

Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations | 1959 – 2014

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Published by:

Aviation Safety Boeing Commercial Airplanes P.O. Box 3707 M/C 0A-19 Seattle, Washington 98124-2207, U.S. E-mail: statsum@boeing.com www.boeing.com/news/techissues/pdf/statsum.pdf August 2015

Introduction

The accident statistics presented in this summary are confined to worldwide commercial jet airplanes that are heavier than 60,000 pounds maximum gross weight. Within that set of airplanes, there are two groups excluded:

- 1) Airplanes manufactured in the Commonwealth of Independent States (CIS) or the Union of Soviet Socialist Republics (USSR) are excluded because of the lack of operational data.
- 2) Commercial airplanes operated in military service. (However, if a military-owned commercial jet transport is used for civilian commercial service, those data will be included in this summary.)

The following airplanes are included in the statistics:

707/720	717	A300	BAe146	F-28	Concorde	L-1011	BAC 1-11	Comet 4
727	DC-8	A300-600	Avro RJ-70/-85/-100	F-70				Trident
737	DC-9	A310	CRJ-700/-900/-1000	F-100				Caravelle
747	DC-10/MD-10	A320/321/319/318	EMB-170/-175					Mercure
757	MD-11	A330	EMB-190/-195					CV-880/-990
767	MD-80/-90	A340						VC-10
777		A350						
787		A380						

Flight operations data for Boeing airplanes are developed internally from airline operator reports. Flight operations data for non-Boeing airplanes are compiled from www.ascendworldwide.com by Ascend. The source of jet airplane inventory data is Jet Information Services, Inc.

Accident data are obtained, when available, from government accident reports. Otherwise, information is from operators, manufacturers, various government and private information services, and press accounts.

Readers may note that cumulative accident totals from year to year may not exactly correlate with the expected change from the previous year's accidents. This is a result of periodic audits of the entire accident history for updates to the data.

Definitions related to development of statistics in this summary are primarily based on corresponding International Civil Aviation Organization (ICAO), U.S. National Transportation Safety Board (NTSB), and Flight Safety Foundation (FSF) terms, as explained in the next section.

Definitions

Airplane Accident

An occurrence associated with the operation of an airplane that takes place between the time any person boards the airplane with the intention of flight and such time as all such persons have disembarked, in which

- The airplane sustains substantial damage.
- The airplane is missing or is completely inaccessible.
 - An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.
- Death or serious injury results from
 - Being in the airplane.
 - Direct contact with the airplane or anything attached thereto.
 - Direct exposure to jet blast.

Excluded Events

- Fatal and nonfatal injuries from natural causes.
- Fatal and nonfatal self-inflicted injuries or injuries inflicted by other persons.
- Fatal and nonfatal injuries of stowaways hiding outside the areas normally available to the passengers and crew.
- Nonfatal injuries resulting from atmospheric turbulence, normal maneuvering, loose objects, boarding, disembarking, evacuation, and maintenance and servicing.
- Nonfatal injuries to persons not aboard the airplane.
 - The following occurrences are **not** considered airplane accidents: those that are the result of experimental test flights or the result of a hostile action, including sabotage, hijacking, terrorism, and military action.

Note: This is generally consistent with the ICAO and the NTSB definition of an accident (see the Referenced ICAO and NTSB Definitions section). The differences are

- 1) The ICAO and NTSB references to "aircraft" were changed to "airplane" and references to propellers and rotors were eliminated.
- 2) This publication excludes events that result in nonfatal injuries from atmospheric turbulence, normal maneuvering, etc.; nonfatal injuries to persons not aboard the airplane; and any events that result from an experimental test flight or from hostile action, such as sabotage, hijacking, terrorism, and military action.

Within this publication, the term "accident" is used interchangeably with "airplane accident."

Definitions

Destroyed

The estimated or likely cost of repairs would have exceeded 50 percent of the new value of the airplane had it still been in production at the time of the accident.

Note: This definition is consistent with the FSF definition. NTSB defines "destroyed" as damaged due to impact, fire, or in-flight failures to an extent not economically repairable.

Fatal Iniury

Any injury that results in death within 30 days of the accident.

Note 1: This is consistent with both the ICAO and the NTSB definitions.

Note 2: External fatalities include on-ground fatalities as well as fatalities on other aircraft involved.

Major Accident

An accident in which any of three conditions is met:

- The airplane was destroyed.
- There were multiple fatalities.
- There was one fatality and the airplane was substantially damaged.

This definition is consistent with the NTSB definition. It also is generally consistent with FSF, except that the FSF definition specifies that fatalities include only occupants of the airplane. ICAO does not normally define the term "major accident."

