BOEING

Commercial Airplanes

Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations
1959 – 2012

1959

2012

Contents

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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; and

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	BAe 146	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		A380						
787								

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), 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, or
- The airplane is missing or is completely inaccessible, or
- Death or serious injury results from:
  - Being in the airplane, or
  - Direct contact with the airplane or anything attached thereto, or
  - Direct exposure to jet blast.

  Excluding:
  - Fatal and nonfatal injuries from natural causes, and
  - Fatal and nonfatal self-inflicted injuries or injuries inflicted by other persons, and
  - Fatal and nonfatal injuries of stowaways hiding outside the areas normally available to the passengers and crew, and
  - Nonfatal injuries resulting from atmospheric turbulence, normal maneuvering, loose objects, boarding, disembarking, evacuation, and maintenance and servicing, and
  - 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, and*

  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."

Definitions (continued)

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 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.

Major Accident: An accident in which any of three conditions is met:

- The airplane was destroyed, or
- There were multiple fatalities, or
- 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, or
- Results in a fracture of any bone (except simple fractures of fingers, toes, or nose), or
- Causes severe hemorrhage, nerve, muscle, or tendon damage, or
- Involves injury to any internal organ, or
- Involves second- or third-degree burns, or any burns affecting more than 5 percent of the body surface, or
- 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 (continued)

Substantial Damage: Damage or failure which adversely affects the structural strength, performance, or flight characteristics of the airplane, and which 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: 1) It deletes reference to small puncture holes in the fabric and "ground damage to rotor or propeller blades"; and 2) It 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, NTSB, etc.

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, since 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; or
- The search for the wreckage has been terminated without it being located; or
- The airplane is completely inaccessible.

Note: Neither ICAO nor NTSB has a definition for hull loss.

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, wing tips, 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); or
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 herein.

Referenced ICAO and NTSB Definitions (continued)

Serious Injury

ICAO defines “serious injury” as follows:

Serious Injury. An injury which 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 which 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 which:

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 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. 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”.

2012 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
24-Jan-12	Swiftair	MD-83 (22)	Sched Pax	Kandahar, Afghanistan	Landing	The airplane sustained damage to the right wing during landing. There were no injuries.	Substantial	X			
5-Feb-12	All Nippon Airways	A320 (20)	Sched Pax	Sendai, Japan	Go Around	The airplane sustained damage as a result of a tail strike during an aborted landing. There were no injuries.	Substantial				
14-Feb-12	easyJet	A319 (1)	Sched Pax	Luton, United Kingdom	Landing	The airplane sustained landing gear damage during a hard landing. There were no injuries.	Substantial				
27-Feb-12	Shuttle America	EMB 170 (7)	Sched Pax	Newark, USA	Landing	The airplane sustained damage during a landing with the nose landing gear not fully extended. There were no injuries.	Substantial				
28-Feb-12	Hi Fly	A340 (15)	Charter Pax	Darwin, Australia	Landing	The airplane sustained landing gear damage during a hard landing in highly variable winds. There were no injuries.	Substantial				
12-Mar-12	Air India	A319 (2)	Sched Pax	Mumbai, India	Go Around	The airplane sustained damage as a result of a tail strike during an aborted landing. There were no injuries.	Substantial				
31-Mar-12	Japan Airlines	777-200 (9)	Sched Pax	Tokyo, Japan	Go Around	The airplane sustained damage as a result of a tail strike during an aborted landing. There were no injuries.	Substantial				
20-Apr-12	Bhoja Air	737-200 (27)	Sched Pax	Islamabad, Pakistan	Final Approach	The airplane crashed short of the runway while on final approach. Weather included heavy rain and winds.	Destroyed	X	Fatal	127/127(0)	X
22-Apr-12	Shaheen Air International	737-400 (18)	Sched Pax	Karachi, Pakistan	Landing	The airplane sustained damage, including damage to the left engine, when the left main landing gear collapsed during landing. There were no injuries.	Substantial				
1-May-12	Saudi Arabian Airlines	A300-600 (17)	Positioning	Jeddah, Saudi Arabia	Landing	The airplane sustained damage during a landing with the nose landing gear retracted. There were no injuries.	Substantial	X			
6-May-12	Niki	A321 (3)	Sched Pax	Vienna, Austria	Load/ Unload	During disembarkment, a jetway became entangled with the airplane passenger door, suddenly lifting the airplane, separating the door from the airframe and dropping the airplane back onto the apron. A passenger experienced an associated serious injury.			Serious		
1-Jun-12	Sriwijaya Air	737-400 (21)	Sched Pax	Pontianak, Indonesia	Landing	After landing in heavy rain, the airplane veered off the runway and came to rest in soft ground, resting on its belly and engines. The nose landing gear had also collapsed. There were no injuries.	Substantial	X			

