IATA

SAFETY REPORT 2009

Issued April 2010

SAFETY OUR PRIORITY

46th | Edition

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

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International Air Transport Association
Montreal – Geneva

46th | Edition

NOTICE

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“Our priority remains on safety.”

Foreword

Dear Colleagues,

Safety remains our number one priority. Despite the challenges of the global economic recession, 2009 was another successful year with a 12% decline in the accident rate. The 2009 accident rate was 0.71 Western-built jet hull losses per million sectors flown. Total accidents were reduced by 17% (from 109 to 90), and IATA member airlines surpassed the industry's performance with an accident rate of 0.62 Western-built jet hull losses per million sectors flown.

IATA continues to invest in the improvement of existing safety programs to assist its members and the overall industry in improving industry safety performance. In 2009, IATA launched the Runway Excursion Risk Reduction Toolkit (RERR), along with a continuing series of regional safety workshops, to help reduce the number of runway excursion accidents. These accidents comprised 26% of all accidents in 2009, remaining as the primary category of accidents.

IATA's focus includes fortifying existing programs such as IOSA, and the development of new Safety Management Systems and Fatigue Risk Management guidance materials. In 2009, all IATA member airlines became IOSA registered; a very significant milestone.

In 2009, IATA launched the Global Safety Information Center (GSIC). The GSIC provides IATA members with unprecedented access to multiple IATA safety databases, and collates many forms of safety analysis products. It also provides information to support the IATA Training and Qualification Initiative, a significant effort designed to focus training on a competency-based approach.

This 46th edition of the IATA Safety Report includes valuable information about the global 2009 safety performance. The improvements seen in the past year is a confirmation of our industry's commitment to safety. However, we must continue to review existing processes and evaluate new ideas to improve the results. This report is a key tool used to communicate findings and safety information across the industry, with the aim of improving safety on a global scale.

I sincerely thank the IATA Operations Committee, the IATA Safety Group and the Accident Classification Task Force for their cooperation and expertise essential for the creation of this report.

Günther Matschnigg
Senior Vice President
Safety, Operations & Infrastructure

Safety Report 2009 Executive Summary

The goal of the 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 on the air transport industry and therefore uses more restrictive criteria than ICAO Annex 13 accident definitions. In total, 90 accidents met the IATA accident criteria in 2009. Compared to 2008, the breakdown is as follows:

	Jet	Turboprop	Western-built Jet Hull Loss Rate	Fatal Accidents	Fatalities
2009	59	31	0.71	18	685
2008	66	43	0.81	23	502

Summary data for 2009 provides the following conclusions:

- The total number of accidents decreased by 17% (90 vs. 109 in 2008)
- Western-built jet hull loss rate decreased by 12%
- The total number of fatal accidents decreased by 22%
- Total fatalities increased by 36%, primarily due to three catastrophic events

The total number of industry flights flown in 2009 was within 0.5% of the number flown in 2009. However, the global Western-built jet hull loss rate continued to decline in one of the most difficult operating commercial environments ever seen in the aviation industry. From a regional perspective, the Western-built jet hull loss rates decreased in all IATA regions except Africa, Asia / Pacific, Europe and the Middle East and North Africa. Overall, IATA member airlines surpassed the industry in terms of safety, with an accident rate of 0.62 Western-built jet hull losses per million sectors flown.

Runway Excursions

- Runway excursions were the most common type of accidents and represented 26% of all events in 2009 vs. 27% in 2008 (23 vs. 28 accidents in 2008)
- 35% of all runway excursions were preceded by a long, floated or bounced landing and 38% of these were the result of an unstable approach
- Manual handling was a factor in 43% of runway excursions while weather and/or visual conditions were a factor in 39% of runway excursion accidents

Prevention Strategy: IATA's Runway Excursion Risk Reduction Toolkit was launched in 2009, in addition to a series of regional safety workshops to help airline operators and flight crews better understand the risk factors involved in runway excursions. Toolkit development continues in 2010, with an expanded scope focusing on airport and Air Navigation Service Provider (ANSP) contributing factors. The IATA Global Safety Information Center (GSIC) is providing regional unstable approach rate data and industry benchmarking data to assist in reducing this accident category.

Airmanship & Automation Management

- Aircraft handling was a factor in one third (33%) of all accidents in 2009
- Automation management was a factor in 24% of 2009 accidents (vs. 5% in 2008)
- Hard landings, as a percentage of accidents, increased from 6% in 2008 to 12% in 2009. There was a strong correlation noted with manual handling on specific aircraft types. Type-specific bounced/hard landing training is essential with proper emphasis

on system knowledge. More effective go-around training and standard operating procedures following a bounced landing may have prevented several hard landing accidents that occurred in 2009.

Prevention Strategy: The IATA Training and Qualification Initiative (ITQI) will continue to address areas in training that are leading factors in accidents, such as the go-around decision making process. The ITQI program will also emphasize appropriate skills in Multi-Engine Pilot License (MPL) operations, relative to the specific type of aircraft.

Safety Management Systems (SMS) & Training

- Deficient safety management was a factor in 23% of all accidents in 2009
- Flight crew training was a factor in 20% of all accidents
- Crew training was a factor in 58% of all long, floated or bounced landings in 2009, which represented 35% of all runway excursions

Prevention Strategy: IATA launched an updated SMS Introduction Guide in 2009; the complementary SMS Implementation Guide will be produced in 2010. The IATA Training Development Institute (ITDI) will provide basic and advanced SMS training courses in 2010. In addition, the 2010 IATA Operational Safety Audit (IOSA) Standards Manual (ISM 3rd edition) will be updated in the second quarter of 2010 and will provide the first ICAO-compliant, comprehensive SMS implementation specifications. These new IOSA SMS recommended practices will give operators the ability to have their SMS programs assessed against an ICAO-recognized set of SMS standards.

Safety in Maintenance Operations

- Gear collapses represented 17% of accidents vs. 7% in 2008. There were no strong pilot handling or weather correlations tied to gear collapses.
- Maintenance operations and regulatory oversight were each present as a factor in 27% of events.
- While bogus parts continue to be a problem, maintenance configuration control was also identified as a significant factor. These events occurred when legitimate parts were improperly utilized during aircraft maintenance.

Prevention Strategy: IATA's six-point Safety Program will continue to focus on proper SMS implementation in airline operator maintenance programs and work to address specifically identified areas such as incorrect configuration control with respect to authentic parts.

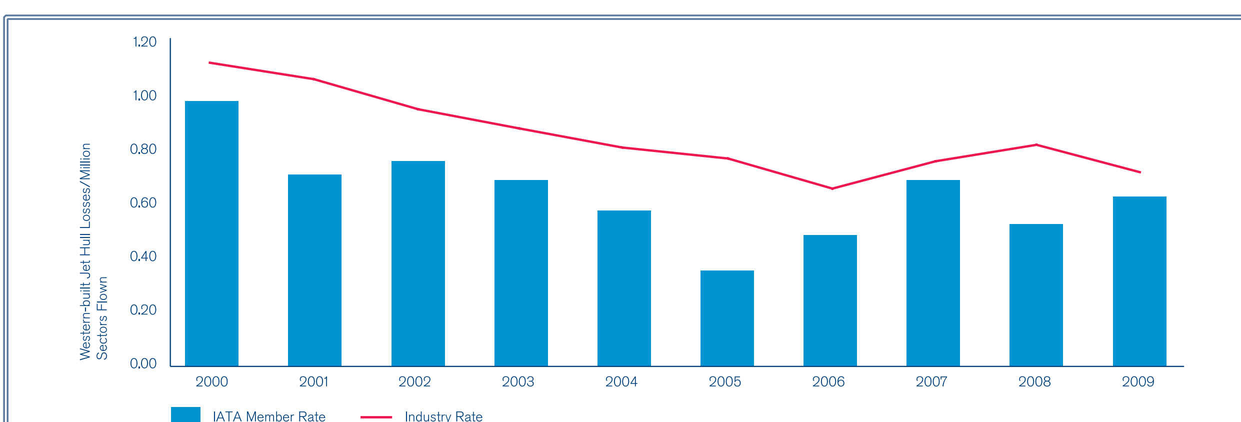
Regional Factors

- All regions except the Middle East & North Africa (MENA) showed a neutral or downward trend in their accident rates based on all aircraft types.
- The MENA accident rate has been steadily increasing for the last three years.
  - Operators based in Iran are of particular concern as they accounted for 40% of the region's accidents in 2009 vs. 17% in 2008

Prevention Strategy: IATA will continue to address regional safety issues with its member airlines, non-members, industry partners and regulators. IATA's regional office in Amman, Jordan, continues to work with IATA Iranian members to assist them in implementing SMS and other IATA safety programs.

In 2010, IATA continues to work with its members to maintain safety as its top priority. The Global Aviation Safety Roadmap (GASR) was produced and developed in the interest of establishing a single level of aviation safety worldwide by the Industry Safety Strategy Group (ISSG). IATA plays a key role in this group and in the regional implementation of the GASR roadmap. IATA's safety strategy is coordinated with the ISSG roadmap in order to reduce duplication and align efforts worldwide. Through this and other initiatives, IATA is continuing its work with airlines, regulatory authorities and other industry stakeholders to fortify existing safety programs and introduce new initiatives to enhance operational safety on a global scale.

Western-built Jet Hull Loss Rate (2000-2009)



"The total number of accidents decreased by 17% in 2009."

The *CSeries* aircraft is in the conceptual design phase and is subject to changes in family strategy, branding, capacity, performance, design and/or systems. The actual aircraft and configuration may differ from the image shown.


AROUND HERE, WE FLY NONSTOP.

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 revise its safety strategy and to determine lessons learned from aircraft accidents.

PURPOSE OF THE SAFETY REPORT 2009

The purpose of the Safety Report 2009 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 2009.

The Safety Report 2009 was produced at the beginning of 2010. The report presents a detailed summary of statistics, trends and contributing factors involved in 2009's accidents. Based on these findings, prevention strategies are developed, with the goal of enhancing operational safety.

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**, all the Safety Report's charts, graphs and illustrations available in electronic format

Image courtesy of Boeing

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ACCIDENT CLASSIFICATION TASK FORCE

The IATA Operations Committee (OPC) and its Safety Group (SG) created the Accident Classification Task Force (ACTF) in order to analyse 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.

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 analysed and presented in this report is extracted from a variety of sources, including Ascend Worldwide, Airclaims Ltd. 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 2009 participants:

Mr. Marcel Comeau
AIR CANADA

Capt. Georges Merkovic
AIR FRANCE

Mr. Albert Urdiroz
AIRBUS INDUSTRIE

Dr. Dieter Reisinger
AUSTRIAN AIRLINES (Chairman)

Capt. David Carbaugh
THE BOEING COMPANY

Capt. Thomas Phillips
THE BOEING COMPANY

Mr. Andre Tousignant
BOMBARDIER AEROSPACE

Capt. Mattias Pak
CARGOLUX AIRLINES INTERNATIONAL

Mr. Savio dos Santos
EMBRAER AVIATION INTERNATIONAL

Mr. Don Bateman
HONEYWELL

Mr. Michael Goodfellow
IATA

Capt. Karel Mündel
IFALPA

Capt. Keiji Kushino
JAPAN AIRLINES INTERNATIONAL

Mr. Richard Fosnot
JEPPESEN

Capt. Peter Krupa
LUFTHANSA GERMAN AIRLINES

Capt. Jean-Lucien Tarrillon
RÉGIONAL

Capt. Peter Eggler
SWISS INTERNATIONAL AIR LINES

Mr. Gustavo Rocha
TAM LINHAS AÉREAS

Capt. Carlos dos Santos Nunes
TAP AIR PORTUGAL

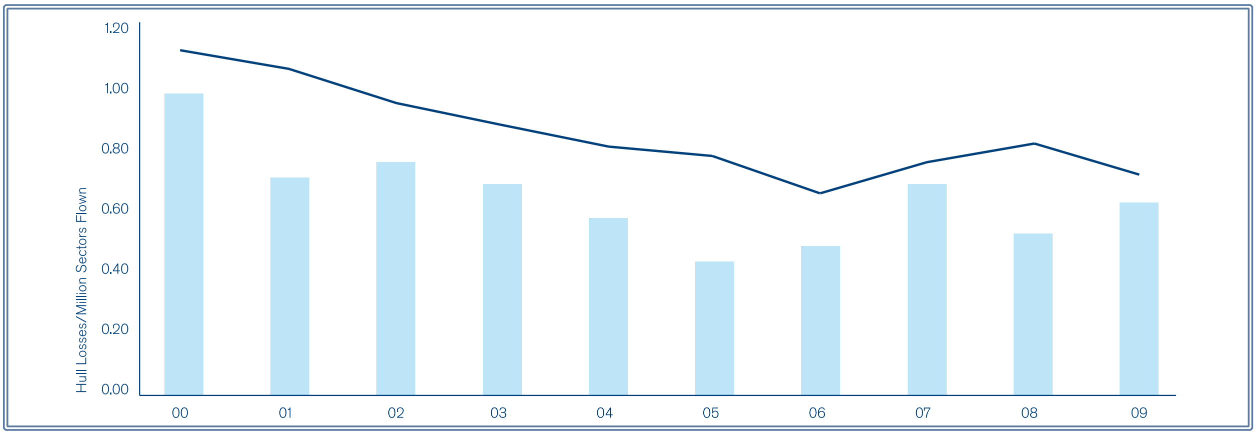
Section 2

2

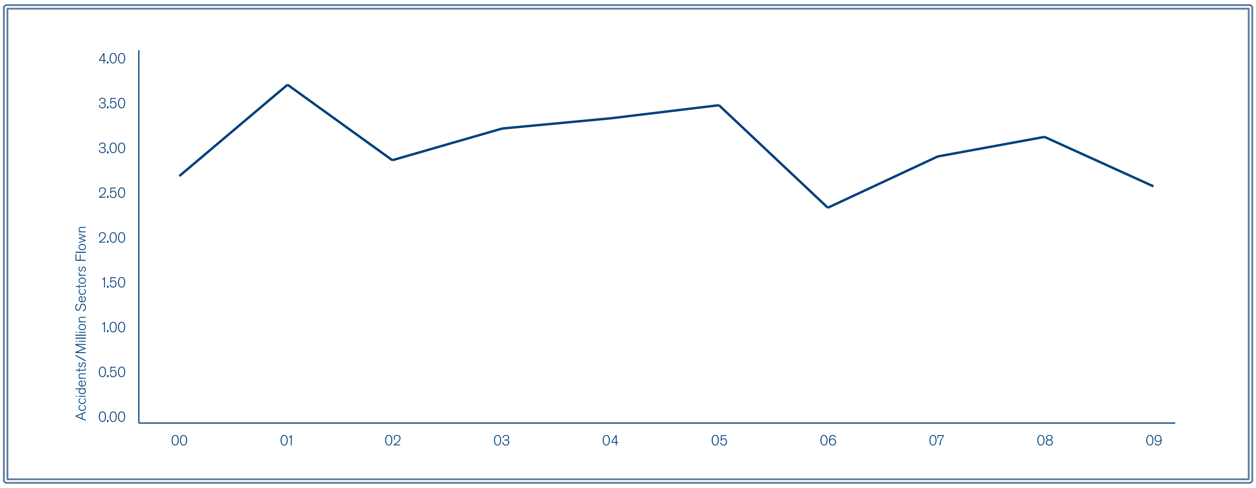
Decade in Review

ACCIDENT / FATALITY STATISTICS AND RATES

Western-built Jet Aircraft Hull Loss Rate: IATA Member Airlines vs. Industry (2000-2009)

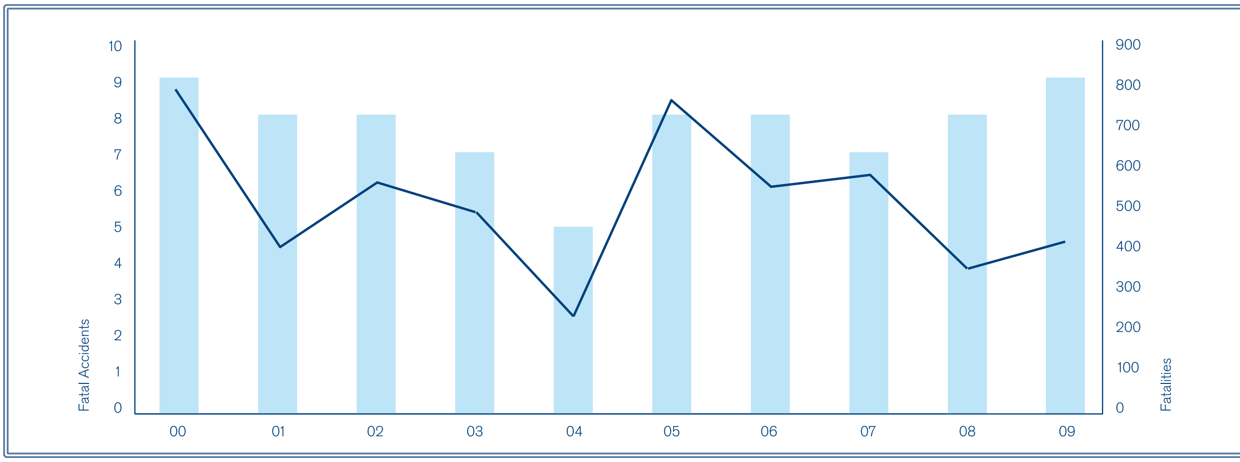


All Aircraft Accident Rate (2000-2009)

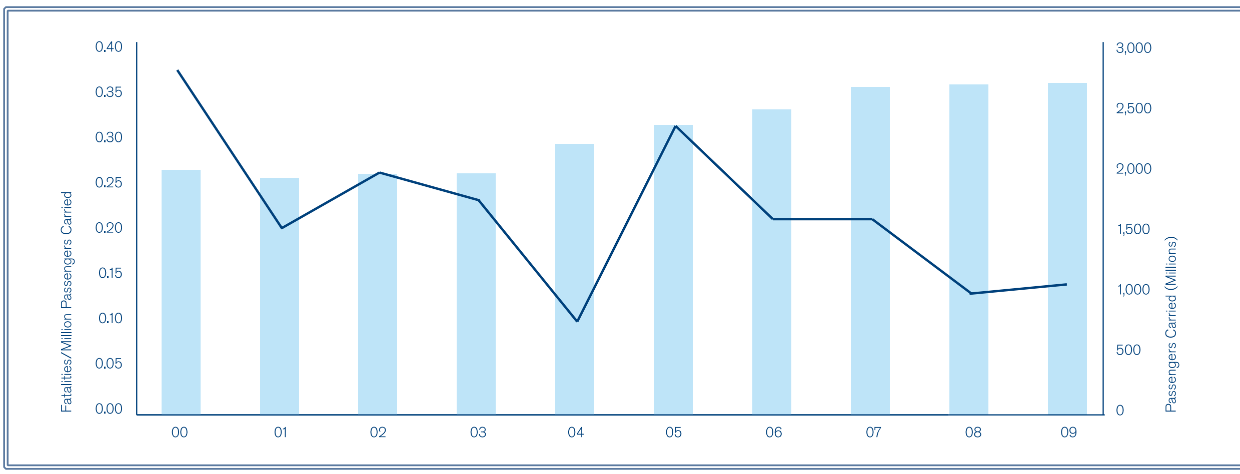


Note: Includes all Eastern-built and Western-built aircraft, including jets and turboprops.