Serious Injury

An injury that is sustained by a person in an accident and that

- Requires hospitalization 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).
- Causes severe hemorrhage, nerve, muscle, or tendon damage.
- Involves injury to any internal organ.
- Involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.
- Involves verified exposure to infectious substances or injurious radiation.

Note: This is generally consistent with the ICAO definition. It is also consistent with the NTSB definition except for the last bullet item, which is not included in the NTSB definition.

Definitions

Substantial Damage

Damage or failure that adversely affects the structural strength, performance, or flight characteristics of the airplane, and that would normally require major repair or replacement of the affected component.

Substantial damage is **not** considered to be

- Engine failure or damage limited to an engine, if only one engine fails or is damaged.
- Bent fairings or cowlings.
- Dents in the skin.
- Small puncture holes in the skin.
- Damage to wheels.
- Damage to tires.
- Damage to flaps.
- Damage to engine accessories.
- Damage to brakes.
- Damage to wingtips.
- Note 1: This definition is generally consistent with the NTSB definition of substantial damage except it (1) deletes reference to "small puncture holes in the skin or fabric" and "ground damage to rotor or propeller blades," and (2) deletes "damage to landing gear" from the list of items not considered to be substantial damage.
- Note 2: ICAO does not define the term "substantial damage." Still, the above definition is generally consistent with the ICAO definition of damage or structural failure contained within part (B) of the ICAO accident definition.
- Note 3: Boeing does not consider damage to be substantial if repairs to an event airplane enable it to be flown to a repair base within 48 hours of the event.

Boeing Terms

The terms on this page were created by Boeing for this publication and do not have corresponding equivalents in ICAO or NTSB.

Accident Rates

In general, this expression is a measure of accidents per million departures. Departures (or flight cycles) are used as the basis for calculating rates because there is a stronger statistical correlation between accidents and departures than there is between accidents and flight hours, or between accidents and the number of airplanes in service, or between accidents and passenger miles or freight miles. Airplane departures data are continually updated and revised as new information and estimating processes become available. These form the baseline for the measure of accident rates and, as a consequence, rates may vary between editions of this publication.

Airplane Collisions

Events involving two or more airplanes are counted as separate events, one for each airplane. For example, destruction of two airplanes in a collision is considered to be two separate accidents.

Fatal Accident

An accident that results in fatal injury.

Hull Loss

Airplane totally destroyed or damaged and not repaired. Hull loss also includes, but is not limited to, events in which

- The airplane is missing.
 - An aircraft is considered to be missing when the official search has been terminated and the wreckage has not been located.
- The airplane is completely inaccessible.

Exclusions

Certain airplanes and events are excluded from consideration as accidents in this summary. This is a complete list of those exclusions.

Excluded Airplanes

Airplanes manufactured in the Commonwealth of Independent States (CIS) or the Union of Soviet Socialist Republics (USSR) are excluded because of the lack of operational data. Commercial airplanes operated in military service are also excluded. (However, if a military-owned commercial jet transport is used for civilian commercial service, those data are included in this summary.)

Excluded Events

- Fatal and nonfatal injuries from natural causes.
- Fatal and nonfatal self-inflicted injuries or injuries inflicted by other persons.
- Fatal and nonfatal injuries of stowaways hiding outside the areas normally available to the passengers and crew.
- Nonfatal injuries resulting from atmospheric turbulence, normal maneuvering, loose objects, boarding, disembarking, evacuation, and maintenance and servicing.
- Nonfatal injuries to persons not aboard the airplane.
- Experimental test flights (however, maintenance test flights, ferry, positioning, training, and demonstration flights are not excluded).
- Sabotage, hijacking, terrorism, and military action.

Referenced ICAO and NTSB Definitions

International Civil Aviation Organization (ICAO) and National Transportation Safety Board (NTSB) definitions are included below for reference.

Accident

ICAO defines an "accident" as follows:

Accident. An occurrence associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down, in which:

- A) A person is fatally or seriously injured as a result of:
- Being in the aircraft, or
- Direct contact with any part of the aircraft, including parts which have become detached from the aircraft, or
- 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, or
- B) The aircraft sustains damage or structural failure which:
- Adversely affects the structural strength, performance, or flight characteristics of the aircraft, and
- Would normally require major repair or replacement of the affected component, except for engine failure or damage, when the damage is limited to a single engine (including its cowlings or accessories), to propellers, wingtips, antennas, probes, vanes, tires, brakes, wheels, fairings, panels, landing gear doors, windscreens, the aircraft skin (such as small dents or puncture holes), or for minor damages to main rotor blades, tail rotor blades, landing gear, and those resulting from hail or bird strike (including holes in the radome).
- C) The aircraft is missing or is completely inaccessible.

