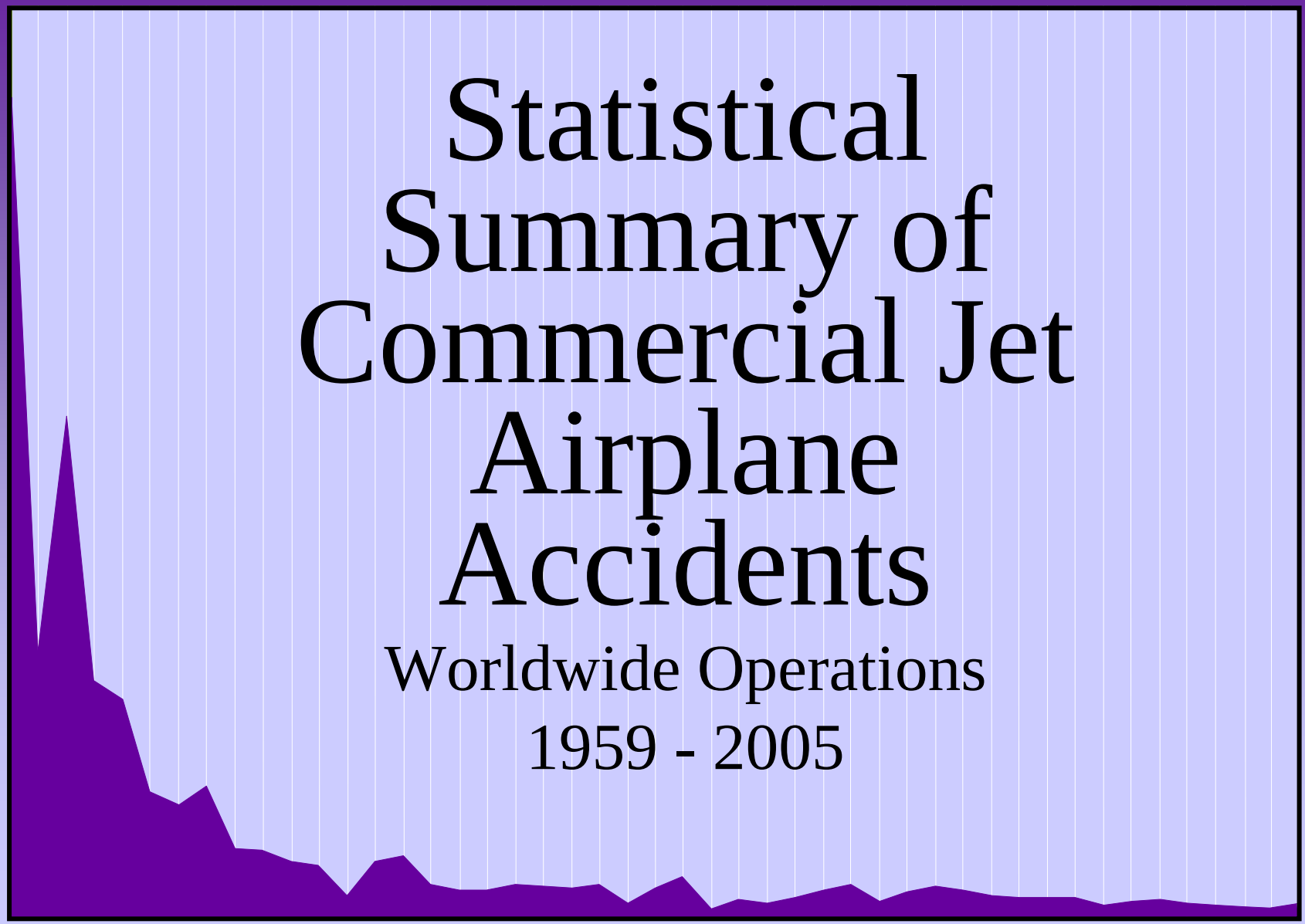
Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations
1959 - 2005



1959

2005

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. These statistics are presented in two distinct sections called; ***Statistical Accidents,*** which outlines hull loss, substantial damage, fatal injury and serious injury accidents; and ***Excluded Events***, outlining hostile actions, and non-hostile events.

Not covered in this document are airplanes manufactured in the Commonwealth of Independent States (CIS) (former Soviet Union), which are excluded because of the lack of operational data. Statistics on commercial airplanes operated in military service are not covered in this document; however, when a military-owned commercial jet transport type is used for civilian commercial service, those data are contained within this document.

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/MD-10	A310	CRJ-700/-900	F-100				Caravelle
737	MD-11	A320/319/321	EMB-170/-190					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 is augmented by the AirCraft Analytical System (ACAS) electronic database that is published by Flight Global, 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 the 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/MD-10	767
Comet 4*	DC-9	L-1011	757
CV-880/-990*	737-100/-200	A300	BAe 146, RJ-70/-85/-100
Caravelle*	F-28		A310
Mercure*	Trident*		A300-600
	VC-10*		737-300/-400/-500
			A320/319/321
			F-100
			F-70
			747-400
			MD-11
			A340
			A330
			777
			737-600/-700/-800/-900
			717
			CRJ-700/-900
			EMB-170/-190

* These types are no longer in significant commercial service.

Terms and Exclusions

Regional identification: Events are identified by the operator's national domicile and not by event location.

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 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 appear to vary between editions of this publication.

Excluded events:

- Fatal and nonfatal injuries from natural causes.
- Fatal and nonfatal self-inflicted injuries.
- 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 – 2005

