U. S. Air Carrier Operations
Calendar Year 2002

ANNUAL REVIEW OF AIRCRAFT ACCIDENT DATA

NTSB/ARC-06/02

PB2007-100695

National Transportation Safety Board

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Annual Review of Aircraft Accident Data

U.S. Air Carrier Operations, Calendar Year 2002

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Abstract: The National Transportation Safety Board's Review of 2002 Aircraft Accident Data: U.S. Air Carrier Operations covers aircraft operated by U.S. air carriers under Title 14, Parts 121 and 135, of the *Code of Federal Regulations* (CFR). Air carriers are generally defined as operators that fly aircraft in revenue service. To provide an historical context for this 2002 review, data for the years 1993–2002 are also presented. Much of the information in this review is presented in graphs and tables. Readers who prefer to view or manipulate tabular data may access the data set online at http://www.ntsb.gov/aviation/stats.htm. A list of 2002 air carrier accidents is presented in appendix A.

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INTRODUCTION

The National Transportation Safety Board's *Review of 2002 Aircraft Accident Data: U.S. Air Carrier Operations* covers aircraft operated by U.S. air carriers under Title 14,[1] Parts 121 and 135, of the *Code of Federal Regulations* (CFR). Air carriers are generally defined as operators that fly aircraft in revenue service. To provide an historical context for this 2002 review, data for the years 1993–2001 are also presented. Much of the information in this review is presented in graphs and tables. Readers who prefer to view or manipulate tabular data may access the data set online at http://www.ntsb.gov/aviation/stats.htm. A list of 2002 air carrier accidents is presented in appendix A.

Part 121

Usually includes operators that fly large transport-category aircraft.

An operation is scheduled if an air carrier or operator offers in advance the departure location, departure time, and arrival location.[1]

Any scheduled or nonscheduled passenger-carrying operation. Regulations limit Part 121 operations to controlled airspace and controlled airports that have available specific weather, navigational, operational, and maintenance support.

Scheduled Part 135

A scheduled passenger-carrying operation that flies to smaller airports that do not provide the services required to support Part 121 operations.

Includes commercial air carriers flying smaller jet and turboprop aircraft commonly referred to as commuter airlines. The definition for scheduled operations in Part 121 also applies to Part 135.

On-Demand Part 135

Any operation for compensation or hire for which the departure location, departure time, and arrival location are negotiated with the customer.

Customers can arrange to charter an entire aircraft or book a single seat on an air taxi.[2]

Also includes medical evacuation flights when a patient is on board.

Commercial aviation experienced one of its safest years in 2002 with fewer accidents than in previous years and no fatalities in Part 121 and scheduled Part 135 operations. A total of 108 accidents occurred among U.S. air carriers in 2002, down 9% from 2001: 41 Part 121 accidents, 7 scheduled Part 135 accidents, and 60 on-demand Part 135 accidents (table 1). At the same time, air carriers flew more than 7.9 billion miles, recorded at least 11.1 million departures, and logged more than 21 million flight hours.

[1] Title 14 is also known as the *Federal Aviation Regulations* (FAR).

Table 1: Accidents and Accident Rates for 2002

	Number of Accidents	Accidents Per Million Flight Hours
Part 121	41	2.37
Scheduled Part 135	7	25.6
On-Demand Part 135	60	20.6

Part 121 air carriers continue to exhibit the lowest accident rates of all commercial operations (tables 1 and 2), and scheduled and on-demand Part 135 operations exhibit accidents rates that are 10 times greater than Part 121 operations. In 2002, there were no Part 121 or scheduled Part 135 fatal accidents; all of the fatalities occurred as the result of on-demand Part 135 accidents.

Table 2: Fatal Accidents, Fatalities, and Fatal Accident Rates for 2002

	Number of Fatal Accidents	Fatalities	Fatal Accidents Per Million Flight Hours
Part 121	0	0	0.00
Scheduled Part 135	0	0	0.00
On-Demand Part 135	18	35	6.18

Historical Context for 2002 Air Carrier Accidents

Although 2002 was one of the safest years in recent history for commercial aviation, the number of accidents and the accident rates for air carrier operations were consistent with previous years. In general, the number of Part 121 accidents rose steadily from 1994–2000, and remained lower and constant in 2001 and 2002 (figure 1). The number of Part 135 accidents decreased from a peak in 1996, with 2002 showing a 17% decrease from 2001. As a group, scheduled and on-demand Part 135 operations consistently accounted for more accidents than Part 121.