NTSB defines an "aircraft accident" as follows:

Aircraft accident means 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 and all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage. For purposes of this part, the definition of "aircraft accident" includes "unmanned aircraft accident," as defined in 49 CFR 830.2.

Referenced ICAO and NTSB Definitions

Serious Injury

ICAO defines "serious injury" as follows:

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

- A) Requires hospitalization for more than 48 hours, commencing within seven days from the date the injury was received; or
- B) Results in a fracture of any bone (except simple fractures of fingers, toes or nose); or
- C) Involves lacerations that cause severe hemorrhage, nerve, muscle, or tendon damage; or
- D) Involves injury to any internal organ; or
- E) Involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface; or
- F) Involves verified exposure to infectious substances or injurious radiation.

NTSB defines "serious injury" as follows:

Serious injury means any injury that

- 1) Requires hospitalization for more than 48 hours, commencing within 7 days from the date the injury was received;
- 2) Results in a fracture of any bone (except simple fractures of fingers, toes, or nose);
- 3) Causes severe hemorrhages, nerve, muscle, or tendon damage;
- 4) Involves any internal organ; or
- 5) Involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface.

Substantial Damage

NTSB defines "substantial damage" as follows:

Substantial damage means damage or failure that 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. Engine failure or damage limited to an engine if only one engine fails or is damaged, bent fairings or cowling, dented skin, small puncture holes in the skin or fabric, ground damage to rotor or propeller blades, and damage to landing gear, wheels, tires, flaps, engine accessories, brakes, or wingtips are not considered "substantial damage" for the purpose of this part.

ICAO does not define the term "substantial damage."

2014 Airplane Accidents

All Accidents | Worldwide Commercial Jet Fleet

Event Date	Airline	Model (Age in Years)	Type of Operation	Accident Location	Phase of Flight	Event Description	Damage Category	Hull Loss	Injury Category	Onboard Fatalities/ Occupants (External Fatalities)	Major Accident
05-Jan-14	Saudia	767-300 (17)	Sched Pax	Medina, Saudi Arabia	Landing	The airplane landed with right main landing gear retracted. There were injuries sustained during the evacuation.	Substantial		Serious		
05-Jan-14	Air India	A320 (20)	Sched Pax	Jaipur, India	Landing	While landing in low-visibility conditions, the airplane sustained damage when it veered off the runway, colliding with an object. The accident occurred in dense fog. There were no injuries.	Substantial				
18-Jan-14	Aeronaves TSM	DC-9 (46)	Sched Cargo	Saltillo, Mexico	Landing	The airplane sustained damage during landing when the nose landing gear collapsed and the airplane subsequently veered off the runway. Minor injuries were sustained.	Substantial	X			
26-Jan-14	Airwork NZ	737-300 (26)	Sched Cargo	Honiara, Solomon Islands	Landing	The airplane sustained damage during landing when the right main landing gear collapsed. There were no injuries.	Substantial	X			
01-Feb-14	Lion Air	737-900ER (7)	Sched Pax	Surabaya, Indonesia	Landing	The airplane sustained damage during a hard landing.	Substantial		Serious		
02-Feb-14	East Air	A320 (20)	Sched Pax	Kulob, Tajikistan	Landing	The airplane sustained damage when it landed on a poorly prepared runway and impacted a snow bank. The nose landing gear collapsed. There were no injuries.	Substantial	X			
17-Feb-14	Jet2.com Ltd	737-800 (15)	Sched Pax	Funchal, Portugal	Landing	The airplane sustained damage due to a tail strike during landing. There were no injuries.	Substantial				
17-Feb-14	Ural Airlines	A321 (14)	Sched Pax	Dubai, United Arab Emirates	Load/ Unload	A ground vehicle collided with an airplane while the passenger door was open, causing a flight attendant to fall from the airplane.	Minor		Serious		
22-Feb-14	Travel Service	737-800 (2)	Sched Pax	Terceira, Portugal	Landing	The airplane sustained damage during a hard landing in gusting winds. There were no injuries.	Substantial				
04-Mar-14	LAN Airlines	A320 (11)	Sched Pax	Buenos Aires, Argentina	Taxi	The airplane sustained damage during taxi when the tail was struck by the wingtip of another airplane. There were no injuries.	Substantial				
13-Mar-14	US Airways	A320 (14)	Sched Pax	Philadelphia, USA	Takeoff	The airplane sustained damage while performing a rejected takeoff, subsequently contacting the runway, which caused the nose landing gear to collapse. The airplane veered off the runway. There were no injuries.	Substantial	X			
28-Mar-14	Avianca	F-100 (21)	Sched Pax	Brasília, Brazil	Landing	The flight crew was unable to extend the nose landing gear due to a hydraulic failure. The airplane sustained damage when it landed with the nose landing gear retracted. There were no injuries.	Substantial	X			