Date	Airline	Airplane Type	Accident Location	Hull Loss	Fatalities	Phase	Description
03-Jan-05	Asia Airlines	737-200	Banda Aceh, Indonesia	X		Landing	Airplane struck water buffalo
08-Jan-05	Aero Republica	MD-80	Cali, Colombia	X		Landing	Landing overrun
12-Jan-05	Myanmar Airways	F-28	Myeik, Myanmar (Burma)			Landing	Nose landing gear collapse
18-Jan-05	Novair	A321	Sharm El-Sheikh, Egypt			Landing	Tailstrike
23-Jan-05	Spanair	MD-80	Asturias, Spain			Landing	Hard landing
24-Jan-05	Atlas Air	747-200F	Dusseldorf, Germany	X		Landing	Landing overrun in snowstorm
25-Jan-05	Republic of Yugoslavia	F-100	Podgorica, Yugoslavia			Landing	Veered off icy runway
01-Feb-05	Air France	A319	Paris, France		1	Parked	Cabin attendant fell
02-Feb-05	El Al Israel Airlines	747-200	Tel Aviv, Israel			Takeoff	Thrown tire tread after takeoff
03-Feb-05	Kam Air	737-200	Kabul, Afghanistan	X	104	Approach	Crashed into mountain
25-Feb-05	Syrianair	727-200	Kuwait City, Kuwait			Landing	Runway excursion
02-Mar-05	Continental Airlines	777-200	Newark, New Jersey, USA			Takeoff	Tailstrike
06-Mar-05	Delta Air Lines	757-200	Boston, Massachusetts, USA			Taxi	Flight attendant injured during taxi
07-Mar-05	Iraq Ministry of Defense	A310	Tehran, Iran			Landing	Veered off runway
19-Mar-05	Ethiopian Airlines	707-300F	Entebbe, Uganda	X		Landing	Landed short, crashed into lake
01-Apr-05	El Al Israel Airlines	737-800	Tel Aviv, Israel			Parked	Cabin attendant fell
07-Apr-05	ICARO	F-28	Coca, Ecuador	X		Landing	Hard landing short MLG collapse
14-Apr-05	Merpati Nusantara Airlines	737-200	Ujung, Pandang, Indonesia			Landing	Veered off runway
20-Apr-05	Iranian Air Force	707-300F	Tehran, Iran	X	3	Landing	Landing overrun into river
05-May-05	Northwest Airlines	DC-9	Minneapolis, Minnesota, USA	X		Parked	Airplane hit by fuel truck while parked
10-May-05	Northwest Airlines	DC-9	Minneapolis, Minnesota, USA	X		Taxi	Airplane collision during taxi
10-May-05	Northwest Airlines	A319	Minneapolis, Minnesota, USA			Parked	Struck by taxiing airplane
13-May-05	Delta Air Lines	MD-80	Denver, Colorado, USA			Climb	Air turn back - loss of pressurization
13-May-05	Lufthansa Cargo	747-200	Sharjah, United Arab Emirates			Landing	LH main gear partially retracted
22-May-05	Skyservice Airlines	767-300ER	Punta Cana, Dominican Republic			Landing	Hard derotation - skin wrinkling
26-May-05	Alitalia	MD-80	Prague, Czech Republic			Pushback	Failure of nose landing gear
31-May-05	Adam Air	737-400	Jakarta Soekarno, Indonesia			Landing	Right main landing gear collapsed
07-Jun-05	UPS	MD-11	Louisville, Kentucky, USA			Landing	Nose wheel separated
12-Jun-05	Chanchangi Airlines	727-200	Lagos, Nigeria			Landing	Off-runway excursion
19-Jun-05	Mahfooz Aviation	707-300	Addis Ababa, Ethiopia	X		Landing	Hard landing - MLG collapse
01-Jul-05	Biman Bangladesh Airlines	DC-10	Chittagong, Bangladesh	X		Landing	Veered off runway - MLG collapse
02-Aug-05	Air France	A340	Toronto, Canada	X		Landing	Runway overrun and burned
09-Aug-05	Saudia	MD-90	Cairo, Egypt			Landing	Engine fire on landing
14-Aug-05	Helios Airways	737-300	Grammatikos, Greece	X	121	Climb	Flight crew incapacitation
16-Aug-05	West Caribbean Airways	MD-82	Machiques, Venezuela	X	160	Cruise	Loss of control
19-Aug-05	Northwest Airlines	747-200	Agana, Guam	X		Landing	Landed with nose landing gear retracted
23-Aug-05	Tans	737-200	Pucallpa, Peru	X	45	Landing	Crashed while attempting to land
24-Aug-05	SAS	A340	Shanghai, China			Takeoff	Tailstrike on takeoff
05-Sep-05	Mandala Airlines	737-200	Medan, Indonesia	X	145	Takeoff	Crashed during takeoff
08-Sep-05	Saudia	747-300	Colombo, Sri Lanka		1	Taxi	Evacuation fatality and injuries
18-Sep-05	Spirit Airlines	A321	Ft. Lauderdale, Florida, USA			Landing	Tailstrike
09-Oct-05	Sahara India Airlines	737-400	Mumbai, India			Landing	Runway overrun
22-Oct-05	Bellview Airlines	737-200	Lagos, Nigeria	X	117	Climb	Crashed during climb
31-Oct-05	MIBA Aviation	727-100	Kindu, D. R. Congo	X		Landing	Landing overrun
14-Nov-05	Asian Spirit	BAe 146	Catarman, Philippines	X		Landing	Runway overrun
08-Dec-05	Southwest Airlines	737-700	Chicago, Illinois, USA		1	Landing	Runway overrun
10-Dec-05	Sosoliso Airlines	DC-9	Port Harcourt, Nigeria	X	107	Approach	Crashed during go-around
14-Dec-05	FedEx	727-200	Memphis, Tennessee, USA			Pushback	Airplane collision with tow tractor
23-Dec-05	Koda Air	707-300	Istanbul, Turkey	X		Parked	Airplane fire on ground
49	Totals			22	805		

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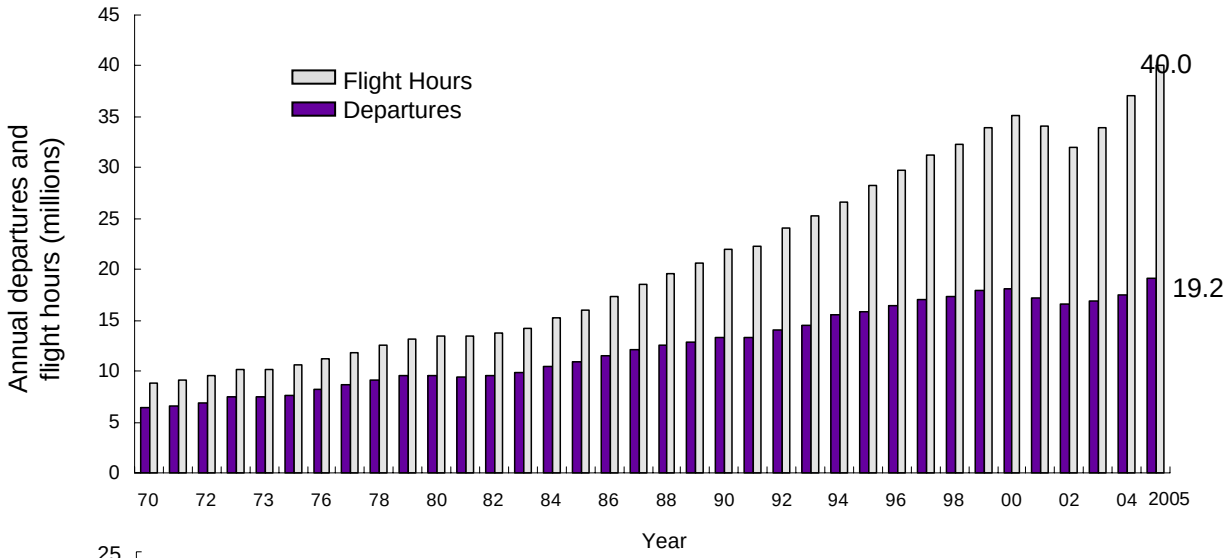
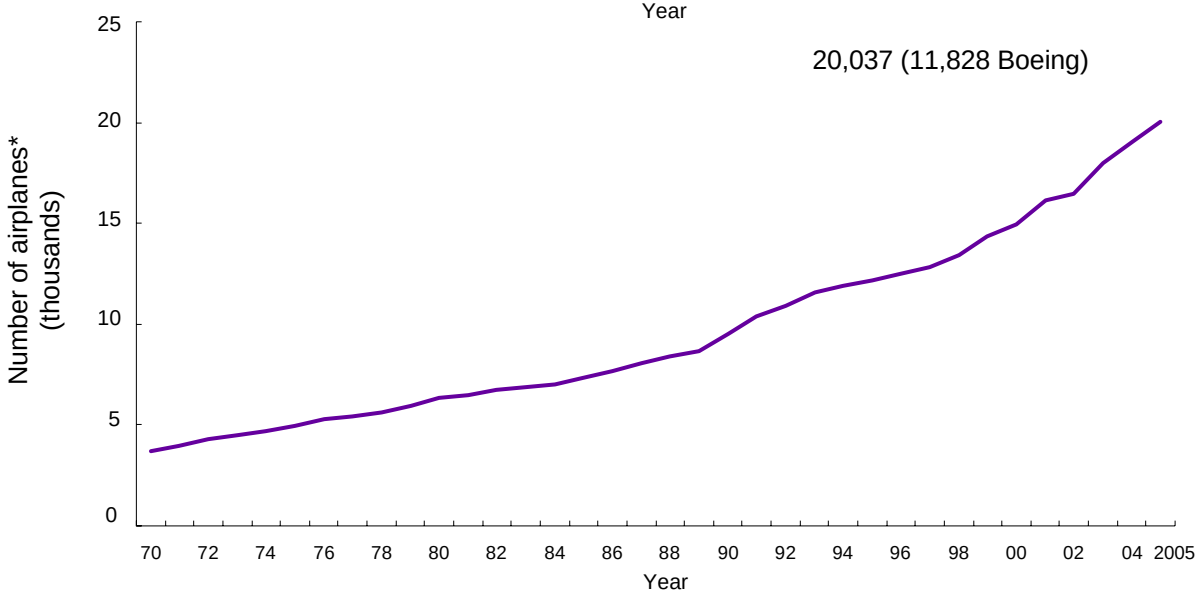
Departures, Flight Hours, and Jet Airplanes in Service*

Worldwide Operations Through 2005





- 492.2 million cumulative departures (406.2 million on Boeing airplanes)
- 846.9 million cumulative flight hours (706.5 million on Boeing airplanes)
- 7 manufacturers – 35 significant types (14 Boeing) in service as of 12/31/2005

*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- (Soviet Union) manufactured airplanes.