2012 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
2-Jun-12	Allied Air Limited	727-200 (30)	Sched Cargo	Accra, Ghana	Landing	After landing long in the vicinity of a heavy thunderstorm, the airplane overran the end of the runway, crossed a road and impacted an occupied bus before stopping in a dirt field adjacent to the road.	Destroyed	X	Fatal	0/4(12)	X
3-Jun-12	Dana Airlines	MD-83 (21)	Sched Pax	(near) Lagos, Nigeria	Final Approach	During approach, neither engine responded to the crew's command. The airplane crashed into a populated area several kilometers short of the runway. A post impact fire ensued.	Destroyed	X	Fatal	153/153(10)	X
6-Jun-12	EgyptAir	A320 (19)	Sched Pax	Nairobi, Kenya	Landing	After landing, the airplane veered off the runway and came to rest in soft ground. There were no injuries.	Substantial				
20-Jun-12	All Nippon Airways	767-300 (9)	Sched Pax	Tokyo, Japan	Landing	The airplane's fuselage was damaged during a hard landing. The airplane was then taxied normally to the gate. There were no injuries.	Substantial				
18-Jul-12	Sky Airline	737-200 (30)	Sched Pax	La Serena, Chile	Landing	The airplane struck a wingtip during landing. An aborted landing was performed after touchdown, and the airplane continued to a normal landing at an alternate airport. There were no injuries.	Substantial				
17-Aug-12	Mandarin Airlines	EMB 190 (4)	Sched Pax	Makung, Taiwan	Landing	After landing, the airplane overran the runway end and came to rest in soft ground. The airplane also sustained a collapsed nose landing gear. There were no injuries.	Substantial				
24-Aug-12	Aserca Airlines	MD-82 (21)	Sched Pax	Santo Domingo, Venezuela	Landing	During landing, the nose gear tires burst, after which the airplane veered off of the runway. There were no injuries.	Substantial	X			
29-Aug-12	Vueling Airlines	A320 (5)	Sched Pax	Berlin, Germany	Landing	The airplane sustained a tail strike during a hard landing. There were no injuries.	Substantial				
20-Sep-12	SyrianAir	A320 (12)	Sched Pax	(near) Duma, Syria	Climb	While climbing, the airplane was damaged when it struck the main rotor of a Syrian military helicopter. The helicopter went out of control and crashed.	Substantial		Fatal	0/156(2)	
25-Sep-12	Air Astana	A320 (4)	Sched Pax	Istanbul, Turkey	Landing	The airplane sustained a tail strike during landing. There were no injuries.	Substantial				
13-Oct-12	Centurion Air Cargo	MD-11-F (20)	Sched Cargo	São Paulo, Brazil	Landing	During landing, the airplane sustained a collapse of the left main landing gear and settled onto its left engine and wing tip. The airplane remained on the runway. There were no injuries.	Substantial	X			

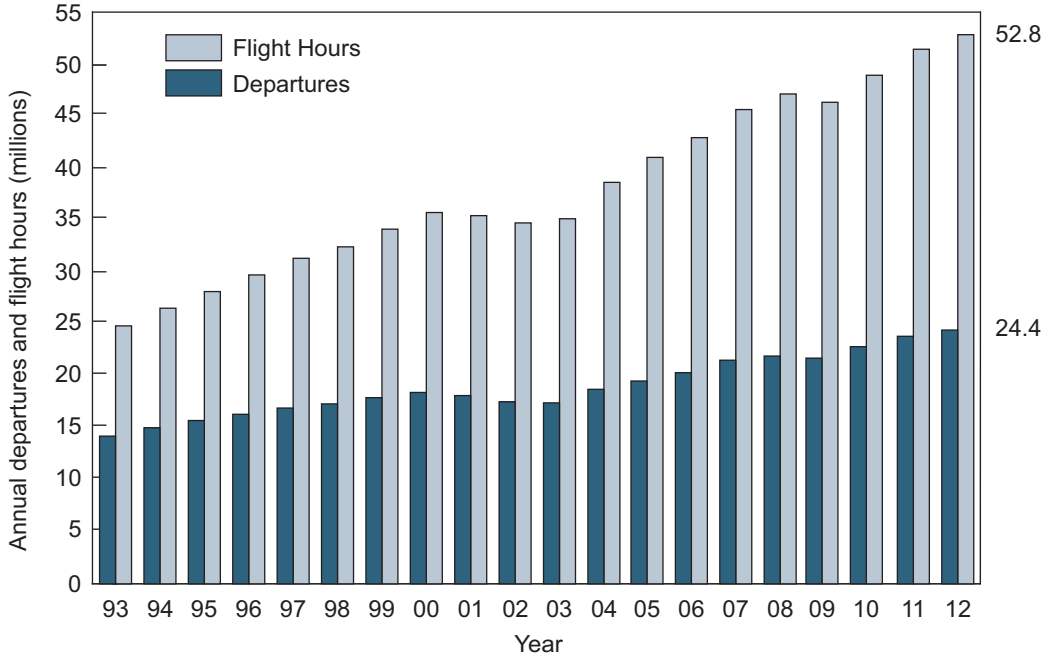
2012 Airplane Accidents

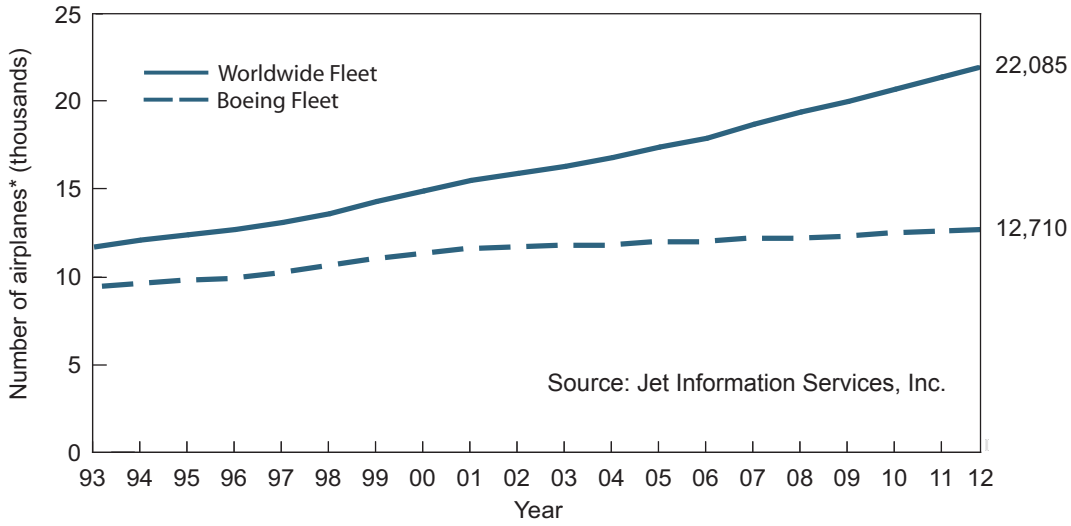
All Accidents – Worldwide Commercial Jet Fleet