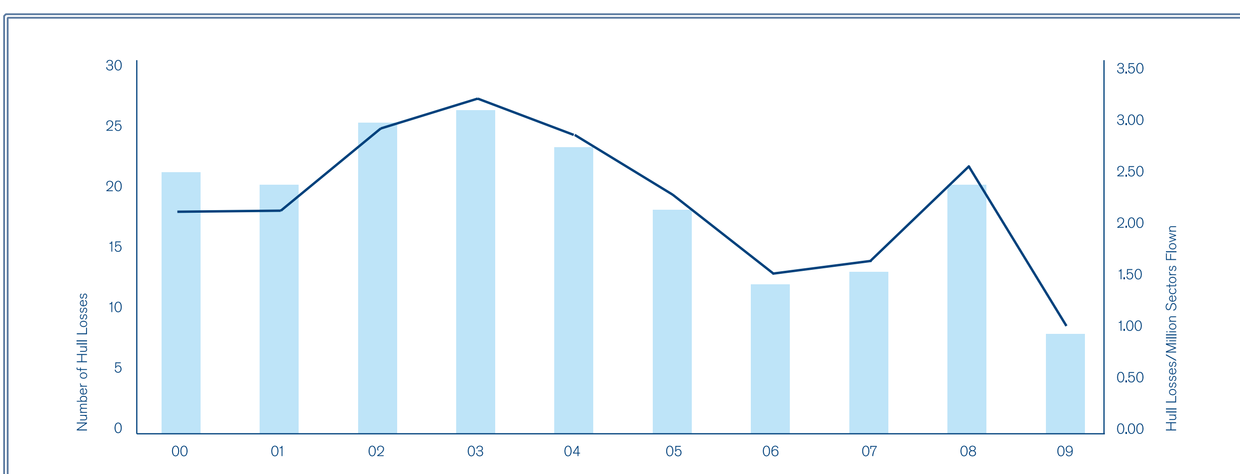
Western-built Jet Aircraft: Fatal Accidents and Fatalities (2000-2009)



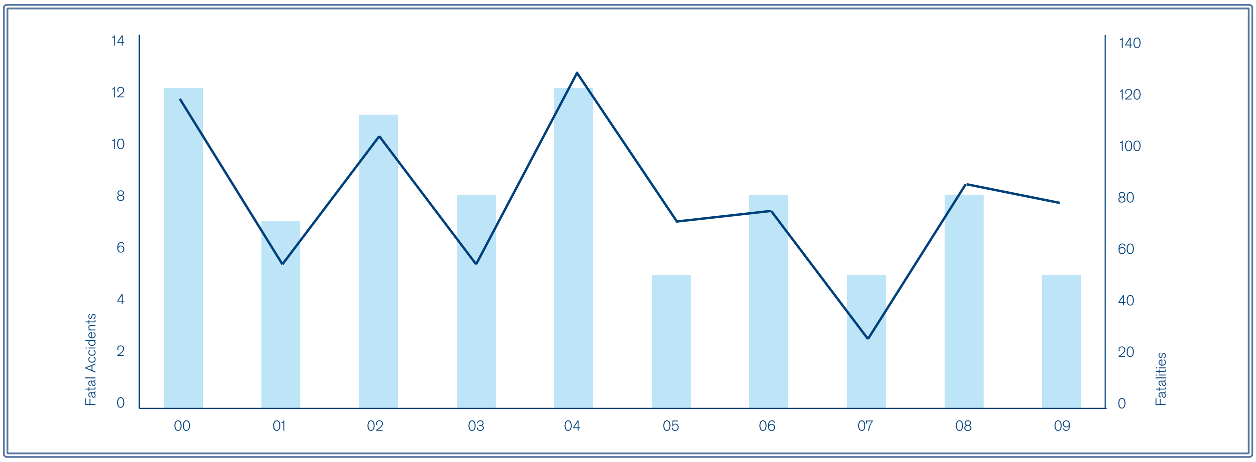
Western-built Jet Aircraft: Passengers Carried and Passenger Fatality Rate (2000-2009)



Western-built Turboprop Aircraft Hull Losses and Accident Rate (2000-2009)



Western-built Turboprop Aircraft: Fatal Accidents and Fatalities (2000-2009)

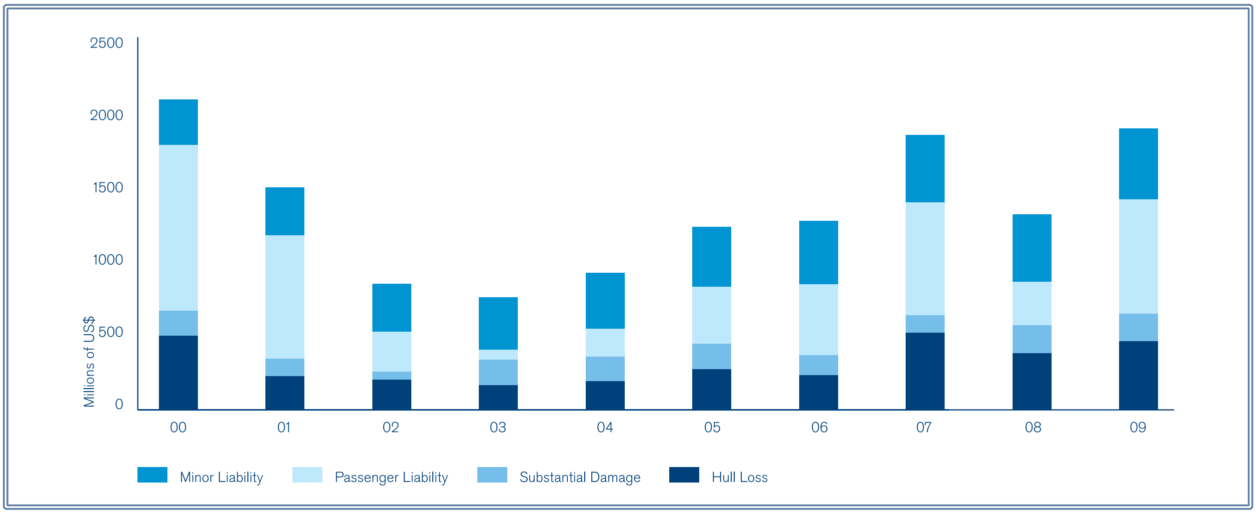


ACCIDENT COSTS

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.

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

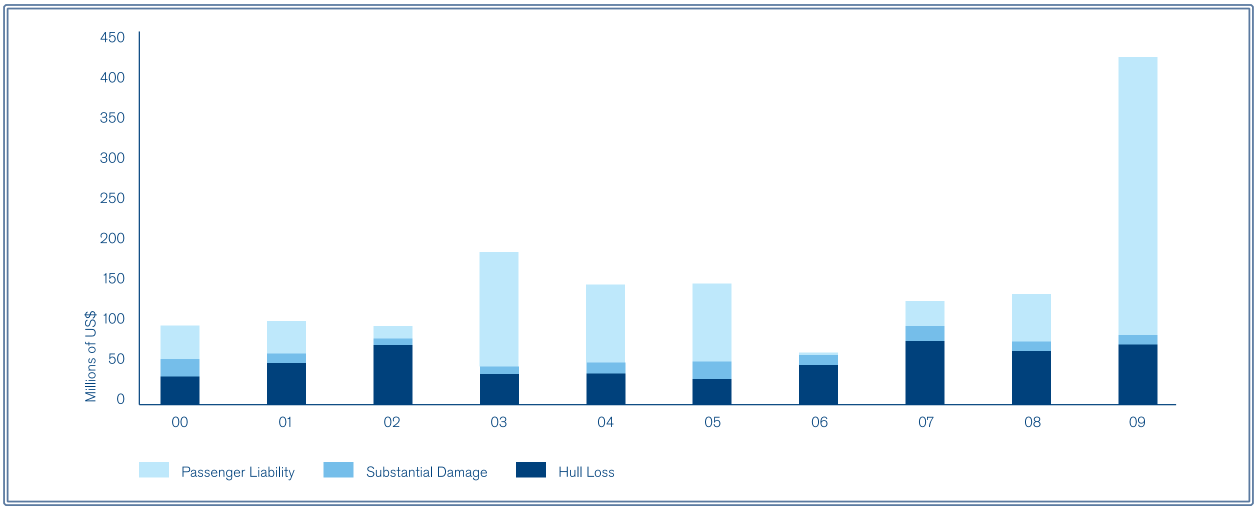
Western-built Jet Aircraft: Accident Costs (2000-2009)



Source: Ascend Worldwide

2

Western-built Turboprop Aircraft: Accident Costs (2000-2009)



Source: Ascend Worldwide

Image courtesy of Bombardier

Section 3

3

Year 2009 in Review

AIRCRAFT ACCIDENTS

There were a total of 90 accidents in 2009. Summaries of all the year's accidents are presented in **Annex 4**.

Fleet Size, Hours and Sectors Flown

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
World Fleet (end of year)	19,724	4,465	1,216	1,326
Hours Flown (millions)	52.27	6.62	0.90	0.54
Sectors (landings) (millions)	26.77	7.90	0.41	0.38

Note: World fleet includes in-service and stored aircraft operated by commercial airlines as of 31 December 2009.

Operational Accidents

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Loss:	19	8	3	5
Substantial Damage:	36	15	1	3
Total Accidents:	55	23	4	8
Fatal Accidents:	9	5	3	1

3

Operational Hull Loss Rates

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Hull Losses (per million sectors):	0.71	1.01	7.3	13.09
Hull Losses (per million hours):	0.36	1.21	3.32	9.23

Passengers Carried

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passengers Carried (millions):	2,672	146	23	6
Estimated Change in Passengers Carried Since 2008:	+0.5%	0%	-28%	-14%

Fatal Accidents per Operator Region

	AFI	ASPAC	CIS	EUR	LATAM	MENA	NAM	NASIA
Accidents:	14	15	2	17	10	15	14	3
Fatal Accidents:	7	2	0	2	1	4	2	0
Fatalities (crew and passengers):	23	8	0	237	24	342	51	0

Fatalities per Aircraft Type

	Western-built Aircraft		Eastern-built Aircraft	
	Jet	Turboprop	Jet	Turboprop
Passenger Fatalities:	365	67	167	0
Crew Fatalities:	50	10	23	3
Total Fatalities:	415	77	190	3

AIRCRAFT ACCIDENTS PER REGION

Western-built Aircraft Accidents per Operator Region

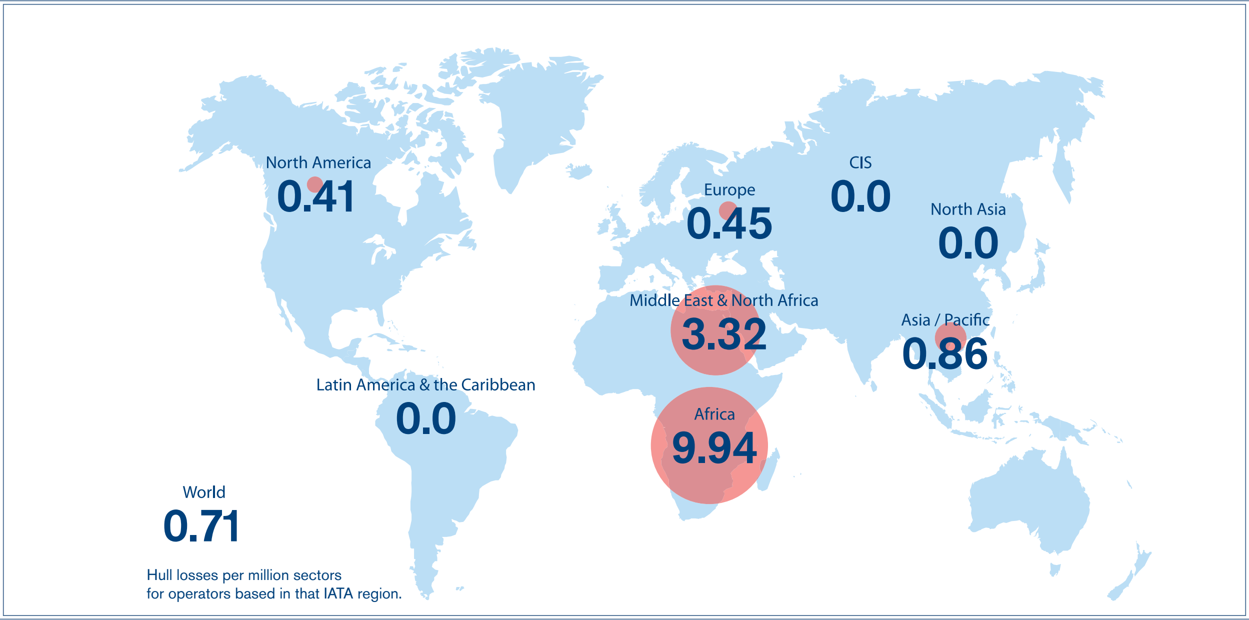
To calculate regional accident rates, IATA determines the accident region based on the operator's country. Moreover, the operator's country is specified in the operator's Air Operator Certificate (AOC).

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.

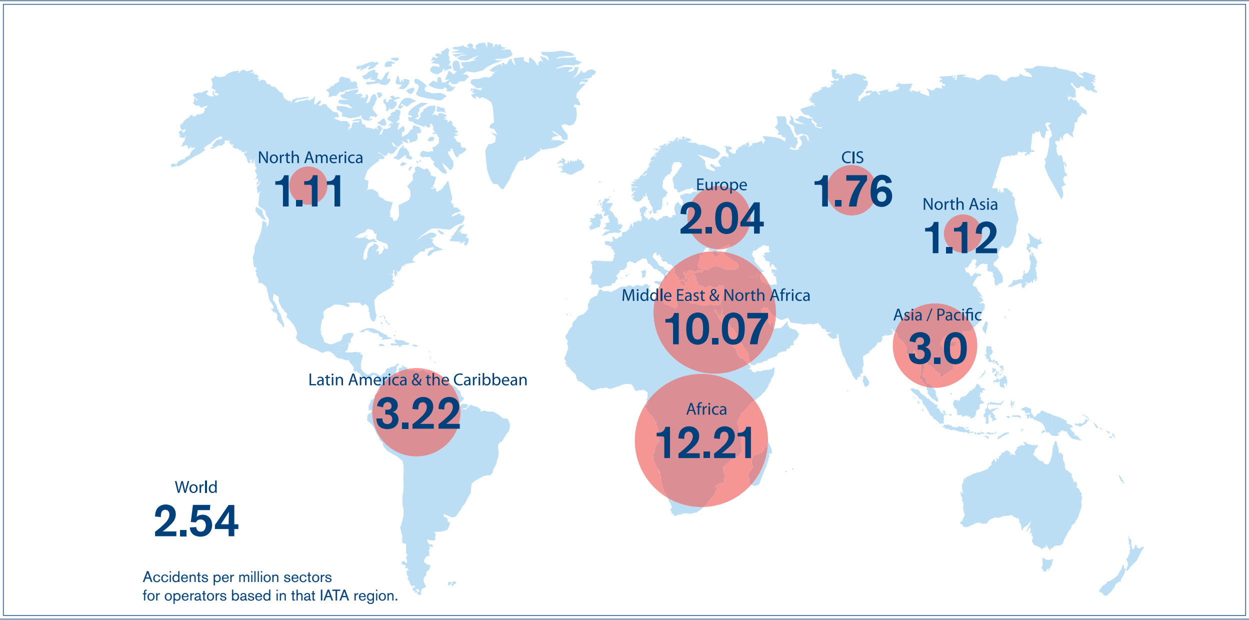
For a complete list of countries assigned per region, please consult **Annex 1**.

3

Western-built Jet Hull Loss Rate per Region of Operator



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

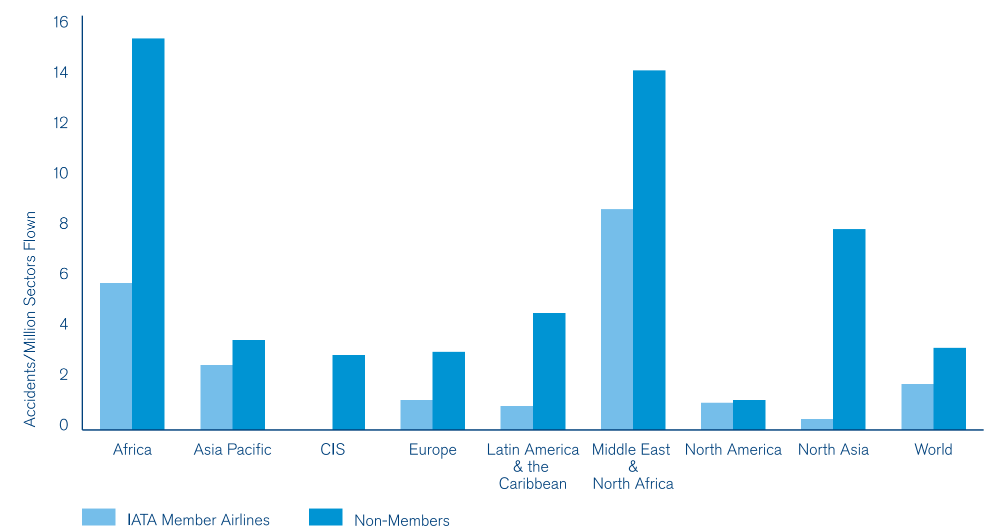


IATA Member Airlines vs. Non-Members Total Accident Rate by Region of Operator

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 and globally in 2009.

3

IATA Member Airlines vs. Non-Members



Section 4

In-Depth Accident Analysis 2009

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 Organisation (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.

Note: these definitions are valid for accident analysis conducted from the flight crew perspective. Definitions of threats, errors and undesired states vary for cabin crew-centered analysis. These definitions are presented in Section 7, "Cabin Operations Safety".

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 accidents 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 systems for both flight and cabin crew are presented in **Annexes 2** and **3**, respectively.

ORGANIZATIONAL AND FLIGHT CREW-AIMED COUNTERMEASURES

Every year, the ACTF classifies accidents and, with the benefit of hindsight, determines actions or measures that could have been taken to prevent an accident. These proposed countermeasures can include overarching issues within an organization or a particular country, or involve performance of front line personnel, such as pilots or ground personnel.

Countermeasures are aimed at two levels:

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

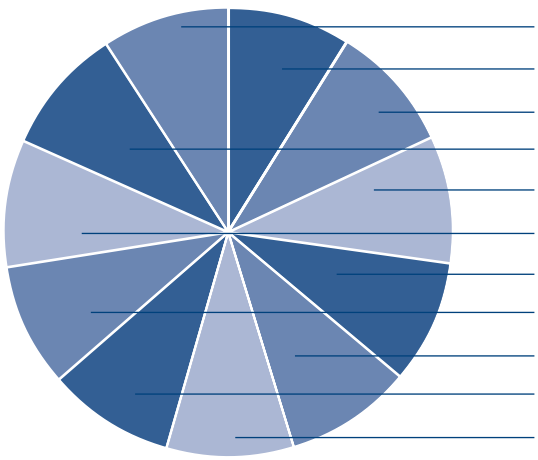
Countermeasures for other personnel, such as air traffic controllers, ground crew, cabin crew or maintenance staff, are important but they are not considered at this time.

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

ANALYSIS BY ACCIDENT CATEGORIES AND REGIONS

- This section presents an in-depth analysis of the 2008 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 and Section 7 is dedicated to accidents involving cabin safety issues, such as passenger evacuations.

4

Year 2009 Aircraft Accidents

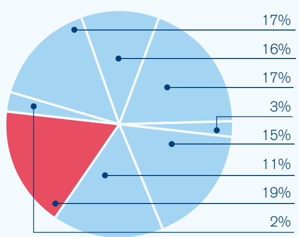
90 Accidents

IATA Members	31%
Hull Losses	39%
Fatal	20%

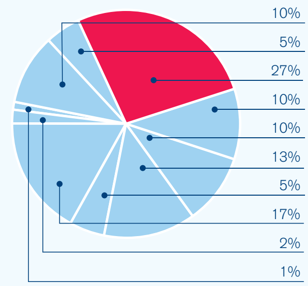
73% Passenger | 25% Cargo | 2% Ferry

66% Jet | 34% Turboprop

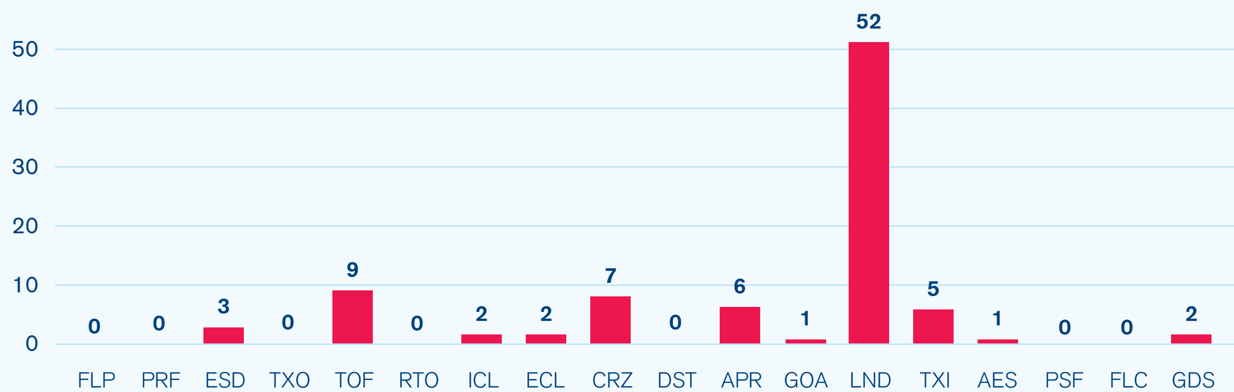
Accidents per Operator Region



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 2009 Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

- **29%** Regulatory oversight
- **26%** Flight operations: SOPs & checking
- **23%** Safety management
- **23%** Management decisions
- **9%** Maintenance operations: SOPs & checking

Threats

Environmental

- **29%** Meteorology
  - Wind / windshear / gusty wind (**46%** of all these events)
  - Poor visibility / IMC (**31%** of all these events)
  - Thunderstorms (**27%** of all these events)
  - Icing conditions (**8%** of all these events)
- **10%** Airport facilities
  - Inadequate overrun area / trench / ditch or structures in close proximity to runway / taxiway (**78%** of all these events)
  - Contaminated runway or taxiway / poor braking action (**67%** of all these events)
- **8%** Wildlife / birds / foreign objects
- **7%** Navigation aids

Airline

- **29%** Aircraft malfunction
  - Gear / tire (**46%** of all these events)
  - Contained engine failure / powerplant malfunction (**19%** of all these events)
  - Fire / smoke (**12%** of all these events)
  - Hydraulic system failure (**12%** of all these events)
- **11%** Maintenance events
- **7%** Operational pressure

Flight Crew Errors (relating to...)

