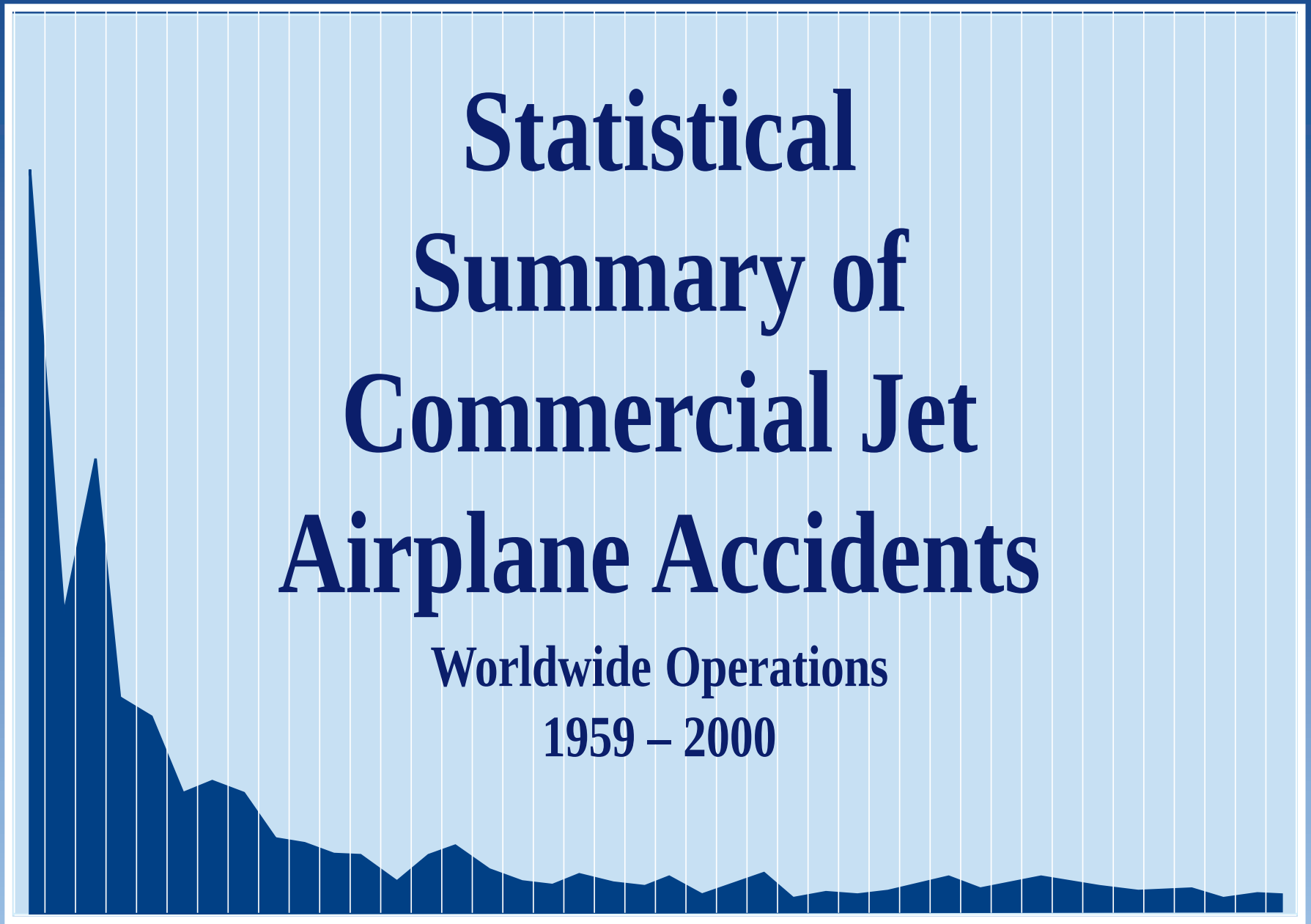
Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations
1959 – 2000



1959

2000

Contents

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Introduction

The accident statistics presented in this document apply to worldwide commercial jet airplanes that are heavier than 60,000 pounds maximum gross weight with the following exceptions:

- Airplanes manufactured in the Commonwealth of Independent States (CIS) (former Soviet Union) are excluded because of the lack of operational data.
- Commercial airplanes in military service are excluded.

The following airplane types are included:

717	DC-8	A300	BAe 146	F-28	Concorde	L-1011	BAC 1-11	Comet 4
707, 720	DC-9	A300-600	RJ-70/-85/-100	F-70				Trident
727	DC-10	A310		F-100				Caravelle
737	MD-11	A320, A319, A321						Mercure
747	MD-80/-90	A330						CV-880/-990
757		A340						VC-10
767								
777								

Airplane flight time and departures are primarily obtained from airplane and engine manufacturer compilations. Flight operations data for non-Boeing manufactured airplanes are augmented by the AirCraft Analytical System (ACAS) electronic database that is published by AvSoft, Limited, of Rugby, England.

Accident data are obtained, when available, from government accident reports. Otherwise, information is solicited from operators, manufacturers, various government and private information services, and press accounts. Definitions related to development of statistics in this book are primarily based on corresponding International Civil Aviation Organization (ICAO) terms as explained in the next section. Some variations to the ICAO definitions are applied to facilitate the purposes of this document.

Definitions

Events in this publication are classified according to the following definitions. These definitions are consistent with those of the National Transportation Safety Board (NTSB) and International Civil Aviation Organization (ICAO).

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:

- Airplane sustains substantial damage.
- Death or serious injury results from:
  - Being in or upon the airplane.
  - Direct contact with the airplane or anything attached thereto.
  - Direct exposure to jet blast.

Hull loss: Airplane damage that is substantial and is beyond economic repair. Hull loss also includes events in which:

- Airplane is missing.
- Search for the wreckage has been terminated without it being located.
- Airplane is substantially damaged and inaccessible.

Substantial damage: Damage or structural failure that adversely affects the structural strength, performance, or flight characteristics of the airplane and 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 aerodynamic fairings.
- Dents in the skin.
- Damage to landing gear.
- Damage to wheels.
- Damage to tires.
- Damage to flaps.

Fatal accident: An accident that results in fatal injury.

Fatal injury: An injury that results in death within 30 days as a result of the accident.

Definitions (continued)

Serious injury: An injury sustained in the accident that:

- Requires hospitalization for more than 48 hours that begins within 7 days of the date of injury.
- Results in a fracture of any bone (except simple fractures of fingers, toes, or nose).
- Produces lacerations that result in severe hemorrhage or nerve, muscle, or tendon damage.
- Involves injury to any internal organ.
- Involves second or third degree burns over 5 percent or more of the body.
- Involves verified exposure to infectious substance or injurious radiation.

Generation: Airplane types are classified by generation groups in order of introduction to service as follows:

First	**Second**	**Early Widebody**	**Current**
707, 720	727	747-100/-200/-300/SP	MD-80/-90
DC-8	BAC 1-11	DC-10	767
Comet 4	DC-9	L-1011	757
CV-880/-990	737-100/-200	A300	BAe 146
Caravelle	F-28		A310
Mercure	Trident		A300-600
	VC-10		737-300/-400/-500
			A320, A319, A321
			F-100
			F-70
			747-400
			MD-11
			A340
			A330
			777
			737-600/-700/-800
			717
			RJ-70/-85/-100

Terms and Exclusions

Regional identification: Events are identified by operators' national domicile and not by event location.

