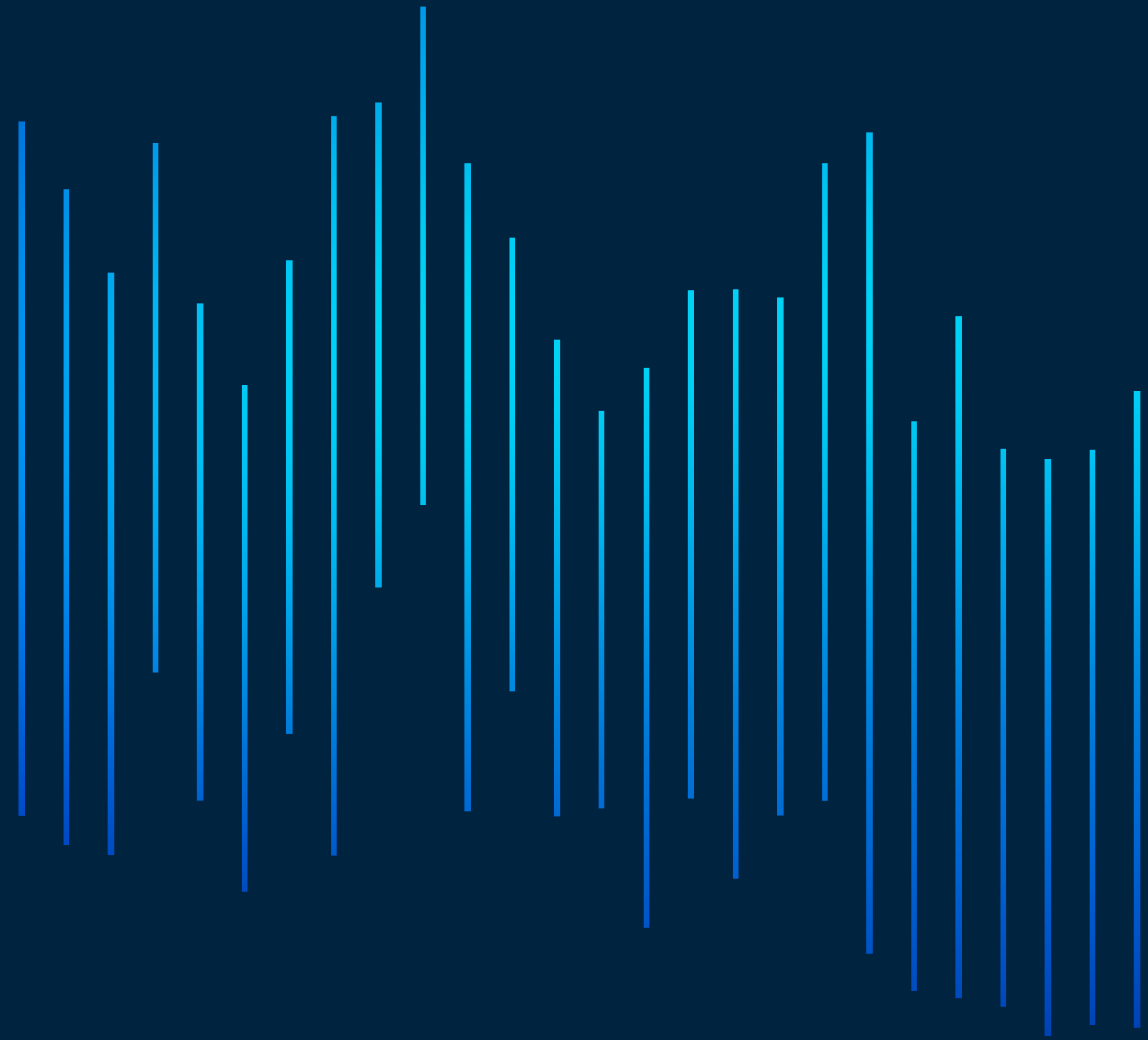




# Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations | 1959-2022



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# Leadership Message



## **Elisabeth Martin**

Vice President, Enterprise Safety and Mission Assurance  
Product and Services Safety

Boeing designs and builds aircraft that must operate safely every second of every day in every region of the world.

We take that responsibility seriously. Data is a powerful tool to proactively manage safety risks, and it helps the entire industry know where to focus to continue to enhance safety in the worldwide fleet.

This year's report offers a deeper, more global view of actionable data to help us make that progress.

In this 54<sup>th</sup> edition of the Statistical Summary of Commercial Jet Airplane Accidents, we have organized accident data by regions in alignment with the International Civil Aviation Organization (ICAO). Previously, the report presented these statistics in a two-region format: U.S. and Canada and rest of the world.

With air traffic in every region of the world expected to grow at a rate faster than that of North America – it is time for a more globally diverse approach when reviewing the data. The new regional breakouts can help complement ICAO and the industry's efforts to improve aviation safety within each region across the globe.

The industry is expanding its worldwide safety engagement in a variety of ways.

At Boeing, we have proactively joined airlines in implementing a Safety Management System (SMS), a framework used for identifying and managing safety risks throughout the product and service life cycle. SMS is recognized as a best practice for managing safety, and it aligns with the standards set by ICAO and global regulators.

Boeing also has implemented its Global Aerospace Safety Initiative, which integrates and strengthens the expansive range of work that Boeing teams do, in collaboration with customers, regulators and other stakeholders, to help improve operational safety throughout the aerospace industry.

The transparent, global nature of this report, combined with these broader safety initiatives, is part of our industry's collective work to help prevent accidents, injuries and loss of life.

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# 2022 Statistical Summary

This is the 54<sup>th</sup> edition of the Boeing Statistical Summary of Commercial Jet Airplane Accidents, which has been published by the company every year since 1969. The annual report provides data and statistical analysis to yield key insights into the safety of commercial air travel worldwide.

The information contained in this report can be used by the aviation industry to identify global trends and opportunities to advance safety. The findings underscore the importance of the industry's continuous pursuit of new levels of safety in order to prevent accidents, injury or loss of life.



2022 Airplane Accidents | Worldwide Commercial Jet Fleet

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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
1/5/22	Caspian Airlines	737-400 (29)	Sched Pax	Isfahan, Iran	Landing	While landing, the left-hand main landing gear collapsed. The aircraft sustained substantial damage. Multiple serious injuries were reported.	Substantial		Serious	(0)	
1/22/22	JetBlue Airways	A320 (13)	Sched Pax	Hayden, USA	Takeoff	The airplane experienced a tail strike on departure, resulting in substantial damage. There were no injuries reported.	Substantial			(0)	
4/7/22	DHL Aero Expreso	757-200 (22)	Sched Cargo	San Jose, Costa Rica	Landing	Shortly after takeoff, the airplane experienced hydraulic failure. After air turnback and landing, the airplane lost control, veered off the runway and sustained substantial damage. No injuries were reported.	Destroyed	X		(0)	
5/6/22	Blue Air	737-800 (12)	Charter Pax	Naples, Italy	Landing	The airplane sustained damage due to a tail strike during landing. No injuries were reported.	Substantial			(0)	
5/12/22	Tibet Airlines	A319 (8)	Sched Pax	Chongqing, China	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 and a post-crash fire ensued. There were multiple injuries sustained during evacuation.	Destroyed	X	Minor	(0)	
6/16/22	Gomair	737-300 (33)	Sched Cargo	Kananga, Democratic Republic of the Congo	Landing	The airplane sustained damage after landing when the left main landing gear collapsed during rollout. No injuries were reported.	Substantial			(0)	
6/17/22	Air France	777-200 (21)	Sched Pax	New York City, USA	Parked	The airplane was involved in a ground collision with another airplane and was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
6/21/22	RED Air	MD-82 (30)	Sched Pax	Miami, USA	Landing	The aircraft experienced a left main gear collapse during landing roll and subsequently veered off the runway. There was a post-crash fire. The aircraft sustained substantial damage. There were minor injuries sustained during the evacuation.	Destroyed	X	Minor	(0)	
6/23/22	Jetstar Japan	A320 (9)	Sched Pax	Kochi, Japan	Landing	The aircraft experienced a hard landing. One flight attendant sustained serious injuries. No damage to the aircraft was reported.	None		Serious	(0)	
7/1/22	Southwest Airlines	737-700 (17)	Sched Pax	Santa Ana, USA	Landing	The aircraft experienced a hard landing. One flight attendant sustained serious injuries. No damage to the aircraft was reported.	None		Serious	(0)	
7/25/22	AVIANCA	A320 (15)	Sched Pax	Rionegro, Colombia	Taxi	The airplane stopped abruptly while taxiing. There was one serious injury. The airplane was undamaged.	None		Serious	(0)	
7/30/22	NOK AIR	737-800 (7)	Sched Pax	Chiang Rai, Thailand	Landing	The airplane sustained damage when it veered off the runway while landing. The accident occurred in a thunderstorm and heavy rain. No injuries were reported.	Substantial			(0)	
8/5/22	Qatar Airways	777-F (7)	Sched Cargo	Chicago, USA	Taxi	While taxiing, the airplane collided with a light pole and was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
8/6/22	Delta Air Lines	757-200 (26)	Sched Pax	Atlanta, USA	Landing	While performing a go-around, the airplane experienced a tail strike and was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
9/2/22	Air Portugal	A320NEO (1)	Sched Pax	Conakry, Guinea	Landing	During landing, the airplane struck a motorcycle with two airport security officers on board. There were two fatalities as a result.	Substantial		Fatal	0/79 (2)	X
9/4/22	Iberia Airlines	A320NEO (0)	Sched Pax	Madrid, Spain	Landing	The airplane experienced a tail strike on landing and was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
9/4/22	AeroLogic	777-F (10)	Sched Pax	Frankfurt, Germany	Taxi	Ground handler injured by jet blast during airplane taxiing.	None		Serious	(0)	
9/22/22	SunExpress	737-800 (5)	Sched Pax	Cologne, Germany	Parked	Ground equipment collided with the airplane, and the airplane was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
9/24/22	Swiftair	737-400 (11)	Sched Cargo	Montpellier, France	Landing	The airplane overran the runway upon landing and came to rest partially submerged in water. No injuries were reported.	Destroyed	X		(0)	
9/25/22	COPA Airlines	737-800 (12)	Sched Pax	Panama City, Panama	Landing	The airplane sustained substantial damage when it veered off the runway while landing. The nose gear collapsed. The accident occurred in heavy rain. No injuries were reported.	Substantial			(0)	
10/1/22	Transavia France	737-800 (14)	Sched Pax	Nantes, France	Landing	The aircraft experienced a hard landing and nose landing gear tire burst. The aircraft sustained substantial damage. No injuries were reported.	Substantial	X		(0)	
10/23/22	Korean Air	A330 (23)	Sched Pax	Cebu, Philippines	Landing	The airplane overran the runway upon landing. The airplane sustained substantial damage. No injuries were reported.	Destroyed	X		(0)	
11/7/22	Corse Mediteranee	A320NEO (2)	Sched Pax	Ajaccio, France	Parked	Ground equipment collided with the airplane, and the airplane was substantially damaged. There were no injuries or fatalities.	Substantial			(0)	
11/18/22	LATAM Airlines Group	A320NEO (4)	Sched Pax	Lima, Peru	Takeoff	During takeoff, the airplane struck two occupied fire engines participating in simulation training. There were two fatalities as a result.	Destroyed	X	Fatal	0/108 (2)	X
12/31/22	Envoy	ERJ 175 (4)	Sched Pax	Montgomery, USA	Parked	While parked at the gate with engines still running, a ramp worker was fatally ingested into an engine.	Minor		Fatal	0/63 (1)	
25	Total Accidents									0 On board (5 External)	2