Accident Summary by Type of Operation

Worldwide Commercial Jet Fleet

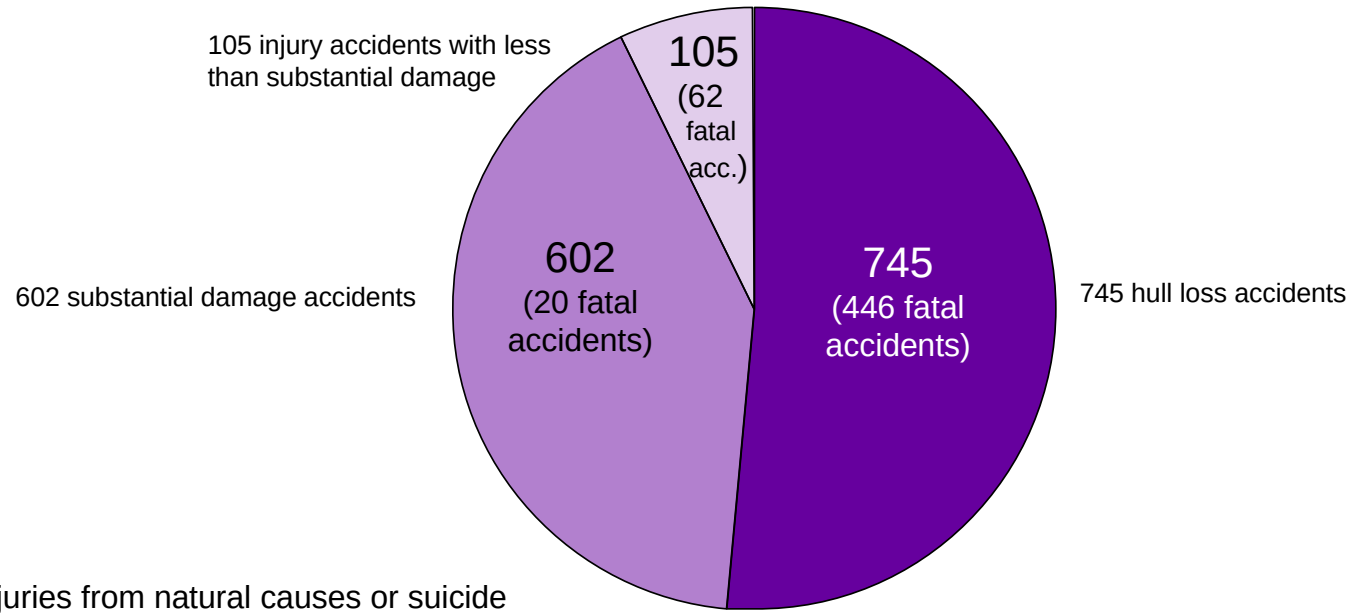
Type of operation	All Accidents		Hull loss and/or fatal accidents		Onboard fatalities	
	1959-2005	1996-2005	1959-2005	1996-2005	1956-2005	1996-2005
Passenger	1,146	296	627	142	26,004	5,900
Cargo	199	78	135	49	227	43
Ferry, test	105	11	63	8	189	14
Other*	2	0	2	0	11	0
Totals	1,452	385	827	199	26431	5,957
U.S.A. and Canadian operators	477	90	231	40	6,081	720
Rest of the world	975	295	596	159	20,350	5.237
Totals	1,452	385	827	199	26,431	5,957

*Military-owned commercial jet transport types used in civilian commercial service.

Accident Summary by Damage and Injury

All Accidents – Worldwide Commercial Jet Fleet –1959 through 2005

1,452 accidents worldwide

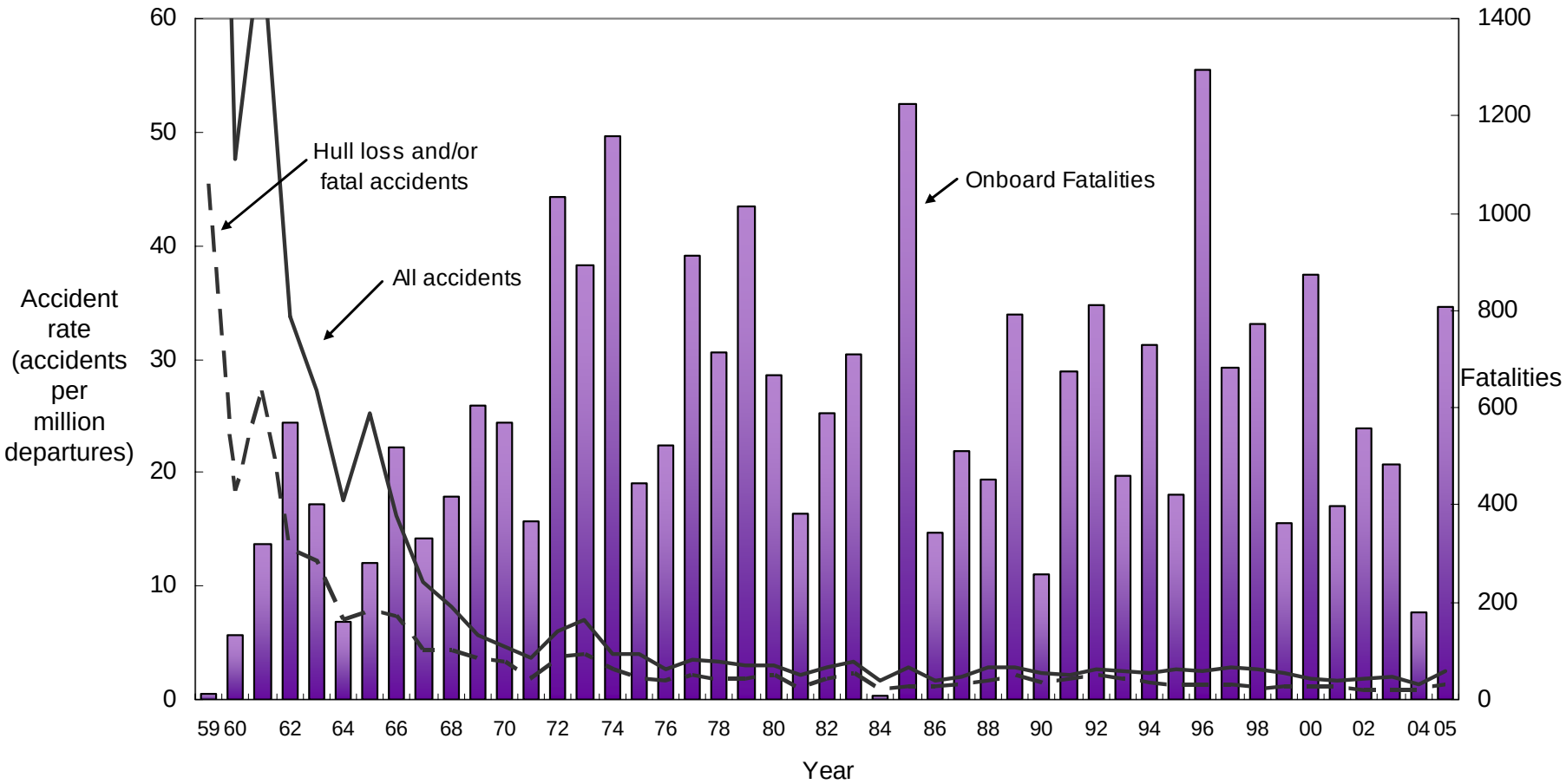


Excludes:

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

Accident Rates and Fatalities by Year

Worldwide Commercial Jet Fleet – 1959 through 2005



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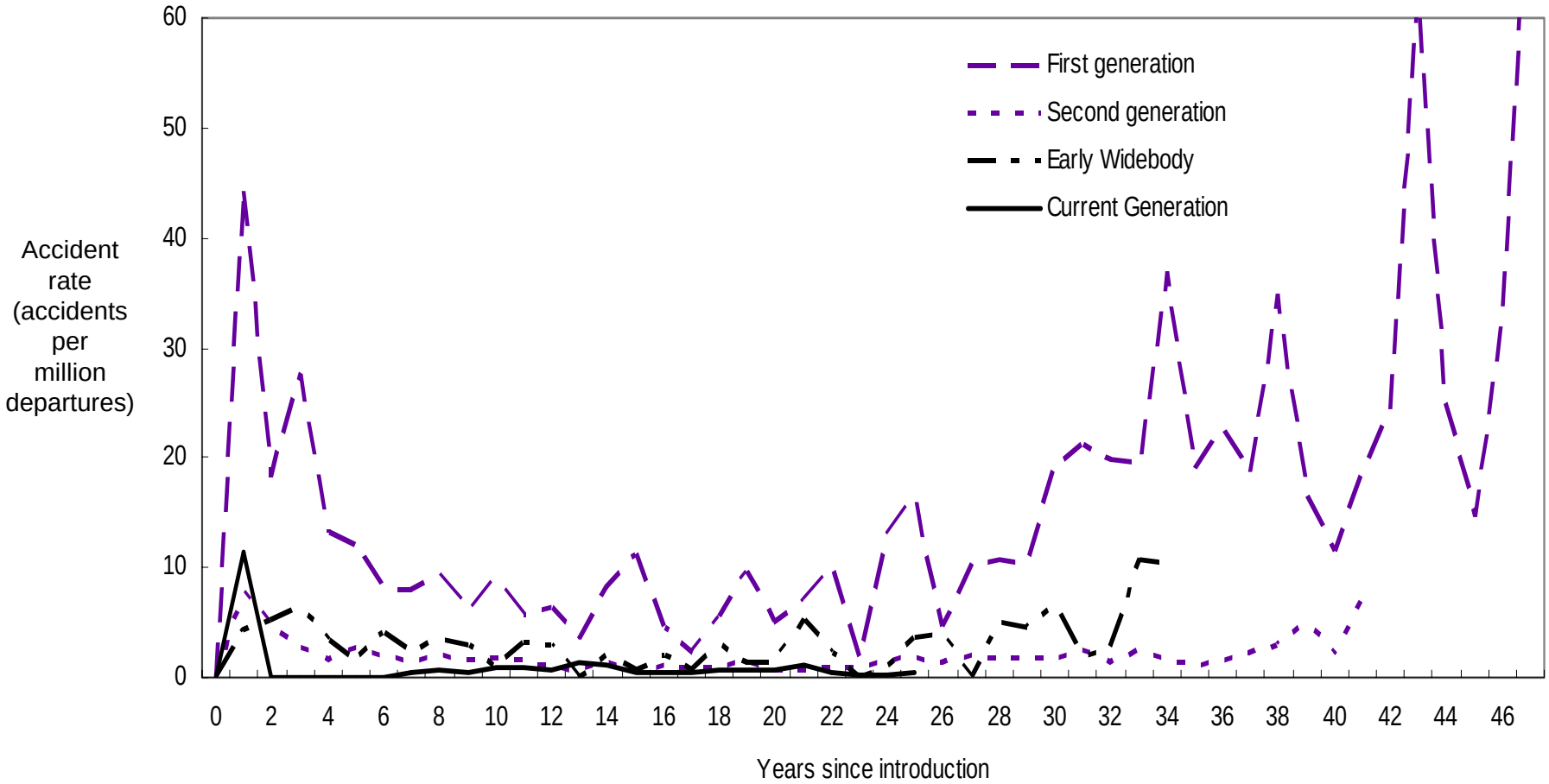
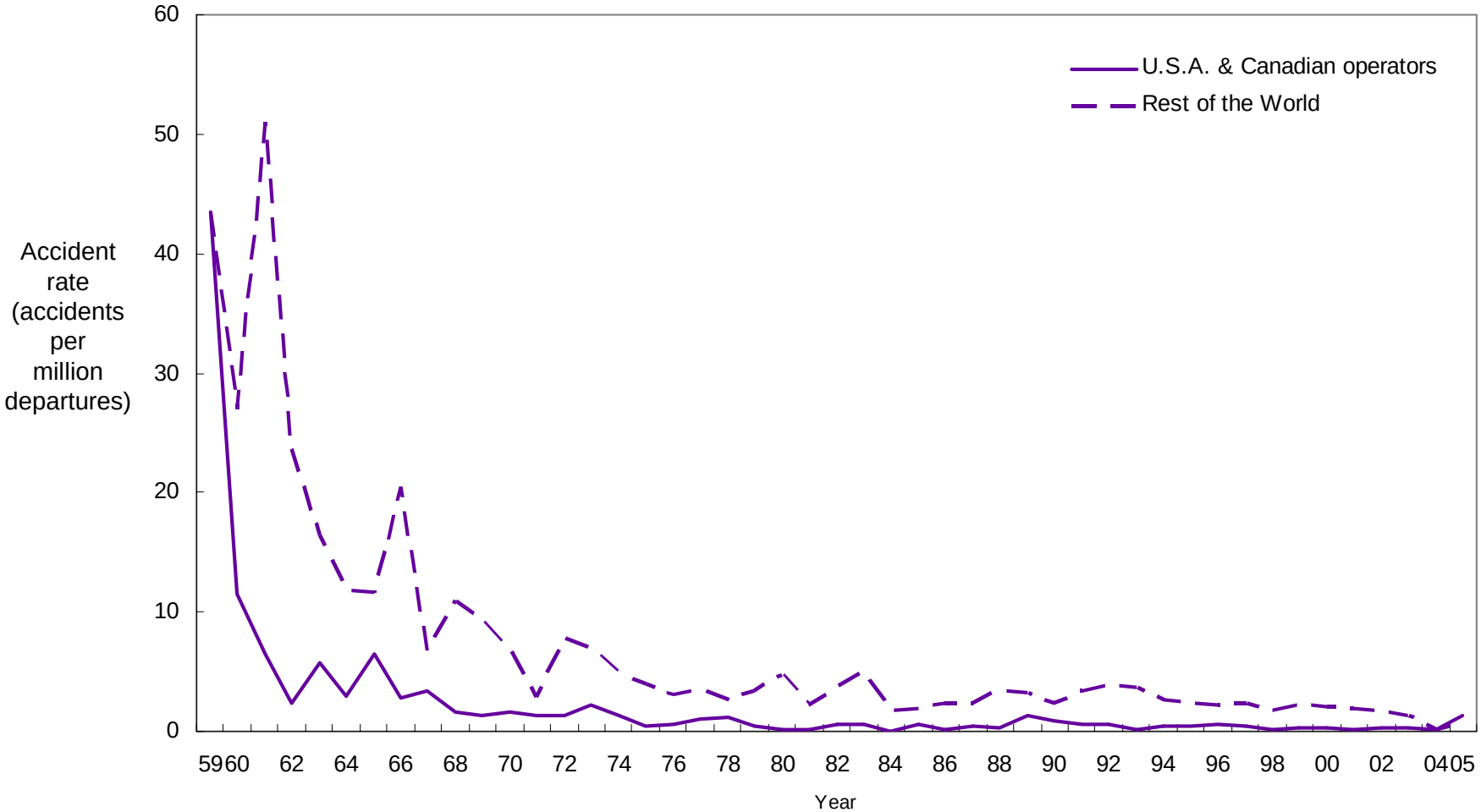
Accident Rates by Years Following Introduction

Hull Loss and/or Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 through 2005