The decrease in Part 135 accidents that began in 2001 continued in 2002. Much of this decrease was most likely due to decreased flight activity following September 11 when air carrier operations were suspended and then gradually reintroduced over a 20-day period. This decrease was apparent in both flight hours and departures, as shown in figures 2 and 3, respectively; flight hours continued to decrease in 2002, accompanied by a slight increase in departures. The increase in Part 121 accidents, hours, and departures beginning in 1997 was caused by the reclassification of some scheduled Part 135 operations as Part 121 in March of that year. (This phenomenon is discussed in more detail in appendix C.)

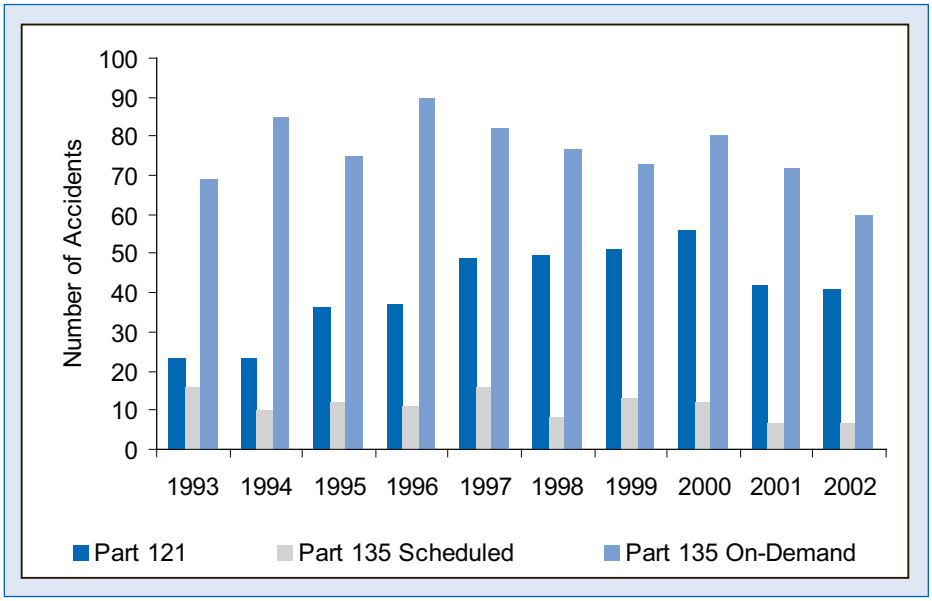

Figure 1: U.S. Air Carrier Accidents by FAR Part, 1993-2002

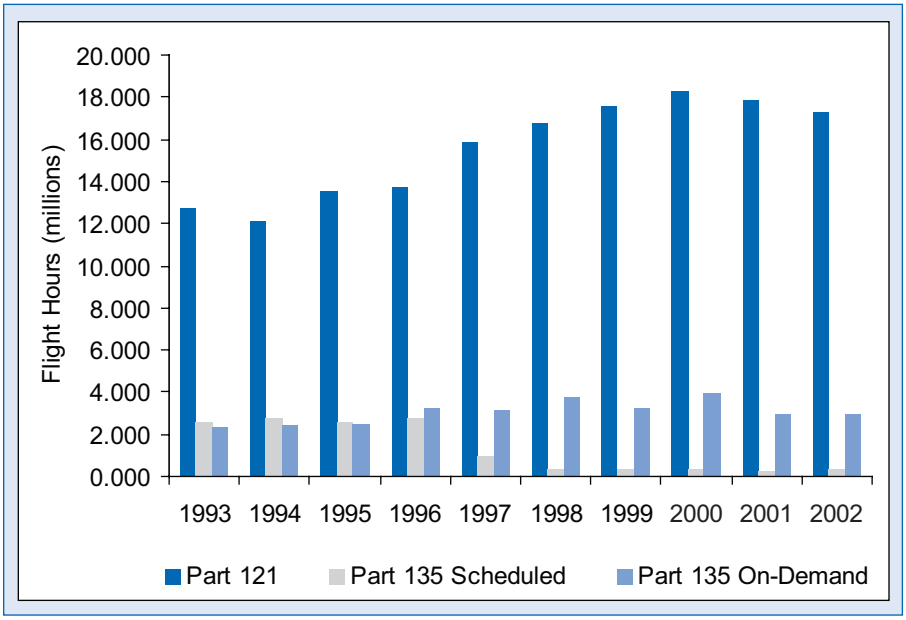

Figure 2: Flight Hours by FAR Part, 1993-2002

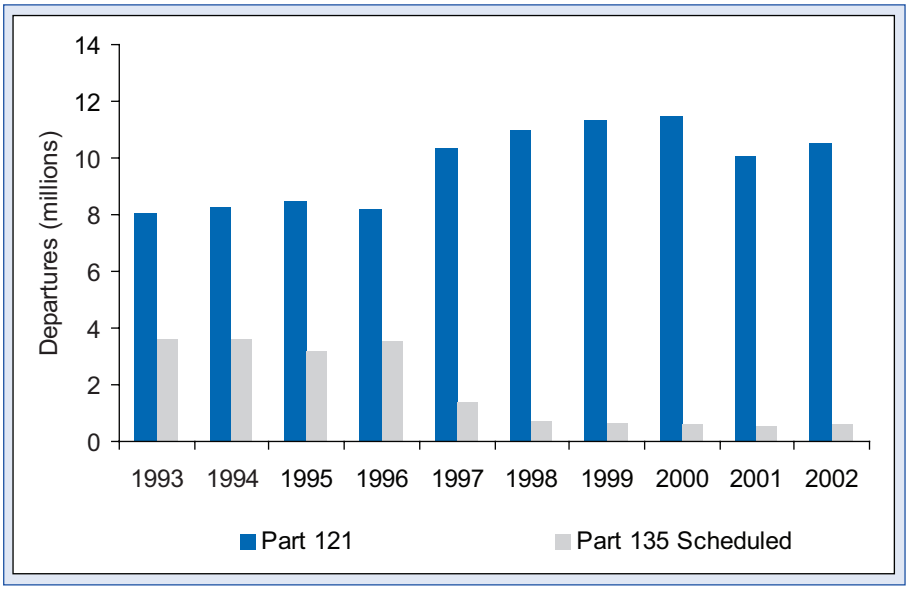

Figure 3: Scheduled Departures by FAR Part, 1993-2002

The flight activity data shown in figure 2 are compiled differently depending on the type of operation. Part 121 and scheduled Part 135 operations are required to report actual flight hours, and as a result, flight activity data for these operations are considered to be accurate. In contrast, on-demand Part 135 operations are not required to report flight activity data. Instead, these data are estimated using the voluntary *General Aviation and Air Taxi Activity (GAATA) Survey,* which is compiled annually by the Federal Aviation Administration (FAA). This survey gathers information from a sampling of owners of general aviation and on-demand Part 135 aircraft. This information includes flight hours, avionics, base location, and use, but does not include miles flown or departures. The small proportion of on-demand Part 135 aircraft surveyed, combined with a sample based on aircraft owners rather than operators and low survey response rates, produces an imprecise activity estimate. The *GAATA Survey* methodology and the way in which on-demand Part 135 flight hours are estimated is discussed in more detail in appendix C.

Estimates of on-demand Part 135 aircraft activity are further complicated by the fact that, in 2002, the FAA changed its estimating method and revised its flight-hour estimates for on-demand Part 135 operations. The revised method calculates activity based on the number of aircraft assumed to operate in on-demand operations[2] and the average number of flight hours reported on the *GAATA Survey*, and is applied retroactively to survey data for 1992–2001. As a result, FAA's flight-hour estimates for on-demand Part 135 flight operations beginning in 1992 are substantially higher than they would be using the previous method, and accident rates are consistently lower. This review uses the revised activity measures for on-demand Part 135 operations.