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
14-Oct-12	Corendon Airlines	737-800 (3)	Sched Pax	Antalya, Turkey	Taxi	During pushback, the captain noticed smoke coming from the left side of the flight deck near the crew oxygen mask area. He ordered an immediate evacuation of the airplane. A fire ensued. There were a number of serious and minor injuries during the resulting evacuation.	Substantial	X	Serious		
16-Oct-12	Brit Air	CRJ 700 (10)	Sched Pax	Lorient, France	Landing	During landing on a wet runway with strong gusting winds, the airplane overran the end of the runway and came to rest in soft ground. There were no injuries.	Substantial				
19-Oct-12	Network Aviation	F-100 (19)	Charter Pax	Nifty, Australia	Landing	The airplane sustained a hard landing after encountering wind shear on final approach. There were no injuries.	Substantial				
1-Nov-12	Lion Air	737-400 (23)	Sched Pax	Pontianak, Indonesia	Landing	During landing roll, the airplane overran the runway end. Damage was sustained during the ensuing stop in soft ground. There were no injuries.	Substantial				
13-Nov-12	Global Aviation Leasing Ltd	MD-82 (22)	Sched Pax	Johannesburg, South Africa	Takeoff	The airplane sustained a tire burst during an aborted takeoff. Emergency services crews extinguished a resulting fire. There were no injuries.	Substantial				
16-Nov-12	European Air Transport	A300 (26)	Sched Cargo	Bratislava, Slovakia	Landing	During landing, the airplane sustained a nose landing gear collapse. There were no injuries.	Substantial	X			
25-Dec-12	Air Bagan	F-100 (19)	Sched Pax	(near) Heho, Myanmar	Final Approach	The airplane crashed short of the runway while on final approach. The airplane broke up and was consumed by fire.	Destroyed	X	Fatal	1/71(1)	X
30	Total Accidents							11		281 Onboard (25 External)	4

Departures, Flight Hours, and Jet Airplanes in Service*

Worldwide Operations – 1993 Through 2012





- 635 million departures since 1959 (470 million on Boeing airplanes)
- 1,148 million flight hours since 1959 (855 million on Boeing airplanes)

* 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.

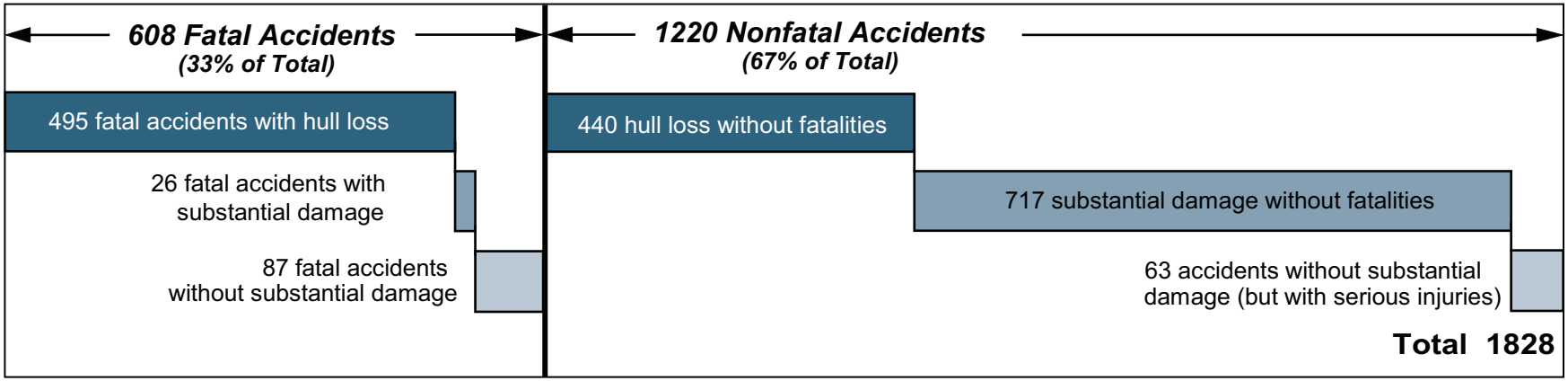
Accident Summary by Type of Operation
Worldwide Commercial Jet Fleet

Type of Operation	All Accidents		Fatal Accidents		Onboard Fatalities (External Fatalities)		Hull Loss Accidents	
	1959-2012	2003-2012	1959-2012	2003-2012	1959-2012	2003-2012	1959-2012	2003-2012
Passenger	1,450	323	487	59	28,834 (790)	4,210 (124)	688	123
— Scheduled	*1,331*	*298*	*441*	*56*	*24,708*	*4,194*	*619*	*116*
— Charter	*119*	*25*	*46*	*3*	*4,126*	*16*	*69*	*7*
Cargo	255	71	77	13	264 (342)	42 (15)	172	42
Maintenance test, ferry, positioning, training, and demonstration	123	13	44	3	208 (66)	17 (0)	75	8
Totals	1,828	407	608	75	29,306 (1,198)	4,269 (139)	935	173
U.S. and Canadian Operators	557	74	180	11	6,193 (381)	17 (8)	223	23
Rest of the world	1,271	333	428	64	23,113 (817)	4,252 (131)	712	150
Totals	1,828	407	608	75	29,306 (1,198)	4,269 (139)	935	173