Airplane collisions: Events involving two or more airplanes are counted as separate events for each airplane. For example, total destruction of two airplanes in a collision is considered two separate hull loss accidents.

Accident Rates: In general, this expression is a measure of accidents per million departures. Departures (or flight cycles) are used as the basis for computing 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. 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.

Excluded accidents:

- Fatal and nonfatal injuries from natural causes.
- Fatal and nonfatal self-inflicted injuries

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- Fatal and nonfatal injuries of stowaways hiding outside the areas normally available to the passengers and crew.
- Experimental test flight accidents. (Maintenance test flights, ferry, positioning, training and demonstration flights are included.)
- Nonfatal injuries resulting from atmospheric turbulence, maneuvering, loose objects, boarding, disembarking, evacuation, and maintenance and servicing.
- Nonfatal injuries to persons not onboard the airplane.

Airplane Accidents

Worldwide Commercial Jet Fleet — 2000

Date	Airline	Airplane Type	Accident location	Hull loss	Fatalities	Phase	Description
30-Jan-00	Kenya Airways	A310	Abidjan, Ivory Coast	X	169	Climb	Crashed into ocean
31 Jan-00	Alaska Airlines	MD-80-83	Port Hueneme, CA, USA	X	88	Descent	Crashed into ocean
03-Feb-00	TransArabian Air Transport	707-300	Mwanza, Tanzania	X		Final Approach	Crashed short into lake
11-Feb-00	Air Afrique	A300-B4	Dakar, Senegal	X		Taxi	MLG collapse, engine damage, fire
12-Feb-00	Transafrik	727-100	Luanda, Angola	X		Landing	Wing struck ground
16-Feb-00	Emery Worldwide	DC-8-61	Sacramento, CA, USA	X	3	Initial Climb	Crashed after cargo shifted aft
22-Feb-00	Egyptair	767-300	Harare, Zimbabwe			Landing	Hard landing engine separation
26-Feb-00	Iran Air	747-200BPC	Jeddah, Saudi Arabia			Taxi	Airplane hit tow tug
27-Feb-00	Transbrasil	737-400	Porto Alegre, Brazil			Landing	Veered off in heavy rain
01-Mar-00	South African Airways	A320	Lusaka, Zambia			Landing	Veered off runway
05-Mar-00	Southwest Airlines	737-300	Burbank, CA, USA	X		Landing	Skidded off end of runway
19-Mar-00	Aero Continente	727-100	Tacna, Peru			Landing	Partial gear up landing
01-Apr-00	Continental Micronesia	727-200	Yap, Caroline Island			Landing	Departed Runway, MLG collapsed
19-Apr-00	Air Philippines	737-200	Davao, Philippines	X	131	Final Approach	Crashed into hill 7 miles short
22-Apr-00	Turkish Airlines	RJ-70	Siirt, Turkey	X		Landing	Landing overrun
22-Apr-00	QANTAS	747-300	Rome, Italy			Taxi	MLG collapsed. Outer cylinder fractured
30-Apr-00	DAS Air Cargo	DC-10-30	Entebbe, Uganda	X		Landing	Landing overrun
25-May-00	Air Liberte	MD-80-83	Paris, France		1	Takeoff	Runway collision with Shorts 330
07-Jun-00	Varig Airlines	767-200	Sao Paulo, Brazil			Takeoff	RTO - engine fire
26-Jun-00	Yemenia	737-200C	Khartoum, Sudan	X		Landing	Skidded off runway - weather
12-Jul-00	Hapag Lloyd	A310	Vienna, Austria	X		Landing	Fuel exhaustion, landed short
17-Jul-00	Alliance Air	737-200	Patna, India	X	52	Final Approach	Crash 2 km short of runway
25-Jul-00	Air France	Concorde	Paris, France	X	113	Initial Climb	Crashed after takeoff
08-Aug-00	Airtran Airlines	DC-9-32	Greensboro, NC, USA			Climb	Bulkhead electrical fire
23-Aug-00	Gulfair	A320	Manama, Bahrain	X	143	Final Approach	Crashed into sea
21-Sep-00	Republic of Togo	707-300B	Niamey, Niger	X		Initial Approach	Destroyed by fire after landing
06-Oct-00	Aeromexico	DC-9-31	Reynosa, Mexico	X	92	Landing	Landing overrun
31-Oct-00	Singapore Airlines	747-400	Taipei, Taiwan	X	85	Takeoff	Takeoff on closed runway
05-Nov-00	Camaroon Airlines	747-200	Paris, France	X		Landing	Ran off runway
13-Nov-00	Ghana Airways	DC-9-51	Conakry, Guinea	X		Landing	Gear up landing
20-Nov-00	American Airlines	A300-600	Miami, FL, USA		1	Landing	F/A fell from door
24-Nov-00	Airtran Airlines	DC-9-32	Atlanta, GA, USA			Climb	Fire in forward cargo compartment
30-Nov-00	Futura International Airways	737-800	Shannon, Ireland			Landing	Hard landing - NLG
23-Dec-00	Hawaiian Air	DC-10-10	Papeete, Tahiti			Landing	Landing overrun into water
	34 Total Accidents			20	878		

Excluded Accidents

Accidents Occurring in 2000

Turbulence:

- Flight attendant injury – 15 events
- Passenger injury – 8 events

Pushback:

- Aircraft pushed into other aircraft – 3 events
- Aircraft pushed into jetway - 3 events

Hit by vehicle:

- Ground collision with tug - 1 event
- Ground collision with cargo container loader – 1 event
- Service truck struck aircraft – 2 events

Boarding:

- Passenger jumped out of door before arrival at gate - 1 event
- Evacuation slide injury - 2 events

Ground crew:

- Ground crew wedged between vehicle and airplane – 1 injury
- Catering lift hand injury - 1 event
- Jet blast damage - 2 events