[2] Data are derived from the FAA's Vital Information Subsystem, a database used to track commercial and government operations certificates.

After 1997, scheduled Part 135 operations represented a small segment of air carrier operations. In 2002, scheduled 135 operations accounted for less than 2% of air carrier flight hours (figure 2) and less than 6% of scheduled air carrier departures (figure 3). As a result, scheduled Part 135 operations accounted for a small proportion of Part 135 accidents (figure 4). Consequently, the Part 135 discussion in this review focuses on on-demand (air taxi and charter) operations.

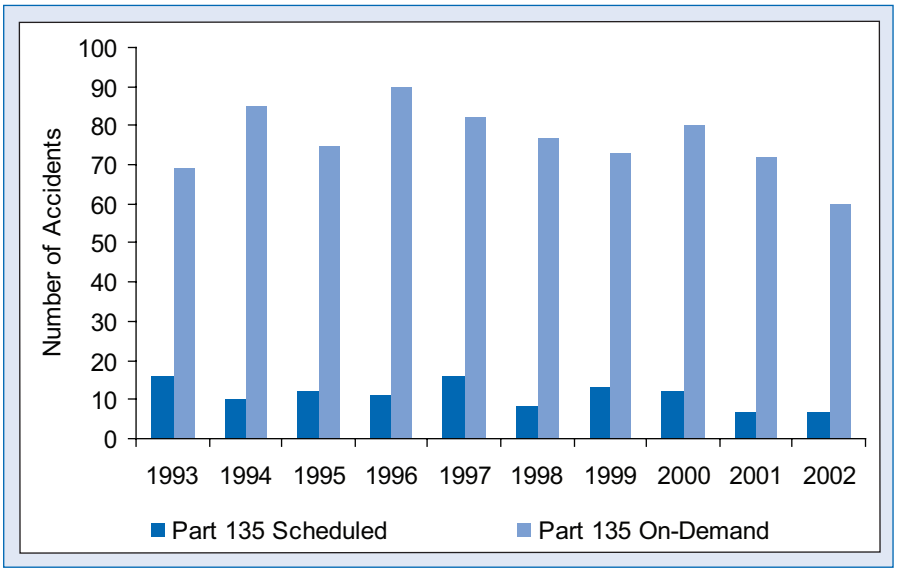

Figure 4: Part 135 Accidents by Type of Operation, 1993-2002

Although the number of Part 121 accidents increased from 1993–2002, the number of fatal Part 121 accidents remained relatively constant and low, with no fatal accidents in 2002 (figure 5). The number of on-demand Part 135 fatal accidents varied considerably from year to year (also shown in figure 5), but the number of fatal accidents in 2002 changed little from 2001, despite a 17% decrease in accidents. In general, Part 121 fatal accidents accounted for less than 2% of all air carrier accidents from 1993–2002, whereas on-demand Part 135 fatal accidents accounted for almost 16% of all air carrier accidents.