Accident Summary by Injury and Damage

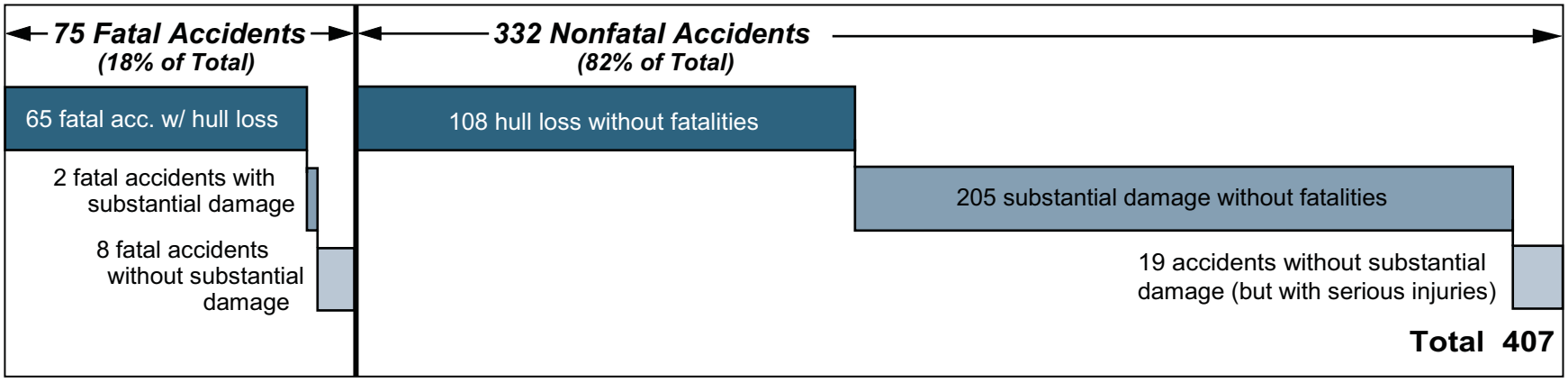
All Accidents – Worldwide Commercial Jet Fleet