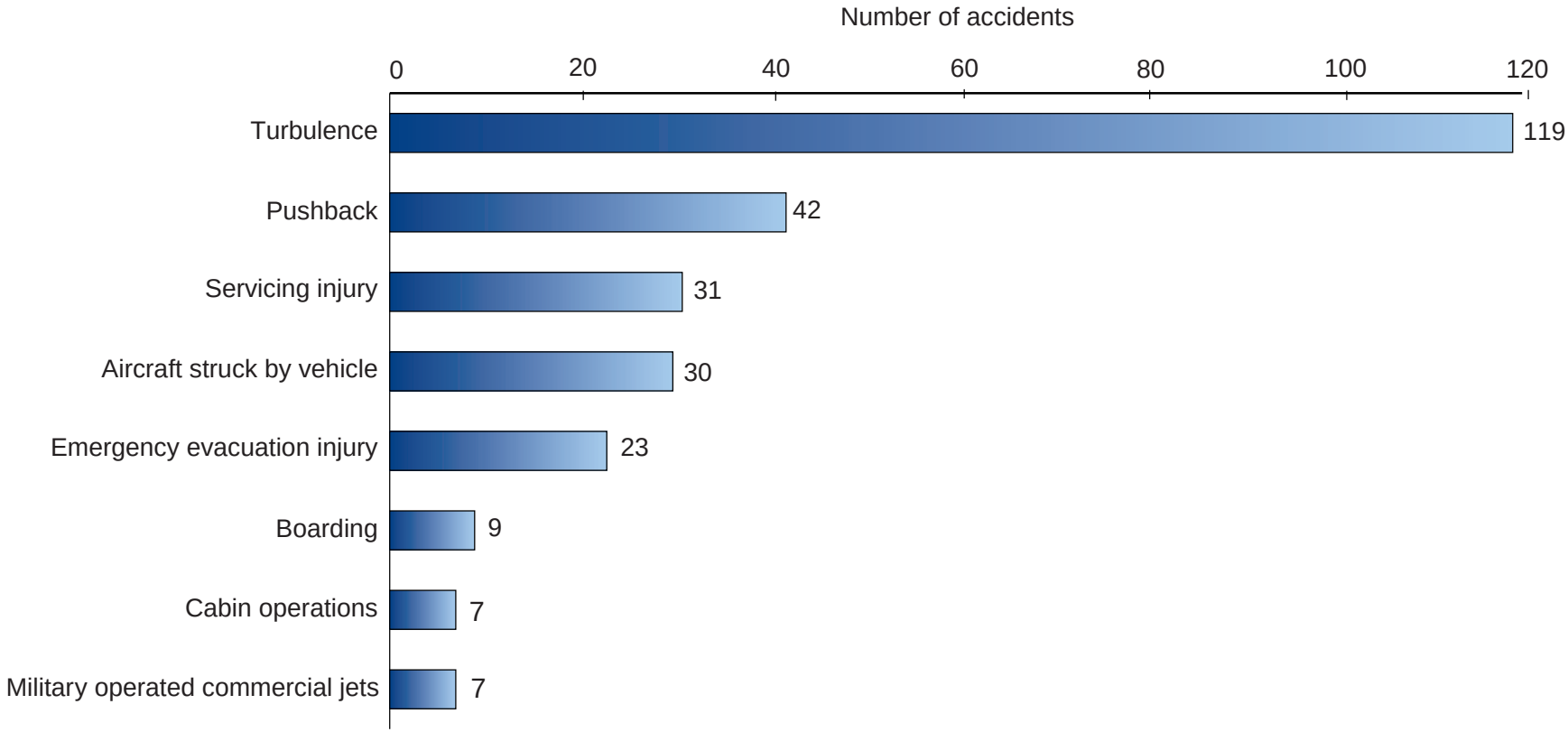
Cabin operation:

- Cart overturned - coffee spill - 1 event

Note: These events are excluded from the statistical analysis in the remainder of the document and may not be a complete listing due to incomplete reporting.

Excluded Accidents

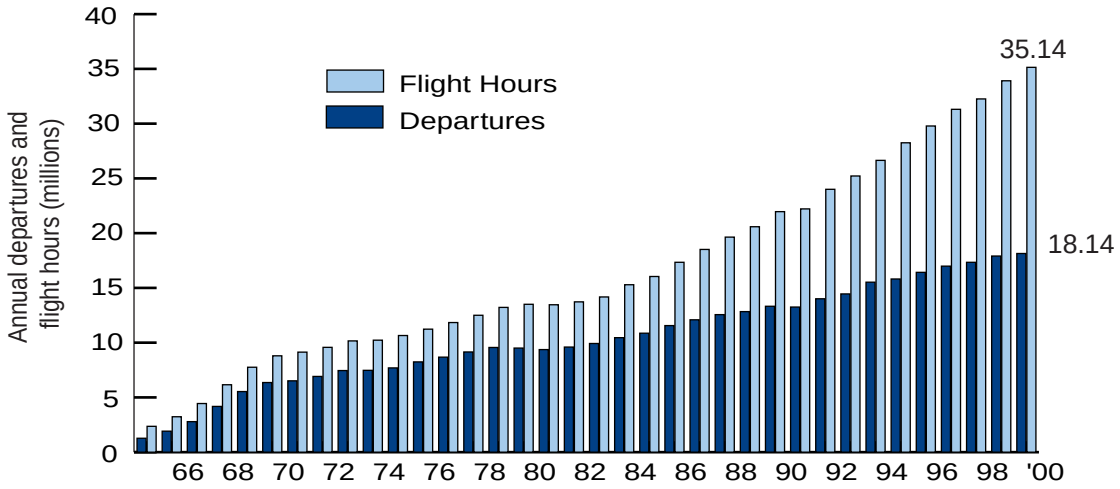
Accidents Occurring From 1991 through 2000

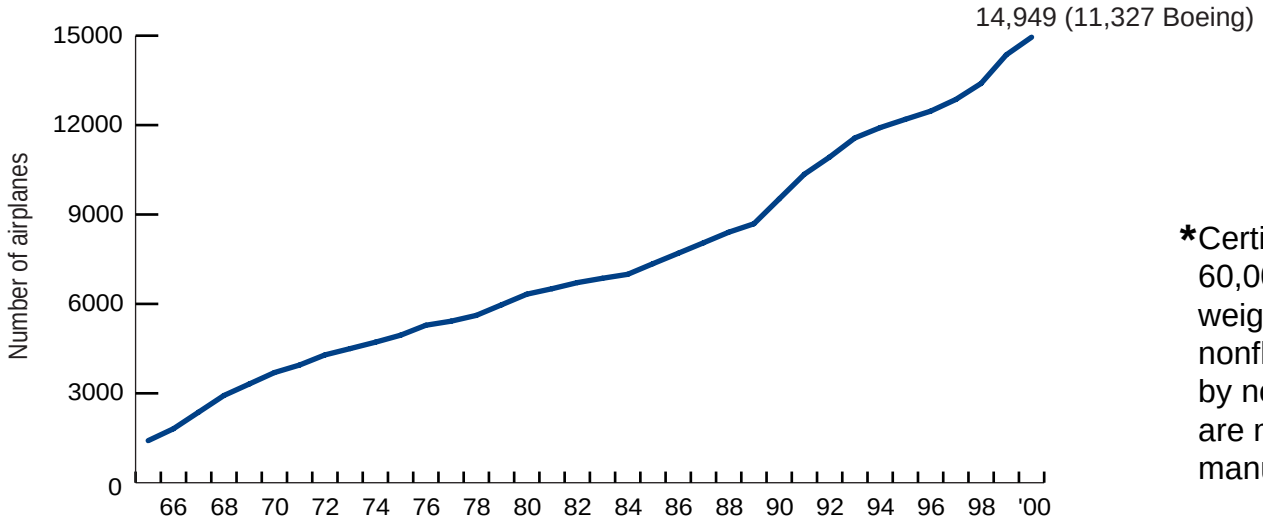


Note: Sabotage, hijacking, terrorism, or military action events are not considered accidents and are not listed in this table.

Departures, Flight Hours, and Jet Airplanes in Service*

Worldwide Operations 1965 to 2000





- 378.6 million cumulative departures (316.9 million on Boeing airplanes)
- 610.5 million cumulative flight-hours (520.1 million on Boeing airplanes)
- 7 manufacturers – 33 significant types (13 Boeing) in service as of 12/31/2000

*Certified jet airplanes greater than 60,000 pounds maximum gross weight, including those in temporary nonflying status and those in use by non-airline operators. Excluded are military airplanes and CIS-manufactured airplanes.