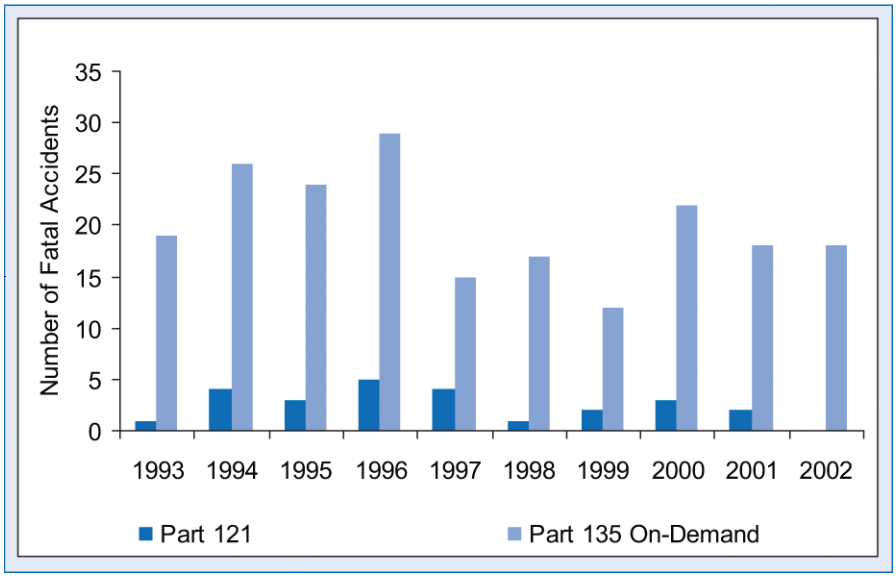

Figure 5: U.S Air Carrier Fatal Accidents by FAR Part, 1993-2002

Accident rates for Part 121 and on-demand Part 135 operations reflect similar patterns (figure 6). Although the number of Part 121 accidents increased slightly toward the end of the period, the accident rate for Part 121 remained relatively constant from 1993–2002. On-demand Part 135 accident rates decreased overall from 1994–1998, rising slightly thereafter and after that ranged between 20 and 25 accidents per million flight hours. Throughout the period, the accident rate for on-demand Part 135 operations (and for Part 135 operations in general) remained almost 10 times greater than the Part 121 accident rate. The following sections consider in more detail accident data for Part 121 and Part 135 air carrier operations.

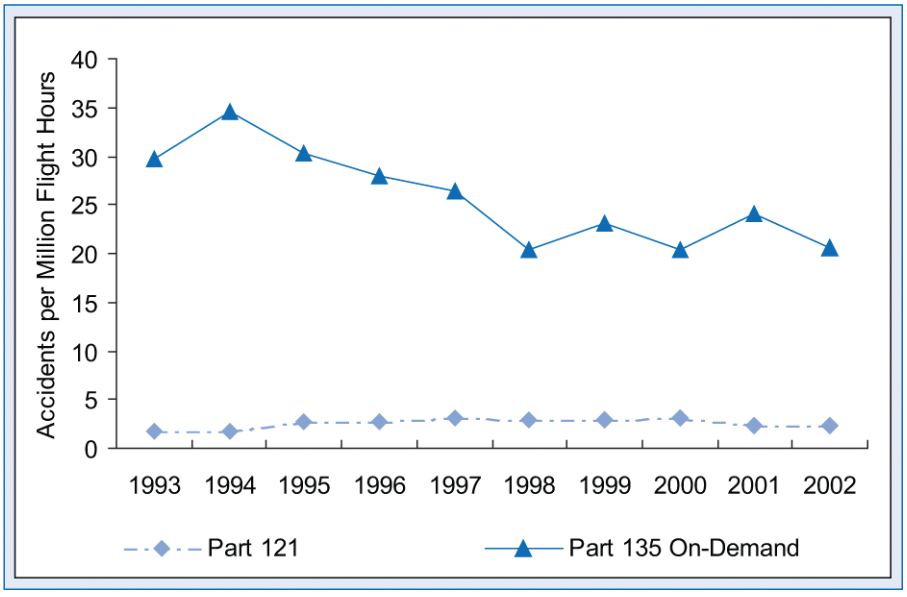

Figure 6: U.S. Air Carrier Accident Rates by FAR Part 1993-2002

PART 121 ACCIDENTS IN 2002

Part 121 operations in 2002 carried more than 619 million passengers a total of 7.9 billion miles and accumulated more than 17.3 million flight hours. The 41 Part 121 accidents involved 41 aircraft, produced an accident rate of 2.4 accidents per million flight hours, and resulted in no fatalities, 24 serious injuries, and 56 minor injuries (as shown in table 3).

Few passengers were injured in Part 121 accident flights in 2002 (table 3). The risk of injury to Part 121 passengers remained low: only 1 of about 11.3 million passengers who boarded a Part 121 air carrier flight was injured in an accident, and only 1 of every 229,000 Part 121 passengers was involved in an accident. Of the 2,709 passengers involved in Part 121 accidents, only 2% received any type of injury. The number of flight and cabin crewmembers injured in Part 121 accidents was also small: of the 84 flight crewmembers involved, only 6 sustained injuries, and of the 119 cabin crew involved, 17 sustained injuries. Cabin crewmembers were twice as likely to be injured as flight crewmembers.