2014 Airplane Accidents

All Accidents | Worldwide Commercial Jet Fleet

Event Date	Airline	Model (Age in Years)	Type of Operation	Accident Location	Phase of Flight	Event Description	Damage Category	Hull Loss	Injury Category	Onboard Fatalities/ Occupants (External Fatalities)	Major Accident
11-Apr-14	Kenya Airways	ERJ 190 (2)	Sched Pax	Dar Es Salaam, Tanzania	Landing	The airplane was damaged when it veered off the runway during landing. Both engines failed. There were injuries sustained during the evacuation.	Substantial		Serious		
29-Apr-14	Air Contractors (Ireland) Ltd.	737-400 (24)	Sched Cargo	East Midlands, United Kingdom	Landing	The airplane sustained damage during landing roll when the left main landing gear collapsed. There were no injuries.	Substantial	X			
08-May-14	Ariana Afghan Airlines	737-400 (21)	Sched Pax	Kabul, Afghanistan	Landing	The airplane sustained damage when it overran the end of the runway and came to a stop with all landing gear collapsed. There were no injuries.	Destroyed	X			X
09-May-14	Avior Airlines	737-400 (25)	Sched Pax	Panama City, Panama	Takeoff	During a high-speed rejected takeoff, tires burst and mechanical parts liberated, causing damage to the airplane. There were no injuries.	Substantial				
10-May-14	Iran Aseman Airlines	F-100 (21)	Sched Pax	Zahedan, Iran	Landing	The left main landing gear would not extend on approach. The airplane sustained damage when it performed a partial gear up landing. There were minor injuries sustained during the evacuation.	Substantial				
10-May-14	IRS Airlines	F-100 (24)	Test, Training, Demo, and Position	Kano, Nigeria	Landing	The airplane sustained damage during an emergency landing in the desert. The nose and right main landing gear failed. There were no injuries.	Substantial	X			
12-May-14	Aegean Airlines	A320 (6)	Sched Pax	Moscow, Russia	Load/ Unload	After removal of the stairs, a flight attendant stepped out of the airplane to close the passenger door and fell from the airplane. There was no damage to the airplane.	None		Serious		
20-Jun-14	Omni Air International	767-300 (15)	Charter Pax	Kabul, Afghanistan	Landing	The airplane sustained damage due to a hard landing and tail strike. There were no injuries.	Substantial				
28-Jun-14	Ryanair	737-800 (8)	Sched Pax	Stansted, United Kingdom	Tow	The airplane sustained damage during pushback when the tail was struck by the wingtip of another airplane. There were no injuries.	Substantial				
07-Jul-14	AirAsia	A320 (4)	Sched Pax	Bandar Seri Begawan, Brunei	Landing	The airplane sustained damage during landing when it veered off the runway onto soft ground. Both engines ingested mud. There were no injuries.	Substantial				
17-Jul-14	Eastern SkyJets	737-300 (23)	Sched Pax	Libreville, Gabon	Landing	During landing, the airplane struck a person on the runway.	None		Fatal	0/137 (1)	
24-Jul-14	Swiftair	MD-83 (18)	Sched Pax	Gao, Mali	Cruise	While in cruise, control of the airplane was lost, and it impacted the ground.	Destroyed	X	Fatal	116/116 (0)	X

2014 Airplane Accidents

All Accidents | Worldwide Commercial Jet Fleet

Event Date	Airline	Model (Age in Years)	Type of Operation	Accident Location	Phase of Flight	Event Description	Damage Category	Hull Loss	Injury Category	Onboard Fatalities/ Occupants (External Fatalities)	Accident
07-Nov-14	Ariana Afghan Airlines	737-400 (21)	Sched Pax	Kabul, Afghanistan	Landing	The airplane sustained damage during landing when the main landing gear collapsed. There were no injuries.	Substantial				
24-Nov-14	Cargolux Airlines	747-8F (3)	Charter Cargo	Libreville, Gabon	Landing	The airplane sustained damage due to a hard landing. There were no injuries.	Substantial				
28-Dec-14	PT. Indonesia AirAsia	A320 (6)	Sched Pax	Java Sea	Cruise	In cruise, control of the airplane was lost and it impacted the Java Sea.	Destroyed	X	Fatal	162/162 (0)	X
30-Dec-14	Shaheen International	737-400 (21)	Sched Pax	Lahore, Pakistan	Landing	The airplane sustained damage during landing when it impacted a bird, affecting steering control. A subsequent departure off the side of the runway caused the left main landing gear to collapse. There were no injuries.	Substantial				
30-Dec-14	Zest Airways Inc	A320 (8)	Sched Pax	Kalibo, Philippines	Landing	The airplane sustained damage during landing when it overran the end of the runway and the landing gear sank into soft ground. There were no injuries.	Substantial				
29	Total Accidents							10		278 Onboard (1 External)	3