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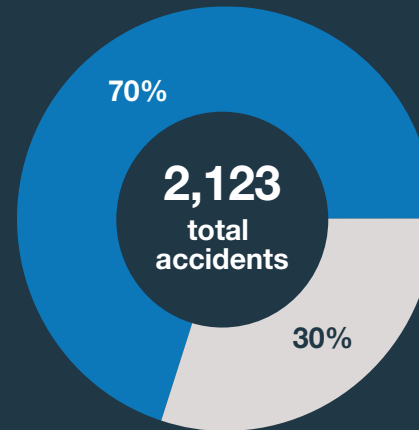
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# Accident Summary by Injury and Damage

Worldwide Commercial Jet Fleet  
1959-2022

## 1959-2022



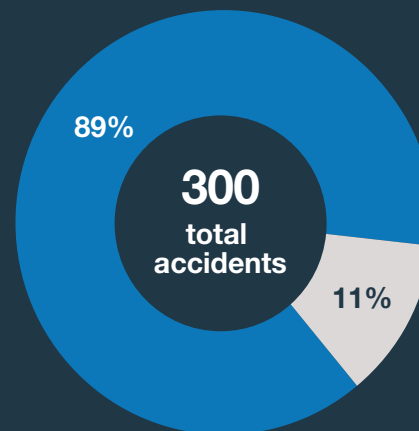
### 1,488 Nonfatal accidents

515 with hull loss  
886 with substantial damage  
87 without substantial damage

### 635 Fatal accidents

513 with hull loss  
28 with substantial damage  
94 without substantial damage

## 2013-2022



### 268 Nonfatal accidents

77 with hull loss  
167 with substantial damage  
24 without substantial damage

### 32 Fatal accidents

24 with hull loss  
1 with substantial damage  
7 without substantial damage

# Departures, Flight Hours and Jet Airplanes in Service\*

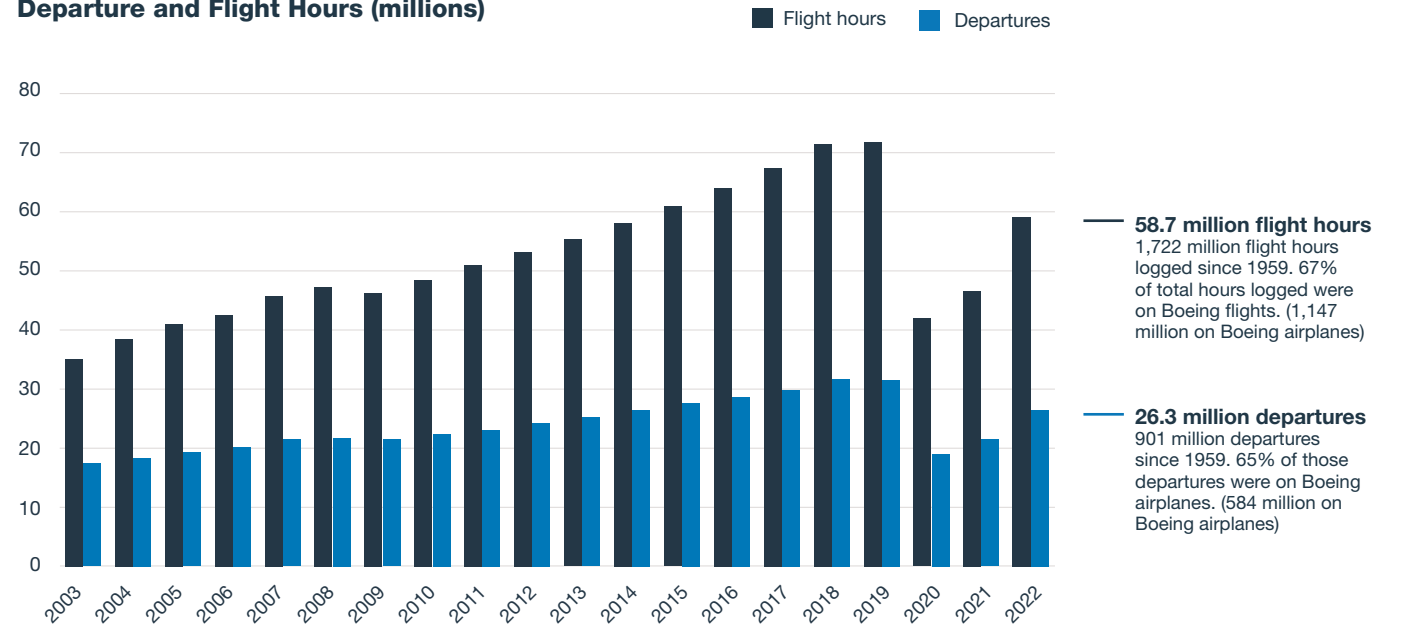
## Worldwide Commercial Jet Fleet 2003-2022

Over the past 20 years, the statistics show a growing trend in the gap between total number of departures and total flight hours. While passenger traffic continues to rebound worldwide, global air travel numbers have not yet reached pre-pandemic numbers. However, the worldwide airplane fleet and commercial air traffic are expected to continue to grow over the next two decades.

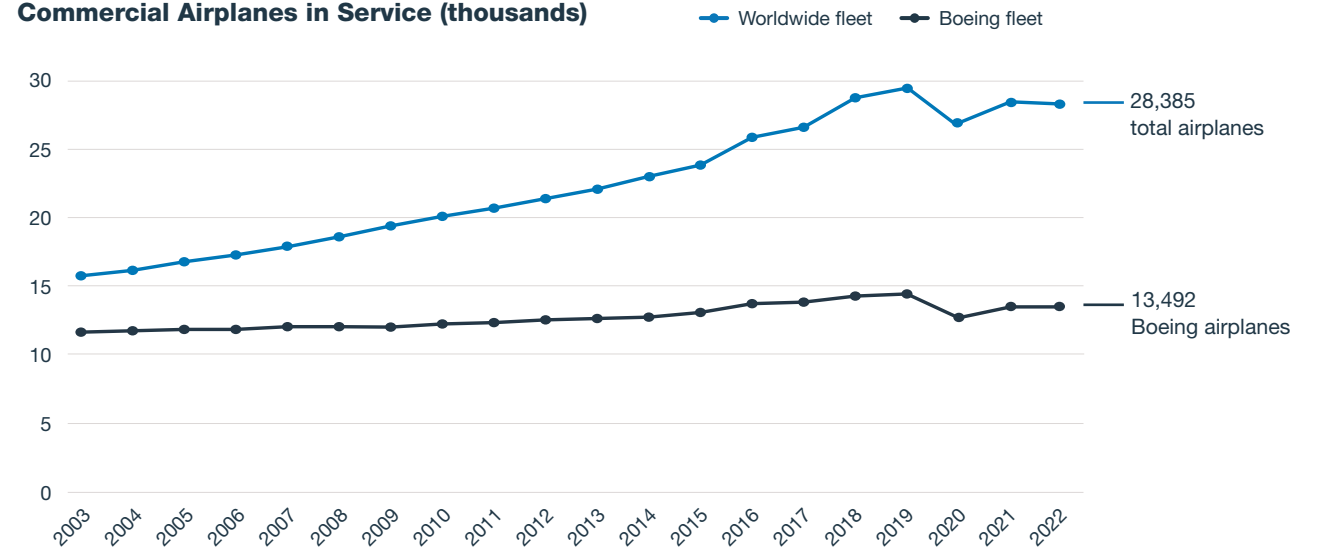
Sources: 2003-2019, Jet Information Services, Inc.  
2020-2022, Cirium

\*Certified jet airplanes greater than 60,000 pounds (27,216 kilograms) maximum gross weight, including those in temporary nonflying status and those in use by non-airline operators. Excluded are commercial airplanes operated in military service and CIS/USSR/PRC-manufactured airplanes.

Departure and Flight Hours (millions)



Commercial Airplanes in Service (thousands)



# Accident Summary by Type of Operation

## Worldwide Commercial Jet Fleet

Type of Operation	All Accidents		Fatal Accidents		Onboard Fatalities (External Fatalities)*		Hull Loss Accidents	
	1959-2022	2013-2022	1959-2022	2013-2022	1959-2022	2013-2022	1959-2022	2013-2022
Passenger	1,697	249	510	26	29,643 (810)	1,119 (19)	757	74
– Scheduled	1,573	244	463	25	25,446	1,048	686	72
– Charter	124	5	47	1	4,197	71	71	2
Cargo	304	49	83	6	285 (385)	21 (43)	197	25
Maintenance test ferry, positioning, training and demonstration	122	2	42	0	190 (66)	0 (0)	74	2
<b>Totals</b>	<b>2,123</b>	<b>300</b>	<b>635</b>	<b>32</b>	<b>30,118</b> <b>(1, 261)</b>	<b>1,140</b> <b>(62)</b>	<b>1,028</b>	<b>101</b>

\*External fatalities include on-ground fatalities as well as fatalities on other aircraft involved.