Accident Summary by Type of Operation

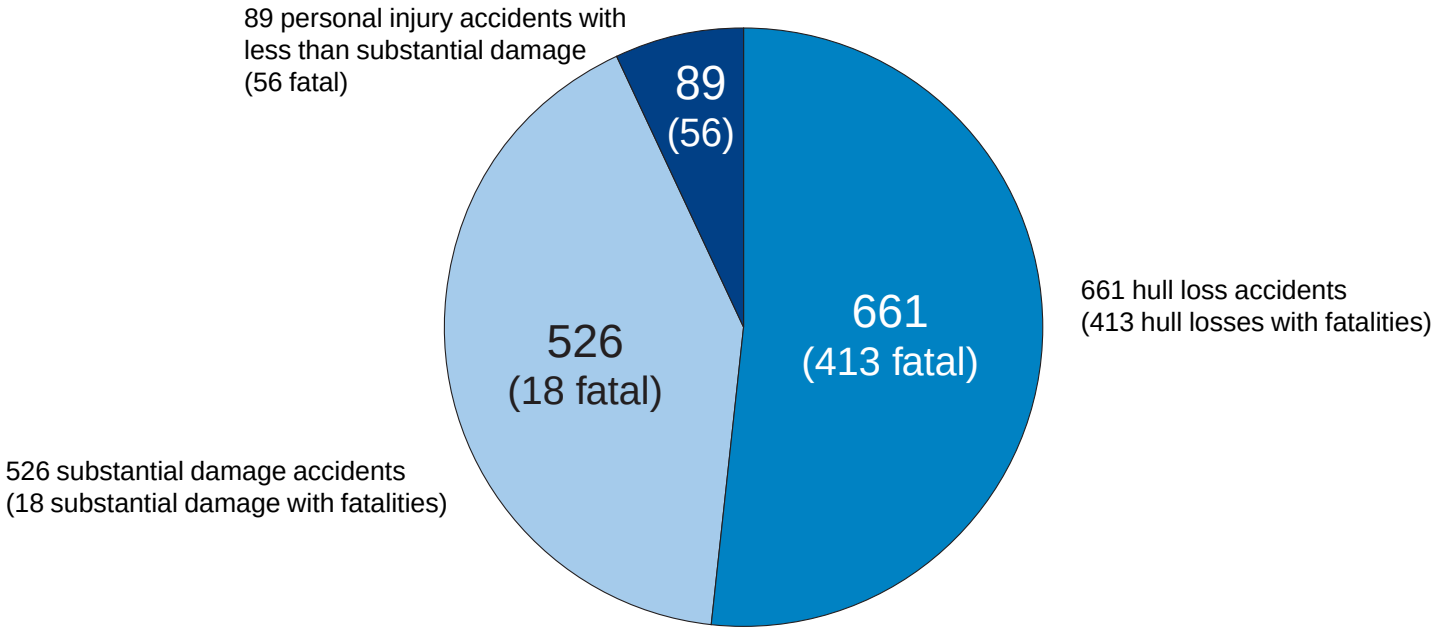
Worldwide Commercial Jet Fleet

Type of operation	All accidents		Hull loss and/or fatal accidents		Onboard fatalities	
	1959-2000	1991-2000	1959-2000	1991-2000	1959-2000	1991-2000
Passenger	1,015	302	564	171	23,995	6,981
Cargo	159	74	111	54	212	63
Ferry, test, training, and demonstration	102	15	60	10	189	34
Totals	1,276	391	735	235	24,396	7,078
U.S.A. and Canadian operators	434	90	213	47	5,819	1,131
Rest of the world	842	301	522	188	18,577	5,947
Totals	1,276	391	735	235	24,396	7,078

Accident Summary by Damage and Injury

All Accidents — Worldwide Commercial Jet Fleet — 1959 Through 2000

1,276 accidents worldwide

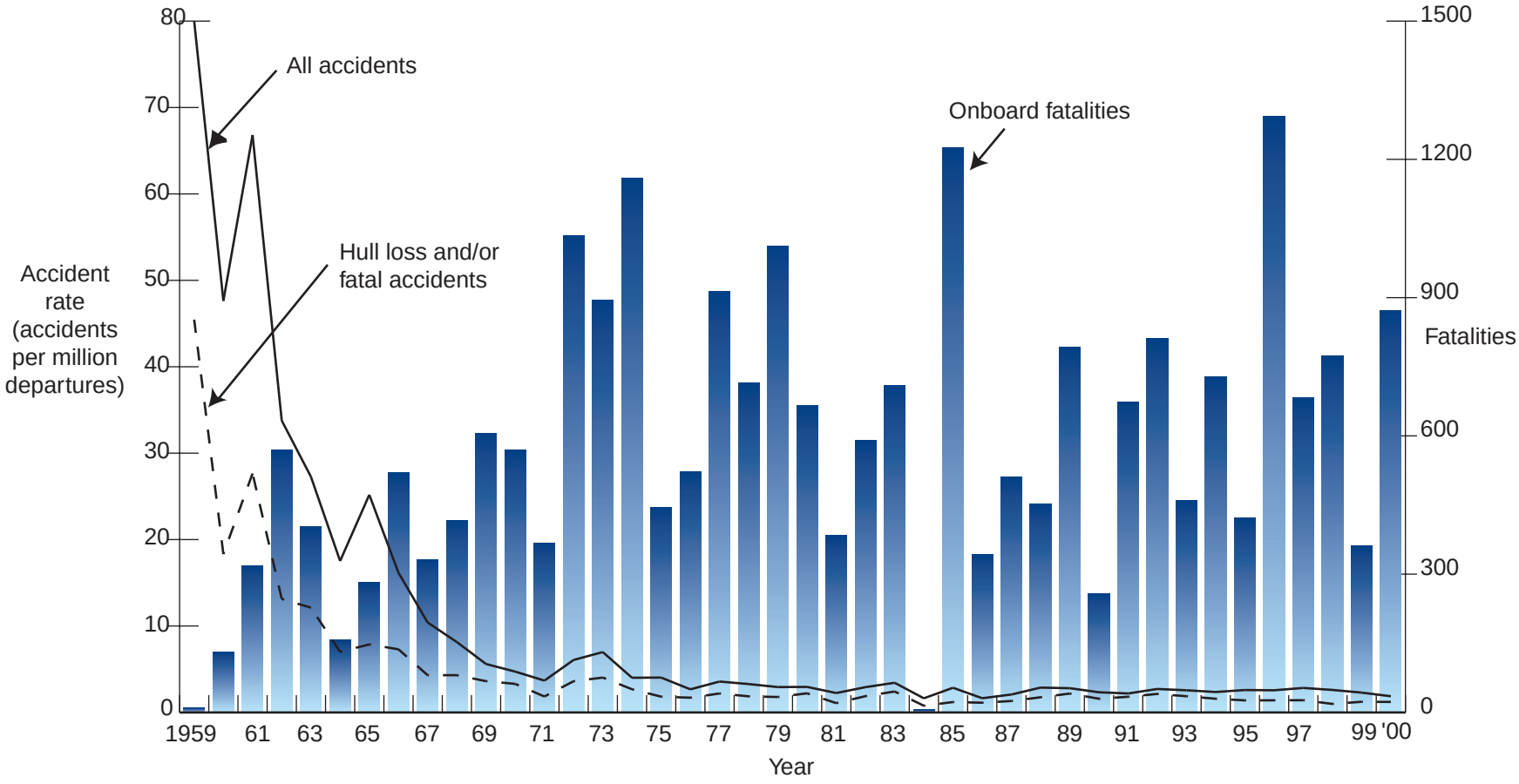


Excludes:

- Fatal injuries from natural causes or suicide.
- Experimental test flights.
- Military airplanes.
- Sabotage, hijacking, terrorism, or military action.
- Nonfatal injuries involving:
  - Atmospheric turbulence, maneuvering, or loose objects.
  - Boarding, disembarking, or evacuation.
  - Maintenance and servicing.
  - Persons not on board the airplane.

