall, crew members should perform well as risk managers	Includes Flight, Cabin, Ground crew as well as their interactions with ATC
Other	Not clearly falling within the other categories	

6 Flight Crew Countermeasures (cont'd)

Planning		
SOP Briefing	The required briefing should be interactive and operationally thorough	Concise and not rushed – bottom lines are established
Plans Stated	Operational plans and decisions should be communicated and acknowledged	↗ Shared understanding about plans – "Everybody on the same page"
Contingency Management	Crew members should develop effective strategies to manage threats to safety	↗ Threats and their consequences are anticipated. ↗ Use all available resources to manage threats
Other	Not clearly falling within the other categories	
Execution		
Monitor/ Cross-check	Crew members should actively monitor and cross-check flight path, aircraft performance, systems and other crew members	Aircraft position, settings, and crew actions are verified
Workload Management	Operational tasks should be prioritized and properly managed to handle primary flight duties	↗ Avoid task fixation. ↗ Do not allow work overload
Automation Management	Automation should be properly managed to balance situational and/or workload requirements	↗ Brief automation setup. ↗ Effective recovery techniques from anomalies
Taxiway/Runway Management	Crew members use caution and kept watch outside when navigating taxiways and runways	Clearances are verbalised and understood – airport and taxiway charts or aircraft cockpit moving map displays are used when needed
Other	Not clearly falling within the other categories	
Review/Modify		
Evaluation of Plans	Existing plans should be reviewed and modified when necessary	Crew decisions and actions are openly analysed to make sure the existing plan is the best plan
Inquiry	Crew members should not be afraid to ask questions to investigate and/or clarify current plans of action	"Nothing taken for granted" attitude – Crew members speak up without hesitation
Other	Not clearly falling within the other categories	

7 Additional Classifications

Additional Classification	Breakdown
Insufficient Data	Accident does not contain sufficient data to be classified
Incapacitation	Crew member unable to perform duties due to physical or psychological impairment
Fatigue	Crew member unable to perform duties due to fatigue
Spatial Disorientation and Spatial/ Somatogravic Illusion (SGI)	SGI is a form of spatial disorientation that occurs when a shift in the resultant gravitoinertial force vector created by a sustained linear acceleration is misinterpreted as a change in pitch or bank attitude