U.S.A. and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1959 through 2005



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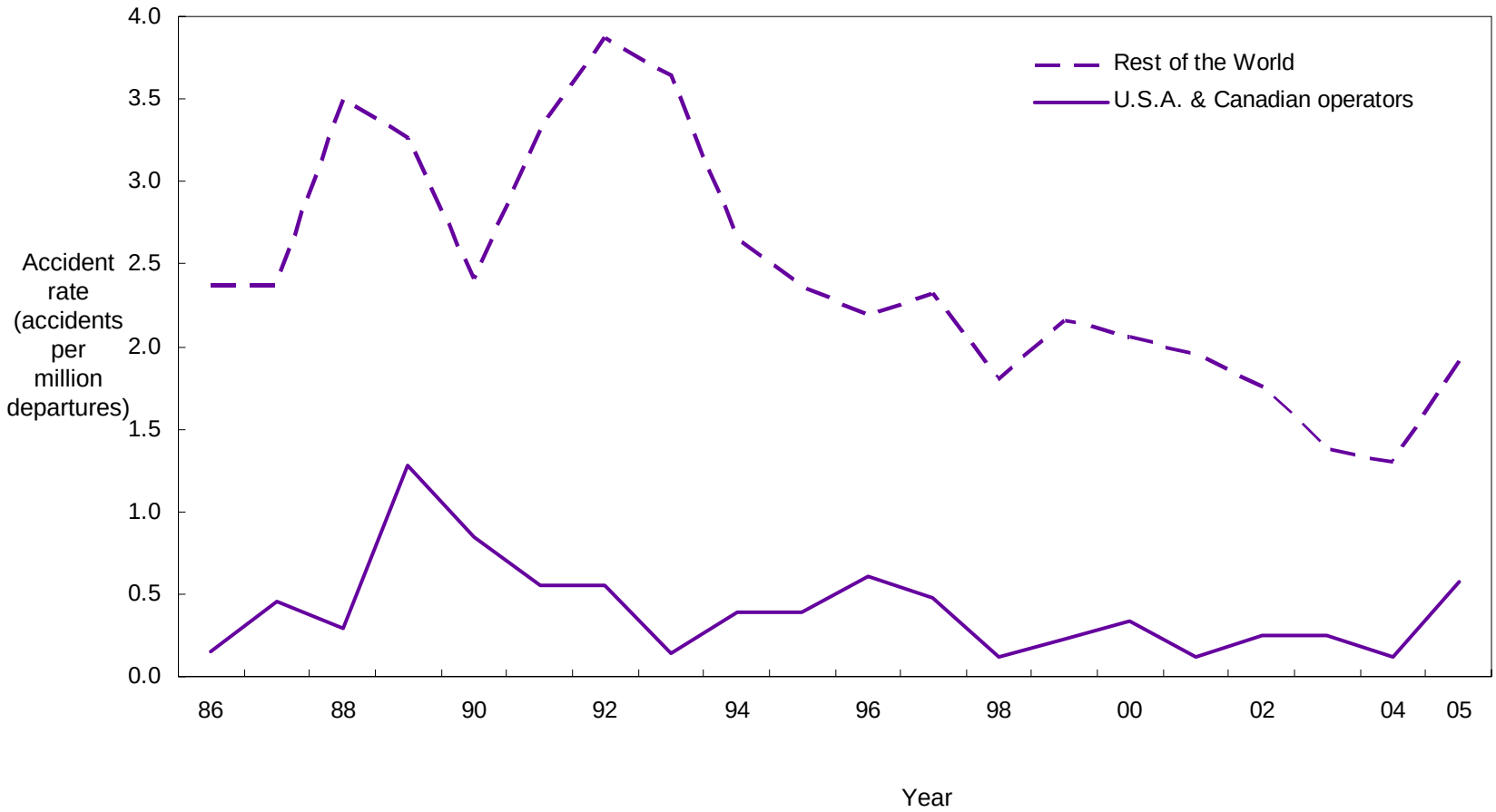
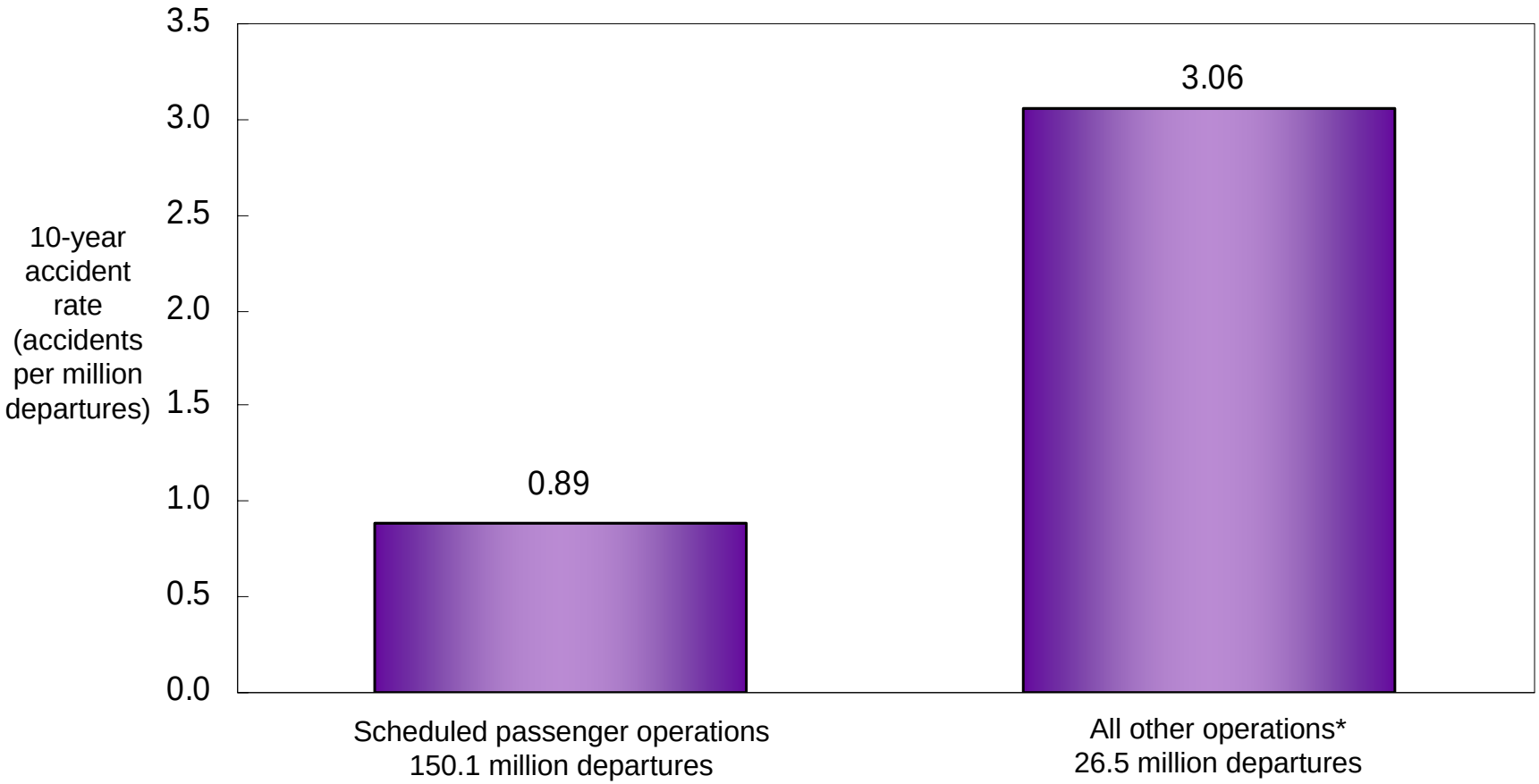
U.S.A and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1986 through 2005



