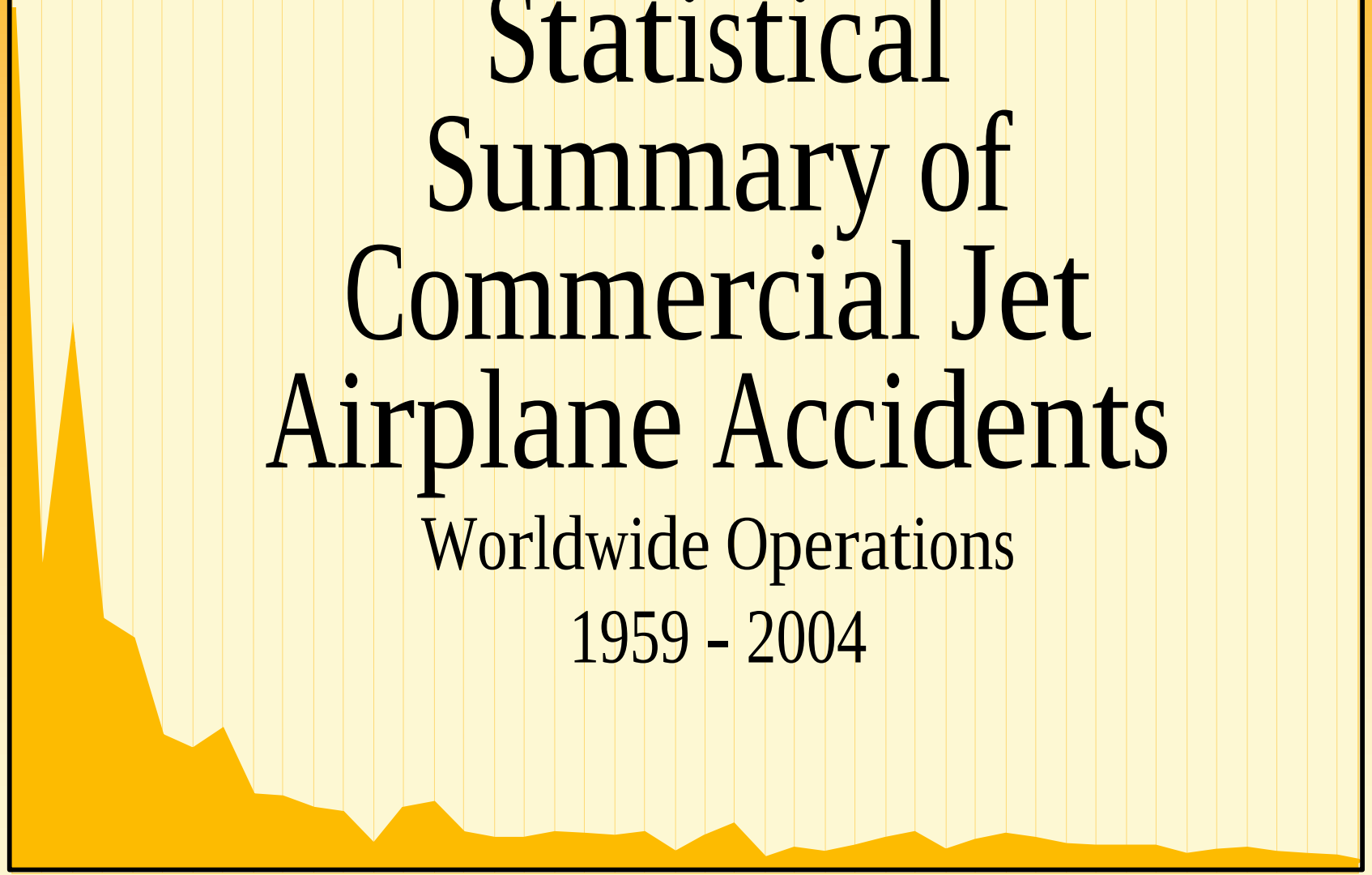
Statistical Summary of Commercial Jet Airplane Accidents

Worldwide Operations

1959 - 2004



1959

2004

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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	A310	CRJ-700/-900	F-100				Caravelle
737	MD-11	A320/319/321						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 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 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	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

* 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.