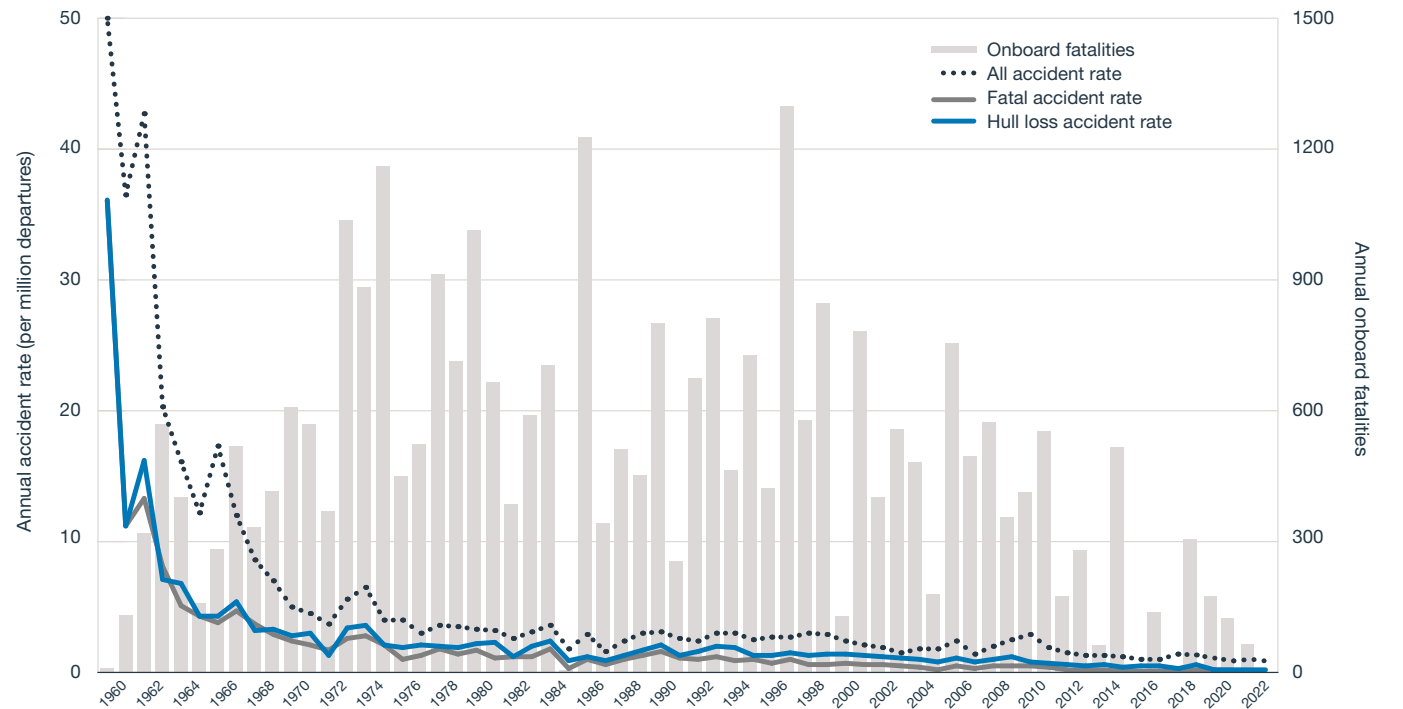


# Accident Rates and Onboard Fatalities by Year

## Worldwide Commercial Jet Fleet 1959-2022

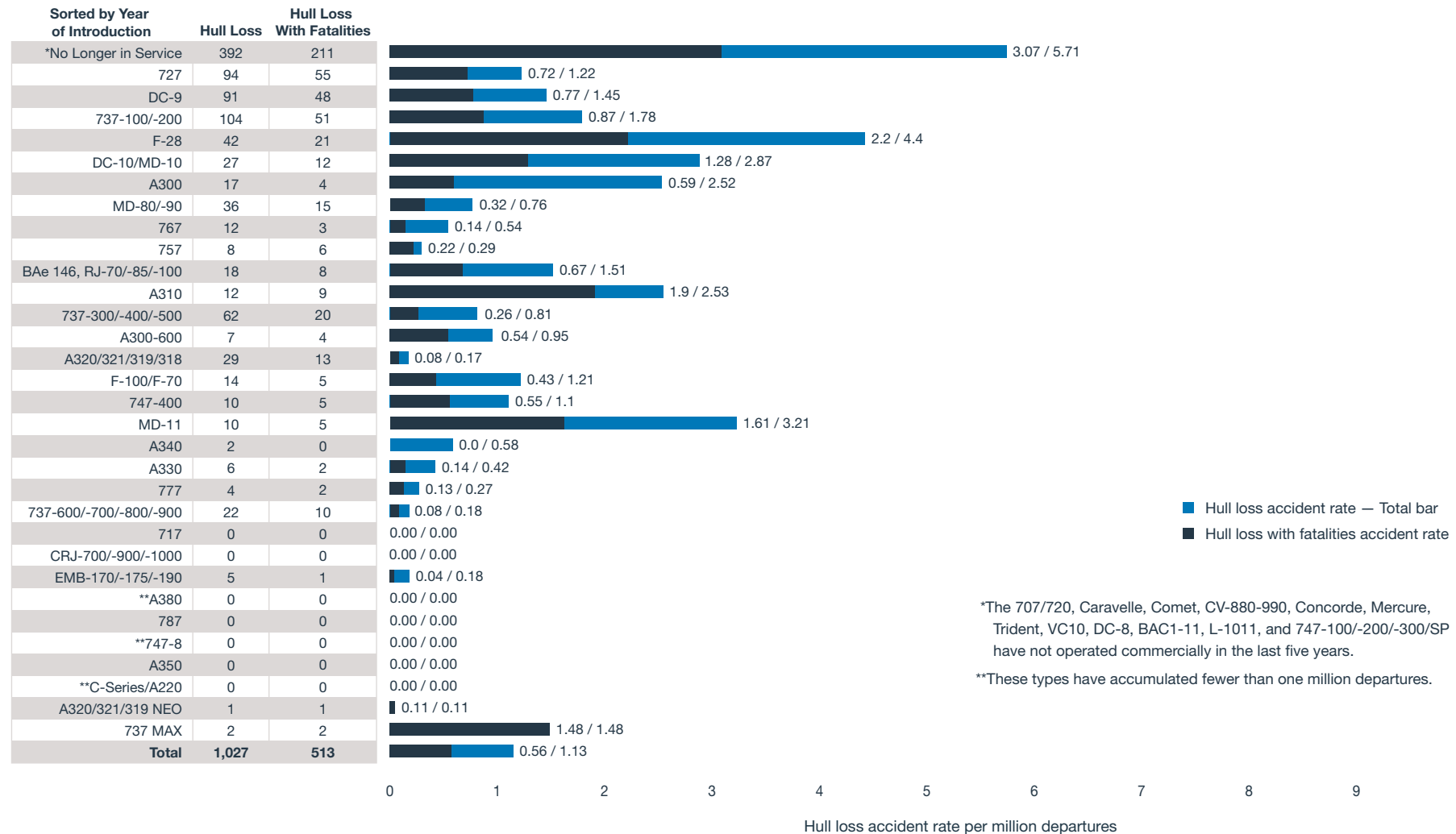
The first decade of the jet age saw dramatic improvements in fatal accident rates. Since then, safety advancements across the industry have helped continue the downward trend. In 2022, fatal accident rates were lower than 20 years ago.

Accident Rates and Onboard Fatalities per One Million Departures



# Accident Rates by Airplane Type

## Hull Loss Accidents | Worldwide Commercial Jet Fleet | 1959-2022



\*The 707/720, Caravelle, Comet, CV-880-990, Concorde, Mercure, Trident, VC10, DC-8, BAC1-11, L-1011, and 747-100/-200/-300/SP have not operated commercially in the last five years.

\*\*These types have accumulated fewer than one million departures.

# CAST/ICAO Common Taxonomy Team 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 an assignment of multiple categories as necessary to describe the accident or incident. Since 2001, the Occurrence Validation Study Group (OVSG), formerly Safety Indicator Steering Group (SISG), has met annually to assign CICTT occurrence categories to the prior year's accidents.