- **33%** Manual handling / flight controls
- **30%** SOP adherence / SOP cross-verification
  - Intentional error (**37%** of all these events)
  - Unintentional error (**37%** of all these events)
- **11%** Failure to go-around after destabilisation during approach
- **9%** Automation

Undesired Aircraft States (UAS)

- **21%** Long / floated / bounced / firm / off-center / crabbed landing
- **11%** Vertical, lateral or speed deviations
- **10%** Operation outside aircraft limitations
- **9%** Unstable approach

Additional Classifications

- **3%** Insufficient data
- **2%** Fatigue
- **1%** Spatial disorientation & spatial / somatogravic illusion

Correlations of Interest

In **55%** of accidents where long, floated, bounced, firm or off-center landing was cited, flight crew training deficiencies and manual handling errors were noted.

In **30%** of all runway excursions, inadequate airport facilities were also noted.

In **27%** of accidents where an aircraft malfunction was cited as a contributing factor, a maintenance event was also noted.

70% of accidents where the crew failed to go-around after a de-stabilized approach also cited flight crew training deficiencies and unintentional lack of Standard Operating Procedures (SOP) adherence or cross-checking.

In **67%** of loss of control in-flight accidents, crew failing to follow SOPs were also cited.

Weak regulatory oversight was a factor in **86%** of accidents where poor safety management was noted.

Note: 3 accidents were not classified due to insufficient data.
Note: 1 accident could not be classified into any existing accident category.
**See Annex 1 for "Phase of Flight" definitions.*
***See Annex 2 for "Contributing Factors" definitions.*

4

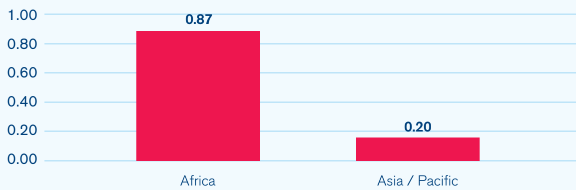
Controlled Flight Into Terrain

2 Accidents

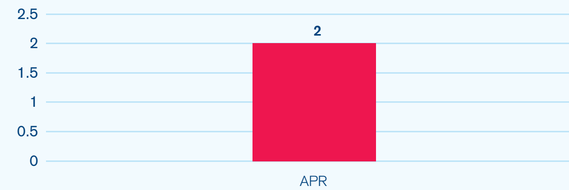
IATA Members	0%
Hull Losses	100%
Fatal	100%
Accident Rate*	0.06

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Regulatory oversight **(2 cases)**

Management decisions **(2 cases)**

Safety management **(1 case)**

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

Technology and equipment **(1 case)**

Threats

Environmental

Poor visibility / IMC **(2 cases)**

Nav aids: ground-based nav aid malfunction or not available **(1 case)**

Nav aids: nav aid not calibrated – unknown to crew **(1 case)**

Lack of visual reference **(1 case)**

Airline

Aircraft malfunction: avionics / flight instruments **(1 case)**

Flight Crew Errors (relating to...)

SOP adherence / SOP cross-verification
Intentional non-compliance **(2 cases)**

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

Crew to ATC communication **(1 case)**

Undesired Aircraft States (UAS)

Vertical, lateral or speed deviations **(1 case)**

Unnecessary weather penetration **(1 case)**

Correlations of Interest

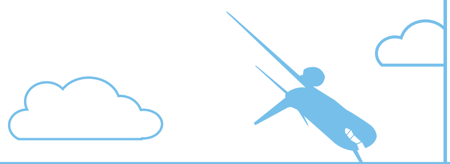
Weak regulatory oversight and management decisions were factors in both CFIT accidents.

In both CFIT accidents, intentional non-compliance with SOPs was a factor.

Accident Scenarios of Interest

No significant scenarios 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.



Loss of Control In-flight

9 Accidents

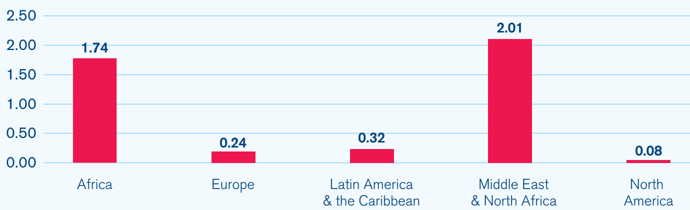
IATA Members	**44%**
Hull Losses	**89%**
Fatal	**89%**
Accident Rate*	**0.25**

4

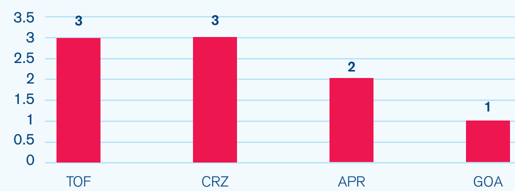
67% Passenger **33%** Cargo **0%** Ferry

67% Jet **33%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in…)

- **56%** Safety management
- **56%** Regulatory oversight
- **56%** Management decisions
- **22%** Flight operations: SOPs & checking
- **22%** Flight operations: Training systems
- **22%** Ops planning and scheduling

Threats

Environmental

- **33%** Meteorology
  - Icing conditions (**67%** of all these events)
  - Wind / windshear / gusty wind (**33%** of all these events)
- **30%** Air traffic services

Airline

- **44%** Aircraft malfunction
  - Contained engine failure / powerplant malfunction (**50%** of all these events)
- **33%** Operational pressure
- **22%** Maintenance events

Flight Crew Errors (relating to…)

- **67%** SOP adherence / SOP cross-verification
  - Intentional non-compliance (**50%** of all these events)
  - Unintentional non-compliance (**33%** of all these events)
- **55%** Manual handling / flight controls
- **22%** Automation

Undesired Aircraft States (UAS)

- **78%** Operation outside aircraft limitations
- **44%** Vertical, lateral or speed deviations
- **22%** Unstable approach

Additional Classifications

- **22%** Fatigue
- **11%** Spatial disorientation & spatial / somatogravic illusion

Correlations of Interest

67% of accidents involving intentional non-compliance with SOPs also cited poor safety management and operational pressure.

In **50%** of accidents involving aircraft malfunctions, airline maintenance events were also noted.

In **50%** of all accidents involving icing conditions, pilot to pilot communication and fatigue were also noted.

Accident Scenarios of Interest

Scenario 1:

The operator in question has deficiencies with regards to safety management and was in an area of weak regulatory oversight. The flight crew faces operational pressures from their airline. They commit SOP adherence and cross-verification errors leading to the aircraft operating outside its limitations or in an incorrect configuration. The flight crew loses control and the aircraft is destroyed.

This scenario is common for 33% of all the loss of control in-flight accidents.

Scenario 2:

While operating in adverse weather, the flight crew commits errors relating to manual handling / flight controls and does not adhere to SOPs. The aircraft undergoes vertical, lateral or speed deviations and subsequently loses control. The aircraft is destroyed.

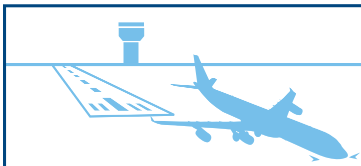
This scenario is common for 22% of all the loss of control in-flight accidents.

Scenario 3:

The crew encounters an aircraft malfunction during the flight. They commit manual handling / flight control errors and do not adhere to SOPs or perform cross checks. The aircraft is operated outside of its limitations. The crew lose control of the aircraft and it is destroyed.

This scenario is common for 33% 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

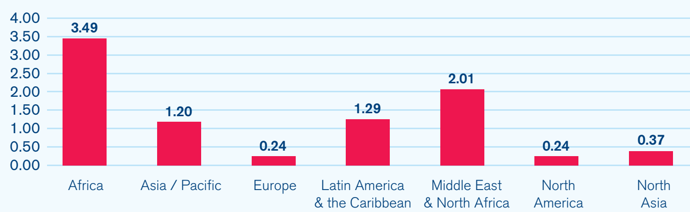
23 Accidents

IATA Members	26%
Hull Losses	43%
Fatal	9%
Accident Rate*	0.65

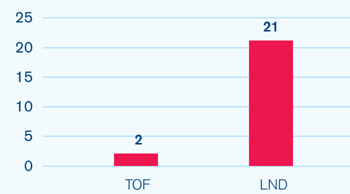
83% Passenger | **13%** Cargo | **4%** Ferry

48% Jet | **52%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

30% Regulatory oversight

26% Safety management

22% Flight operations: Training systems

22% Management decisions

Threats

Environmental

39% Meteorology

- Wind / windshear / gusty wind (**56%** of all these events)
- Poor visibility / IMC (**33%** of all these events)
- Thunderstorms (**33%** of all these events)

30% Airport facilities

- Contaminated runway / poor braking action (**86%** of all these events)
- Inadequate overrun area / trench / ditch or structures in close proximity to runway (**57%** of all these events)

Airline

13% Aircraft malfunction

- Contained engine failure / powerplant malfunction (**33%** of all these events)
- Gear / tire (**33%** of all these events)
- Hydraulic system failure (**33%** of all these events)

Flight Crew Errors (relating to...)

43% Manual handling / flight controls

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

Undesired Aircraft States (UAS)

35% Long, floated, bounced, firm, off-centerline or crabbed landing

13% Unstable approach

9% Vertical / lateral / speed deviation

9% Loss of aircraft control while on the ground

Correlations of Interest

In **63%** of the runway excursions after a long, floated, bounced, firm, off-center or crabbed landing, flight crew training was identified as a contributing factor.

17% of all the runway excursions involved a long landing on a contaminated runway or on one with poor braking action.

Flight crew manual handling was identified as an error in **88%** of accidents where a long, floated, bounced, firm, off-centerline or crabbed landing occurred before the aircraft left the runway.

Weather (wind / windshear / gusting wind or thunderstorms) was a factor in **50%** of runway excursions were a long, floated, bounced, firm, off-centerline or crabbed landing occurred.

In **43%** of runway excursions where weak regulatory oversight was noted, poor airport facilities were also a factor. Within these cases of poor airport facilities, inadequate overrun area / trench / ditch / proximity of structures was a factor in **67%** of accidents.

Accident Scenarios of Interest

Scenario 1:

The flight crew originates from an airline where training has been identified as an issue and commits manual handling / fight control errors. The aircraft lands long, bounces, or touches down off the centreline on a runway with poor breaking action. The flight departs the runway and is substantially damaged or destroyed.

This scenario is common for 13% of all runway excursion accidents.

Scenario 2:

The flight is operating in a thunderstorm or windy / windshear or gusty wind conditions. The flight crew commits manual handling / flight control errors and loses control of the aircraft. It exits the runway and is substantially damaged or destroyed.

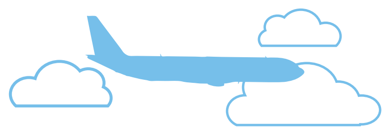
This scenario is common for 17% of all runway excursion accidents.

Scenario 3:

The destination airport in question has weak regulatory oversight and inadequate overrun areas, ditches or structures in close proximity to the runway. The aircraft departs the runway without any notable error by the crew and is substantially damaged or destroyed.

This scenario is common for 9% 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

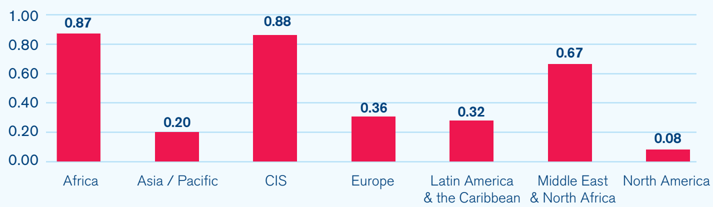
9 Accidents

IATA Members	**22%**
Hull Losses	**11%**
Fatal	**0%**
Accident Rate*	**0.25**

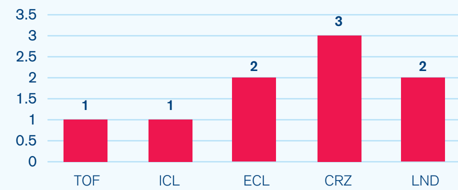
78% Passenger | **22%** Cargo | **0%** Ferry

89% Jet | **11%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

22% Regulatory oversight

Threats

Environmental

44% Meteorology: Thunderstorms

44% Wildlife / birds / foreign object

Airline

22% Aircraft malfunction

- Contained engine failure / powerplant malfunction (**50%** of all these events)
- Secondary flight controls (**50%** of all these events)

Flight Crew Errors (relating to...)

11% SOP adherence / verification

Undesired Aircraft States (UAS)

11% Unnecessary weather penetration

Correlations of Interest

50% of in-flight damage accidents that resulted from a bird strike were associated with regulatory oversight.

In **25%** of cases where the in-flight damage was due to a thunderstorm, lack of SOP adherence and unnecessary weather penetration were noted.

Accident Scenarios of Interest

No significant scenarios 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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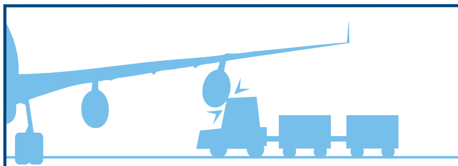


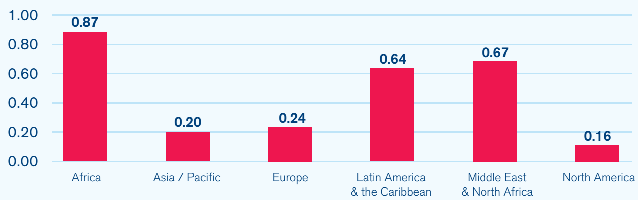
Ground Damage

9 Accidents

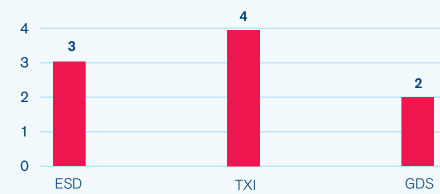
IATA Members	**44%**
Hull Losses	**11%**
Fatal	**11%**
Accident Rate*	**0.25**

89% Passenger · **11%** Cargo · **0%** Ferry · **89%** Jet · **11%** Turboprop

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

- **33%** Regulatory oversight
- **33%** Safety management
- **33%** Management decisions
- **33%** Ground ops: SOPs and checking
- **22%** Ground ops: Training systems
- **22%** Maintenance operations

Threats

Environmental

- **11%** Airport facilities: Inadequate overrun area / trench / ditch / proximity of structures

Airline

- **44%** Aircraft malfunction
  - Fire / smoke (**67%** of all these events)
- **33%** Ground events
- **33%** Maintenance events

Flight Crew Errors (relating to...)

- **22%** SOP adherence / SOP cross-verification
- **22%** Ground navigation
- **11%** Flight to ground crew communication
- **11%** Checklists

Undesired Aircraft States (UAS)

- **22%** Ground navigation
- **11%** Incorrect aircraft configuration: Brakes / thrust reversers / ground spoilers
- **11%** Incorrect aircraft configuration: Engines

Correlations of Interest

75% of the accidents involving an aircraft malfunction also cited maintenance events as a contributing factor.

In **50%** of accidents where procedural errors were noted as a contributing factor, ground navigation errors also occurred.

Accident Scenarios of Interest

No scenarios of interest.

Note: 11% of Ground Damage accidents were not classified due to insufficient data.
* Accidents per million sectors flown for all aircraft types.
** See Annex 1 for "Phase of Flight" definitions.
*** See Annex 2 for "Contributing Factors" definitions.

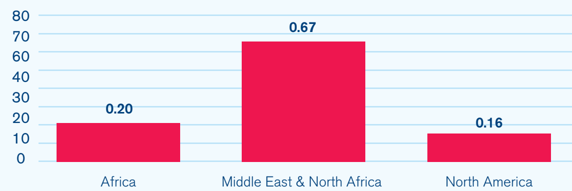
Undershoot

4 Accidents

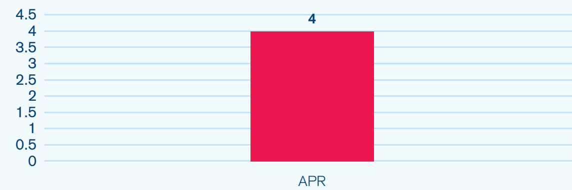
IATA Members	0%
Hull Losses	75%
Fatal	0%
Accident Rate*	0.11

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

50% Safety management
50% Regulatory oversight
50% Management decisions

Threats

Environmental
75% Meteorology
25% Lack of visual reference
25% Nav aids: ground-based nav aid malfunction or not available

Airline
None noted.

Flight Crew Errors (relating to...)

50% Manual handling / flight controls
25% SOP adherence / SOP cross-verification: intentional non-compliance

Undesired Aircraft States (UAS)

50% Unstable approach
50% Vertical / lateral / speed deviations

Correlations of Interest

All the accidents involving unstable approaches also involved flight crew manual handling / flight controls errors.

Poor visibility / IMC was a factor in **50%** of undershoot accidents.

Accident Scenarios of Interest

Scenario 1:

On the day of the accident, the flight crew is operating in adverse weather conditions. Visibility is poor and conditions are IMC in cold weather. The aircraft undergoes vertical, lateral or speed deviations and touches down before the runway surface.

This scenario is common to 50% 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.*

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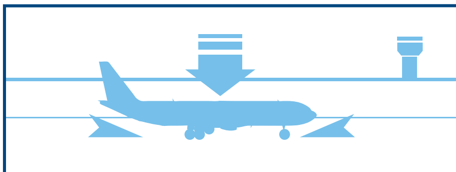


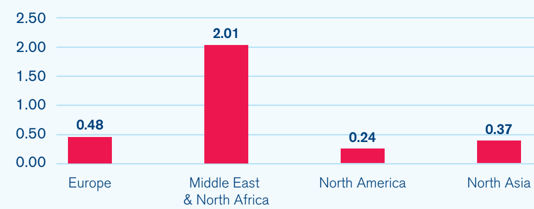
Hard Landing

11 Accidents

IATA Members	**45%**
Hull Losses	**18%**
Fatal	**9%**
Accident Rate*	**0.31**

55% Passenger **45%** Cargo **0%** Ferry **91%** Jet **9%** Turboprop

Accident Rates per Operator Region*



Top Contributing Factors**

Latent Conditions (deficiencies in...)

36% Flight operations: Training systems

27% Flight operations: SOPs & checking

9% Ops planning and scheduling

Threats

Environmental

36% Meteorology: poor visibility / IMC or wind / windshear / gusty wind

9% Lack of visual reference

Airline

No threats identified

Flight Crew Errors (relating to...)

55% Manual handling / flight controls

46% Failure to go-around after destabilization during approach

36% SOP adherence / SOP cross-verification: Unintentional non-compliance

Undesired Aircraft States (UAS)

82% Long, floated, bounced, firm, off-centreline or crabbed landing

27% Incorrect aircraft configuration: Flight controls / automation

9% Unnecessary weather penetration

9% Unstable approach

Correlations of Interest

In **67%** hard landings 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.

In all accidents where incorrect aircraft configuration was cited as a contributing factor, SOPs and checking latent issues, training system deficiencies, flight crew errors relating to automation and manual handling / flight controls were also noted.

In all the accidents where the aircraft touched down long, firm, off-centreline or floated and experienced a hard landing, the crew failed to go-around after a destabilized approach.

Accident Scenarios of Interest

Scenario 1:

The operator in question has deficiencies with regards to flight crew training and flight operations SOPs and checking. On the day of the accident, the flight crew commits errors relating to manual handling / flight controls and use of automation. They do not adhere to SOPs. Their actions lead to long, floated, bounced, firm, off-centreline or crabbed landing and subsequent aircraft damage.

This scenario is common for 27% of all the hard landings.

Scenario 2:

The flight crew commits errors relating to manual handling / flight controls. The approach becomes unstable but the flight crew does not go-around. The aircraft touches down hard and is damaged.

This scenario is common for 36% of all the hard landings.

Scenario 3:

Weather conditions upon approach are gusty winds or windshear. The crew flies for an airline with deficient training systems. They elect to land after a destabilized approach which results in a long, floated, bounced, or crabbed landing. The impact force on landing damages the aircraft.

This scenario is common for 27% of all the hard landings.

*Accidents per million sectors flown for all aircraft types.
**See Annex 2 for "Contributing Factors" definitions.