Annex 3 2010 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2010-01-02	Boeing	727	CAA - Compagnie Africaine d'Aviation	Kinshasa, DR Congo	LND	Cargo	Western-built	Jet	Hull Loss	Runway Excursion - Veered Off
2010-01-02	Fairchild (Swearingen)	Metro	Locair	Somerset, KY, USA	LND	Passenger	Western-built	Turboprop	Hull Loss	Loss of control during landing roll
2010-01-05	Bombardier	Dash 8	Intersky	Elba, Italy	APR	Passenger	Western-built	Turboprop	Substantial Damage	Struck power lines on approach
2010-01-07	Saab	340	Sky Bahamas	Nassau, Bahamas	PRF	Passenger	Western-built	Turboprop	Hull Loss	Undercarriage collapse
2010-01-13	Bombardier	Dash 8	CMC Aviation	Moba, DR Congo	LND	Passenger	Western-built	Turboprop	Hull Loss	Undershot resulted in runway excursion
2010-01-15	Fokker	F-100	Iran Air	Isfahan, Iran	LND	Passenger	Western-built	Jet	Substantial Damage	Hard Landing
2010-01-16	Boeing	737	UTAir	Vnukovo Airport, Moscow, Russia	TXI	Passenger	Western-built	Jet	Substantial Damage	Runway excursion
2010-01-19	Airbus	A318	Mexicana	Cancun, Mexico	TOF	Passenger	Western-built	Jet	Substantial Damage	Damage from loose cowl on take-off.
2010-01-21	Hawker Beechcraft	1900	ACE Air Cargo	In sea, off Sand Point, Alaska, USA	ICL	Cargo	Western-built	Turboprop	Hull Loss	Engine Failure
2010-01-21	Embraer	ERJ-145	Aeromexico Connect	Tijuana, Mexico	LND	Passenger	Western-built	Jet	Substantial Damage	Loss of Control resulted in Runway Excursion
2010-01-23	ATR	ATR 42	Tarom	Bacau, Romania	TXI	Passenger	Western-built	Turboprop	Substantial Damage	Loss of Control
2010-01-24	Tupolev	Tu-154	Taban Air	Mashad - Shahid Hashemi Nejad, Iran	LND	Passenger	Eastern-built	Jet	Hull Loss	Hard Landing
2010-01-25	Boeing	737 (NG)	Ethiopian Airlines	in Mediterranean Sea, off Naameh, Lebanon	ICL	Passenger	Western-built	Jet	Hull Loss	Loss of control in flight
2010-01-28	Antonov	An-26	Manunggal Air	Wamena, Indonesia	LND	Cargo	Eastern-built	Turboprop	Substantial Damage	Runway Excursion - Overrun
2010-01-31	Yakovlev	Yak-40	Guicango	Luanda, Angola	LND	Passenger	Eastern-built	Jet	Substantial Damage	Gear Collapsed
2010-02-03	Boeing	747	Thai Airways International	in flight, (near) Bangkok	ECL	Passenger	Western-built	Jet	Substantial Damage	Uncontained engine failure
2010-02-04	Antonov	An-24	Yakutia Airlines	Yakutsk, Russia	TOF	Passenger	Eastern-built	Turboprop	Substantial Damage	Power Loss
2010-02-06	Boeing	MD-80	SAS	Grenoble - St Geoirs, France	LND	Passenger	Western-built	Jet	Substantial Damage	Tail Strike

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2010-02-11	Fokker	100	Click Mexicana	Monterrey, Mexico	LND	Passenger	Western-built	Jet	Substantial Damage	Gear Damage resulted in Runway excursion
2010-02-11	ATR	ATR 42	Trigana Air	(near) Kutai Kartanegara, Indonesia	CRZ	Passenger	Western-built	Turboprop	Hull Loss	Engine Failure
2010-02-16	Embraer	EMB-120 Brasilia	SkyWest Airlines	Los Angeles, CA, USA	GDS	Passenger	Western-built	Turboprop	Substantial Damage	Collided with an object
2010-03-01	Airbus	A300	ACT Airlines	Bagram, Afghanistan	LND	Cargo	Western-built	Jet	Hull Loss	Gear Collapsed resulted in Runway Excursion
2010-03-01	Boeing	737	Air Tanzania	Mwanza, Tanzania	LND	Passenger	Western-built	Jet	Hull Loss	Runway Excursion - Veer off
2010-03-04	Boeing	747	China Airlines	Anchorage, AK, USA	TOF	Cargo	Western-built	Jet	Substantial Damage	Tailstrike
2010-03-04	Fokker	F.27	Safe Air Company	Bosaso, Somalia	LND	Cargo	Western-built	Turboprop	Substantial Damage	Runway Excursion - veer off
2010-03-18	Antonov	An-26	EXIN	Tallinn, Estonia	LND	Cargo	Eastern-built	Turboprop	Hull Loss	Engine failure
2010-03-18	Boeing	747	Thai Airways International	Charles de Gaulle Airport, Paris, France	GDS	Passenger	Western-built	Jet	Substantial Damage	Ground fire
2010-03-22	Tupolev	TU-204	Aviastar-TU	(near) Domodedovo Airport, Moscow, Russia	LND	Ferry	Eastern-built	Jet	Hull Loss	Undershoot
2010-03-25	Boeing	737	Air Madagascar	Nosy Be, Madagascar	LND	Passenger	Western-built	Jet	Substantial Damage	Long Landing resulted in runway excursion
2010-04-02	Airbus	A330	EgyptAir	Cairo, Egypt	TXO	Passenger	Western-built	Jet	Substantial Damage	Collision with object
2010-04-13	Airbus	A300	AeroUnion	Monterrey, Mexico	LND	Cargo	Western-built	Jet	Hull Loss	Undershot
2010-04-13	Airbus	A330	Cathay Pacific	Chep Lap Kok International Airport, Hong Kong	LND	Passenger	Western-built	Jet	Substantial Damage	Engine failure
2010-04-13	Boeing	737	Merpati Nusantara Airlines	Manokwari, Indonesia	LND	Passenger	Western-built	Jet	Hull Loss	Runway Excursion - Overrun
2010-04-17	Bombardier	CRJ Regional Jet	SA Express	Windhoek, Namibia	LND	Passenger	Western-built	Jet	Substantial Damage	Landed with nose gear retracted
2010-04-21	Antonov	An-12	InterIsland Airlines	(near) Angeles City, Philippines	LND	Cargo	Eastern-built	Turboprop	Hull Loss	Destroyed in post-impact fire