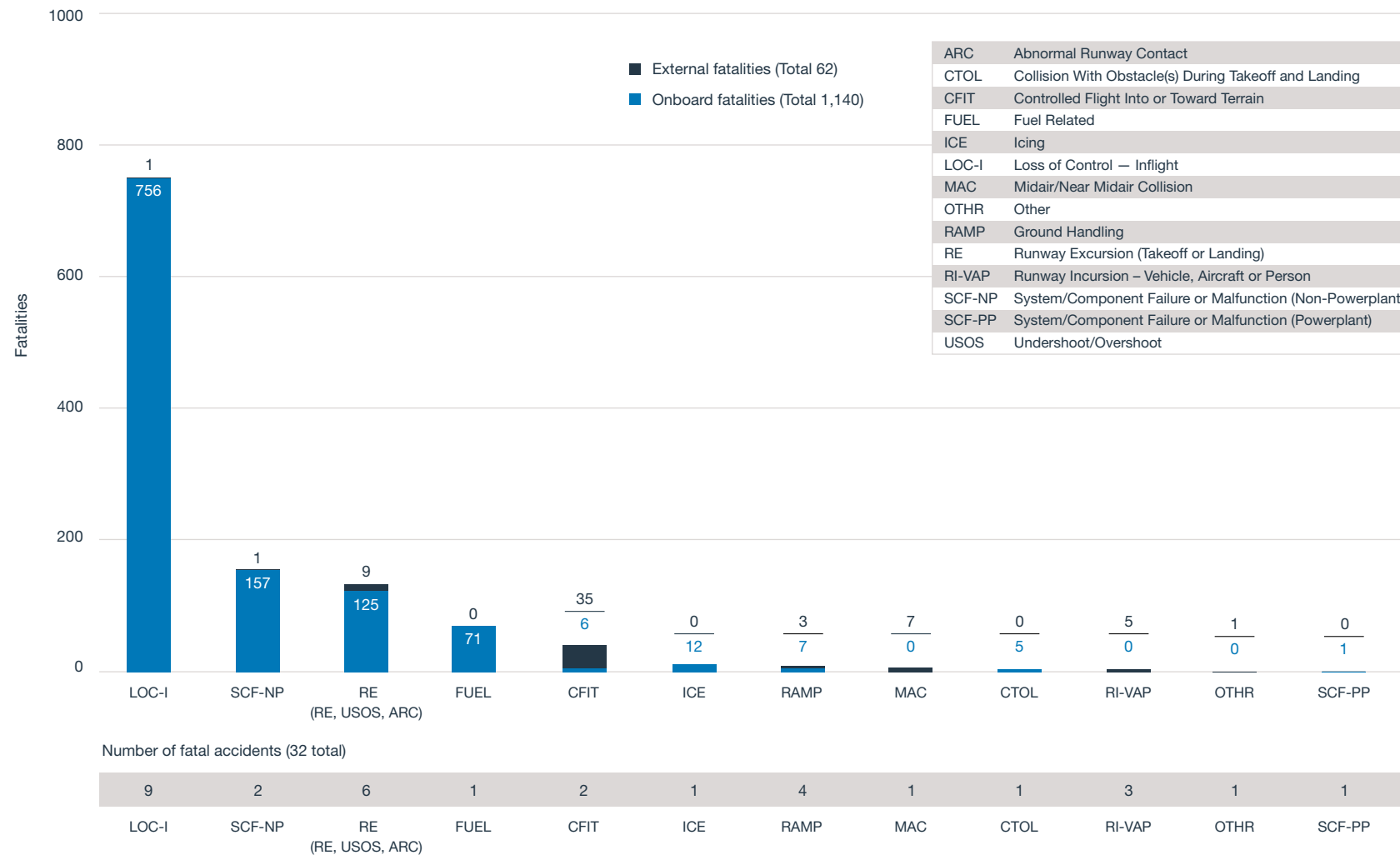
In a separate activity, the CAST assigned each fatal accident to a single principal category. Those accident assignments and a brief description of the categories are reported in the following chart.

The CAST's 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 the CAST to identify changes to historical 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](http://www.intlaviationstandards.org).

# Fatalities by CICTT Aviation Occurrence Categories

## Fatal Accidents | Worldwide Commercial Jet Fleet | 2013-2022



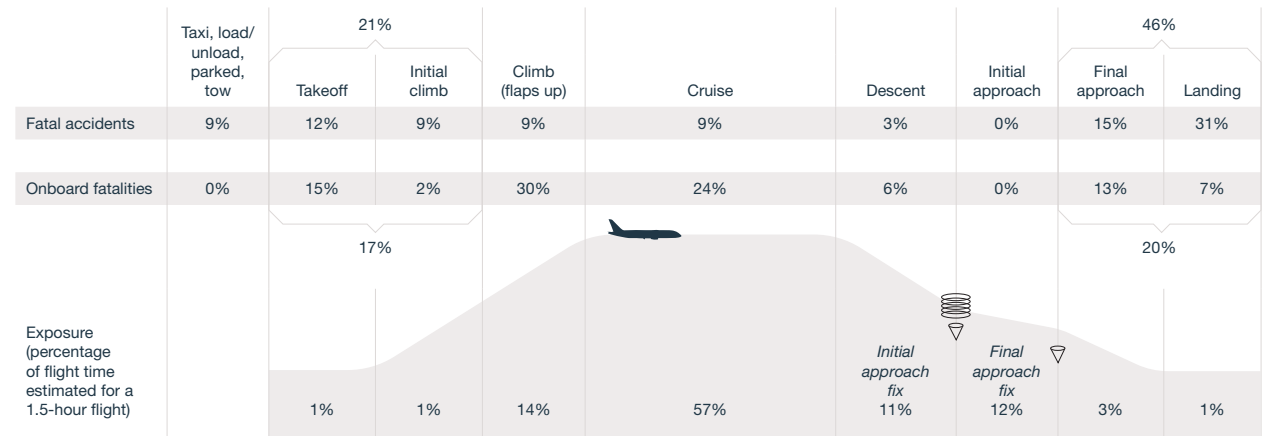
Note: Principal categories as assigned by CAST. See ["Definitions and Terms"](#) for included and excluded event details. For a complete description of CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories, go to [www.intlaviationstandards.org](http://www.intlaviationstandards.org).

# Fatal Accidents and Fatalities by Phase of Flight

## Worldwide Commercial Jet Fleet 2013-2022

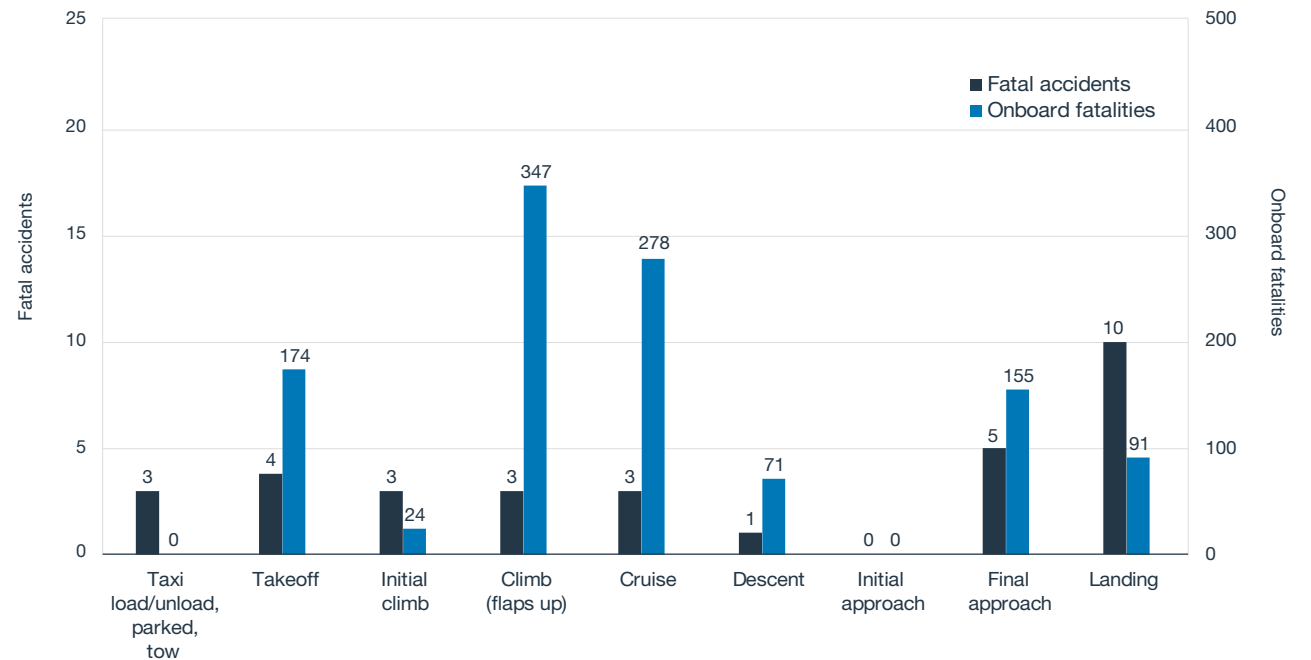
While cruising at altitude makes up the majority of time in the air, this phase of flight accounts for 9% of all fatal accidents. Conversely, almost half of all fatal accidents occur during final approach and landing. Most safety-related improvements over the past few decades have focused on the taxi, climb, approach and landing phases.

Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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

Distribution of Fatal Accidents and Onboard Fatalities | 2013-2022



# Regional Statistics

**North America,  
Central America  
and Caribbean  
(NACC)**

**Europe and  
North Atlantic  
(EUR/NAT)**

**Asia and Pacific  
(APAC)**

**Middle East  
(MID)**

**Western  
and Central  
Africa  
(WACAF)**

**Eastern and  
Southern Africa  
(ESAF)**

**South  
America  
(SAM)**

This section organizes accident data into seven regions aligned with the [ICAO's annual Safety Report](#). Each region is different in terms of air travel growth rates, operational profiles and other important factors, and the data is reflected with those factors in mind. However, all regions share one common trend – the continued decline in accident rates across the board.

Accident statistics are aligned with operators and their home state of operation. This regional data perspective provides additional safety data for ICAO members as they develop and implement their global, regional and national aviation safety plans.