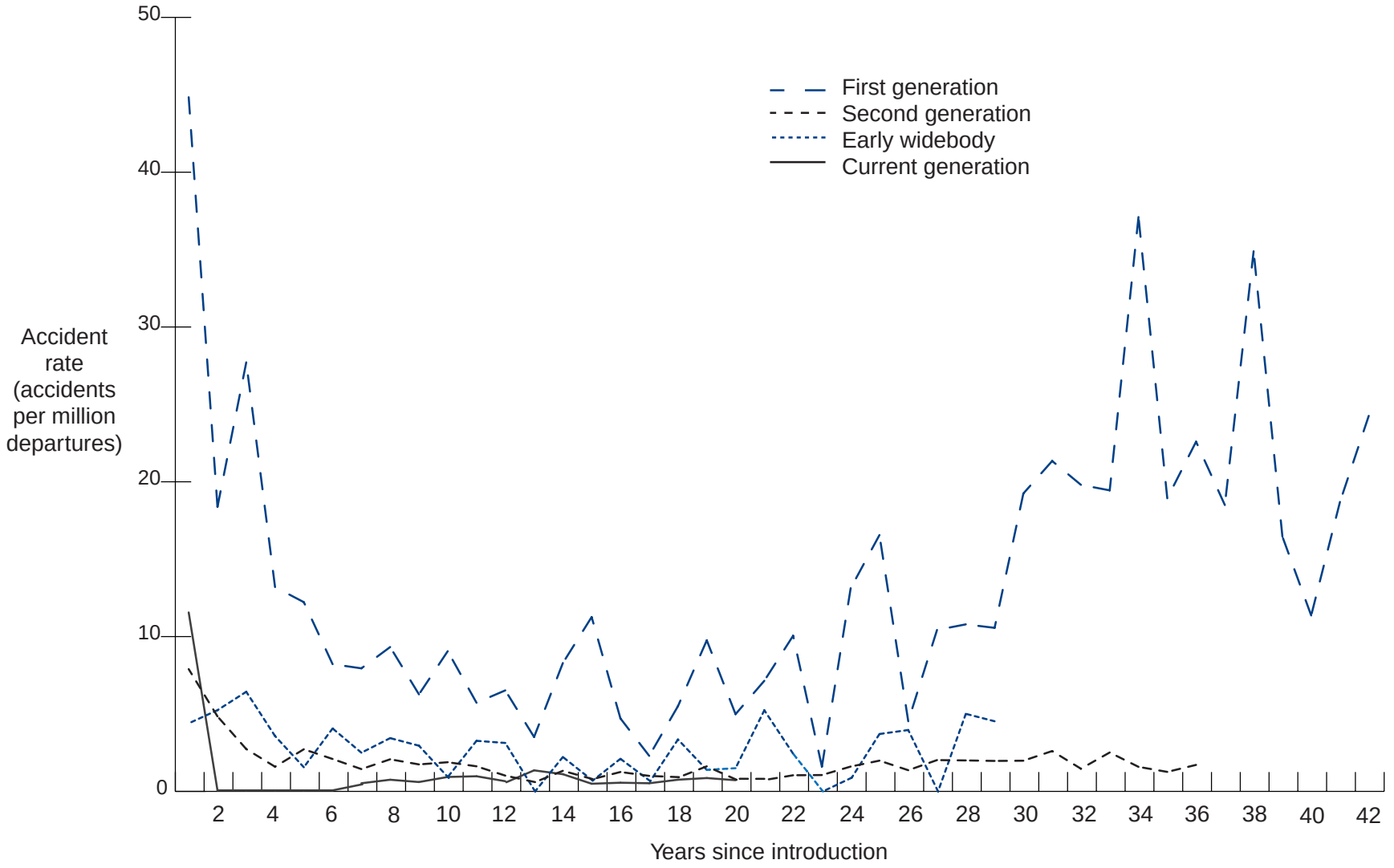
Accident Rates and Fatalities by Year

Worldwide Commercial Jet Fleet — 1959 Through 2000



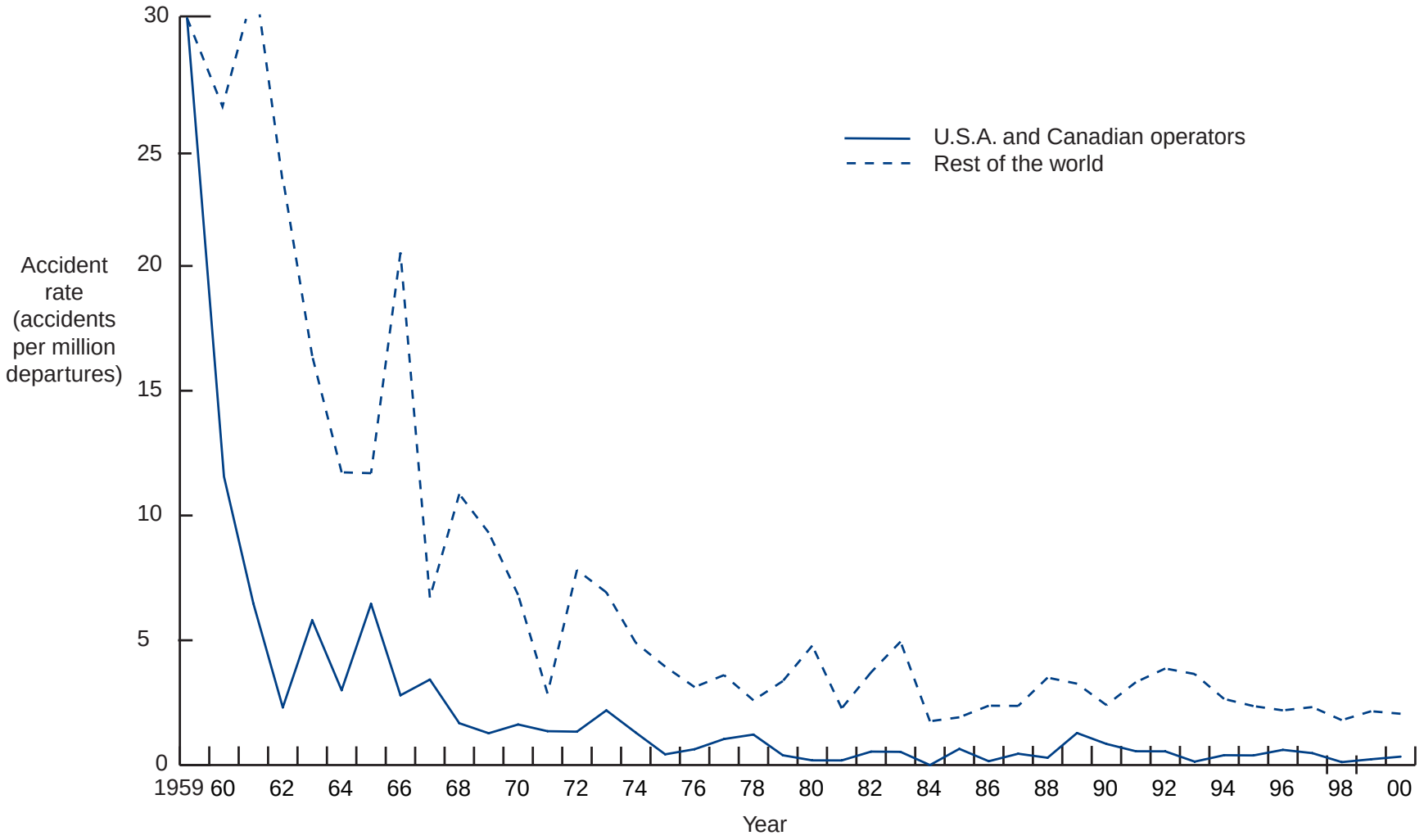
Accident Rates by Years Following Introduction