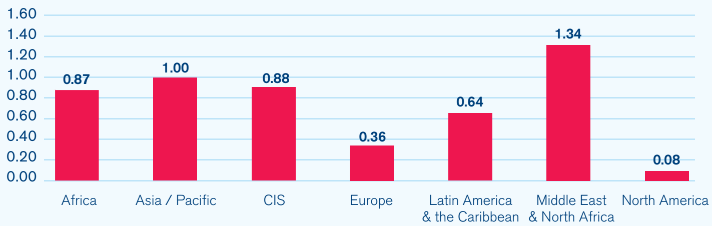
Gear-up Landing / Gear Collapse

15 Accidents

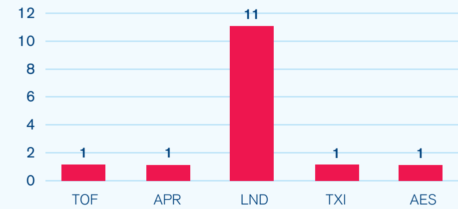
IATA Members	**27%**
Hull Losses	**27%**
Fatal	**0%**
Accident Rate*	**0.42**

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

Accident Rates per Operator Region*



Accident per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

27% Regulatory oversight
27% Maintenance Ops: SOPs and checking
27% Maintenance Ops: Training systems
13% Safety management
13% Management decisions

Threats

Environmental
7% Wind / windshear / gusty wind

Airline
73% Aircraft malfunction
- Gear / tire (**100%** of all these events)
- Hydraulic system failure (**9%** of all these events)
- Electrical power generation failure (**9%** of all these events)

33% Maintenance events

Flight Crew Errors (relating to...)

13% SOP adherence / SOP cross-verification
13% Manual handling / flight controls

Undesired Aircraft States (UAS)

20% Incorrect aircraft configuration: landing gear

Correlations of Interest

In **45%** of the accidents citing an aircraft malfunction, maintenance events were also noted.

In all accidents where safety management and management decisions were cited as a contributing factor, poor regulatory oversight was also noted.

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 for 33% of all the accidents involving a gear-up landing or a gear collapse during landing.

Scenario 2:

The state of the operator in question has deficiencies with regards to its regulatory oversight. Maintenance is performed on the aircraft based on the regulator's standards. 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 for 13% 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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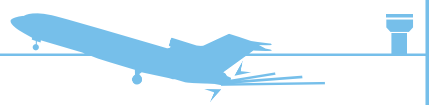
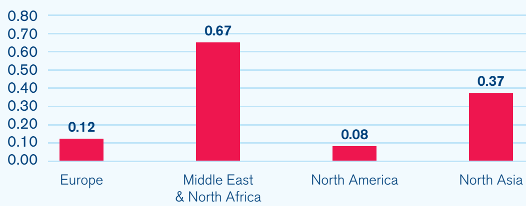


Tailstrike
4 Accidents

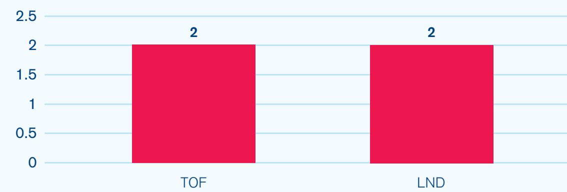
IATA Members	**75%**
Hull Losses	**0%**
Fatal	**0%**
Accident Rate*	**0.11**

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

Accident Rates per Operator Region*



Accidents per Phase of Flight**



Top Contributing Factors***

Latent Conditions (deficiencies in...)

Design **(1 case)**

Management decisions **(1 case)**

Safety management **(1 case)**

Flight operations: SOPs and checking **(3 cases)**

Flight operations: Training systems **(3 cases)**

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

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

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

Threats

Environmental
None noted.

Airline
Operational pressure **(2 cases)**
Cabin events **(1 case)**
Dispatch / paperwork **(1 case)**

Flight Crew Errors (relating to...)

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

Automation **(3 cases)**

SOP adherence / SOP cross-verification **(4 cases)**

Failure to go-around after destabilisation during approach **(2 cases)**

Undesired Aircraft States (UAS)

Incorrect aircraft configuration: Flight controls / automation **(3 cases)**

Incorrect aircraft configuration: Weight and balance **(2 cases)**

Long, floated, bounced, firm, off-centreline or crabbed landing **(2 cases)**

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

Correlations of Interest

SOP adherence / cross-verification was a factor in all four accidents.

Incorrect use of automation was a factor in three accidents.

Accident Scenarios of Interest

No significant scenarios 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.

TREND ANALYSIS

Accidents Overview (2007-2009)

	Total Accidents	IATA Members	Hull Losses	Fatal	Fatalities	Passenger	Cargo	Ferry	Jet	Turboprop
2009	90	28	35	18	685	66	22	2	59	31
2008	109	33	53	23	502	71	34	4	66	43
2007	100	35	45	20	692	81	16	3	57	43

Accidents per Category (2007-2009)

	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
2009	2	9	23	0	0	9	9	4	11	15	4
2008	7	14	28	2	0	16	18	6	7	8	3
2007	5	13	26	0	0	9	19	5	6	15	2

Note: One 2009 accident did not fit into any of the above categories and was not included in the table.

Note: IATA's accident classification system was redesigned in 2007 and data from previous years is not included in the tables.

"IATA continues to aid its members through these difficult times."

Section 5

5

In-Depth Regional Accident Analysis

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

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

Note: IATA determines the accident region based on the operator's country. Moreover, the operator's country is specified in the operator's Air Operator Certificate (AOC).

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

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

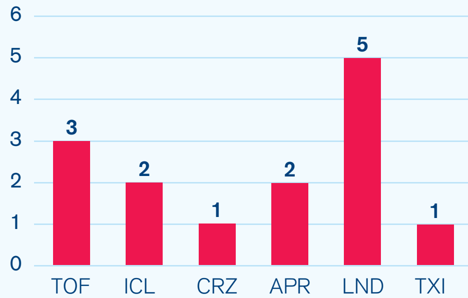
Africa

14 Accidents

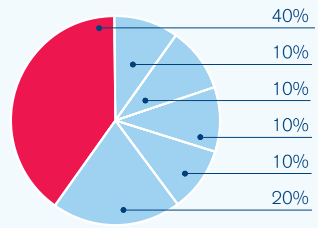
IATA Members	**14%**
Hull Losses	**64%**
Fatal	**50%**

43% Passenger | **50%** Cargo | **7%** Ferry | **50%** Jet | **50%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

50% Regulatory oversight

43% Management decisions

36% Safety management

21% Flight operations: SOPs & checking and training systems

Threats

Environmental

29% Airport facilities
Inadequate overrun area / trench / ditch / proximity of structures
(**100%** of all these events)

14% Meteorology

14% Wildlife / birds / foreign object

Airline

29% Aircraft Malfunction

14% Operational pressure

Flight Crew Errors (relating to...)

36% SOP adherence / SOP cross-verification
Intentional non-compliance (**40%** of all these events)
Unintentional non-compliance (**40%** of all these events)

29% Manual handling / flight controls

21% Checklist

Undesired Aircraft States (UAS)

21% Operation outside aircraft limitations

21% Incorrect aircraft configuration: Engine

14% Vertical / lateral / speed deviation

14% Incorrect aircraft configuration: landing gear

Correlations of Interest

80% of accidents where deficient safety management (on the part of the Operator) was cited, poor regulatory oversight was also noted as a contributing factor.

Weak regulatory oversight was noted in **75%** of all accidents where inadequate airport facilities were a factor.

Improper use of checklists was a factor in **75%** of all accidents where an aircraft malfunction was a threat.

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.*

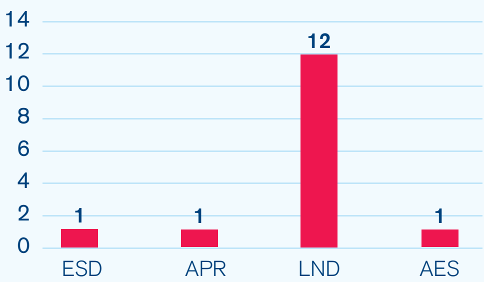
Asia / Pacific

15 Accidents

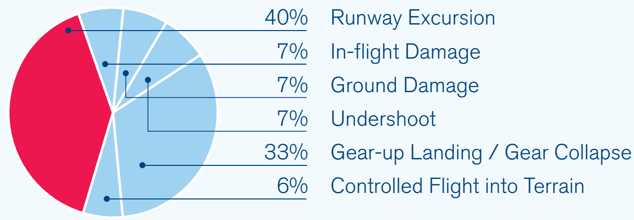
IATA Members	**40%**
Hull Losses	**33%**
Fatal	**13%**

87% Passenger **13%** Cargo **0%** Ferry **53%** Jet **47%** Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

40% Regulatory oversight
27% Safety management
20% Flight operations
20% Training systems Management decisions
13% Maintenance Operations: Training systems
13% Dispatch operations: Training systems

Threats

Environmental

47% Meteorology
- Wind / windshear / gusty winds (**71%** of these events)
- Poor visibility / IMC (**43%** of all these events)

20% Airport Facilities
- Contaminated runway / taxiway – poor breaking action (**67%** of all these events)

Airline

33% Aircraft malfunction
- Gear / tire (**60%** of all malfunctions)
- Fire / smoke (**20%** of all malfunctions)
- Secondary flight controls (**20%** of all malfunctions)

13% Maintenance events

Flight Crew Errors (relating to...)

33% Manual handling / flight controls

Undesired Aircraft States (UAS)

20% Long, floated, bounced, firm, off-centerline or crabbed landing
20% Vertical, lateral or speed deviations
13% Unstable approach

Correlations of Interest

80% of runway excursions that occurred after a long / floated / bounced / firm / off-centerline / crabbed landing also cited poor weather (thunderstorms or wind / windshear / gusty winds) as a factor.

In **33%** of accidents where poor visibility / IMC was a factor, ground based navigation aids malfunctioning or not available was also noted.

Poor regulatory oversight was a factor in **75%** of runway excursion accidents in the region.

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

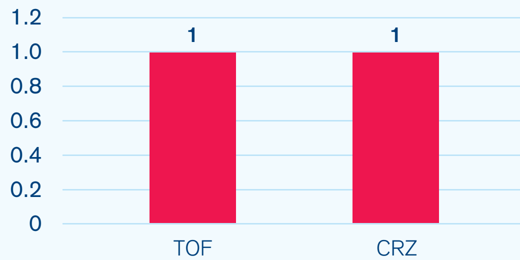
Commonwealth of Independent States (CIS)

2 Accidents

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

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

Accidents per Phase of Flight*



Breakdown per Accident Category

Top Contributing Factors**

Latent Conditions (deficiencies in...)

Regulatory oversight
(1 case)

Management decisions
(1 case)

Safety management
(1 case)

Threats

Environmental

Methodology: Tunderstorms
(1 case)

Airline

None identified.

Flight Crew Errors (relating to...)

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

Undesired Aircraft States (UAS)

Incorrect aircraft configuration:
Landing gear

(1 case)

Correlations of Interest

No significant correlations noted.

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

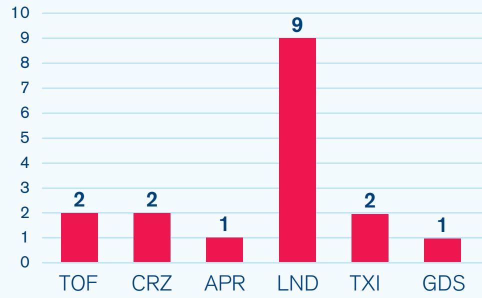
Europe

17 Accidents

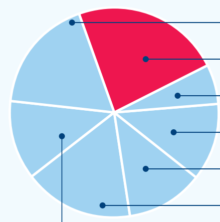
IATA Members	29%
Hull Losses	24%
Fatal	12%

94% Passenger | 6% Cargo | 0% Ferry | 82% Jet | 18% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



18%	Gear-up Landing / Gear Collapse
23%	Hard Landing
6%	Tailstrike
12%	Loss of Control In-flight
12%	Runway Excursion
17%	In-flight Damage
12%	Ground Damage

Top Contributing Factors**

Latent Conditions (deficiencies in...)

- **33%** Flight operations: Training systems
- **13%** Flight operations: SOPs & checking
- **13%** Management decisions
- **13%** Design
- **13%** Ground operations: SOPs & checking

Threats

Environmental

- **20%** Meteorology
  - Wind / windshear / gusty wind (**50%** of all these events)
- **20%** Air traffic services
- **13%** Airport facilities
- **13%** Wildlife / birds / foreign object

Airline

- **33%** Aircraft malfunction
  - Gear / tire (**60%** of all these events)
- **13%** Maintenance events
- **13%** Cabin events

Flight Crew Errors (relating to...)

- **33%** Manual handling / flight controls
- **33%** SOP adherence / SOP cross-verification
- **20%** Failure to go-around after destabilized approach

Undesired Aircraft States (UAS)

- **27%** Long, floated, bounced, firm, off-centerline or crabbed landing
- **20%** Operation outside aircraft limitations
- **13%** Ground navigation
- **13%** Incorrect aircraft configuration: Flight controls / automation

Correlations of Interest

75% of accidents where a long / floated / bounced / off-centerline or crabbed landing occurred also cited deficiencies in flight crew training.

Flight crew training was a factor in **80%** of events where non-adherence to SOPs was noted.

29% 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

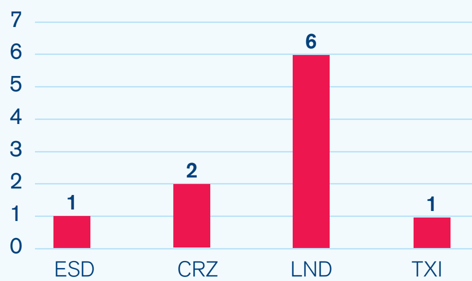
10 Accidents

IATA Members	**10%**
Hull Losses	**30%**
Fatal	**10%**

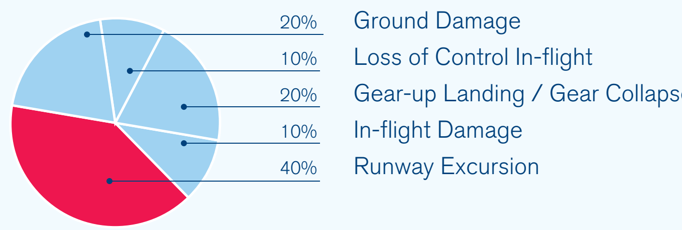
90% Passenger | **10%** Cargo | **0%** Ferry | **40%** Jet | **60%** Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

- **20%** Regulatory oversight
- **20%** Safety management
- **20%** Management decisions
- **10%** Flight operations: SOPs & checking
- **10%** Flight operations: Training systems

Threats

Environmental

- **25%** Meteorology: Thunderstorms

Airline

- **30%** Aircraft malfunction
- **10%** Operational pressure

Flight Crew Errors (relating to...)

- **30%** Manual handling / flight controls
- **10%** SOP adherence / SOP cross-verification: Intentional non-compliance

Undesired Aircraft States (UAS)

- **20%** Incorrect aircraft configuration
- **10%** Operation outside aircraft limitations

Correlations of Interest

25% of runway excursions were linked with errors in manual handling / flight controls.

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

Middle East & North Africa

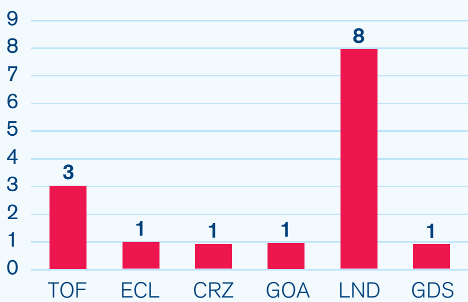
15 Accidents

IATA Members	60%
Hull Losses	47%
Fatal	27%

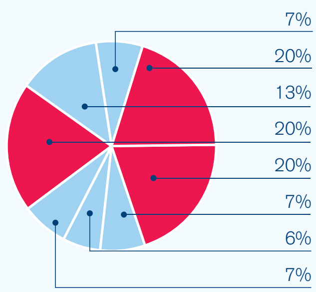
67% Passenger | 27% Cargo | 7% Ferry | 87% Jet | 13% Turboprop

5

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

- **27%** Regulatory oversight
- **27%** Safety management
- **20%** Management decisions
- **20%** Flight operations: SOPs & Checking
- **20%** Maintenance operations (includes SOPs & checking and Training systems)

Threats

Environmental

- **13%** Meteorology

Airline

- **33%** Aircraft malfunction
- **20%** Maintenance events

Flight Crew Errors (relating to...)

- **40%** SOP adherence / SOP cross-verification
  - Intentional (**50%** of all these events)
  - Unintentional (**50%** of all these events)
- **33%** Manual handling / flight controls
- **20%** Automation

Undesired Aircraft States (UAS)

- **27%** Long, floated, bounced, firm, off-centreline or crabbed landing
- **20%** Unstable approach
- **13%** Incorrect aircraft configuration: flight controls / automation

Correlations of Interest

75% of accidents citing deficient safety management (on the part of the operator) also cited poor regulatory oversight.

In **67%** of runway excursion accidents, intentional non-compliance with SOPs was also noted.

Meteorology was a factor in **33%** of accidents were non-compliance with SOPs was also cited.

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

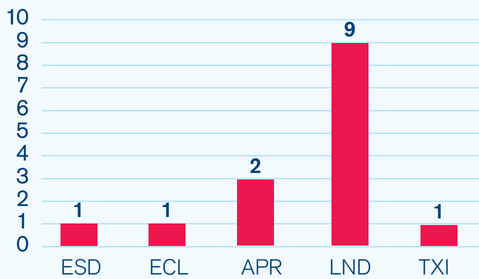
North America

14 Accidents

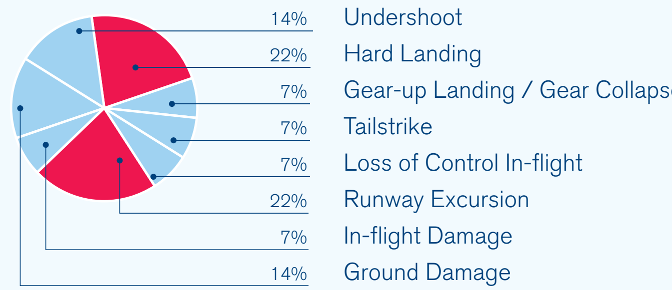
IATA Members	29%
Hull Losses	43%
Fatal	14%

64% Passenger | 36% Cargo | 0% Ferry | 64% Jet | 36% Turboprop

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

36% Regulatory oversight

29% Safety management

29% Management decisions

29% Flight operations: Training systems

14% Operations planning & scheduling

Threats

Environmental

50% Meteorology

- Poor visibility / IMC (**43%** of all these events)
- Wind / windshear / gusty wind (**43%** of all these events)

18% Lack of visual reference

14% Ground-based navigation aids malfunctioning or not available

Airline

21% Aircraft malfunction

14% Maintenance events

Flight Crew Errors (relating to...)

50% SOP adherence / SOP cross-verification

- Unintentional non-compliance (**29%** of all these events)
- Intentional non-compliance (**29%** of all these events)

43% Manual handling / flight controls

29% Failure to go-around after destabilisation during approach

14% Callouts

Undesired Aircraft States (UAS)

36% Long / floated / bounced / firm / off-centreline / crabbed landing

21% Vertical, lateral or speed deviations

14% Unnecessary weather penetration

Correlations of Interest

In **50%** of cases where the crew failed to go-around after a destabilized approach, deficient training systems at the operator were also noted.

In all undershoot accidents, vertical / lateral / speed deviations, non-compliance to SOPs and poor visibility / IMC conditions were factors.

Flight crew training deficiencies were noted in **60%** of accidents where a long / floated / bounced / firm / off-centerline / crabbed landing occurred.

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

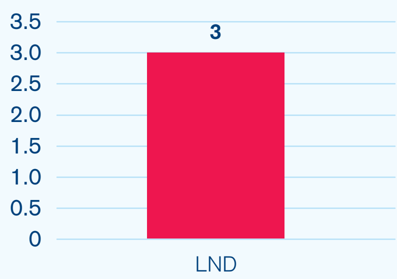
North Asia

3 Accidents

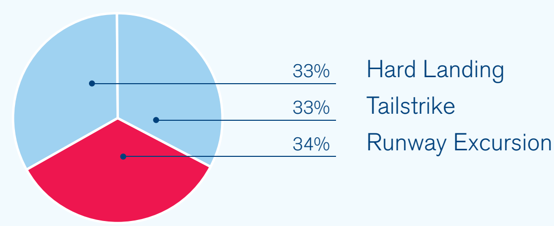
IATA Members	**33%**
Hull Losses	**0%**
Fatal	**0%**

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

Accidents per Phase of Flight*



Breakdown per Accident Category



Top Contributing Factors**

Latent Conditions (deficiencies in...)

Flight Operations: SOPs and Checking
(1 case)

Flight Operations: Training Systems
(1 case)

Threats

Environmental
None identified.

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

Flight Crew Errors (relating to...)