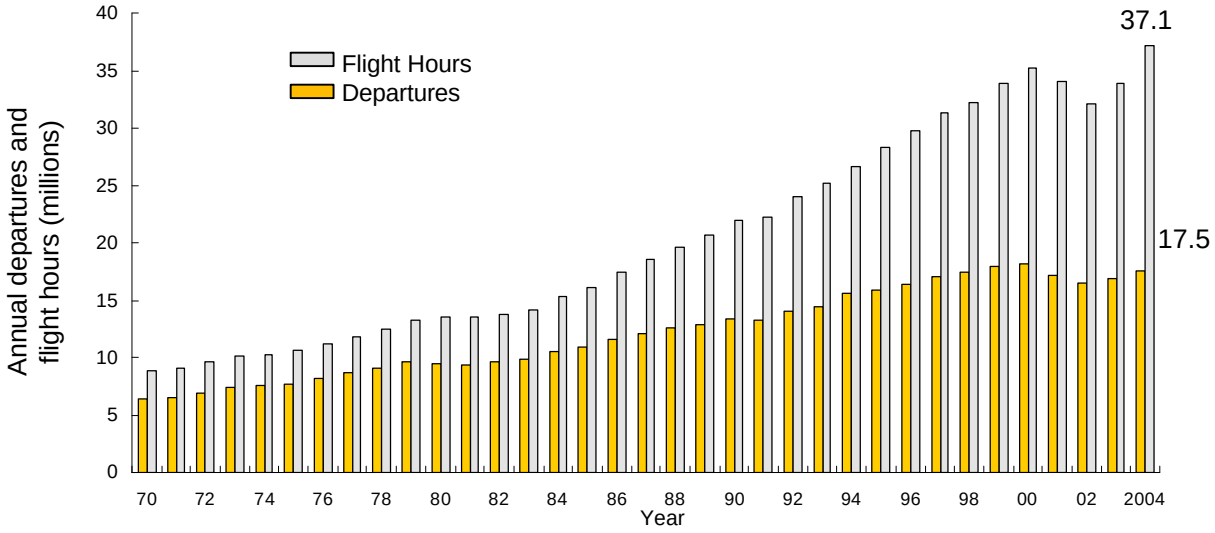
Airplane Accidents

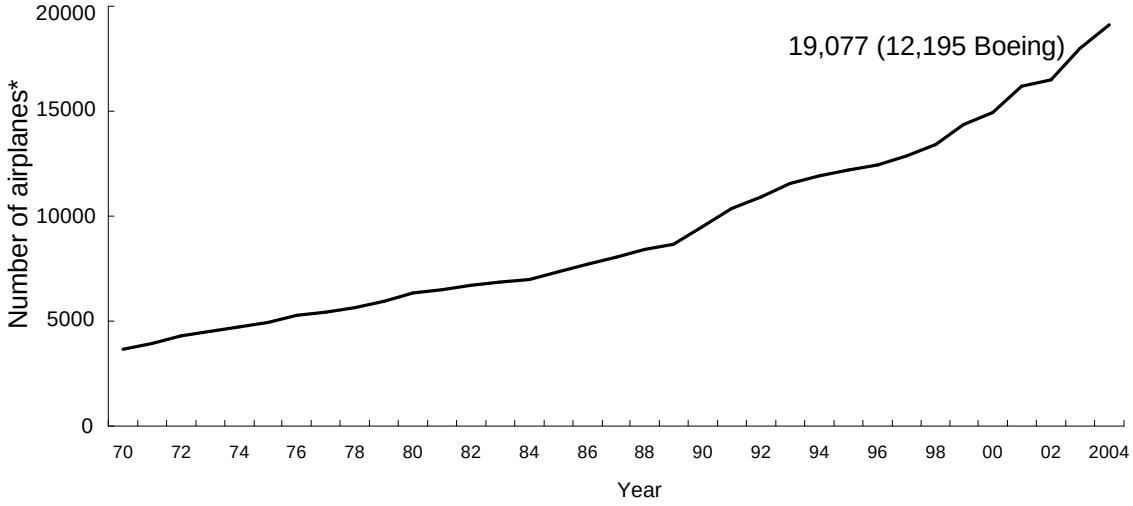
Worldwide Commercial Jet Fleet – 2004

Date	Airline	Airplane Type	Accident Location	Hull Loss	Fatalities	Phase	Description
01-Jan-04	Japan Air System	MD-81	Tokunoshima, Japan		0	Landing	MLG collapsed
03-Jan-04	Flash Airlines	737- 300	Sharm El-Sheikh, Egypt	X	148	Climb	Airplane crashed after takeoff
05-Jan-04	Austrian Airlines	F-70	Munich, Germany	X	0	Landing	Emergency landing in field
15-Jan-04	Iran Air	747- SP	Beijing, China		0	Landing	Nose gear collapsed
19-Jan-04	Air Malta	A320- 210	Malta, Malta		0	Taxi	Collision with light pole
20-Feb-04	Austral - Cielos del Sur	MD-81	Buenos Aires, Argentina		0	Takeoff	MLG wheels departed, diverted
25-Feb-04	First Air	737- 200C	Edmonton, Canada		0	Landing	Offside landing
01-Mar-04	Pakistan Int'l Airlines	A300- B4	Jeddah, Saudi Arabia	X	0	Takeoff	NLG tire failure
02-Apr-04	Air Memphis	707- 300	Cairo, Egypt	X	0	Takeoff	RMLG collapsed
09-Apr-04	Emirates	A340- 313X	Johannesburg, South Africa		0	Takeoff	Takeoff overrun/go-around
20-Apr-04	Alitalia	MD-82	Trieste, Italy		0	Taxi	Collision with dump truck
27-Apr-04	Aerosvit	737- 500	Moscow, Russia		0	Takeoff	Runway excursion - NLG collapsed
28-Apr-04	Centurion Air Cargo	DC-10- 30F	Bogota, Colombia	X	0	Landing	Landing overrun
29-Apr-04	Turkish Airlines	737- 800	Gaziantep, Turkey		0	Landing	Runway excursion
13-Jun-04	Turkish Airlines	A321- 210	Istanbul, Turkey		0	Landing	Hard landing - tail strike
17-Jun-04	Egyptair	A300- B4-200F	Khartoum, Sudan		0	Landing	Hard landing runway overrun
06-Jul-04	Iberia Airlines	A319- 110	San Pedro Sula, Honduras		0	Landing	Veered off runway
21-Jul-04	Aero California	DC-9- 14	Mexico City, Mexico	X	0	Takeoff	Settled after takeoff
25-Jul-04	Inter Airlines	F-100	Istanbul, Turkey		0	Landing	MLG collapse
03-Aug-04	Volare Airlines	A320- 210	Valencia, Spain		0	Initial Climb	Severe hail damage during climb
09-Aug-04	Swissair	RJ100	Frankfurt, Germany		0	Cruise	Dual engine damage
11-Aug-04	Air Guinee	737- 200	Free Town, Sierra Leone	X	0	Takeoff	RTO – runway overrun
28-Aug-04	Transair Cargo	Caravelle- 11R	Gisenya, Rwanda	X	0	Landing	Landing overrun - post crash fire
08-Oct-04	Biman Bangladesh Airlines	F-28	Sylhet, Bangladesh	X	0	Landing	Landing overrun
14-Oct-04	MK Airlines	747- 200	Halifax, Canada	X	7	Takeoff	Crashed after takeoff
23-Oct-04	BETA	707- 300	Manaus, Brazil	X	0	Taxi	RMLG collapsed
07-Nov-04	Air Atlanta Icelandic	747- 200F	Sharjah, United Arab Emirates	X	0	Takeoff	RTO - runway overrun
07-Nov-04	AirAsia	737- 300	Kota Kinabalu, Malaysia		0	Landing	Runway excursion
28-Nov-04	KLM - Royal Dutch Airlines	737- 400	Barcelona, Spain	X	0	Landing	Runway excursion
30-Nov-04	Lion Air	MD-82	Solo City, Indonesia	X	25	Landing	Crashed during landing
09-Dec-04	ASTAR	727- 200	Atlanta, USA		0	Taxi	MLG collapsed after landing
29-Dec-04	Chanchangi Airlines	727- 200	Lagos, Nigeria		0	Landing	Nose gear up landing
32	total			14	180		

Departures, Flight Hours, and Jet Airplanes in Service*

Worldwide Operations 1970 Through 2004





- 443.7 million cumulative departures (365.9 million on Boeing airplanes)
- 748.6 million cumulative flight hours (621.9 million on Boeing airplanes)
- 7 manufacturers – 33 significant types (13 Boeing) in service as of 12/31/2004

*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

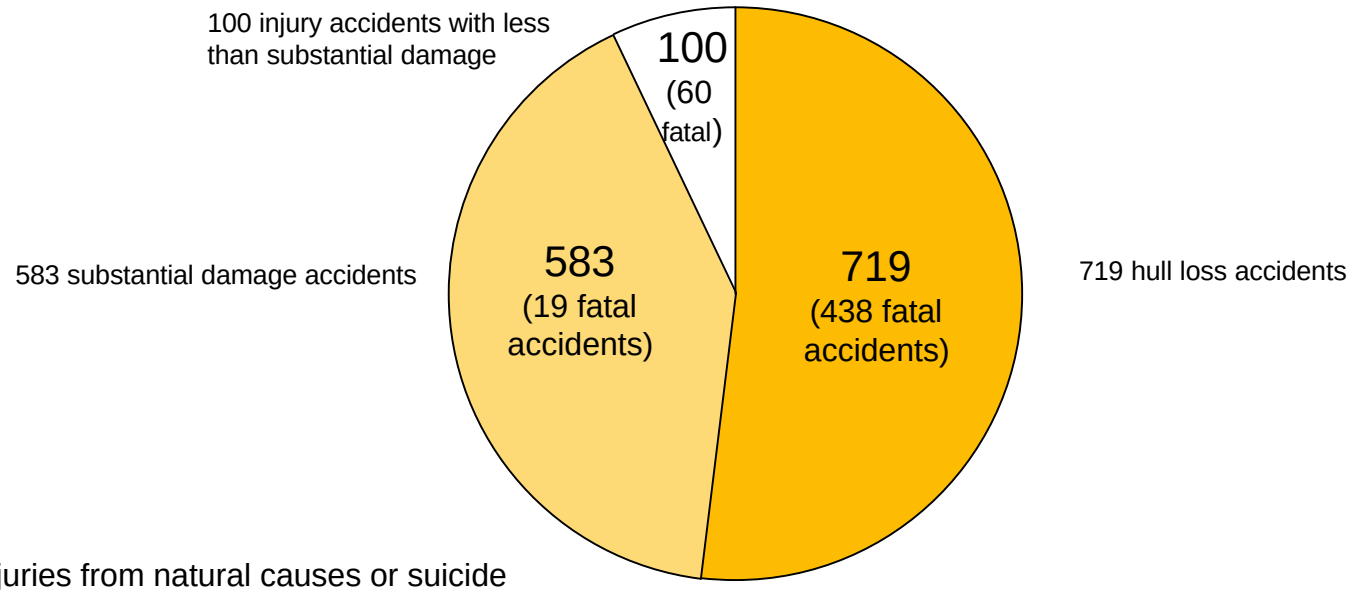
Type of operation	All Accidents		Hull loss and/or fatal accidents		Onboard fatalities	
	1959-2004	1995-2004	1959-2004	1995-2004	1959-2004	1995-2004
Passenger	1,104	285	604	135	25,237	5,550
Cargo	192	79	131	50	227	45
Ferry, test	104	12	61	7	189	17
Other*	2	0	2	0	11	0
Totals	1,402	376	798	192	25,664	5,612
U.S.A. and Canadian operators	463	88	224	38	6,081	883
Rest of the world	939	288	574	154	19,583	4,729
Totals	1,402	376	798	192	25,664	5,612