Hull Loss and/or Fatal Accidents – Worldwide Commercial Fleet – 1959 Through 2000



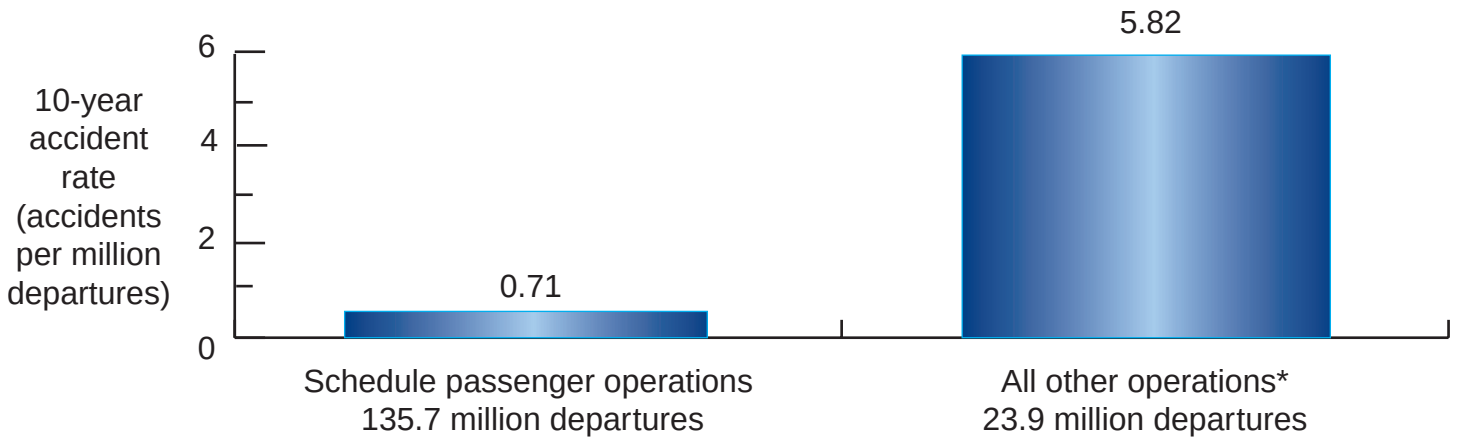
U.S.A. and Canadian Operators Accident Rates

Hull Loss and/or Fatal Accidents — Worldwide Commercial Jet Fleet — 1959 Through 2000



Accident Rates by Type of Operation

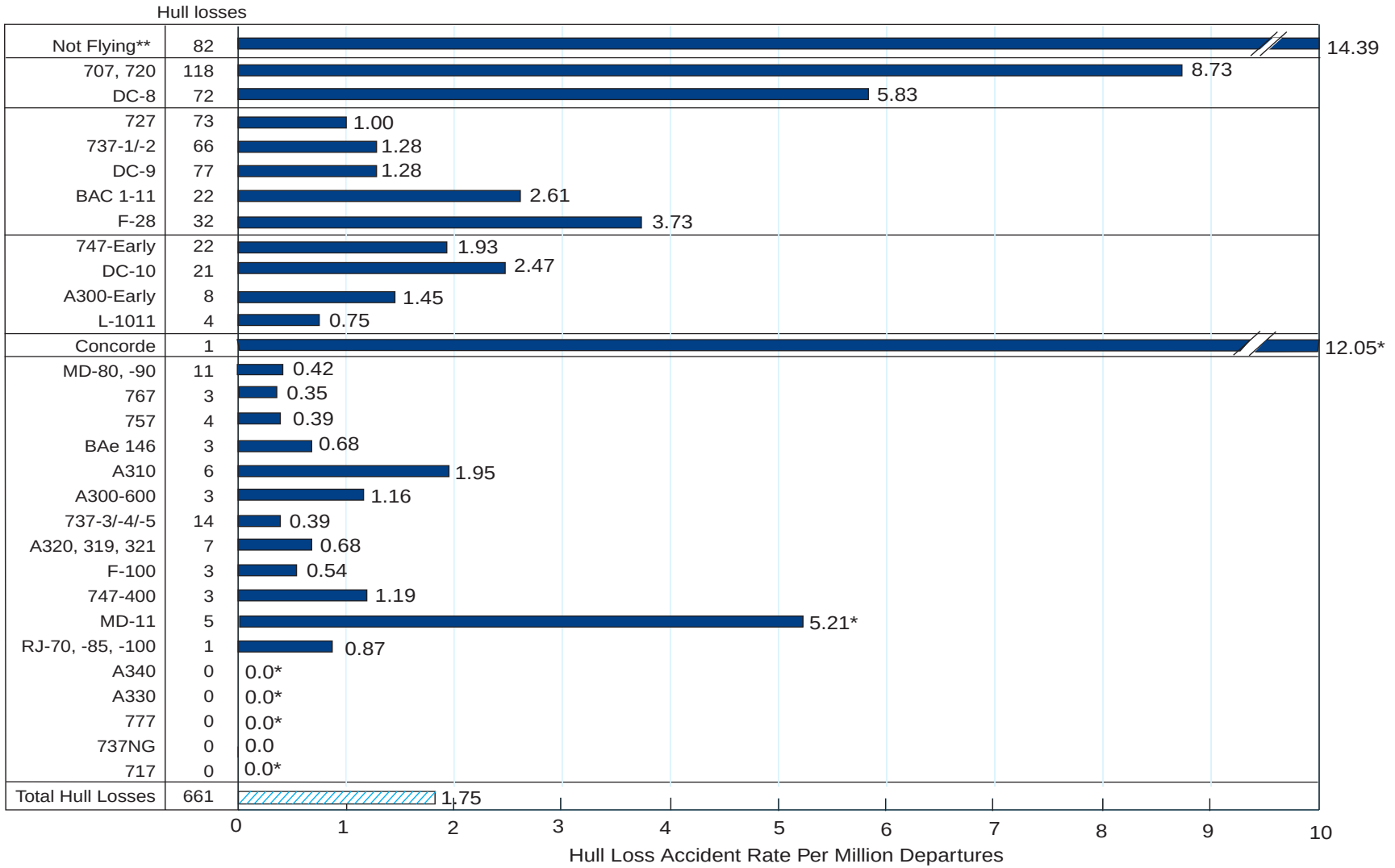
Hull Loss and/or Fatal Accidents — Worldwide Commercial Jet Fleet — 1991 Through 2000



*Unscheduled passenger and charter, cargo, ferry, test, training, and demonstration.

Accident Rates by Airplane Type

Hull Loss Accidents — Worldwide Commercial Jet Fleet — 1959 Through 2000



** The Comet, CV-880/-990, Caravelle, Mercure, Trident & VC-10 are no longer in commercial service, and are combined in the “Not Flying” bar.
* These types have accumulated fewer than 1 million departures.