Accident Rates by Type of Operation

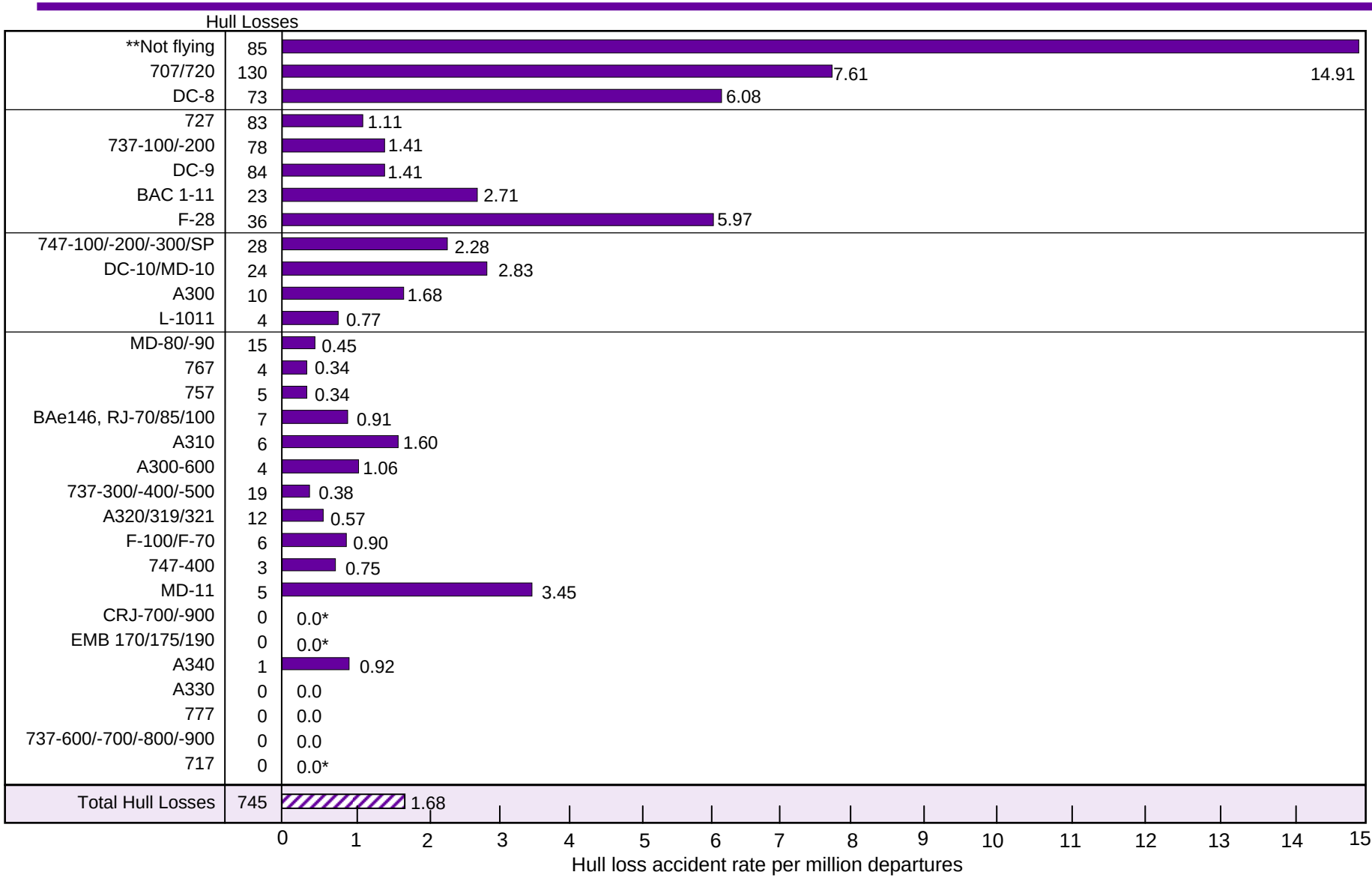
Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1996 through 2005



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

Accident Rates by Airplane Type

Hull Loss Accidents – Worldwide Commercial Jet Fleet – 1959 through 2005

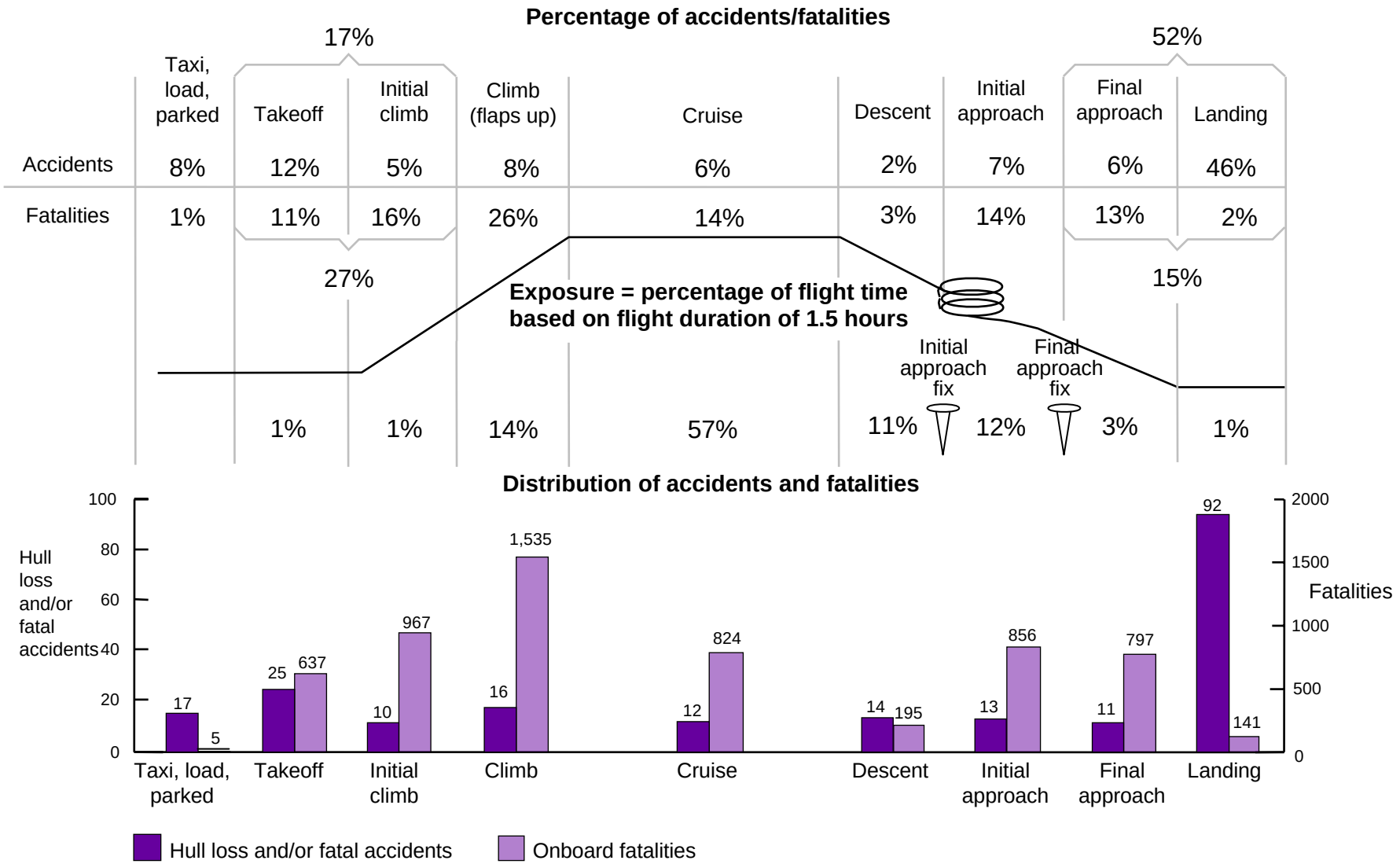


** The Comet, CV880/990, Caravelle, Concorde, Mercure, Trident and VC-10 are no longer in commercial service, and are combined in the "Not flying" bar.

* These types have accumulated fewer than 1 million departures.