# Asia and Pacific (APAC)

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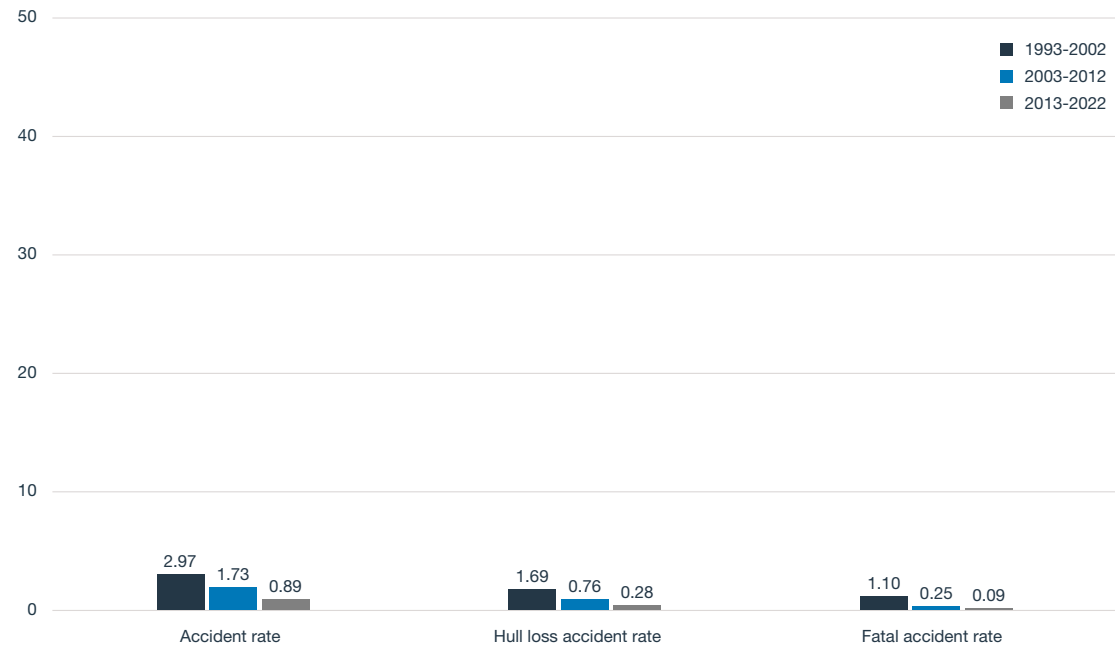
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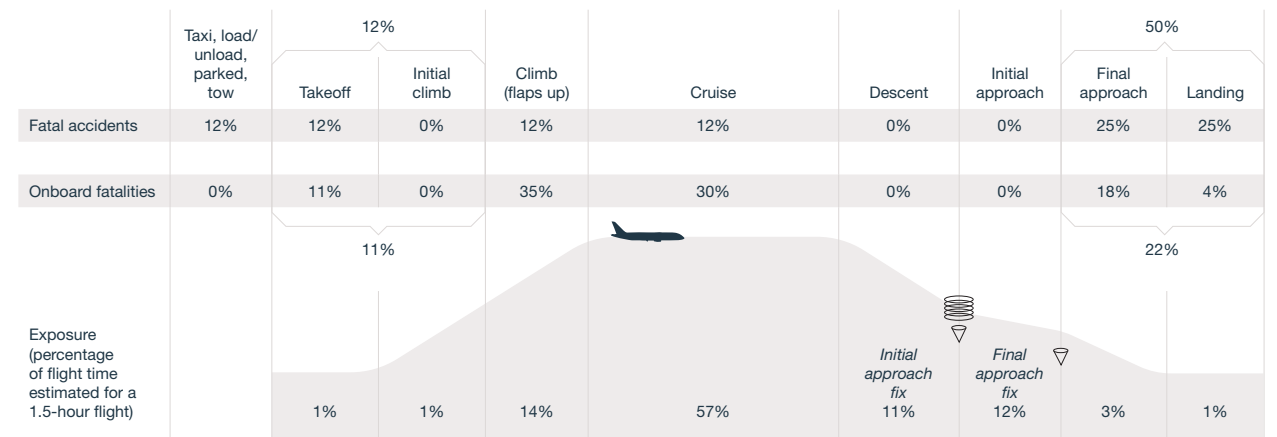
Regional Accident Counts		
APAC	1959-2022	2013-2022
All Accidents	398	77
Fatal Accidents	128	8
Onboard Fatalities	7,197	535
External Fatalities	271	2
Hull Loss Accidents	195	24

Fatal Accidents	
CICTT Category	2013-2022
CFIT	0
CTOL	0
FUEL	0
ICE	0
LOC-I	3
MAC	0
OTHR	0
RAMP	1
RE (RE, USOS, ARC)	4
RI-VAP	0
SCF-NP	0
SCF-PP	0

Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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

# Eastern and Southern Africa (ESAF)

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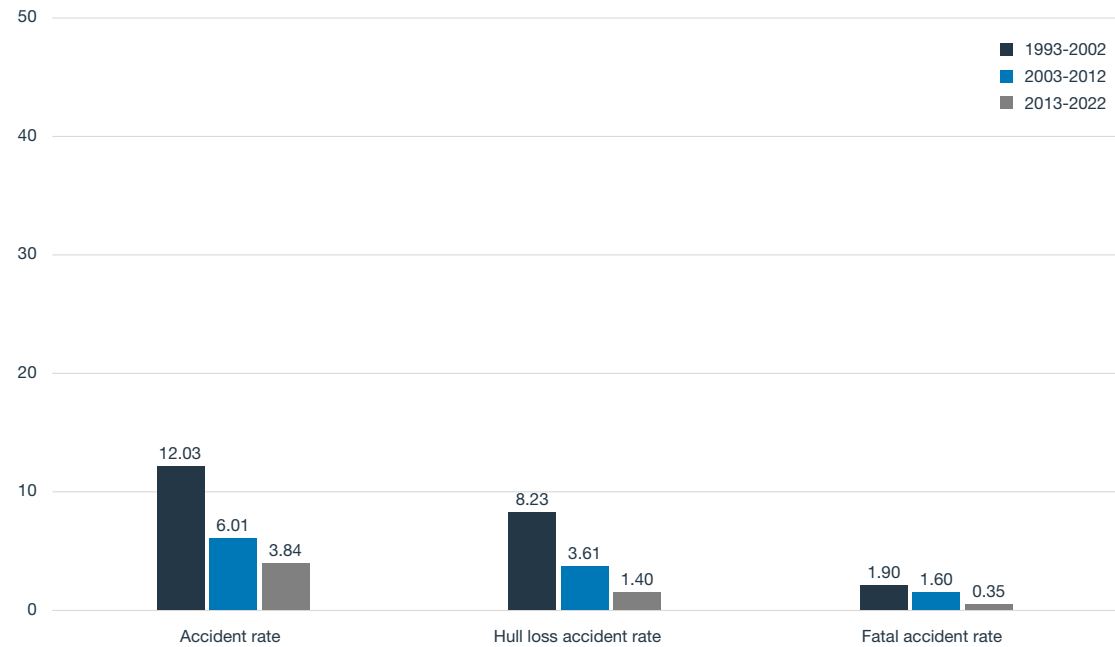
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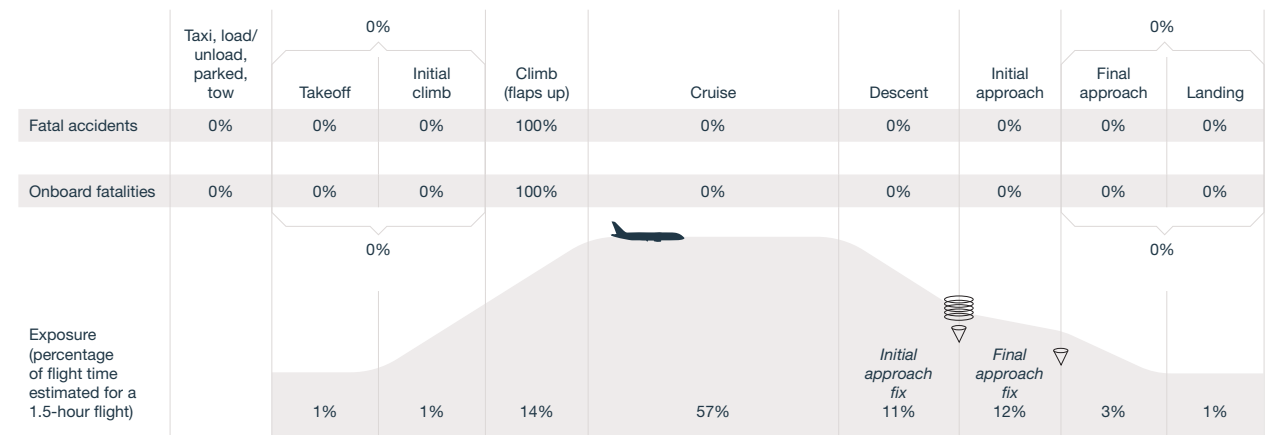
Regional Accident Counts		
ESAF	1959-2022	2013-2022
All Accidents	72	11
Fatal Accidents	16	1
Onboard Fatalities	1,064	157
External Fatalities	10	0
Hull Loss Accidents	44	4

Fatal Accidents	
CICTT Category	2013-2022
CFIT	0
CTOL	0
FUEL	0
ICE	0
LOC-I	0
MAC	0
OTHR	0
RAMP	0
RE (RE, USOS, ARC)	0
RI-VAP	0
SCF-NP	1
SCF-PP	0

Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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