Annex 3 2010 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2010-05-05	Embraer	ERJ-145	SATENA	Mitu, Colombia	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion
2010-05-12	Airbus	A330	Afriqiyah Airways	Tripoli, Libya	LND	Passenger	Western-built	Jet	Hull Loss	Crashed short of Runway
2010-05-15	Antonov	An-28	Blue Wing Airlines	(near) Pokisi, Suriname	CRZ	Passenger	Eastern-built	Turboprop	Hull Loss	Crashed in poor weather
2010-05-17	Boeing	747	Atlas Air	near Miami, FL, USA	APR	Cargo	Western-built	Jet	Substantial Damage	Flap separation in-flight
2010-05-17	Antonov	An-24	Pamir Airways	Salang Pass, north of Kabul, Afghanistan	CRZ	Passenger	Eastern-built	Turboprop	Hull Loss	Crashed attempting to land in poor weather
2010-05-22	Boeing	737 (NG)	Air India Express	Mangalore, India	LND	Passenger	Western-built	Jet	Hull Loss	Runway Excursion - Overrun
2010-06-03	Lockheed	Hercules	National Airlines	Sharana, Afghanistan	LND	Cargo	Western-built	Turboprop	Hull Loss	Undershot
2010-06-06	Boeing	737	Royal Air Maroc	Amsterdam, Netherlands	ICL	Passenger	Western-built	Jet	Substantial Damage	Birdstrike
2010-06-15	Let	L-410 Turbolet	Safe Air Company	Shabunda, DR Congo	LND	Cargo	Eastern-built	Turboprop	Hull Loss	Crashed in poor weather
2010-06-16	Embraer	ERJ-145	Trans States Airlines	Ottawa, Canada	LND	Passenger	Western-built	Jet	Substantial Damage	Runway Excursion - overrun
2010-06-19	EADS - CASA	C-212	Aero Service (Congo Brazzaville)	(near) Yangadou, DR Congo	LND	Passenger	Western-built	Turboprop	Hull Loss	Collision with high ground
2010-06-21	Boeing	MD-80	Hewa Bora Airways	Kinshasha, DR Congo	TOF	Passenger	Western-built	Jet	Substantial Damage	Landed with nose gear retracted
2010-06-23	Bombardier	CL-600	SkyWest	Ontario, CA, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2010-07-16	Bombardier	Dash 8	SA Express	Kimberley, South Africa	LND	Passenger	Western-built	Turboprop	Substantial Damage	Animal strike on landing
2010-07-17	Boeing	747	Saudi Arabian Airlines	Cairo, Egypt	TOF	Ferry	Western-built	Jet	Substantial Damage	Uncontained engine failure during take-off run
2010-07-20	Fokker	F-27	Air Kasai	Lubumbashi, DR Congo	LND	Passenger	Western-built	Turboprop	Substantial Damage	Gear collapse on landing
2010-07-21	Antonov	An-12	Khabarovsk Airlines	Keperveem, Russia	TOF	Cargo	Eastern-built	Turboprop	Hull Loss	Gear collapse on take-off
2010-07-27	Boeing	MD-11	Lufthansa Cargo	Riyadh, Saudi Arabia	LND	Cargo	Western-built	Jet	Hull Loss	Destroyed by fire after runway excursion