Accident Categories by Airplane Generation

All Accidents — Worldwide Commercial Jet Operations — 1991 Through 2000

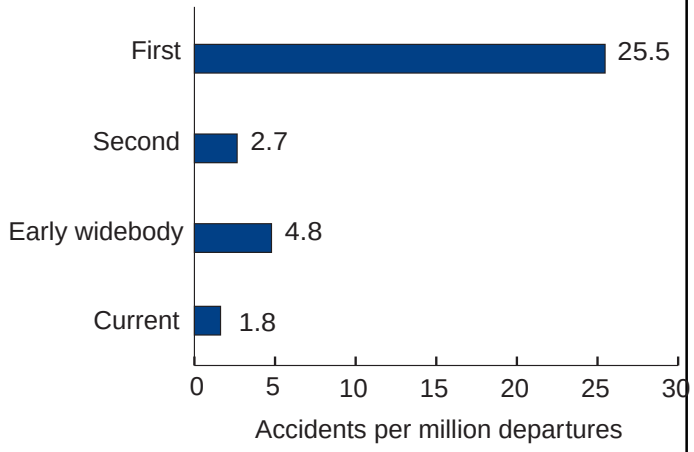
Generation	Controlled flight into terrain	Loss of control	Midair collision	In-flight fire	Fuel tank explosion	Off end on landing	Off side on landing	Hard landing	Landed short	Gear collapse/fail/up	Ice/snow	Fuel management/exhaustion	Windshear	Takeoff configuration	Refused takeoff - off end	Off side on takeoff	Runway incursion vehicle/people	Wing strike	Engine failure/separation	Ground collision	Ground crew injury	Boarding/deplaning	Turbulence fatality	Miscellaneous*	Fire on ground	Aircraft structure	Unknown	Total
	Landing																											
First	5	8		2		6	3	2	3	8		1		1	2	1		2	3					1	1		1	50
Second	17	10	1	4		16	21	14	9	10	1	3	1	1	6	1	1	1	2	2	2			2	2	2	3	132
Early widebody	3	2	1	1	1	4	3	5	1	4		1	1		3	3	1		4	3	2	1	1	2	3	2		52
Current	11	17		1		24	13	35	3	13	1		1	1	2	3	9		2	6	1	3	1	2	2	2	4	157
Total	36	37	2	8	1	50	40	56	16	35	2	5	3	3	13	8	11	3	11	11	5	4	2	7	8	6	8	391

Generation	
First	Comet 4, 707, 720, DC-8, CV-880/-990, Caravelle
Second	727, Trident, VC-10, BAC 1-11, DC-9, 737-100/-200, F-28
Early widebody	747-100/-200/-300/SP, DC-10, L-1011, A300
Current	MD-80/-90, 767, 757, A310, BAe 146, A300-600, 737-300/-400/-500, F-100, A320, A319, A321, 747-400, MD-11, RJ-70/-85/-100, A340, A330, 777, 737NG, 717

***Miscellaneous Accidents**

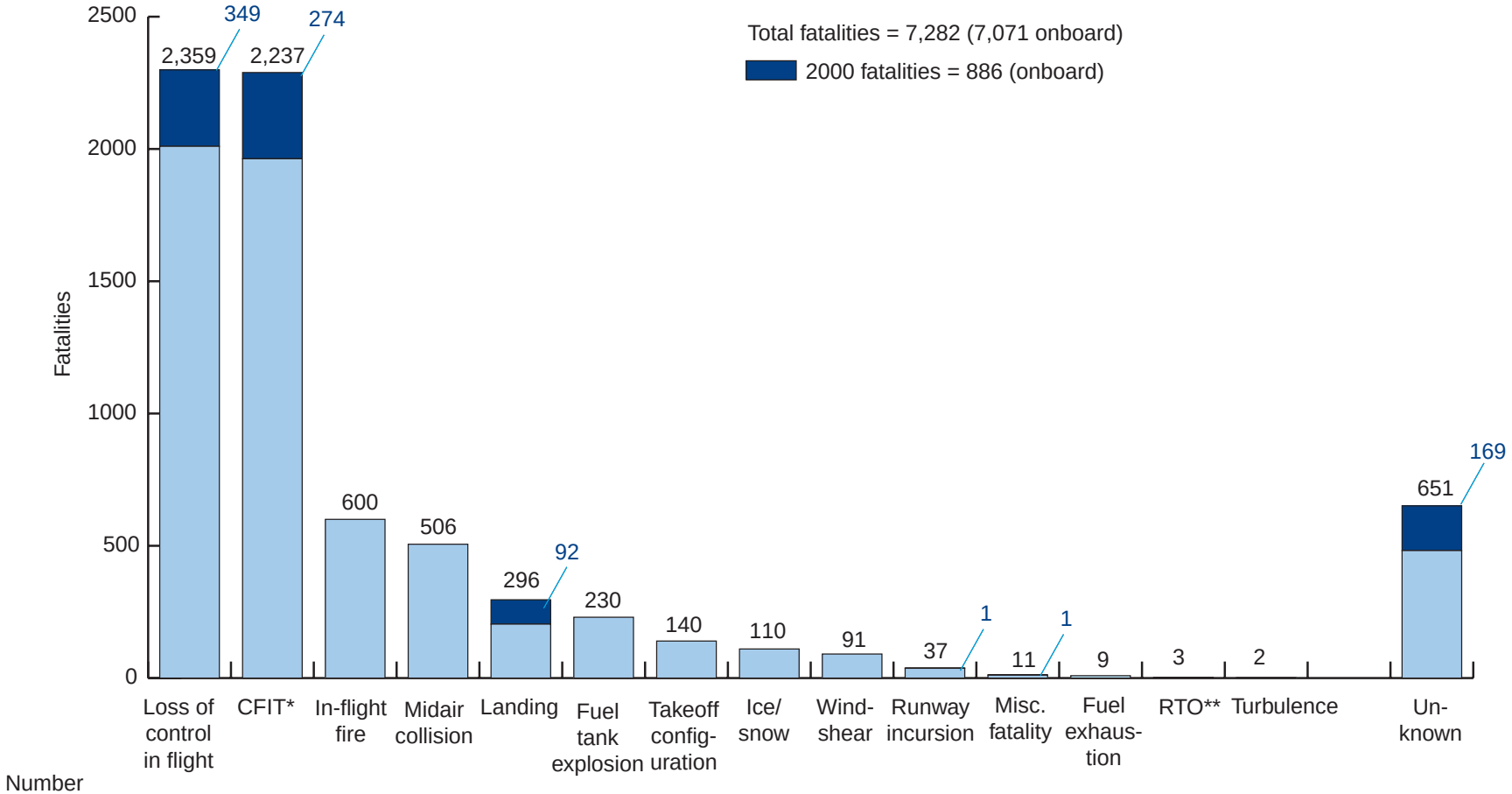
Coffee maker explosion	Jet blast	Tailstrike/RTO
Hail Damage	Pilot incapacitated	Taxied across ditch
Instrument Error		