Manual handling / flight controls
(1 case)

Automation
(1 case)

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

Failure to go-around after destabilized approach
(1 case)

Undesired Aircraft States (UAS)

Long / floated / bounced / firm / off-center / crabbed landing
(2 cases)

Incorrect aircraft configuration: Flight controls / automation
(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 (2007-2009)

	Africa	Asia / Pacific	Commonwealth of Independent States (CIS)	Europe	Latin America & the Caribbean	Middle East & North Africa	North America	North Asia
2009	14	15	2	17	10	15	14	3
2008	7	19	10	17	19	12	24	1
2007	12	23	3	19	12	6	21	4

Section 6

6

Analysis of Cargo Aircraft Accidents

YEAR 2009 CARGO OPERATOR REVIEW

Cargo vs. Passenger Operations for Western-built Jet Aircraft

	Fleet Size End of 2009	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	1,938	5	2.58	9	14	7.22
Passenger	17,786	14	0.79	27	41	2.31
Total	19,724	19	0.96	36	55	2.79

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 2009	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	936	2	2.14	2	4	4.27
Passenger	3,529	6	1.70	13	19	5.38
Total	4,465	8	1.79	15	23	5.15

HL = Hull Loss   SD = Substantial Damage

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

Cargo Aircraft Accidents

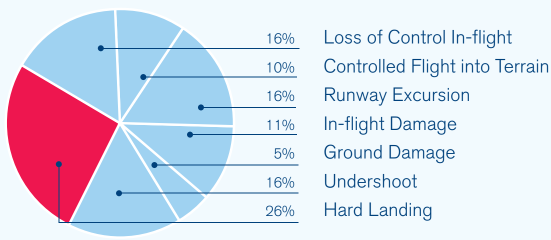
22 Accidents

68% Jet

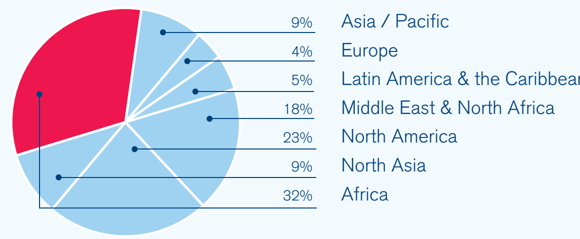
32% Turboprop

IATA Members	18%
Hull Losses	45%
Fatal	36%

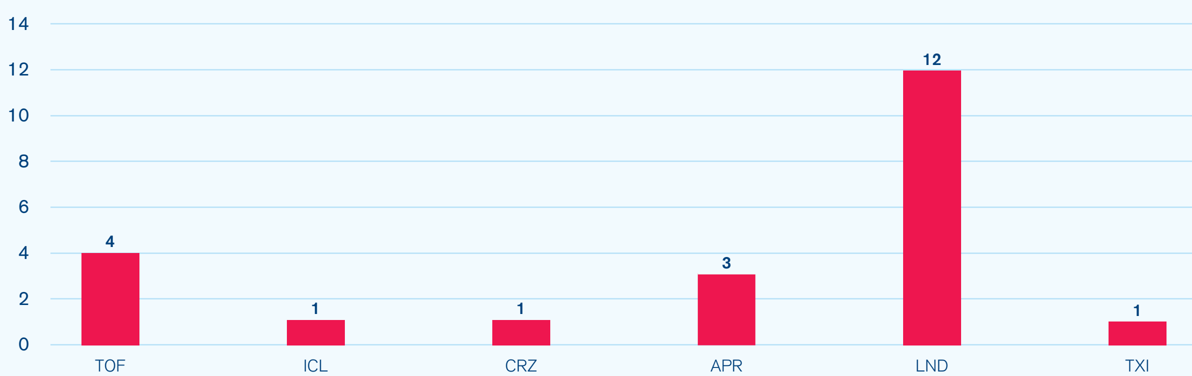
Breakdown per Accident Category



Accidents per Operator Region
(raw numbers)



Accidents per Phase of Flight*



Cargo Aircraft Accidents
Continued

Top Contributing Factors**

Latent Conditions (deficiencies in...)

- **41%** Regulatory Oversight
- **41%** Management decisions
- **36%** Safety management
- **14%** Flight operations
- **9%** Operations planning and scheduling

Threats

Environmental

- **32%** Meteorology
  - Poor visibility / IMC (**71%** of all these events)
  - Wind / windshear / gusty wind (**43%** of all these events)
- **14%** Lack of visual reference
- **14%** Navigation aids
  - Ground-based navigation aids malfunctioning or not available (**67%** of all these events)
  - Navigation aids not calibrated – unknown to flight crew (**33%** of all these events)

Airline

- **27%** Aircraft malfunction
  - Contained engine failure / powerplant malfunction (**33%** of all malfunctions)
  - Flight controls (**33%** of all malfunctions)
- **9%** Operational pressure

Flight Crew Errors (relating to...)

- **18%** Manual handling / flight controls
- **32%** SOP adherence / SOP cross-verification
  - Intentional non-compliance (**57%** of all these events)
  - Unintentional non-compliance (**37%** of all these events)
- **14%** Failure to go-around after destabilization during approach

Undesired Aircraft States (UAS)

- **18%** Vertical, lateral or speed deviations
- **18%** Long / floated / bounced / firm / off-centerline / crabbed landing
- **14%** Unnecessary weather penetration
- **9%** Operation outside aircraft limitations

Correlations of Interest

In all of the accidents where deficient safety management (on the part of the Operator) was cited as a contributing factor, deficiencies in regulatory oversight were also noted.

67% of accidents where the crew failed to go-around after an unstable approach led to a long, floated, bounced, firm, off-centerline or crabbed landing and a subsequent hard landing.

In accidents where manual handling was a factor, **50%** of cases also had poor safety management, poor regulatory oversight, deficiencies in training and led to a hull loss.

Note: 18% of accidents were not classified due to insufficient data.
**See Annex 1 for "Phase of Flight" definitions.*
***See Annex 2 for "Contributing Factors" definitions.*

“The role of the cabin crew goes beyond evacuations.”

Section 7

7

Cabin Operations Safety

NEW CABIN OPERATIONS SAFETY SECTION

Following the same model as the in-depth analysis by accident category, presented in Section 4, which focuses on accidents from a flight crew perspective, this section presents an overview of accidents that involved cabin operations aspects, their contributing factors and correlation between these factors. A detailed list of all the accidents analysed in this section can be found at **Annex 5**.

The purpose of this section is to identify safety-related issues in cabin operations and assist airlines in improving cabin safety.

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 Organisation (ICAO) and its member airlines and manufacturers to apply TEM to its many safety activities.

The Safety Report 2008 marked the first year that IATA presented a TEM-based accident classification system designed specifically for cabin crew and cabin operations-related events.

Figure 7.1 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 7.1.

Latent Conditions: Conditions present in the system before the accident, made evident by triggering factors. *Note: these are the same categories as for flight crew.*

Threat: An event or error that occurs outside the influence of the cabin crew, but which requires cabin crew attention and management if safety margins are to be maintained.

7

Cabin Crew Error: An observed cabin crew deviation from organizational expectations or crew intentions.

Undesired Cabin / Aircraft State: A cabin-crew-induced cabin / aircraft state that clearly reduces safety margins; a safety-compromising situation that results from ineffective error management. An undesired state is recoverable.

End State: A reportable event. An end state is unrecoverable. End states (or "accident categories") in cabin operations remain the same as for the flight crew taxonomy but include additional end states.

Note: these definitions are valid for accident analysis conducted from the cabin crew perspective. Definitions of threats, errors and undesired states vary for flight crew-centered analysis. These definitions are presented in Section 4, entitled "In-Depth Accident Analysis 2009".

ACCIDENT CLASSIFICATION SYSTEM FOR CABIN OPERATIONS

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 new cabin operations-specific taxonomy:

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

Unfortunately, some accidents 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 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 this section, 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 cabin operations is presented in **Annex 3**.

Cabin Safety Related Events

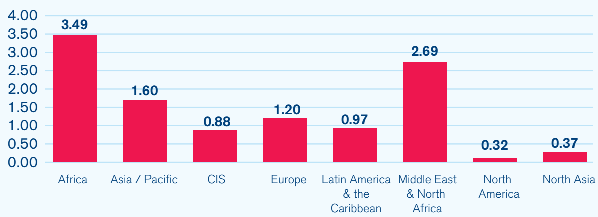
35 Accidents

IATA Members	**46%**
Hull Losses	**37%**
Fatal	**14%**
Accident Rate*	**0.99**

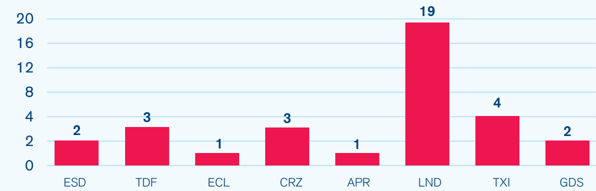
80% Jet

20% Turboprop

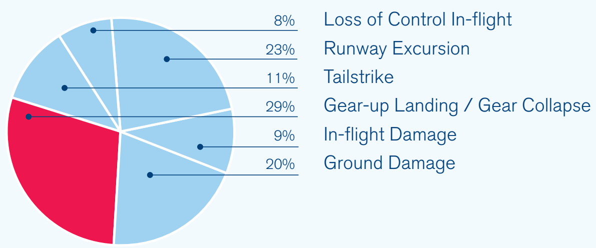
Accident Rates per Operator Region*



Accident per Phase of Flight**



Breakdown per Accident Category



Top Contributing Factors***

Latent Conditions (deficiencies in...)

6% Regulatory oversight
6% Management decisions
3% Safety management

Threats

Environmental
6% Airport facilities: trench / ditch / inadequate overrun area

Airline
40% Structural failure
29% Gear / tire / brake malfunction
20% Abnormal / emergency operations
14% Fire / smoke
9% Exit / escape slide malfunction

Passenger
3% Non-compliance to cabin crew instructions

Cabin Crew Errors (relating to...)

3% SOP adherence / cross-verification

Undesired States

None identified.

Correlations of Interest

74% of accidents were associated to an aircraft malfunction, such as a structural failure or gear collapse.

54% of accidents occurred during the landing phase.

Note: 14% of these accidents were not classified due to insufficient data.
* Accidents per million sectors flown for all aircraft types.
** See Annex 1 for "Phase of Flight" definitions.
*** See Annex 3 for "Contributing Factors" definitions.

7

SUMMARY OF FINDINGS

- Out of the 90 accidents, 35 contained a cabin operations safety dimension
- 46% of these accidents involved IATA members
- 80% of accidents occurred on jet aircraft
- 37% of accidents resulted in a hull loss; while 20% resulted in fatalities
- Over half (54%) of the accidents occurred during the landing phase

In broad terms, the accident breakdown is as follows:

- 32% involved gear collapses on landing
- 26% involved runway excursions
- 22% involved ground damage
- 14% involved an onboard fire (this excludes post-crash fires)
- 6% involved passenger evacuations
- One accident involved a successful ditching where all passengers and crew survived

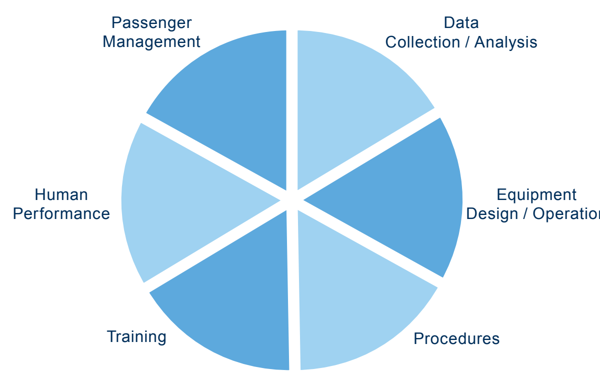
IATA CABIN OPERATIONS SAFETY

Cabin safety is a key area, which impacts operational safety. The role of cabin crew was historically seen as limited to evacuations in a post-accident scenario. Although this remains an essential duty of every cabin crew, today the role of cabin crew goes beyond passenger evacuations.

Cabin crew have a responsibility to manage safe and efficient operations, working hand-in-hand with the flight crew. Moreover, cabin crews play an important role in identifying operational deficiencies and safety or security hazards that may prevent serious incidents and accidents.

For this reason, IATA focuses on cabin safety and develops standards, procedures and best practices to ensure safety in all aspects of cabin operations.

Figure 7.2 IATA Cabin Operations Safety Areas



ONGOING IATA CABIN OPERATIONS SAFETY INITIATIVES

- Passengers with reduced mobility
- On-board medical incidents and medical diversions
- In-flight fires, including laptop battery fires
- Aircraft systems and installations
- Inadvertent slide deployments

IOSA & CABIN OPERATIONS SAFETY

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

- Cabin operations management and control
- Cabin crew training and qualification
- Line operations
- Equipment and cabin systems

More information on IOSA, as well as a free downloadable version of the IOSA Standards Manual, which includes the complete set of cabin operations standards, can be found at www.iata.org/iosa.

CABIN OPERATIONS SAFETY TOOLKIT

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

To help the industry, IATA developed the Cabin Operations Safety Toolkit, which brings together safety expertise from member airlines, manufacturers and industry associations.

It contains training material, procedures, incident analysis and other useful tools to assist airlines target these issues. The toolkit is available at the IATA Online Store (http://www.iataonline.com). The 3rd edition of the Cabin Operations Safety Toolkit will be published in 2010 and will include a module for on-board medical incidents.

AVIATION HEALTH CONFERENCE

The annual IATA Aviation Health Conference provides an unparalleled opportunity to hear from leading aviation experts on such topics as:

- On-board medical events and medical diversions
- Fatigue Risk Management Systems (FRMS)
- Cabin air quality
- Galley design
- Fear of flying

The event will be held in London, United Kingdom, from the 28th to the 29th of September, 2010. More information can be found at http://www.iata.org/events.

Image courtesy of Airbus

“Runway excursion was the most frequent type of accident in 2009.”

Section 8

8

Report Findings and IATA Prevention Strategies

TOP FINDINGS

- 90 accidents in 2009: 31% involved IATA members
- 20% of all accidents were fatal
- 73% involved passenger aircraft, 25% involved cargo aircraft and 2% involved ferry flights
- 66% on jet aircraft and 34% on turboprops
- 39% of accidents resulted in a Hull Loss and 61% in Substantial Damage
- The majority (58%) of accidents occurred during landing

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

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 2009.

The following tables present the top five counter-measures, 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.

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Countermeasures for the Operator and the State

Subject	Description	% of accidents where countermeasures could have been effective
Regulatory oversight by the State of the Operator	States must be responsible for establishing a safety program, in order to achieve an acceptable level of safety, encompassing the following responsibilities: • Safety regulation • Safety oversight • Accident / incident investigation • Mandatory / voluntary reporting systems • Safety data analysis and exchange • Safety assurance • Safety promotion	**29%**
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	**26%**
Management decisions (Operator)	The Operator must ensure that management personnel understand the operational consequences of business and/or financial decisions such as: • Cost cutting • Stringent fuel policy • Performance of fuel bonuses • Outsourcing of operations	**23%**
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.	**23%**
Flight Operations: SOPs & checking (Operator)	Ensure the Operator addresses clearly: Standard Operating Procedures (SOPs), operational instructions and / or policies, company regulations, and controls to assess compliance with regulations and SOPs.	**9%**

8

Countermeasures for the Flight Crews

Subject	Description	% of accidents where countermeasures could have been effective
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.	**32%**
Overall crew performance	Overall, crew members should perform well as risk managers. Includes Flight, Cabin, Ground crew as well as their interactions with ATC.	**22%**
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).	**12%**
Automation Management	Automation should be properly managed to balance situational and/or workload requirements (e.g. brief automation setup, effective recovery techniques from anomalies).	**10%**
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).	**9%**

Image courtesy of Embraer

ACTF DISCUSSION & STRATEGIES

8

The following section presents the issues discussed at the January 2010 ACTF meeting, following the classification of the year's accidents. The ACTF felt that the following topics should be noted.

Airmanship and Automation Management

Background:

- Aircraft handling was a factor in one third of all accidents in 2009
- Automation management was a factor in 24% of 2009 accidents (vs. 5% in 2008)
- Hard landings as a percentage of accidents increased from 6% in 2008 to 12% in 2009 (There was a strong correlation noted with manual handling on specific aircraft types)

Objective: Manual handling skills need to be reinforced during initial and recurrent training.

Discussion:

- Certain aircraft (e.g. MD-11) are known to be a challenge to land – type-specific bounced/hard landing training is essential with proper emphasis on system knowledge to minimize the risk of an accident
- Flight crews are seemingly becoming more and more reluctant to revert to manual flying when automated systems fail
- 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
- 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
- Dispatch often generates performance data. This increases the chances of both data miscalculations and input errors – performance data can and should be double checked before entering into the FMS
- Perform a "gross error check" to verify that numbers calculated or provided make sense
  - Helps reduce chances of tailstrikes, overruns and other types of accidents
  - Refer to discussion on rules of thumb

Safety Management and Crew Training

Background:

- Safety management was a factor in 23% of all accidents in 2009
- Flight crew training was a factor in 20% of all accidents
- Crew training was a factor in 58% of all long, floated or bounced landings in 2009, which in turn represented 35% of all runway excursions
- Go-around training from bounced landings may have prevented several hard landing accidents that occurred in 2009

Objective: Training forms a key pillar of any safety management system.

Discussion:

- 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 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
- Current simulator technology is limited in how accurately it can reproduce certain situations such as stalls or icing
- Crews should be well trained on manually flying the aircraft and not over-rely on automation
- 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
- 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
- Operators should maintain vigilance in multi-crew pilot license situations as crews flying different aircraft types may not develop sufficient familiarity to learn average values or rules of thumb

Adapt Briefing to the Situation That You Expect

Background:

- Flight crews tend to repeat standard briefings, despite knowing that the actual situation may be different.

Objective: Briefings should not only include published procedures, but specifically address anticipated threats and available countermeasures.

Discussion:

- Threats included in the briefing can include:
  - Special considerations due to adverse weather and airport conditions
  - Calculation of landing distance with current conditions, applying an ample safety margin
  - Effectiveness of reverse thrust based on runway conditions
    - > Refer to the Boeing reverse thrust effectiveness presentation on the included CD-ROM
  - Runway changes
  - Approach briefing
  - Be go-around minded: rejected landings and go-around instructions
  - Altitude awareness and visual minima on approach
- Briefings should be adapted to the situation and repeated or updated as circumstances change
- Briefings should be occasionally "spiced up" by adding extra, but related, elements to help reduce any monotony and better engage the other crew member
- Briefings should at all times cover both the expected threats to be encountered and the countermeasure the crew intends to use to mitigate those threats.

Following SOPs

Background:

- Non-compliance with SOPs was a factor in 30% of 2009 accidents

Objective: Re-enforce SOP adherence and knowledge at every opportunity

Discussion:

- 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

Unstable / Destabilized Approaches

Background:

- An unstable approach was a factor in 17% of runway excursions in 2009 vs. 32% in 2008
- No standard definition of an unstable approach, depends upon the operation and the situation
- Flying unstable approaches can become a habit, depending on the operational environment and restrictions

Objective: Understand and prevent unstable approaches, by effective approach management.

Discussion:

- Airlines can use a Flight Data Analysis (FDA) program to understand why unstable approaches occur:
  - 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
- 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
- A flight simulator's capacity to accurately replicate certain scenarios (e.g. gusty tailwinds, bounced landings, etc…) is limited

Note: The go-around decision-making process is discussed below.

8

Go-Arounds

Background:

- A timely go-around before landing, or going around after a long flare or bounced landing may have prevented several accidents in 2009
- Lack of understanding of what conditions necessitate a go-around

Objective: Train flight crews to improve the go-around decision-making and increase proficiency with respect to non-standard go-around procedures (e.g., loss of visual reference below minima, lateral drift due to winds and bounced landings).

Discussion:

- 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
- 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
- Ensure training addresses assertiveness amongst first officers as well as Captains' attitude towards them
- Operators should ensure sufficient practice time for management pilots to maintain proficiency in both the go-around maneuver and decision-making process – management pilots' reduced flying times may lead to extended periods of time between needing to execute challenging maneuvers

Maintenance-related Factors in Accidents

Background:

- Maintenance operations and regulatory oversight were each present as a factor in 27% of events
- Maintenance events played a contributing role in 11% of all the accidents in 2009
- One third of the events relating to gear-up landing or gear collapse were linked to airline maintenance issues
  - Gear collapses represented 17% of accidents vs. 7% in 2008. There were no strong pilot handling or weather correlations tied to gear collapses
- Challenges in maintaining proper oversight over maintenance activities, whether these are run in-house or as an outsourced function

Objective: Ensure acceptable level of safety in maintenance activities.

Discussion:

- Bogus parts and maintenance configuration control are critical factors in maintenance safety
- Airlines need to ensure that operations and maintenance communicate appropriately
- As per ICAO regulation, Maintenance Organizations must implement a Safety Management System (SMS); ICAO SMS standards are included in the 3rd edition of the IOSA Standards Manual
- Data collection systems need to be in place to ensure these organizations can capture hazards relating to maintenance activities and mitigate associated risks
- Airlines need to work with their Maintenance Organizations (internal or external) to ensure information is fed into the SMS and corrective actions are taken

Upset Recovery Training

Background:

- 89% of loss of control in-flight accidents were fatal
- Manual handling was a factor in 56% of all loss of control in-flight accidents

Objective: Focus on training for upset recovery.