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2010-07-28	Airbus	A321	Airblue	Margella Hills, Islamabad, Pakistan	APR	Passenger	Western-built	Jet	Hull Loss	CFIT
2010-07-28	Antonov	An-12	Galex Guinea Air	Helmand Province, Afghanistan	LND	Cargo	Eastern-built	Turboprop	Hull Loss	Damaged during landing
2010-07-28	Boeing	737	Mauritania Airways	Gbessia, Conakry, Guinea	LND	Passenger	Western-built	Jet	Hull Loss	Overrun
2010-08-03	Antonov	An-24	Katekavia	Igarka, Russia	APR	Passenger	Eastern-built	Turboprop	Hull Loss	Undershoot
2010-08-05	Fokker	F-100	Kish Air	Mehrabad, Iran	ESD	Passenger	Western-built	Jet	Substantial Damage	Ground collision
2010-08-12	Airbus	A319	Azerbaijan Airlines	Ataturk, Turkey	LND	Passenger	Western-built	Jet	Substantial Damage	Runway Excursion
2010-08-16	Boeing	737	Aires Colombia	San Andres Island, Colombia	APR	Passenger	Western-built	Jet	Hull Loss	Undershoot
2010-08-20	Boeing	737	Chanchangi Airlines	Kaduna, Nigeria	APR	Passenger	Western-built	Jet	Substantial Damage	Undershoot
2010-08-24	Embraer	EMB-190	Henan	Yichun, China	APR	Passenger	Western-built	Jet	Hull Loss	CFIT
2010-08-25	Antonov	An-26	EXIN	Tallinn, Estonia	TOF	Cargo	Eastern-built	Turboprop	Substantial Damage	Undercarriage retracted during take-off roll
2010-08-25	Let	L-410 Turbolet	Filair	Bandundu, DR Congo	GOA	Passenger	Eastern-built	Turboprop	Hull Loss	Crashed during attempted go-around
2010-08-25	Embraer	ERJ-145	Passaredo Transportes Aereos	Vitoria da Conquista, Brazil	APR	Passenger	Western-built	Jet	Hull Loss	Undershoot
2010-08-26	Fokker	F.100	Iran Aseman Airlines	Tabriz, Iran	LND	Passenger	Western-built	Jet	Substantial Damage	Overrun
2010-09-03	Boeing	747	UPS Airlines	near Dubai, UAE	ECL	Cargo	Western-built	Jet	Hull Loss	In-flight fire
2010-09-07	Tupolev	Tu-154	Alrosa Mirny Air Enterprise	Izhma, Russia	CRZ	Passenger	Eastern-built	Jet	Substantial Damage	Forced landing
2010-09-12	Bombardier	Dash 8	Porter Airlines	Halifax, NS, Canada	TXI	Passenger	Western-built	Turboprop	Substantial Damage	Ground collision
2010-09-13	ATR	ATR 42	Conviasa	Puerto Ordaz, Venezuela	APR	Passenger	Western-built	Turboprop	Hull Loss	CFIT
2010-09-15	Bombardier	Dash 8	Wideroe	Sandnessjoen, Norway	LND	Passenger	Western-built	Turboprop	Substantial Damage	Hard landing