Note: At the time this statistical summary was published, missing Malaysia Airlines Flight 370 did not meet the criteria for being categorized as an airplane accident, per the definition of this publication. It therefore is not included in the summary's accident statistics.

Departures, Flight Hours, and Jet Airplanes in Service*

Worldwide Operations | 1995 through 2014



^{*} Certified jet airplanes greater than 60,000 pounds maximum gross weight, including those in temporary non-flying status and those in use by non-airline operators. Excluded are commercial airplanes operated in military service and CIS/USSR-manufactured airplanes.

Accident Summary by Type of Operation

Worldwide Commercial Jet Fleet

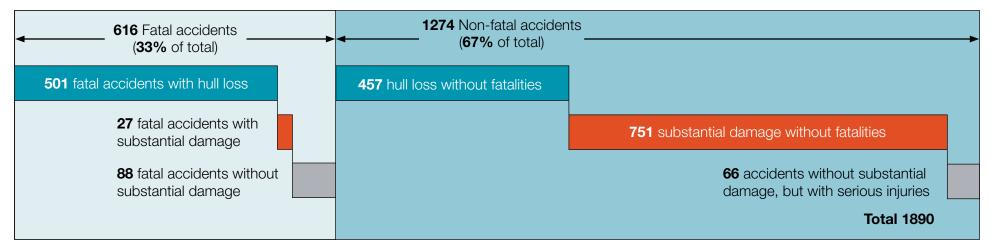
Type of Operation	All Acc	cidents	Fatal Ac	cidents		Fatalities atalities)*	Hull Loss Accidents		
	1959–2014	2005–2014	1959–2014	2005–2014	1959–2014	2005–2014	1959–2014	2005–2014	
Passenger	1,501	327	493	56	29,165 (792)	3,888 (124)	704	118	
Scheduled	1,380	302	447	53	25,039	3,872	634	111	
■ Charter	121	25	46	3	4,126	16	70	7	
Cargo	265	65	79	13	273 (342)	41 (15)	178	39	
Maintenance test, ferry, positioning, training, and demonstration	124	12	44	3	208 (66)	17 (0)	76	8	
Totals	1,890	404	616	72	29,646 (1,200)	3,946 (139)	958	165	
U.S. and Canadian operators	564	75	182	12	6,202 (381)	26 (7)	227	25	
Rest of the world	1,326	329	434	60	23,444 (819)	3,920 (132)	731	140	
Totals	1,890	404	616	72	29,646 (1,200)	3,946 (139)	958	165	

^{*} External fatalities include on-ground fatalities as well as fatalities on the other aircraft involved.

