Safety Report

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International Air Transport Association
Montreal – Geneva

Safety Report
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FOREWORD

Dear Colleagues,

It is a great pleasure to present you the 41st edition of the IATA Safety Report, which was developed in collaboration with the safety experts from IATA and Member Airlines, the aeronautical industry and regulatory boards. Together, we make the effort to uncover issues that threaten safety, early in the new year, and takes action to ensure that safety is continuously enhanced.

IATA's safety goal is to reduce the accident rate a further 25% by 2006. Last year, IATA Members significantly outperformed the industry on safety. IATA's 275 Member Airlines account for 94% of scheduled international traffic but were only involved in under a third of accidents.

Reviewing past years' data, we can say that 2004 was the safest year ever for air transport, as the industry continues to invest in our number one priority with excellent results.

As the industry becomes more and more proactive, IATA has implemented a data-driven approach. IATA turns its attention not only to accidents, but also more actively towards incident analysis with its Safety Trend Evaluation, Analysis & Data Exchange System (STEADES) Programme. The successful expansion of the IATA Operational Safety Audit (IOSA) and the introduction of Flight Data Analysis allow IATA to focus on airlines' organisational issues and normal operations. All these programmes combined provide IATA with a complete picture facing the airlines today and enable it to take action.

I wish to thank the IATA Safety Committee (SAC) and its Accident Classification Working Group (ACWG) as well as the entire safety team at IATA.

The Safety Report will help us to achieve our goal and to continue the improvement of safety.

Günther Matschnigg
Senior Vice President
Safety, Operations & Infrastructure

LIST OF ACRONYMS

AACO	Arab Air Carriers Organization
ACAS	Airborne Collision Avoidance Systems
ACWG	IATA Accident Classification Working Group
ACI	Airports Council International
ATDI	IATA Aviation Training and Development Institute
AENA	Spanish Aviation Authority
AES	Arrival/Engine Shutdown (ATA Phase of Flight)
AF	Africa (IATA Regions)
AGAS	European Action Group for ATM Safety
AIP	Aeronautical Information Publication
ALA	Approach and Landing Accidents
ALAR	Approach and Landing Accident Reduction
ANSP	Aviation Navigation and Satellite Programs
APP	Approach (ATA Phase of Flight)
AS/PAC	Asia/Pacific
ASC	Airports Services Committee
ASG	IATA Airside Safety Group
ASR	Air Safety Reports
ATA	Air Transport Association
ATC	Air Traffic Control
ATOS	Air Transportation Oversight System (FAA)
ATSP	Air Traffic Service Provider
BASIS	British Airways Safety Information System
CAP	UK Civil Aviation Publication
CASA	Civil Aviation Safety Authority
CAST	Commercial Aviation Safety Team
CBT	Computer Based Training
CFIT	Controlled Flight Into Terrain
COSCAP	Co-operative Development Of Operational Safety and Continuing Airworthiness Programmes
CRM	Crew Resource Management
CRZ	Cruise (ATA Phase of Flight)
CSWG	IATA Cabin Safety Working Group
CVR	Cockpit Voice Recorded
DFDR	Digital Flight Data Recorder
DGAC	Dominican Republic CAA
DGB	IATA Dangerous Goods Board
DGR	Dangerous Goods Regulations
DST	Descent (ATA Phase of Flight)
EAGOSH	The European Ground Safety Council
ECL	En Route Climb (ATA Phase of Flight)
EGPWS	Enhanced Ground Proximity Warning System
ERPWG	IATA Emergency Response Planning Working Group
ESD	Engine Start/Depart (ATA Phase of Flight)
ETOPS	Extended-Range Twin-Engine Operations
FAA	Federal Aviation Authority
FDM	Flight Data Monitoring
FDR	Flight Data Recording
FE	Far East
FLC	Flight Close (ATA Phase of Flight)
FLP	Flight Planning (ATA Phase of Flight)
FO	First Officer
FOC	IATA Flight Operations Committee
FOQA	Flight Operations Quality Assurance
FPA	Flight Procedure Authorisations
FSF	Flight Safety Foundation
GAIN	Global Aviation Incident Network
GASAG	Global Aviation Security Action Group
GDS	Ground Servicing (ATA Phase of Flight)
GOA	Go-around (ATA Phase of Flight)
GPWS	Ground Proximity Warning System
HF HWG	Human Factors Harmonisation Working Group
HFWG	IATA Human Factors Working Group
HL	Hull Loss
IACA	International Air Carriers Association
ICAEA	International Civil Aviation English Association
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
IFSP	In Flight Security Personnel
IGHC	IATA Ground Handling Council
INTERPOL	International Criminal Police Organization
IOSA	IATA Operational Safety Audit
IRM	Incident Review Meeting
ISASI	International Society of Air Safety Investigators
ITF	International Transport Workers Federation
JAA	Joint Aviation Authority
LAHSO	Land-and-Hold Short Operations
LND	Landing (ATA Phase of Flight)
LOC	Loss of Control
LOSA	Line Operations Safety Audit
MANPADS	Man Portable Air Defense Systems
METWG	IATA Meteorological Working Group
MIG	Mathematicians Implementation Group
MSTF	IATA Multidivisional Safety Task Force
NAM	North American (IATA Region)
NASP	National Aviation Security Programme
NAT	North Atlantic (IATA Region)
NBIA	New Bangkok International Airport
NE	Near East (IATA Region)
NLR	National Aerospace Laboratory NLR, The Netherlands
NOTAM	Notices to Airmen
OPC	IATA Operations Committee
OQS	Operational Quality Standards
PA	Public Announcement
PAAST	Pan American Aviation Safety Team
PED	Personal Electronic Device
PRF	Pre-Flight (ATA Phase of Flight)
PRIOR	Programme for International Operator Readiness
PSF	Post-flight (ATA Phase of Flight)
QAR	Quick Access Recorder
RA	Resolution Advisory
RDPS	Radar Data Processing System
RIPP	Runway Incursion Prevention Programme
RTC/RCG	Regional Technical Conference
RTL	Regional Team Leaders
RTO	Rejected Take-off (ATA Phase of Flight)
SA	South America (IATA Region)
SAC	IATA Safety Committee
SAFA	Safety Assessment of Foreign Aircraft
SARAST	South Asia Regional Aviation Safety Teams
SBS	Safety Bulletin System
SCCM	Senior Cabin Crew Member
SD	Substantial Damage
SEARAST	Southeast Asia Regional Aviation Safety Teams
SISG	Safety Improvement Sub Group
SMS	Safety Management System
SMSS	Safety Management Support System
SOP	Standard Operating Procedures
SRC	Safety Regulation Commission
STEADES	Safety Trend Evaluation, Analysis and Data Exchange System
SWAP	Safety With Answers Provided
TAWS	Terrain Awareness Warning System
TCAS	Traffic Alert and Collision Avoidance System
TCAS RA	Traffic Alert and Collision Avoidance System Resolution Advisory
TEM	Threat and Error Management
TIPH	Taxy into Position and Hold
TOF	Taxi-off (ATA Phase of Flight)
TOPM	Technical Operations Policy Manual
TXI	Taxi-in (ATA Phase of Flight)
TXO	Taxi-out (ATA Phase of Flight)
UK CAA	UK Civil Aviation Authority
UKFSC	UK Flight Safety Committee
V/S	Vertical Speed
VNAV	Vertical Navigation
WMO — AMDAR	The World Meteorological Organisation — Aircraft Meteorological Data Reporting

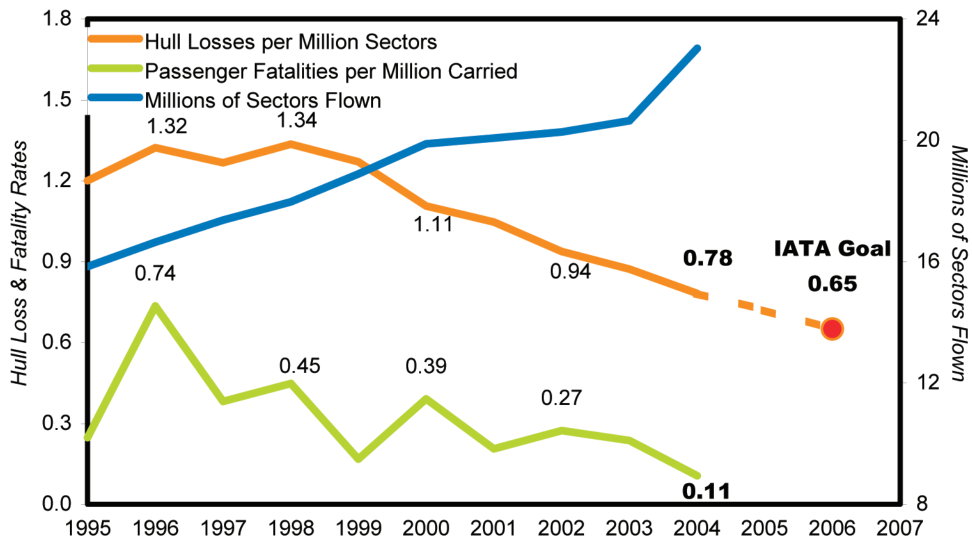
EXECUTIVE SUMMARY

The IATA Safety Report presents the findings from the analysis of accidents that occurred in the year 2004. Through this report, IATA communicates areas of concern and offers prevention strategies to the industry with the goal of continuously improving safety.

In total, 104 accidents occurred in 2004. Compared to 2003, they breakdown as follows:

Year	Jet	Turboprop	Western-built Jet Hull Loss Rate	Fatal Accidents	Fatalities
2003	49	43	0.87	21	663
2004	58	45	0.78	25	428

Western-built Jet Traffic, Hull Loss & Passenger Fatality Rates 1995-2004



Following the analysis of the 2004 accidents, IATA and the airlines need to act on the following findings and prevention strategies:

Cargo operations: these accounted for a third of the year's accidents. In over a quarter of events, flight crews intentionally disregarded procedures. Deficiencies in safety management and standards and checking were also contributors in many events. Weak regulatory oversight was noted in many accidents as well.

Prevention Strategy: IATA has developed a comprehensive Cargo Safety Programme that targets issues in this field and will expand its IOSA Programme to create a safety audit specific to dedicated cargo carriers.

Safety in Africa: almost a quarter of all the year's accidents occurred in Africa. Deficiencies in safety management, training systems and flight crew proficiency issues were the top contributing factors.

Prevention Strategy: IATA will actively participate in the safety campaign in Africa by taking a primary role in the African and Indian Ocean Safety Enhancement Team (ASET).

Ground damage: Ground damage accidents cost the airline industry over USD $4 billion last year. The majority of events involved large Jet aircraft, occurred primarily in Europe during scheduled operations and resulted in major damage. Airport facilities played a contributing role in many cases.

Prevention Strategy: IATA will implement its Ground Damage Prevention Programme to reduce ground incidents and accidents and cut ground damage costs by 10% in 2005.

Approach and Landing accidents: almost half of all the accidents occurred during the Approach and Landing phases of flight. Organisational issues, such as deficiencies in safety management and training systems were among the top contributing factors in these events. Flight crew proficiency issues were also noted.

Prevention Strategy: IATA will deploy its Flight Data Analysis capabilities to help airlines track and prevent unstable approaches and promote non-punitive Go-around policies.

Flight crew training and proficiency: flight crew proficiency was called into question in many of the 2004 accidents. This problem was usually linked to organisational issues, such as deficiencies in safety management, training systems and standards and checking. Flight crew communication issues were also highlighted and often related to inadequate training.

Prevention Strategy: IATA will continue to implement the IOSA Programme in 2005, which addresses deficiencies at the organisational and flight operations levels, to ensure airlines that are audited apply corrective actions regarding these issues.

Information regarding contributing factors in specific types of accidents (e.g. Controlled Flight Into Terrain) is presented in detail in the report.

All the issues mentioned above are covered in the strategic priorities targeted by the IATA Six-point Safety Programme that addresses the key segments of the air transport industry. IATA's Safety Trend Evaluation, Analysis & Data Exchange System (STEADES) Programme, IOSA data and Flight Data Analysis capabilities provide airlines with the tools that they need to monitor normal operations, learn from incidents and prevent accidents.

Although aviation remains the safest mode of transportation, constant vigilance and a business-like approach to safety are key components to ensure that this track record continues to improve.

CHAPTER 1 — INTRODUCTION

1.1 MEETING THE CHALLENGE

The challenge of safe flight with growing passenger and cargo traffic has been met by the aviation industry in 2004. Technology has come to the aid of the safety community by providing tools with which to manage and exchange the constant flow of data industry-wide. In this way, present and future initiatives pinpoint more accurately the precise issues in need of being addressed and rectified. Communication and exchange have vaulted the outreach of local undertakings to the global scale, benefiting a wider audience than previously possible. The industry now enters an era of data-driven safety management, the means by which successes are being measured today.

"IATA Safety is positive, democratic and inclusive."
— Fernando Pinto, CEO, TAP Portugal

1.2 IATA'S ANNUAL SAFETY REPORT

IATA is at the core of the world's international airline industry. Originally founded in 1919, it now groups together over 270 airlines, including the world's largest carriers. These airlines fly over 94% of all international scheduled air traffic. It is upon this vast and highly representative experience that IATA draws when determining the lessons learned from accidents, most of which involve aircraft that are not in the IATA fold.

Produced immediately following the year under review, the report examines not only the accident statistics and trends, but it also attributes contributing factors to these accidents and leads to prevention strategies that the industry can apply to enhance safety.

The first part of the report looks back at the accidents. The approach to this analysis involves a look back at the trends over the last decade and a review the year 2004 in detail. The report presents how the IATA Accident Classification Working Group (ACWG) analyses events to determine contributing factors, in most cases identified for the first time well ahead of formal accident investigation.

The second part of the Safety Report reflects the work of IATA, communicating the important safety issues identified by IATA's Operations and Safety Committees and Working Groups, including those in the Security arena. This illustrates how IATA is tackling issues that have been identified in previous reports in order to implement change and contribute to the overall enhancement of safety in the industry.

Therefore, the Safety Report helps airlines to understand the global safety situation and thus react quickly to the threats to aviation safety. It offers recommendations for accident prevention, which will help shape IATA's airline safety strategies and those of the industry for years to come.

1.2.1 Purpose of the Safety Report

The purpose of the Safety Report is fully described in **Appendix B** on the CD-ROM. Its primary purpose is to assist with maintaining safety vigilance by identifying the areas of greatest risk apparent from the experience of aircraft accidents. It aims to offer practical advice to airlines in accident prevention against the backdrop of accidents that have occurred in 2004. The report is taking an increasing interest in air safety incidents, seeing them as useful pointers for accident prevention. It presents data and trends, analyses and recommends preventative measures.

1.2.2 Safety Report Format

The ambitious technique used by IATA to analyse, early in the year, the accidents (and increasingly the incidents) of the previous year has been retained. The Safety Report does not only present areas of concern and high risk, combined with prevention strategies and recommendations to the industry, but it also provides tools for safety management.

There is a CD-ROM included in the report, which is divided into the following sections:

- ✔ **Safety Report,** containing the report, appendices and PowerPoint slide support package;
- ✔ **Supporting Documents,** containing additional material supporting discussions in the report;
- ✔ **Safety Toolkit,** containing useful and practical material for use at airlines;
- ✔ **CEO Brief,** containing executive summary and PowerPoint presentation;
- ✔ **Web links;** containing links to websites and documents available on the Web that IATA Safety recognises as helpful to airlines.

Although the additional information that is found on the CD-ROM is not exhaustive, it does serve as an indication of some of the valuable tools for accident prevention that have come to IATA's attention during 2004.

1.2.3 Accident Classification Working Group

The IATA Safety Committee (SAC) created the Accident Classification Working Group (ACWG) in order to analyse accidents and identity contributing factors, determine trends and matters of concern in aviation safety worldwide from the accident database available and to develop prevention strategies and recommendations related thereto, which are incorporated into the annual IATA Safety Report.

The ACWG is composed of highly committed airline safety professionals from IATA Member Airlines and representatives from the aeronautical industry and regulatory boards. 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 comes from a variety of sources, including Airclaims Ltd., government accident reports and other sources. Once assembled, the ACWG validates each accident report with their own knowledge to develop as accurate a picture to each accident as possible.

Appendix A on the CD-ROM further describes the role of the ACWG in more detail. Participants in the 2004 sessions were as follows:

Mr. Louis Thériault	Air Canada	Chairman
Captain Deborah Lawrie	KLM Cityhopper	Vice-Chairman
Captain Bertrand de Courville	Air France	
Captain Angelo Ledda	Alitalia	
Captain Yoshiyasu Takano	Japan Airlines International	
Mr. Willem Diederichs	Lufthansa German Airlines	
Captain Jürg Schmid	Swiss International	
Captain Carlos dos Santos Nunes	TAP Portugal	
Captain Araken O. Salamene	Varig	
Mr. Jean Daney	Airbus	
Captain David Carbaugh	Boeing	
Mr. James Donnelly	Bombardier	
Mr. Nuno Aghdassi	Embraer	
Mr. Martin Maurino	IATA	
Captain Karel Mndel	IFALPA	
Captain Lou Van Munster	IFALPA	
Mr. Bert Ruitenberg	IFATCA	
Ms. Sandra Stedman	Jeppesen	
Mr. Don Bateman	Honeywell	

1.2.4 Report Authority

The Safety Report is sponsored by the IATA Safety Department, approved by the IATA Safety Committee (SAC) and authorised for distribution by the Operations Committee (OPC).

1.3 IATA SAFETY PROGRAMMES

1.3.1 Overview

The IATA Safety Programme is driven primarily by the ambitious goals set by the airlines at the IATA Board of Governors (BoG) at their last meetings. These goals determine the direction of IATA safety initiatives in the current year. At the last BoG meeting, the board set down two industry priorities for 2005:

✔ Continue implementing the IATA Six-point Safety Programme to assist the industry in achieving a 25% reduction in the accident rate by 2006.

✔ Ensure 100 Member Airlines are audited by IOSA Audit Organisations in 2005.

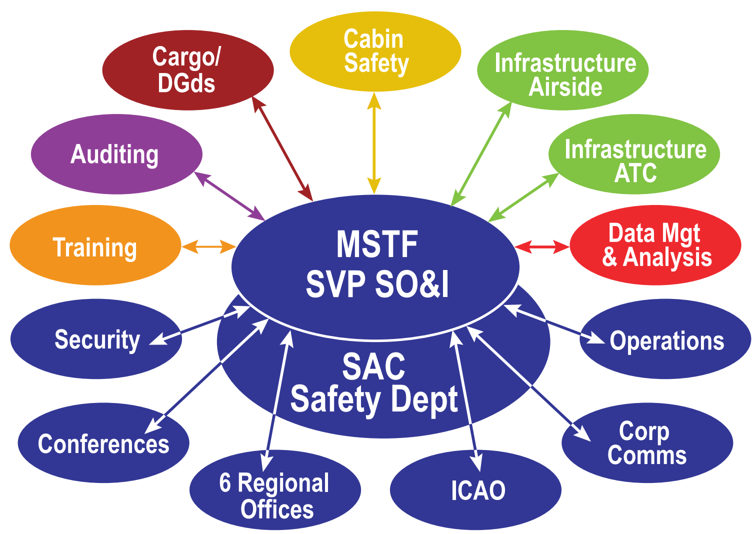
✔ Reduce ramp damage to aircraft by 10% in 2005.

To achieve these goals, strong industry leadership is needed, and IATA for its part is rising to the challenge. IATA has crafted this leadership role to ensure that it blends with the other global safety initiatives of the International Civil Aviation Organisation (ICAO), the Flight Safety Foundation (FSF), the aircraft manufacturers, the Air Transport Association (ATA), the International Federation of Air Line Pilots' Associations (IFALPA) and the regulatory authorities. Most importantly, IATA's leadership role has to do with the airlines — to lead the global airline commitment to achieve a continuous improvement in safety.

1.3.2 IATA Multi-divisional Safety Task Force

The IATA Multi-divisional Safety Task Force (MSTF) was established in 2002 to integrate all IATA safety activities, establish priorities to meet industry safety needs and develop metrics to assess the performance of solutions. Meeting about once per month, the participants debate key safety issues from all divisions and work on harmonising efforts to implement safety programmes efficiently. The MSTF receives strong support from the IATA Director General, the Senior Vice-President, Safety, Operations and Infrastructure and is aided by the Director, Safety. The MSTF transcends both organisational and geographical boundaries within IATA by involving not only members from multiple divisions, but in multiple locations around the world.

Figure 1.3.2.A
Multi-Divisional Safety Task Force (MSTF)

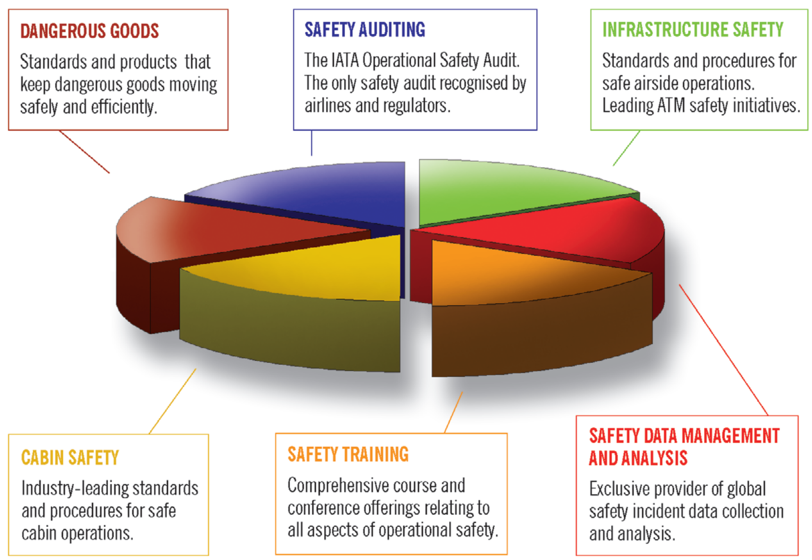


The MSTF is fully integrated with all IATA safety activities and helps ensure consistent management of the safety action plan. It is at the centre of IATA's Safety Management System and is a manifestation of IATA's corporate safety culture. Figure 1.3.2.A illustrates the components that make up the MSTF.

1.3.3 IATA Six-point Safety Programme

The IATA Six-point Safety Programme is now well established in close cooperation with the airlines through SAC, OPC and the MSTF. The programme focuses not on one, but on a system of areas that need to be combined to improve operational safety. The programme addresses areas of global concern, as well as targeting unique regional challenges that are seen as the major impediments to improving safety in those areas. Figure 1.3.3.A illustrates the IATA Six-point Safety Programme. A detailed review of the programme's 2004 achievements and its outlook for 2005 are presented in Chapter 5.

Figure 1.3.3.A
Six-point Safety Programme



Safety Auditing

The IATA Operational Safety Audit (IOSA) Programme is now fully implemented. Since the official launch in September 2003, over 100 audits have been contracted with many airlines incorporating the standards into their operations. The primary benefits of IOSA are a reduction in the number of audits for the industry, and increased safety for all airlines. IOSA is the first globally harmonised set of operational safety standards and audit programme for the airline industry.

Infrastructure Safety

Infrastructure safety covers both Air Traffic Management (ATM) and Ground Safety. In 2004, IATA paired itself with the world's infrastructure and regulatory authorities in order to develop a series of action plans for enhanced safety. In Europe, a joint Eurocontrol/IATA level-bust workshop and toolkit were introduced in the fall. IATA collaborated with the Federal Aviation Administration (FAA) to develop a strategy for the reduction of runway incursion events, elements of which are under consideration for adoption by ICAO.

Ground Damage Prevention Programme: the objective has been set at a 10% reduction in ground accidents by the end of 2005. IATA will provide the tools and expertise necessary to combat this USD $4 billion per year industry-wide challenge.

Safety Data Management & Analysis

Safety Data Management & Analysis (SDMA) is one of the focal points of the Six-point Safety Programme. In 2004, IATA's data-driven analysis capabilities were extended to support infrastructure, cabin operations and cargo safety activities. The Safety Trend Evaluation, Analysis & Data Exchange System (STEADES) Monthly Safety Bulletin, STEADES Safety Trend Analysis Report and IATA Annual Safety Report are all successfully reaching wider distribution networks, contributing to improved safety information sharing throughout the industry.

Flight Data Analysis Programme: following the ICAO mandate for implementation of flight data analysis (FDA) capabilities for many airlines by 2005, IATA will soon be providing data analysis services. Improvements in efficiency, standardisation and safety comprise the primary objectives for this endeavour.

Safety Training

Training tools and courses have been developed to meet the safety demands of airlines, airports and regulators. A new accreditation process was developed for the Diploma Programme in Safety Management in 2004 and English language courses and testing continue to be implemented worldwide. The IATA Training & Development Institute has developed a comprehensive list of courses that give any airline professional the foundations needed to successfully develop a company-wide Safety Management System (SMS). Safety courses cover the entire spectrum of the Six-point Safety Programme, including ground safety and cargo operations.

Cabin Operations Safety

The Cabin Operations Safety Programme was approved and launched in 2004 to contribute to the reduction of incidents/accidents and costs to airlines associated with the operation of commercial passenger aircraft. Cabin operations safety is a component of an airline safety management programme that includes proactive data collection and the ensuing prevention activities regarding: cabin design and operation, equipment, procedures, training, human performance and passenger management. Cabin operations safety also deals with all activities that cabin crews must accomplish during the commercial operation of an aircraft to maintain safety in the cabin, and contribute to the overall safe and efficient operation of the aircraft.

Cabin Operations Safety Toolkit: to counteract the USD $85 million per year in costs to operators due to turbulence-related injuries and inadvertent slide deployments, IATA has launched a campaign with the explicit aim to cut this figure in half by 2008. A toolkit will be made available to all IATA Member Airlines by mid-2005.

Cargo Safety

In 2004, IATA took steps towards driving down the disproportionately high accident rate among cargo operators experienced in the past few years. Major updates have been included in both the Airport Handling and Aircraft Loading Manuals to combat some of the main threats to the safety in this type of operation. The Cargo Operations Safety Task Force was also created to more closely examine the issues relating directly to freight carriers in order to meet the safety norms established throughout the industry.

1.4 IATA REGIONS

At the time of writing the 2004 Safety Report, IATA delineates between regions using the definition set out by IATA's Regional Technical Conferences and Regional Coordination Groups. **Refer to Appendix C** on the CD-ROM. There is, however, a move in the industry toward aligning the definitions of regions for the purpose of representing regional safety information. There are many organisations producing safety statistics as they relate to regions of the world. Unfortunately there has been little coordination between these organisations and the definitions used, which can lead to variances in the statistics. The Safety Indicator Study Group of ICAO, of which IATA is a member, is endeavouring to develop definitions for regions which are no longer based on jurisdictions of regional offices but based on geographic location of the land mass where the accident occurs or the operator's region of origin. The aim is that through the work of this study group, agreed regional definitions will be developed and thus enable the industry to move yet another step closer to aligning safety statistics.

CHAPTER 2 — DECADE IN REVIEW

This chapter presents the record of accidents of the past ten years and compares it to the data for 2004. It aims to establish a benchmark, assess achievements in aviation safety during the past decade, and determine the direction it should take in the coming years.

Background

IATA has been recording Jet accident statistics since 1959, when the first Jet operational airline accident occurred. ICAO has been monitoring accident statistics since 1947 and many national authorities have had a long history of accident analysis. Collectively, there is now a considerable accident database that allows comprehensive analysis that assists in the development of accident prevention strategies.

Previous editions of the IATA Safety Report have addressed historical statistics, in some cases, going back a number of decades. This report assesses the year under review in contrast with the statistics for the past decade. It is considered that the exclusion of data dated from over ten years ago will make the analysis more relevant and meaningful. Much of this data contained references to older aircraft that are no longer in service and to operations that did not benefit from newer technologies and operating methods.

Aviation safety has improved ~~drastically~~ in the last decade. Safe air travel is considered as a given. This is due in part to the considerable efforts made by airlines, regulators, the manufacturers and other stakeholders. The data from 2004 shows that this encouraging trend is continuing as reflected in the Western-built Jet Hull Loss rate.

When reviewing this data, readers should be aware that there is always some minor variance in the accident data provided by IATA, in comparison with ICAO or other agencies. This is not through any lack of effort to harmonize the global accident statistics. Indeed, this Safety Report uses the CAST/ICAO common taxonomy and the increasingly widely used Airclaims accident definitions and those used by Boeing in their reviews. This is due to the use of slightly different parameters for data collection, analysis and presentation and the fact that IATA focusses on commercial, rather than civil aviation. The data used by IATA is obtained from a number of sources and is continually updated. In some cases, this may be reflected in some changes to the total number of accidents from previous reports.

The Western-built Jet Hull Loss rate has been reduced by almost half in contrast to the past decade. The downward trend has been maintained for the past five years.

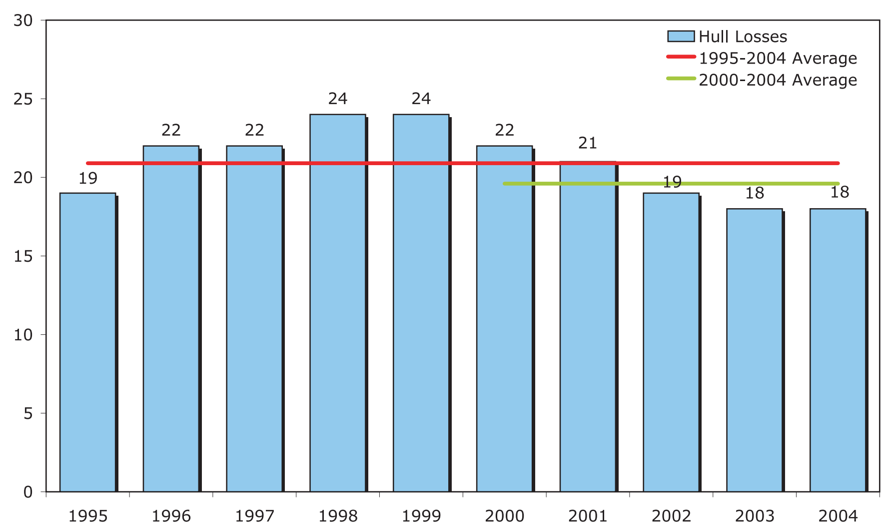
Photo courtesy of Boeing

2.1 DATA FOR LAST TEN YEARS (JET)

In 2004, the number of Western-built Jet Hull Losses was the same as in 2003 and still below the five and ten year averages. The 18 Hull Losses that occurred in 2004 tied 2003 as the best performance of the decade (see Figure 2.1.A).

Figure 2.1.A

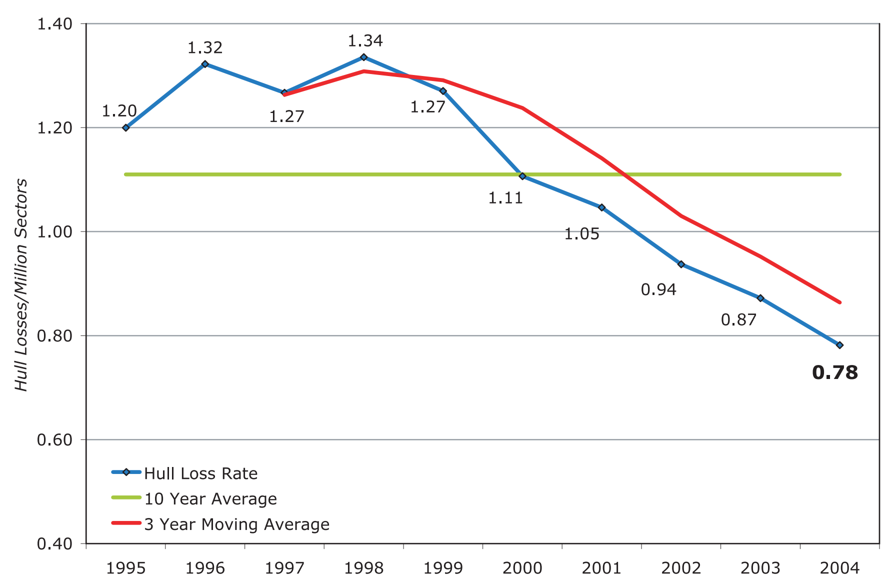
Western-built Jet Hull Losses 1995-2004



The Western-built Jet Hull Loss rate showed a continued decrease in 2004 to 0.78 Hull Losses per million sectors flown. The Western-built Jet Hull Loss rate for 2004 is the best of the decade and well below the ten-year linear and three-year moving averages. Figure 2.1.B shows the Hull Loss rate (Hull Losses per Million Sectors), together with the 10-year average and moving average trend line.