*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 2004

1,402 accidents worldwide

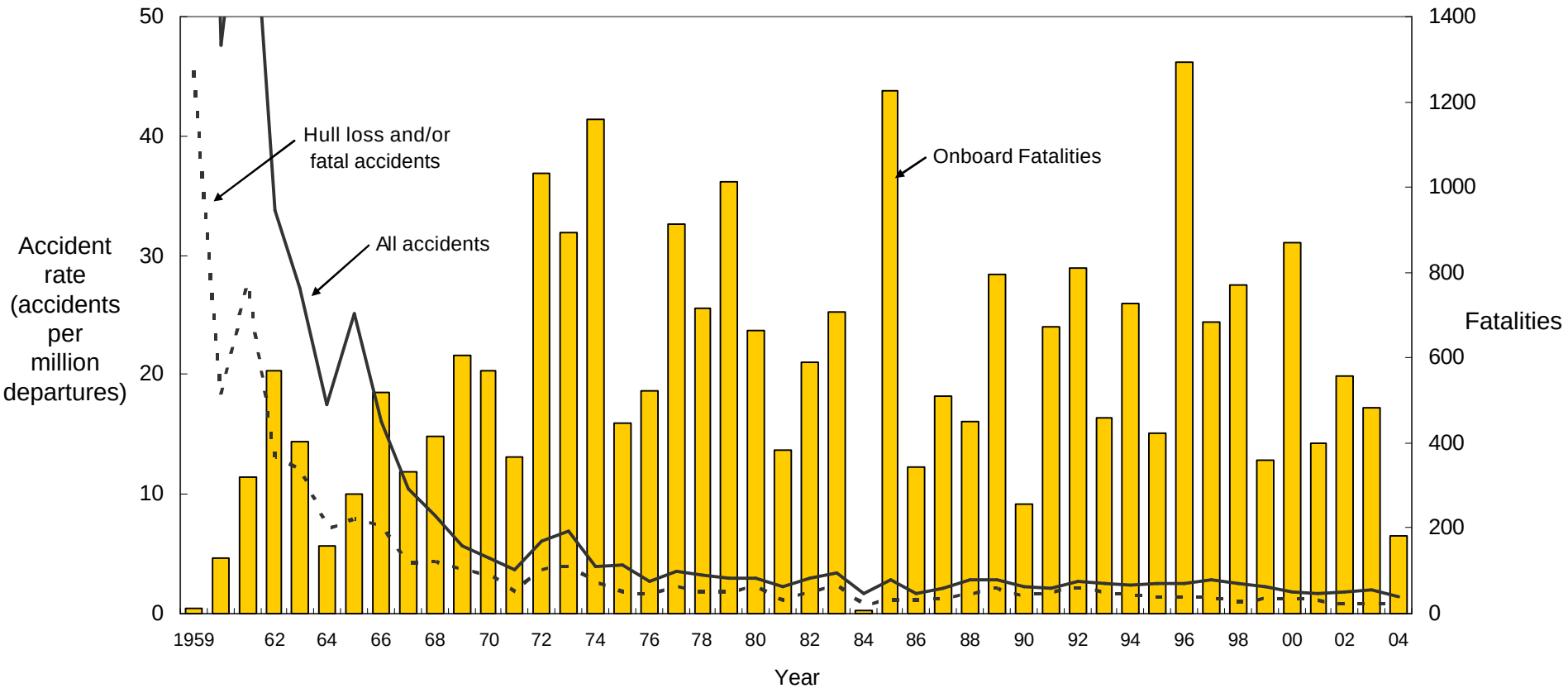


Excludes:

- 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

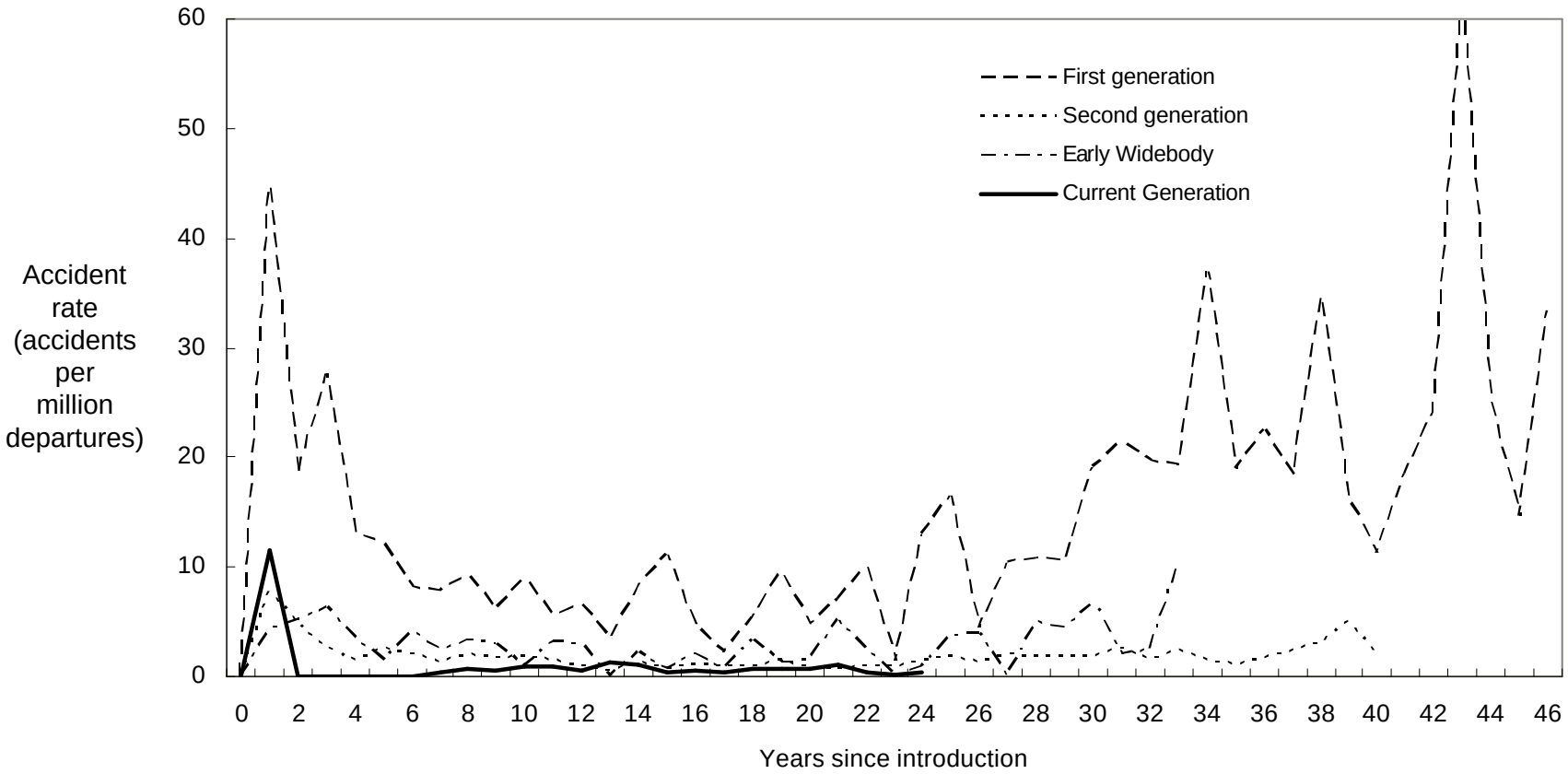
Accident Rates and Fatalities by Year

Worldwide Commercial Jet Fleet – 1959 through 2004



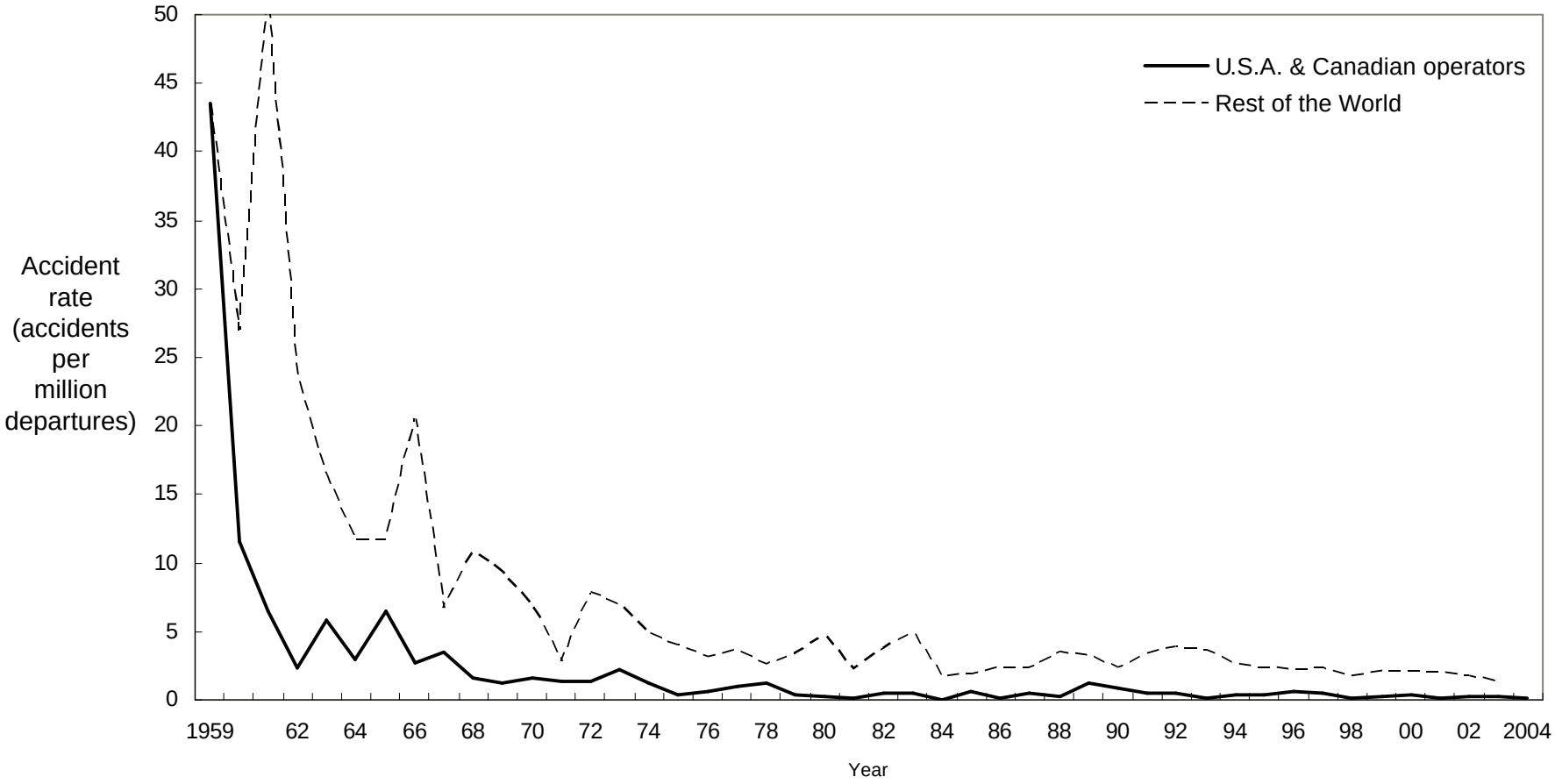
Accident Rates by Years Following Introduction

Hull Loss and/or Fatal Accidents – Worldwide Commercial Jet Fleet – 1959 through 2004