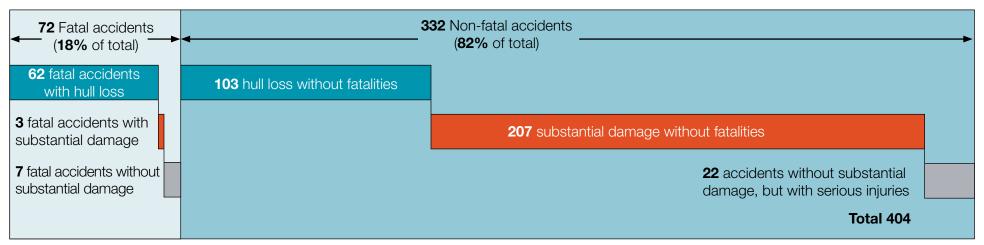
Accident Summary by Injury and Damage

All Accidents | Worldwide Commercial Jet Fleet

Number of Accidents | 1959 through 2014

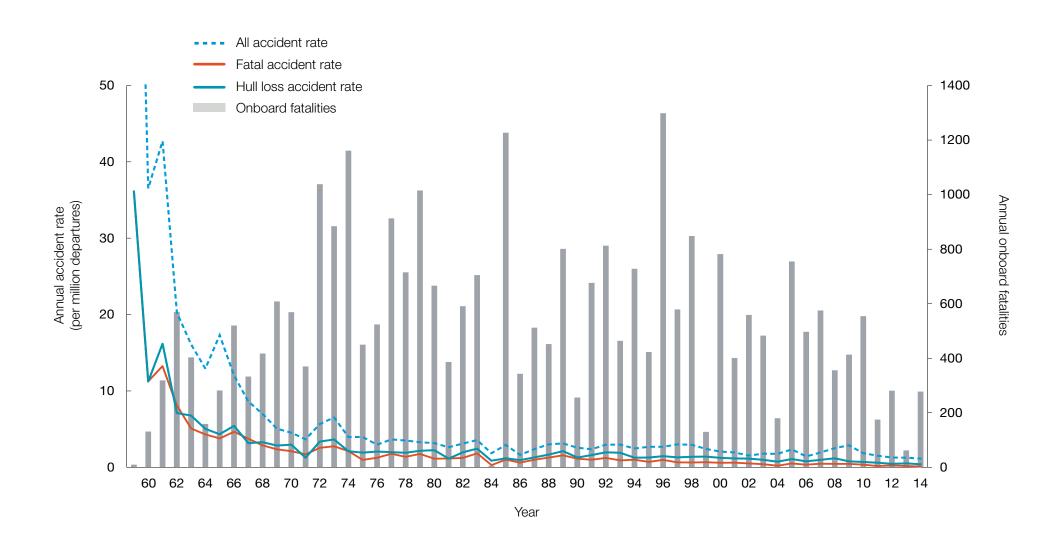


Number of Accidents | 2005 through 2014



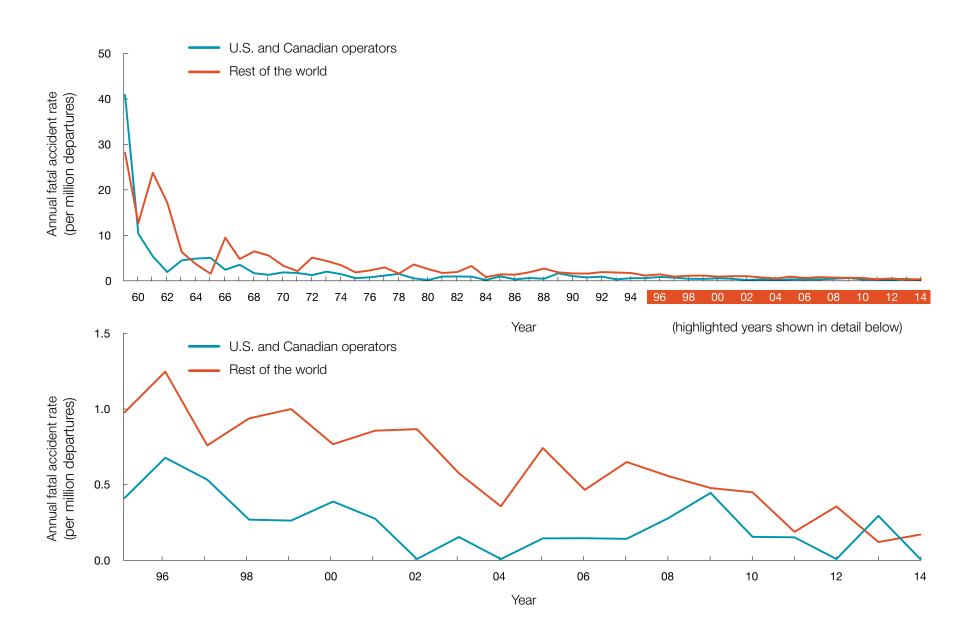
Accident Rates and Onboard Fatalities by Year

Worldwide Commercial Jet Fleet | 1959 through 2014



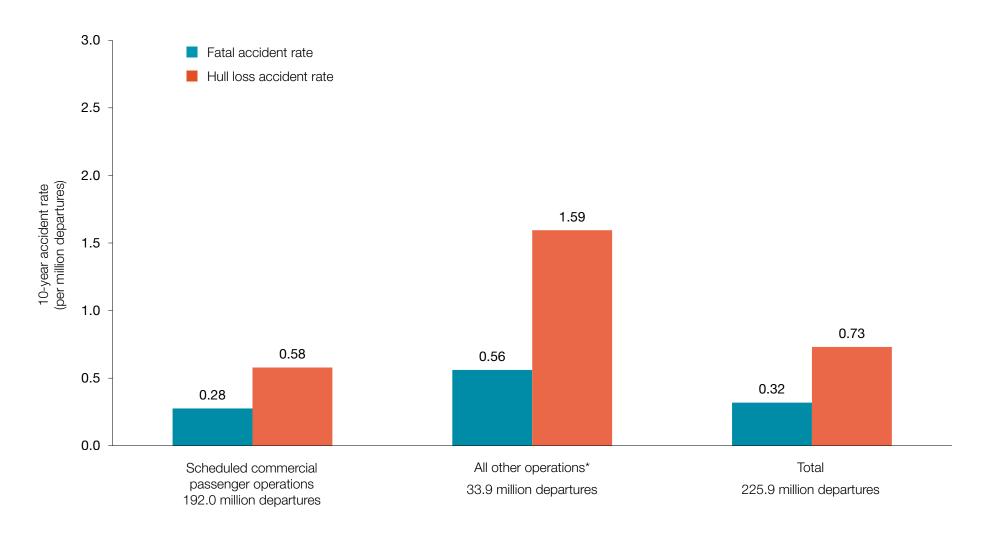
U.S. and Canadian Operators Accident Rates by Year