Figure 2.1.B

Western-built Jet Hull Loss Rate 1995-2004



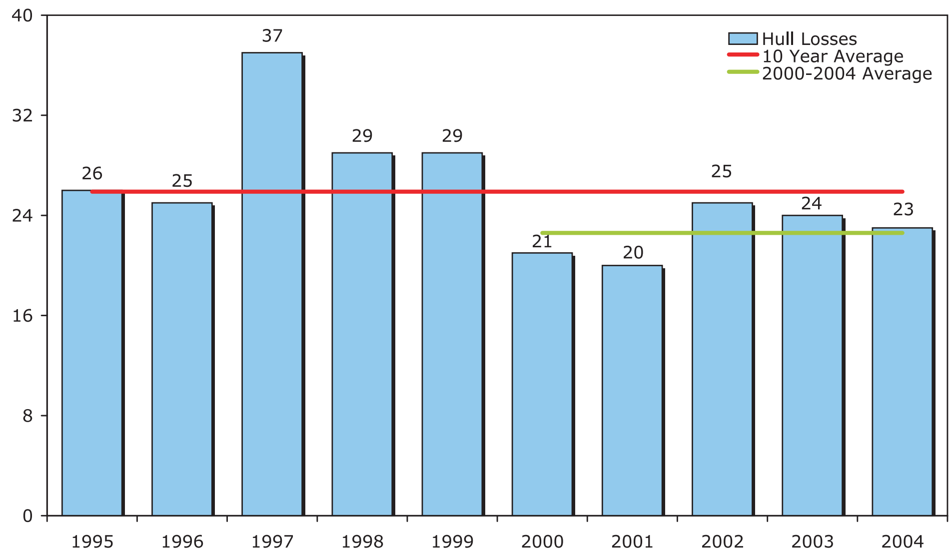
2.2 DATA FOR LAST TEN YEARS (TURBOPROP)

Turboprop aircraft continue to be a notable proportion of the global airline fleet. The latest figures show a worldwide fleet just fewer than 7000 aircraft of which approximately 70% are Western-built. They are predominantly used to support larger markets by providing a feeder service from regional centres into larger cities or on routes that do not justify Jet aircraft. In many cases, regional jets are replacing Turboprop aircraft as airlines upgrade their fleets. However, this only displaces the Turboprop fleet and positions these older aircraft into operators that are upgrading but cannot justify new aircraft. The number of turboprop deliveries in 2004 marked a small increase, breaking a three-year trend.

The number of Turboprop Hull Losses in 2004 was well below the ten-year average and slightly higher than the five-year figure (see Figure 2.2.A). Although the 23 Hull Losses in 2004 were less than 2003, there is still room for improvement when compared to the decade low of 20 in 2001.

Figure 2.2.A

Western-built Turboprop Hull Losses 1995-2004

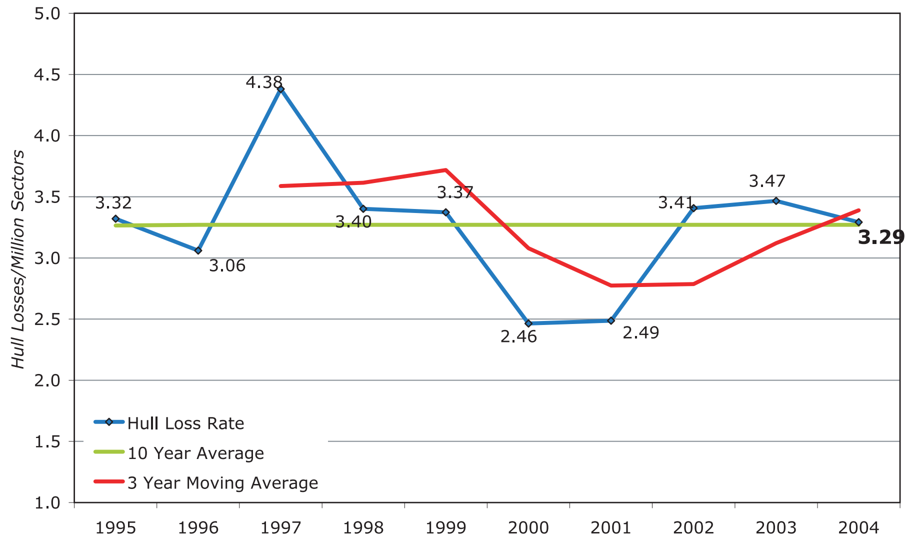


This year, IATA is using a new metric to express the Western-built Turboprop Hull Loss rate. It is now possible to accurately estimate the number of hours and sectors flown by the Turboprop fleet and as such the rates seen below are expressed in the same manner as Western-built Jets (Hull Losses per million sectors flown).

The Hull Loss rate of 3.29 Hull Losses per million sectors in 2004 was the lowest in three years. There was a slight increase in the Turboprop Hull Loss rate for the year 2004 in comparison to the average rate for the past decade (see Figure 2.2.B).

Figure 2.2.B

Western-built Turboprop
Hull Loss Rate 1995-2004



2.3 REVIEW OF FATAL ACCIDENTS AND FATALITIES — JET & TURBOPROP

This section presents the relationship between accidents and fatalities. The review of the year's Jet accidents showed a continued improvement in all areas compared with the decade.

Figure 2.3.A

Western-built Jet
Fatal Accidents and Fatalities 1995-2004

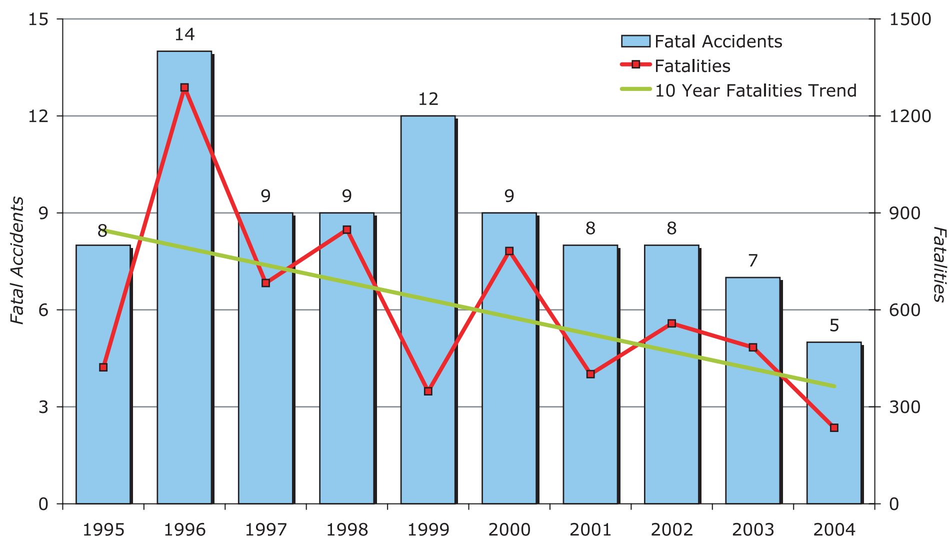
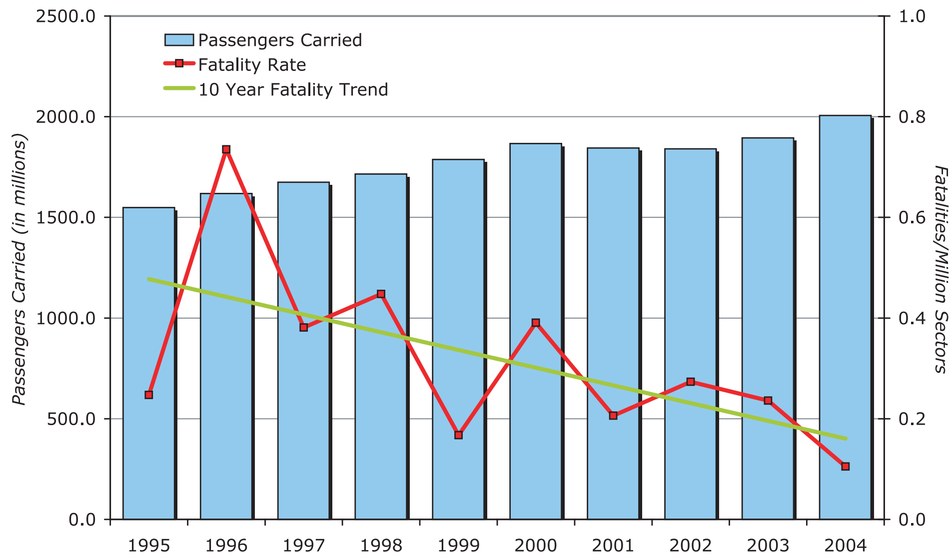


Figure 2.3.A illustrates the constant decrease in fatal accidents and fatalities. Most notably, the number of fatalities has been greatly reduced and represents the lowest number of the decade.

Figure 2.3.B

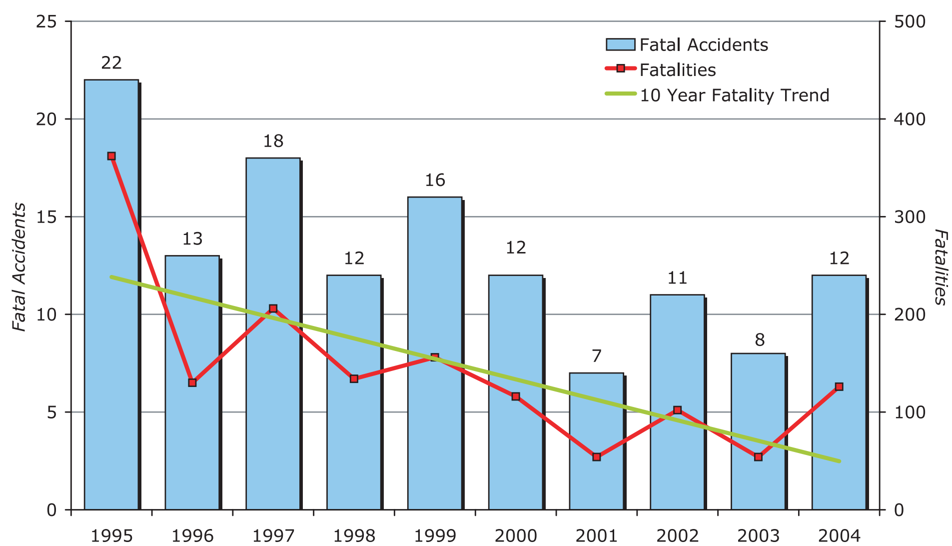
Western-built Jet
Passengers Carried & Passenger Fatality Rate 1995-2004



The relationship between the increase in passengers carried and the reduction of the fatality rate continued to demonstrate improvement. Even with a continuous increase in the number of passengers carried, the 2004 fatality rate is the lowest of the decade, continuing a declining trend (see Figure 2.3.B).

Figure 2.3.C

Western-built Turboprop
Fatal Accidents & Fatalities 1995-2004



The number of accidents and fatalities on Western-built Turboprop aircraft increased in 2004 and the number of fatalities has bottomed out over the last five years to an average of approximately 90 fatalities per year (see Figure 2.3.C).

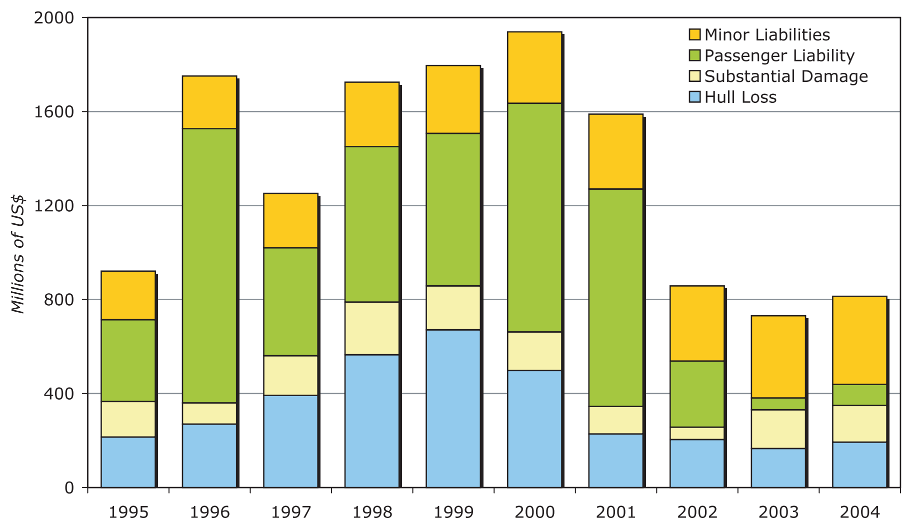
2.4 ACCIDENT COSTS

Western-built Jet

All figures in US$

IATA has obtained the estimated cost for **all losses** involving Western-built Jet airlines over the past decade, excluding acts of violence.

Figure 2.4.A
Western-built Jet
Accident Costs 1995-2004



The estimated cost of Hull Losses involving Western-built Jet aircraft over the past decade appears cyclical. However, Figure 2.4.A shows a significant overall reduction in costs starting in 2002 when comparing with previous years. The 2004 amount is more that the 2002 figure, but less than 2003, indicating a bottoming-out trend over the last three years. The cost of accidents for 2004 is detailed in Figure 2.4.B.

Figure 2.4.B
Western-built Jet
Accident Costs 2004

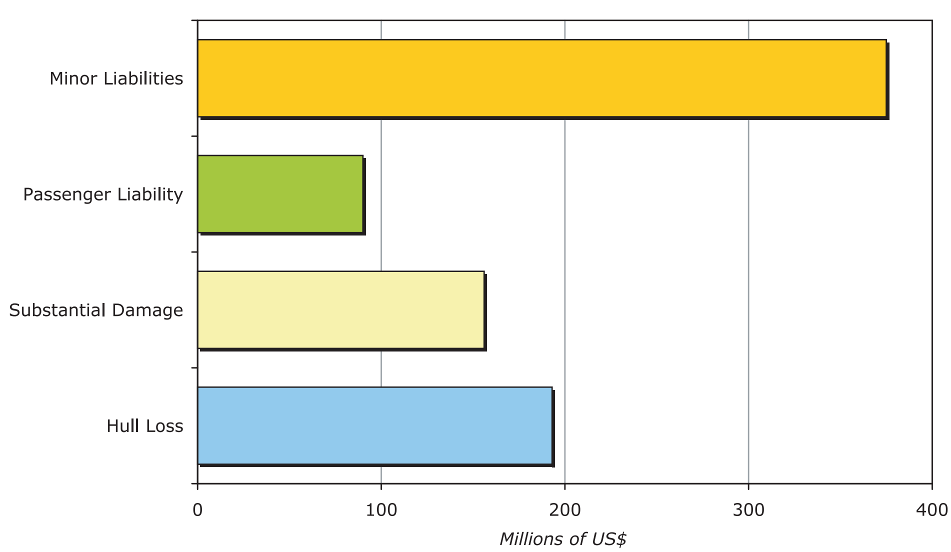
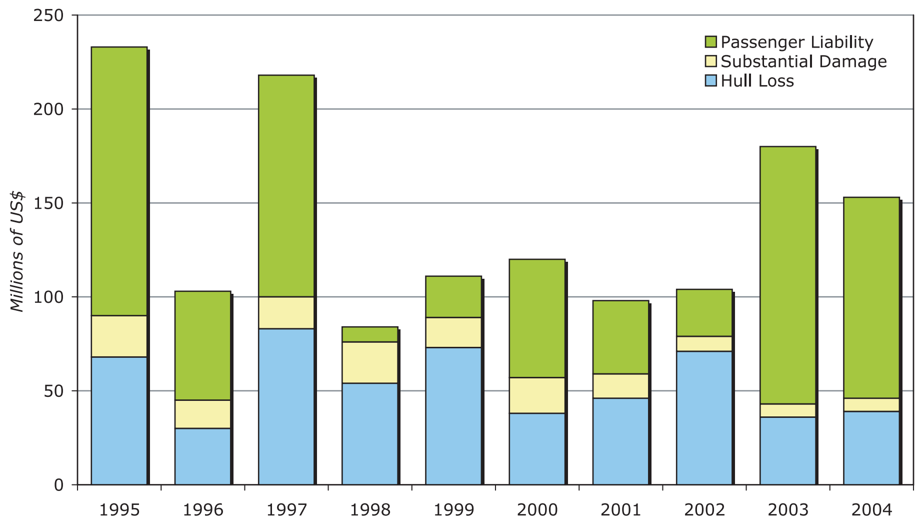


Figure 2.4.C

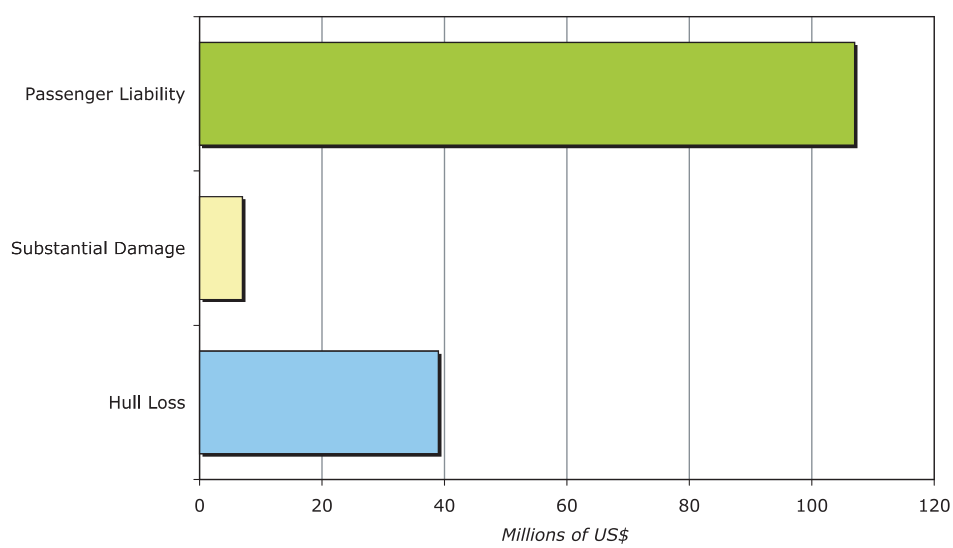
Western-built Turboprop Accident Costs 1995-2004



During the past decade, costs resulting from Western-built Turboprop aircraft accident dropped from over $400M to about $150M (see Figure 2.4.C). While the cost of accidents relating to Hull Losses and Substantial Damage accidents has remained relatively low over the last few years, 2003 and 2004 saw costs spike in the area of passenger liabilities (see Figure 2.4.D). Revised figures for 2003 indicate that passenger liability costs alone accounted for $137 million in that year. Passenger liability costs for 2004 have decreased to $107 million.

Figure 2.4.D

Western-built Turboprop Accident Costs 2004



2.5 CHAPTER 2 SUMMARY

- The Western-built Jet Hull Loss rate decreased by 10% in 2004, and is the best result of the decade. This reflects a 30% improvement over the 10-year average.
- The number of Western-built Jet Hull Losses for 2004 tied the lowest figure for the decade.
- While the number of fatal accidents increased in 2004, the fatality rate for 2004 was the lowest on record.
- The year 2004 experienced the lowest number of fatalities on Western-built Jets in the past decade, with 235 recorded.
- The Western-built Jet Hull Loss rate for 2004 was 0.78 Hull Losses per Million Sectors. This shows a continuation of the positive trend observed since 1998.
- The estimated cost of Western-built Jet Hull Losses over the past decade continued to decline from a high of over $ 600M in 1999 to less than $ 200M in 2004. This was the second lowest in the decade after 2003.
- The number of Western-built Turboprop Hull Loss increased slightly, in contrast with the previous year. In total, there were 23 Western-built Turboprop Hull Losses in 2004 in comparison to 22 in 2003 and this was still below the ten-year average.
- The ten-year average Western-built Turboprop Hull Loss rate was 3.22 Hull Losses per million sectors flown. For the year 2004, this rate presented a slight increase at 3.29, however it is in-line with the previous three years.
- Over the past decade, there was a steady reduction in the number of fatal accidents involving Western-built Turboprop aircraft up until 2001 when only seven occurred. However, the number now appears cyclical and in 2004 there were 12. The ten-year trend line is reducing despite such spikes.
- Accident costs resulting from Western-built Turboprop operations dropped from their decade high of almost $ 250M in 1995 to a plateau of around $ 100M starting in 1998. However, costs have been rising in recent years, particularly in the area of passenger liability.
- The total cost of Hull Losses involving Western-built Jet and Turboprop aircraft for 2004 was around $ 232M. This was the second lowest cost during the past decade.

CHAPTER 3 — YEAR 2004 IN REVIEW

The aim of this chapter is to present the global accident statistics for 2004 with a view to highlighting the primary safety issues arising from 2004. The review will cover both Western and Eastern-built Jet and Turboprop aircraft although the primary focus will be on the accidents involving Western-built aircraft.

DATA ANALYSIS

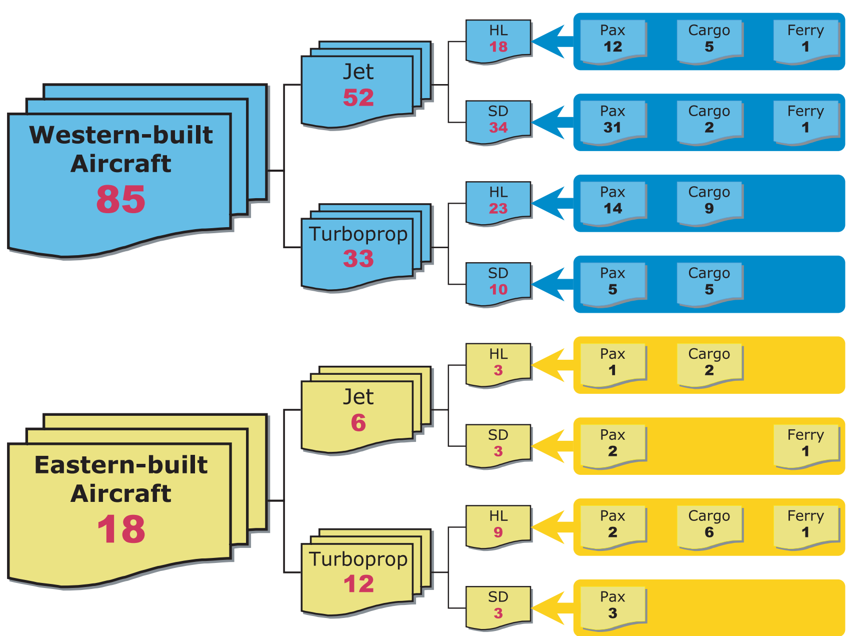
Total of Accidents

The ACWG classified a total of 103 accidents in 2004. There was an additional fatal accident in which the aircraft suffered no damage that was not classified. The breakdown of accidents is shown in Figure 3.A.

The operational Jet and Turboprop Hull Loss (HL) and Substantial Damage (SD) accidents that occurred in 2004 are the primary focus of the Safety Report. When comparisons are made with 2003 data, they refer to the figures appearing in the IATA Safety Report 2003. In general, the only continuously updated statistical figures are the Hull Loss counts in the Western-built fleets.

Throughout this analysis, it should be assumed that only operational accidents are being reviewed unless specifically stated otherwise. An operational accident is one that occurred during normal revenue operations or positioning flights. Figure 3.A therefore excludes ground events where there was no intention of flight and does not encompass deliberate acts of violence.

Figure 3.A
Distribution of 2004 Accidents



3.1 STATISTICS FOR WESTERN-BUILT AIRCRAFT

3.1.1 Western-built Jets

Accident Summaries

A tabular synopsis of Western-built Jet operational Hull Loss and Substantial Damage accidents is presented in Annex 2 at the end of this Report.

Fleet-Hours-Sectors

World Fleet (end of year):	17,779
Hours Flown:	42.91 million
Sectors (landings):	23.03 million

Therefore, fleet size, hours and sectors continue to increase.

Operational Accidents

Hull Losses (HL):	18
Substantial Damage (SD):	34
Total Accidents:	**52**

Loss Rates

Hull losses per million sectors:	0.78
Hull losses per million hours:	0.42

Passengers Carried-Fatal Accidents-Fatalities & Fatality Rate

Passengers carried (million):	2,006
Estimated change since the previous year:	+6%
Fatal accidents (see Figure 3.1.A):	5
Fatalities:	
Passenger fatalities on board revenue passenger flights:	211
Passenger fatalities on board cargo flights:	0
Crew:	24
Total:	**235**

Passenger Fatality Rate

0.11 passenger-fatalities per million passengers or the equivalent of one passenger-fatality per 9.1 million passengers carried on board revenue passenger flights.

It is extremely encouraging to note that Africa, Europe, and Latin America did not have any fatal Jet accidents in 2004.

Figure 3.1.A
Western-built Jet Fatal vs Non-Fatal Accidents

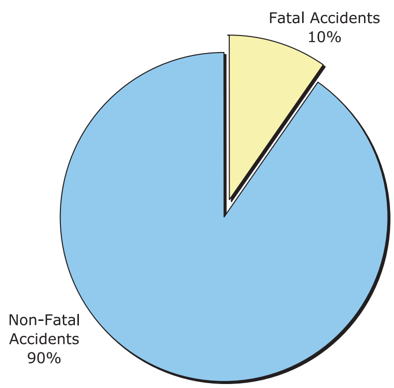
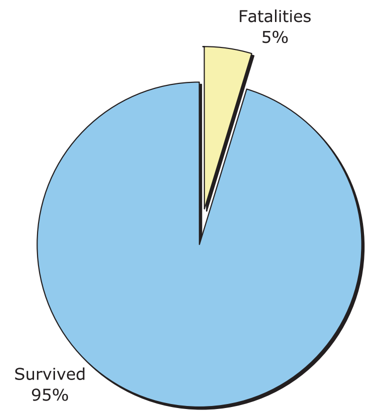


Figure 3.1.B
Western-built Jet Accident Survivability



There were 4,666 people (crew and passengers) aboard the 52 aircraft involved in operational accidents during 2004. Of these, 235 suffered fatal injuries from accidents, while 4,431 survived. Figure 3.1.B illustrates this relationship.

3.1.2 Western-built Turboprops

Fleet-Hours-Sectors

World Fleet (end of year):	5,587
Hours Flown (thousands):	6,186
Sectors (landing, thousands):	6,986

For the first time, there is sufficient data to provide a reasonable estimate of the numbers of hours and sectors flown in 2004 for Western-built Turboprop aircraft. This allows for a common metric to be used when comparing between the Jet and Turboprop fleets.

Operational Accidents

Hull Losses:	23
Substantial Damage:	10
Total accidents:	**33**

The number of Hull Losses in 2004 continued a two-year trend of gradual decrease, and should be viewed as encouraging. The high percentage of Western-built Turbooprop accidents that are Hull Losses remains a concern.

Operational Hull Loss Rates

For the first time in 2004, there is sufficient data to calculate Turboprop operational Hull Loss rates on a per million sectors and per million hours basis. The Hull Loss rates are shown below.

Hull Losses per million hours:	3.72
Hull Losses per million sectors:	3.29

Fatal Accidents & Fatalities

Fatal accidents:	12
Fatalities:	
Passengers:	100
Crew:	26
Total:	**126**

Of the 33 operational accidents (23 HL and 10 SD), 12 (36%) resulted in passenger and/or crew fatalities. This percentage, substantially higher than the equivalent Jet figure, remains an area of concern for the Turboprop fleet.

Over the past decade, small regional jet aircraft has replaced many Turboprop operations. This has shown in the marked reduction in the number of new Western-built Turboprop aircraft deliveries during this period. At its peak in 1995, 327 aircraft were delivered, however in 2003 only 57 were delivered. Of note is that 2004 marked an increase in Turboprop deliveries, breaking a four-year declining trend. It is hypothesized that operators are increasingly relying on Turboprop aircraft to service small markets and short-length sector operations where using regional jets is not profitable.

3.1.3 Summary Assessement of Western-built Aircraft

Amongst the Western-built Jet and Turboprop fleets in 2004 there were 85 accidents (HL plus SD). The Western-built Jet category total of 52 accidents is 10 more than the 42 reported in the 2003 edition of the Safety Report.

In 2004, the Western-built Turboprop category experienced 33 accidents, an increase of one compared with 2003.

There were 18 Jet Hull Loss accidents. Compared with 2003, the number of Hull Losses is the same, however the increase in the number of sectors flown in 2004 versus 2003 has caused the rate to decrease.

Of the Turboprop accidents, 23 were Hull Losses and 10 aircraft were Substantially Damaged. Therefore, compared with 2003, there was a 3% increase in the number of accidents experienced by the Turboprop Fleet. This marks the second year in a row that there has been such an increase.

Hull Loss Rates

The Hull Loss rate per million sectors for Western-built Jets reduced from 0.87 per million sectors in 2003 to 0.78 per million sectors in 2004. The rate when compared over the past decade has had a notable decrease, and the Hull Loss rate has been on the decline for the last six years running.

The Hull Loss rate for Western-built Turboprops was 3.79 Hull Losses per million sectors flown. This is the first year that IATA is able to use the same metrics on both the Jet and Turboprop fleets.

Fatal Accidents and Fatalities

In the public eye and more so in the media, it is often the number of fatalities resulting from an accident that feature prominently. That said, while fatalities resulting from accidents are regrettable, they themselves have no bearing on the contributing factors of the accident and therefore are not used as a safety metric.

Amongst Western-built fleets, there were 5 fatal accidents involving Jet aircraft and 8 fatal accidents involving Turboprop aircraft.

In terms of fatal accidents, 2004 was a banner year for Western-built Jets with the best result performance of the decade. Western-built Turboprops fared worse in fatal accidents. There were 4 more in 2004 than 2003, tying the 4th best of the decade.

Over the decade, the Turboprop fleet has enjoyed a steady decline in the number of fatal accidents up until 2001 when only 7 occurred. This trend was interrupted by the 12 fatal accidents occurring in 2002. Since then, a cyclical pattern has emerged with alternating higher and lower number of fatal accidents each year. The 2004 total of 12 represents one of the peaks of this trend.

In 2004, there were 235 fatalities involving Jet aircraft and 126 involving Turboprop aircraft (crew and passengers).

3.2 EASTERN-BUILT AIRCRAFT

Introduction

This part of the Safety Report deals with Eastern-built aircraft, generally those manufactured in the former Soviet Union.

The majority of these aircraft are operated in the former Soviet Union, Eastern Europe and Africa.

3.2.1 Eastern-built Jet

Hours and Sectors Flown

Detailed hours and sectors flown are not available for the year 2004 but are projected to be in the region of 1.6 million hours and 1.1 million sectors (broad estimate), with operations largely concentrated in eastern Europe, the former Soviet Union, and Africa.

Utilisation of Eastern-built Jets has continued to decrease during the past decade. This reduced utilisation would explain, in part, the relatively few Hull Losses now compared with previous years.

Accidents

Hull Losses:	3
Substantial Damage:	3
Other (Fatal):	1
Total Accidents:	**7**

Fatal Accidents

There were 4 fatal accidents involving Eastern-built aircraft. A total of 16 crew and 32 passengers were killed in the accidents.

Hull Loss Rate

The operational Hull Loss rate is estimated to have been 2.73 per million sectors and 1.88 per million hours.

3.2.2 Eastern-built Turboprops

Hours and Sectors Flown

No accurate exposure data is available for Eastern-built Turboprop aircraft. However, estimates have been made for passenger aircraft (see Figure 3.2.A).

Figure 3.2.A

	2004
Hours, million	0.76
Landings, million	0.57

Accidents

There were 9 Hull Loss and 3 Substantial Damage accidents involving Eastern-built Turboprops.

Fatal Accidents

Four of the 9 operational Hull Loss accidents (44%) resulted in fatalities (14 crew and 5 passengers).

Hull Loss Rates

The operational Hull Loss rate for Eastern-built Turboprop is estimated to have been 16 per million sectors and 12 per million hours.

3.2.3 Summary Assessment of Eastern-built Aircraft

There were 18 Eastern-built Jet and Turboprop accidents (HL plus SD) during 2004, plus one fatal accident without any damage to the aircraft. Utilisation of Eastern-built Jet and Turboprop aircraft has reduced considerably during the 1990s and this significantly reduced exposure would explain, in part, the low number of Hull Loss accidents now compared with earlier years.

On this basis the number of Eastern-built Jet Hull Loss accidents was 3, representing a small increase over the 2003 figure of 2. However, the 9 Eastern-built Turboprop Hull Losses showed a steady improvement compared with the 11 that occurred in 2003.

In terms of those accidents in which the aircraft was substantially damaged, there were only 3 reported accidents each for both Jet and Turboprop aircraft. The total number of Eastern-built aircraft accidents in 2004 did increase slightly versus 2003, as did the total number of Hull Losses (each by one respectively).

Out of the 19 Eastern-built aircraft accidents in 2004, almost half (47%) occurred in Africa. One accident involving an Eastern-built aircraft that resulted in a fatality but no damage or loss to the aircraft.

3.3 AIRCRAFT ACCIDENTS BY REGION

3.3.1 All Accidents

The global picture of the accident scene for 2004 is shown in Figure 3.3.A, which indicates the location of all the accidents addressed in this Report.

Figure 3.3.A
2004 Accident Review By Location

This map provides a quick visual overview of where most of the accident were concentrated in 2004. Africa, as usual, features prominently on the distribution. A detailed breakdown of accident locations can be found in the summary table in Annex 2.

Western-built Aircraft Accidents by IATA Operator Region

Excellent sector and flying hour data is available for Western-built Jet fleets. Even with this data some estimation and approximation has been applied, but it may be assumed accurate within 2%.