Accidents and Onboard Fatalities by Phase of Flight

Hull Loss and/or Fatal Accidents – Worldwide Commercial Jet Fleet – 1996 through 2005



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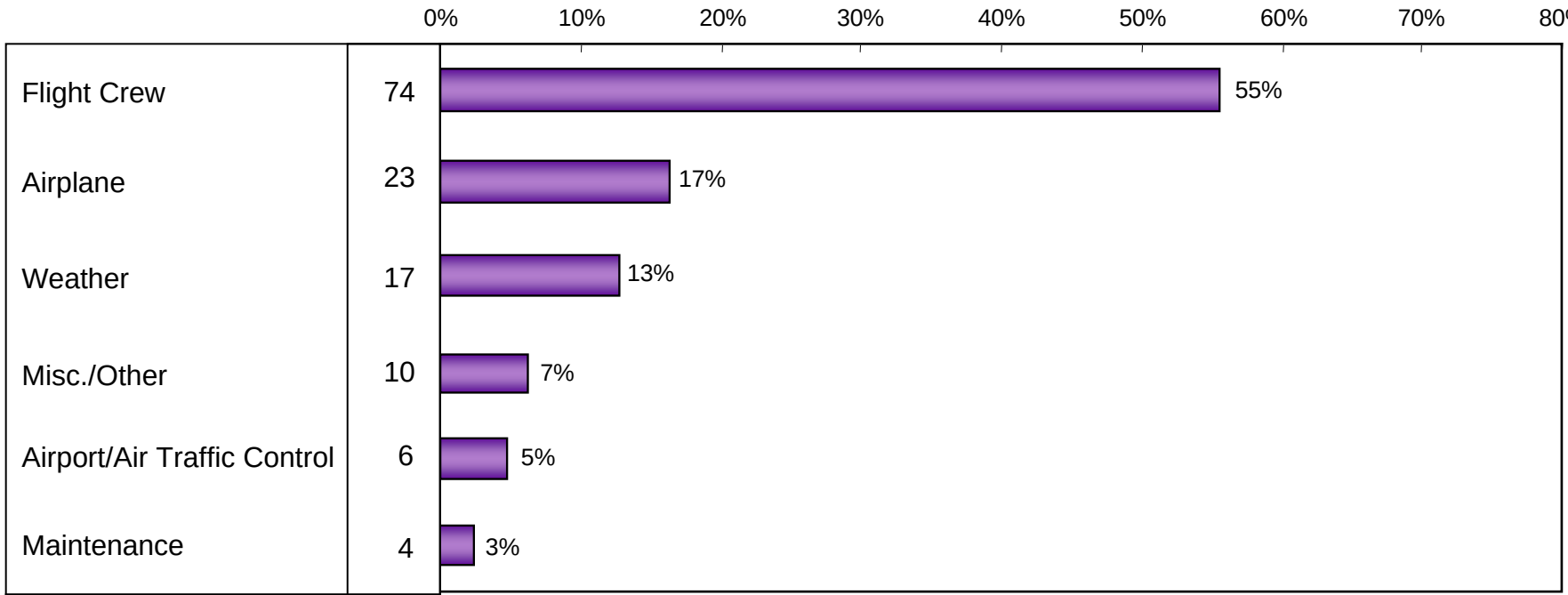
Accidents by Primary Cause*

Hull Loss Accidents – Worldwide Commercial Jet Fleet – 1996 through 2005

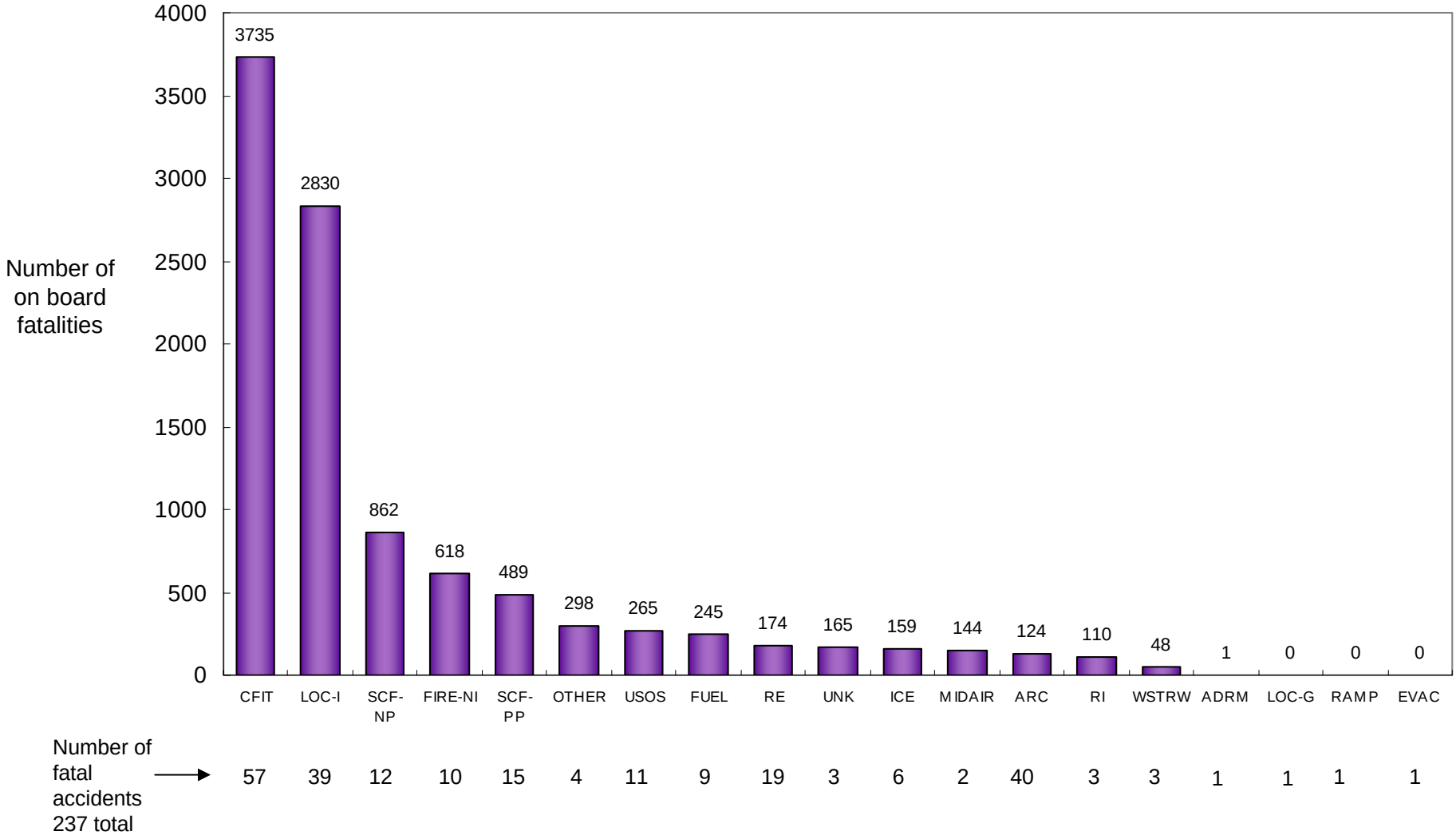


Total with known causes	134
Unknown or awaiting reports	49
Total	183

*As determined by the investigating authority, percent of accidents with known causes.

Fatalities by CAST/ICAO Taxonomy Accident Category*

Fatal Accidents – Worldwide Commercial Jet Fleet – 1987 Through 2005



* See page 19 for the CAST/ICAO category definitions

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CAST/ICAO Taxonomy Accident Categories - Definitions

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, Netherlands, 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 reportings. Common taxonomies and definitions establish a standard industry language, thereby improving the quality of information and communications. With this common language, the aviation community's capacity to focus on common safety issues is greatly enhanced.

The CICTT taxonomy is designed to permit the assignment of multiple categories as necessary to fully describe the event. The intent of the chart on page 18 is to introduce the CICTT taxonomies. Accordingly, each accident was assigned to the single classification that was deemed to be the principal, or most descriptive, category.

The following are a complete set of the categories with a brief description:

ARC	Abnormal Runway Contact
AMAN	Abrupt Maneuver
ADRM	Aerodrome
ATM	Air Traffic Management/ Communications, Navigation, Surveillance
CABIN	Cabin Safety Events
CFIT	Controlled Flight into or Toward Terrain
EVAC	Evacuation
F-NI	Fire/Smoke (Non-Impact)
F-POST	Fire/Smoke (Post-Impact)
FUEL	Fuel Related
GCOL	Ground Collision
RAMP	Ground Handling
ICE	Icing
LOC-G	Loss of Control – Ground
LOC-I	Loss of Control – In flight
LALT	Low Altitude Operations
MAC	Midair/Near Midair Collision
OTHR	Other
RE	Runway Excursion
RI-A	Runway Incursion – Animal
RI-VAP	Runway Incursion – Vehicle, Aircraft or Person
SEC	Security Related
SCF-NP	System/Component Failure or Malfunction (Non-Powerplant)
SCF-PP	System/Component Failure or Malfunction (Powerplant)
TURB	Turbulence Encounter
USOS	Undershoot/Overshoot
UNK	Unknown or Undetermined
WSTRW	Wind shear or Thunderstorm

For a more complete description go to: http://www.intlaviationstandards.org/

Excluded Events

Worldwide Commercial Jet Fleet

The following 2 pages, Hostile Actions and Non-Hostile Events, are excluded from the statistical analysis in the preceding portions of the document and may not be a complete listing due to incomplete reporting.