Fatal Accidents | Worldwide Commercial Jet Fleet | 1959 through 2014



10-Year Accident Rates by Type of Operation

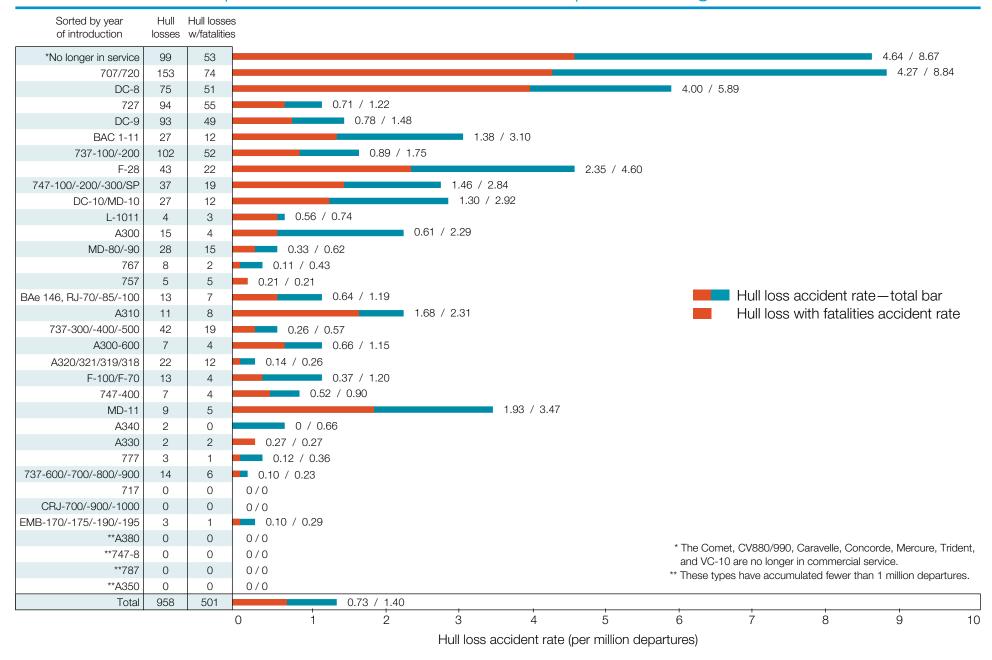
Fatal and Hull Loss Accidents Worldwide Commercial Jet Fleet | 2005 through 2014



^{*}Charter passenger, charter cargo, scheduled cargo, maintenance test, ferry, positioning, training, and demonstration flights.

Accident Rates by Airplane Type

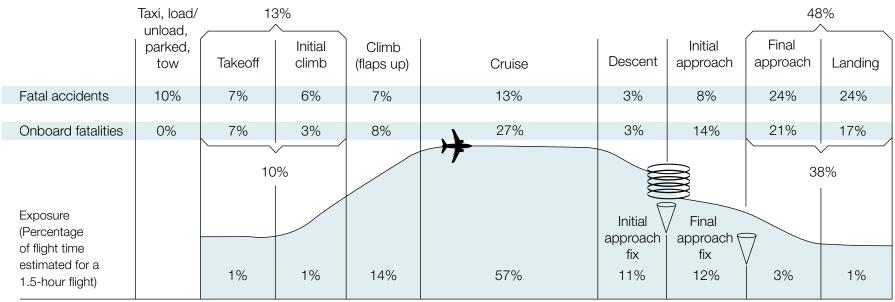
Hull Loss Accidents | Worldwide Commercial Jet Fleet | 1959 through 2014