The 2004 data for Western-built Jet utilisation spans 23.03 million sectors broken down as follows:

- North America (NA) 10.3 Million
- Europe (EU) 5.81 Million
- Far East (FE) 4.27 Million
- South America (SA) 1.52 Million
- Africa (AF) 0.58 Million and
- Near East (NE) 0.56 Million sectors

For the first time, sufficiently accurate exposure data for Western-built Turboprops is available, and IATA has seized this opportunity to establish a common safety metric between the Jet and Turboprop fleets. Therefore, the regional accident rates for Turboprop aircraft, as expressed Hull Losses per million sectors flown instead of aircraft-year as in previous editions, are shown below.

Figures 3.3.B and 3.3.C show the best possible picture of the accidents by IATA Region of Operator.

Figure 3.3.B
Western-built Jet Hull Loss Rate by Region

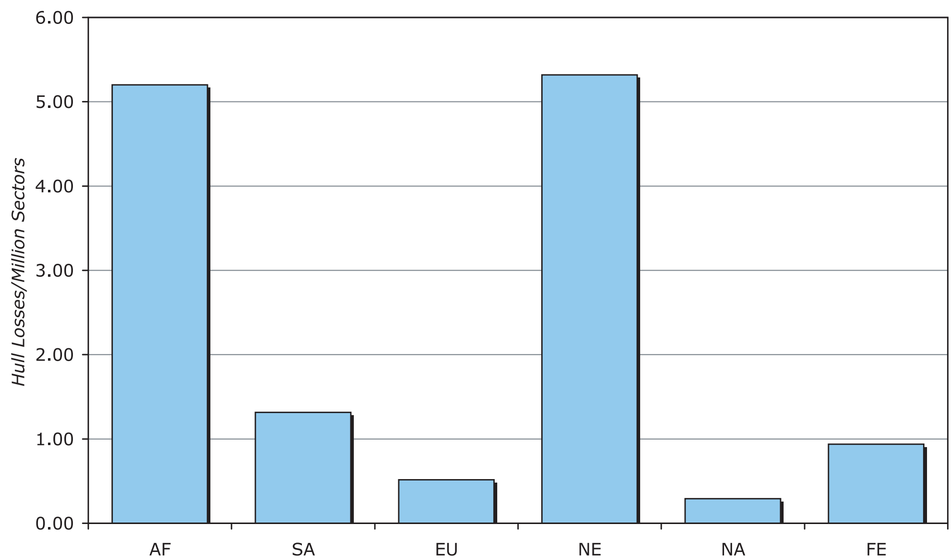
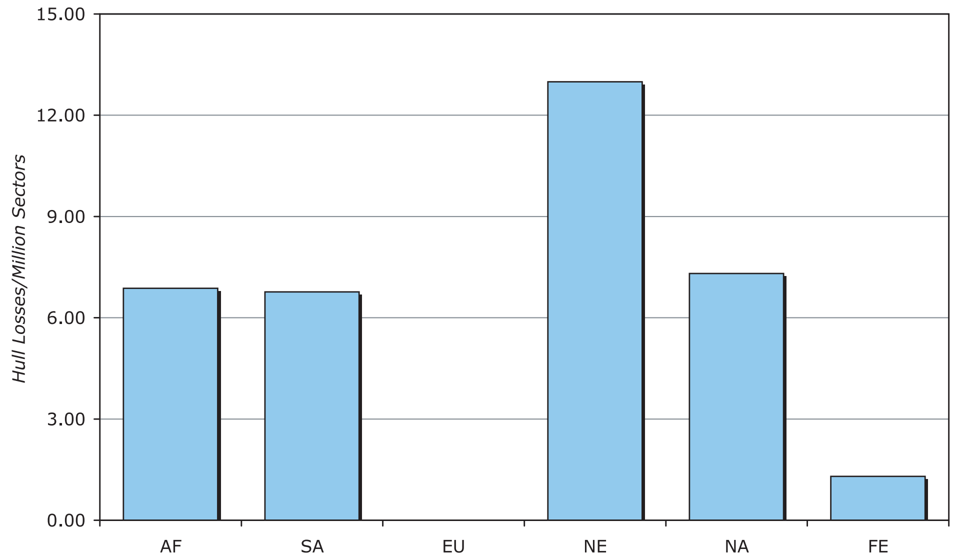


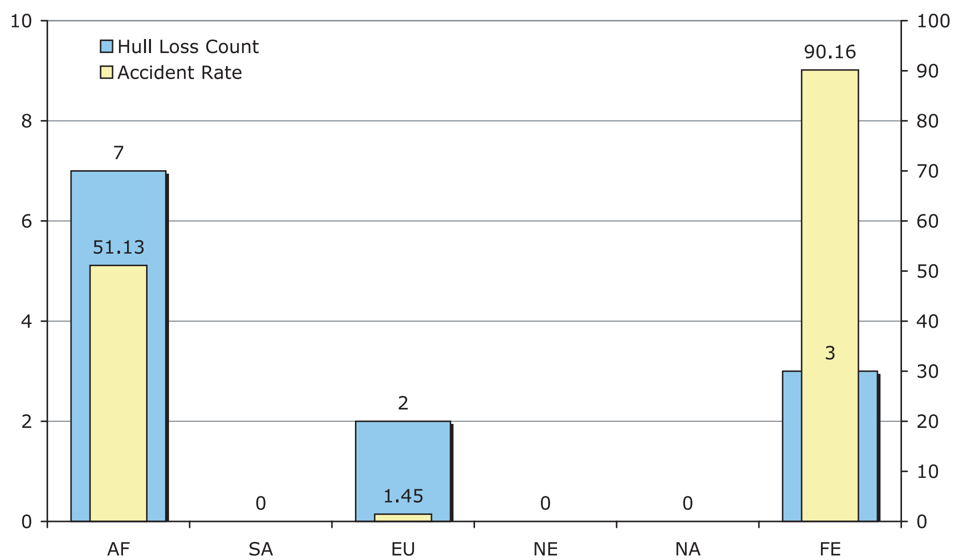
Figure 3.3.C
Western-built Turboprop Hull Loss Rate by Region



Eastern-built By Region

IATA has also obtained exposure data for the Eastern-built fleet this year. The regional accident rate breakdown is presented in Figure 3.3.D.

Figure 3.3.D
Eastern-built Aircraft Hull Loss by Region



3.4 REGIONAL SUMMARY OF ACCIDENTS

- In terms of Hull Loss rates for 2004, it is very pleasing to note the sharp decrease that Africa has had with respect to Western-built Jets. This achievement is, however, overshadowed by the fact that 23 of 2004's 103 accidents (22%) occurred in Africa, an area that accounts for only 4.5% of all sectors flown globally for all fleets (Eastern and Western). This continuing disparity is seen as a key safety concern for the immediate future. Also of note is that 6 of the 25 fatal accidents in 2004 (24%) occurred in Africa. The fatalities picture however is improved for Africa in 2004. A total of 36 fatalities occurred in the region, representing an improvement over the 414 fatalities that occurred in 2003.
- North America (NA) continues to show the lowest accident rate for Western-built Jets, and recorded 2 Jet Hull Losses in 2004. However, these 2 Jet Hull Losses were fatal accidents and this is an increase from the banner year of 2003 when there were no fatalities onboard Jet accidents.
- The Turboprop fleet in NA fared better with 5 Hull Loss accidents (versus 8 in 2003) for the year, 3 of which accounted for 16 fatalities, also an improvement.
- The Western-built Jet Hull Loss rates in Europe (EU) and the Far East (FE) were low with 3 Hull Losses accounting for no fatalities and 4 Hull Losses accounting for 78 fatalities respectively.
- The Western-built Jet accident rate for the Near East (NE) marked a stark increase in 2004, due to the 4 Hull Losses that occurred there. Given that, like Africa, the region accounts for relatively few sectors, it is more sensitive to rate spikes and dips. Therefore, no undue alarm should be raised as a result of this information. Only one of the Hull Losses in the Near East was fatal, an improvement over 2003.
- South America (SA) also marked an improvement in 2004, with only 3 Western-built Jet Hull Losses that accounted for no fatalities. The Turboprop fleet, however, did not fare as well, representing over 50% of the accidents in the region during 2004.

3.5 AIR CARGO OPERATIONS 2004 (DEDICATED FREIGHTER AIRCRAFT)

Figure 3.4.A

Cargo vs Passenger Operations for Western-built Jets

	Fleet Size End of 2004	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	1687	5	2.96	2	7	4.15
Passenger	16092	13	0.81	32	45	2.80
Total	**17779**	**18**	**1.01**	**34**	**52**	**2.92**

Cargo vs Passenger Operations for Western-built Turboprops

	Fleet Size End of 2004	HL	HL per 1000 Aircraft	SD	Total	Operational Accidents per 1000 Aircraft
Cargo	822	9	10.9	5	14	17.0
Passenger	4765	14	2.94	5	19	4.80
Total	**5587**	**23**	**4.12**	**10**	**33**	**5.91**

The world's Jet cargo fleet size remained ~~effectively~~ constant from 1,686 in 2003 to 1,687 in 2004. The Turboprop fleet showed similar stalled growth, with 822 aircraft in 2004 versus 819 in 2003. A total of 33 accidents involved cargo aircraft of Eastern and Western origin in 2004. This represents nearly a third (33%) of all accidents in 2004, a stark increase compared with 2003's percentage (22%). Focusing on Western-built aircraft, a quarter (25%) of Western-built Jet and Turboprop accidents occurred to cargo aircraft and 28% of the Western-built Jet Hull Loss accidents involved cargo operators.

3.6 FERRY FLIGHTS 2004

A total of 4 accidents occurred while ferrying aircraft in 2004, representing 3.9% of all accidents and down from 7.7% in 2003. Three of the four ferry accidents occurred to Western-built aircraft (2 Jet and 1 Turboprop). A single Eastern-built Jet was also involved in a ferry accident. Of the four ferry accidents, only one was a Hull Loss.

A total of 3 ferry accidents happened to passenger aircraft, one involving 2 fatalities. A single ferry accident occurred while ferrying a cargo aircraft. This single ferry accident accounted for 3% of all cargo accidents in 2004, a substantial decrease from 2003's figure of 11.5%.

3.7 CHAPTER 3 SUMMARY

- In 2004, the Hull Loss Rate per million sectors for Western-built Jets fell from 0.87 per million sectors in 2003 to ~~0[illegible]~~ per million. The rate has been on a declining trend for the past 6 years.
- Among Western-built fleets, there were 5 fatal accidents involving Jet aircraft and 12 fatal accidents involving Turboprop aircraft. These accounted for 235 fatalities on board Jet aircraft and 126 on board Turboprop aircraft. The fatality rate on Western-built Jets is the lowest on record.
- There were 18 Eastern-built Jet and Turboprop Hull Loss and Substantial Damage accidents.
- Nine out of the 18 accidents involving Eastern-built Jet and Turboprop aircraft (50%) occurred in Africa and 5 events occurred in Europe.
- Africa continues to show high accident rates, however the Middle East (NE) had the higest Western-built Jet accident rate in 2004. The low number of sectors flown in Africa and the Middle East makes these regions vulnerable to rate fluctuations not seen in other areas.
- There were no fatal Jet aircraft accidents in either Africa (AF) or Latin America (SA).
- There were 33 accidents involving Eastern and Western-built cargo aircraft, representing almost one third of all the year's accidents.
- A total of 4 accidents occurred while ferrying aircraft in 2004. This is an improvement of 2 over 2003.

CHAPTER 4 — ACCIDENT ANALYSIS 2004

4.1 DATA COLLECTION AND CLASSIFICATION

The Accident Classification Working Group (ACWG) is composed of safety experts, accident investigators, aircraft manufacturers and other specialists who meet to classify operational accidents that occur during a given year.

In order to permit the classification of accidents, based on the data available at the time of the meeting, IATA has developed a classification system that highlights contributing factors. These factors are grouped into four broad categories: human, organisational, environmental and technical. Each of the categories is subdivided into more concise contributing factors. Accidents are generally the result of a combination of factors. Therefore, one accident may be attributed several factors from various categories.

The assignment of the classifications is based on a subjective assessment of the contributing factors that are believed to have played a role in an accident. The early classification of accidents, prior to the release of the accident investigation report, can help to identify threats in the aviation industry and aid developing prevention strategies to avoid their recurrence.

Every year, the ACWG comes across reports, which contain little or no information regarding an accident. Reporting cultures in certain areas of the world, or in certain types of operations, continue to be deficient or non-existent. This impedes the classification process and prevents the industry from learning lessons from an event. If an accident contains insufficient information, the contributing factors cannot be assessed. In this type of scenario, the ACWG assigns the event the code “insufficient data”.

4.1.1 Changes in the Contributing Factor Codes

In 2004, the ACWG and the IATA Human Factors Working Group (HFWG) conducted a review of the contributing factor codes to ensure that they are easy to use and do not leave room for ambiguity.

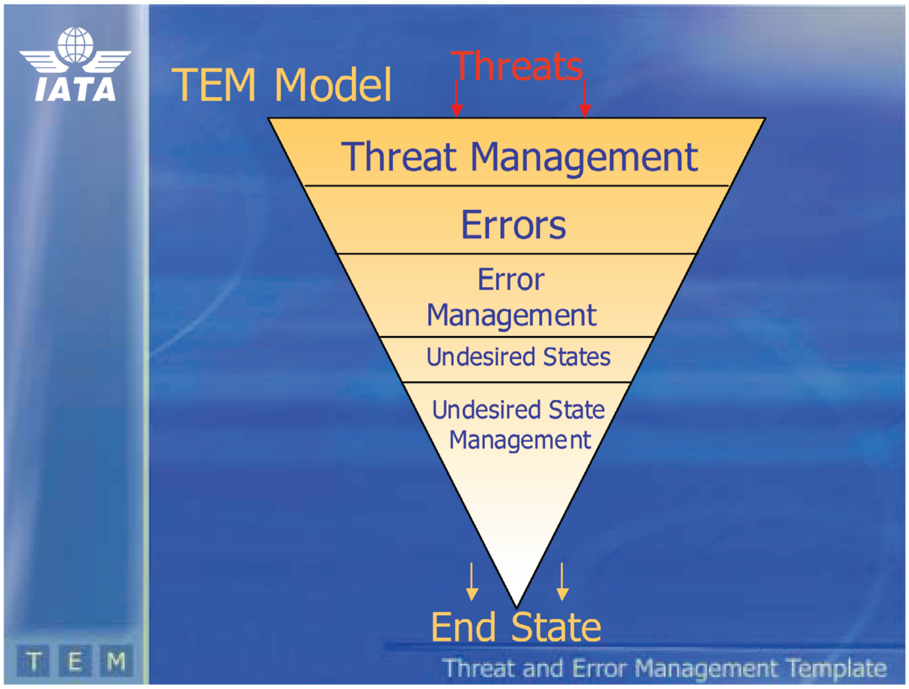
The contributing factor codes for all categories are presented in Annex 1. It is recommended that readers familiarise themselves with these codes, in order to gain a better understanding of their use in section 4.2, which presents the detailed analysis of accidents.

4.1.2 Application of the Threat and Error Management Model

The Human Factors Research Project at The University of Texas at Austin developed the Threat and Error Management (TEM) model as a conceptual framework to interpret data obtained from both normal and abnormal operations. IATA and its HFWG have worked closely with The University of Texas at Austin Human Factors Research Team and the International Civil Aviation Organisation (ICAO) to apply TEM to IATA’s safety activities.

The TEM model helps to underline the classification system used by IATA to determine contributing factors, in accidents. These factors can be viewed as threats or as errors depending on their nature. Figure Figure 4.1.2.A illustrates the TEM model.

Figure 4.1.2.A
Threat and Error Management Model



Threats are situations external to the flight deck that must be managed by flight crew in everyday operations. These threats can endanger flight safety and increase the complexity of operations. Threats can be subdivided into expected and unexpected threats. Foreseen adverse weather can be an expected threat; a landing gear malfunction can be an unexpected one. Thus, contributing factors in the environmental, organisational and technical categories are all threats because they occur outside the flight deck but must be managed by the flight crew.

The human factors category, on the other hand, defines errors produced by the flight crew. An error is defined as an action taken by the operating flight crew, or lack thereof, which leads to deviations from their expectations or intentions, or from those of the organisation. IATA's system for assigning contributing human factors is based on the TEM model. In collaboration with the HFWG, the new subcategories are believed to better assess flight crew performance and to allow a deeper understanding of the human elements that contribute to an accident. The human factors category is now subdivided into five subcategories: intentional non-compliance, proficiency errors, procedural errors, communication errors and fatigue/pilot incapacitation.

If a crew manages a threat, it can render the threat inconsequential. However, if the situation is mismanaged, the flight crew may commit errors. Depending on the flight crew's response following an error, the situation may be resolved, further errors may be produced or the aircraft may be placed in an undesired state. An undesired aircraft state occurs when safety is unnecessarily compromised by the flight crew's actions or inactions. It should be noted that not all threats or errors set off a chain reaction resulting in an accident.

4.1.3 Accident Data and the Analysis of Contributing Factors

IATA's analysis of preliminary accident data and of the contributing factors attributed to each event allows the unveiling of areas of concern that pose a risk to the safe operation of aircraft. The early identification of operational threats and flight crew errors can assist in developing prevention strategies in IATA's commitment to reducing the accident rate.

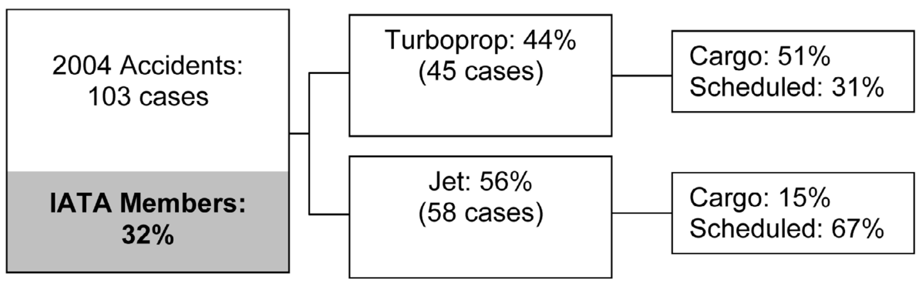
The following section presents the findings from the 2004 accidents analysed by the ACWG. Unlike previous years, this year's analysis blends both Eastern and Western-built aircraft. The data analysed is presented under Jet and Turboprop aircraft, regardless of the origin of the manufacturer.

4.2 OVERVIEW OF THE 2004 ACCIDENTS

4.2.1 Jet and Turboprop Aircraft Accidents

In 2004, 56% of accidents involved Jet aircraft, 14% were fatal and 36% resulted in a Hull Loss. In contrast, 44% of accidents involved Turboprop aircraft, 36% were fatal and 32% resulted in a Hull Loss.

The following diagram illustrates the overall Jet and Turboprop aircraft events. The grey box represents the number of carriers involved in the accidents, which are IATA members. The third box from the left illustrates what percentage of the overall accidents by aircraft (Jet or Turboprop) occurred during scheduled operations and which ones involved cargo operations.



Most significant factor(s) in Jet aircraft events:

1. Flight crew proficiency issues: 40%
2. Deficient airline safety management: 34%
3. Flight crew training deficiencies: 34%
4. Deficient flight crew communication: 28%
5. Poor standards and checking: 26%

For this section of the report, the ACWG analysed contributing factors based on positive correlations and correlations. These are defined as follows:

Positive Correlation: factors were present in over 50% of cases analysed.   Correlation: factors were present in less than 50% of cases analysed.

✔ Positive correlation between deficient flight crew proficiency, airline training systems deficiencies, and inadequate safety management.

✔ Positive correlation between inadequate flight crew communication and airline training system deficiencies, and inadequate safety management.

✔ Correlation between deficiencies in airline safety management and deficiencies in regulatory oversight

✔ Least significant factor(s): technical factors.

In 2004, the most frequently noted contributor in accidents involving Jet aircraft was deficient flight crew proficiency. Proficiency issues relate to flight crew performance failures due to deficient knowledge or skills (e.g. inappropriate handling of the aircraft). This may be exacerbated by lack of experience, knowledge or training.

Deficient safety management was noted in over a third of the Jet aircraft accidents. This factor relates to inadequate or absent Safety Management Systems (SMS) such as: ineffective/absent safety officer, inadequate/absent accident/incident prevention programme or inadequate/absent voluntary confidential reporting system.

Flight crew training systems deficiencies were also noted in over a third of accidents involving Jet aircraft. This factor refers to omitted or inadequate training; language skills deficiencies; qualifications and experience of flight crews, operational needs leading to training reductions, insufficient assessment of training, and inadequate training resources such as manuals or Computer-based Training (CBT) devices.

Flight crew communication issues were highlighted in over a quarter of Jet aircraft accidents. These issues include: miscommunication, misinterpretation or failure to communicate pertinent information within the flight crew or between the flight crew and an external agent (e.g. Air Traffic Control or ground operations). Crew Resource Management (CRM) issues typically fall under this category. Examples include: failures in monitoring and crosschecking, misunderstanding a clearance; or failure to convey relevant operational information.

Poor standards and checking also featured in over a quarter of the Jet aircraft accidents. This factor includes: inadequate, incorrect, unclear 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.

There was a link between inadequate or absent safety management at the airline level, deficient training systems within the organisation and flight crew proficiency issues on Jet aircraft, which generally combined to contribute to an accident. Likewise, communication issues were often linked to deficient safety management and training systems.

Weak or absent regulatory oversight was often noted in cases where airlines did not have adequate safety management in place. It should also be noted that technical failures were the least common type of contributor cited in Jet aircraft accidents.

Note: *7% of Jet aircraft accidents could not be classified due to insufficient information.*

Most significant factor(s) in Turboprop aircraft events:

1. Deficient airline safety management: 29%
2. Flight crew training deficiencies: 27%
3. Meteorology: 27%
4. Poor standards and checking: 24%
5. Flight crew proficiency issues: 22%

✔ Positive correlation between deficient flight crew proficiency and airline training systems deficiencies (100%).

✔ Positive correlation between deficient flight crew proficiency and airline training system deficiencies, and meteorology.

✔ Correlation between deficiencies in airline safety management and training systems deficiencies.

✔ Correlation between training systems deficiencies and poor regulatory oversight.

✔ Least significant factor(s): technical factors.

The top contributing factors in accidents involving Turboprop aircraft were similar to those in Jet aircraft, despite small fluctuations in the percentages. Meteorology was among the top five contributing factors in Turboprop aircraft accidents, noted in 27% of events. This factor includes windshear, jet upset, atmospheric turbulence, icing, wake turbulence (aircraft spacing), volcanic ash, sand, precipitation, lightning, poor visibility and poor runway condition reporting. In comparison, meteorology was cited in 21% of accidents involving Jet aircraft.

Similar to Jet aircraft accidents, poor safety management at the organisational level, deficient training systems and inadequate flight crew proficiency were closely liked in the majority of accidents where these factors were cited. Inadequate training and flight crew proficiency were tied to accidents where meteorology played a role. This raised questions regarding the operator's effectiveness in training flight crews to deal with adverse weather and transmit to them the adequate skills and knowledge to manage such a situation. A thread was also established between inadequate or absent safety management and weak regulatory oversight in the State where the operator was based. These findings resemble those from Jet aircraft accidents.

Note: *22% of Turboprop aircraft accidents could not be classified due to insufficient information.*

4.2.2 Accidents by Phase of Flight

Figure 4.2.2.A presents the 2004 operational accidents by phase of flight for both Jet and Turboprop aircraft. Overall, Landing was the predominant phase when accidents occurred. The majority of accidents resulting in a Hull Loss or Substantial Damage also took place during Landing.

Figure 4.2.2.A
Operational Accidents by Phase of Flight

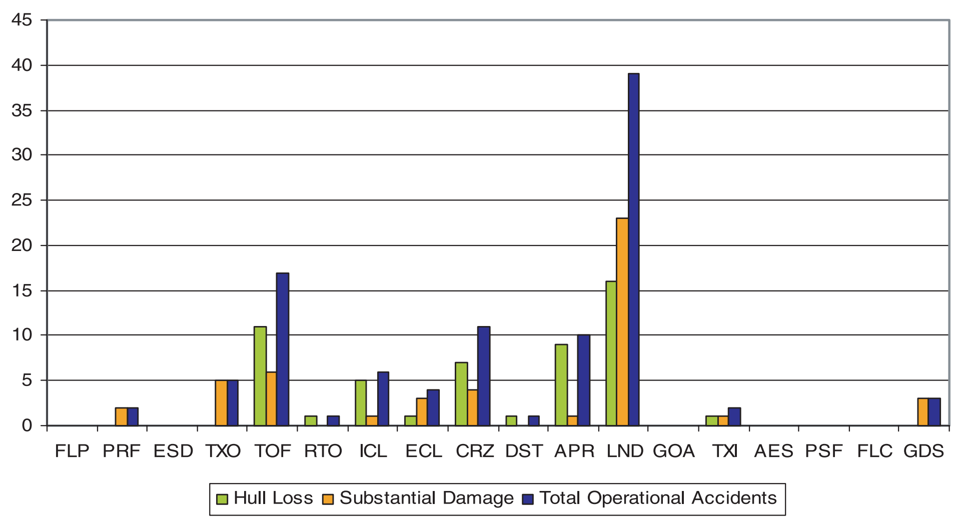


Figure 4.2.2.B
Fatal Accidents and Fatalities by Phase of Flight

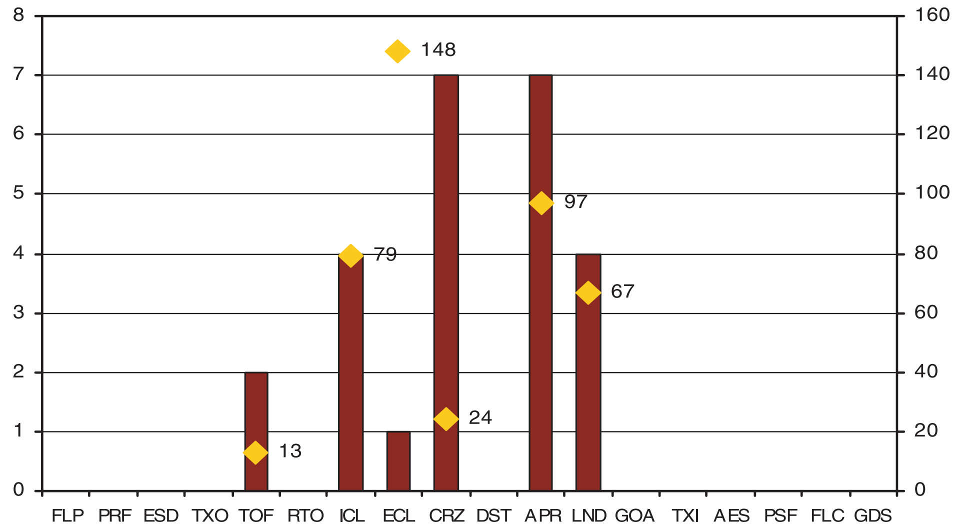


Figure 4.2.2.B illustrates fatal accidents (shown by the red bars) and fatalities (shown by the yellow diamonds) by phase of flight for all Jet and Turboprop aircraft. Cruise and Approach were the main phases of flight where passengers or crewmembers were fatally injured. The greatest number of fatalities was attributed to Enroute Climb. However, it should be noted that all these fatalities were the result of one single accident.

4.3 IN-DEPTH ANALYSIS OF EVENTS

4.3.1 Accident Families

This section presents an in-depth analysis of the 2004 events by accident families. The term “accident families” refers to a generic classification of accidents, as presented in Figure 4.3.1.A. Table 4.3.1.B illustrates the breakdown of families in accordance to severity and probability of occurrence.

Figure 4.3.1.A
Accident Families

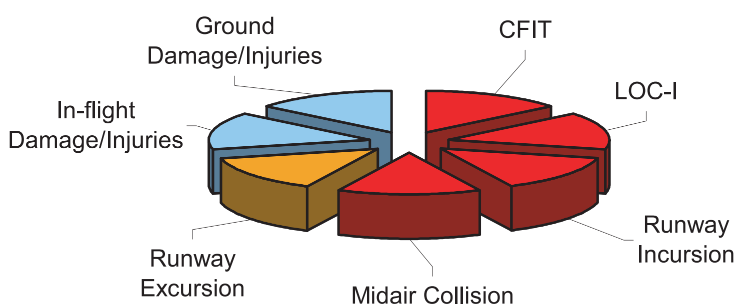


Table 4.3.1.B
Classification of Accident Families

Accident Family	Description
Controlled Flight into Terrain (CFIT)	Generally a Total Loss (aircraft & occupants) ✓ Maximum severity ✓ Low probability
Loss of Control In-flight (LOC-I)	
Runway Incursion	
Midair Collision	
Runway Excursion	Possible Hull Loss and historically few fatalities ✓ Low severity ✓ Higher probability
In-flight Damage/Injuries	High costs (remote fatalities) ✓ Low (high) severity ✓ High probability
Ground Damage/Injuries	

Referring to these families helps an operator to:

✔ Structure its safety activities and set priorities.

✔ Avoid "forgetting" key risk areas, when a type of accident does not occur in a given year.

✔ Mobilize concerned people around well-identified prevention opportunities.

✔ Be more proactive by creating links in databases between safety reports and generic accident families.

✔ Address systematically and continuously these accidents in the airline's annual prevention programme.

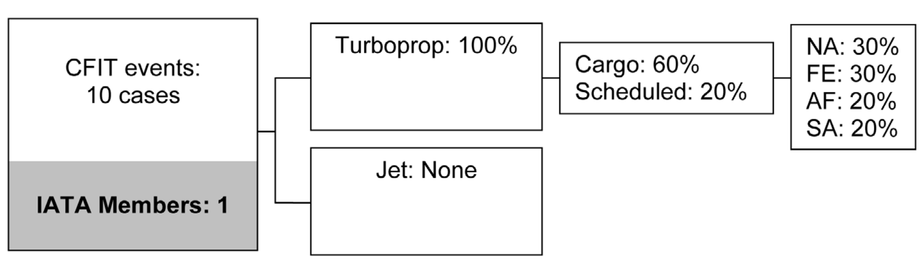
Although some families may not have appeared in the 2004 accidents, operators should not dismiss efforts needed to prevent these types of events as they may reoccur if work to develop awareness and prevention strategies is weakened.

Each of the accident families presented in this section contains a breakdown of the most significant contributing factors, as well as the correlations established between the predominant contributors.

4.3.2 Controlled Flight Into Terrain

In 2004, there were 10 Controlled Flight Into Terrain (CFIT) accidents. In total, 9 were fatal and all these resulted in a Hull Loss. All the CFIT events in 2004 involved Turboprop aircraft.

The following diagram illustrates CFIT events regarding Jet and Turboprop aircraft. These categories are then broken down to represent the percentage of accidents that involved cargo operations. The third box from the left also illustrates what percentage of the overall accidents by aircraft (Jet or Turboprop) occurred during scheduled operations. The grey box represents the overall number of carriers involved in the accidents that are IATA members. The box on the far right represents the percentage of events by IATA region of occurrence for all the events in the accident family.



Overall, half of the CFIT accidents (5 cases) occurred during Approach, 3 during Cruise and 2 during Landing.

Most significant factor(s) in CFIT events:
1. Deficient airline safety management: 60%
2. Poor standards and checking: 60%
3. Meteorology: 60%
4. Deficient flight crew communications: 50%
5. Intentional non-compliance: 40%

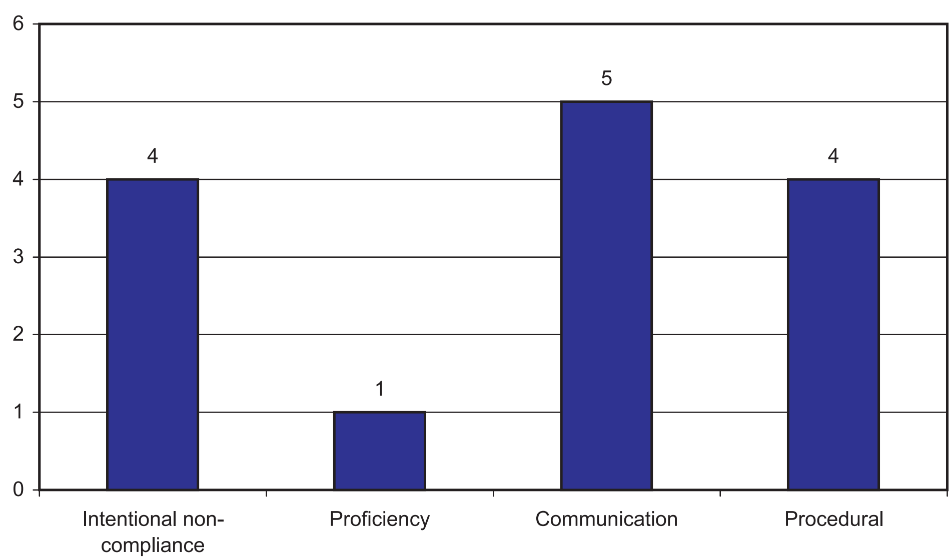
✔ Positive correlation between flight crew intentional non-compliance and meteorology (100%).