Annex 3 2010 Accidents Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2010-09-19	Bombardier	Dash 8	Commutair	Newark, NJ, USA	TXI	Passenger	Western-built	Turboprop	Substantial Damage	Ground collision
2010-09-21	Boeing	747	Air Cargo Germany	Hong Kong SAR, China	TXI	Cargo	Western-built	Jet	Substantial Damage	Gear collapse prior to take-off
2010-09-22	Bombardier	CRJ Regional Jet	Air Canada Jazz	Moncton, NB, Canada	ESD	Passenger	Western-built	Jet	Substantial Damage	Aircraft damaged on ground
2010-09-24	Boeing	747	Southern Air	Frankfurt Main Airport, Frankfurt, Germany	TOF	Cargo	Western-built	Jet	Substantial Damage	Uncontained engine failure
2010-09-24	Airbus	A319	Wind Jet	Palermo, Italy	APR	Passenger	Western-built	Jet	Hull Loss	Undershoot
2010-09-25	Bombardier	CRJ-900	Atlantic Southeast Airlines	JFK International Airport, New York, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Landed with main gear retracted
2010-09-28	Bombardier	CRJ Regional Jet	SkyWest	Milwaukee, WI, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Landed with main gear retracted
2010-10-03	Boeing	767	Thomson Airways	Bristol, United Kingdom	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2010-10-12	Lockheed	Hercules	National Air Cargo	near Kabul, Afghanistan	APR	Cargo	Western-built	Turboprop	Hull Loss	CFIT
2010-10-21	Let	L-410 Turbolet	Tracep Congo Aviation	Bukavu - Kavumu, DR Congo	ICL	Cargo	Eastern-built	Turboprop	Hull Loss	Suspected engine failure
2010-10-31	Airbus	A310	Turkish Airlines	Casablanca, Morocco	APR	Cargo	Western-built	Jet	Substantial Damage	Runway excursion on landing
2010-11-02	Boeing	737	Lion Air	Pontianak, Indonesia	LND	Passenger	Western-built	Jet	Substantial Damage	Overrun
2010-11-02	Bombardier	CRJ Regional Jet	SkyWest	Milwaukee, WI, USA	PRF	Passenger	Western-built	Jet	Substantial Damage	Ground vehicle collision
2010-11-04	ATR	ATR 72	Aerocaribbean	near Guiasimal, Cuba	CRZ	Passenger	Western-built	Turboprop	Hull Loss	Crashed for unknown reasons en-route
2010-11-04	Boeing	737	Global Air	Puerto Vallarta, Mexico	LND	Passenger	Western-built	Jet	Substantial Damage	Landed with nose gear retracted
2010-11-04	Airbus	A380	Qantas	Sydney, Australia	ECL	Passenger	Western-built	Jet	Substantial Damage	Uncontained engine failure
2010-11-05	Hawker Beechcraft	1900	JS Air	Karachi, Pakistan	ICL	Passenger	Western-built	Turboprop	Hull Loss	Engine failure
2010-11-08	Bombardier	Dash 8	Horizon Airlines	Los Angeles, CA, USA	APR	Passenger	Western-built	Turboprop	Substantial Damage	Birdstrike

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2010-11-11	Antonov	An-24	Tarco Air	Zalingei Airstrip, Sudan	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Destroyed by post-landing fire
2010-11-23	Bombardier	CRJ Regional Jet	Atlantic Southeast Airlines	Salt Lake City, UT, USA	ESD	Passenger	Western-built	Jet	Substantial Damage	Ground vehicle collision
2010-11-28	Ilyushin	Il-76	Sun Way	Karachi, Pakistan	ICL	Cargo	Eastern-built	Jet	Hull Loss	Crashed after suspected engine failure
2010-12-04	Bombardier	CRJ Regional Jet	Mesa Airlines	Chicago, IL, USA	PRF	Passenger	Western-built	Jet	Substantial Damage	Ground collision
2010-12-04	Tupolev	Tu-154	SE Airlines	Domodedovo Airport, Moscow, Russia	ECL	Passenger	Eastern-built	Jet	Hull Loss	Runway excursion

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