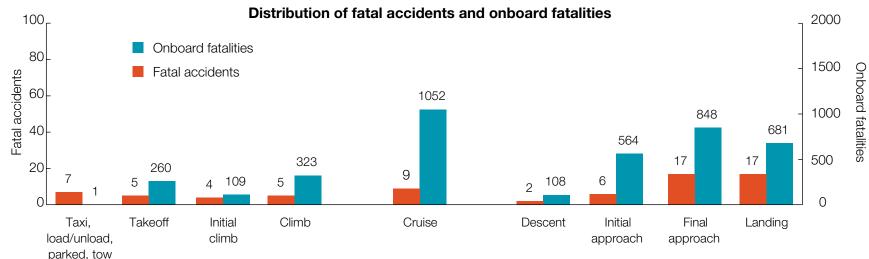
Fatal Accidents and Onboard Fatalities by Phase of Flight

Worldwide Commercial Jet Fleet | 2005 through 2014

Percentage of fatal accidents and onboard fatalities



Note: Percentages may not sum to 100% due to numerical rounding.



CAST/ICAO Common Taxonomy Team (CICTT) **Aviation Occurrence Categories**

The International Civil Aviation Organization (ICAO) and the Commercial Aviation Safety Team (CAST), which includes government officials and aviation industry leaders, have jointly chartered the CAST/ICAO Common Taxonomy Team (CICTT). CICTT includes experts from several air carriers, aircraft manufacturers, engine manufacturers, pilot associations, regulatory authorities, transportation safety boards, ICAO, and members from Canada, the European Union, France, Italy, the Netherlands, the United Kingdom, and the United States. CICTT is co-chaired by one representative each from ICAO and CAST.

The team is charged with developing common taxonomies and definitions for aviation accident and incident reporting systems. Common taxonomies and definitions establish a standard industry language, thereby improving the quality of information and communication. With this common language, the aviation community's capacity to focus on common safety issues is greatly enhanced.

The CICTT Aviation Occurrence Taxonomy is designed to permit the assignment of multiple categories as necessary to describe the accident or incident. Since 2001, the Safety Indicator Steering Group (SISG) has met annually to assign CICTT occurrence categories to the prior year's accidents.

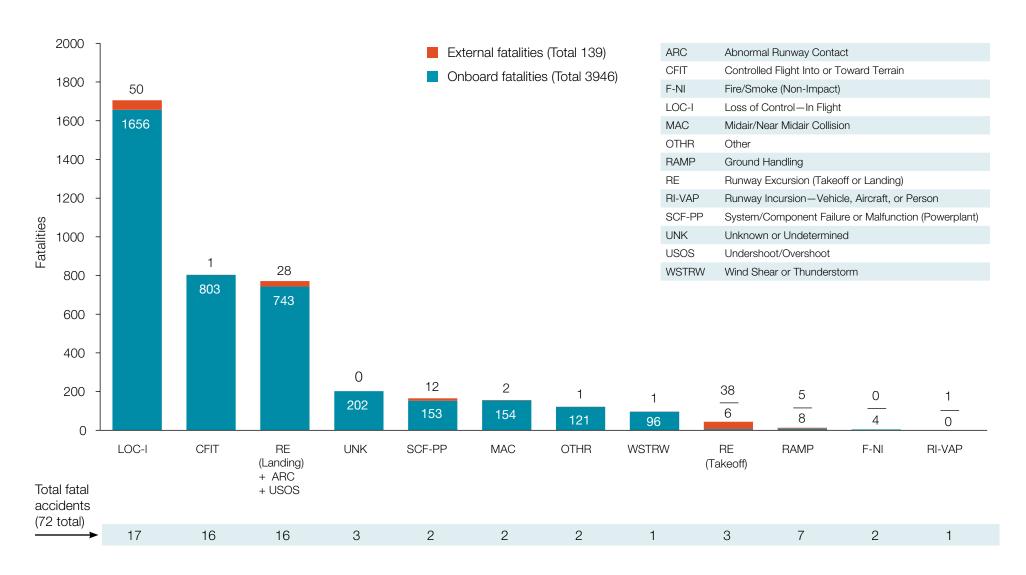
In a separate activity, the CAST assigned each fatal accident to a single principal category. Those accident assignments and a brief description of the categories are reported in the following chart.

The CAST use of principal categories has been instrumental in focusing industry and government efforts and resources on accident prevention. Charts using principal categories are used by CAST to identify changes to historic risk and to help to determine if the safety enhancements put in place are effective.

For a complete description of the categories, go to www.intlaviationstandards.org.

Fatalities by CICTT Aviation Occurrence Categories

Fatal Accidents | Worldwide Commercial Jet Fleet | 2005 through 2014



Note: Principal categories as assigned by CAST.

For a complete description of CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories, go to www.intlaviationstandards.org.

Notes

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