✔ Positive correlation between flight crew intentional non-compliance and deficient airline safety management.

✔ Least significant factor(s): technical factors.

Deficiencies in safety management, poor standards and checking and meteorology were the main contributing factors in CFIT events. Deficient flight crew communications featured in half of the events. Intentional non-compliance was noted in 4 cases. This factor relates to a deliberate and premeditated deviation from operator procedures and/or regulations by the flight crew (e.g. intentional disregard of operational limitations or SOPs). A summary of human factors in CFIT events is presented in Figure 4.3.2.A. Meteorology was a contributing factor in all the events involving intentional non-compliance. In 3 out of 4 cases where flight crews voluntarily violated company procedures or regulations, safety management deficiencies were also cited.

Figure 4.3.2.A
Human Factors in CFIT Events



Deficient regulatory oversight was cited in half of the accidents where safety management deficiencies were highlighted. Two thirds of the CFIT accidents involving inadequate or absent regulatory oversight occurred in South America and involved South American Operators.

Note: *One CFIT accident could not be classified due to insufficient information.*

4.3.2.1 Enhanced-Ground Proximity Warning System (E-GPWS)

Ground Proximity Warning Systems (GPWS) have been widely fitted on commercial transport aircraft for a considerable time and have been successful in preventing many Controlled Flight Into Terrain (CFIT) accidents. A major drawback of GPWS is that it is based on the aircraft radio altimeters and gives very little warning of approaching terrain. Furthermore, it is inhibited in the landing configuration (i.e. gear down and land flap selected).

E-GPWS has been designed to overcome these limitations and provides crews with more warning of approaching terrain in time for them to take corrective action. The system consists of a global terrain database; a data feed from the aircraft air data computers and a Global Positioning System (GPS) input from the aircraft GPS or an internal GPS in the E-GPWS computer itself. A second choice is to use data from the Flight Management System (FMS).

The E-GPWS unit combines the aircraft current position with the terrain database and presents the information to the crew on the navigation display, giving a picture of terrain relative to the aircraft. 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 gives crews visual and aural warnings of proximity to terrain. When a hazardous condition occurs, a nominal of 60 seconds of alert is given by an aural “terrain” message, followed with a nominal 30 seconds of warning to “pull up”.

To date, over 32 potential CFIT incidents have been documented over the past six years where EGPWS has assisted in preventing accidents. E-GPWS is predicted to reduce the risk of CFIT accidents by a factor of 100 (1 CFIT accident per 250,000,000 departures). The system is also known in some areas as Terrain Awareness Warning System (TAWS).

Regulation

ICAO Annex 6 currently requires aircraft be fitted with a ground proximity warning system, which has a forward looking terrain avoidance function (i.e. EGPWS) according to the following table:

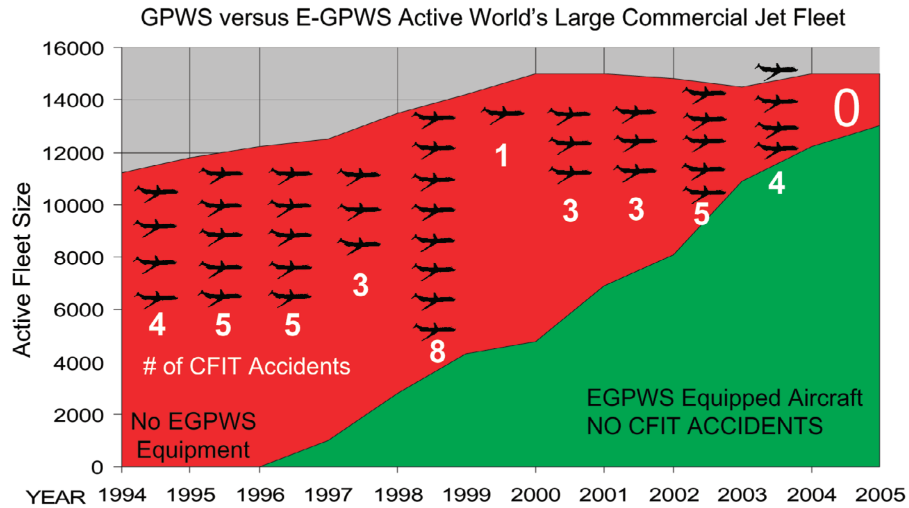
Table 4.3.2.1.B

E-GPWS Information, as of March 2005

Aircraft Fitted and flying with E-GPWS	27,004	
Worldwide Large Commercial Jets:	12,200+ of 15,000	81%
Europe	3,400 of 3,400 aircraft	100
USA	5,800 of 6,000 aircraft**	97%
Regional USA	1,200 of 1,500 aircraft	80%
Air Taxi - Cargo Part 135	130 of 1,500 aircraft	9%
Business/Corporate/other	7,000 of 10,000* aircraft	70%
Delivered EGPWS Computers	30,000+	
Flight Sectors Flown	Exceeds 250,000,000	
Audited Flight Sectors	Exceeds 6,500,000	
* Includes approx. 1500 TAWS provided by other manufacturers		
** 1,100 with no GPS		

*Includes approx. 550 TAWS provided by other manufacturers
**1,260 with no GPS

Figure 4.3.2.1.C
GPWS versus E-GPWS Active World's Large Commercial Jet Fleet



Provided by Honeywell

Figure 4.3.2.1.C indicates the increase in the number of aircraft fitted with E-GPWS and the related decrease in the number of CFIT accidents. In fact no aircraft equipped with E-GPWS has had a CFIT accident. 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 is kept up to date. This is leading to a growing concern that there may eventually be a CFIT accident to an aircraft capable of avoiding a CFIT accident because in addition to other defences it is equipped with E-GPWS, however an E-GPWS with outdated information provides a misleading sense of comfort. To get the most CFIT risk reduction from E-GPWS, the airline needs to provide GPS position to E-GPWS, use the latest software and use the latest database.

GPS: There are approximately 6,333 aircraft using a GPS engine internal to E-GPWS. The airline needs to pin up by means of a rear jumper Geometric Altitude (Airbus only), Obstacles, and 'Peaks'. Every E-GPWS has these safety functions built-in and they are available free from Honeywell.

Software: The software is also free, but needs to be updated by a Personal Computer Memory Card International Association (PCMCIA) card. Unfortunately, if the airline received the E-GPWS installed by Airbus or Boeing, they have to coordinate with them, unless the airline uses an E-GPWS that was installed using an amended Supplemental Type Certificates.

Database: It is discouraging to learn that many airlines have never updated their E-GPWS database since they first installed the E-GPWS equipment. It is important to keep the Terrain/Obstacle/Runway WGS-84 database current. It is provided free of charge from Honeywell and can be downloaded from their website www.egpws.com with a simple arrangement or on a PCMCIA card from Honeywell. Airlines can also sign up to receive e-mail notifications when new databases are released. The PCMCIA card is inserted into the front of the E-GPWS computer (power on) installed on the aircraft. Once the front panel button pressed, the database is loaded within 30 minutes.

4.3.3 Loss of Control In-flight

During 2004, 17% of the accidents involved a Loss of Control In-flight (LOC-I), of which 65% resulted in crew or passenger fatalities and 94% resulted in a Hull Loss.

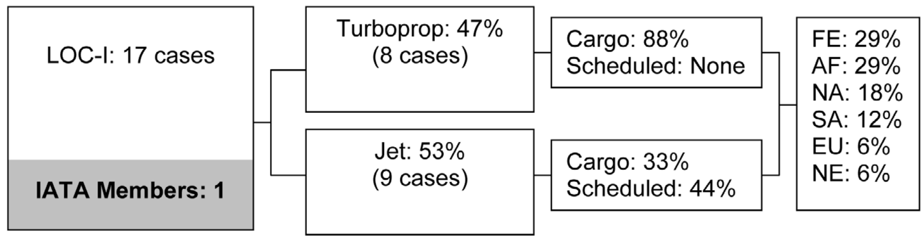
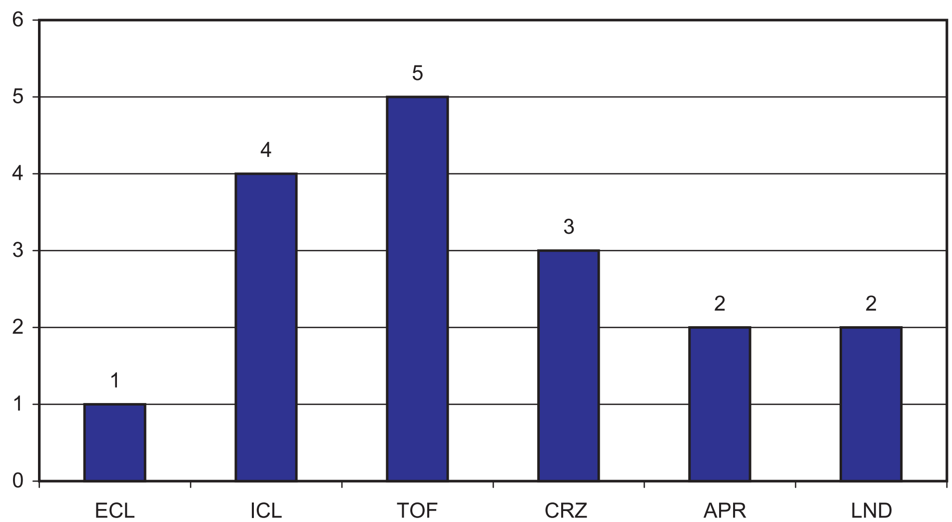


Figure 4.3.3.A illustrates LOC-I events by phase of flight. Take-off and Initial Climb were the main phases of flight when Loss of Control occurred.

Figure 4.3.3.A

LOC-I Events by Phase of Flight



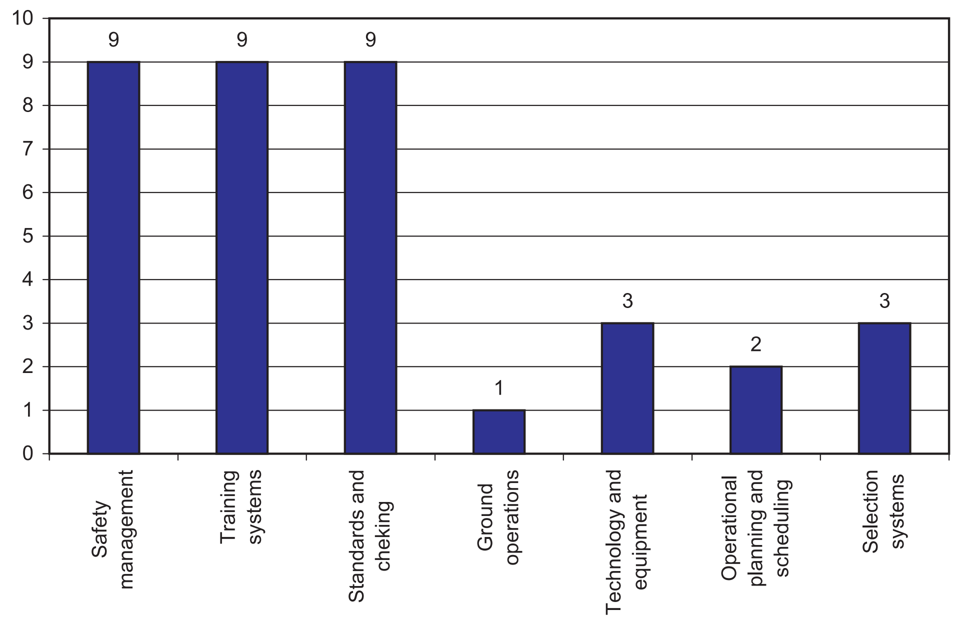
Most significant factor(s) in LOC-I events:

1. Deficient airline safety management: 53%
2. Poor standards and checking: 53%
3. Flight crew training deficiencies: 53%
4. Deficient flight crew communication: 53%
5. Flight crew proficiency issues: 41%

- ✔ Positive correlation between inadequate flight crew communication and deficient flight crew proficiency, and airline training system deficiencies
- ✔ Correlation between deficiencies in airline safety management and weak regulatory oversight
- ✔ Least significant factor(s): technical factors.

Deficiencies in safety management, standards and checking, training systems and flight crew communication were all equally cited in over half of the LOC-I events. It should be noted that all these factors, aside from flight crew communication, refer to organisational issues. A summary of the organisational factors cited in LOC-I events is presented in Figure 4.3.3.B. Proficiency issues were noted in over 40% of events. Inadequate training systems at the organisational level were linked to flight crew proficiency and communication issues. Almost half the operators (44%) who had inadequate safety management operated in an environment where weak regulatory oversight is believed to have been a contributor in the accident. Overall, meteorology played a contributing role in 24% of accidents.

Figure 4.3.3.B
Organisation Factors in LOC-I Events



In the majority of events where flight crew communication was cited (78%), training deficiencies also played a contributing role. In all the cases where flight crew proficiency issues where highlighted, training deficiencies within the airline were also noted.

Note: *24% of LOC-I accidents (4 cases) could not be classified due to insufficient information.*

4.3.4 Runway Incursions

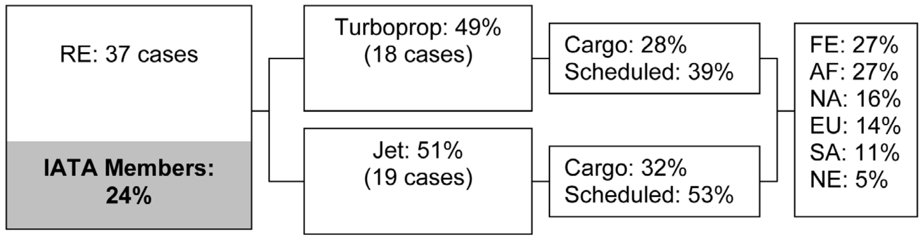
There were no accidents involving runway incursions in 2004. These occurrences involve the incorrect presence of an aircraft, vehicle or person on a protected area designated for Take-off and Landing. Events where aircraft were damaged during ground operations are presented in section 4.5.7.

4.3.5 Midair Collisions

In 2004, one accident involved a midair collision between two cargo aircraft from the same operator, of which 2 crewmembers in one of the aircraft were fatally injured, and one resulted in a Hull Loss.

4.3.6 Runway Excursions

During 2004, 36% of the accidents involved a runway excursion (RE), of which 11% resulted in crew or passenger fatalities and 59% resulted in a Hull Loss.



Overall, the majority of runway excursions (62%) occurred during the Landing phase of flight. Take-off was the second most common phase when excursions took place, accounting for 30% of the events. The remaining excursions occurred during other phases of flight (e.g. Rejected Take-off).

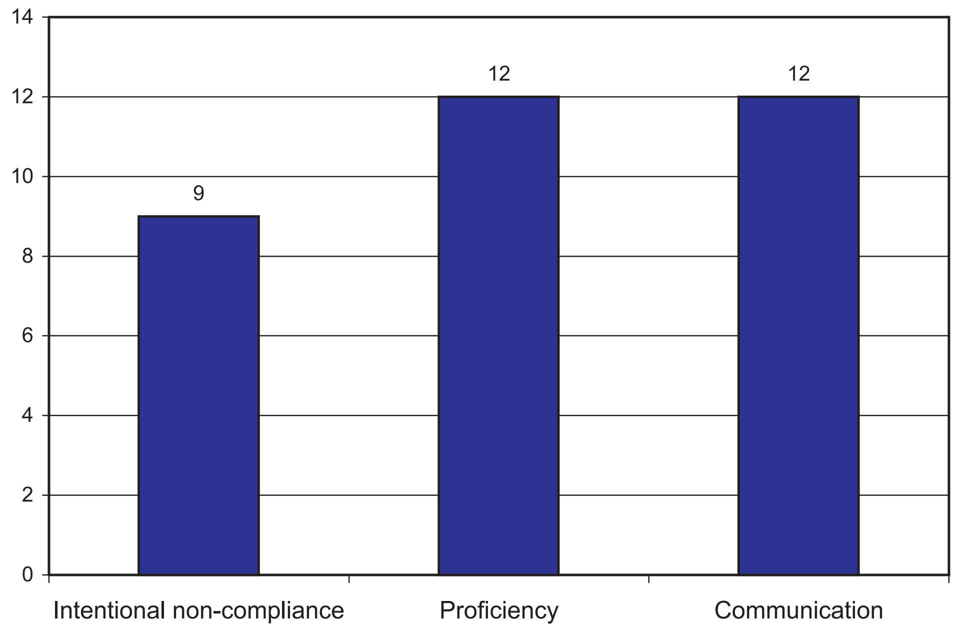
Most significant factor(s) in RE events:

1. Flight crew training deficiencies: 33%
2. Deficient flight crew communication: 32%
3. Flight crew proficiency issues: 32%
4. Deficient airline safety management: 29%
5. Poor standards and checking: 27%

- ✔ Positive correlation between inadequate flight crew communication and deficient flight crew proficiency, and airline training system deficiencies
- ✔ Positive correlation between flight crew intentional non-compliance and airline safety management deficiencies
- ✔ Least significant factor(s): technical factors

Training deficiencies, flight crew communication and proficiency issues were the most frequently cited contributing factors in runway excursions. In 10 out of the 12 accidents featuring proficiency issues, flight crew training was also a contributor. Inadequate flight crew training was also noted in 80% of accidents where communication played a role. Intentional non-compliance was cited in almost a quarter (24%) of runway excursion accidents. In 67% of occurrences where intentional non-compliance was highlighted, deficiencies in safety management were also noted at the organisational level. Meteorology played a role in 24% of all the runway excursions. Overall, human factors were the main category of contributors cited in runway excursions. A breakdown of the contributing human factors is presented in Figure 4.3.6.A.

Figure 4.3.6.A
Human Factors in Runway Excursion Events

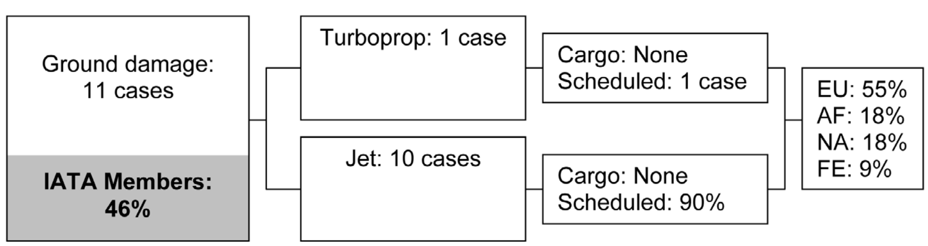


Tyre/gear failure was the main technical factor, cited in 19% of all excursions. Maintenance deficiencies were noted in almost half of accidents involving a type/gear failure. In 3 out of the 5 cases citing poor maintenance operations, inadequate regulatory oversight also played a role.

***Note:** 19% of runway excursions (7 cases) could not be classified due to insufficient information.*

4.3.7 Ground Damage

During 2004, 11% of the accidents involved ground damage from collisions between aircraft or with service vehicles or structures, none of which resulted in crew or passenger fatalities and 2 accidents resulted in a Hull Loss.



Overall, 64% of ground damage events took place as the aircraft taxied to and from the gate.

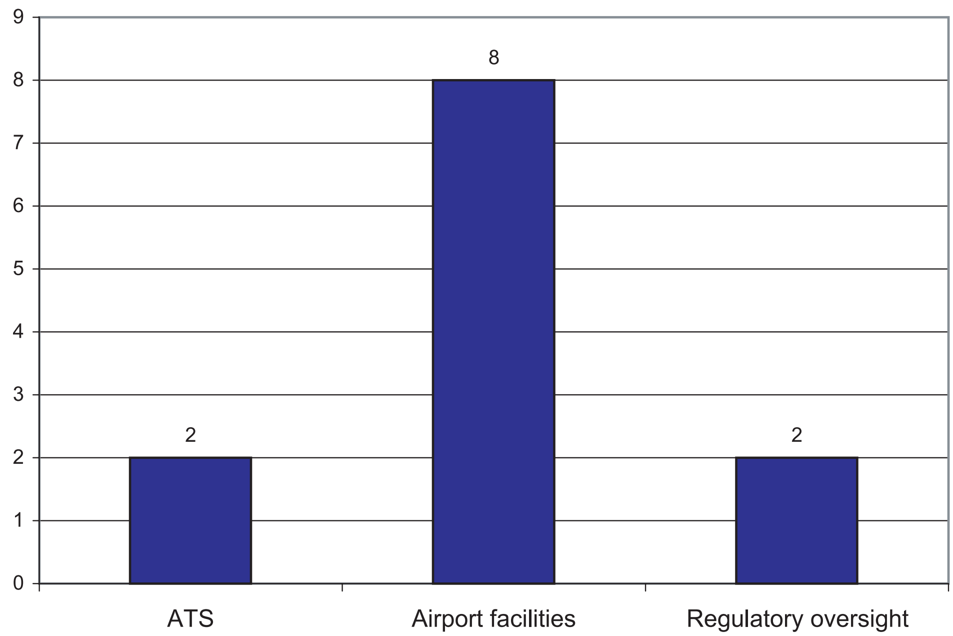
Most significant factor(s) in ground damage events:

1. Deficient airport facilities: 82%
2. Procedural errors by flight crew: 45%

✔ No significant correlations found.

Environmental factors were the main contributors to ground collision events, these are presented in Figure 4.3.7.A. Deficiencies in airport facilities, such as inadequate aerodrome support, failure to eliminate runway hazards and inadequate or misleading airport marking or information, played a role in the majority of all ground damage events. Air traffic services played a contributing role in only 2 out of the 11 ground accidents. Weak regulatory oversight of airport facilities was also noted as a contributing factor.

Figure 4.3.7.A
Environmental Factors in Ground Damage Events



Organisational issues were the least noted of all contributors. The management of ground operations was believed to have played a role in 2 out of the 11 accidents. Flight crew procedural errors were noted in 45% of accidents. Procedural errors relate to an unintentional deviation in the execution of operator procedures and/or regulations. It is believed that in such cases, the flight crew has the necessary knowledge and skills, the intention was correct, but the execution was flawed.

4.3.8 In-flight damage/injuries

One accident in 2004 resulted in a fatality but no damage to aircraft. The occupant was lost overboard when a cabin door inadvertently opened in-flight.

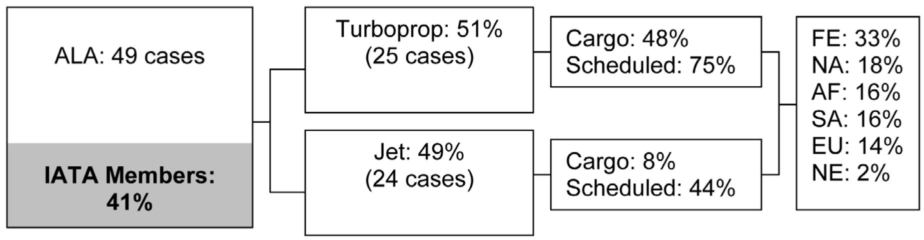
IATA does not classify serious injuries to passengers and crew from turbulence encounters under the Accident Classification Working Group's mandate. However, this issue is addressed in Chapter 5, under cabin operations safety.

4.4 OTHER AREAS OF INTEREST

This section presents an in-depth analysis of certain topics, which were considered significant in 2004.

4.4.1 Approach and Landing Events

During 2004, 48% of the accidents analysed occurred during the Approach and Landing (ALA) phases of flight, of which 23% resulted in crew or passenger fatalities and 41% resulted in a Hull Loss.



Most significant factor(s) in ALA events:

1. Deficient airline safety management: 43%
2. Flight crew proficiency issues: 43%
3. Flight crew training deficiencies: 41%
4. Poor standards and checking: 37%
5. Deficient flight crew communications: 29%

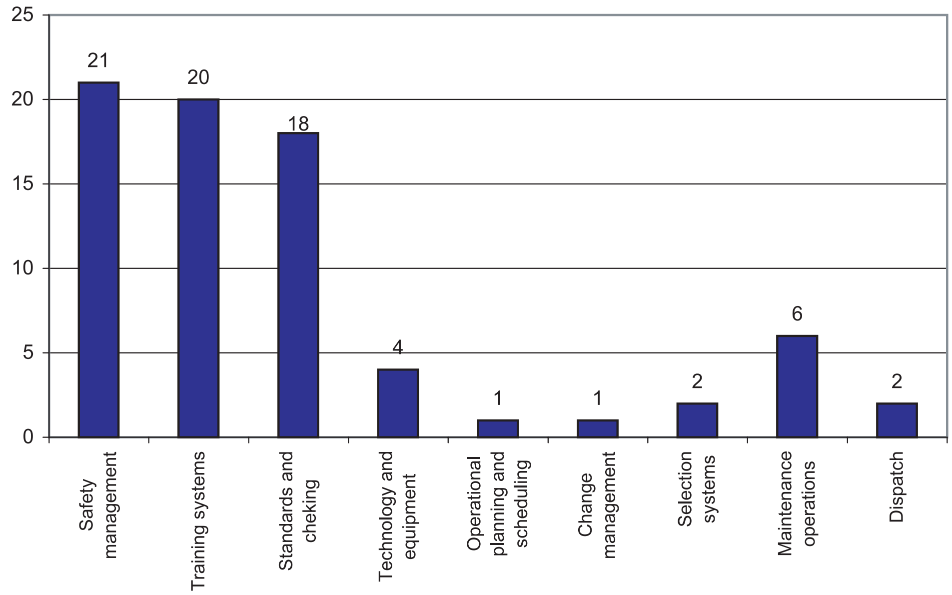
- ✔ Positive correlation between deficient flight crew proficiency and meteorology.
- ✔ Positive correlation between deficient flight crew proficiency and airline training systems deficiencies.
- ✔ Positive correlation between deficient flight crew communications and airline training systems deficiencies.
- ✔ Positive correlation between flight crew intentional non-compliance and adverse weather.
- ✔ Positive correlation between deficient airline safety management and weak regulatory oversight.
- ✔ Correlation between deficiencies in standards and checking and weak regulatory oversight.
- ✔ Least significant factor(s): technical factors.

Deficiencies in safety management and training systems were among the main contributing factors identified in ALA events. Flight crew proficiency was noted in almost half of the occurrences. Inadequate flight crew proficiency and communication issues were generally linked to training systems deficiencies at the organisational level. It is believed that in these cases, training courses did not address specific issues, such as CRM, or were altogether non-existent. In 43% of accidents where flight crew proficiency played a role, meteorology was also noted as a factor.

Intentional non-compliance on the part of the flight crew is believed to have played a contributing role in almost a quarter of ALA events. Meteorology was a factor in 83% of accidents where flight crews intentionally deviated from standard procedures.

In over half of the cases where poor safety management played a contributing role, inadequate regulatory oversight was also noted. Poor standards and checking were attributed to over a third of the ALA events. In almost half of these cases, weak regulatory oversight was linked to deficiencies in standards and checking within the airlines. A summary of all the contributing organisational factors in ALA events is presented in Figure 4.4.1.A.

Figure 4.4.1.A
Organisational Factors in ALA Events



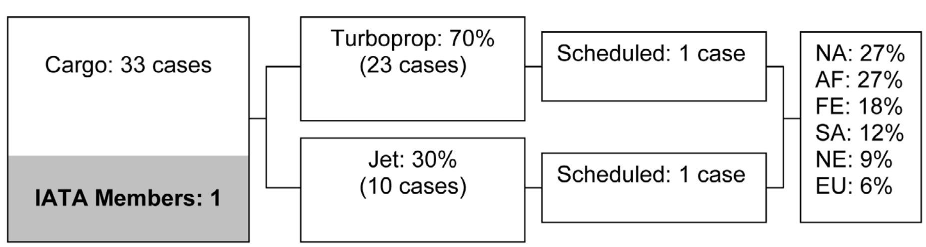
Gear and/or tyre failures were noted in 18% of all ALA accidents. It should be noted that, in these events, the gear/tyre malfunction was noted as a contributing factor that led to the accident and not as an outcome (e.g. gear collapse after a runway excursion). Maintenance operations deficiencies were cited in 4 out of the 9 cases of the accidents involving gear or tyre malfunctions.

Deficient regulatory oversight was identified in a quarter of the accidents. A third of the regulatory oversight deficiencies occurred in the Africa, making it the primary region where this type of issue was highlighted.

Note: *10% of ALA events (5 cases) could not be classified due to insufficient information.*

4.4.2 Cargo Operations

During 2004, 32% of the accidents involved cargo operations of which 39% resulted in fatalities and 67% resulted in a Hull Loss.



Most significant factor(s): in cargo events:

1. Deficient airline safety management: 42%
2. Poor standards and checking: 33%
3. Intentional non-compliance: 27%
4. Flight crew training deficiencies: 27%
5. Deficient flight crew communication 24%

- ✔ Positive correlation between flight crew intentional non-compliance and meteorology (100%).
- ✔ Positive correlation between flight crew intentional non-compliance, deficiencies in airline safety management and deficiencies in standards and checking.
- ✔ Positive correlation between inadequate flight crew communication and airline training systems deficiencies.
- ✔ Correlation between deficiencies in airline safety management and deficiencies in regulatory oversight.
- ✔ Correlation between deficiencies in maintenance and weak regulatory oversight.
- ✔ Least significant factor(s): technical factors.

Deficiencies in safety management and in standards and checking were among the main contributing factors in accidents involving cargo operations. In over a third of accidents (36%) where safety management was an issue, weak or absent regulatory oversight was also noted as a contributor. This correlation occurred primarily in the African region.

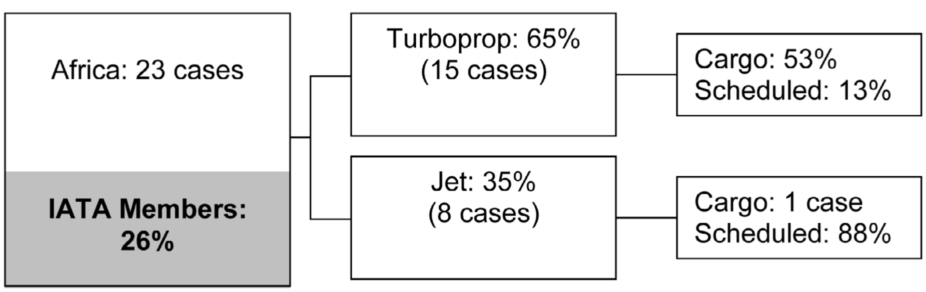
Intentional non-compliance by the flight crew was noted in over a quarter of the cargo events. In all the accidents were flight crew voluntary disregarded company policies and procedures; meteorology was also a contributing factor. Furthermore, inadequate or absent safety management was cited in 8 out of the 9 accidents involving intentional non-compliance by flight crews. The lack of proper standards and checking were also linked to accidents where crews voluntarily disregarded SOPs. Also, in over half the occurrences where communication issues were cited, operators had inadequate or non-existent training systems.

Deficient maintenance operations were highlighted in 2 out of the 3 accidents involving tyre/gear failure. Maintenance operations were also cited in all the accidents involving a structural failure. In two thirds of the accidents where maintenance is believed to have played a contributing role, weak regulatory oversight was also an issue. Regulatory oversight deficiencies were mainly identified in Africa and South America (2 cases each).

Note: *21% of cargo accidents (7 cases) could not be analysed due to insufficient information.*

4.4.3 Accidents in the African Region

During 2004, 22% of the accidents analysed occurred in the African region, of which 26% resulted in crew or passenger fatalities and 61% resulted in a Hull Loss.



Overall, 13% of accidents that occurred in Africa involved non-African operations.

Most significant factor(s) in African events:

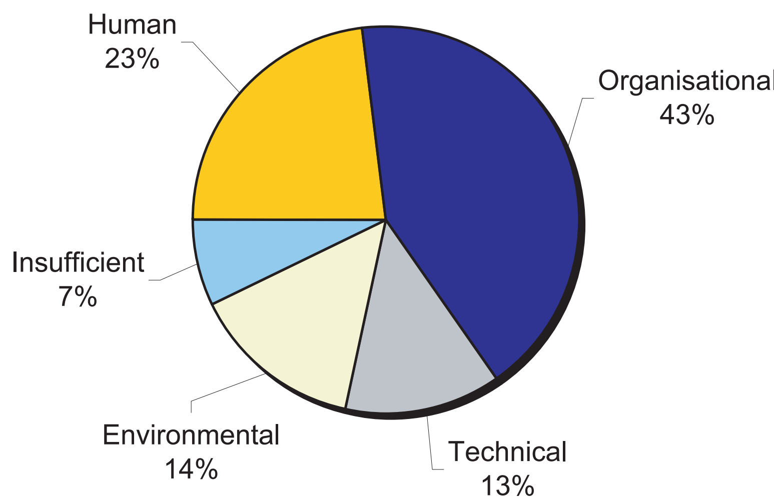
1. Deficient airline safety management: 39%
2. Flight crew training deficiencies: 39%
3. Flight crew proficiency issues: 35%

- ✔ Positive correlation between deficient flight crew proficiency and training issues (100%).
- ✔ Positive correlation between flight crew intentional non-compliance and deficiencies in airline safety management (100%).
- ✔ Positive correlation between deficient training systems and meteorology (100%).
- ✔ Positive correlation between deficient airline safety management and deficient flight crew training systems.
- ✔ Least significant factor(s): technical factors.