Hostile Action Events

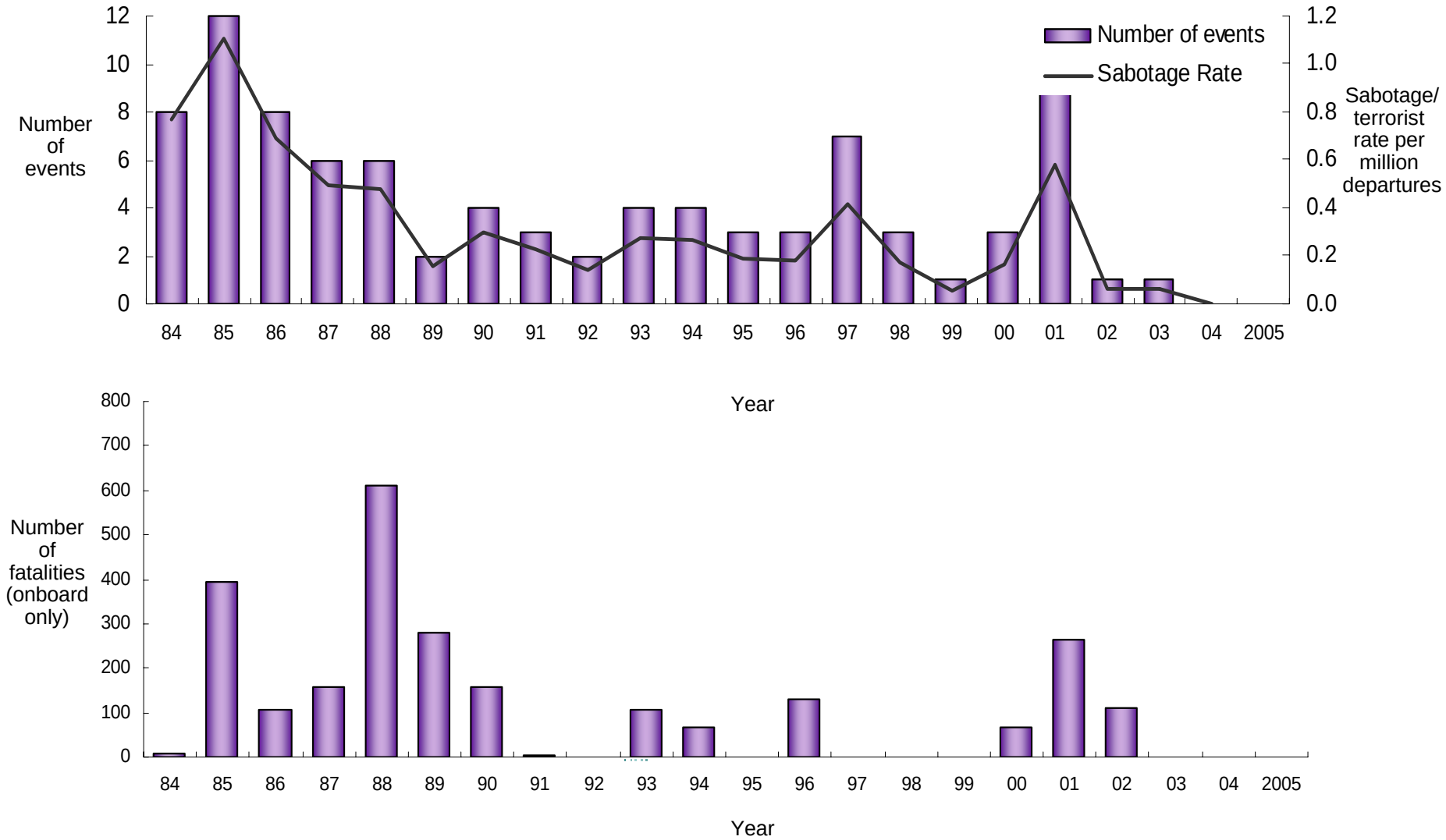
Worldwide Commercial Jet Fleet - 2005

Events which occur as a result of a premeditated, overt act originating from terrorism, sabotage.

Date	Airline	Airplane Type	Accident Location	Hull Loss	Onboard	Description
0	Total events			0	0	

Hostile Actions

Worldwide Commercial Jet Fleet — 1984 Through 2005



Non-Hostile Events

Worldwide Commercial Jet Fleet

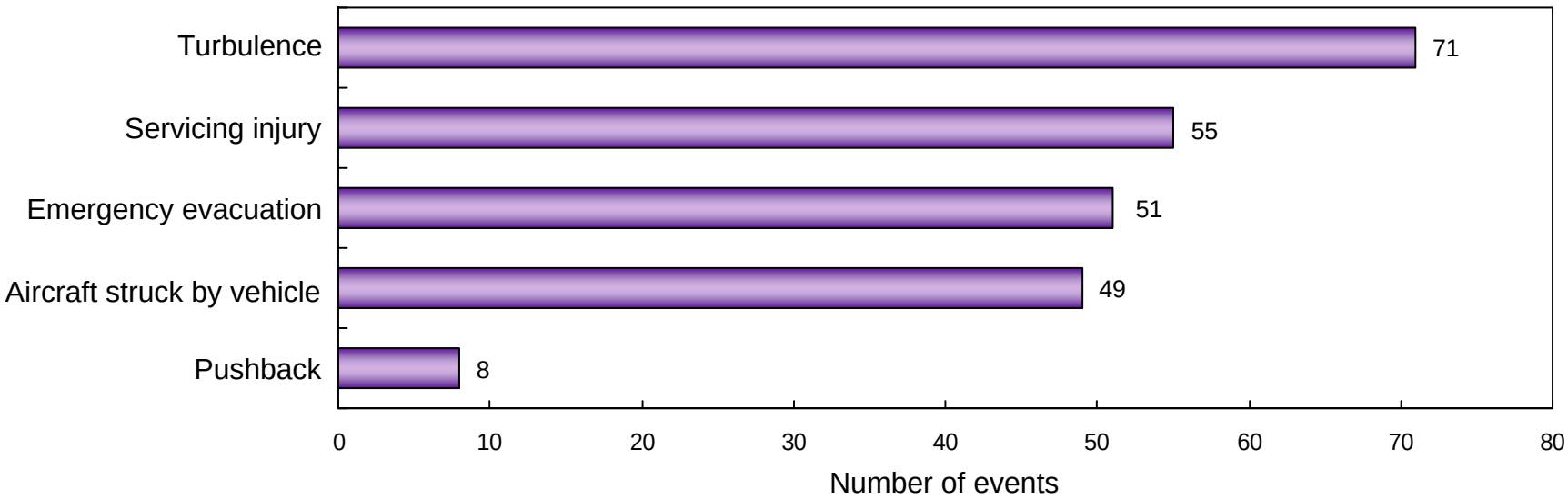
Events Occurring In 2005

Severe turbulence:
- No injury – 4 events
- Flight attendant injury – 4 events
- Passenger injury – 3 events
- Passenger and flight attendant injury – 3 events

Emergency evacuation:
- Minor injury – 5 events

Ground operations:
- Airplane damaged while taxiing - inadvertently hit other airplane, tug, jetway – 15 events
- Airplane damaged from foreign object debris – 6 events
- Engine ingestion fatality – 1 event
- Crew, passenger/maintenance fell – 7 events

Events Occurring From 1996 Through 2005



Notes

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