# Europe and North Atlantic (EUR/NAT)

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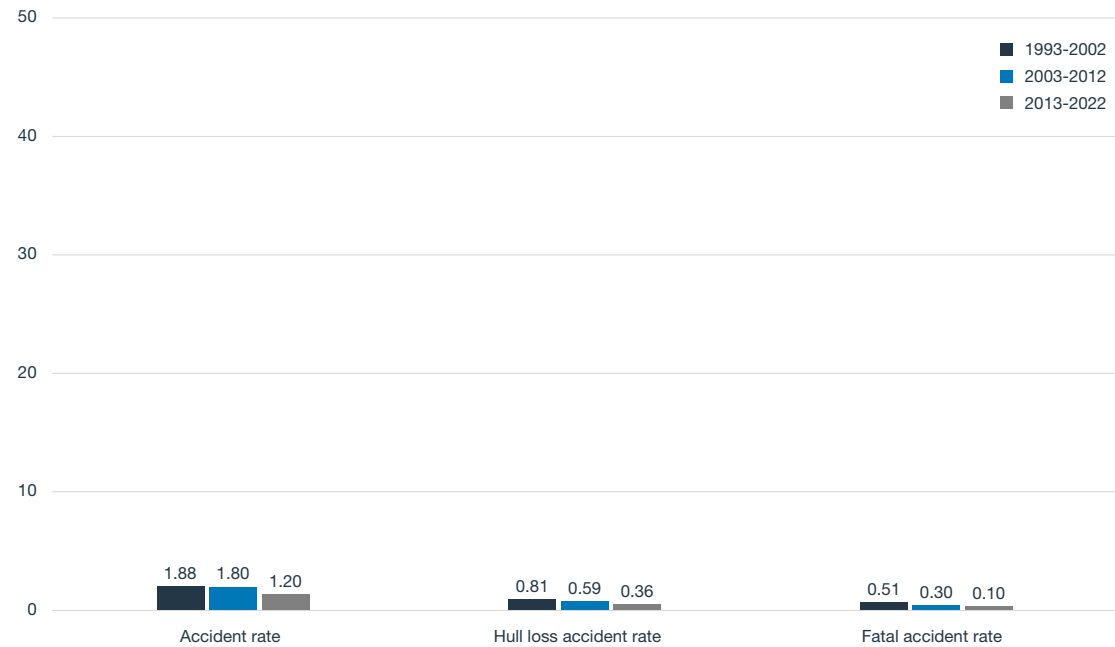
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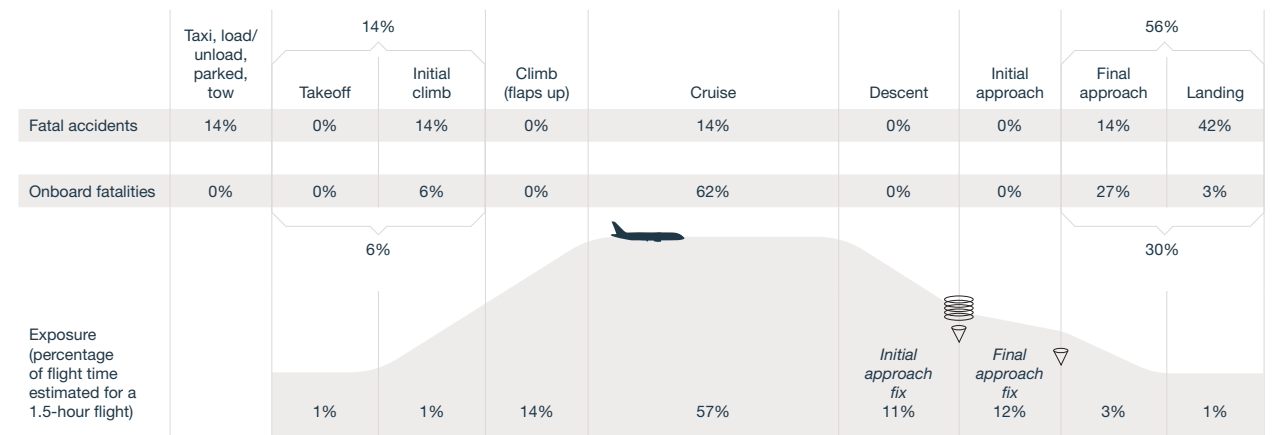
Regional Accident Counts		
EUR/NAT	1959-2022	2013-2022
All Accidents	506	84
Fatal Accidents	142	7
Onboard Fatalities	8,069	185
External Fatalities	146	38
Hull Loss Accidents	217	25

Fatal Accidents	
CICTT Category	2013-2022
CFIT	1
CTOL	0
FUEL	0
ICE	1
LOC-I	2
MAC	0
OTHR	0
RAMP	1
RE (RE, USOS, ARC)	1
RI-VAP	1
SCF-NP	0
SCF-PP	0

Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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

# Middle East (MID)

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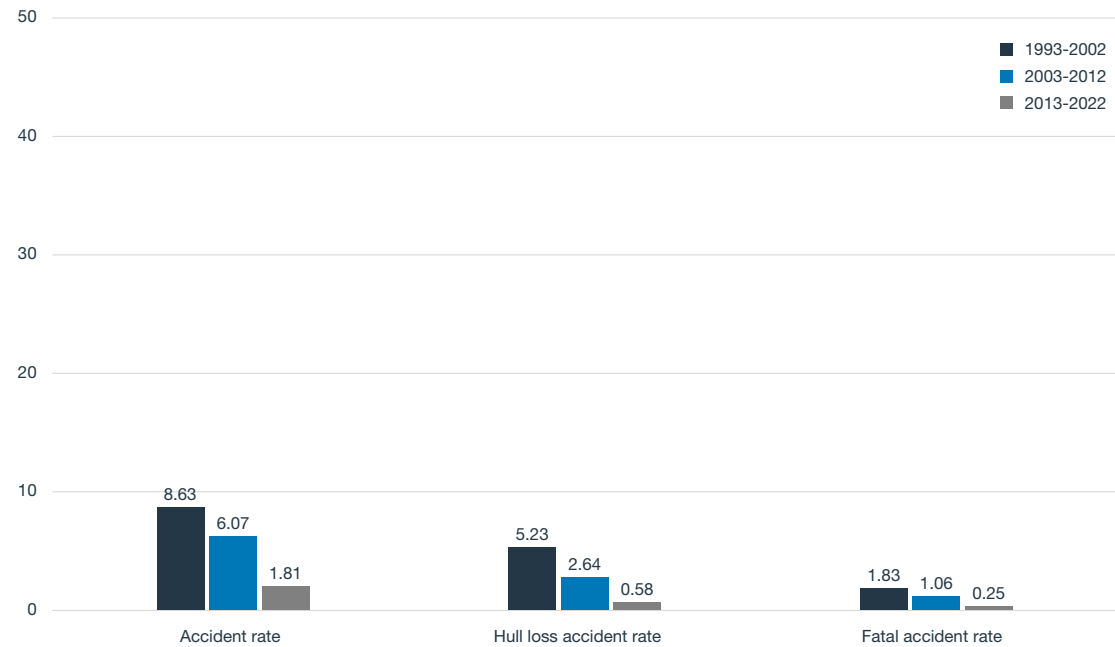
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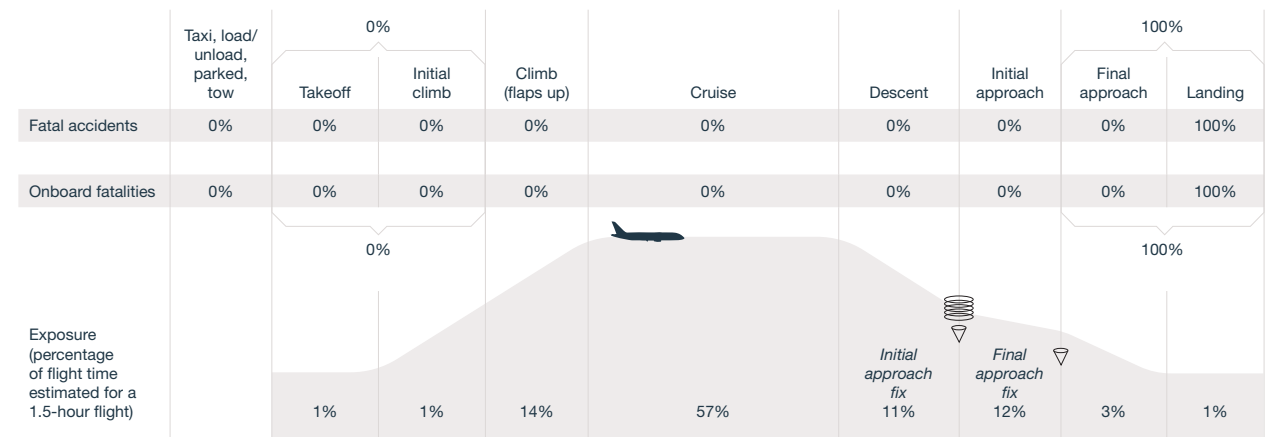
Regional Accident Counts		
MID	1959-2022	2013-2022
All Accidents	148	22
Fatal Accidents	41	3
Onboard Fatalities	2,353	62
External Fatalities	128	2
Hull Loss Accidents	76	7

Fatal Accidents	
CICTT Category	2013-2022
CFIT	0
CTOL	0
FUEL	0
ICE	0
LOC-I	2
MAC	0
OTHR	0
RAMP	0
RE (RE, USOS, ARC)	0
RI-VAP	1
SCF-NP	0
SCF-PP	0

## Accident Rates per One Million Departures



## Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



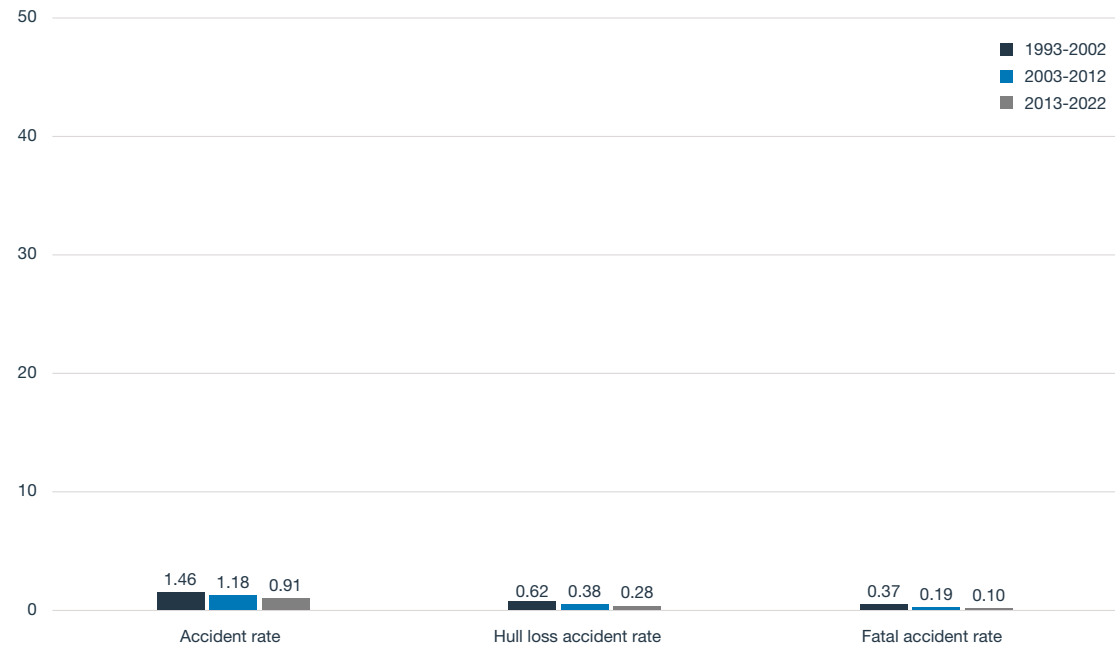
Note: Percentages may not sum to 100% because of numerical rounding.