Organisational factors were the main contributors in accidents that occurred in Africa. The overall distribution of contributing factors is presented in Figure 4.4.3.A. Deficiencies in safety management and training systems were the most frequently noted factors. Deficient safety management was often linked to inadequate training of flight crews, which in turn was linked to all the cases where proficiency issues played a role. Deficient training was also cited in all the accidents where meteorology played a contributing role. Lack of safety management was linked to all the occurrences where flight crews voluntarily disregarded SOPs. In a third of the accidents where deficient safety management was identified, deficient regulatory oversight was also a contributor.

Figure 4.4.3.A

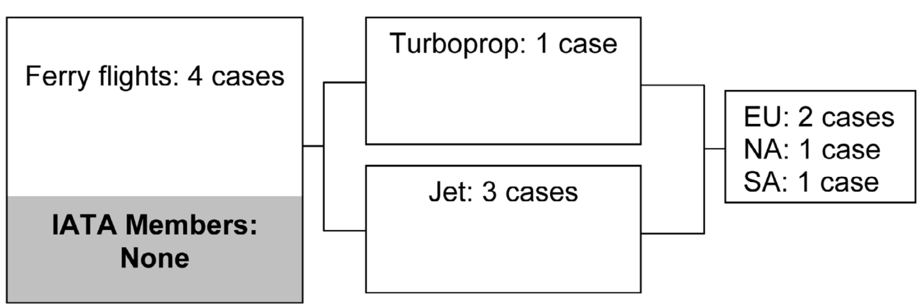
Contributing Factors in the African Region



Note: *22% of accidents in Africa (5 cases) could not be analysed due to insufficient information.*

4.4.4 Ferry Flights

During 2004, 4% of the accidents analysed occurred during ferry flights, all of which resulted in fatalities and 1 case resulted in a Hull Loss.



Most significant factor(s) in ferry flight events:

1. Deficient airline safety management: 2 cases
2. Flight crew training deficiencies: 2 cases
3. Poor standards and checking: 2 cases
4. Poor selection systems: 2 cases

Due to the small number of accidents, no significant correlations could be made. Deficient safety management, training systems, standards and checking and selection systems were all noted in half of the events. These issues all relate to problems at the organisational level.

Note: *1 ferry flight accident could not be analysed due to insufficient information.*

4.5 ACCIDENT ANALYIS, STEADES RESEARCH AND IOSA FINDINGS

The analysis of data from audit results, normal operations and incident reports can help identify precursors to accidents. Based on these findings, IATA and the airline industry can develop and implement prevention strategies to continuously improve safety. Going beyond accidents into incident analysis and a better understanding of deficiencies in normal operations and audit findings is a proactive method to enhance safety in a data-driven manner.

IATA has access to a number of data points regarding de-identified audit findings, normal operations, incidents and accidents. When this data is viewed through the TEM model, as described in section 4.1.2, its analysis can uncover threats, flight crew errors and undesired states.

	Audit Findings	Normal Operations	Incidents	Accidents
Collection Tool	IOSA	LOSA	STEADES	Safety Report
Collection Agency	IATA	University of Texas	IATA	IATA

This section presents two studies, one conducted by the Human Factors Working Group (HFWG) and another accomplished by the IATA Safety Department in collaboration with the IATA Operational Safety Audit (IOSA) team. The goal of these projects is to examine the relationship between threats, errors and undesired states in audit findings, normal operations, incidents and accidents.

4.5.1 Integrated Threat Analysis

The HFWG began a project in November 2004 entitled the “Integrated Threat Analysis”. The goal of this analysis is to establish a correlation between threats, errors and undesired states (using the TEM model) in normal operations, incident and accident reports, to determine some generic scenarios where safety can be compromised in order to develop prevention strategies for crews to properly manage these situations. The topic chosen for the first Integrated Threat Analysis (ITA) was runway excursions. For the purpose of this study, the following definitions were applied:

Incident: aircraft sustained minor damage.

Accident: aircraft sustained Substantial Damage or was declared a Hull Loss (as per the Safety Report definition).

As a first step, the HFWG analysed incident and accident narratives. The IATA Safety Trend Evaluation, Analysis and Data Exchange System (STEADES) is the only global source of pooled incident data and gave the HFWG the opportunity to review de-identified incident reports filed by flight crews. Accident data was obtained by the same means as it is collected for the Safety Report.

Each incident and accident report was classified using the TEM model. Annex 1 presents background information on the classifications used for this study. The results from this study are presented in this section. They illustrate the correlation between incident and accident data.

4.5.2 Integrated Threat Analysis Findings

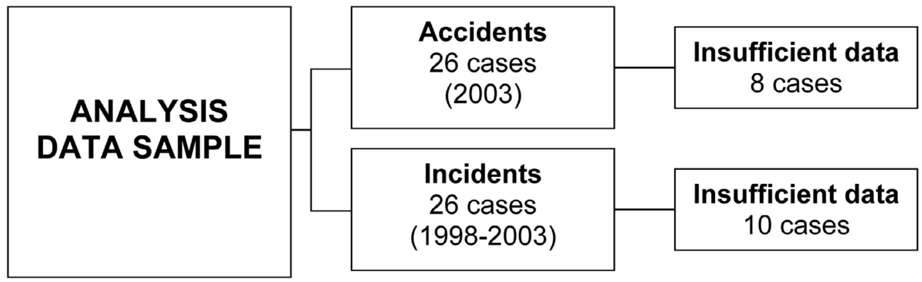
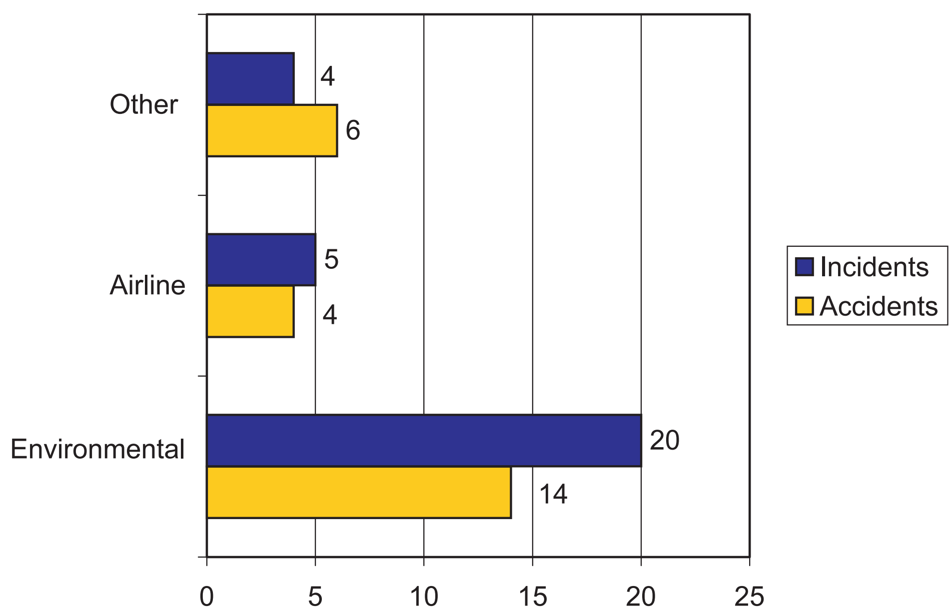


Figure 4.5.2.A illustrates the threats identified in runway excursion incidents and accidents. Threats are defined as events that occur outside the influence of the flight crew, or errors by others than the flight crew that increase complexity of the flight, and require flight crew attention and management to maintain the margins of safety.

Figure 4.5.2.A
Threats in runway excursion incident and accidents



Most significant threat(s) in runway excursion for both incidents and accidents:

- ✔ The analysis shows consistency between incidents and accidents regarding threat significance among the three general categories of threats;
- ✔ Most significant threats: environmental threats (both in incident and accident narratives);
- ✔ Most significant environmental threats: airport facilities (incidents) and weather (accidents). Weather is also a significant threat in incidents; airport facilities are not so significant in accident narratives;
- ✔ Most significant weather threat for both is heavy rain;
- ✔ Most significant airline threat for both is aircraft malfunction;
- ✔ Other significant threats: Rejected Take-offs and night operations.

Based on the preliminary analysis, three threat scenarios or set of precursors (red flags) of runway excursion occurrences would include:

✔ Heavy rain, thundershowers, wind gusts, tailwind

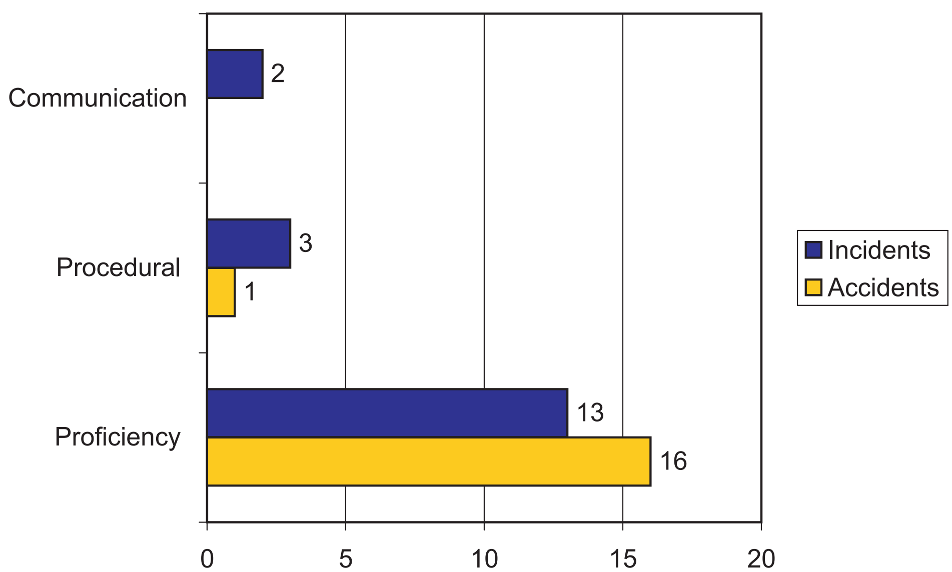
✔ Aircraft malfunction, Rejected Take-off

✔ Night operations

Figure 4.5.2.B presents the flight crew errors highlighted in incident and accident narratives. Errors are defined as observed actions or inactions by the flight crew, leading to a deviation from flight crew or organisational intentions or expectations.

Figure 4.5.2.B

Errors in runway excursion incident and accidents



Most significant error(s) in runway excursion for both incidents and accidents:

Consistency between incidents and accidents regarding error-category significance;

✔ Most significant category of error: proficiency;

✔ Main proficiency errors: manual handling and communication issues.

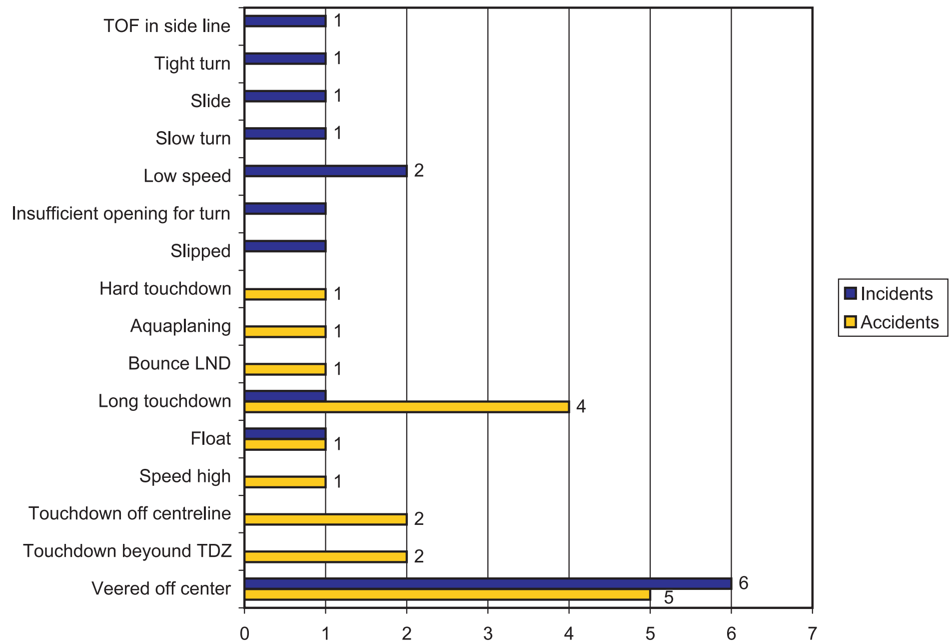
Based on the preliminary analysis, proficiency errors precursors of runway excursion occurrences would include:

✔ Manual handing issues

✔ Flight crew communication deficiencies

Figure 4.5.2.C illustrates undesired aircraft states (UAS) in runway excursion events. Undesired aircraft states are defined as flight crew-induced aircraft states (deviations or incorrect configurations) associated with a clear reduction in safety margins: a safety-compromising situation that results from ineffective threat and error management.

Figure 4.5.2.C
UAS in runway excursion incident and accidents



Most significant UAS in runway excursion for both incidents and accidents:

- ✔ Consistency between UAS in incidents and accidents regarding;
- ✔ Most frequent UAS: veering of centreline;
- ✔ “Long touchdown” identified in accidents as a significant UAS.

Based on the preliminary analysis, UAS precursors of runway excursion occurrences would include:

- ✔ Veering off centreline during Take-off or Landing run
- ✔ Long touchdown

Incident and accident narratives allow for accurate identification and classification of threats and undesired aircraft states. They also allow for general identification of errors. The narratives do not provide, in most instances, enough detail to accurately classify errors. Expert judgment by the HFWG therefore underlies the error analysis part of the ITA.

As a next step, the HFWG will compare these findings with those from the Line Operation Safety Audit (LOSA) archives. This will be completed by May 2005 at the next meeting of the HFWG.

From this preliminary analysis, some key points can already be noted: particularly flight crew proficiency issues and the need for no fault Go-around policies to avoid incidents and accidents. The findings in this section mirror those from the 2004 accident analysis, shown in sections 4.3 and 4.4. Prevention strategies to address these issues are presented in Chapter 6.

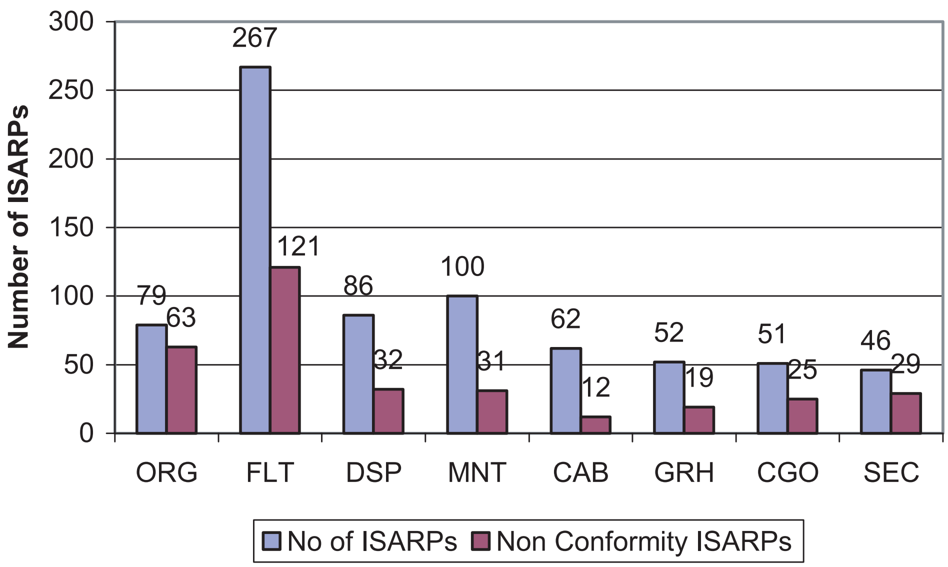
4.5.3 IOSA Findings and Accident Prevention

Since 31 May 2003, IATA has received 28 IOSA Audit Reports (IAR's'). These reports allow IATA to understand operators' deficiencies. Once deficiencies are identified, these can be addressed and corrected, thus enhancing the safety of operations.

As the IOSA Programme expands, and more airlines are added to the registry, IATA becomes the custodian of de-identified, pooled data that can be analysed to identify areas of concern and provide prevention strategies. The following section presents de-identified findings from IOSA Audit Reports and illustrates how many of the deficiencies found in audits are also identified in accident analysis.

Figure 4.5.3.A

Number of non-conformity's ISARPs vs. number of ISARPs in each section[1]



Based on 28 IARs, IATA calculated the number of IAR non-conformity IOSA Standards and Recommended Best Practices (ISARPs) per section of the IOSA Standards Manual (ISM) versus number of individual ISARPs that have been recorded as non-conformity at least once in IARs. The results are presented in Figure 4.5.3.A.

Most significant finding(s) in IOSA Audit Reports:

- ✔ 80% of the ISARPs under the Corporate Organisation and Management Systems (ORG) section had findings that needed to be corrected. The ORG section includes safety management standards.
- ✔ 45% of ISARPs in the Flight Operations (FLT) section of IOSA had findings that needed correction. Flight operations include training requirements.
- ✔ 63% of ISARPs in the Operation Security (SEC) section had findings, making it the second section with the most findings, after ORG.
- ✔ 49% of ISARPs in the Aircraft Ground Handling (GRH) section had findings.

[1] Jun 04 ISM has been used as the reference for these statistics, as it is the latest version and the highest numbers of IARs, as a group, are based on this ISM.

Issues relating to organisation management systems and flight operations featured among the top findings in IOSA audit results. This is also true for in the 2004 accident findings, where deficiencies at the organisational level (particularly in safety management) and flight operations issues (predominantly flight crew training & proficiency) were the two most frequently noted contributing factors. Detailed findings are presented in section 4.2 of this chapter.

For the 2004 accidents, organisational management was the main category where deficiencies were found. Human factors were second. A breakdown of the contributing factors demonstrated the following:

✔ Deficient safety management was cited in 32% of all the accidents in 2004.

✔ Inadequate flight crew training systems were noted in 31% of occurrences.

✔ Flight crew proficiency issues were highlighted in 32% of cases.

When comparing accident analysis results and IOSA findings, the following findings were established:

✔ Organisational factors and human factors were the main contributors to accidents in 2004.

✔ Deficiencies in safety management, training and standards & checkings were the main organisational contributors in accidents.

✔ Inadequate flight crew proficiency was the main human factor contributor, often linked to poor training.

✔ These findings mirror the deficiencies that are uncovered by IOSA audits.

IOSA as a Proactive Safety Tool:

✔ The Flight Operations section in IOSA addresses flight crew training and proficiency by providing safety requirements that outline how pilots are trained and maintain proficiency.

✔ IOSA addresses standards, not only in flight operations, but other areas such as maintenance, cabin operations and ground handling.

✔ Organisational aspects, such as safety management are addressed in the ORG section of the IOSA standards and ensure the airlines on the IOSA registry comply with a standard of safety at the corporate level.

✔ Airlines that have had findings within the ORG or FLT sections during their IOSA audits are currently correcting the findings to improve the safety of their operations. Therefore, there is a continuous improvement in safety on their part, as they have identified the deficiencies and are managing them.

✔ Early identification and correction of deficiencies, such as those highlighted by IOSA audits help airlines improve the safety of their operations and prevent accidents by addressing these issues in a proactive manner rather than after they have been highlighted in accident analysis.

4.6 OVERVIEW OF THE ANALYTICAL FINDINGS

Organisational factors and human factors were the main contributors to Jet and Turboprop aircraft accidents in 2004. Overall, IATA Member Airlines were involved in almost a third (32%) of accidents.

Deficiencies in safety management, training systems and standards & checking were the main organisational contributors in accidents. Inadequate flight crew proficiency was the main human factor contributor, often linked to poor training systems.

More specifically, deficient safety management was cited in 32% of all the accidents in 2004. Inadequate flight crew training systems were noted in 31% of occurrences. Flight crew proficiency issues were highlighted in 32% of cases. Generally, these three factors were interrelated. Technical factors were the least cited of all contributors.

Almost half of all the accidents (48%) occurred during the Approach and Landing phases of flight. IATA Member Airlines were involved in 41% of these accidents.

In 2004, no Jet aircraft were involved in a CFIT accident. One IATA Member Airline was involved in a CFIT event. Deficient safety management and poor standards and checking were among the main contributors in this accident family.

One IATA Member Airline was involved in a LOC-I event. Training and proficiency were among the top contributing factors in this category.

Runway excursions occurred predominantly during the Landing phase. Flight crew communication and proficiency issues were noted in almost a third of the runway excursion accidents. These issues were linked to deficient training systems. Almost quarter of the runway excursions involved IATA Member Airlines.

Ground damage was a significant category because almost half of the carriers involved in this type of occurrence were IATA Member Airlines. This is the area where Member Airlines featured the most. Over 90% of the aircraft involved in ground damage events were Jet. Overall, 18% of ground events resulted in a Hull Loss. Ground damage events occurred primarily in Europe during scheduled operations.

Cargo operations accidents accounted for 32% of the year's overall accidents. Only one carrier was an IATA Member Airline. Intentional non-compliance by flight crews was noted in over a quarter of cargo accidents. Deficiencies in safety management and standards and checking were also contributors in many events. These three factors were often interrelated.

The African region accounted for 22% of all the year's accidents. Much like the worldwide findings, deficiencies in safety management, training systems and flight crew proficiency issues were the top contributing factors to the events in that region. Overall, 26% of the accidents in Africa involved IATA Member Airlines.

The type of operation during which accidents took place also raised concerns during the accident analysis. In 69% of Turboprop aircraft accidents, operations were non-scheduled. A third of the accidents involving Jet aircraft also occurred during non-scheduled flights.

CHAPTER 5 — INTEGRATED ACCIDENT PREVENTION PROGRAMME

Safety is IATA's top priority. In 2004, IATA continued its campaign towards reducing the accident rate 25% by 2006 through the implementation of the Six-point Safety Programme. Significant developments have occurred in the domains of Safety Auditing, Infrastructure Safety, Safety Data Management, Safety Training, Cabin Safety and Cargo Safety. Combined, these components have each contributed to an already marked decrease in both aircraft Hull Losses and passenger fatalities. This chapter presents the 2004 IATA initiatives that helped to ensure the constant enhancement of safety during the past year, and gives a glimpse at the 2005 projects that will contribute to continuously improving in safety.

5.1 SAFETY AUDITING: IATA OPERATIONAL SAFETY AUDIT (IOSA)

5.1.1 About IOSA

The IATA Operational Safety Audit (IOSA) Programme is now fully implemented. Since the official launch in September 2003, over 100 audits have been contracted with many airlines incorporating the standards into their operations. The primary benefits of IOSA are a reduction in the number of audits for the industry, and increased safety for all airlines. IOSA is the first globally harmonised set of operational safety standards and audit programme for the airline industry.

5.1.2 IOSA Documentation

The IOSA Standards Manual (ISM) was first published in April 2003, as a prelude to initial training of IOSA auditors, and the first IOSA audits in September 2003. Since that time, a number of revisions have taken place to incorporate additional standards that have arisen as a result of the International Civil Aviation Organisation (ICAO) action, as well as general improvement to the standards to promote clarity of interpretation. IATA has made the standards and documentation freely available to all airlines so they can prepare for an IOSA audit.

5.1.3 Audit and Training Organisations

The IOSA Programme Office (IPO) has accredited Audit and Training Organisations around the world to deliver a consistent and quality audit to airlines. IATA continually monitors these organisations and feeds back data for continuous improvement of the audit and the standards. All Audit Organisations meet the standards as outlined in the IOSA Programme Manual.

5.1.4 The IOSA Registry

Upon completion of all corrective actions, an airline is entered into the IOSA Registry. Managed by the IOSA Programme Office, the IOSA Registry is a listing of all operators who have met the IOSA standards. With a validity period of 24 months, these airlines have met the safety bar set by the IOSA standards. In addition, interested parties wishing to view an audit report can e-mail the IOSA Programme Office at iosa@iata.org. Through the sharing of audit reports, the industry reduces the number of audits, and cost savings are realised. The Registry is located at www.iata.org/registry.

Basic steps to seek an IOSA Audit and become IOSA Registered:

- ✔ Download the IOSA Standards from IATA's website
- ✔ Incorporate the Standards into the Operational areas of the airline
- ✔ Contact an IATA accredited Audit Organisation
- ✔ Schedule and host an IOSA Audit
- ✔ Complete all Corrective Actions (if any)
- ✔ Enter the IOSA Registry

5.1.5 The Quality Assurance Commitment to the IOSA Programme

IATA has a firm commitment to an active Quality Assurance (QA) role in all aspects of the IOSA Programme. The underpinning principles of its QA activity strive to ensure consistency and standardization in all aspects of the programme and to provide demonstrable evidence of performance monitoring to all interested parties and stakeholders.

QA is now more formalised within the IOSA Programme Office and has also been extended outwards to incorporate all the third parties involved in the delivery of the programme. The QA framework is based on a Quality Management System (QMS) made up of the following elements:

- ✔ Quality Manual
- ✔ Operating procedures
- ✔ Process flowcharts

The above framework is firmly based on ISO 9001:2002 requirements, following the commitment for a planned ISO Registration audit in May 2005.

One of the most important pieces of work undertaken in the development of the QA framework was the identification of the processes, which are considered programme critical. In developing the QMS, it was important to separate activities and functions into two distinct areas — Internal and External. Elements of work already completed include:

Internal benefits of the QA framework include:

- ✔ Documenting the IOSA Programme Office key programme processes;
- ✔ Implementing a quality control process to review IOSA audit reports;
- ✔ Identifying, gathering and analysing data to measure deliverables and performance of AO's.

Numerous data streams have provided very useful information, which has been fed back to the IPO and has resulted in improvements in several areas, including, but not restricted to:

- ✔ Re-wording of IOSA Standards and Recommended Best Practices (ISARP's)
- ✔ Decline in deficiencies in Audit Reports
- ✔ Reduction in late submissions of Audit Reports
- ✔ Rewording of feedback surveys

External benefits of the QA framework include:

The aim of the external activity is firmly focused on ensuring that the accredited Audit Organisations are conforming to all the requirements and standards as set out in the IOSA Programme Manual, by means of the following activities:

- ✔ On site reviews of the Audit Organisations undertaking audits;
- ✔ AO Headquarters audits;
- ✔ Attending the IOSA Auditor Training courses to assess the course content and delivery;
- ✔ Endorsed Training Organisation headquarters audit.

The IPO is working closely and cooperatively with the accredited Audit and Training Organisations in ensuring the QA programme maintains a high profile and actively feeds back audit results to support the continuous improvement methodology.

5.1.6 Operations Quality Standards Audit Programme

The Operations Quality Standards (OQS) membership audit programme concluded in December 2004 with 13 audits completed during the year, a total of 61 audits completed and six in process, to be concluded in 2005.

A large segment of applicant airlines again tended to be from developing nations, taking advantage of a growing market opportunity and often undergoing high rates of expansion.

Deficiencies observed during the 2004 audit programme tended to follow the pattern observed during the previous three years, namely:

- ✔ The predominant lack of functioning Quality Assurance systems, predominantly within Flight Operations, when required by company policy or as a regulatory requirement. A significant amount of re-audits were required to address this deficiency;
- ✔ A lack of regulatory oversight in certain regions, resulting directly in structural and procedural deficiencies;
- ✔ In certain regions, Safety Departments lacked qualified resources and structured, documented policies and procedures;
- ✔ Difficulties in implementing effective Crew Resource Management (CRM), due to multiple significantly different cultural groups within crew and staff;

A significant new trend was the recording of multiple instances of poor operational training standards.

From 2005, new applicants will be required to undergo the IATA Membership Entry Audit (IMEA), based on the following principles:

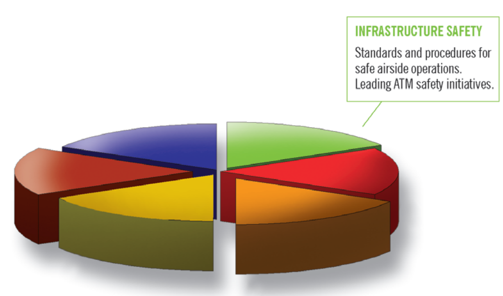
- ✔ The audit process will be an upgrade of the OQS requirement, structured to align closer to the IOSA audit process;
- ✔ Based on lessons learned from the OQS programme, there will be an extended Operational Assessment Visit (OAV), to assess readiness for the actual audit;
- ✔ The audit will be required to be successfully completed before membership is commenced.

Applicant airlines may also chose to take advantage of the strategic benefits of undergoing the IOSA process to qualify for membership. Three recent applicants to IATA have already chosen this option.

5.2 INFRASTRUCTURE SAFETY: AIR TRAFFIC MANAGEMENT SAFETY

5.2.1 ATM Safety, a Top priority for IATA

The attainment of a safe system is the highest priority in Air Traffic Management (ATM) and a comprehensive process for safety management must be implemented that enables the ATM community to achieve efficient and effective outcomes. ATM plays an important part in ensuring overall aviation safety. Uniform safety standards and risk and safety management practices should be applied systematically to the ATM system. In implementing elements of the global aviation system, safety needs to be assessed against appropriate criteria, and in accordance with appropriate and globally standardized safety management processes and practices.



5.2.2 Safety Levels

The acceptable or tolerable safety level will be determined from the perception of safety needs by society, and the international community. Acceptable safety will be related to the trust required from the ATM system. The target level of safety will be the minimum level of safety to be achieved in any case. Possibly enforced by regulation, it will be equal to or better than the acceptable level of safety. The target level of safety will be based on risk assessment and acceptance criteria. The observed safety level is that which will be measurable. The observed level could produce results in a defined range without compromising acceptable and target levels of safety. Global ATM will enhance aviation safety.

5.2.3 System Safety

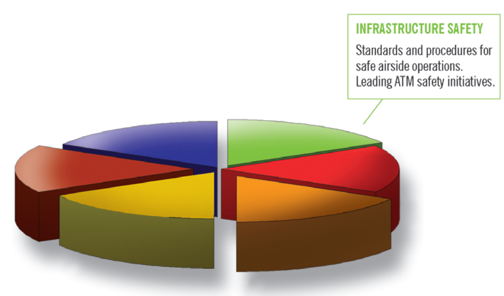
All safety practices and processes will be explicit, and will comply with the safety requirements and standards of ICAO, State regulatory authorities and other appropriate parties. Each element of the ATM system, wherever implemented, will be subject to specific safety analysis, as an individual element and as a component of the larger integrated system. For any change, a clearly defined and explicit change management process will be used. Clear accountabilities for all aspects of safety must be defined and the roles and responsibilities for the management and integration of system elements must be explicitly stated. Where target levels of safety have been defined, they will form the basis for safety assessment — if not defined, contemporary safety principles or comparative studies maybe used, but will ensure global consistency.

Adequate security is a major expectation of the ATM community and of the public. The ATM system should therefore contribute to security, and the ATM system, as well as ATM-related information, should be protected against security threats. Security risk management should balance the needs of the members of the ATM community who require access to the system, with the need to protect the ATM system. In the event of threats to aircraft or threats using aircraft, ATM shall provide responsible authorities with appropriate assistance and information.

5.3 INFRASTRUCTURE SAFETY: AIRSIDE SAFETY

The Airside Safety Group is responsible for monitoring and recording data and development of standards, products and services designed to achieve the general following objectives:

- ✔ Enhancement of airside safety by addressing both human and technical issues
- ✔ Prevention of injuries to personnel and passengers
- ✔ Prevention of damage to aircraft, equipment and facilities



In 2004 the group focused on activities presented in the following section.

5.3.1 Airside Safety Driver Training Standards

Driving on the airside of an airport carries substantial risk. Drivers are required to operate in close proximity to aircraft, areas of intense activity and restricted space. This requires knowledge of the rules, standards and conduct for driving in these areas, which are designed primarily for aircraft, not vehicles. Persons driving on the airside of an airport should receive driver training relative to the areas in which they will operate and the tasks that they are required to undertake. This will reduce the potential for incidents and accidents that may result in injury to persons, as well as damage to aircraft, vehicles and property. The scope of this new standard is to provide guidance for training programmes for all persons required to operate vehicles on the airside of the airport.

5.3.2 Risk Management Programme Development

Risk management is one element of a safety management system. Risk management will include processes for both hazard identification and risk assessment.

5.3.3 Passenger Bridge Operation Standards

The operation of passenger boarding bridges ("bridge") is a high-risk activity that has the potential to cause injury to passengers or personnel and/or damage to aircraft and equipment. The scope of this new standard is to provide guidance to operators for the safe operation of passenger boarding bridges.

5.3.4 Foreign Object Damage Prevention Programme

Damage to aircraft / equipment / property / injury to personnel caused by foreign object debris is not only a serious threat to safety but continues to cost aircraft operators annually in direct losses resulting from aircraft / equipment out of service and disruption of schedules. Creating a Foreign Object Damage (FOD) prevention culture requires constant vigilance.

This information provides guidance for establishing and conducting an effective Foreign Object Damage Prevention Programme. Responsibilities are specifically outlined in this programme but ultimately the responsibility for FOD prevention and the implementation of this program rests with senior management. Key elements in the FOD programme are but not limited to; tool accountability, enforcing proper maintenance practices and housekeeping.