1959 Through 2012



Number of Accidents

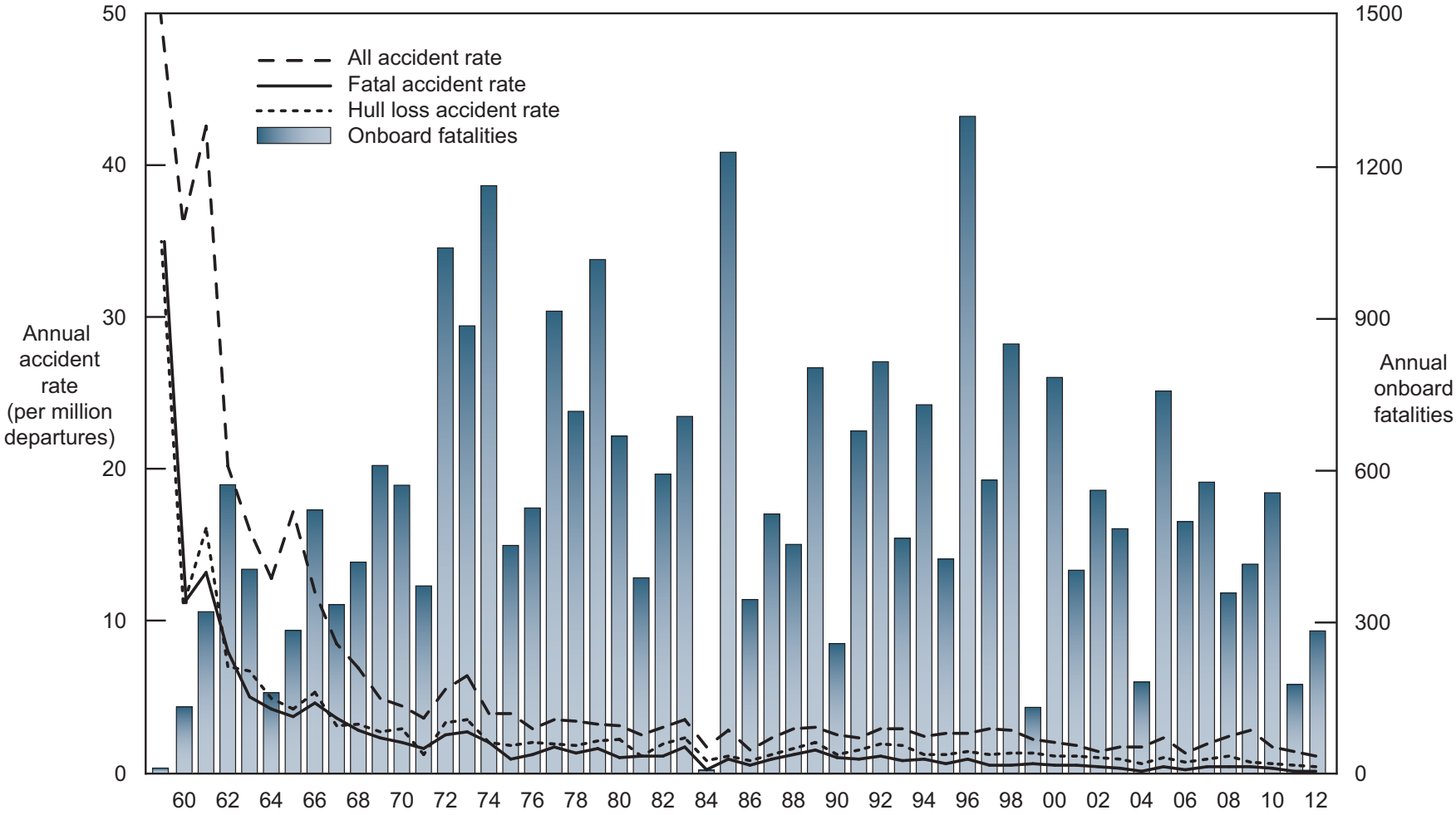
2003 Through 2012



Number of Accidents

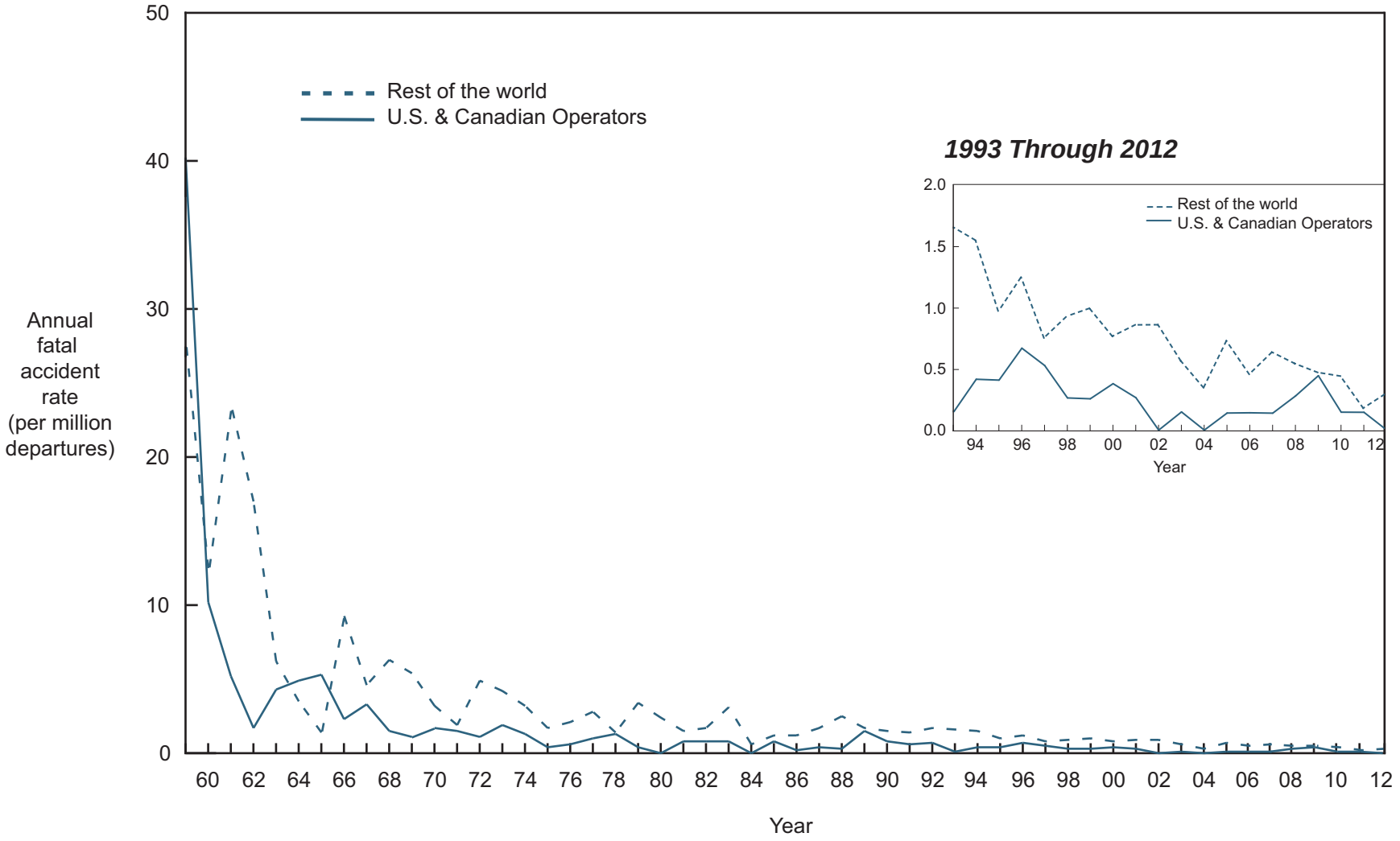
Accident Rates and Onboard Fatalities by Year