Discussion:

- The manufacturers have worked extensively to prevent upsetting aircraft in-flight
- Operators need to train for spatial disorientation
- Training needs to emphasize how crews should handle spatial disorientation
- The availability and proper use of secondary flight controls (e.g., trim) to recover from upsets should be emphasized in training
- Operators should ensure upset recovery training is conducted and be in accordance with the guidelines published in the Airplane Upset Recovery Training Aid Rev 2

Ground Damage / Inappropriate Ground Handling Procedures

Background:

- Much of the ground damage that occurs in the industry remains unreported
- The lack of standardization can contribute to ground handling errors that result in damage to aircraft

Objective: Reduce ground damage accidents and incidents.

Discussion:

- Situational awareness on the ramp
  - Do not rely on ground marshals or wing walkers for obstacle avoidance and/or clearance while taxiing
  - ATC clearance to taxi is not an indication that it is safe to begin – surroundings must be monitored at all times

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)

Objective: Airlines should implement Standard Operating Procedures (SOPs) with regards to operations in severe weather conditions

Discussion:

- The practice of suspending operations based on severe weather should be considered in areas prone to snow, storms, etc.
- 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
- 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
- Operators should consider tools that allow dispatch offices to provide crews with the most up-to-date weather information possible
- 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

THE USE OF TECHNOLOGY FOR ACCIDENT PREVENTION

8

Technology and CFIT Accident Prevention

In 2009, 2% of all accidents involved a Controlled Flight into Terrain (CFIT). All of these events were fatal and all events resulted in a hull loss. The majority of CFIT accidents involved aircraft without adequate technology / equipment, such as Enhanced-Ground Proximity Warning System (E-GPWS) also known as Terrain Awareness Warning System (TAWS).

Ground Proximity Warning System (GPWS)

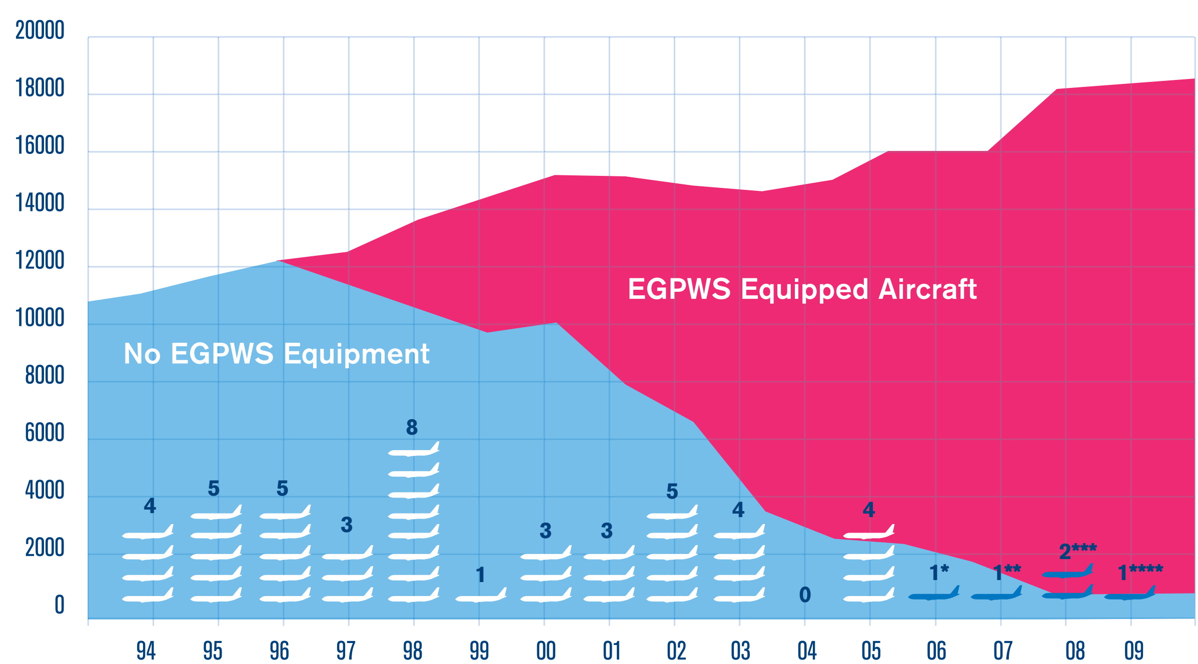
- Beginning in the 1970s, Ground Proximity Warning Systems (GPWS) were widely fitted on commercial transport aircraft and were successful in preventing many CFIT accidents
- There were still accidents due to a major drawback of GPWS performance that was limited by the downward looking aircraft radio altimeter, which could not see terrain ahead of the aircraft especially in precipitous terrain
- Furthermore, GPWS automatic warnings were inhibited in full landing configuration (i.e., gear down and flaps selected) to prevent unwanted warnings across undulating terrain and there were CFIT accidents short of the runway with a stable approach and no GPWS warnings

Enhanced-Ground Proximity Warning System (E-GPWS) / TAWS

These GPWS limitations were addressed in E-GPWS equipment, which was first installed in 1996. The world's Western-built large commercial jet fleet fitted with E-GPWS / TAWS has grown to 97% of the fleet with over 360,000,000 departures.

- Since 1996, approximately 50 large commercial jet aircraft have been involved in CFIT accidents, most not fitted with E-GPWS, as shown in Figure 8.1
- E-GPWS / TAWS has been designed to overcome GPWS limitations providing flight crews with a terrain display to help provide situational awareness to terrain and provide more warning time for the pilot to take corrective action of approaching terrain
- The system consists of a global terrain database; a Global Positioning System (GPS) input from the aircraft GPS or an internal GPS in the E-GPWS computer itself, computers and the existing signals to the GPWS

FIGURE 8.1 GPWS Versus E-GPWS Active World's Large Commercial Jet Fleet



* One aircraft was flown into the water with the pilot suffering from spatial disorientation.
E-GPWS provided 15 seconds of warning.
** One aircraft was flown into a mountain with E-GPWS inoperative.
*** One aircraft flown into mountain-TAWS.
One aircraft flown into ground with E-GPWS function inhibited because of nuisance warnings during QFE procedures and NO GPS.
**** One aircraft with equipped with EGPWS inhibited and GPWS warnings ignored.

- An inferior position data choice is to use data from the Flight Management System (FMS). Unfortunately, this can cause many unwanted warnings from FMS map shifts where there is scare VOR DME updating of the FMS aircraft position. Another problem is with altimeter errors, especially in States where QFE altimeter setting standards are still in use. In these aircraft, the E-GPWS equipment often ends up being inhibited
- Unfortunately the FMS can be subject to Map Shift, or faulty ground navigation position updating and AIP coordinates that may not agree to WGS-84 coordinates used by E-GPWS / TAWS terrain, obstacle and runway end position
- E-GPWS / TAWS units combine the aircraft current position with the terrain database and present the information to the crew on the navigation display, giving a picture of significant terrain relative to the aircraft. An SOP that has one ND on Weather and the Other ND on Terrain and ranged appropriately is recommended for every take-off and initial approach
- GPS track, ground speed, with data from the aircraft air data computers and roll attitude is used to predict the aircraft flight path in terms of horizontal and vertical profile
- E-GPWS / TAWS gives the flight crew visual and aural warnings of proximity to terrain. When a hazardous condition occurs, a nominal alert time of 60 seconds is given by an aural “terrain” message, followed with a nominal 30 seconds of warning to “pull up” en-route, but with shorter times as the runway is approached. Figure 8.1 indicates the increase in the number of aircraft fitted with E-GPWS / TAWS and the related decrease in the number of CFIT accidents. E-GPWS has been hailed as one of the greatest CFIT prevention tools that the industry has seen, but it will only be reliable if the software and database are kept up to date. This leads to a growing concern that there may be a CFIT accident to an aircraft capable of avoiding a CFIT accident because an E-GPWS with outdated information provides a misleading sense of comfort

GPS

To get the most CFIT risk reduction from E-GPWS, the airline needs to complete the following:

- Provide a GPS position directly to the E-GPWS unit
- Use the latest software and database
- Keep the system maintained
- Use a Terrain Display take-off and landing

The advantages of using GPS direct to the E-GPWS are, independence from the FMS, independence from altimetry errors, altimeter setting errors or various altimeter setting standards used such as QFE. Unwanted warnings are significantly reduced with the use of GPS. There are approximately 7,000 large aircraft using a GPS engine internal to E-GPWS. Unfortunately, there remain some 5,500 large commercial jet aircraft without GPS direct to E-GPWS. Many of these aircraft may fly in areas where VOR DME updates are scarce (FMS map shift) and QFE setting standards that cause many unwanted warnings.

Software

It is highly recommended that Obstacles and Peaks Alerts and Geometric Altitude software functions be pinned up by means of a rear jumper. No jumper is necessary for Geometric Altitude on Boeing aircraft. Software is updated by means of a PCMCIA card. If the E-GPWS was Type Certified by Airbus or Boeing, the operator may need to coordinate with them. Otherwise, the airline can use an amended Supplemental Type Certificate to the original Supplemental Type Certificate.

Database

It is important to keep the Terrain / Obstacle / Runway WGS-84 databases current. Terrain databases from Honeywell can be downloaded from their website:

http://www.honeywell.com/sites/aero/Egpws-Home.htm

Operators can also sign up with Honeywell to receive email notifications when new databases are released and a PCMCIA card from Honeywell. The PCMCIA card is inserted into the front of the E-GPWS computer (power on), while on the aircraft and the front panel button pressed, and the database is loaded within 30 minutes. Obstacle databases for various States are slowly becoming more available.

8

Technology and Runway Excursion Prevention

Runway excursions during the landing phase were the largest percentage of accidents in 2009. Manufacturers have been working for several years to reduce the occurrence rate of runway excursions through technology introduced on new aircraft or retrofitted onto existing airframes.

Airbus in particular has developed a system known as ROPS (Runway Overrun Protection System) that aims to reduce the probability of a runway excursion by providing a real-time predicted stop point on the runway during approach and landing roll.

The system integrates two functions; a warning function, called Runway Overrun Warning (ROW), that alerts the flight crew to the possibility of an overrun in flight where a go-around would be advised; and an active protection function, referred to as Runway Overrun Protection (ROP), which applies on the ground.

From Auto-Brake activation until the aircraft stops, the Runway Overrun Protection (ROP) will:

- Compute and display a stop bar on the Navigation Display
- Automatically increase the braking to maximum braking and trigger appropriate alerts under predicted runway overrun conditions. This braking is equivalent to that developed in a rejected take-off by the Auto-Brake in RTO mode, which represents the maximum physical braking capacity of the system

The displayed stop bar indicates the best possible estimation of the remaining landing roll-out distance, integrating the current aircraft ground speed, deceleration rate and distance to the runway end. It is continuously updated taking account of the actual braking conditions (runway friction and slope, thrust reversers, anti-skid, etc.).

If the landing is attempted despite ROW warnings, or if the aircraft's deceleration is not sufficient, the ROP stop bar will appear, or move, beyond the end of the runway. In this situation, the path and stop bar turn red on the Navigation Display, and a "MAX REVERSE" warning is displayed on the PFD. Max physical braking is automatically applied (if Auto-Brake is selected). In addition, a repetitive "MAX REVERSE!" aural alert is triggered if max reversers are not both selected. This message will be repeated until the crew selects both max reversers.

The "MAX REVERSE" warning remains on the PFD as long as the stop bar shows a runway overrun condition, whether or not Max Reverse is set.

If the stop bar still shows a runway overrun condition at 80 knots, a "KEEP MAX REVERSE!" audio callout is triggered once, to warn against undue Max Reverse de-selection.

SUMMARY OF MAIN FINDINGS AND IATA PREVENTION STRATEGIES

In 2009, the global western-built jet hull loss rate continued to decline in one of the most difficult operating commercial environments ever seen in the aviation industry. From a regional perspective, the western-built jet hull loss rates decreased in all IATA regions except Africa, Asia / Pacific, Europe, and the Middle East and North Africa. Overall, IATA member airlines surpassed the industry in terms of safety, with an accident rate of 0.62 Western-built jet hull losses per million sectors flown.

Runway Excursions

- Runway excursions were the most common type of accident and represented 26% of all events in 2009 vs. 27% in 2008 (23 vs 28 accidents in 2008)
- 35% of all runway excursions were preceded by a long, floated or bounced landing, and 38% of these were the result of an unstable approach
- Manual handling was a factor in 43% of runway excursions while weather and/or visual conditions were a factor in 39% of runway excursion accidents

Prevention Strategy: IATA's Runway Excursion Risk Reduction Toolkit was launched in 2009, in concert with a series of regional safety workshops to help airline operators and flight crews better understand the risk factors involved in runway excursions. Toolkit development continues in 2010, with an expanded scope focusing on airport and Air Navigation Service Provider (ANSP) contributing factors. The IATA Global Safety Information Center (GSIC) is providing regional unstable approach rate data, and industry benchmarking data, to assist in reducing this accident category.

Airmanship & Automation Management

- Aircraft handling was a factor in one third (33%) of all accidents in 2009
- Automation management was a factor in 24% of 2009 accidents (vs. 5% in 2008)
- Hard landings, as a percentage of accidents, increased from 6% in 2008 to 12% in 2009. There was a strong correlation noted with manual handling on specific aircraft types. Type-specific bounced/hard landing training is essential with proper emphasis on system knowledge. More effective go-around training and standard operating procedures following a bounced landing may have prevented several hard landing accidents that occurred in 2009

Prevention Strategy: The IATA Training and Qualification Initiative (ITQI) will continue to address areas in training that are leading factors in accidents, such as the go-around decision making process. The ITQI program will also emphasize appropriate skills in Multi-Engine Pilot License (MPL) operations relative to the specific type aircraft.

Safety Management Systems (SMS) & Training

- Safety management was a factor in 23% of all accidents in 2009
- Flight crew training was a factor in 20% of all accidents
- Crew training was a factor in 58% of all long, floated or bounced landings in 2009, which in turn represented 35% of all runway excursions

Prevention Strategy: IATA launched an updated SMS Introduction Guide in 2009; the complementary SMS Implementation Guide will be produced in 2010. The IATA Training Development Institute (ITDI) will provide basic and advanced SMS training courses in 2010. In addition, the 2010 IATA Operational Safety Audit (IOSA) Standards Manual (ISM 3rd edition) will be updated in the second quarter of 2010 and will provide the first ICAO compliant, comprehensive SMS implementation specifications. These new IOSA SMS recommended practices will give operators the ability to have their SMS programs assessed against an ICAO recognized set of SMS standards.

Safety in Maintenance Operations

- Gear collapses represented 17% of accidents vs. 7% in 2008. There were no strong pilot handling or weather correlations tied to gear collapses
- Maintenance operations and regulatory oversight were each present as a factor in 27% of events
- While bogus parts continue to be a problem, maintenance configuration control was also identified as a significant factor. These events occur when legitimate parts are improperly utilized during aircraft maintenance.

Prevention Strategy: IATA's Six-Point Safety Program will continue to focus on proper SMS implementation in airline operator maintenance programs, and work to address specifically identified areas such as incorrect configuration control with respect to authentic parts.

Regional Factors

- All regions except Middle East & North Africa (MENA) showed a neutral or downward trend in their accidents rates based on all aircraft types
- The MENA accident rate has been steadily increasing for the last 3 years
  - Operators based in Iran are of particular concern as they accounted for 40% of the region's accidents in 2009 vs. 17% in 2008

Prevention Strategy: IATA will continue to address regional safety issues with its member airlines, non-members, industry partners and regulators. IATA's regional office in Amman, Jordan continues to work with IATA Iranian members to assist them in implementing SMS and other IATA safety programs.

In 2010, IATA continues to work with its members to maintain safety as its top priority. The Global Aviation Safety Roadmap was produced and developed in the interest of establishing a single level of aviation safety worldwide by the Industry Safety Strategy Group (ISSG). IATA plays a key role in this group and in the regional implementation of the roadmap. IATA's safety strategy is coordinated with the roadmap in order to reduce duplication and align efforts worldwide. Through this and other initiatives, IATA is continuing its work with airlines, regulatory authorities and other industry stakeholders to fortify existing safety programs and introduce new initiatives, enhancing operational safety on a global scale.

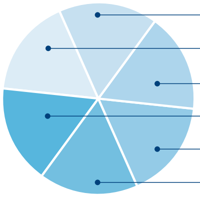
"The Six-Point Safety Program addresses areas of global concern and targets specific regional challenges."

Section 9

IATA Safety Strategy

9

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)

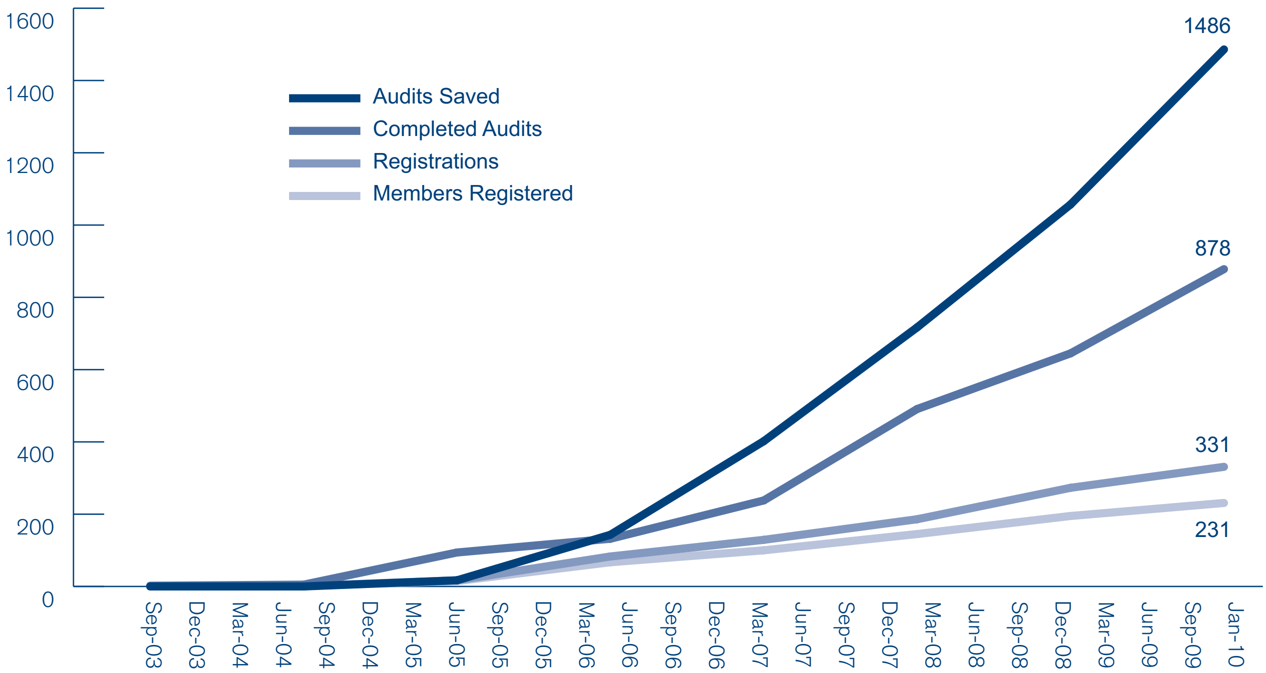
IOSA is the world's first airline safety audit program based on internationally-harmonized standards.

The program is designed to improve the safety levels throughout the entire airline industry, help airlines to share audit resources and reduce the overall number of audits performed. IOSA standards have been upgraded routinely, constantly 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) will be published in the spring of 2010, incorporating the first ICAO recognized SMS auditing standards as recommended practices.

IATA oversees the accreditation of audit and training organizations, ensures continuous development of the IOSA standards and recommended practices and manages the central database of IOSA audit reports. In 2009, IOSA certification became mandatory for IATA member carriers and this goal was achieved by April 2009. IATA member airline safety performance vs. non-members is shown on page 20.

IATA also implements effective quality assurance to provide overall program standardization and to ensure that the program is meeting airline needs as effectively as possible. More information on this program can be found at: www.iata.org/iosa

IOSA Program Status as of 31January 2010



IATA Safety Audit for Ground Operations (ISAGO)

Modeled on the successful IOSA framework, IATA has developed the industry's first global standard for the oversight and auditing of ground handling companies.

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 personal injuries in the ground environment, while also driving down the number of redundant audits.

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.

More information on this program can be found at: 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

Runway safety remains a concern. A quarter of all accidents last year involved a runway excursion. Although no accidents last year involved a runway incursion, airlines continue to report serious incidents of this nature.

The IATA Runway Excursion Risk Reduction Toolkit will address the issues linked to runway safety enhancement, including measures that will mitigate the consequences of runway excursions and the establishment of a standard for braking-action measuring and reporting.