# North America, Central America and Caribbean (NACC)

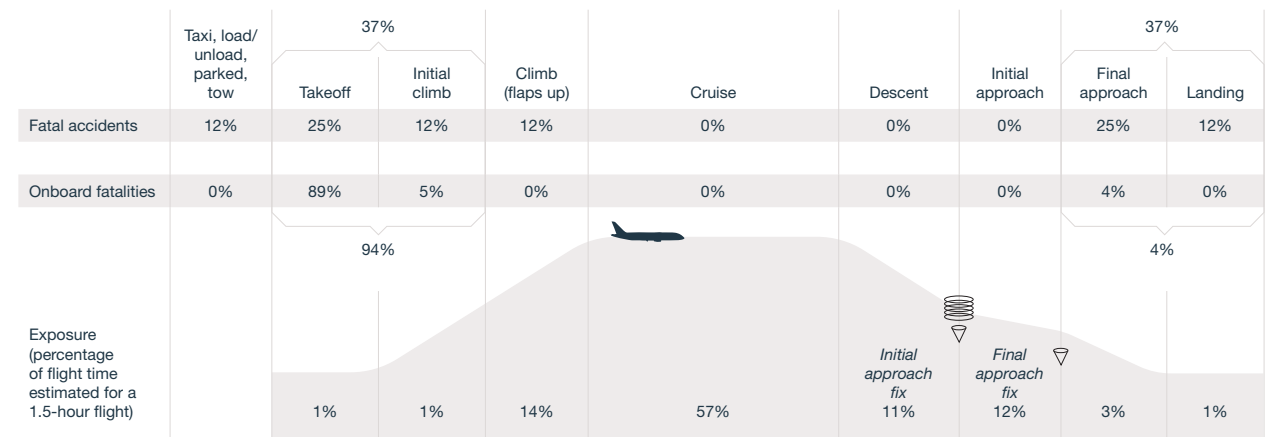
Regional Accident Counts		
NACC	1959-2022	2013-2022
All Accidents	695	74
Fatal Accidents	210	8
Onboard Fatalities	7,228	125
External Fatalities	416	3
Hull Loss Accidents	281	23

Fatal Accidents	
CICTT Category	2013-2022
CFIT	1
CTOL	0
FUEL	0
ICE	0
LOC-I	2
MAC	0
OTHR	1
RAMP	2
RE (RE, USOS, ARC)	0
RI-VAP	0
SCF-NP	1
SCF-PP	1

Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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

# South America (SAM)

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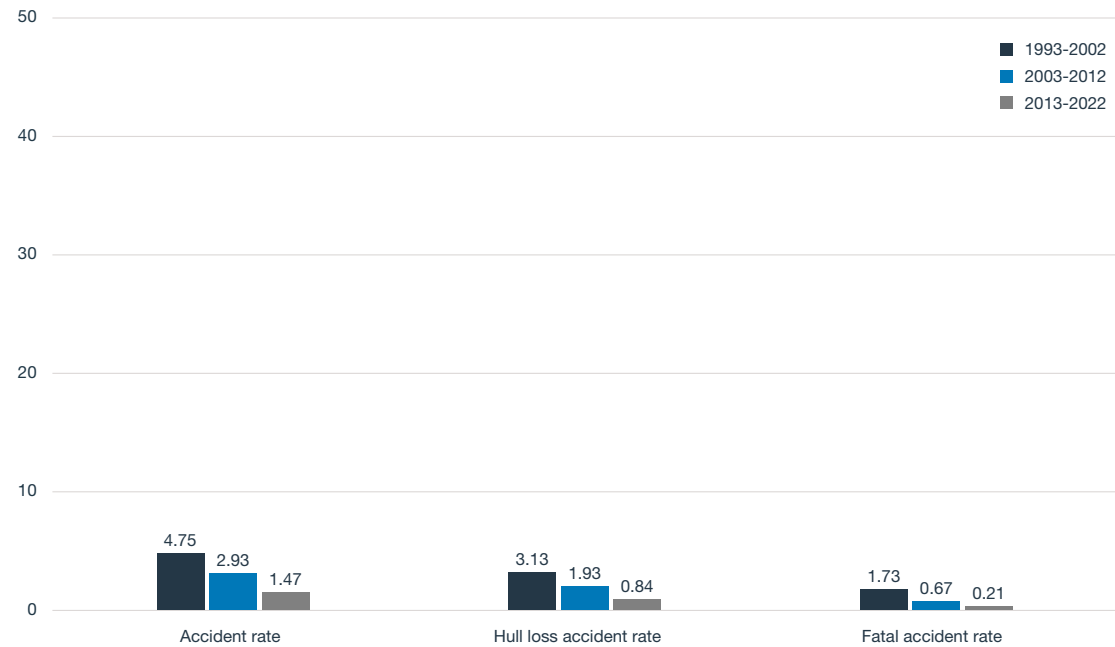
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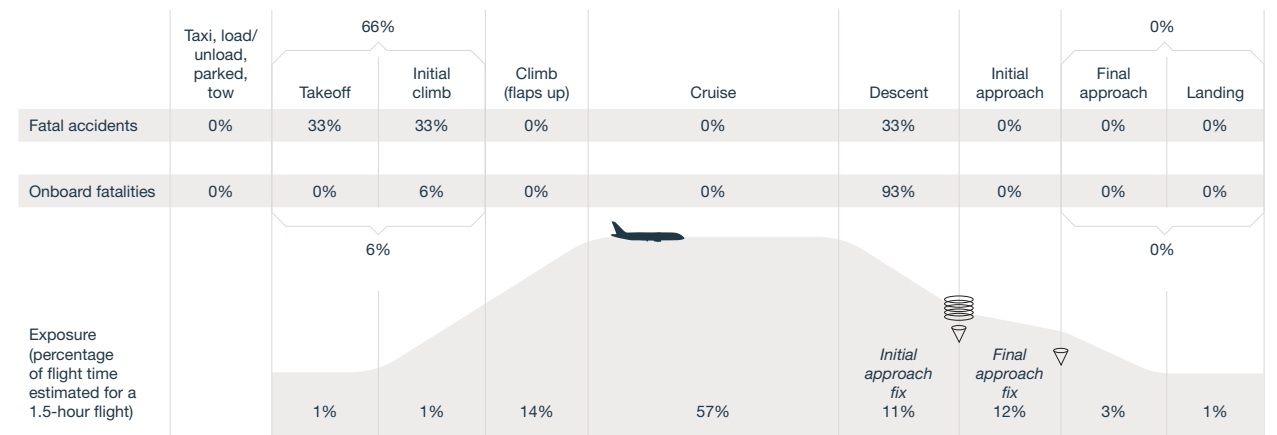
Regional Accident Counts		
SAM	1959-2022	2013-2022
All Accidents	211	21
Fatal Accidents	74	3
Onboard Fatalities	3,250	76
External Fatalities	212	2
Hull Loss Accidents	145	12

Fatal Accidents	
CICTT Category	2013-2022
CFIT	0
CTOL	1
FUEL	1
ICE	0
LOC-I	0
MAC	0
OTHR	0
RAMP	0
RE (RE, USOS, ARC)	0
RI-VAP	1
SCF-NP	0
SCF-PP	0

Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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

# Western and Central Africa (WACAF)

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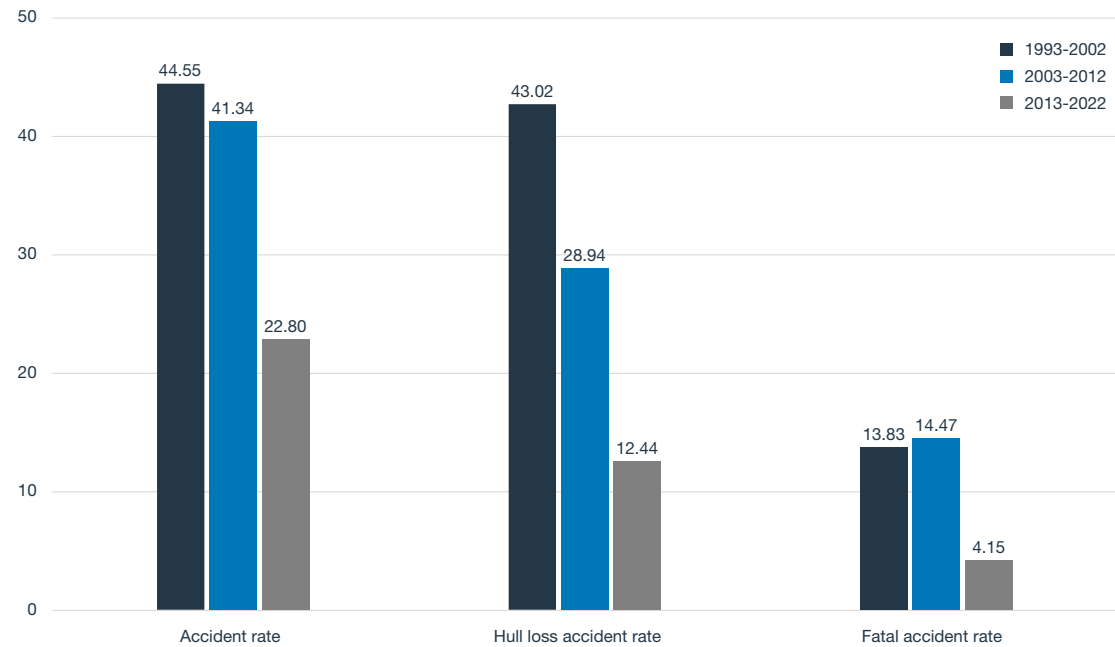
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Definitions and Terms