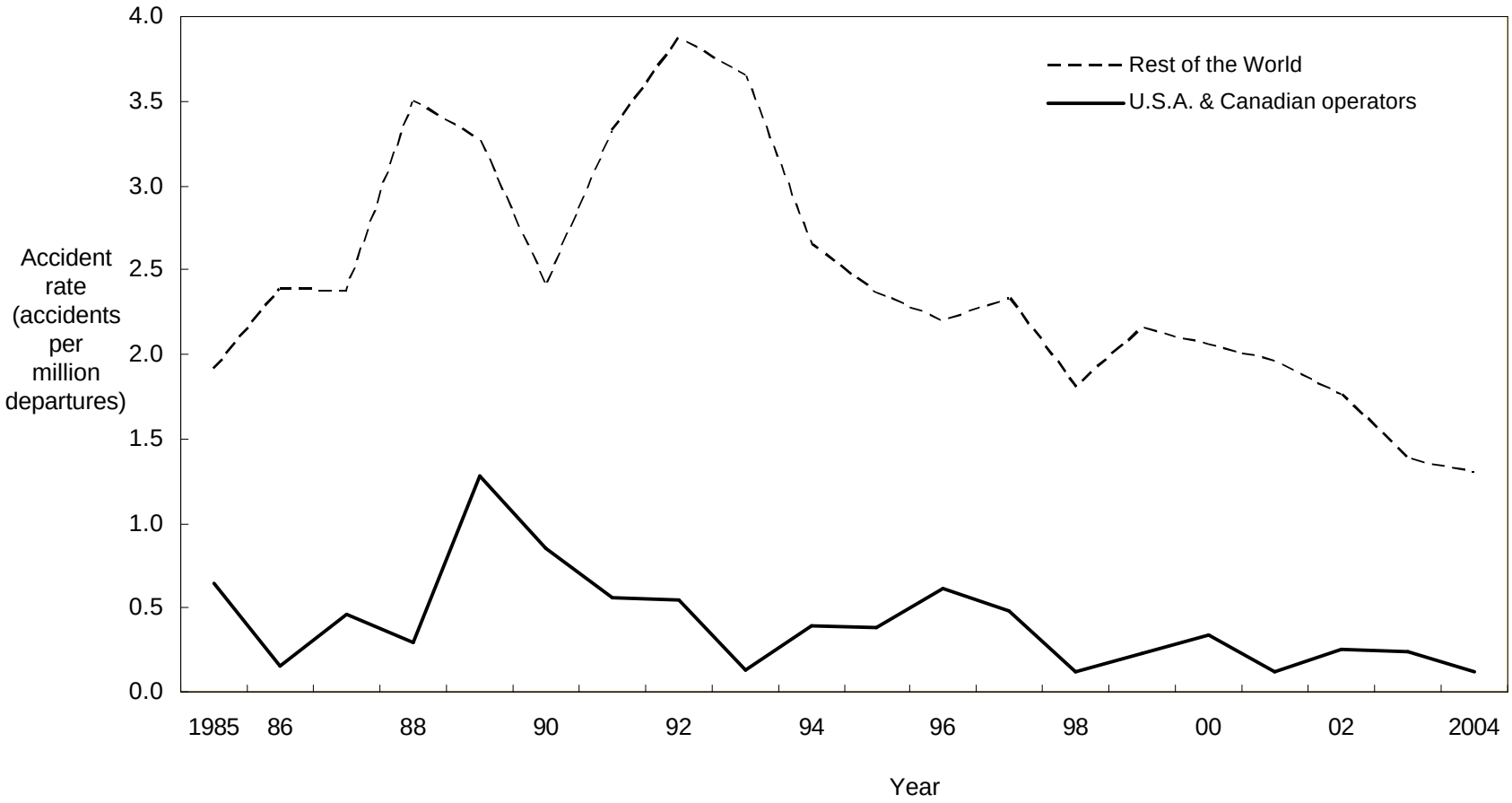
U.S.A. and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1959 through 2004



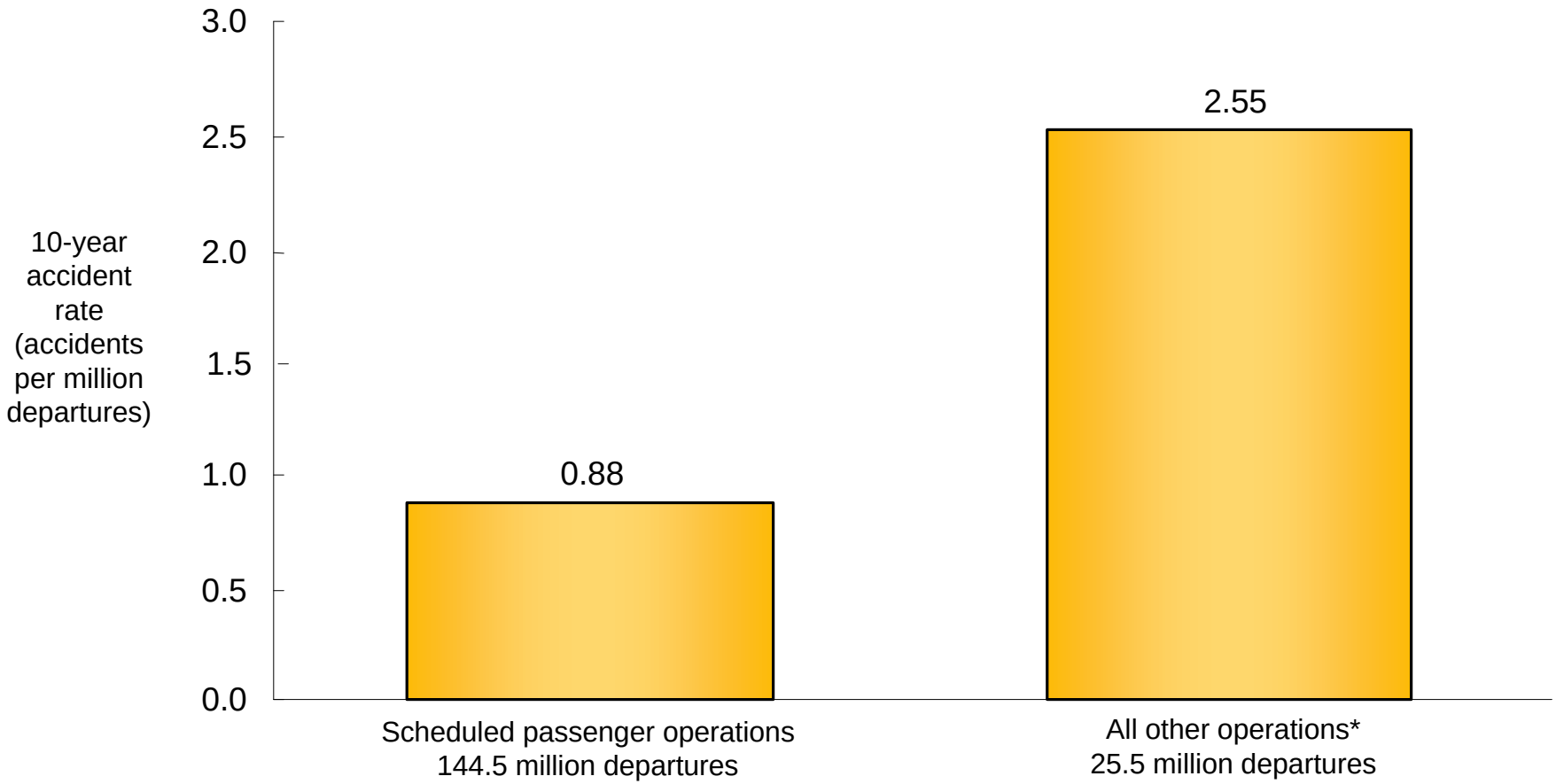
U.S.A and Canadian Operators Accident Rates

Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1985 through 2004



Accident Rates by Type of Operation

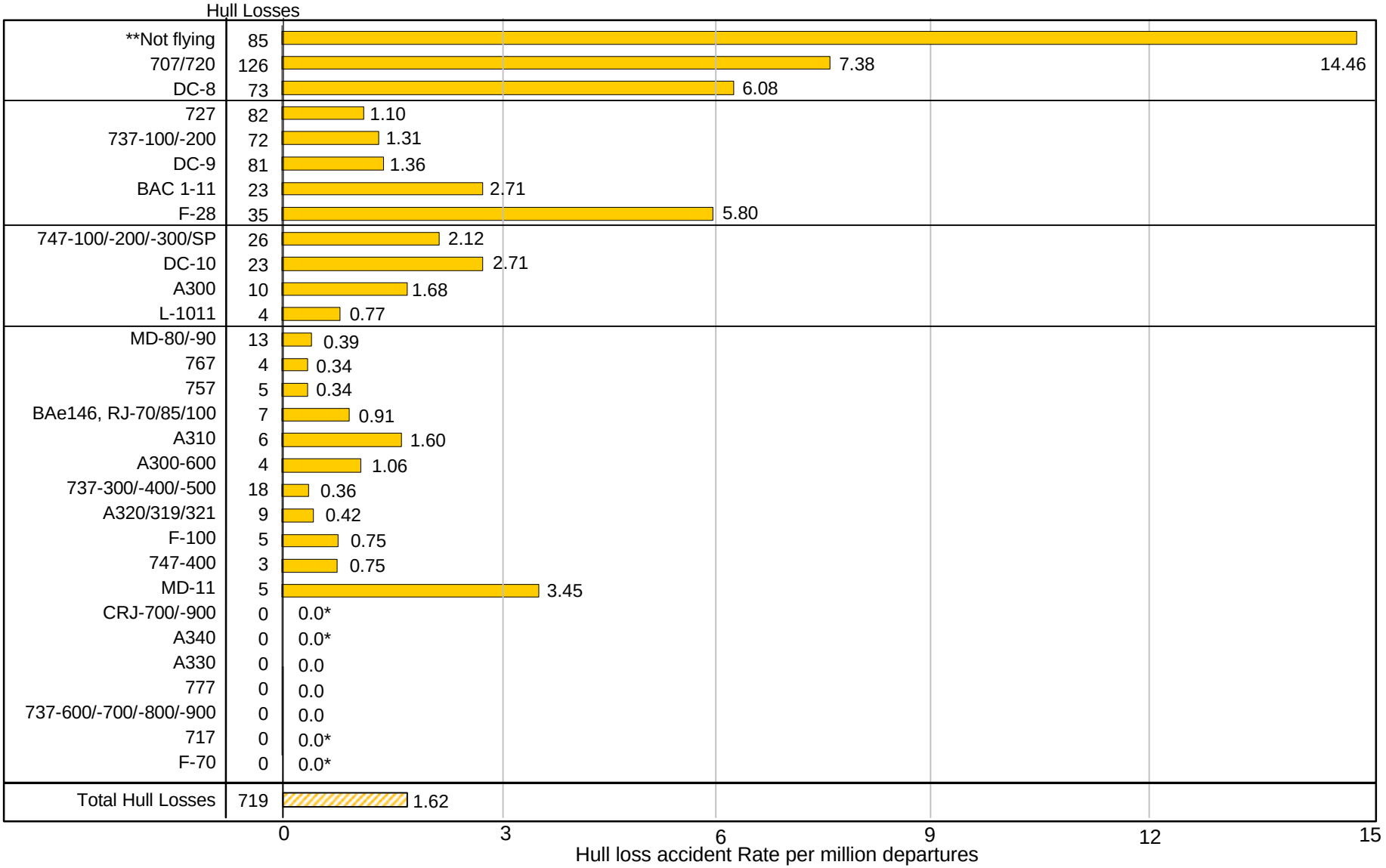
Hull Loss and/or Fatal accidents – Worldwide Commercial Jet Fleet – 1994 through 2004



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

Accident Rates by Airplane Type

Hull Loss Accidents – Worldwide Commercial Jet Fleet – 1959 through 2004

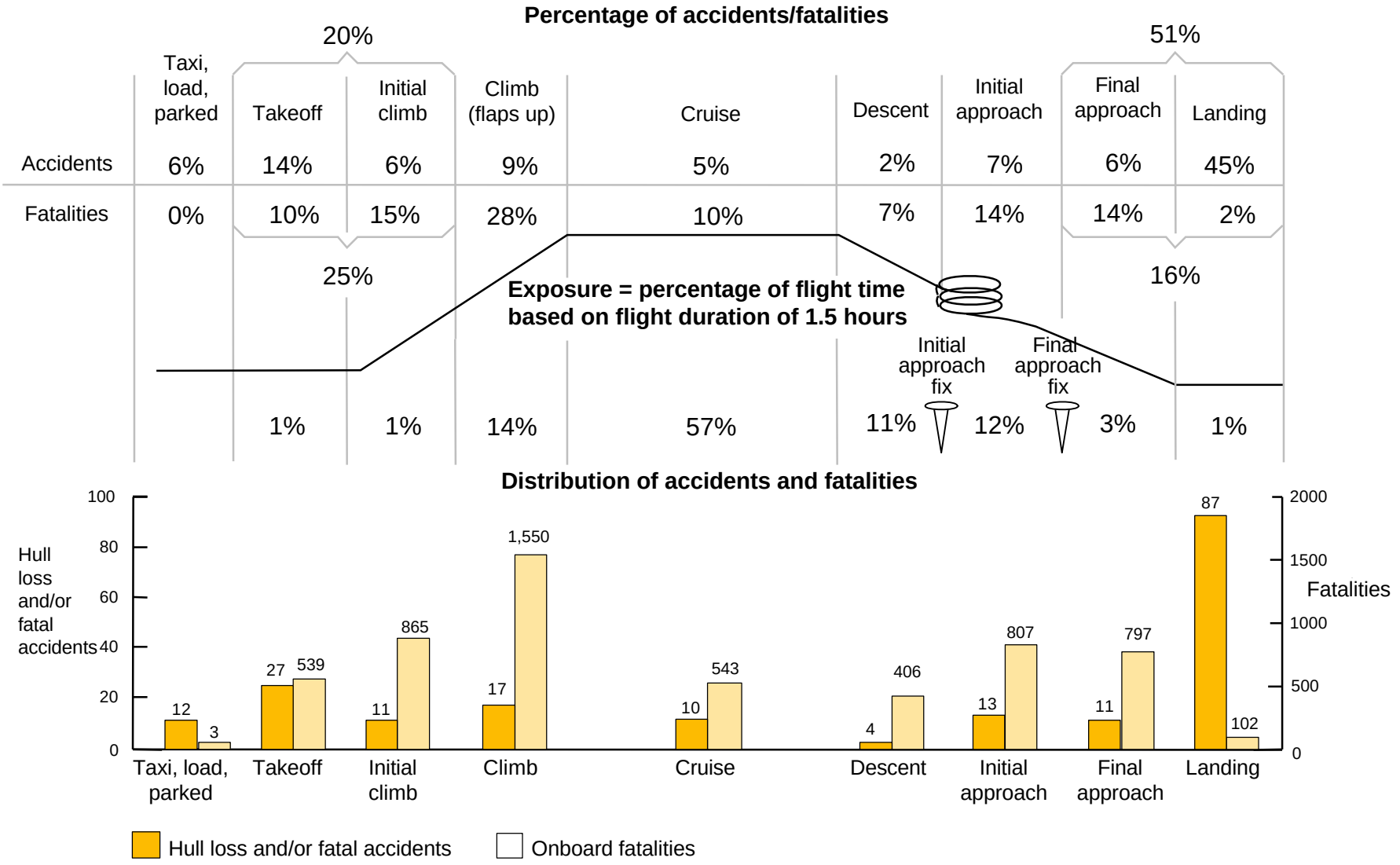


** The Comet, CV880/990, Caravelle, Concorde, Mercure, Trident and VC-10 are no longer in commercial service, and are combined in the "Not flying" bar.

* These types have accumulated fewer than 1 million departures.