The main focus of the infrastructure safety segment is runway excursions / incursions prevention. The 2nd edition of the Toolkit will be available by the end of 2010. The subsequent dissemination of information will take place by implementing safety workshops.

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 monitor 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 prepare for 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 2010 launch of the Global Safety Information Center (GSIC) will provide unprecedented access to existing IATA safety databases for all IATA members. Accident data, operational safety reports, IOSA and ISAGO audit data, and Flight Data Analysis (FDA) data 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 initiatives for 2010 include the following:

- A substantial expansion of the Safety Trend Evaluation Analysis & Data Exchange System (STEADES) operational safety reporting system to include cabin safety reports. The STEADES program is now the world's largest operational safety database, with over 550,000 reports. 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 data, and the launch of a global FDA data sharing exchange (FDX). IATA provides a Flight Data Analysis Service, with 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 is focused 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 standards will support 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 personal 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 excursions.

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 organisation 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
	Azerbaijan
	Belarus

Region	Country
	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
	Kosovo
	Latvia
	Liechtenstein
	Lithuania
	Luxembourg
	Macedonia
	Malta
	Monaco
	Montenegro
	Netherlands[5]
	Norway
	Poland
	Portugal
	Romania

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Region	Country
	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
	Saint Vincent and the Grenadines
	Suriname
	Trinidad and Tobago
	Uruguay
	Venezuela

Region	Country
MENA	Afghanistan
	Algeria
	Bahrain
	Egypt
	Iran
	Iraq
	Israel
	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

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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

Accident Classification Taxonomy Flight Crew

A2

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

A2

1 Latent Conditions (cont'd)

Technology and Equipment	↗ Available safety equipment not installed (E-GPWS, predictive wind-shear, TCAS / ACAS, etc.)
Flight Operations	See the following breakdown
Flight Operations: Standard Operating Procedures and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs
Flight Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of flight crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Cabin Operations	See the following breakdown
Cabin Operations: Standard Operating Procedures and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs
Cabin Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of cabin crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Ground Operations	See the following breakdown
Ground Operations: SOPs and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs
Ground Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of ground crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices

1 Latent Conditions (cont'd)

Maintenance Operations	See the following breakdown
Maintenance Operations: SOPs and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs ↗ Includes deficiencies in technical documentation, unrecorded maintenance and the use of bogus parts / unapproved modifications
Maintenance Operations: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of maintenance crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Dispatch	See the following breakdown
Dispatch: Standard Operating Procedures and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs
Dispatch: Training Systems	↗ Omitted training, language skills deficiencies, qualifications and experience of dispatchers, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Other	↗ Not clearly falling within the other latent conditions

Note: All areas such as Training, Ground Operations or Maintenance include outsourced functions for which the operator has oversight responsibility.

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2 Threats

Definition: An event or error that occurs outside the influence of the flight crew, but which requires crew attention and management if safety margins are to be maintained.

Mismanaged threat: A threat that is linked to or induces a flight crew error.

Environmental Threats	Examples
Meteorology	See the following breakdown
	↗ Thunderstorms
	↗ Poor visibility / IMC
	↗ Wind / wind shear / gusty wind
	↗ Icing conditions
Lack of Visual Reference	↗ Darkness / black hole effect ↗ Environmental situation, which can lead to spatial disorientation
Air Traffic Services	↗ Tough-to-meet clearances / restrictions ↗ Reroutes ↗ Language difficulties ↗ Controller errors ↗ Failure to provide separation (air / ground)
Wildlife / Birds / Foreign Object	↗ Self-explanatory
Airport Facilities	See the following breakdown
	↗ Poor signage, faint markings ↗ Runway / taxiway closures
	↗ Contaminated runways / taxiways ↗ Poor braking action
	↗ Trenches / ditches ↗ Inadequate overrun area ↗ Structures in close proximity to runway / taxiway

2 Threats (cont'd)

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

2 Threats (cont'd)

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

3 Flight Crew Errors

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

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

Aircraft Handling Errors	Examples
Manual Handling / Flight Controls	↗ Hand flying vertical, lateral, or speed deviations ↗ Approach deviations by choice (e.g., flying below the 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

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3 Flight Crew Errors (cont'd)

Documentation	See the following breakdown
	↗ Wrong weight and balance information, wrong fuel information
	↗ Wrong ATIS, or clearance recorded
	↗ Misinterpreted items on paperwork
	↗ Incorrect or missing log book entries
Failure to go-around after destabilisation during approach	↗ Flight crew does not execute a go-around after stabilization requirements are not met
Other Procedural	↗ Administrative duties performed after top of descent or before leaving active runway ↗ Incorrect application of MEL
Communication Errors	Examples
Crew to External Communication	See breakdown
With Air Traffic Control	↗ Flight crew to ATC – missed calls, misinterpretation of instructions, or incorrect read-backs ↗ Wrong clearance, taxiway, gate or runway communicated
With Cabin Crew	↗ Errors in Flight to Cabin Crew communication ↗ Lack of communication
With Ground Crew	↗ Errors in Flight to Ground Crew communication ↗ Lack of communication
With Dispatch	↗ Errors in Flight Crew to Dispatch ↗ Lack of communication
With Maintenance	↗ Errors in Flight to Maintenance Crew ↗ Lack of communication
Pilot-to-Pilot Communication	↗ Within-crew miscommunication ↗ Misinterpretation

4 Undesired Aircraft States (UAS)

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

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

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Undesired Aircraft States	Breakdown
Aircraft Handling	↗ Abrupt Aircraft Control
	↗ Vertical, Lateral or Speed Deviations
	↗ Unnecessary Weather Penetration
	↗ Unauthorised Airspace Penetration
	↗ Operation Outside Aircraft Limitations
	↗ Unstable Approach
	↗ Continued Landing after Unstable Approach
	↗ Long, Floated, Bounced, Firm, Off-Centreline Landing ↗ Landing with excessive crab angle
	↗ Rejected Take-off after V1
	↗ Controlled Flight Towards Terrain
	↗ Other
Ground Navigation	↗ Proceeding towards wrong taxiway / runway
	↗ Wrong taxiway, ramp, gate or hold spot
	↗ Runway / taxiway incursion
	↗ Ramp movements, including when under marshalling
	↗ Loss of aircraft control while on the ground
	↗ Other

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4 Undesired Aircraft States (UAS) (cont'd)

Incorrect Aircraft Configurations	↗ Brakes, Thrust Reversers, Ground Spoilers
	↗ Systems (Fuel, Electrical, Hydraulics, Pneumatics, Air Conditioning, Pressurization / Instrumentation
	↗ Landing Gear
	↗ Flight Controls / Automation
	↗ Engine
	↗ Weight & Balance
	↗ Other

5 End States

Definition: An end state is a reportable event. It is **unrecoverable**.

End States	Definitions
Controlled Flight into Terrain (CFIT)	↗ In-flight collision with terrain, water, or obstacle without indication of loss of control
Loss of Control In-flight	↗ Loss of aircraft control while in-flight
Runway Collision	↗ Any occurrence at an aerodrome involving the incorrect presence of an aircraft, vehicle, person or wildlife on the protected area of a surface designated for the landing and take-off of aircraft and resulting in a collision
Mid-air Collision	↗ Collision between aircraft in flight
Runway Excursion	↗ A veer off or overrun off the runway 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

A2

6 Flight Crew Countermeasures

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

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

6 Flight Crew Countermeasures (cont'd)

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

7 Additional Classifications

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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

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Annex 3

Accident Classification Taxonomy Cabin Crew

1 Latent Conditions

Definition: Conditions present in the system before the accident, made evident by triggering factors.

Note: these are the same categories as for flight crew.

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

1 Latent Conditions (cont'd)

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Operations Planning and Scheduling	↗ Deficiencies in crew rostering and staffing practices ↗ Issues with flight and duty time limitations ↗ Health and welfare issues
Technology and Equipment	↗ Available safety equipment not installed (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: 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
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

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1 Latent Conditions (cont'd)

Maintenance Operations	See the following breakdown
Maintenance 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 ↗ Includes deficiencies in technical documentation, unrecorded maintenance and the use of bogus parts / unapproved modifications
Maintenance Operations: Training Systems	↗ Omitted training, language skills deficiencies; qualifications and experience of maintenance crews, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Dispatch	See the following breakdown
Dispatch: Standard Operating Procedures and Checking	↗ Deficient or absent: (1) Standard Operating Procedures (SOPs), (2) operational instructions and / or policies, (3) company regulations, (4) controls to assess compliance with regulations and SOPs
Dispatch: Training Systems	↗ Omitted training, language skills deficiencies; qualifications and experience of dispatchers, operational needs leading to training reductions, deficiencies in assessment of training or training resources such as manuals or CBT devices
Other	↗ Not clearly falling within the other latent conditions

Note: All areas such as Training, Ground Operations or Maintenance include outsourced functions for which the operator has oversight responsibility.

2 Threats

Definition: An event or error that occurs outside the influence of the cabin 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 cabin crew error.

Environmental threats	Examples
Meteorology	↗ Adverse weather / turbulence
Airport Facilities	See the following breakdown
	↗ Trenches / ditches ↗ Inadequate overrun area ↗ Structures in close proximity to runway / taxiway that impede evacuation or post crash survivability
	↗ Inadequate airport emergency response
Other	↗ Not clearly falling within the other environmental threats

Airline threats	Examples
Operational	↗ Time pressures / delays ↗ Flight diversion ↗ Traffic and ground congestion
Abnormal / Emergency Operations	↗ Rejected take-off ↗ Emergency landing / ditching ↗ Decompression
Configuration	↗ Particular cabin / galley configuration ↗ Systems / safety equipment and / or its location differ from other aircraft in the fleet
MEL Item	↗ MEL items with operational implications
Flight Deck Events	↗ Pilot incapacitation ↗ Flight crew error / distraction / interruption
Ground Events	↗ Aircraft loading events ↗ Fueling errors ↗ Agent interruptions ↗ Improper ground support ↗ Improper de-icing / anti-icing ↗ Faulty service equipment boarded ↗ Catering crew errors
Dispatch / Paperwork	↗ Passenger load errors ↗ Crew scheduling events ↗ Late paperwork changes or errors

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2 Threats (cont'd)

Maintenance Events	↗ Aircraft repairs on ground ↗ Maintenance log / cabin defect logbook 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 / Checklists	↗ Incorrect / unclear pages or operating manuals ↗ Checklist layout / design issues
Aircraft / Cabin Malfunction	See the following breakdown
Engine Failure	↗ Contained or uncontained engine failure ↗ Fragments penetrating the cabin
Gear / Tire / Brakes	↗ Failure affecting parking, taxi, take-off or landing ↗ Gear penetrating aircraft cabin ↗ Gear collapse affecting the use of exits
Fire / Smoke / Fumes	↗ Fire / smoke / fumes due to aircraft systems ↗ Post-crash fire
Structural failure	↗ Break-up of fuselage ↗ Damage inside the cabin impeding egress ↗ Damage resulting in slow / rapid decompression
Exit / Escape Slide Malfunction	↗ Failure of escape slides to deploy ↗ Exits obstructed due to malfunction or structural damage
Cabin Equipment Malfunction	↗ Unserviceable portable equipment (fire extinguishers, O_2 bottles, etc.)
Cabin Systems Malfunction	↗ Failure affecting: electrical systems (including battery power), lighting systems, electronic systems (control panels, IFE), water systems, cabin pressurisation or communication systems
Other	↗ Not clearly falling within the other aircraft malfunction threats

2 Threats (cont'd)

Passenger threats	Examples
Abusive or Unruly Passengers	↗ Includes physical / verbal abuse towards cabin crew and other passengers, as well as cases of intoxication
Passengers Smoking in the Cabin or Lavatory	↗ Self-explanatory
Passengers Standing During Turbulence / Critical Phases	↗ Passengers are not seated during take-off, landing, turbulence, etc.
Baggage Not Stowed	↗ Passengers do not stow baggage during critical phases of flight / turbulence
Undeclared Dangerous Goods in the Cabin	↗ Passenger boards articles or substances in the cabin, which are capable of posing a significant risk to health, safety or property when transported by air
Medical Events	↗ Medical situation involving passenger
Non-Compliance to Cabin Crew Instructions	↗ Passengers refuse to leave baggage behind during evacuation ↗ Passengers attempt to use blocked exits ↗ Passengers begin an evacuation without the crew's instruction ↗ Passengers disregard any other order given by the cabin crew

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3 Cabin Crew Errors

Definition: An observed cabin crew deviation from organisational expectations or crew intentions.

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

Cabin Management Errors	Examples
Passenger	↗ Passengers allowed to stand during critical phases / turbulence ↗ Cabin not secured before take-off and landing
Medical Emergencies and First-Aid	Errors in handling: ↗ Life-threatening medical emergencies ↗ Cardiopulmonary resuscitation (CPR) ↗ Treatment of injuries ↗ Treatment of illnesses and diseases ↗ First-aid medical equipment and supplies
Emergency Assignments	↗ Errors in assignment of duties during planned or unplanned emergency
Exits	↗ Cabin crew do not arm doors for flight ↗ Cabin crew open doors in wrong mode ↗ Cabin crew allow exits / areas around exits / exit routes to be obstructed ↗ Crew allow non-Able Bodied Passengers (ABP) to be seated at overwing exits
Systems / Equipment	↗ Incorrect system settings / use ↗ Incorrect use of equipment (e.g. Halon extinguisher vs. water) ↗ Crew exceed limitations for resetting tripped electrical system circuit breakers during flight ↗ Crew do not stow / secure equipment ↗ Crew do not pre-flight check equipment
Cabin Baggage	↗ Crew do not stow / secure baggage
Other	↗ Not clearly falling within the other errors

3 Cabin Crew Errors (cont'd)

Procedural Errors	Examples
SOP Adherence / SOP Cross-Verification	↗ Intentional / unintentional failure to follow SOP ↗ Sterile cockpit violations
Checklist	See the following breakdown
Normal Checklist	↗ Checklist performed from memory or omitted ↗ Checklist performed late or at wrong time ↗ Checklist items missed
Abnormal Checklist	↗ Checklist performed from memory or omitted ↗ Checklist performed late or at wrong time ↗ Checklist items missed
Shouted Commands	↗ Omitted / incomplete shouted commands during planned or unplanned emergency
Briefings	↗ Omitted pre-flight crew or handover briefing; items missed ↗ Briefing does not address expected situation ↗ Omitted passenger safety demonstration; items missed; including special needs passengers and emergency exit briefings ↗ Video malfunction not monitored during safety briefing
Documentation	See the following breakdown
	↗ Wrong information entered
	↗ Misinterpreted items on paperwork
	↗ Incorrect or missing log book entries
Other Procedural	↗ Administrative / service duties performed during critical phases of flight ↗ Service procedures violate safety procedures ↗ Other

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3 Cabin Crew Errors (cont'd)

Communication Errors	Examples
Crew to External Communication	See the following breakdown
With Flight Crew	↗ Errors in Cabin to Flight Crew communication ↗ Missed calls, misinterpretation of instructions, or incorrect read-backs ↗ Wrong information communicated ↗ Lack of communication
With Ground Crew / Maintenance	↗ Errors in Cabin Crew to Ground / Maintenance communication ↗ Lack of communication
With Passengers	↗ Errors in Cabin Crew to Passenger communication ↗ Lack of communication ↗ Able Bodied Passengers and / or Passengers with Reduced Mobility (PRMs) not briefed on emergency procedures ↗ Language barriers
Cabin Crew-to-Cabin Crew Communication	↗ Within-cabin crew miscommunication ↗ Lack of communication ↗ Misinterpretation

4 Undesired Cabin / Aircraft States

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

Mismanaged Undesired State: An Undesired State that is linked to or induces additional cabin crew errors.

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Undesired Cabin / Aircraft States	Examples
Cabin Management	↗ Cabin / galley not secured
	↗ Crew not seated / seatbelt not fastened
	↗ Seats / tray tables not in up-right position ↗ Curtains & dividers not open for take-off and landing
	↗ Crew rest area not vacated for landing
	↗ Passengers not braced for forced landing
	↗ Aisles / exits obstructed
	↗ Exits unmanned by cabin crew
	↗ Exits not manned by able bodied passengers
	↗ Passengers unaware of how to open exits
	↗ Inappropriate exits opened by cabin crew (fire, water, debris, unusual a/c pitch)
	↗ Delays in commencing evacuation
	↗ Uncommanded evacuation
	↗ Fire / smoke not monitored (including post-extinguishment)
	↗ Other
Ground States	↗ Passengers smoking during refueling
	↗ Designated evacuation doors left unarmed or unmanned, passengers not briefed on SOPs during refueling
	↗ Isles / exits obstructed
	↗ Oversize / overweight baggage boarded
	↗ Unclaimed baggage left on board
	↗ Doors left armed during a stopover
	↗ Other
Incorrect Cabin Configuration	↗ Cabin systems (electrical, lighting, electronic, water, communication)
	↗ Escape slides
	↗ Galley systems
	↗ Safety equipment
	↗ Other

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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
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

Note: End States (or "accident categories") remain the same as for the flight crew taxonomy but include the following "Additional End States for Cabin".

5 End States (cont'd)

Additional End States (Cabin)	Definitions
Rapid deplaning	↗ Passengers exit aircraft via jet bridge or stairs
Evacuation	↗ Passengers exit aircraft via escape slides or gaps in fuselage
Ditching	↗ Water landing / evacuation

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Annex 4 2009 Accidents Summary

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DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-01-02	Antonov	An-12	British Gulf International Airlines	Sharjah – International, Dubai United Arab Emirates	TOF	Cargo	Eastern-built	Turboprop	Substantial Damage	Runway excursion after gear collapse
2009-01-11	Xian Aircraft Company Limited	MA-60	Zest Airways	Caticlan Malay Airport	LND	Passenger	Western-built	Turboprop	Hull Loss	Undershoot on landing
2009-01-15	Airbus	A320	US Airways	Hudson River,New York,USA	ECL	Passenger	Western-built	Jet	Hull Loss	Damaged during take-off climb due to bird strike; ditched in Hudson River
2009-01-17	Fokker	F.100	Iran Air	Yazd Airport, Iran	GDS	Passenger	Western-built	Jet	Substantial Damage	Aircraft struck by ground vehicle
2009-01-19	Fokker	F.100	Iran Air	Mehrabad International Airport, Iran (OIII)	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion after apparent main gear failure
2009-01-27	ATR	ATR 42	Empire Airlines	Lubbock – International, USA	LND	Cargo	Western-built	Turboprop	Hull Loss	Aircraft undershot on landing
2009-02-07	Embraer	EMB-110 Bandeirante	Manaus Aero Taxi	Manacapuru River, Manacapuru, Brazil	CRZ	Passenger	Western-built	Turboprop	Hull Loss	Aircraft destroyed during ditching
2009-02-09	Airbus	A321	Air Mediterranee	Charles de Gaulle International Airport, Paris, France	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion following landing
2009-02-12	Bombardier	Dash 8	Colgan Air	near Buffalo, New York, USA	APR	Passenger	Western-built	Turboprop	Hull Loss	Aircraft struck a house during approach
2009-02-12	BAE SYSTEMS	Jetstream 31	Sky Express Airlines	Heraklion International Airport, Heraklion, Greece	TXI	Passenger	Western-built	Turboprop	Hull Loss	Undercarriage collapse
2009-02-13	BAE SYSTEMS	RJ Avroliner	BA Cityflyer	London City Airport, UK	LND	Passenger	Western-built	Jet	Hull Loss	Undercarriage collapsed during landing
2009-02-14	Construcciones Aeronauticas	SA C-212-CC	Arctic Transportation Services	Kotzebue Airport	LND	Cargo	Western-built	Jet	Substantial Damage	Undershoot
2009-02-16	Boeing	B737	SAGA Airlines	In Amenas, Algeria	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion on landing
2009-02-19	Airbus	A320	Atlasjet Airlines	Istanbul Ataturk Int'l, Turkey	GDS	Passenger	Western-built	Jet	Substantial Damage	Aircraft collided with obstacle during pushback
2009-02-23	Boeing	MD-90	Lion Air	Hang Nadim International Airport, Batam, Indonesia	LND	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2009-02-25	Boeing	B737	Turkish Airlines	(near) Schiphol Airport, Amsterdam, Netherlands	APR	Passenger	Western-built	Jet	Hull Loss	The aircraft crashed during the final stage of approach