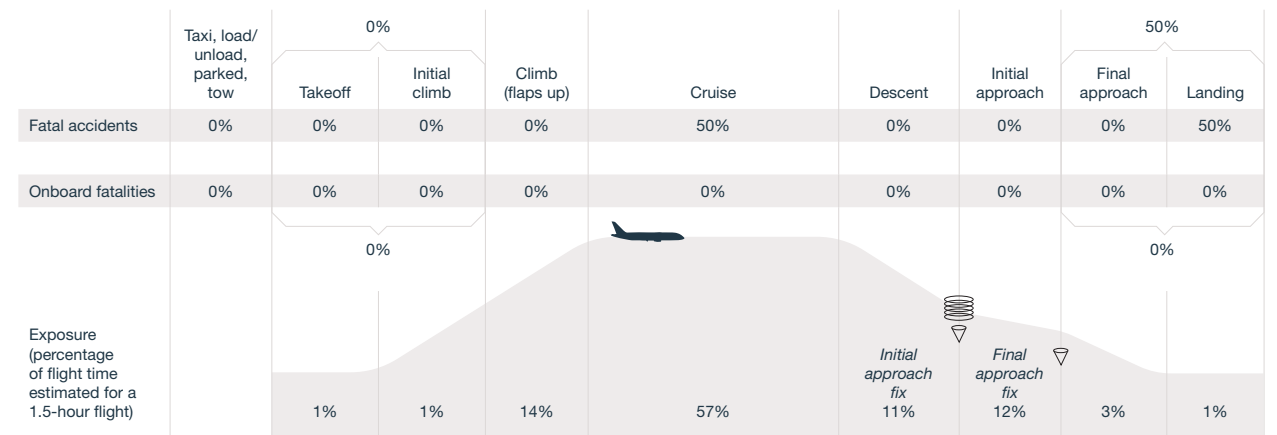
Regional Accident Counts		
WACAF	1959-2022	2013-2022
All Accidents	93	11
Fatal Accidents	24	2
Onboard Fatalities	957	0
External Fatalities	78	15
Hull Loss Accidents	70	6

Fatal Accidents	
CICTT Category	2013-2022
CFIT	0
CTOL	0
FUEL	0
ICE	0
LOC-I	0
MAC	1
OTHR	0
RAMP	0
RE (RE, USOS, ARC)	1
RI-VAP	0
SCF-NP	0
SCF-PP	0

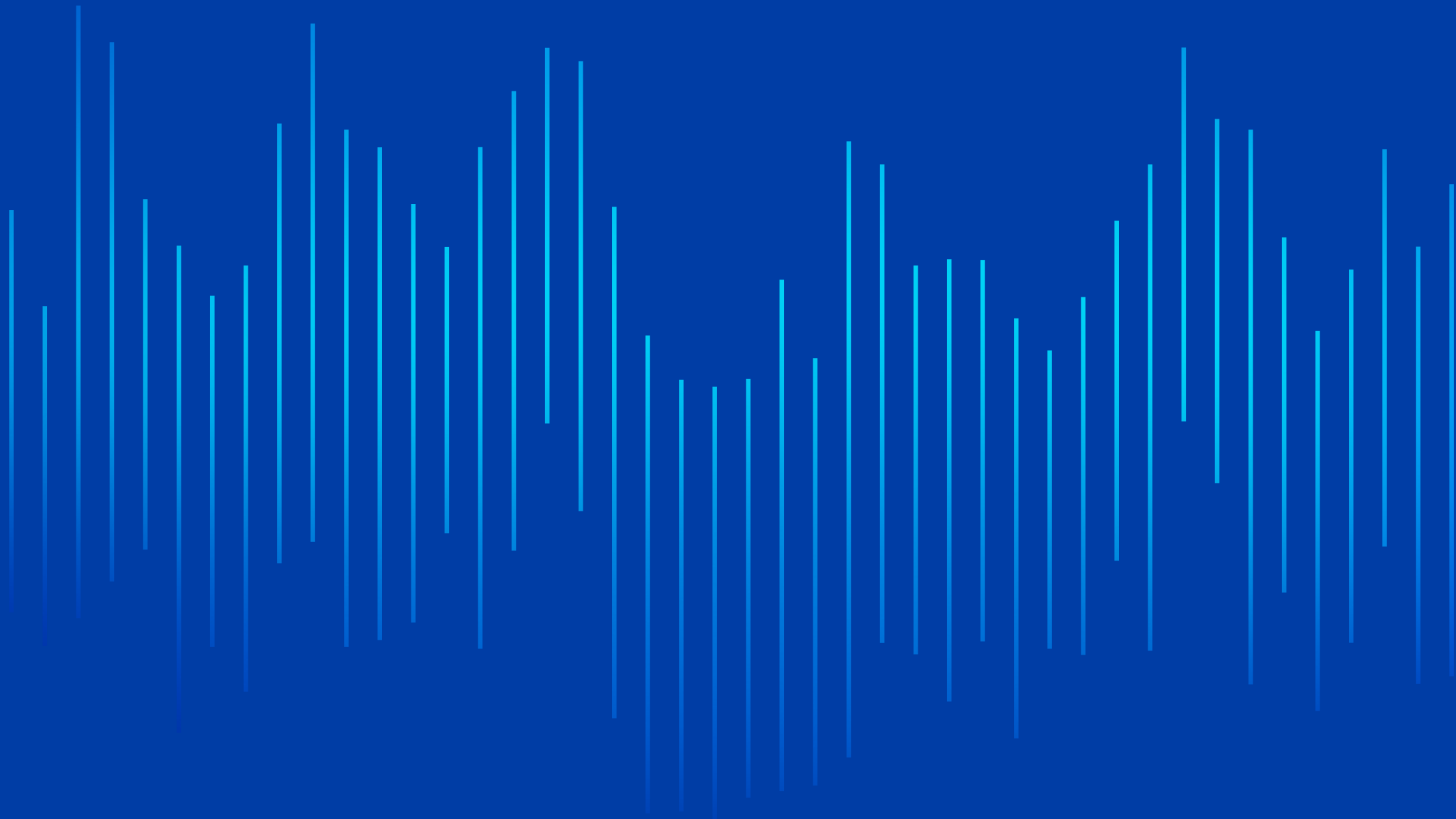
Accident Rates per One Million Departures



Percentage of Fatal Accidents and Onboard Fatalities | 2013-2022



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



# About This Document

The accident statistics presented in this summary are confined to worldwide commercial jet airplanes that are heavier than 60,000 pounds (27,216 kilograms) maximum gross weight. Within that set of airplanes, there are two groups excluded:

1. Airplanes manufactured in the Commonwealth of Independent States (CIS), the Union of Soviet Socialist Republics (USSR), or the People's Republic of China (PRC) due to 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, that data will be included in this summary.)

## The following airplanes are included in the statistics:

<b>Boeing</b>		<b>Airbus</b>	<b>BAE SYSTEMS (Avro)</b>	<b>BAE SYSTEMS (HS)</b>	<b>Embraer</b>	<b>Lockheed</b>
707/720	DC-8	A300	Avro RJ70/85/100	BAe 146	E170/175	L-1011
727	DC-9	A300-600		Comet 4	E190/195	
737	DC-10/MD-10	A310	<b>BAE SYSTEMS (BAC)</b>	Trident		<b>Dassault Aviation</b>
747	MD-11	A320/321/319/318	Concorde		<b>Fokker</b>	Mercure
757	MD-80/-90	A330	One-Eleven	<b>Bombardier</b>	F28	
767		A340	VC10	CRJ700/900/1000	F70	<b>General Dynamics</b>
777		A350			F100	<b>(Convair)</b>
787		A380		<b>Aerospatiale</b>		CV-880/-990
717		A220/C Series		Caravelle		

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

Accident data is 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 the development of statistics in this summary are primarily based on corresponding 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.
- 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 Airplanes

Airplanes manufactured in the CIS, USSR or the PRC are excluded because of the lack of operational data. Commercial airplanes operated in military service are generally excluded. (If a military-owned commercial jet transport is used for civilian commercial service, that data is 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.
- Occurrences classified as missing, unknown or undetermined (CICTT occurrence category UNK) are not included in this publication until otherwise determined by the official ICAO Annex 13 investigation.

**Note:** The exclusion of the UNK occurrence category is in alignment with industry efforts to identify, prioritize and reduce global high-risk categories of occurrences such as those identified in ICAO's Global Aviation Safety Plan (GASP).

(See the [“CAST/ICAO Common Taxonomy Team Aviation Occurrence Categories”](#) section.)



# Definitions

## Excluded Events (continued)

The following occurrences are **not** considered airplane accidents:

- Those that are the result of experimental test flights. (However, maintenance test flights, ferry, positioning, training and demonstration flights are not excluded.)
- Those that are 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 Definition”](#) 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.

**Note:** Within this publication, the term “accident” is used interchangeably with “airplane accident.”

## Destroyed

The estimated or likely cost of repairs would have exceeded 50% 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 Injury

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.

# Definitions

## 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.

**Note:** 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% 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, 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 the reference to “small puncture holes in the 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 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\*

## 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 is 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.

## State of Operation

Regional data is reported based on the ICAO member state that serves as the headquarters location of the operator involved in the accident.

# Referenced ICAO and NTSB Definitions\*

## Accident

ICAO defines an “accident” as follows:

*Accident.* An occurrence associated with the operation of an aircraft that, 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.
- Direct contact with any part of the aircraft, including parts which have become detached from the aircraft.
- 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.

**B.** The aircraft sustains damage or structural failure which:

- Adversely affects the structural strength, performance or flight characteristics of the aircraft.
- 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 that 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.

\*ICAO and NTSB definitions are included below for reference.

# Referenced ICAO and NTSB Definitions\*

## Safety Management System (SMS)

ICAO defines an “SMS” as follows:

An SMS is a systematic approach to managing safety, including the necessary organizational structures, accountabilities, policies and procedures. Visit [www.icao.int/safety/SafetyManagement](http://www.icao.int/safety/SafetyManagement) for more information.

## 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.
- B. Results in a fracture of any bone (except simple fractures of fingers, toes or nose).
- C. Involves lacerations that cause severe hemorrhage, nerve, muscle or tendon damage.
- D. Involves injury to any internal organ.
- E. Involves second- or third-degree burns, or any burns affecting more than 5% of the body surface.
- 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 seven 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.
5. Involves second- or third-degree burns, or any burns affecting more than 5% 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.”

\*ICAO and NTSB definitions are included below for reference.

# 2022 Statistical Summary