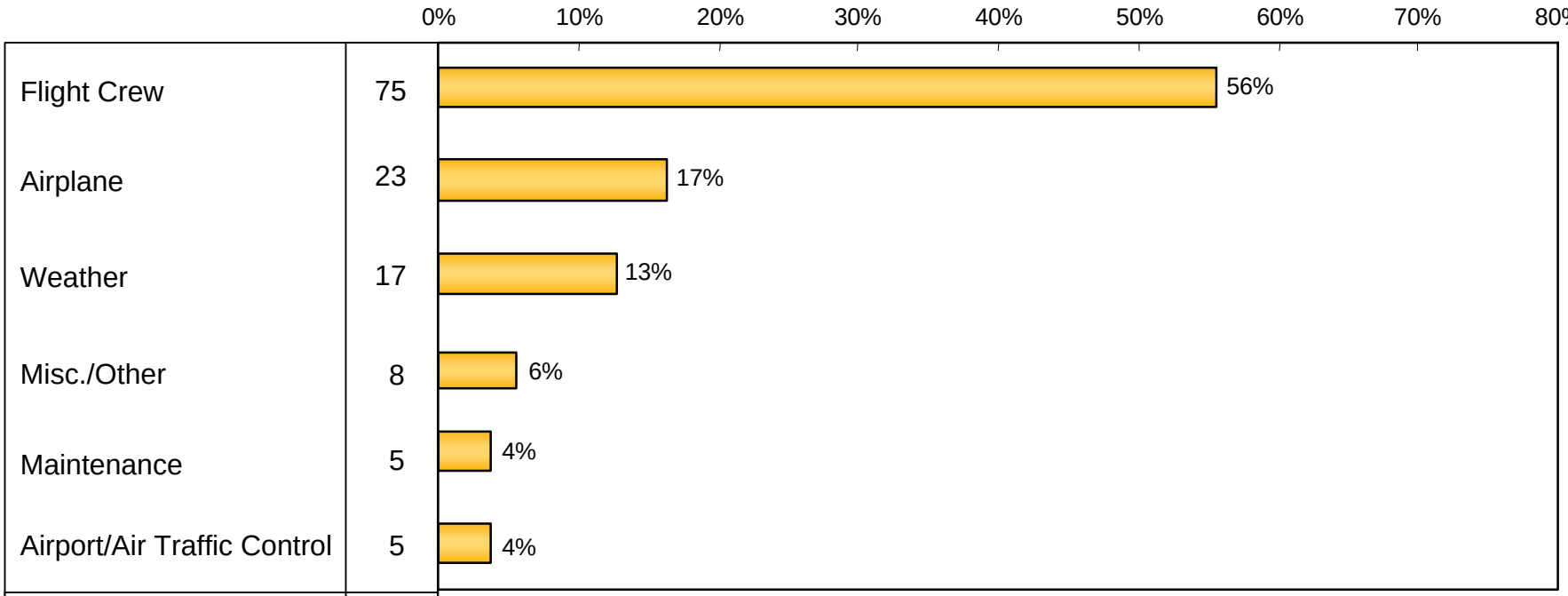
Accidents and Onboard Fatalities by Phase of Flight

Hull Loss and/or Fatal Accidents – Worldwide Commercial Jet Fleet – 1995 through 2004



Accidents by Primary Cause*

Hull Loss Accidents – Worldwide Commercial Jet Fleet – 1995 through 2004

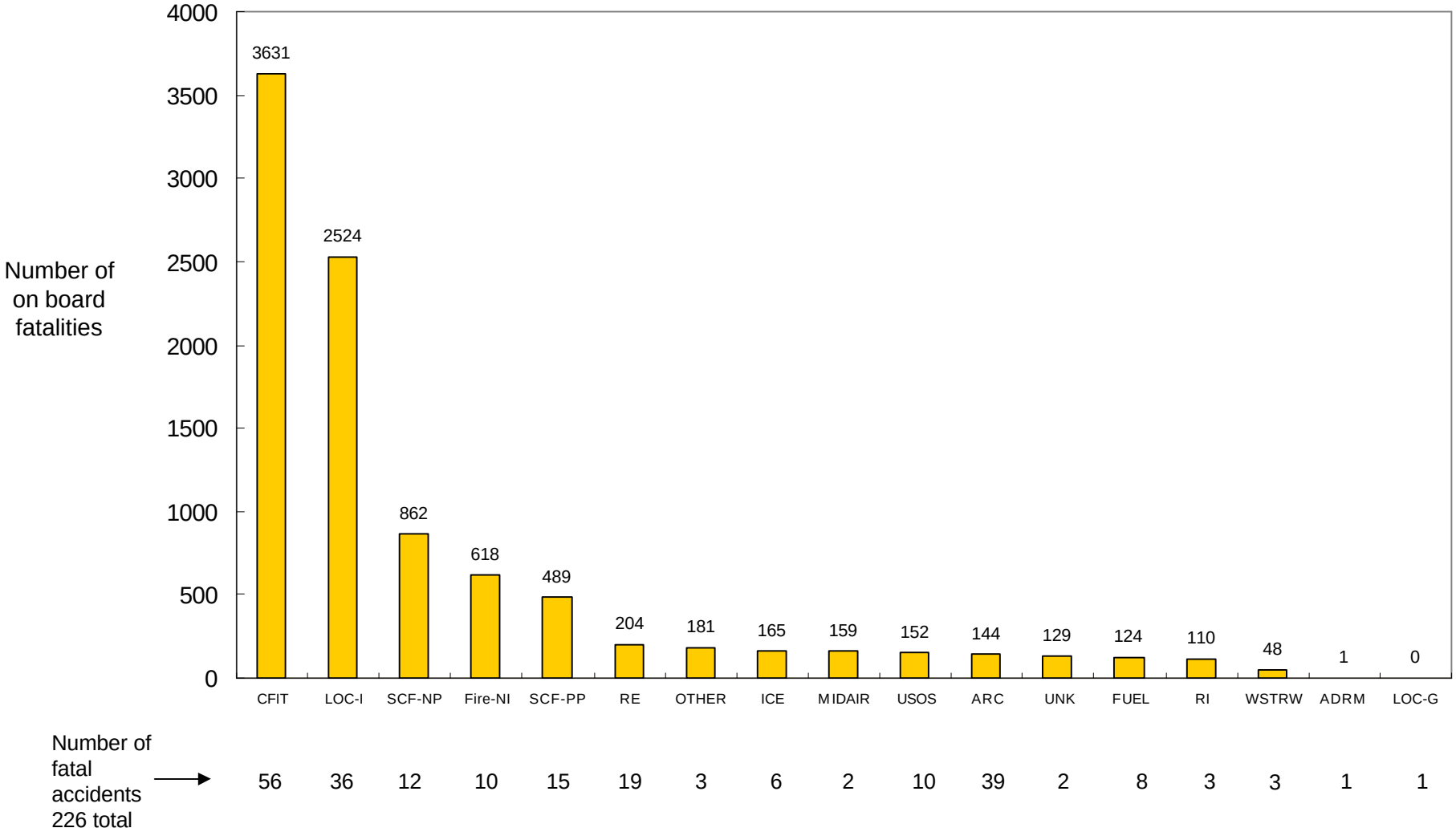


Total with known causes	133
Unknown or awaiting reports	44
Total	177

*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 2004



* 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 principle, or most descriptive category. It is intended that future editions of this document will contain the more detailed multiple category analysis and information.