10-Year Accident Rate



Fatalities by Accident Categories

Fatal Accidents — Worldwide Commercial Jet Fleet — 1991 Through 2000

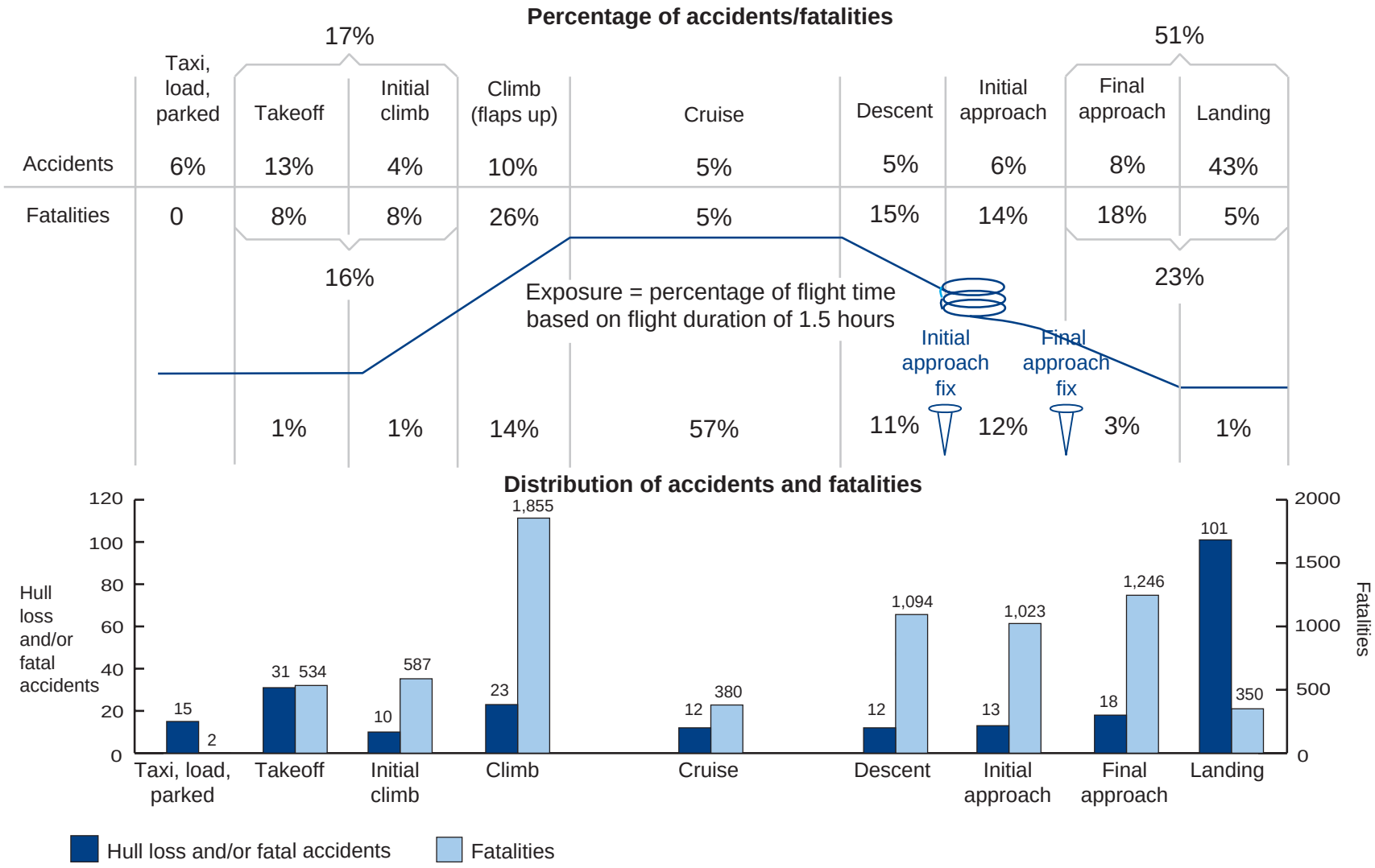


Note: Accidents involving multiple non-onboard fatalities are included.
Accidents involving single, non-onboard fatalities are excluded.

* CFIT Controlled flight into terrain
** RTO Refused takeoff

Accidents and Onboard Fatalities by Phase of Flight

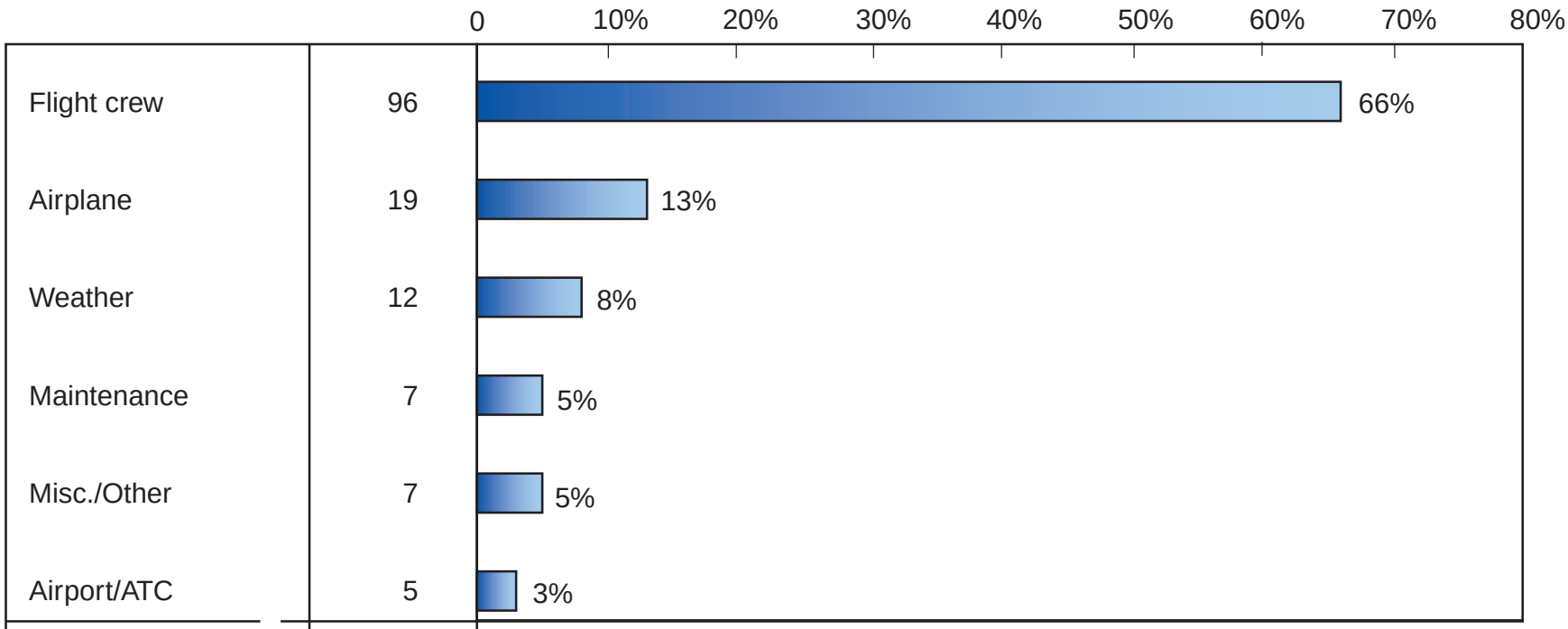
Hull Loss and/or Fatal Accidents — Worldwide Commercial Jet Fleet — 1991 through 2000



BOEING

Accidents by Primary Cause*

Hull Loss Accidents — Worldwide Commercial Jet Fleet — 1991 Through 2000



Flight crew	96
Airplane	19
Weather	12
Maintenance	7
Misc./Other	7
Airport/ATC	5
Total with known causes	146
Unknown or awaiting reports	65
Total	211

*As determined by the investigative authority.

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