Worldwide Commercial Jet Fleet – 1959 Through 2012



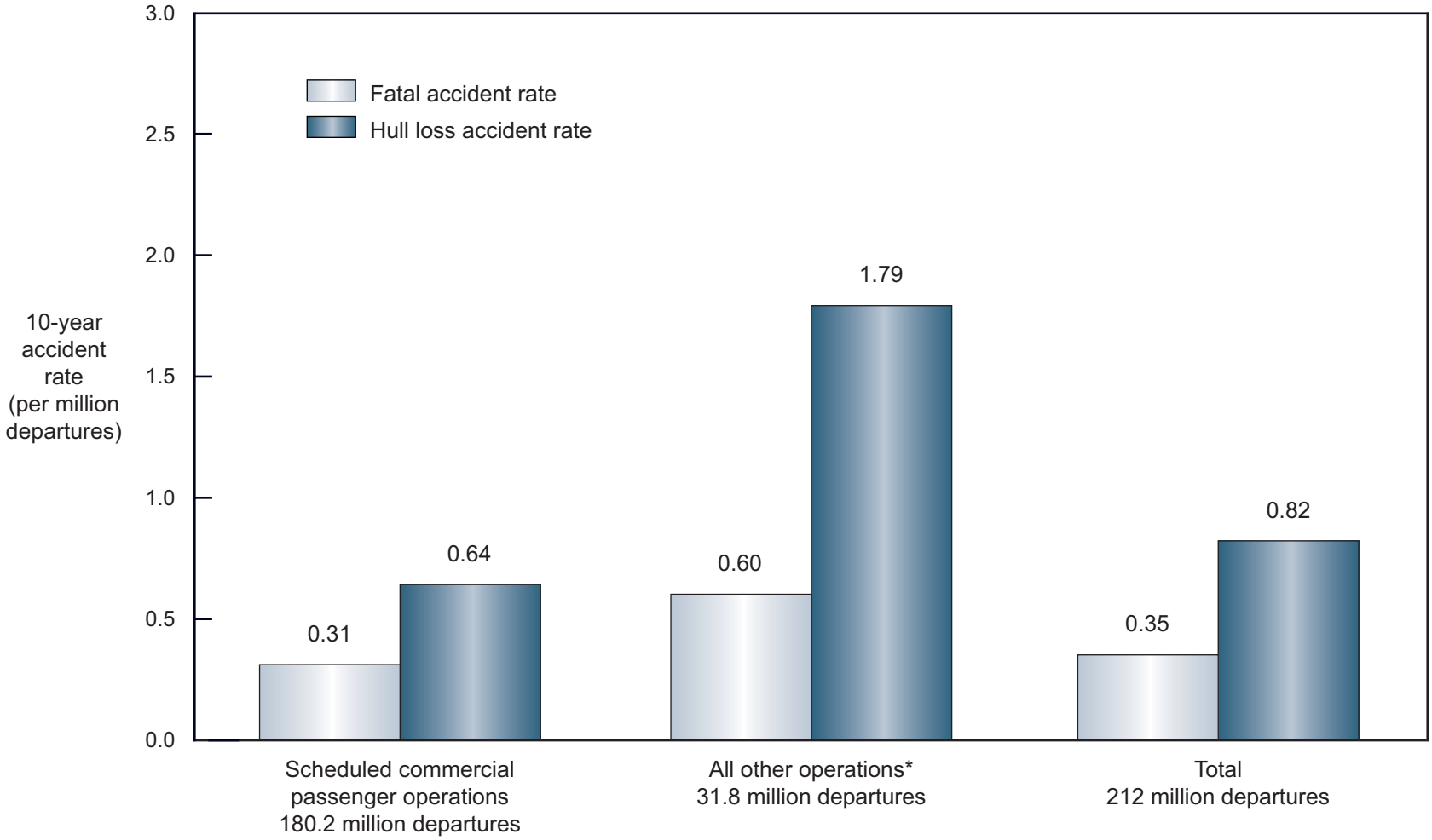
U.S. and Canadian Operators Accident Rates by Year

Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 Through 2012



10-Year Accident Rates by Type of Operation

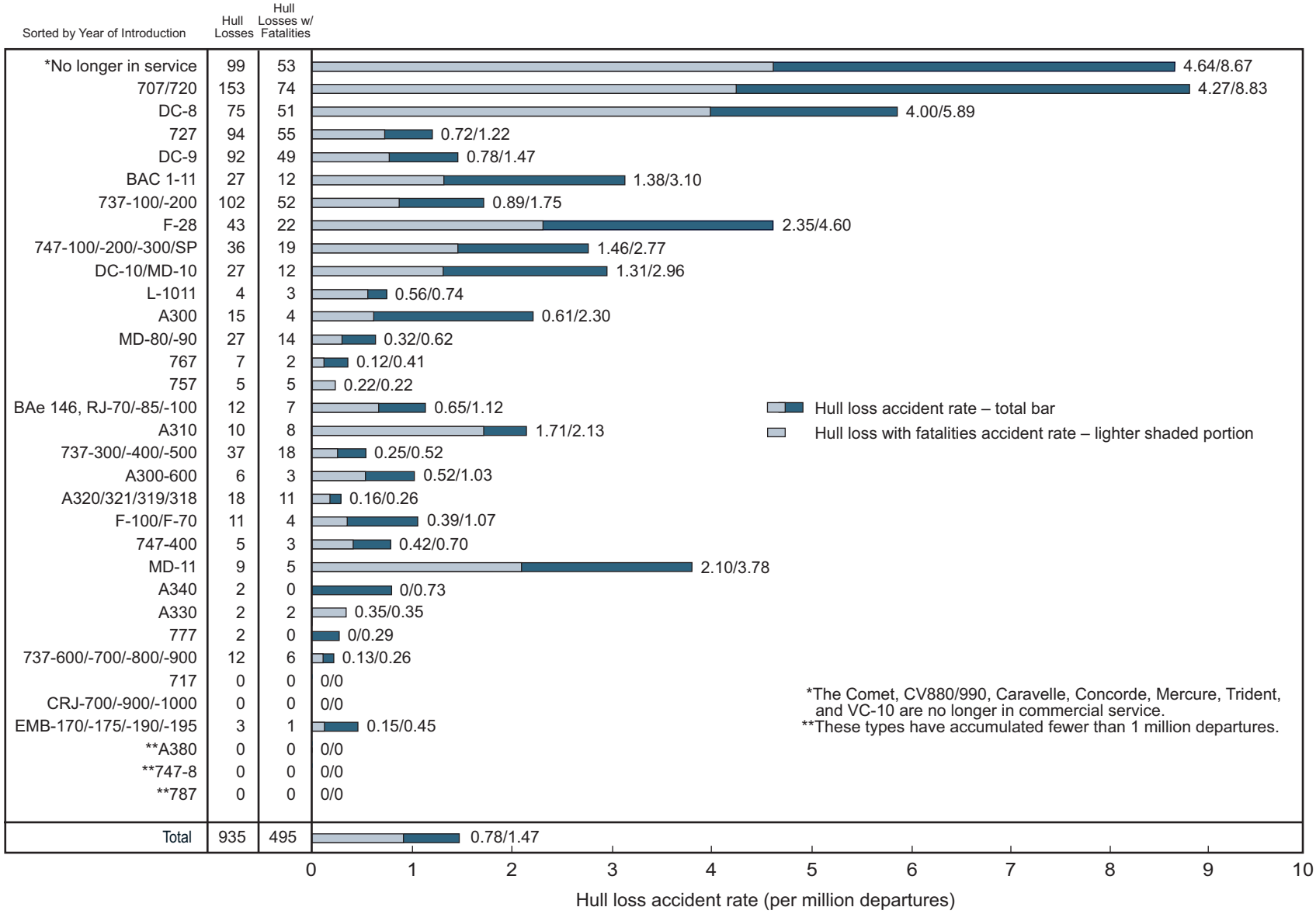
Fatal and Hull Loss Accidents – Worldwide Commercial Jet Fleet – 2003 Through 2012