5.3.5 IOSA Task Force for Ground Handling

A task force responsible for the development and revision of guidelines and IOSA standards applicable in ground handling has been established. Five members of the Airside Safety Group have volunteered to join the task force, which will work in cooperation with the IOSA team.

5.3.6 Ground Damage Prevention Programme

The goal of the IATA Ground Damage Prevention Programme is to enhance safety and operational efficiency by contributing to the reduction of ground incidents/ accidents associated with the operation of commercial aircraft. Programme targets Civil Aviation Authorities, Airport Authorities and Ground Handling Agents.

The objective of Ground Damage Prevention Programme is to assist airlines, airports and ground services providers to considerably reduce the number of ground incidents and accidents and its associated costs through a consistent action plan including:

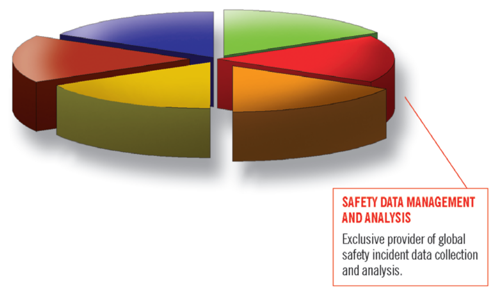
- ✔ Identification of possibilities to enhance uninsured cost recovery for airlines
- ✔ Identification of weak areas through analysis of ground incident/accident reports and auditing of ground handling operations
- ✔ Development of training courses for the implementation of Safety Management Systems
- ✔ Promote the implementation of Safety Management Systems
- ✔ Continuous improvement of airside safety standards

The first action plan for the project was established and includes following next steps:

- ✔ Bring together all concerned industry stakeholders and agree on the necessity to actively cooperate in the implementation of audit programmes and Safety Management Systems
- ✔ Continue the development of a ground accident database to identify potential risks and weak areas and measure performance
- ✔ Launch an awareness campaign on the benefits of safety management
- ✔ Develop a training programme for the implementation of Safety Management systems
- ✔ Assist industry stakeholders in the implementation of Safety Management Systems

5.4 SAFETY DATA MANAGEMENT AND ANALYSIS

5.4.1 Industry Safety Data Challenges



Within the IATA 6-point Safety Programme, which is designed mainly to meet airline safety requirements, Safety Data Management and Analysis (SDMA) plays a dominant role. To link the SDMA programme more closely with the IATA Safety Committee, the SDMA Oversight Group was formed in 2004. This group's purpose is to guide the SDMA programme and review IATA's analysis to ensure it both remains relevant and continues to develop with the needs of a fast changing industry.

Translating data into useful information

Moving into 2005, the Commercial Aviation Safety Team (CAST) and Global Aviation Information Network (GAIN) initiatives will modify their relationship and the industry may witness a change in the CAST and GAIN mandates. But while these industry groups sort out their new roles, the industry at large continues to amass large amounts of data and is becoming increasingly data rich. The challenge facing the industry lies in how to reveal the insight that remains locked in the unanalysed data. With this in mind, IATA continues to develop and expand its SDMA programme to meet the needs of the airlines and the industry as a whole.

Safety data analysis is the cornerstone of any Safety Management Systems (SMS), and the benefit of this analysis can by increased exponentially by comparing it with global norms and issues. While many organisations are looking at sharing analysis, as a vital part of proactive knowledge exchange, it is potentially limited to providing comparative analysis. Data pooling is all together different in that it not only provides opportunities for comparative analysis; it also has the ability to provide insight on a global perspective. In terms of data pooling, IATA is leading the way with the Safety Trend Evaluation, Analysis and Data Exchange System (STEADES) programme. A critical success factor to establishing a useful globally pooled database is the requirement that it is compatible with many systems. STEADES has always viewed this compatibility as a key factor, which is why IATA is involved in the alignment and standardisation of incident descriptor codes under the GAIN mantle. This is an exciting new activity that gained momentum in 2004. When complete, this task will help the industry make great strides in the sharing of incident data and analysis performed on that data. However, in the meantime STEADES continues to be the only global ASR database.

Analysis Tools: Is automated text mining the answer?

In cooperation with GAIN, IATA was involved in a research project examining the benefits of text mining tools, and the findings indicate that while this technology is promising, it nevertheless has a long way to go. Specifically, as most of these tools rely on a context dictionary of terms as their reference, such dictionaries must be properly defined and implemented to make text mining, as a truly automated system, successful. Therefore, until such a time as these tools are improved, subdividing data into manageable chunks is a necessary step. This is commonly done through the application of descriptors. While it would be wonderful is text mining tools were capable of eliminating the needs for human event coding, the text mining tools currently available are not capable of doing this with acceptable reliability on a global scale database. The assignment of descriptor codes remains one of the most important elements of the data analysis process. While STEADES was involved in the first set of global incident descriptors, GAIN is now furthering this work.

To remain at the leading edge of combating SDMA challenges, IATA STEADES and Megaputer Intelligence conducted a joint proof-of-concept project in conjunction with FAA and GAIN Working Group (WG) B's efforts to facilitate and promote the use of automated data and text mining tools in the aviation community.

Megaputer Intelligence analytical software PolyAnalyst™ was applied to a de-identified sample of reports describing Traffic Collision Avoidance System (TCAS) events from the IATA Safety Trend Evaluation Analysis and Data Exchange System (STEADES) database. IATA provided guidance and insight on the relevancy and type of results.

IATA's use of PolyAnalyst offered some useful and interesting insights into both the state of the industry in text-mining capabilities and what is required to successfully implement text mining in the aviation industry. Although there are many different analysis options in the software, IATA focused on a few areas that were identified as likely to have the most potential for industry safety analysis:

Automated Assignment of Descriptors

PolyAnalyst was able to classify a sample of TCAS data with reasonable accuracy and some false-positives. It successfully classified 77% of the sample data set. The model supplied by Megaputer was changed to account for TCAS jargon likely to be used in ASRs. This module shows eventual promise for being able to help classify earlier events not coded in the descriptor classification system and to assist in accommodating other electronic safety reporting systems not using the STEADES descriptor system. The other sections of the descriptor classification system were not sufficiently defined and tended to produce erratic results. Considerable time in the development of the complete taxonomy and dictionary that forms the core of any text-mining engine would be required to make this feature work practically with the entire STEADES descriptor classification system.

Advanced Analysis

PolyAnalyst was carefully evaluated to see how it could be applied to routine STEADES analysis. IATA's tests showed: a) 21% of records were ignored by PolyAnalyst because they could not be slotted into a specific category and b) 72% of the remaining records were properly assigned correct categories. Overall, this feature shows potential in isolating clear-cut categories from the narratives such as the class of airspace a TCAS Resolution Advisory (RA) occurred in where the categories are well defined. With respect to the STEADES database, further development of the aviation term dictionaries would be required to take better advantage of this tool's capabilities.

IATA Feedback & Limitations

The software's ability to combine both structured (flight phase, etc.) and text data into the same analysis shows potential for an analysis of events at particular airfields. Also, the way a user builds analysis models is intuitive and simple for non-technical users to grasp.

While the software demonstrated future potential for analysing records not classified in a descriptor-like system, IATA strongly feels that the dictionary needs to be further enhanced to offer a truly automated system for global analysis. The STEADES database currently houses records from about 40 contributing airlines over five continents with varying reporting styles and cultures, as well as differing terminology for similar events. Although the previous work from the Southwest Airlines project was applied in the base dictionary, further work is still required to create a global reference dictionary. This work will undoubtedly take some time to perform and perfect. That said, once a quality aviation-specific global dictionary exists, automated text mining should provide valuable insights into the airline industry's safety concerns.

IATA's Holistic Approach to Safety Data Management and Analysis

IATA has been involved in accident data analysis for over 40 years through its Safety Report. To concentrate solely, or predominantly, on the analysis of accidents and accident data, however, tends to be reactive, missing the opportunity to apply preventive measures before the occurrence of an accident. Initially incident analysis was performed on a more informal basis through sharing of incident information at the twice yearly Safety Committee and Incident Review Meetings. In 2001 IATA's role in incident analysis was formalised with the launch of the Safety Trend, Evaluation, Analysis and Data Exchange System (STEADES). In the more than three years since its inception, STEADES has grown and matured into the only global air safety report database and analysis programme.

With analysis programmes for accidents (Safety Report) and incidents (STEADES) now firmly in place, IATA will continue to evolve the SDMA programme towards a holistic approach to safety data management, one that encompasses accident, incident and normal operations data. IATA will continue to move back up the error chain into the realm of normal operations with the launch of a Flight Data Analysis (FDA) Service in 2005. The benefits of an IATA FDA service include improved safety oversight and assisting airlines to meet the ICAO standard mandating that airlines incorporate FDA into their accident prevention programme.

5.4.2 Accident Data Analysis

IATA's main vehicle for communicating accident analysis, lessons learned and prevention strategies is the annually distributed IATA Safety Report. A further monthly report, the IATA Safety Bulletin, summarises air transport accidents and serious incidents of the previous month to give air safety departments an early picture of the current global air transport safety situation. Since IATA's SDMA programme's aim is to identify precursors to accidents, this activity drives part of the incident analysis programme by determining some of the research areas to pursue in the STEADES Safety Trend Analysis Reports.

5.4.3 Incident Data Analysis

STEADES was developed to analyse airline safety incident reports, such as Air Safety Reports (ASRs) and reports through programmes such as the U.S. Aviation Safety Action Programme (ASAP) and Aviation Safety Reporting System (ASRS), for trends indicating risks that, if managed correctly, could identify and prevent possible accident situations. STEADES is the primary investigative tool used for this purpose. It uses the most sophisticated classification and incident descriptor system, optimised for global data exchange based on a data-driven programme, and is a focal point in the IATA Six-point Safety Programme.

STEADES Analysis and Research Update

In responding to issues raised in the safety report as well as predominant categories featuring in the global trend analysis, STEADES endeavours to unearth precursors to accidents through analysis of incidents. The main topics of research pursued in STEADES in 2004 were:

STEADES Research Topics 2004*	Edition
Cargo Fires	2004-1
Level Busts	2004-1
Cabin Safety Issues	2004-2
De-icing Events	2004-2
Ground Marshalling	2004-2
Operational Decisions	2004-2
Technical Failures	2004-2
Weather Radar Issues	2004-2
Air Traffic Management Issues	2004-3
Tailstrikes	2004-3
TCAS Review	2004-3
Portable Electronic Devices (PED) Issues	2004-3

*STEADES members can view all archived STEADES Safety Trend Analysis Reports on the members website at www.iata.org/ps/services/steades1.htm

In order to provide this information in a more relevant, readable and useful format the STEADES Safety Trend Analysis Report was revamped, and now encompasses feedback from the SDMA OG, included the following changes:

- ✔ The **Global Safety Trends** help to describe generally the major incident groups that are most prevalent in the database.
- ✔ A new **Feedback** section — a direct link to the STEADES Team, where the safety community can address their topics of concern and analysis requests.
- ✔ Each issue of the STEADES Safety Trend Analysis Report planned for next year will present a separate focus on a particular area of safety analysis (i.e. flight operations, cabin safety, etc...). Each issue will contain a detailed **Feature Article** on the leading contributors to incidents within that safety area, with supporting articles to provide a balanced view of the industry as a whole.
- ✔ A new **Monitor & Cross-Check** section has been added, where topics discussed in previous STEADES Reports will be updated and reviewed with the benefit of an extended data range.
- ✔ The **On the Numbers** data table will be included in each issue so that STEADES members can get a glimpse of the raw figures in the STEADES database to formulate their own conclusions on the status of safety incident reporting and draw comparisons with their in-house safety issues.
- ✔ Finally, the **IATA Safety Calendar** will give members a look into the events and activities in the safety calendar. Future report briefs in this section will also give STEADES members an idea of what they can expect in their next Report.

Within the articles themselves, a new format has been adopted to make the Report more user-friendly. Each of the topics researched will now include:

- ✔ A clear explanation of why the article topic was chosen.
- ✔ A Quick Facts brief at the beginning of the article to give, at a glance, an idea of what some of the figures represent.
- ✔ A characteristic, de-identified air safety report, to help illustrate a typical incident scenario.

STEADES Milestone:

In addition to format changes, 2004 also saw STEADES incorporate risk-based reporting and analysis. In 2004 the STEADES Safety Trend Analysis Report (Issue 2004-2) marked a milestone in the continuously developing STEADES programme.

Of course STEADES continues to rely on rate-based data, as there is no real substitute for trend monitoring, however the focus shifted to more risk assessment analysis of the STEADES database.

Through its safety successes contemporary aviation has been turned into the first ultra-safe system in the history of industrial systems.

Photo courtesy of Airbus

Assessing and Analysing Risk

The major limiting issue surrounding the concept of risk assessment and analysis today is the lack of a clear standard for how risk should be categorised. Many publications, such as the UK CAA's CAP 712 paper offer guidance on the formation and use of risk assessment methodologies and tools (such as risk matrices), but do not elaborate on exactly how risk assessment should be performed.

Since some form of standard is needed for the type of analysis conducted by STEADES, the following definition is tabled as a recommended description of risk assessment in STEADES:

> *Risk should be assessed in relation to the severity and recurrence probability of the entire event that generated the Air Safety Report. Damage to aircraft, injuries to persons, potential legal and/or public relations issues and other such outcomes shall be determined to be outcomes as a result of the inherent risk of the situation only and should not affect the classification.*

This definition falls into the STEADES methodology of "the only difference between an incident and an accident is the outcome." Therefore, the outcome of an event should not effect the classification and assessment of the risk that contributed to the event's happening.

Risk Assessment Compatibility Issues

Just as there is no clear standard for theoretical risk assessment, there is no standardised risk assessment tool available to users. While the venerable risk matrix may be by far the most popular assessment model, there is little agreement on the best size of the matrix or the weightings created in it.

As the size and shape of the risk matrix varies, so does the risk weightings in it. Therefore, on top of the assessment definition, a further, lower level standardisation is required for the risk matrix. The size recommended in CAP 712 referenced above is deemed by IATA to be optimal, and affords sufficient detail to classify properly the risk of the event without adding a confusing number of risk weightings or pigeonholes to choose from.

5.4.4 Monitoring Normal Operations

For IATA to continue to remain at that leading edge of providing the industry with safety data management and analysis solutions, IATA must continue to evolve its programmes into the area of normal operations monitoring. This means examining how to include Line Operations Safety Audit (LOSA) data, and Flight Data Analysis (FDA). As an early step in examining how to incorporate LOSA data into the analysis process, the HFWG embarked on an "Integrated Threat Analysis" to examine the feasibility of using Threats, as defined in the LOSA context, as a platform to analyse accident, incident and LOSA data (see section 4.5.1.). The other branch of normal operations data is of course Flight Data Analysis, also referred to as Flight Operations Quality Assurance (FOQA) and Flight Data Monitoring (FDM).

Flight Data Analysis

The Safety Data Management and Analysis (SDMA) Programme will add Flight Data Analysis (FDA) service to its product suite. FDA is the proactive and non-punitive analysis of routinely recorded digital flight data from flight operations to improve aviation safety and efficiency. This means adding "normal operations" data to the accident and incident data we currently have in STEADES. This will improve safety by identifying precursors to incidents and provide operators with an IATA-managed means of complying with ICAO requirements in the field of Flight Data Management. The initial focus of the FDA programme is on safety and efficiency, while in the longer term it be used to identify tremendous cost savings for airlines.

ICAO Standards mandate that airlines incorporate an FDA programme into their accident prevention programme. The high initial set-up costs combined with yearly operating fees for an FDA programme may make it prohibitive to some airlines. However, an airline can benefit from economies of scale by outsourcing their FDA programme to a third party, such as IATA.

In the longer term IATA can expand the service beyond the ICAO requirement, and help airlines find opportunities for greater operational efficiencies leading to tremendous cost savings in areas such as fuel costs, overflight charges, reduced maintenance costs, etc.

Early customer benefits of IATA providing an FDA service are:

- ✔ Avoid major set-up costs and save approximately 30% when compared with running their own in-house system.
- ✔ Identify areas of operational risk and quantify current safety margins by highlighting when non-standard, unusual or unsafe circumstances occur.
- ✔ Use the FDA information on the frequency of safety event occurrences, combined with an estimation of the level of severity, to assess the safety risks and to determine when risks may become unacceptable if the discovered trend continues.
- ✔ Put in place appropriate procedures for remedial action once an unacceptable risk has been identified.
- ✔ Confirm the effectiveness of any remedial action by continued monitoring.
- ✔ Benchmark against others to assess their operational standards.

The following provide a non-exhaustive list of potential benefits that could arise out of the operational efficiency dimension:

- ✔ Component health monitoring (engine trend monitoring, identification of degrading or unreliable components, etc.): Systematic monitoring helps in maintenance diagnostics and decision-making, reducing shop visits and overhaul costs. Quantitative data on system exceedences allows proper corrective actions.
- ✔ Fuel consumption monitoring: substantial savings can be achieved through the monitoring of individual aircraft performance, and a comparison with expected fuel burn degradation. Once accurate fuel performance is available, better flight planning allows lower fuel reserves. Aircraft scheduling can be optimised. The need for maintenance actions, such as flight control rigging, compressor wash and engine overhaul can be evaluated or validated.
- ✔ Systematic fuel reserves statistics can be developed with the possibility of optimising the fuel policy.
- ✔ Flight operations policies comparisons between operators can yield substantial improvements (e.g. aircraft loading, approach and departure procedures).
- ✔ Warranty claims: component reliability can be monitored to file substantiated warranty claims.
- ✔ In some areas, user charges can be reduced through monitoring of aircraft actual routing.

IATA's new FDA programme represents a great opportunity for smaller operators to alleviate the direct costs of an FDA programme, analyzing existing FDA data to reap efficiency benefits.

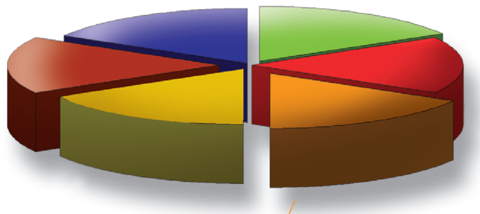
5.4.5 Summary

While the industry has made great strides in the safety data arena, it is however, somewhat vulnerable, in that it there is a potentially a single point of failure, namely the protection of sources of safety data. The entire safety reporting culture, a vital part to SMS and indeed improvements in safety and further reduction of the accident rate, is contingent on the protection of sources of safety information from judicial process. The trust that has been built up over years can be eroded quickly if safety data is used for purposes other than safety improvement.

While IATA prides itself on a reputation as a trusted keeper of safety data, the development of retribution free environments is critical to the ongoing improvement safety improvement. IATA is fully committed to supporting the ICAO principle of non-punitive reporting. IATA shares ICAO's concerns on the protection of people (and data) from interference by judicial authorities, particularly in the area of air accident investigation, and supports the protection of Critical Safety Data to ensure the free flow of safety information worldwide.

The principle of non-punitive reporting has always been a keystone for data contribution and integrity in the STEADES programme. This principle will continue to be emphasised with the expansion of IATA's SDMA programme into the FDA area.

5.5 SAFETY TRAINING



SAFETY TRAINING

Comprehensive course and conference offerings relating to all aspects of operational safety.

In order to improve air transport safety, IATA sets annual priorities to meet airline members' needs with special focus on safety training. IATA's safety training programme focuses on areas such as Safety Management Systems, airside management, flight operations, quality assurance, auditing and emergency response planning.

IATA recently revised its three-day Crew Resource Management (CRM) / Threat and Error Management (TEM) course to focus on training instructors to enable them to deliver this course in their own organisation. This course will help to better understand and implement TEM within the operator's training course curriculum.

Safety Management Systems (SMS) is a five-day course that all safety and operational personnel need to take to effectively manage a realistic balance between safety, productivity and costs. The process for achieving this balance is called SMS. In this course, airline personnel will be able to apply what they have learned in training by developing their own SMS to manage and improve their current system.

Airside Safety Awareness is a five-day course that helps ground operators and airline safety officers create and maintain safety in the airside area. The course focuses on providing personnel with the safety tools they will need to safely offload and load an aircraft, conduct an airside investigation and complete a ramp inspection.

Training is conducted in IATA's regional training centres or can be customised and delivered locally as in-company training. A complete list of training courses is available at www.iata.org/training.

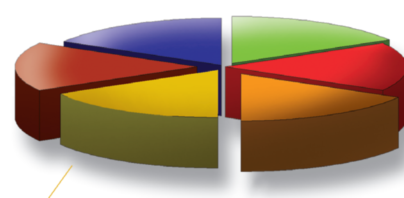
5.6 CABIN OPERATIONS SAFETY

In 2004, IATA redefined its cabin safety activities by reshaping its Cabin Operations Safety Programme and the role it plays to contribute to the airline industry's efforts in this field in 2005 and onwards.

5.6.1 Redefining Cabin Operations Safety

Cabin operations safety is a component of an airline safety management programme that includes proactive data collection and the ensuing prevention activities regarding cabin design and operation, equipment, procedures, crew training, human performance, and passenger management.

Cabin operations safety also deals with all activities that cabin crews must accomplish during the commercial operation of an aircraft to maintain safety in the cabin, and contribute to the safe and efficient operation of the aircraft during normal, abnormal and emergency situations.



CABIN SAFETY

Industry-leading standards and procedures for safe cabin operations.

5.6.2 IATA's Role in Cabin Operations Safety

In the past, the safety role of cabin crews was generally limited to post-accident evacuation. The contemporary approach to safety considers cabin crews as cabin safety agents, with the responsibility of managing safe and effective operations. IATA Member Airlines have expressed a concern over the role that cabin crew play in preventing incidents and accidents. Investigations of past accidents have demonstrated that the actions by cabin crews, or lack thereof, have had a direct effect on the outcome of these events and impacted overall flight safety.

5.6.3 The Objective of the IATA Cabin Operations Safety Programme

The objective of the IATA Cabin Operations Safety Programme is to contribute to the reduction of incidents/accidents and costs to airlines associated with the operation of commercial passenger aircraft. This objective can be achieved through the activities presented below.

5.6.4 Enhancing Safety and Operational Efficiency in Cabin Operations

As part of IATA's initiatives to enhance safety and improve operational efficiency, cabin operations became the focus of a new project in 2004. The safety concerns and costs associated with turbulence-related injuries suffered by cabin crew and of inadvertent slide deployments are at the centre of this new project. The following sections describe these issues in detail.

5.6.5 Turbulence-related Cabin Crew Injuries

Based on analysis obtained from STEADES data, 18 cabin crewmembers are injured in turbulence for every million flight hours. IATA estimates the cost to airlines of turbulence-related injuries to cabin crew (including lost workdays and medical bills) at more than USD $65.8 million per year. According to the Federal Aviation Administration (FAA), in-flight turbulence is the leading cause of injury to cabin crewmembers and passengers in non-fatal accidents.

IATA has set to reduce the turbulence-related injury rate for cabin crew by 50% by 2008. This will help prevent hundreds of injuries and translate into industry-wide savings of USD $32 million.

5.6.6 Inadvertent Slide Deployments

Inadvertent slide deployments are costly events and can result in injuries as well as material damage. In 2003, cabin crewmembers produced 63% of the inadvertent slide deployments reported to STEADES. Based only on this STEADES data, in 2003, 20 slides were inadvertently deployed by cabin crew per million sectors flown. This translates into an industry-wide cost of USD $20 million per year to replace inadvertently deployed slides. Costs related to slide deployments include medical bills, off boarding of passengers, flight delays or cancellations and damage to aircraft or ground equipment.

IATA's goal is to reduce the number of inadvertent slide deployments by cabin crew by 50% by 2008. This will result in industry wide savings of approximately USD $10 million.

5.6.7 2005 Cabin Operations Safety Project

Airlines need specific tools to prevent and manage turbulence events and inadvertent slide deployments. To improve safety and operational efficiency, IATA has launched a project to create a toolkit that will help airlines target these specific topics within their operations. A task force of cabin safety specialists from Member Airlines and manufacturers is working with IATA to develop material that can effectively be applied by carriers. The CD-ROM toolkit will be distributed free of charge to IATA Member Airlines and incorporate:

- ✔ *Tools for incident/accident analysis:* Threat and Error Management model, incident/accident statistics for benchmarking and other means to diagnose and correct deficiencies in the airline's cabin operations.
- ✔ *Training material:* case studies, workshops and team simulations for trainees, as well as audio-visual material that can be integrated into the airline's current cabin crew training course content.
- ✔ *Cost analysis templates:* tools to help airlines assess the cost of slide deployments and turbulence injuries and determine costs savings to allow for budget planning and financing of corrective activities.
- ✔ *Documentation for briefing management:* audio-visual presentations, statistics and other material to provide general overviews of problems and corrective activities to the airline's management and obtain internal support for initiatives undertaken by the safety and training departments.

5.6.8 IOSA Cabin Standards Review

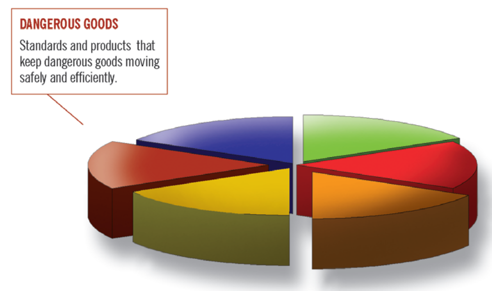
In 2004, the IOSA Cabin Operations Task Force conducted a thorough review of Section 5 (Cabin Operations) in the IOSA Standards Manual (ISM). Amendments included a revision of the cabin crew training standards and all the guidance material applicable the section. The Task Force presented its proposed changes to the IOSA Oversight Committee (IOC) and these recommendations were included in the new edition of the ISM. The Task Force will reconvene during 2005 to review Section 5 once again to further enhance its standards for the next edition of the ISM.

5.7 CARGO SAFETY

IATA is constantly looking at ways to improve and enhance safety in all aspects of cargo and cargo operations. Several innovations are under development that will further promote safety and improve the conveyance of information to shippers, forwarders, handlers, passengers, and air carrier employees as well as the general public.

5.7.1 IATA Dangerous Goods Regulations

In the safe carriage of dangerous goods (DG), IATA has been at the forefront for quite some time. In 1956 IATA developed and published the first edition of regulations that addressed the unique characteristics of air transportation. These were the IATA Restricted Articles Regulations (IATA Dangerous Goods Regulations today) that were adopted by many States and legislated into law.



Today the IATA Dangerous Goods Regulations (DGR) totally reflect the requirements and intent of the International Civil Aviation Organisation's (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air (TIs) along with incorporating specific air carrier requirement deemed necessary by IATA Member Airlines. This further enhances the safe transport of dangerous goods along with providing a harmonised system for operators to accept, handle and interline dangerous goods effectively and efficiently.

5.7.2 Supporting the Regulations

IATA and its Dangerous Goods Board (DGB) continuously performs a gap analysis on the document to ensure all areas are covered especially with new and emerging substances, experiences, etc. In 2004 there were major changes to the DGR that would come into effect January 1, 2005. These have all been accurately incorporated into the 46th edition.

- ✔ In addition, further initiatives were initiated to close a major gap in the industry — Public Awareness.
- ✔ IATA held an industry conference — DG by Air Conference & Exhibition — targeted at shippers, forwarders, airlines, etc.
- ✔ Held a combined DG Awareness Seminar and Several DG Training Programs.
- ✔ Posted a brief “Check Before You Pack” awareness video on the IATA DG website.
- ✔ Initiated a User Mailing List to easily communicate urgent changes and other valid communiqués.
- ✔ Published a Quick Reference Guide for shippers and other handling personnel.

5.7.3 Continued Leadership in the Industry

The information contained in the IATA Dangerous Goods Regulations is subject to constant review in the light of changing government requirements and regulations. Changes may also come about pursuant to operational conditions inherent to air transportation. IATA does all possible to communicate these changes and revisions as they become applicable. Amendments are published as required at the IATA Dangerous Goods website. This site is located at www.iata.org/dangerousgoods.

5.7.4 Cargo Operations

Pursuant to an increasing number of incidents and accidents in the past few years involving cargo aircraft, IATA has undertaken a project to determine if any trends in contributing factors exist in relation to these events and develop recommended practices where needed.

The four major areas of concern reported in 2003 relative to ground operations have been addressed and changes, modifications, upgrades and additions have been made to the relative documents and publications as required.

The year 2004 saw the trend for all cargo carriers continue where they were responsible for 32% of all accidents versus 5% of total sectors flown. None however were attributed to ground operations or ground handling. Generally, events were predominantly attributed to deficiencies in flight operations or overall safety management and the majority of carriers involved were non-IATA Member Airlines.

Several initiatives have been introduced to address these issues. The workload involves the following:

- ✔ The extension of the IOSA programme to include all cargo carrier standards and guidance material.
- ✔ The formation of an action group made up of IATA management and interested stakeholder personnel.
- ✔ Communication with involved carriers and oversight authorities.

In parallel with the IATA efforts in this area, the Federal Aviation Administration (FAA) has launched a similar exercise and formed the Air Cargo Safety Implementation Plan (ACIP) Working Group with the goal of developing recommended cargo operational guidelines. These have not been promulgated to date.

The IATA document or existing publication revisions will incorporate any ACIP recommendations, where necessary, once the FAA publishes a final rule. This will ensure that industry practices are fully aligned with prevailing regulatory guidance in this area. IATA will continue to monitor further developments on this issue on an ongoing basis to ensure that the industry guidance on this subject remains current.

5.8 SAFETY AND SECURITY

5.8.1 Security Management Systems

The integration of Security Management Systems (SEMS) into the IOSA Operational Security Standards and Guidance Material (SGM) began in 2004. The first step in this process was to have the SGM reviewed by IATA Management and the Heads of Security of member air carriers. This was undertaken in order to ensure an operationally sound set of standards and related guidance material that was current with respect to regulatory mandates and industry best practice. The SEMS template itself was then harmonised with the new SGM.

Safety Management Systems (SMS) principles have been incorporated into IOSA standards virtually from the start of the IOSA project. This has benefited Member Ailines by eliminating extra processes and thus the added costs required to mitigate unexpected events. There is no reason why SEMS, properly implemented, cannot achieve the same goals in the security area.

Looking forward, 2005 will be a very important year for the SEMS project. SEMS will be harmonised with the IATA SMS template once that document is finalised. Also, the existing SEMS document will be further aligned with threat assessment programmes, in use by some IATA Member Airlines, to provide best practice guidance in that area.

The major undertaking however, is to develop a set of metrics to allow industry to measure its performance in the area of security management. In addition, a data collection/analysis tool will be developed to facilitate ready access to data/information, one of the basic components of any management system. This obviously borrows heavily from tools/processes that are well advanced in the flight safety area and which have served the industry well in that discipline.

Once all the tools are in place, the advanced set of SEMS principles will be integrated into the IOSA SGM, to facilitate implementation of these principles by IATA Member Airlines. These same principles will also be integrated into the IATA Operational Quality Standards (OQS) audit making SEMS an entry requirement for all future IATA Member Airlines.

The SEMS and related work on IOSA Operational Security SGM will be reviewed regularly and amended as necessary. The project plan outlined in this section has been approved for implementation by the IATA Operations Committee (OPC) at their meeting in October 2004 and by the Security Committee (SEC) at their meeting in November 2004.

5.8.2 Audit and Training Organisations

IATA is heavily involved with several aircraft security issues, many with potential safety implications.

Protecting aircraft against the threat of Man-Portable Air Defence Systems (MANPADS) is a major area of ongoing activity. IATA is stressing the need to look at this threat in context of all threats to aviation and especially versus the threat posed by other direct fire “dumb” weapons systems such as rocket propelled grenades or sniper rifles. IATA believes that a multi-layered approach is necessary with on board technical counter-measures systems being but one option (in many cases probably not the most appropriate option) along with ground security measures to protect sensitive areas (potential launch sites) around the airport and efforts to reduce the availability of MANPADS to non-State entities.

Among the safety related issues under consideration are those related to Emergency Ground Notification (EGN) which is a functionality built into the countermeasures systems currently being evaluated in the United States. EGN is the automated transmission (via transponder Mode 3/A 4096) of confirmed MANPADS events to Air Traffic Control (ATC) and potentially other authorities. IATA has emphasised the need to ensure that appropriate ATC procedures are developed to ensure continued safe flight operations should an EGN alert be received and airspace be closed around airports. It is also critical to ensure quick processing of such alerts and safe resumption of flight operations in the shortest possible timeframe.

Other issues being examined with respect to MANPADS include aircraft integration issues and the need to account for flight safety in the installation and operation of any on board technical systems. Also of major importance is the issue of flight crew interface and what interaction that the crew will have with the operation of onboard systems. Currently the agreed way forward is that the systems themselves will function in a fully automated way with no need for flight crew interaction other than to turn the systems on prior to departure and to deactivate the automatic EGN if required and to provide alternative EGN (voice) if required.

Work on numerous other flight safety-related issues such as system certification, maintainability/supportability and reliability are also under consideration and IATA Security Management is ensuring ongoing liaison with IATA Engineering & Maintenance, Flight Operations and Safety on these issues.