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-02-28	Bombardier	CRJ Regional Jet	Atlantic Southeast Airlines	Tallahassee Regional Airport, Tallahassee, Florida, USA	ESD	Passenger	Western-built	Jet	Substantial Damage	Damage by fire
2009-03-03	Fairchild (Swearingen)	Metro	Perimeter Airlines	Winnipeg International Airport,Winnipeg,Manitoba,Canada	APR	Passenger	Western-built	Turboprop	Substantial Damage	Gear-up landing
2009-03-09	Boeing	MD-90	Lion Air	Soekarno-Hatta International, Indonesia	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion on landing
2009-03-20	Airbus	A340	Emirates Airline	Melbourne – International, Victoria, Australia	TOF	Passenger	Western-built	Jet	Substantial Damage	Tailstrike on take-off
2009-03-23	Boeing	MD-11	FedEx	Tokyo – Narita/New Tokyo International, Japan	LND	Cargo	Western-built	Jet	Hull Loss	Crashed on landing
2009-04-01	Embraer	EMB-110 Bandeirante	Aberdair Airlines	Boh, Ethiopia	TOF	Cargo	Western-built	Turboprop	Substantial Damage	
2009-04-04	Airbus	A321	Air China	Beijing International Airport, Beijing, China	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2009-04-09	BAE SYSTEMS	BAe-146	Aviastar Mandiri	Gunung Pike Mountain,(near) Wamena,Indonesia	APR	Cargo	Western-built	Jet	Hull Loss	CFIT
2009-04-12	Airbus	A320	Wizz Air	Giarmata Airport,Timisoara, Romania	LND	Passenger	Western-built	Jet	Substantial Damage	Hard Landing – 'wheel barrowed' landing
2009-04-16	Boeing	B747	Jade Cargo International	Incheon International Airport,Seoul,South Korea	LND	Cargo	Western-built	Jet	Substantial Damage	Runway excursion on landing
2009-04-20	Bombardier	Dash 8	Mesa Airlines	Phoenix – Sky Harbor International, USA	TXI	Passenger	Western-built	Turboprop	Substantial Damage	Collision with ground object
2009-04-20	Boeing	B767	Royal Air Maroc	New York – JFK International, NY, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2009-04-27	Boeing	B737	Magnicharters	Guadalajara – Miguel Hidalgo y Costilla, Mexico	LND	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2009-04-29	Boeing	B737	Bako Air	Massamba area, 120 km SE of Kinshasa (Democratic Republic of Congo)	CRZ	Cargo	Western-built	Jet	Hull Loss	Crash while enroute
2009-05-04	Airbus	A320	Northwest Airlines	Denver International Airport, Denver, Colorado, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Tailstrike on landing

Annex 4 2009 Accidents Summary (Cont'd)

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-05-06	Boeing	DC-10	World Airways	Washington International Airport, Baltimore, Maryland, USA	LND	Passenger	Western-built	Jet	Hull Loss	Hard landing
2009-05-07	Airbus	A320	Nas Air	Alexandria – International, Egypt	LND	Passenger	Western-built	Jet	Substantial Damage	Hard landing
2009-05-08	Boeing	B747	Asiana Airlines	Frankfurt International Airport,Germany	LND	Cargo	Western-built	Jet	Substantial Damage	Airframe failure
2009-05-08	Tupolev	Tu-154	Iran Air Tours	Mashad – Shahid Hashemi Nejad, Iran	ECL	Passenger	Eastern-built	Jet	Substantial Damage	Damaged by hail in-flight
2009-05-08	Boeing	MD-90	Saudi Arabian Airlines	King Khaled International Airport, Riyadh Saudi Arabia	LND	Ferry	Western-built	Jet	Hull Loss	Runway excursion on landing
2009-05-14	Hawker Beechcraft	1900	Air Ethiopia	Bole Airport, Addis Ababa, Ethiopia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Landed with gear retracted
2009-05-26	Antonov	AN-26	Service Air	Near Airport Isiro	APR	Cargo	Eastern-built	Turboprop	Hull Loss	CFIT
2009-05-30	ATR	ATR 42	Pakistan International Airlines	Lahore Airpor, Pakistan	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion on landing
2009-06-01	Airbus	A330	Air France	In sea, 200 miles NE of Natal, Brazil	CRZ	Passenger	Western-built	Jet	Hull Loss	Aircraft impacted ocean
2009-06-03	Boeing	MD-11	China Cargo Airlines	Diwopu Airport, Urumqi, China	LND	Cargo	Western-built	Jet	Substantial Damage	Hard landing
2009-06-03	Boeing	B737	Nordavia- Aeroflot-Nord	In flight,(near) Moscow,Russia	CRZ	Passenger	Western-built	Jet	Substantial Damage	In-flight damage by hail
2009-06-06	Fokker	F.28	Myanma Airways	Sittwe Airport (VYSW), Union of Myanmar (Burma)	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion on landing
2009-06-09	Boeing	MD-11	Saudi Arabian Airlines	Khartoum Airport, Khartoum, Sudan	LND	Cargo	Western-built	Jet	Substantial Damage	Hard landing
2009-06-11	Bombardier	CRJ Regional Jet	Atlantic Southeast Airlines	Hartsfield International Airport, Atlanta, Georgia, USA	LND	Passenger	Western-built	Jet	Substantial Damage	Runway excursion after gear-up landing
2009-06-14	M7 Aerospace	Do-328	Express Air	Tanahmerah Airport,Tanahmerah, Indonesia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion on landing
2009-06-15	Boeing	DC-10	Avient Aviation	Idris International Airport,Tripoli,,Libya	ICL	Cargo	Western-built	Jet	Substantial Damage	Suspected birdstrike
2009-06-25	Xian Aircraft Company Limited	MA60	Zest Airways	Caticlan-Malay Airport, Malay, Philippines	LND	Passenger	Eastern-built	Turboprop	Substantial Damage	Runway excursion on landing

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-06-26	Let	L-410 Turbolet	TAC – Transporte Aereo De Colombia	Capurgana Airport, Capurgana, Colombia	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Runway excursion on landing
2009-06-30	Airbus	A310	Yemenia Airways	off Mitsamiouli (Comoros)	GOA	Passenger	Western-built	Jet	Hull Loss	Impacted the ocean during attemepted go-around
2009-07-06	Antonov	An-28	El Magal Aviation	Saraf Omra Airport,Saraf Omra,,Sudan	LND	Cargo	Eastern-built	Turboprop	Hull Loss	Undershoot on landing
2009-07-15	Tupolev	Tu-154	Caspian Airlines	near Jannalabad, Iran	CRZ	Passenger	Eastern-built	Jet	Hull Loss	Crashed after takeoff due to suspected technical problems
2009-07-21	Boeing	B737	Aeromexico	San Francisco – International, CA, USA	ESD	Passenger	Western-built	Jet	Substantial Damage	Gear collapse
2009-07-24	Ilyushin	Il-62	Aria Air	Shahid Hashemi Nejad Airport, Mashad, Iran	LND	Passenger	Eastern-built	Jet	Hull Loss	Runway excursion on landing
2009-08-03	Airbus	A320	Wind Jet	Parma, Italy	TOF	Passenger	Western-built	Jet	Substantial Damage	Birdstrike on take-off
2009-08-04	ATR	ATR 72	Bangkok Airways	Koh Samui Airport,Koh Samui,Thailand	LND	Passenger	Western-built	Turboprop	Hull Loss	Runway excursion on landing
2009-08-04	Airbus	A320	SATA Internacional	Ponta Delgada Airport, Portugal	LND	Passenger	Western-built	Jet	Substantial Damage	Damaged during hard landing
2009-08-15	Antonov	An-24	Uzbekistan Airways	Zarafshan Airport, Zarafshan, Uzbekistan	TOF	Passenger	Eastern-built	Turboprop	Hull Loss	Undercarriage retracted during take-off roll
2009-08-26	Antonov	An-12	Aero-Fret Business	6 nm short of the Runway 05 of Maya Maya Airport, Brazzaville	APR	Cargo	Eastern-built	Jet	Hull Loss	Crashed on approach
2009-09-01	Airbus	A320	Air Vallee	Verona – Valerio Catullo , Italy	TOF	Passenger	Western-built	Jet	Substantial Damage	Tailstrike
2009-09-04	Boeing	B747	Air India	Chhatrapati Shivaji International Airport, Mumbai, India	ESD	Passenger	Western-built	Jet	Substantial Damage	Damaged by fire after pushback
2009-09-13	Boeing	MD-11	Lufthansa Cargo	Mexico City – Benito Juarez, Mexico	LND	Cargo	Western-built	Jet	Substantial Damage	Hard landing
2009-09-14	Fokker	F.100	Contact Air	Echterdingen Airport, Stuttgart, Germany	LND	Passenger	Western-built	Jet	Substantial Damage	Gear-up landing
2009-09-18	EADS – CASA	C-212	Bering Air	Savoonga, AK, USA	LND	Cargo	Western-built	Turboprop	Substantial Damage	Runway excursion on landing
2009-09-24	Bae Systems	Jetstream 41	Airlink-SA Airlink	Durban – Louis Botha/ International, South Africa	ICL	Ferry	Western-built	Turboprop	Hull Loss	Crashed on take-off due to technical problems

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Annex 4 2009 Accidents Summary (Cont'd)

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-10-01	Airbus	A319	Wind Jet	En Route near Catania, Italy	CRZ	Passenger	Western-built	Jet	Substantial Damage	Aircraft damaged by hail
2009-10-02	Boeing	737	Malaysia Airlines	Kuching Airport, Kuching, Malaysia	AES	Passenger	Western-built	Jet	Substantial Damage	Gear collapse on stand
2009-10-06	Boeing	737	Boliviana de Aviacion	in flight,(near) Cochabamba,Bolivia	CRZ	Passenger	Western-built	Jet	Substantial Damage	Damaged by hail
2009-10-15	Antonov	An-28	Blue Wing Airlines	Kwamalasamutu, Suriname	LND	Passenger	Eastern-built	Turboprop	Hull Loss	Landed abeam of runway
2009-10-20	Boeing	MD-11	Centurion Air Cargo	Montevideo – Carrasco Int'l, Uruguay	LND	Cargo	Western-built	Jet	Substantial Damage	Hard landing
2009-10-21	Boeing	B707	Azza Transport Company	Sharjah – International, United Arab Emirates	TOF	Cargo	Western-built	Jet	Hull Loss	Crashed on take-off; destroyed by fire
2009-10-22	Fairchild (Swearingen)	Do-228	Island Aviation Inc	Amanpulo Airstrip, Amanpulo, Philippines	LND	Passenger	Western-built	Turboprop	Substantial Damage	Landed with undercarriage retracted
2009-10-30	Boeing	B737 (NG)	Pegasus Airlines	Malatya – Erhac, Turkey	TXI	Passenger	Western-built	Jet	Substantial Damage	Aircraft struck a light pole
2009-11-03	Xian	MA-60	Air Zimbabwe	Harare-Intl, Zimbabwe	TOF	Passenger	Eastern-built	Turboprop	Substantial Damage	Runway excursion after rejected take-off
2009-11-08	Fairchild (Swearingen)	Metro	Euro Continental Air	Barcelona – El Prat, Spain	LND	Passenger	Western-built	Turboprop	Substantial Damage	Hard Landing
2009-11-09	Hawker Beechcraft	1900	Blue Bird Aviation	(near) Wilson Airport,Nairobi,,Kenya	LND	Cargo	Western-built	Turboprop	Hull Loss	Undershoot
2009-11-10	Bombardier	Dash 8	Air Nostrum	San Sebastian-Intl AP	LND	Passenger	Western-built	Turboprop	Substantial Damage	Birdstrike
2009-11-10	ATR	ATR 72	Kingfisher Airlines	Mumbai – Chhatrapati Shivaji International, India	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion on landing
2009-11-12	Bombardier	CRJ Regional Jet	RawandAir	Kigali – Gregoire Kayibanda, Rwanda	TXI	Passenger	Western-built	Jet	Hull Loss	Impacted building due to technical problem
2009-11-18	Fokker	F.100	Iran Air	Isfahan, Iran	LND	Passenger	Western-built	Jet	Substantial Damage	Gear collapse and fire after landing
2009-11-19	Boeing	MD-80	CAA – Compagnie Africaine d'Aviation	Goma – International, DR Congo	LND	Passenger	Western-built	Jet	Hull Loss	Runway excursion on landing
2009-11-27	Boeing	MD-11	Avient Aviation	Shanghai-Pu Dong Airport, China	TOF	Cargo	Western-built	Jet	Hull Loss	Crashed on takeoff
2009-12-01	Fairchild (Swearingen)	Metro	AeroCon	Trinidad – Jorge Henrich Arauz, Bolivia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway Excursion – Veer Off

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	SERVICE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-12-01	Boeing	727	TAF Linhas Aereas	Sao Paulo – Guarulhos International, Brazil	TXI	Cargo	Western-built	Jet	Substantial Damage	Collision with a building
2009-12-02	Fokker	F-100	Merpati Nusantara Airlines	Kupang – Eltari, Indonesia	LND	Passenger	Western-built	Jet	Substantial Damage	Runway Excursion – veer off
2009-12-07	Embraer	ERJ-135	Airlink – SA Airlink	George Airport, South Africa	LND	Passenger	Western-built	Jet	Hull Loss	Runway Excursion
2009-12-19	BAE SYSTEMS	HS 748	748 Air Services	Tonj Airport, Tonj, Sudan	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway Excursion
2009-12-20	Fairchild (Swearingen)	Metro	Western Air	Cap Haitien International Airport,Cap Haitien,,Haiti	LND	Passenger	Western-built	Turboprop	Substantial Damage	Gear failed to Extend
2009-12-22	Boeing	737	American Airlines	Kingston – Norman Manley Intl Airport, Jamaica	LND	Passenger	Western-built	Jet	Hull Loss	Runway Excursion on Landing
2009-12-27	Fairchild (Swearingen)	Metro	AeroCon	Ernesto Roca Airport, Guayaramerin, Bolivia	LND	Passenger	Western-built	Turboprop	Substantial Damage	Runway excursion on landing

Annex 5 2009 Cabin Safety-related Events Summary

DATE	MANUFACTURER	AIRCRAFT	OPERATOR	LOCATION	PHASE	ORIGIN	JET/TURBOPROP	SEVERITY	SUMMARY
2009-01-15	Airbus	A320	US Airways	Hudson River, New York, USA	ECL	Western-built	Jet	Hull Loss	Damaged during take-off climb due to bird strike; ditched in Hudson River.
2009-01-17	Fokker	F.100	Iran Air	Yazd Airport, Iran	GDS	Western-built	Jet	Substantial Damage	Aircraft struck by ground vehicle.
2009-01-19	Fokker	F.100	Iran Air	Mehrabad International Airport, Iran	LND	Western-built	Jet	Hull Loss	Runway excursion after apparent main gear failure.
2009-02-07	Embraer	EMB-110 Bandeirante	Manaus Aero Taxi	Manacapuru River, Manacapuru, Brazil	CRZ	Western-built	Turboprop	Hull Loss	Aircraft destroyed during ditching.
2009-02-12	BAE SYSTEMS	Jetstream 31	Sky Express Airlines	Heraklion International Airport, Heraklion, Greece	TXI	Western-built	Turboprop	Hull Loss	Undercarriage collapse.
2009-02-13	BAE SYSTEMS	RJ Avroliner	BA Cityflyer	London City Airport, London, UK	LND	Western-built	Jet	Hull Loss	Undercarriage collapsed during landing.
2009-02-16	Boeing	B737	SAGA Airlines	In Amenas, Algeria	LND	Western-built	Jet	Substantial Damage	Runway excursion on landing.
2009-02-19	Airbus	A320	Atlasjet Airlines	Istanbul Ataturk Int'l, Turkey	GDS	Western-built	Jet	Substantial Damage	Aircraft collided with obstacle during pushback.
2009-02-23	Boeing	MD-90	Lion Air	Hang Nadim International Airport, Batam, Indonesia	LND	Western-built	Jet	Substantial Damage	Gear-up landing.
2009-02-25	Boeing	B737	Turkish Airlines	(near) Schiphol Airport, Amsterdam, Netherlands	APR	Western-built	Jet	Hull Loss	The aircraft crashed during the final stage of approach.
2009-03-09	Boeing	MD-90	Lion Air	Soekarno-Hatta International, Indonesia	LND	Western-built	Jet	Hull Loss	Runway excursion on landing.
2009-03-20	Airbus	A340	Emirates Airline	Melbourne - International, Victoria, Australia	TOF	Western-built	Jet	Substantial Damage	Tail strike on take-off.
2009-04-04	Airbus	A321	Air China	Beijing International Airport, Beijing, China	LND	Western-built	Jet	Substantial Damage	Hard landing.
2009-04-20	Bombardier	Dash 8	Mesa Airlines	Phoenix - Sky Harbor International, USA	TXI	Western-built	Turboprop	Substantial Damage	Collision with ground object.
2009-04-27	Boeing	B737	Magnicharters	Guadalajara - Miguel Hidalgo y Costilla, Mexico	LND	Western-built	Jet	Substantial Damage	Gear-up landing.
2009-05-04	Airbus	A320	Northwest Airlines	Denver International Airport, Denver, Colorado, USA	LND	Western-built	Jet	Substantial Damage	Tailstrike on landing.
2009-05-14	Hawker Beechcraft	1900	Air Ethiopia	Bole Airport, Addis Ababa, Ethiopia	LND	Western-built	Turboprop	Substantial Damage	Landed with gear retracted.
2009-05-30	ATR	ATR 42	Pakistan International Airlines	Lahore Airpor, Pakistan	LND	Western-built	Turboprop	Substantial Damage	Runway excursion on landing.

2009-06-01	Airbus	A330	Air France	In sea, 200 miles NE of Natal, Brazil	CRZ	Western-built	Jet	Hull Loss	Aircraft impacted ocean.
2009-06-03	Boeing	B737	Nordavia- Aeroflot-Nord	In flight, (near) Moscow, Russia	CRZ	Western-built	Jet	Substantial Damage	In-flight damage by hail.
2009-06-06	Fokker	F.28	Myanma Airways	Sittwe Airport (VYSW), Union of Myanmar (Burma)	LND	Western-built	Jet	Hull Loss	Runway excursion on landing.
2009-06-11	Bombardier	CRJ Regional Jet	Atlantic Southeast Airlines	Hartsfield International Airport, Atlanta, Georgia, USA	LND	Western-built	Jet	Substantial Damage	Runway excursion after gear-up landing.
2009-07-21	Boeing	B737	Aeromexico	San Francisco - International, USA	ESD	Western-built	Jet	Substantial Damage	Gear collapse.
2009-08-03	Airbus	A320	Wind Jet	Parma, Italy	TOF	Western-built	Jet	Substantial Damage	Birdstrike on take-off.
2009-08-04	ATR	ATR 72	Bangkok Airways	Koh Samui Airport,Koh Samui,Thailand	LND	Western-built	Turboprop	Hull Loss	Runway excursion on landing.
2009-09-01	Airbus	A320	Air Vallee	Verona - Valerio Catullo , Italy	TOF	Western-built	Jet	Substantial Damage	Tailstrike.
2009-09-04	Boeing	B747	Air India	Chhatrapati Shivaji International Airport, Mumbai, India	ESD	Western-built	Jet	Substantial Damage	Damaged by fire after push-back.
2009-09-14	Fokker	F.100	Contact Air	Echterdingen Airport, Stuttgart, Germany	LND	Western-built	Jet	Substantial Damage	Gear-up landing.
2009-10-30	Boeing	B737 (NG)	Pegasus Airlines	Malatya - Erhac, Turkey	TXI	Western-built	Jet	Substantial Damage	Aircraft struck a light pole.
2009-11-10	ATR	ATR 72	Kingfisher Airlines	Mumbai - Chhatrapati Shivaji International, India	LND	Western-built	Turboprop	Substantial Damage	Runway excursion on landing.
2009-11-12	Bombardier	CRJ Regional Jet	RawandAir	Kigali - Gregoire Kayibanda, Rwanda	TXI	Western-built	Jet	Hull Loss	Impacted building due to technical problem.
2009-11-18	Fokker	F.100	Iran Air	Isfahan, Iran	LND	Western-built	Jet	Substantial Damage	Gear collapse and fire after landing.
2009-11-19	Boeing	MD-80	CAA - Compagnie Africaine d'Aviation	Goma - International, DR Congo	LND	Western-built	Jet	Hull Loss	Runway excursion on landing.
2009-12-02	Fokker	F-100	Merpati Nusantara Airlines	Kupang - Eltari, Indonesia	LND	Western-built	Jet	Substantial Damage	Runway Excursion - veer off
2009-12-07	Embraer	ERJ-135	Airlink - SA Airlink	George Airport, South Africa	LND	Western-built	Jet	Hull Loss	Runway Excursion

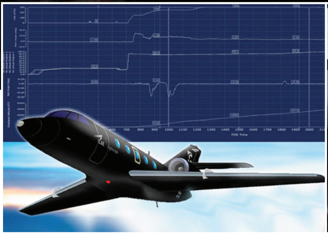
LIST OF ACRONYMS

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
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

LIST OF ACRONYMS (Cont'd)

TEM Threat and Error Management
TIPH Taxi into Position and Hold
TOF Take-off (ATA Phase of Flight)
TXI Taxi-in (ATA Phase of Flight)
TXO Taxi-out (ATA Phase of Flight)
UAS Undesired Aircraft State
WGS-84 World Geodetic System 1984



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