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

ARC	Abnormal Runway Contact
AMAN	Abrupt Maneuver
ADRM	Aerodrome
ATM	ATM/CNS
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/Comp. Failure or Malfunction (Non-Power plant)
SCF-PP	System/Component Failure or Malfunction (Power plant)
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 3 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

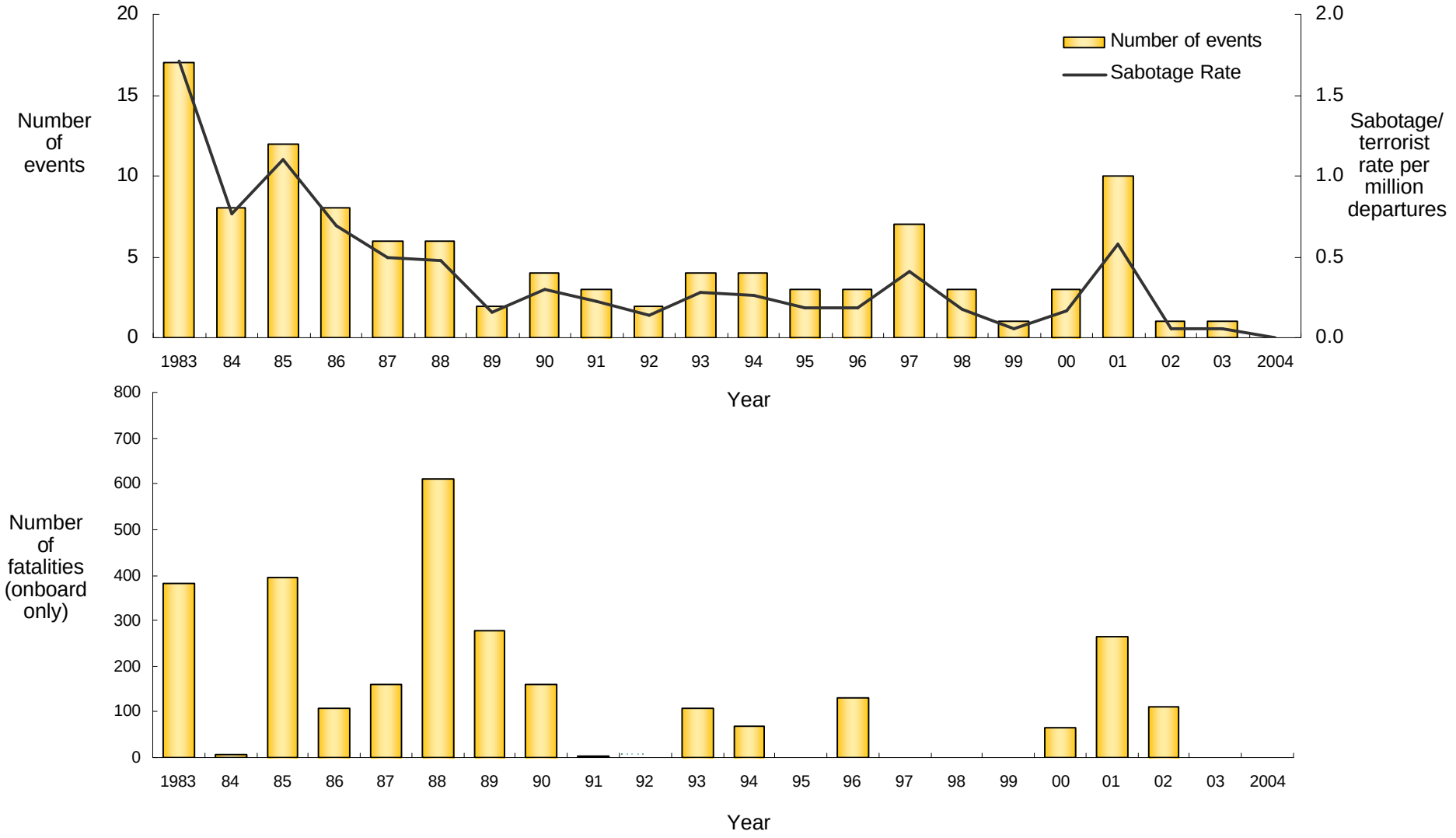
Worldwide Commercial Jet Fleet - 2004

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 — 1983 Through 2004



Non-Hostile Events

Worldwide Commercial Jet Fleet

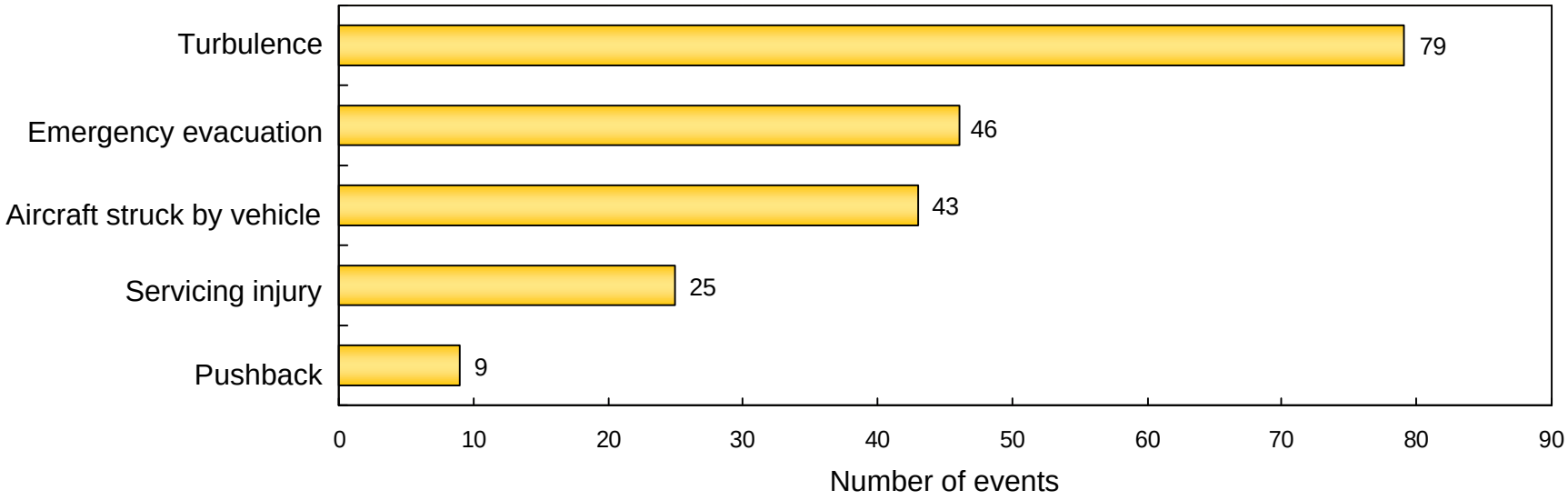
Events Occurring In 2004

Severe turbulence:
- No injury – 8 events
- Flight attendant injury – 7 events
- Passenger injury – 4 events
- Passenger and flight attendant injury – 8 events

Emergency evacuation:
- Minor injury – 3 events

Ground operations:
- Airplane damaged while taxiing - inadvertently hit other airplane, tug, jetway – 5 events
- Airplane damaged from foreign object debris – 4 events
- Engine ingestion fatality – 1 event
- Crew/maintenance fell – 3 events

Events Occurring From 1995 Through 2004



Notes

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