Other aircraft security issues with potential flight safety ramifications include new requirements for aircraft search, including the need to search accessible points to air circulation systems. IATA is pushing for acceptance of alternate measures which would render such access points tamper evidence or resistant. There is also potential legislation in the United States that would require the installation of a secondary barrier, in addition to the already installed enhanced security flight deck doors. IATA is opposing this legislation on the grounds that tremendous investments have already been made to secure the flight deck and emphasis should instead be on deploying scarce resources to further enhance ground security measures to defeat threats on the ground.

IATA is also actively involved in work underway in ICAO to develop guidance material for selection, training, deployment and operation of In-flight Security Officers (IFSO) also known as air/sky marshals. There currently exists a severe lack of guidance on this issue with the result that some States contemplating development of IFSO programmes are doing so in a way that may well compromise flight safety/security rather than enhancing it.

IATA is also working on the issue of in flight bomb threats and related military intercept of civil aircraft. Recent incidents have highlighted several potential flight safety issues related to military intercept of civil aircraft that include the lack of uniformity in the risk assessment processes used to evaluate such threats as well as in the intercept protocols and procedures implemented by various States. IATA has established a Task Force under its Security Committee (SEC) with input from Flight Operations, Safety as well as the International Federation of Airline Pilots Associations (IFALPA) to develop guidance material for submission to ICAO on this issue.

5.9 REGIONAL SAFETY INITIATIVES

This section presents the initiatives undertaken by IATA's Regional Safety, Operations and Infrastructure offices during the past year and their strategies for 2005 onwards.

5.9.1 Africa

The African and Indian Ocean Safety Enhancement Team (ASET) had noted that, in several occurrences in 2003, what would in principle have been a survival failure of a system and/or a flight in unusual situations had resulted in accidents. To address this issue in 2004, two workshops were held in Johannesburg and Cairo to promote training materials relating to Threat and Error Management (TEM).

A total of sixty-four representatives from twenty-one operators participated in the two workshops. The aircraft manufacturers distributed a set of four CDs that included safety-training aids to participating delegations.

This campaign seams to have had a certain positive effect, since less Western-built Jet aircraft were involved in accidents in comparison to previous years. This has led to a significant improvement of Africa's accident rate in 2004, which still remains at a disproportionate level compared to the world average.

Weak safety oversight of regulatory authorities leading to poor organisational structures of operators continued to be the main contributors of accidents in Africa in 2004. This phenomenon was significant in States with civil unrest and their neighbouring States from where unreliable cargo operators provide humanitarian relief services on behalf of the international community.

To take up the enforcement of safety in operational environment, ASET campaigned to obtain African Sates to enlist support to IOSA implementation in their respective States. A Safety Summit has been scheduled to increase the awareness of African decision makers on the Region's safety performance and urge them to the improvement measures in a coordinated manner.

Infrastructure has contributed in many incidents while its contribution to accidents continued in a downtrend. Significant improvements in the increase of VHF coverage has been noted in the airspaces of Sudan and the Democratic Republic of Congo (DRC); AFISNET has migrated to Intelsat IS 10-02, the Satellite retained in the Region for all VSAT networks; SADC VSAT 2 has been sketched on the design board while NAFISAT has been successfully launched. However, shortcomings in communications are still of concern in Angola, Eastern DRC and Libya.

In 2005, ASET strategy will focus on the implementation of SMS to airlines operations, airports and air navigation services while concentrating on programmes of preparing African based carriers for IOSA registration. This should assist in strengthening the operational organisation of safety stakeholders. It would also be highly appropriate to actively support the implementation in Africa of the ICAO Unified Strategy to resolve Safety-related deficiencies.

5.9.2 Asia Pacific

Safety Auditing (IOSA)

Actively promoted IOSA benefits at every opportunity — examples:

- ✔ ICAO COSCAP meetings. Presentation to COSCAP South Asia in November 2004, to COSCAP South East Asia March 2005.
- ✔ ICAO ASPAC DGCA Conference — after presentation was nicknamed "the mother of all audits" at this conference.
- ✔ ICAO Universal Safety Oversight Symposium — IOSA presentation to 32 State representatives.

- ✔ Civil Aviation Chief Executives Programme presentation given to 11 States.
- ✔ Soft copy of IOSA Standards Manual given to all ASPAC State Regulatory Authorities.

ATC Safety

- ✔ Promoted the introduction of SMS to ATC in the region.
- ✔ Problem database established.
- ✔ Service standards and safety surveys have been developed and trialled.

Safety and Security

- ✔ Aligned efforts with the AAPA Security Committee to address safety issues.

Operational Efficiency

- ✔ Addressed with presentations, working papers and voiced positions at every airspace-planning forum in the region.

Other initiatives

- ✔ Developed and promulgated a formal ASPAC Shortcoming and Deficiency Programme that will address deficiencies in safety, security and operational efficiencies.
- ✔ Developed an Air Traffic Services Pilot Survey that will provide a qualitative and quantitative analysis of ATS within the region.
- ✔ Assited the ATC providers in the region to improve safety with the installation of ADS-B.

5.9.3 Pilot / Junior ATCO English ATC Training Course in Europe

IATA member airlines, in cooperation with Charles de Gaulle (CDG) Air Traffic Service Provider, in Paris, have volunteered to provide native English speaking pilots to attend a one-day Air Traffic Controller (ATC) training course. The aim is to bring together pilots and junior student Air Traffic Controllers (ATCOs) for a one-day session. The junior ATCOs are in their final phase of training on approach and departure frequencies. American Airlines, British Airways, British Midland, Federal Express, Delta Air Lines and United Airlines participated and reported good results. The 5 sessions held in 2004 included discussions on operating procedures at CDG on which airlines might have questions, piloting aspects on which the junior ATCOs have questions; and a visit to the control tower cab and approach.

Expected results for the ATCO students are to speak as much English as possible in relation to their duties, and become familiar with a correct phraseology and better understand the pilots' position. In addition, this project promotes the use of English radio transmissions as a common language. This has been vigorously advocated by the airlines as a safety feature in raising awareness. The use of English, in a busy and complicated environment, has proven to be best practice and should be encouraged as a standard, and IATA pursues this at every opportunity. Expected results for member airlines are to become more familiar with the ATC personnel and with the environment at CDG, including the situation with taxiing and the inherent danger of runway incursion.

Level Bust Prevention

The Action Plan for the Prevention of Level Bust, together with the Level Bust Tool Kit, a multimedia interactive application, have been produced in cooperation with Air Navigation Service Providers, airlines, Eurocontrol and IATA and officially launched during a workshop held in October 2004. Approximately 120 people from 5 continents, 37 airlines, 35 States participated at this event. The Action Plan is related to pilots and air traffic controllers covering pilot-controller communication, call sign confusion, Standard Operating Procedures, aircraft technical equipment, ACAS, safety reporting, airspace and procedure design etc.

More information can be found on:
http://www.eurocontrol.int/safety/public/standard_page/standart_page_tool_kit.html

Runway Safety

The European Action Plan for the Prevention of Runway Incursions with educational information for pilots and awareness raising programme has been published in April 2003. The Action Plan calls for airlines full compliance of six recommendations for aircraft operators. A survey amongst our member airlines revealed that on average 80% of the recommendations have been already fulfilled. Members are being updated by regular Runway Safety Progress Reports (number 13 in November 2004 was the latest publication). Further actions were awareness raising visits to BCN, CDG, NCE, PMI, WAW, NAP, FCO, MXP and VNO. Positive feedback was received from numerous airports in the European Region that have established Local Runway Safety Teams (LRST). Such Teams consist of representatives of local airlines, airport operational personnel, ATC tower personnel and ground handlers in order to facilitate effective local implementation of all recommendations as described in the action plan.

Air-Ground Communication

Together with Eurocontrol, IATA initiated a study on the air-ground communication problems. The objective of the study is to examine incident reports, identify causal factors, and provide recommendations. Some of the problems as, similar call sign, sleeping receivers, frequency change, incorrect read back, radio interference, controllers' non-standard R/T phraseology have been already identified. Further work and formulation of the recommendations will be done during workshops in 2005.

Madrid and Moscow Safety Groups

IATA established safety working groups with Madrid and Moscow TWR/TMA/ACC aiming to improve safety in those areas. The main safety problems, as well as causal factors, have been commonly identified (lack of traffic information, inadequate separation minimum in approach, radar vectoring techniques, English language, Level Bust, Air Traffic Controllers rate for licensing, lack of regulation etc). IATA works together with the relevant ANSPs to overcome the identified problems.

European Strategic Safety Action Plan (SSAP)

IATA, together with Eurocontrol and its member States, participated in the development and in the current implementation of the European Strategic Safety Action Plan (SSAP), ensuring improvement of the overall European safety. SSAP covers safety-related human resources in Air Traffic Management (ATM), incident reporting and data sharing, Airborne Collision Avoidance System Ground-based safety nets, runways and runway safety, enforcement of Eurocontrol Safety Regulatory Requirements (ESARR) and the monitoring of their implementation, awareness of safety matters and safety research & development.

SRC/European Commission Regulatory Activities

IATA participates in Eurocontrol and European Commission (EC) activities regarding harmonisation of safety regulatory framework. Full support is given to the transposition of ESARRs into Community low in accordance with the EC regulations and needs of the future Single European Sky (SES). Current activities relate to ESARR 1 (ATM Safety Oversight) that provides an operating baseline for ATM safety regulatory bodies to conduct safety oversight.

5.9.4 Latin America & Caribbean

Consistent with IATA's Global Safety Strategy, the Latin America and Caribbean Regional Safety, Operations and Infrastructure office placed priority on improvements in the safety environment of the region. A great deal of progress in safety initiatives was achieved, mostly through the execution of technical missions, airport operational assessments, resolution of airline operational requests, and industry-wide regional consolidation of safety programmes.

Safety-oriented airport operational assessments were conducted in 10 airports in the region. The results of these assessments have produced corrective actions for serious deficiencies in the ATC, AGA, MET, COM, and AIS areas, all of which represent significant safety and operating benefits to the airlines.

IATA continued to lead in the Pan American Aviation Safety Team (PAAST) initiative. PAAST has achieved an impressive level of distribution of the Flight Safety Foundation's (FSF) Approach and Landing Reduction (ALAR) and the FAA-IATA Runway Incursion toolkits. PAAST unifies various safety programmes into a consolidated programme, thus avoiding duplicity and waste of resources.

Operational improvements have been aggressively pursued across the region, in particular, with the development and implementation of GNSS/RNAV terminal procedures. These procedures enhance safety to aircraft operations by providing more accurate aircraft position awareness via moving map displays and stabilised descents. The adoption of these procedures combines to minimize the potential for Controlled Flight Into Terrain (CFIT) and Approach and Landing Accidents (ALA), which typically occur during the approach phase to the airport. GNSS/RNAV procedures were implemented in the Dominican Republic (4 airports) and in Trinidad & Tobago (2 airports) during 2004. IATA is working to implement these procedures in Ecuador and Chile. Mexico and Colombia have expressed interest in developing these procedures during 2005.

In an effort to improve surface safety, IATA updated the FAA-IATA Runway Incursion Prevention Program CD (version 4.1). IATA has been lobbying regulators, airport operators and airlines to include a runway incursion prevention program in the initial and recurrent training for pilots and ATC controllers.

ATC incident/airprox reports continue to be a matter of concern. A total of 60 reports from 18 airlines were received in 2004. Since the majority of the reports received continue to come from a limited number of airlines, it is assumed that the actual frequency of incidents is much higher. The main source of alert continues to be Terrain Alert and Collision Avoidance System (TCAS), in 55 cases, while the majority of the incidents occurred during enroute and the approach segments of flight.

The US FAA Safety oversight programme, known as IASA, which seeks to establish the level of compliance by governments with ICAO Annexes (1, 2, 6 and 8), has categorised 15 States in the region as non-compliant due to lack of official aviation regulations, personnel licensing deficiencies and inadequate airworthiness inspections. While the programme is aimed at the assessment of Civil Aviation Authorities (CAAs), the punitive side of the programme results in operating restrictions to the airlines headquartered in the non-compliant States. Little progress was observed since last year.

The region continues to suffer from a high number (over 300) of unresolved deficiencies and shortcomings affecting the provision of air navigation services. The need for States to implement programs for their elimination is a matter of constant concern and of high priority for IATA and Member Airlines. Unfortunately, many States have ignored recommendations from ICAO to prepare action plans to resolve ongoing deficiencies. In 2005, IATA will work closely with ICAO and the CAAs to establish formal review, analysis and resolution of deficiencies.

5.9.5 Middle East

In the Middle East, the initiatives undertaken by IATA were:

- ✔ Surveying the status of Operators' readiness to implement Safety Management Systems and the Flight Operation Quality Assurance programmes. The results of the survey show that five Middle Eastern-based carriers have already established SMS and two carriers showed interest of having an in-company SMS course. FOQA programmes have been implemented in four Middle Eastern-based carriers, while the project is still in the pipeline for two other carriers and will be implemented in 2005.
- ✔ As a result of the intense IOSA awareness campaign within Middle-Eastern Civil Aviation Authorities and IATA Member Airlines and non-member charters, five members have been secured for IOSA registry and three are potential candidates for end of the year 2005.
- ✔ A list of reported ATS incidents was presented at ICAO ATS Incident Task Force, highlighting that the main cause of incidents and recurrent incidents is deficient air-ground communication.
- ✔ Furthermore, as a result of the strong follow-up with the authorities concerned, a number of reported deficiencies have been resolved.
- ✔ As a result of an awareness campaign, one member airline has joined the STEADES programme.

5.10 SPACE IMAGING

The air transport industry has strived to reduce chances of runway incursion accidents, and enhance the safety/efficiency of surface movements. In this respect, IATA has taken a lead role. Presently IATA wishes to examine an opportunity to provide a radical increase in airline safety and efficiency with technology around surface movement optimisation.

5.10.1 The Runway Incursion Challenge

Runway incursion problems can basically be determined via three levels of threat/hazards, in descending order of risk of major loss of life:

1. Runway Incursion, during takeoff or landing operations
2. Aircraft to aircraft collision during taxiing operations
3. Ground vehicle to aircraft collisions during taxiing operations

The most suitable technologies for mitigating the risks associated with the above can also broadly be broken down into three sets:

(a) Surface Movement Guidance and Control Systems known as SMGCS and A-SMGCS.

(b) Multilateration Radar systems.

(c) Synthetic Vision for surface movements

SMGCS has already been implemented at a number of airports around the world, and has had some degree of success in reducing Runway Incursions. It does require expensive installation, and is for the most part a passive system, that requires the successful viewing of lighting signals around the perimeter of an airport's movement areas in order to work. Multilateration Radar systems are coming into usage at a number of airports worldwide. They focus on the use of ground-based radar systems that "detect" aircraft targets on the movement areas, and can perform the same kind of 2D separation (on the ground) that terminal radar can provide in the 3D airspace (in the air). They are built on mature technology, and are very capable for the most part. They are designed to be tools that are primarily used by CNS/ATM authorities, in conventional control applications — a ground controller effecting control over an apron, taxiway or runway zone. Unless the ground vehicles are equipped with transponders, in some cases they may be shielded from the beam, and not be registered as threats when they should be.

***Figure 1:** IKONOS satellite image of Jeddah, courtesy of Space Imaging.*

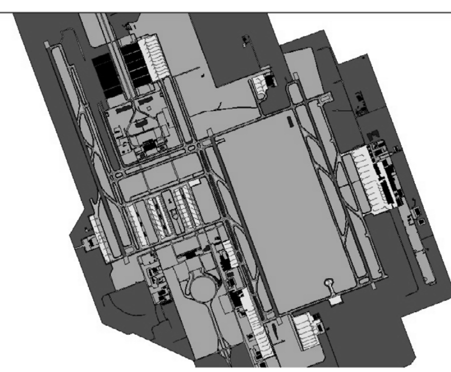


***Figure 2:** Airport Mapping Database of Jeddah derived from satellite image, courtesy of Space Imaging.*

The third technology is the one that holds the most promise for the future, as it can readily address all of the three types of threats listed above. Synthetic Vision is the ultimate collaborative decision making between the flight deck, and the control tower. Using a common moving map display of the airport surface movement areas that both parties view, both parties are thus enabled to make inputs under explicit protocols. In effect, this is an extension of Controller to Pilot Data Link Control (CPDLC) technology down to the ground. When pilot and controller both share the same view of all aircraft and ground vehicles (the controller all in their sector of responsibility, the pilot in a virtual zone around their aircraft), the best possible decisions can be made, in all weather conditions, towards the safety of surface movements. And the critical piece of this solution is the ready availability of vector moving maps of the airports that are kept up to date for all commercial airports worldwide, known as Airport Mapping Databases or AMDB.

5.10.2 Enabling Technology

In order for Synthetic Vision to be successful, a number of technologies need to be readily available, and technical standards published for certification purposes. Fortunately, they all exist:

- CPDLC is already being widely adopted in trans-oceanic routes. First pioneered in the Australian FIR/UIR of the Pacific, it has now been extended into the North Atlantic and many other regions.
- Standards for datalinked CNS/ATM commands have been published as part of the RTCA's DO-269, and those include a command set for taxiing operations. This is a logical next step for the CPDLC technology, moving from enroute flight operations into terminal flight operations.
- Basic VHF datalink's exist with a wide variety of technologies, from VDL-2, VDL-3, and the competing Swedish technology of VDL-4, which can provide the necessary connection.
- An alternative to this in second and third world airports is conventional wireless or cellular, as the message sizes to transmit a position update is very small.
- Fixed display subsystems that are capable of showing the pilot moving maps of the airport surface are already manufactured by Honeywell (Primus Epic), Rockwell-Collins (PRO LINE 21), Universal (System 1), UPS AT (MX20), Astronautics (EFB), and several Thales companies.
- For those older flight decks that are not economical to retrofit the above, the portable electronic flight bag can be used, built in off-the-shelf Intel Tablet devices are already made by Fujitsu, Panasonic, and several other major vendors.
- For aircraft location, conventional Ground Positioning Systems (GPS) without SA can provide adequate position information, LAAS or WAAS systems can be used to provide true Cat I level guidance on the ground.
- Standards for Airport Mapping Databases have been published by EUROCAE (spec ED-99) and the RTCA (DO-272), and fully endorsed by ICAO, the FAA, Eurocontrol and the Joint Aviation Authority (JAA) for certification purposes.
- IATA in conjunction with Space Imaging LLC is the first commercial partnership able to manufacture Airport Mapping Databases (ADMB) to the DO-272 and ED-99 standards, as a complete Data Originator. All of this is manufactured according to the rigorous processing standards of DO-200A. Any airfield in the world can be constructed, in 2D or in 3D as per the customer requirements. Our standard products are the **"Coarse"** and **"Medium"** AMDB's, and we are able to build to the **"Fine"** specification when complete ground survey control is made available at the airfield.

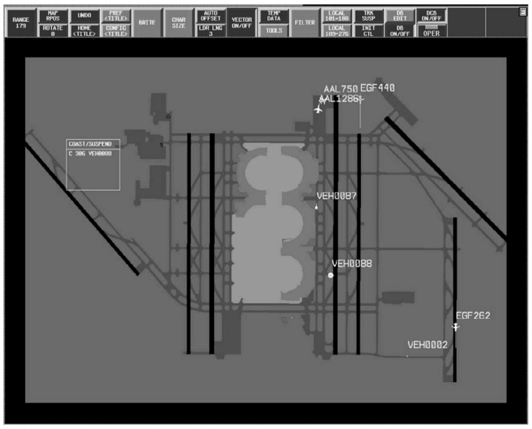


Figure 3: *DFW Runway Surveillance example, courtesy of FAA.*

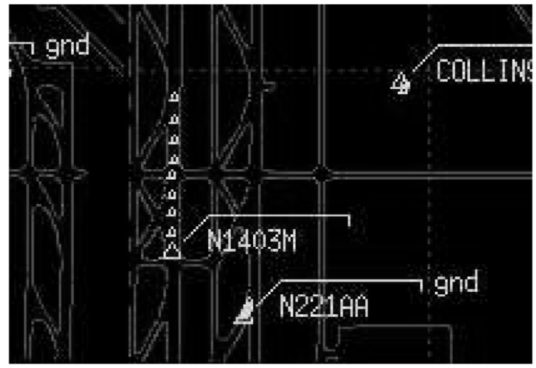


Figure 4: *Multilateration Technology example, courtesy of SENSIS company web site.*

5.10.3 Service Product Concept of Operations

The product to be jointly marketed by the two organisations is the DO-272/ED-99 compliant AMDB. This vector geo-spatial database of the features on an airport required for surface movements is suitable for certified, in-panel moving map applications, and all other types of applications that could use such products. Some examples of those would include:

- Airlines would use the AMDBs to better brief their crews in airport operations.
- Airport authorities can construct or commercially acquire DO-272-compliant AMDBs for their airports. These AMDBs would be shared with all routine and emergency staff on the facility, immediately bringing greater situational awareness.
- CNS/ATM authorities can couple AMDBs with SMGCS and other technologies to reduce the incidents of runway incursions.
- Avionics manufacturers can employ AMDBs in the development of moving map and other applications that can be delivered from a PDA all the way to in-flight deck moving map applications for aircraft and rotorcraft.
- Simulation companies can use AMDBs in building training products to enable all airport users to better perform their activities: both routine and emergency. This could be conventional moving and fixed aircraft simulators, or economical driving simulation training

CHAPTER 6 — CONCLUSION AND PREVENTION STRATEGIES

6.1 CONCLUSION

The year 2004 was the safest on record. Both the Western-built Jet Hull Loss rate and the fatalities rate saw a decrease in the past year. IATA Member Airlines account for 94% of scheduled international traffic but were involved in under a third of accidents.

For Western-built Turboprop aircraft, the rates for Hull Loss and fatal accidents saw an increase, but 2004 remained below the overall ten-year average.

At a regional level, the Western-built Jet Hull Loss rate in Africa remained high, compared to other areas of the world. The Western-built Jet Hull Loss rate in the Middle East increased in 2004. The low number of sectors flown in these two regions makes them more vulnerable to rate fluctuations in comparison to other parts of the world.

Overall, for both Jet and Turboprop aircraft (Western and Eastern-built), organisational issues and human factors were the main contributors to accidents in 2004.

At the organisation level, deficiencies in safety management (e.g. lack of an accident prevention programme in the airline), inadequate flight crew training systems and poor standards and checking were the main contributing factors.

Flight crew proficiency issues were the main human factor cited in the analysis. A correlation was established between operators, who do not have adequate or existent safety management, deficient training systems in those airlines and cases where flight crew proficiency issues were noted. Inadequate flight crew communication was also cited as a top human factor, which was liked to training deficiencies as well. These factors also tied into cases where weak regulatory oversight played a contributing role.

In terms of specific accident families, efforts to reduce Controlled Flight Into Terrain (CFIT) accidents showed success in 2004, as no Jet aircraft were involved in a CFIT accident. The increase in the number of aircraft fitted with E-GPWS is at the forefront of the decrease in the number of CFIT accidents. This type of event affected smaller Turboprop aircraft operating in isolated regions. Only one IATA Member Airline was involved in a CFIT accident last year.

Accidents involving a Loss of Control In-flight (LOC-I) were generally tied to flight crew proficiency issues and deficiencies in training systems. Only one LOC-I event involved an IATA Member Airline.

The context in which airlines operate was noted as an issue of concern in the analysis of the 2004 events. Many accidents occurred during non-scheduled operations. Furthermore, a significant part of events (particularly those on Turboprop aircraft) involved small carriers that operated in isolated regions. The organisational aspects of such operations (e.g. selection process, training systems, etc.) and the environment in which the flights were conducted are believed to have played a role in these occurrences.

Icing issues also raised a concern. Adequate knowledge and training regarding de-icing procedures can prevent accidents due to the contamination of critical surfaces.

Certain accident families were not present in 2004. For example, no runway incursions were recorded. However, work to promote awareness concerning the issues linked to these families will continue in 2005 and onwards.

Following the analysis by the ACWG, findings were communicated to SAC and the OPC, and will now be brought to the industry's attention. As an outcome of the 2004 accident analysis, the five top issues, believed to be of the highest concern for the industry are presented in this chapter.

The top five issues in 2004 are as follows:

Cargo operations: these accounted for a third of the year's accidents. In over a quarter of events, flight crews intentionally disregarded procedures. Deficiencies in safety management and standards and checking were also contributors in many events. Weak regulatory oversight was noted in many cargo accidents and linked to the factors mentioned above.

Safety in Africa: almost a quarter of all the year's accidents occurred in Africa. Deficiencies in safety management, training systems and flight crew proficiency issues were the top contributing factors. Over a quarter of the accidents in Africa involved IATA Member Airlines.

Ground damage: IATA Member Airlines were involved in almost half of ground damage events. The majority of accidents involved large Jet aircraft, occurred primarily in Europe during scheduled operations and resulted in major damage. Airport facilities played a contributing role in many cases. Although no ground damage event resulted in a fatality last year, many events have the potential to seriously or fatally injure persons in or around the aircraft. The financial burden of these events on the industry is also another reason that it is ranked among the top five.

Unstable approaches and Approach and Landing (ALA) accidents: almost half of all the accidents occurred during the Approach and Landing phases of flight. IATA Member Airlines were involved in 41% of these accidents. Many events resulted in runway excursions, some of which were fatal. A large part of the accidents in ALA could have been prevented by a timely Go-around.

Flight crew training and proficiency: Flight crew proficiency was called into question in many of the 2004 accidents. This problem was usually linked to deficiencies in safety management, training systems and standards and checking. Flight crew communication issues were also highlighted in many cases and often related to inadequate training.

All the issues mentioned above align with the priorities set by the IATA Safety Committee and its Future Safety Strategy Task Force (FSSTF). This task force was created to oversee the implementation of the priorities mentioned below. These priorities involve:

- ✔ Standard Operating Procedures and the need for flight crew compliance.
- ✔ Flight crew selection, training and proficiency and the role that these play in the safety of airline operations.
- ✔ Language and communication issues and their contribution to incidents and accidents.
- ✔ Alertness management: crew fatigue and its impact on safety.
- ✔ Integrated Safety Management Systems (SMS) and the need to develop clear guidance material for airlines to implement an SMS within their operations.

Detailed documentation regarding the FSSTF and its work is presented in the CD-ROM toolkit.

6.2 PREVENTION STRATEGIES

In order to act upon the findings of the 2004 Safety Report, IATA, in collaboration with its Member Airlines, will focus on the five following prevention strategies during 2005:

Cargo operations: *IATA has developed a comprehensive Cargo Safety Programme that targets issues in this field and will expand its IOSA Programme to develop a safety audit to target dedicated cargo carriers.*

Safety in Africa: *IATA will actively participate in the safety campaign in Africa by taking a primary role in the African and Indian Ocean Safety Enhancement Team (ASET).*

Ground damage: *IATA will implement its Ground Damage Prevention Programme to reduce ground incidents and accidents and cut ground damage costs by 10% in 2005.*

Unstable approaches and Approach and Landing accidents: *IATA will deploy its Flight Data Analysis capabilities to help airlines track and prevent unstable approaches and promote non-punitive Go-around policies.*

Flight crew training and proficiency: *IATA will continue to implement the IOSA Programme in 2005, which addresses deficiencies at the organisational and flight operations levels, to ensure airlines that are audited apply corrective actions regarding these issues.*

The IOSA programme plays a key role in helping IATA achieve the implementation of its prevention strategies for 2005. Airlines that are audited under IOSA and have findings relating to organisational or flight operations deficiencies are required to subsequently address and correct these issues in order to obtain IOSA registration. Organisational standards in IOSA target aspects such as: accident prevention programmes, risk management and quality assurance. The flight operations standards cover, among others: flight crew hiring, promotion and upgrade, flight time limitations and scheduling, flight management and procedures and initial and recurrent training.

The development of an IOSA audit for dedicated freighter operators will result in the first worldwide safety standard for cargo operations. Deficiencies in standard and checking will be addressed through this initiative.

Now that the year 2004 has come to an end, the airline industry looks back at its successes. These result from the implementation of programmes to constantly monitor and mitigate risk. The industry also seeks to learn from its failures, by trying to capture lessons from accidents to ensure that they are not repeated. IATA continues to develop its data-driven approach and aims at providing tools to help the industry achieve its safety target and thrive in the years to come.

ANNEX 1 — DEFINITIONS

Aircraft-years: means, for purposes of the Safety Report, the average fleet in-service during the year. The figure is calculated by counting the number of days each aircraft is in the airline fleet during the year and then dividing by 365. Periods during which the aircraft is out of service (for repair, storage, parked, etc) are then excluded.

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 or seriously 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.

  Note 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.

  Note 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, accidents are classified as either operational or non-operational.

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

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

Air Traffic Service unit: means an involved air traffic service (ATS) unit, as defined in applicable ATS, Search and Rescue, and Overflight regulations

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

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

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

Controlled Flight into Terrain (CFIT): *(From CAST-ICAO Common Taxonomy Team Occurrence Categories, Refer to Supporting Documents on CD-ROM)*

Inflight collision or near collision with terrain, water, or obstacle without indication of loss of control.

- CFIT is used only for occurrences during airborne phases of flight.
- CFIT includes collisions with those objects extending above the surface (for example: towers.).
- CFIT can occur during either Instrument Meteorological Conditions (IMC) or Visual Meteorological Conditions (VMC).
- This category includes instances when the cockpit crew is affected by visual illusions (e.g., black hole approaches) that result in the aircraft being flown under control into terrain, water, or obstacles.
- If control of the aircraft is lost (induced by crew, weather or equipment failure), do not use this category; use Loss of Control — Inflight (LOC-I) instead.
- For an occurrence involving intentional low altitude operations (e.g., crop dusting) use the Low Altitude Operations (LALT) code instead of CFIT.
- Do not use this category for occurrences involving intentional flight into/toward terrain. Code all suicides under Security Related (SEC) events.
- Do not use this category for occurrences involving runway undershoot/overshoot, which are classified as Undershoot/Overshoot (USOS).

Crewmember: means 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: The main types in current service and considered in this Safety Report are the An-72, Il-62, Il-76, Il-86, Tu-134, Tu-154, Yak-40 and Yak-42.

Eastern-built Turboprop aircraft: The main types in current service and considered in this Safety Report are An-12, An-24, An-26, An-28, An-32, L-410 and Y-12.

Fatal accident: A fatal accident is one where at least one passenger or crew member 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.

Most fatal accidents also result in the aircraft becoming a hull loss but this is not necessarily always the case and there have been a number of substantial damage accidents where deaths have occurred.

Fatality: A fatality is 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 generally excluded, however, one or two cases where death came later but could reasonably be shown to have been a direct result of injuries sustained in the original accident, are included. (This does not conform to the ICAO Annex 13 definition but, in this context, is thought to be more meaningful).

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: IATA’s accident classification system comprises five categories: human, technical, environmental, organisational, and insufficient data. Each category (excepting the last) is further subdivided into detailed contributing factors.

Human Factors (HUM): The human factors category relates only to the involved flight crew.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
H1	Intentional non-compliance	**Deliberate and premeditated** deviation from operator procedures and/or regulations. Examples include intentional disregard of operational limitations or SOPs.
H2	Proficiency	Flight crew performance failures due to deficient knowledge or skills. This may be exacerbated by lack of experience, knowledge or training. Examples include inappropriate handling of the aircraft, such as flying within established approach parameters, or of systems, such as the inability to correctly programme a flight management computer.
H3	Communication	Miscommunication, misinterpretation or failure to communicate pertinent information within the flight crew or between the flight crew and an external agent (e.g. ATC or ground operations). CRM issues typically fall under this category. Examples include: failures in monitoring and crosschecking, misunderstanding a clearance; or failure to convey relevant operational information.
H4	Procedural	Unintentional deviation in the execution of operator procedures and/or regulations. The flight crew has the necessary knowledge and skills, the intention is correct, but the execution is flawed. It may also include situations where flight crews forget or omit relevant appropriate action. Examples include a flight crew dialling a wrong altitude into a mode control panel or a flight crew failing to dial an altitude in a mode control panel.
H5	Incapacitation/Fatigue	Flight crewmember unable to perform duties due to physical or psychological impairment.

Technical Factors (TEC): The technical factors category relates specifically to systems and components of the involved aircraft and their airworthiness and/or serviceability.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
T1	Extensive engine failure, uncontained engine fire	Damage due to non-containment.
T2	Engine failure, malfunction, fire warning	Engine overheat, propeller failure.
T3	Gear and tire	Failure affecting parking, taxi, take-off and landing.
T4	Flight controls	Failure affecting aircraft controllability.
T5	Structural failure	Failure due to flutter, overload, corrosion/fatigue; engine separation.
T6	Fire, smoke (cockpit, cabin, cargo)	Post-crash fire, fire due to aircraft systems, fire other cause(s).
T7	Unapproved modification/ bogus parts	Self-explanatory.
T8	Avionics	All avionics except autopilot and FMS.
T9	Design, manufacturer	Design shortcomings, manufacturing defect.
T10	Autopilot/ FMS	Self-explanatory.
T11	Hydraulic system failure	Self-explanatory.
T12	Other	Not clearly falling within another technical category.