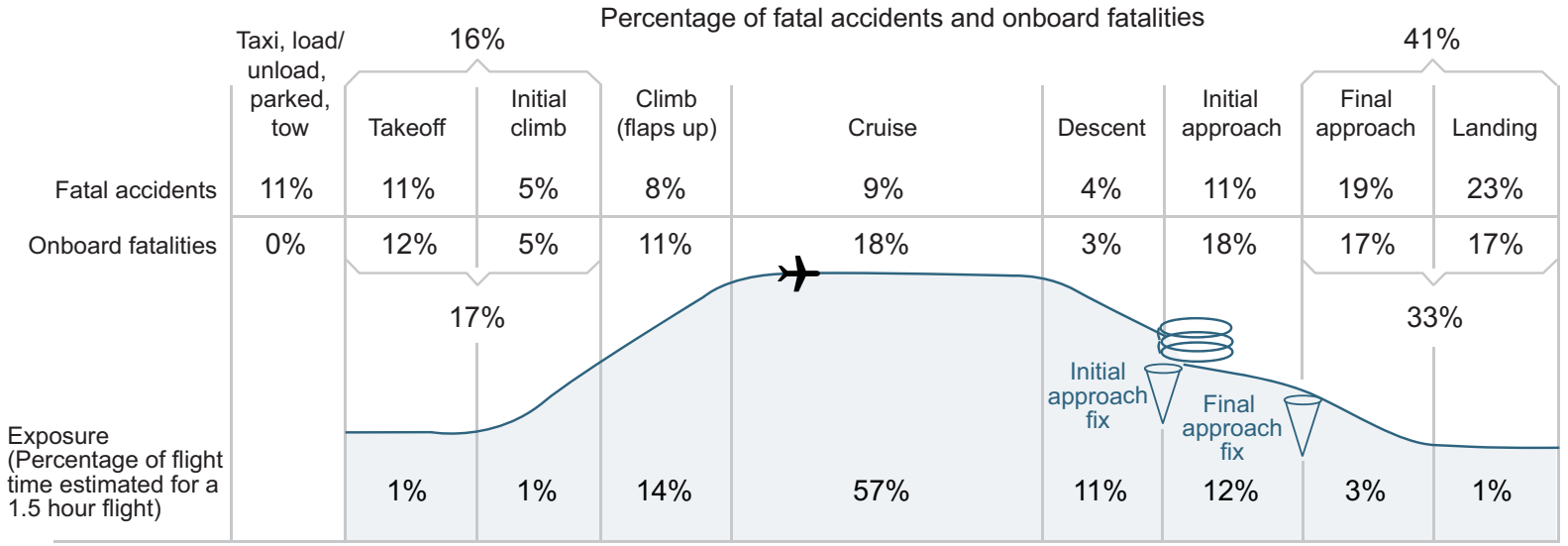
*Charter passenger, charter cargo, scheduled cargo, maintenance test, ferry, positioning, training, and demonstration flights

Accident Rates by Airplane Type

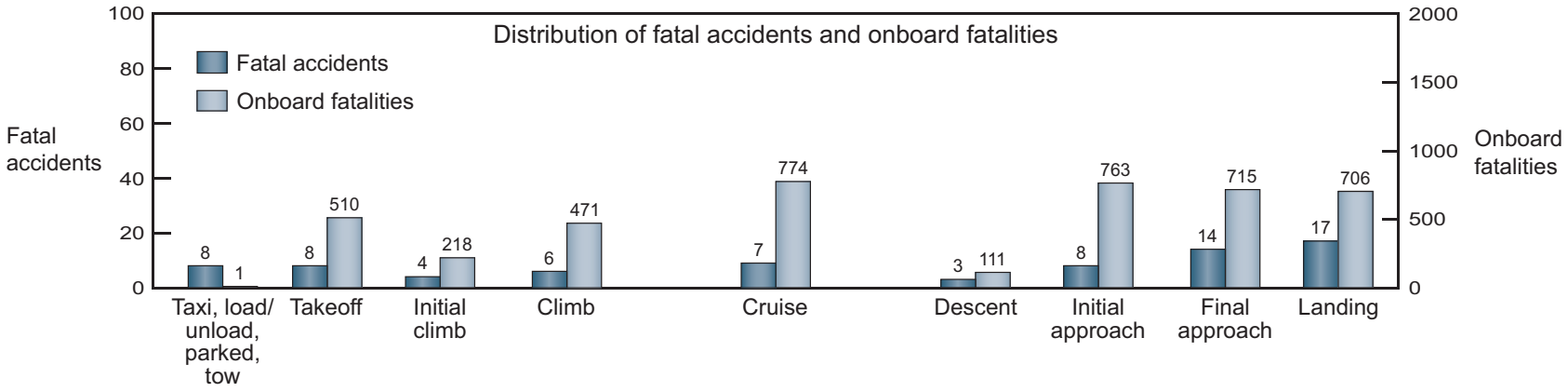
Hull Loss Accidents – Worldwide Commercial Jet Fleet – 1959 Through 2012