Environmental Factors (ENV): The environmental factors category relates to the physical world in which the involved aircraft operated and the infrastructural resources (excluding corporate) required for successful performance.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
E1	Meteorology (MET)	Windshear, jet upset, atmospheric turbulence, icing, wake turbulence (aircraft spacing), volcanic ash, sand, precipitation, lightning. Poor visibility, poor runway condition reporting.
E2	Air Traffic Services (ATS)/ Communications (COM)/ conflicting traffic	Incorrect, inadequate or misleading instruction or advice, misunderstood/ missed communication, failure to provide separation (air), failure to provide separation (ground).
E3	Birds/Foreign Object Damage (FOD)	Self-explanatory.
E4	Airport facilities	Inadequate aerodrome support (crash, rescue capability, snow removal, sanding); failure to eliminate runway hazards; inadequate, improper, or misleading airport marking or information.
E5	Navaids	Ground navigation aid malfunction, lack or unavailability.
E6	Security	Inadequate security measures; breach of security procedures.
E7	Regulatory oversight	Failure by cognisant authority to exercise regulatory oversight or lack thereof.
E8	Other	Not clearly falling within another environmental category.

Organisational Factors (ORG): The organisational factors category relates to the corporate environment in which flight crews operate, including management aspects.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
O1	Safety management	Inadequate or absent SMS such as: Ineffective or absent safety officer, inadequate or absent accident/incident prevention programme, inadequate or absent voluntary confidential reporting system.
O2	Training systems	Omitted or inadequate training; language skills deficiencies; qualifications and experience of flight crews, operational needs leading to training reductions, insufficient assessment of training, inadequate training resources such as manuals or CBT devices.
O3	Standards and Checking	Inadequate, incorrect, unclear 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.
O4	Cabin operations	The management of cabin operations. Examples include: Unruly passenger management, failure to perform by cabin crew.
O5	Ground Operations	The management of ground operations. Examples include: Ground support procedures and training, loading errors, incorrect pushback procedures, failure in ground tug, de-icing, or marshalling.
O6	Technology and Equipment	Available safety equipment not installed. (EGPWS, predictive wind-shear, TCAS/ACAS, etc.).
O7	Operational planning and scheduling	Crew rostering and staffing practices, flight and duty time limitations, health and welfare issues.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
O8	Change Management	Inadequate oversight of change. Failure to address operational needs created by, for example: Expansion, or downsizing. Failure to evaluate, integrate and/ or monitor changes to established organisational practices or procedures. Consequences of mergers and acquisitions.
O9	Selection systems	Inadequate or absent selection standards.
O10	Maintenance Operations	The management of maintenance activities. Examples include failure to complete maintenance, maintenance or repair error/ oversight/inadequacy, unrecorded maintenance, deficiencies in technical documentation, deficiencies in trouble shooting.
O11	Dangerous goods	Carriage of articles or substances capable of posing a significant risk to health, safety or property when transported by air.
O12	Dispatch	Self-explanatory.
O13	Other	Not clearly falling within another organisational category.

Insufficient Data (I): The insufficient data category is used to describe accidents for which classification is not possible without further information.

CODE	DESCRIPTION	EXAMPLE EVENT(S)
I	Insufficient data to make any classification	Self-explanatory.

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, authorised 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 organisation, conduct and control of an investigation.

Involved: means directly concerned, or designated to be concerned, with an accident or incident.

Level of safety: means a level of how far safety is to be pursued in a given context, assessed with reference to an acceptable risk, based on the current values of society.

Major repair: means 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 such as sabotage, war etc. and (an IATA constraint) accidents which occur during crew training; demonstration and test flights. (Sabotage, etc. 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 operation).

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

Operator: A person, organisation or enterprise engaged in or offering to engage in aircraft operation.

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

Passenger: means anyone on-board a flight who, as far as may be determined, is not a crew member. 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: means any involved individual, including an aerodrome manager and/or a member of an air traffic services unit.

Phase of Flight: These phase of flight definitions were, and continue to be, developed by the ATA Flight Operations Working Group. The following is an excerpt from the Flight Operations Information Data Interchange — Phase of Flight Specification, ATA iSpec2200 (ATA POF Spec). Further information on iSpec2200 may be obtained from www.airlines.org.

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 cruise; it ends with the aircraft established at a predetermined constant initial cruise altitude at a defined speed or by the crew initiating an “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 an “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 of 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.*

Sky Marshal: see In-flight Security Personnel

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

Risk: means the combination of the probability, or frequency of occurrence of a defined hazard and the magnitude of the consequences of the occurrence.

Safety: means freedom from unacceptable risk of harm.

Sector: the operation of an aircraft between the Take-off at one location and landing at another (other than a diversion).

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).

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

- Requires hospitalisation for more than 48 hours, commencing within seven days from the date the injury was received;
- Results in a fracture of any bone (except simple fractures of fingers, toes or nose);
- Involves lacerations 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.

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.

Note 1: Engine failure (damage limited to an engine), bent fairing or cowling, dented skin, small punctured holes in the skin or fabric, ground damage to rotor or propeller blades, minor damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wing tips are not considered "substantial damage" for purpose of this Safety Report.

Note 2: The ICAO Annex 13 definition is unrelated to cost and includes many incidents in which the financial consequences are minimal.

Threat and Error Management (TEM) model: This section presents definitions for the components of the TEM model and illustrates examples for the classifications used for Integrated Threat Analysis (ITA). Lists of examples are not exhaustive.

Threats
Events that occur **outside the influence of the flight crew,** or errors by **others than the flight crew,** that increase complexity of the flight, and require flight crew attention and management to maintain the margins of safety.

Mismanaged Threat
A threat that is linked to, or induces flight crew error.

Environmental Threats
— *Weather:* thunderstorms, turbulence, icing, wind shear, cross/tailwind, very low/high temperatures.
— *ATC:* traffic congestion, TCAS RA/TA, ATC command, ATC error, ATC language difficulty, ATC non-standard phraseology, ATC runway change, ATIS communication, units of measurement (QFE/meters).
— *Airport:* contaminated/short runway, contaminated taxiway, lack of/confusing/faded signage/markings, birds, aids U/S, complex surface navigation procedures, airport constructions.
— *Terrain:* High ground, slope, lack of references, “black hole”, volcano.
— *Other:* similar call-signs.

Airline Threats
— *Airline operational pressure:* delays, late arrivals, equipment changes.
— *Aircraft:* aircraft malfunction, automation event/anomaly, MEL/CDL.
— *Cabin:* cabin crew error, cabin event distraction, interruption, cabin door security.
— *Maintenance:* maintenance event/error.
— *Ground:* ground handling event, de-icing, ground crew error.
— *Dispatch:* dispatch paperwork event/error.
— *Documentation:* manual error, chart error.
— *Other:* crew scheduling event.

Errors
Observed actions or inactions by the flight crew, that lead to a deviation from flight crew or organisational intentions or expectations.

Mismanaged Error
An error that is linked to or induces additional errors, or an undesired aircraft state.

Proficiency Errors
— *Manual handling/flight controls:* vertical/lateral and/or speed deviations, incorrect flaps/speedbrakes, thrust reverser or power settings.
— *Automation:* incorrect altitude, speed, heading, autothrottle settings, incorrect mode executed, or incorrect entries.
— *Systems/radio/instruments:* incorrect packs, incorrect anti-icing, incorrect altimeter, incorrect fuel switches settings, incorrect speed bug, incorrect radio frequency dialled.
— *Ground navigation:* attempting to turn down wrong taxiway/runway, taxi too fast, failure to hold short, missed taxiway/runway.

Procedural Errors
— *SOPs:* failure to cross-verify automation inputs.
— *Checklists:* wrong challenge and response; items missed, checklist performed late or at the wrong time.
— *Callouts:* omitted/incorrect callouts
— *Briefings:* omitted briefings; items missed.
— *Documentation:* wrong weight and balance, fuel information, ATIS, or clearance information recorded, misinterpreted items on paperwork, incorrect logbook entries, incorrect application of MEL procedures.

Communication Errors
— *Crew to external:* missed calls, misinterpretations of instructions, incorrect read-back, wrong clearance, taxiway, gate or runway communicated.
— *Pilot to pilot:* within crew miscommunication or misinterpretation.

Intentional Non-compliance
Wilful deviation from rules, regulation, SOPs.

Undesired Aircraft States
Flight crew-induced aircraft states (deviations or incorrect configurations) associated with a clear reduction in safety margins; a safety-compromising situation that results from ineffective error management.

Mismanaged Undesired Aircraft State
An Undesired Aircraft State that is linked to, or induces additional error/Undesired Aircraft State, an incident or accident.

Aircraft Handling
— Aircraft control (attitude).
— Vertical, lateral or speed deviations.
— Unnecessary weather penetration.
— Unauthorised airspace penetration.
— Operation outside aircraft limitations.
— Unstable approach.
— Continued landing after unstable approach.
— Long, floated, firm or off-centreline landing.

Ground Navigation
— Proceeding towards wrong taxiway/runway.
— Wrong taxiway, ramp, gate or hold spot.

Incorrect Aircraft Configurations
— Incorrect systems configuration.
— Incorrect flight controls configuration.
— Incorrect automation configuration.
— Incorrect engine configuration.
— Incorrect weight and balance configuration.

Western-built Jet: Commercial Jet transport aeroplane with a maximum certificated takeoff mass of more than 15,000 kg, designed and manufactured in the western world countries.

Western-built Turboprop: Commercial Turboprop transport aeroplane with a maximum certificated takeoff mass of more than 3900 kg, designed and manufactured in the western world countries.

ANNEX 2 — 2004 ACCIDENT SUMMARY

Date	Aircraft Manufacturer	Aircraft Type	Operator	Location	Flight Phase	Service	Western/ Eastern-built	Jet/ Turboprop	Severity	Summary
1-Jan-04	McDonnell-Douglas	MD-81	Japan Air System	Tokunoshima, Japan	LND	DSP	Western-built	Jet	Substantial Damage	Undercarriage failure on landing roll
3-Jan-04	Boeing	B737-300	Flash Airlines	in Madiq Tiran, off Sharm-el-Sheikh, Egypt	ECL	INP	Western-built	Jet	Hull Loss	Loss of control, aircraft impacted the sea
3-Jan-04	Airbus	A320	Air Luxor	Funchal, Portugal	GDS	DSP	Western-built	Jet	Substantial Damage	Undercarriage collapsed shortly after pushback
5-Jan-04	Fokker	F-70	Austrian	(near) Munich, DE	APR	ISP	Western-built	Jet	Hull Loss	Loss of power & engine vibrations, landed short of runway in field
5-Jan-04	de Havilland (Bombardier)	DHC-6 Twin Otter	Regional Air (PNG)	Sturt Island Airport	TOF	DNC	Western-built	Turboprop	Hull Loss	Loss of control on runway leading to excursion
13-Jan-04	Yakovlev	Yak-40	Uzbekistan Airways	Vostochny AP, Tashkent, UZ	LND	DSP	Eastern-built	Jet	Hull Loss	Runway overshoot and failed late go-around, destroyed in ensuing fire
15-Jan-04	Boeing	B747SP	Iran Air	Beijing, China	LND	ISP	Western-built	Jet	Hull Loss	Hydraulic failure, nose gear failed to extend
16-Jan-04	Raytheon	B1900D	SonAir	4 de Fevereiro Airport, Luanda, Angola	TXO	DSP	Western-built	Turboprop	Hull Loss	Collision with ground vehicle
19-Jan-04	de Havilland (Bombardier)	DHC-6 Twin Otter	PT Air Regional	Gunung Mulia, Indonesia	LND	DNC	Western-built	Turboprop	Substantial Damage	Hard landing causing nose gear failure
19-Jan-04	Airbus	A320	Air Malta	Luqa Airport, Vallletta, Malta	GDS	ISP	Western-built	Jet	Substantial Damage	Collision with ground obstacle
24-Jan-04	Boeing	B757	Thomas Cook Airlines	Lyon, France	GDS	INP	Western-built	Jet	Substantial Damage	Collision with ground obstacle
25-Jan-04	Boeing	B767-300ER	Alitalia	Yoff International Airport, Dakar, Senegal	TXO	ISP	Western-built	Jet	Substantial Damage	Collision with other aircraft on stand during marshalled taxi out
26-Jan-04	McDonnell-Douglas	MD-11	Varig	Benito Juarez International Airport, Mexico City. MX	LND	ISP	Western-built	Jet	Substantial Damage	Hard landing causing tail strike, go-around successfully performed
28-Jan-04	Raytheon	B1900D	Tassili Airlines	(near) Ghardaia, Algeria	LND	DNP	Western-built	Turboprop	Hull Loss	Controlled Flight Into Terrain (CFIT) during vectored missed approach
4-Feb-04	Ilyushin	Il-18	Expo Aviation	Bandaranayake Int AP Colombo, Sri Lanka	LND	INC	Eastern-built	Turboprop	Hull Loss	Near CFIT when below glideslope, pilot elected to make gear-up landing on grass between runways
10-Feb-04	Fokker	F-50	Kish Air	(near) Sharjah, UAE	APR	INP	Western-built	Turboprop	Hull Loss	Loss of control due to propeller pitch reversal during approach
20-Feb-04	McDonnell-Douglas	MD-81	Austral	Ezeiza International Airport, AR	LND	DSP	Western-built	Jet	Substantial Damage	Left main undercarriage released shortly after takeoff, subsequent tyre failure on landing
24-Feb-04	de Havilland (Bombardier)	DHC-6 Twin Otter	SonAir	Cubango, AO	TOF	DNP	Western-built	Turboprop	Substantial Damage	Aircraft struck tree on climbout, flight continued without incident
25-Feb-04	Boeing	B737-200C	First Air	Edmonton, CA	LND	DNP	Western-built	Jet	Substantial Damage	Runway excursion with successful recovery
25-Feb-04	Boeing	B737-800	South African Airways	Jan Smuts International Airport Johannesburg, ZA	LND	DSP	Western-built	Jet	Substantial Damage	Runway excursion with successful recovery
1-Mar-04	Airbus	A300	Pakistan International Airlines	King Abdulaziz Int AP, Jeddah, Saudi Arabia	TOF	INP	Western-built	Jet	Hull Loss	Tyre failure on takeoff, successful rejected takeoff completed
4-Mar-04	Ilyushin	Il-76	Azov Avia Aircompany	Baku, AZ	ICL	INC	Eastern-built	Jet	Hull Loss	Multiple tailstrikes and loss of control on takeoff, destroyed in ensuing fire
15-Mar-04	Raytheon	B1900D	Air Midwest Airlines (US Airways Express)	Manhattan Regional Airport (MHK), Manhattan, Kansas	LND	DSP	Western-built	Turboprop	Substantial Damage	Runway excursion on landing, undercarriage collapsed on re-entry attempt
22-Mar-04	Boeing	B737-800	Air Berlin	Hanover, DE	LND	ISP	Western-built	Jet	Substantial Damage	Hard landing with multiple bounce recoveries (3) in gusty conditions
2-Apr-04	Boeing	B707-320C	Air Memphis	Cairo int'l AP, Egypt	TOF	INC	Western-built	Jet	Hull Loss	Right main undercarriage failure in gusty conditions causing aborted takeoff
4-Apr-04	Antonov	An-26	IRBIS	120 km from Kysyl, RU	CRZ	INC	Eastern-built	Turboprop	Substantial Damage	Propeller released from engine, damaging fuselage
9-Apr-04	Airbus	A340-310	Emirates Airlines	Jan Smuts Int AP, Johannesburg, ZA	TOF	ISP	Western-built	Jet	Substantial Damage	Impact with approach lighting on takeoff causing undercarriage and flap damage, successfully returned for landing
10-Apr-04	McDonnell-Douglas	DC-10-30	World Airways	Over the Atlantic Ocean	CRZ	INP	Western-built	Jet	Substantial Damage	Engine cowl released in cruise damaging right inboard elevator

Date	Aircraft Manufacturer	Aircraft Type	Operator	Location	Flight Phase	Service	Western/ Eastern-built	Jet/ Turboprop	Severity	Summary
16-Apr-04	Airbus	A340-310	Air Mauritius	Chhatrapati Shivaji int AP, Mumbai, India	PRF	ISP	Western-built	Jet	Substantial Damage	Collision with ground vehicle
20-Apr-04	McDonnell-Douglas	MD-82	Alitalia	Ronchi dei Legionari Airport, Trieste, Italy	TXI	DSP	Western-built	Jet	Hull Loss	Collision with ground vehicle
27-Apr-04	Boeing	B737-500	Aerosvit Airlines	Sheremetyevo Airport,Moscow, RU	TOF	ISP	Western-built	Jet	Substantial Damage	Runway excursion on takeoff resulting in undercarriage collapse
27-Apr-04	Fokker	F27-500	Mountain Air Cargo	Cerro Largo Airport, (near) Melo, UY	CRZ	INC	Western-built	Turboprop	Hull Loss	Cargo fire during cruise forced emergency landing and evacuation on runway
28-Apr-04	McDonnell-Douglas	DC-10-30F	Centurion Air Cargo	Bogota, CO	LND	INC	Western-built	Jet	Hull Loss	Runway overrun, aircraft came to rest in pond
29-Apr-04	Boeing	B737-800	Turkish Airlines	Gaziantep	LND	DSP	Western-built	Jet	Substantial Damage	Hard landing resulting in tailstrike
6-May-04	Let	L410 Turbolet	Air Cush	Jiech (Sudan)	TOF	DNC	Eastern-built	Turboprop	Hull Loss	Loss of control in stalled condition shortly after takeoff
9-May-04	ATR	ATR 72-210	Executive Airlines (American Eagle)	Luis Munoz Marin International Airport San Juan, PR	LND	DSP	Western-built	Turboprop	Hull Loss	Hard landing
11-May-04	Antonov	An-12	El Magal Aviation	6 miles North of Hugrat al Wazin (Sudan)	CRZ	DNC	Eastern-built	Turboprop	Hull Loss	Crashed in the mountains during storm
11-May-04	Airbus	A320	Iberia	Barajas Airport Madrid, Spain	TOF	DSP	Western-built	Jet	Substantial Damage	Engine cowls on both engines released just after takeoff
14-May-04	Embraer	EMB-120ER Brasilia	Rico Linhas Areas	22NM from Manaus, AM (Brazil)	APR	DSP	Western-built	Turboprop	Hull Loss	Crashed on approach, aircraft destroyed
15-May-04	Tupolev	Tu-154M	Aeroflot Russian Airlines	Sheremetyevo Airport	PRF	DSP	Eastern-built	Jet	Substantial Damage	Collision with ground vehicle
17-May-04	de Havilland (Bombardier)	DHC-6 Twin Otter	Trans Maldivian Airways	Male International Airport (MLE) (Maldives)	ICL	DNP	Western-built	Turboprop	Hull Loss	Failure to lift-off on takeoff from water runway
18-May-04	Ilyushin	Il-76	Silk Way Airlines	near Urumqi (China)	ICL	INC	Eastern-built	Jet	Hull Loss	Aircraft impacted ground, failing to climb after takeoff
22-May-04	Airbus	A321	Vietnam Airlines	Tan Son Nhat Airport Ho Chi Minh City, VN	LND	ISP	Western-built	Jet	Substantial Damage	Hard landing resulting in tailstrike
23-May-04	Let	L410 Turbolet	Bluebird Aviation	30km S of Mwingi (Kenya)	CRZ	INC	Eastern-built	Turboprop	Hull Loss	Midair collision while flying in VFR formation
23-May-04	Let	L410 Turbolet	Bluebird Aviation	(near) Mwingi, KE	CRZ	INC	Eastern-built	Turboprop	Substantial Damage	Midair collision while flying in VFR formation
25-May-04	de Havilland (Bombardier)	DHC-6 Twin Otter	Yeti Airlines	W of Lukla (Nepal)	APR	DNC	Western-built	Turboprop	Hull Loss	Aircraft impacted high mountain terrain
1-Jun-04	Antonov	An-32	Sun Air Charter	Kigali International Airport (KGL) (Rwanda)	LND	INP	Eastern-built	Turboprop	Hull Loss	Right undercarriage released on takeoff resulting in ground loop on emergency landing attempt
2-Jun-04	BAE SYSTEMS	Bae-146	Flightline	Florence Airport, Italy	LND	Ferry	Western-built	Jet	Substantial Damage	Tailstrike on go-around, returned successfully for landing
7-Jun-04	Antonov	An-26	Abadeel Aviation	Geneina, Sudan	LND	DNC	Eastern-built	Turboprop	Hull Loss	Late touchdown and runway overrun
8-Jun-04	Hawker Siddeley	HS-748	Gabon Express	off Libreville (Gabon)	ICL	DSP	Western-built	Turboprop	Hull Loss	Hydraulic failure, runway overshot and aircraft ditched in ocean 100m from shore
13-Jun-04	Airbus	A321-210	Kibris Turkish Airlines	Ataturk Airport -Istanbul, TR	LND	ISP	Western-built	Jet	Substantial Damage	Hard landing resulting in tailstrike
16-Jun-04	Fokker	F-27-200	Pakistan International Airlines	Chitral AP	LND	DSP	Western-built	Turboprop	Hull Loss	Runway overrun on landing
17-Jun-04	Airbus	A300	Egypt Air	Khartoum	LND	ISC	Western-built	Jet	Substantial Damage	Late touchdown and runway overrun
26-Jun-04	Antonov	An-12	Sarit Airlines	Wau, SD	TOF	Ferry	Eastern-built	Turboprop	Hull Loss	Birdstrike on the takeoff roll causing loss of power/ control, runway excursion resulting in fire which destroyed the aircraft
30-Jun-04	Bombardier	CRJ-200ER	United Express (opb Atlantic Coast AL)	Manchester AP / NH	TXO	DSP	Western-built	Jet	Substantial Damage	Collision with other aircraft on taxiway
30-Jun-04	Bombardier	DHC-6 Twin Otter	Trans Island Air 2000	E T Joshua Airport, Kingstown, VC	TOF	Ferry	Western-built	Turboprop	Substantial Damage	Loss of control on takeoff, runway excursion
4-Jul-04	Bombardier	DHC-6 Twin Otter	North Wright Airways	(near) Tsichu River, CA	TOF	DNC	Western-built	Turboprop	Hull Loss	Runway overrun on takeoff in gusty conditions
21-Jul-04	McDonnell-Douglas	DC-9-14	Aerocalifornia	Mexico City's international airport	TOF	DSP	Western-built	Jet	Hull Loss	Loss of control on takeoff in severe weather, runway excursion

Date	Aircraft Manufacturer	Aircraft Type	Operator	Location	Flight Phase	Service	Western/ Eastern-built	Jet/ Turboprop	Severity	Summary
25-Jul-04	Fokker	F-100	Inter Air (Turkey)	Ataturk Airport	LND	INP	Western-built	Jet	Substantial Damage	Undercarriage failure on landing
26-Jul-04	de Havilland (Bombardier)	DHC-6 Twin Otter	Air Moorea	Au Pou Airport, Hakahau, PF	LND	DSP	Western-built	Turboprop	Substantial Damage	Runway excursion on landing
28-Jul-04	Boeing	B777-200ER	Malaysia Airlines	Kloten Airport Zurich, Switzerland	TOF	ISP	Western-built	Jet	Substantial Damage	Tailstrike upon rotation
29-Jul-04	de Havilland (Bombardier)	DHC-6 Twin Otter	Airlines of PNG	near Ononge (Papua New Guinea)	APR	DNC	Western-built	Turboprop	Hull Loss	Impacted terrain on missed approach
7-Aug-04	Boeing	B767-300ER	Lloyd Aer. Boliviano	Santa Cruz-Viru Viru Intl AP / SLVR	LND	ISP	Western-built	Jet	Substantial Damage	Nose gear settled abruptly in gusty conditions
8-Aug-04	ATR	ATR 72	Thai Airways	Mae Hong Son, Thailand	LND	DSP	Western-built	Turboprop	Substantial Damage	Hard landing and bounce recovery resulting in undercarriage collapse
9-Aug-04	BAE SYSTEMS	ARJ-100	Swiss International Air Lines	Frankfurt-Intl AP / EDDF	CRZ	ISP	Western-built	Jet	Substantial Damage	Uncontained engine failure causing damage to no. 1 and 2 engines
11-Aug-04	Boeing	B737-2R6B	Air Guinee Express	5 km (3.1 mls) from Freetown-Lungi International Airport (FNA)	TOF	ISP	Western-built	Jet	Hull Loss	Loss of power following rotation resulting in loss of control and undercarriage collapse
13-Aug-04	Convair	C 580	Air Tahoma (Ops for DHL)	near Cincinnati, Ohio	APR	DSC	Western-built	Turboprop	Hull Loss	Landed short of runway on golf course due to power loss
17-Aug-04	Raytheon	B99	Alpine Air	11 km (6.9 mls) NE of Neihart, MT (United States of America)	CRZ	DNC	Western-built	Turboprop	Hull Loss	Impacted terrain in mountainous region
28-Aug-04	Aerospatiale	SE-210 Caravelle 11R	Transair Cargo	Gisenyi AP (HRYG)	LND	DNP	Western-built	Jet	Hull Loss	Runway overrun after landing at wrong airport, destroyed in ensuing fire
3-Sep-04	Airbus	A320	Volare Airlines	(near) Valencia, ES	ECL	ISP	Western-built	Jet	Substantial Damage	Encountered hailstorm on climbout
10-Sep-04	Fairchild (Swearingen)	Metro III	Ryan Blake Air	George, ZA	APR	DNC	Western-built	Turboprop	Hull Loss	Aircraft impacted ground beyond runway on failed go-around following birdstrike
14-Sep-04	Ilyushin	Il-76	Silk Way Airlines	(near) Baku, AZ	ECL	Ferry	Eastern-built	Jet	Substantial Damage	Uncontained engine failure and engine fire on no. 3 and 4 engines
16-Sep-04	Antonov	An-26	Kam Air	Khwaja Rawash Airport, Kabul, Afghanistan	LND	DSP	Eastern-built	Turboprop	Hull Loss	Runway overrun after return due to engine failure
19-Sep-04	Tupolev	Tu-154	Sibir Airlines	Petropavlovsk-Kamchatskiy Intl AP (UHPP)	TXO	DSP	Eastern-built	Jet	Substantial Damage	Collision with ground vehicles parked on ramp
21-Sep-04	Swearingen	Metro III	Norcanair Airlines	Barber Field, La Ronge, CA	LND	DSP	Western-built	Turboprop	Hull Loss	Undercarriage failure and runway excursion on landing
1-Oct-04	Embraer	Emb-110	Naturelink Charter	Douala Airport, CM	TOF	DNP	Western-built	Turboprop	Hull Loss	Loss of control on runway leading to excursion
5-Oct-04	Antonov	An-12	Sarit Airlines	40nm from Higlig (Sudan)	CRZ	DNC	Eastern-built	Turboprop	Hull Loss	Impact with the ground following engine failure
7-Oct-04	Raytheon	B99	Alpine Air	Great Falls International Airport, Great Falls, Montana, USA	LND	DNC	Western-built	Turboprop	Substantial Damage	Undercarriage collapsed on runway after aircraft struck a building on approach
8-Oct-04	Fokker	F-28	Biman Bangladesh Airlines Biman Airlines	Sylhet-Osmani International Airport (ZYL)	LND	DSP	Western-built	Jet	Hull Loss	Late touchdown and runway overrun
14-Oct-04	Boeing	B747-200SF	MK Airlines	Halifax International Airport, NS (YHZ) (Canada)	TOF	INC	Western-built	Jet	Hull Loss	Runway overrun on takeoff after multiple tailstrikes, destroyed in ensuing fire
14-Oct-04	Bombardier	CRJ-200LR	Pinnacle Airlines (OPS for NWA Airlink)	Jefferson City, MO (United States of America)	CRZ	Ferry	Western-built	Jet	Hull Loss	Impacted ground following double engine failure at cruise altitude
17-Oct-04	Boeing	B777	Air Austral	Gillot Airport, St. Denis de la Reunion, Reunion	TXI	ISP	Western-built	Jet	Substantial Damage	Engine fire on taxiway
18-Oct-04	Airbus	A320	Transasia Airways	Taipei-Sungshan AP (RCSS)	LND	DSP	Western-built	Jet	Substantial Damage	Runway overrun on landing
19-Oct-04	BAE SYSTEMS (Jetstream)	Jetstream 31EP	Corporate Airlines (American Connection)	6,5 km S of Kirksville Municipal Airport, MO (IRK)	APR	DSP	Western-built	Turboprop	Hull Loss	Impacted terrain in wooded area short of runway
19-Oct-04	Antonov	An-12	Sarit Airlines	Heglig Airport, Heglig, Sudan	LND	DNC	Eastern-built	Turboprop	Substantial Damage	Nose gear collapse following short landing
20-Oct-04	Boeing	B747-132SF	Kalitta Air	in flight, (near) Battle Creek, Michigan, USA	ECL	DNC	Western-built	Jet	Substantial Damage	Engine pod released on climbout, safe diversion achieved

Date	Aircraft Manufacturer	Aircraft Type	Operator	Location	Flight Phase	Service	Western/ Eastern-built	Jet/ Turboprop	Severity	Summary
22-Oct-04	Raytheon	B1900C	Southern Air Charter	(near) Nassau, BS	DST	DSP	Western-built	Turboprop	Hull Loss	Engine failure and loss of power in remaining engine, aircraft ditched in ocean close to shore
23-Oct-04	Boeing	B707-320C	BETA Cargo	Manaus Intl AP (SBEG)	TOF	DNC	Western-built	Jet	Hull Loss	Undercarriage failure resulting in aborted takeoff
27-Oct-04	Bombardier	CL-600-2B19	Mesa Airlines Inc. as US Airways Express	Philadelphia International Airport (PHL),	TXO	ISP	Western-built	Jet	Substantial Damage	Collision with ground vehicle on taxiway
4-Nov-04	Boeing	B737-37Q	BMI Baby	Manchester Int'l AP	TXO	DSP	Western-built	Jet	Substantial Damage	Collision with other aircraft on taxiway
7-Nov-04	Boeing	B737-300	Air Asia	Kota Kinabalu-Intl AP (WBKK) / Borneo	LND	DNP	Western-built	Jet	Substantial Damage	Loss of control resulting in runway excursion
7-Nov-04	Boeing	B747-230F (SCD)	Air Atlanta Cargo operating for Lufthansa Cargo	Sharah-Intl AP (OMSJ)	RTO	INC	Western-built	Jet	Hull Loss	Runway overrun and undercarriage collapse following rejected takeoff
8-Nov-04	Raytheon	B1900	Alpine Air	Honolulu International Airport, Honolulu, Hawaii, USA	LND	DNC	Western-built	Turboprop	Substantial Damage	Undercarriage failure on touchdown
9-Nov-04	Swearingen	SA226TC	Western Airlines	Boise, Idaho	APR	DNC	Western-built	Turboprop	Substantial Damage	Collision with approach lights due to short landing
18-Nov-04	BAE SYSTEMS	Jetstream 31	Venezolana	Caracas-Simon Bolivar Airport (CCS)	LND	DSP	Western-built	Turboprop	Hull Loss	Runway excursion and collision with airport fire station, aircraft destroyed
21-Nov-04	Bombardier	CRJ-200LR	China Yunnan Airlines	near Baotou Airport (BAV)	ICL	DSP	Western-built	Jet	Hull Loss	Loss of control shortly after takeoff, impacted small building then crashed in frozen lake
27-Nov-04	CASA	212	Presidential Airways	Mt. Baba, Southeast of Bamiyan, Afghanistan	CRZ	DNP	Western-built	Turboprop	Hull Loss	Impacted high mountain terrain while attempting turnaround
28-Nov-04	Boeing	B737-400	KLM Royal Dutch Airlines	Barcelona AP, Spain	LND	ISP	Western-built	Jet	Hull Loss	Loss of control and undercarriage collapse on runway excursion
30-Nov-04	McDonnell-Douglas	MD-82	Lion Air	Solo-Adi Sumarmo Wiryokusumo Airport	LND	DSP	Western-built	Jet	Hull Loss	Runway overrun following late landing and bounce recovery
1-Dec-04	Boeing	B777-300	Cathay Pacific	near Bangkok's international airport	ICL	ISP	Western-built	Jet	Substantial Damage	Engine duct released shortly after takeoff, striking civilian vehicle on the ground
11-Dec-04	Embraer	Emb-110	NHR Taxi-Areo	Uberaba Airport, MG (UBA) (Brazil)	APR	DNC	Western-built	Turboprop	Hull Loss	Collision with houses on undershot approach in reduced visibility conditions
11-Dec-04	Ilyushin	Il-76	Airline Transport	in flight over, Red Sea, Saudi Arabia	CRZ	INC	Eastern-built	Jet	Fatal Accident	Emergency door opened in flight resulting in the loss of a crew member overboard
16-Dec-04	Bombardier	Shorts 360	Air Cargo Carriers	Oshawa Airport, Oshawa, Ontario, Canada	LND	INC	Western-built	Turboprop	Substantial Damage	Runway overrun on landing
29-Dec-04	Boeing	B727	Chanchangi Airlines	Murtala Muhammed Airport, Lagos, Nigeria	LND	DSP	Western-built	Jet	Substantial Damage	Belly landing after nose gear failed to extend