Fatal Accidents and Onboard Fatalities by Phase of Flight
Worldwide Commercial Jet Fleet – 2003 Through 2012



Note: Percentages may not sum precisely 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 a representative 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.

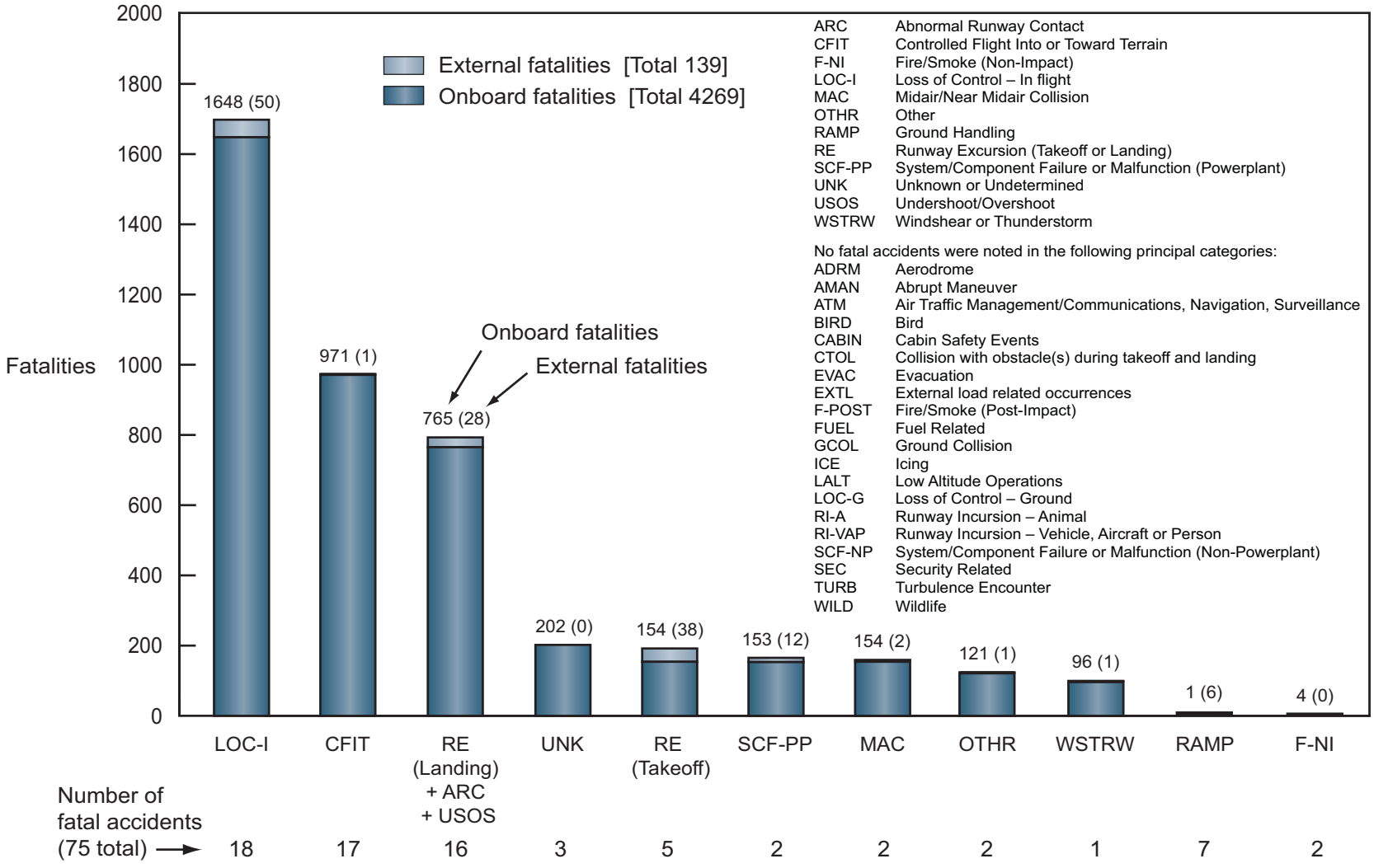
In a separate activity, the CAST assigned each fatal accident to a single principal category. Those accident assignments and a brief description of the categories are reported in the following chart.

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: http://www.intlaviationstandards.org/

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

Fatal Accidents – Worldwide Commercial Jet Fleet – 2003 Through 2012



Note: Principal categories as assigned by CAST.

For a complete description of CICTT Aviation Occurrence Categories, go to: http://www.intlaviationstandards.org/

Notes

This edition is dedicated to our friend and co-worker, Randy Elliott. Randy was instrumental in the production of this document for many years. He is and will be fondly remembered and sorely missed.

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