Table 3: Part 121 Injuries By Role In 2002

	Fatal	Serious	Minor	None	Total
Flight crew		3	3	78	84
Cabin crew		9	8	102	119
Other crew				10	10
Passengers		11	44	2'844	2,924
Total aboard	**0**	**23**	**55**	**2,844**	**2,924**
On ground		1	1		2
Total	**0**	**24**	**56**	**2,844**	**2,924**
Accidents	0	16	1	24	41

Only six Part 121 accidents occurred outside of the United States and its territories. Three of these accidents involved encounters with turbulence at cruising altitudes. In addition, seven accidents were cargo-only flights (and two of them occurred in the Philippines). The list of accidents is presented in appendix A.

Accidents, Accident Severity, and Injuries

The number of Part 121 accidents more than doubled after 1994, reaching a peak in 2000 (figure 7). The increase was primarily due to nonfatal injury-only and damage-only accidents.[3] After 1994, nonfatal injury-only accidents doubled and damage-only accidents tripled in frequency, while the most serious types of accidents—those resulting in fatalities and substantial damage to the aircraft (either *major* or *serious* in severity)—remained at a constant, low level. However, the number of nonfatal injury-only accidents in 2002 declined 26% from 2001, reaching a level not recorded since 1995. With the exception of nonfatal injury-only accidents, the data for 2002 were consistent with past years. Accident rates based on flight hours (figure 8) show the same pattern, and highlight how much the rate of damage-only accidents increased and how little the rate of more severe accidents changed during the period 1993–2002. Nonfatal injury-only accident rates for both flight hours and departures declined 25%, recording a new low for the period 1993–2002. These data illustrate a pattern over the past decade of increasing numbers of damage-only accidents and decreasing nonfatal injury-only accidents. The marked increase in the number of Part 121 accidents in 1997 was due in part to the Part 121/135 reclassification that occurred in March of that year. After 1982, all aircraft involved in Part 121 accidents were airplanes.

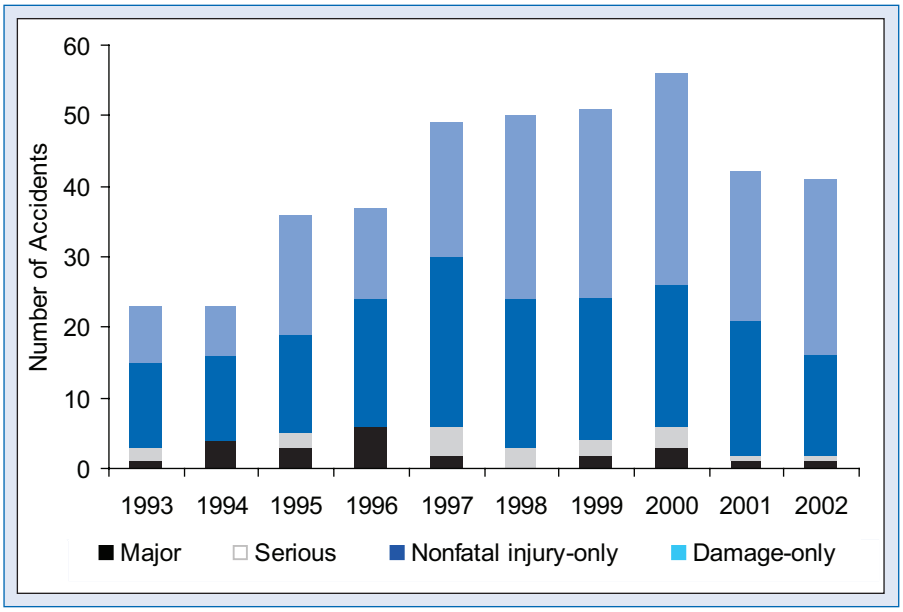

Figure 7: Part 121 Accidents by Serverity Classification, 1993-2002

[3] The severity of a Part 121 accident is classified into one of four categories defined in appendix B. Briefly, an accident is *major* if there is at least one fatality and substantial damage to the aircraft, *serious* if there is at least one serious injury and substantial damage to the aircraft; *injury-only* if there are nonfatal injuries and no damage to the aircraft; and *damage-only* if there are no injuries but the aircraft is substantially damaged.

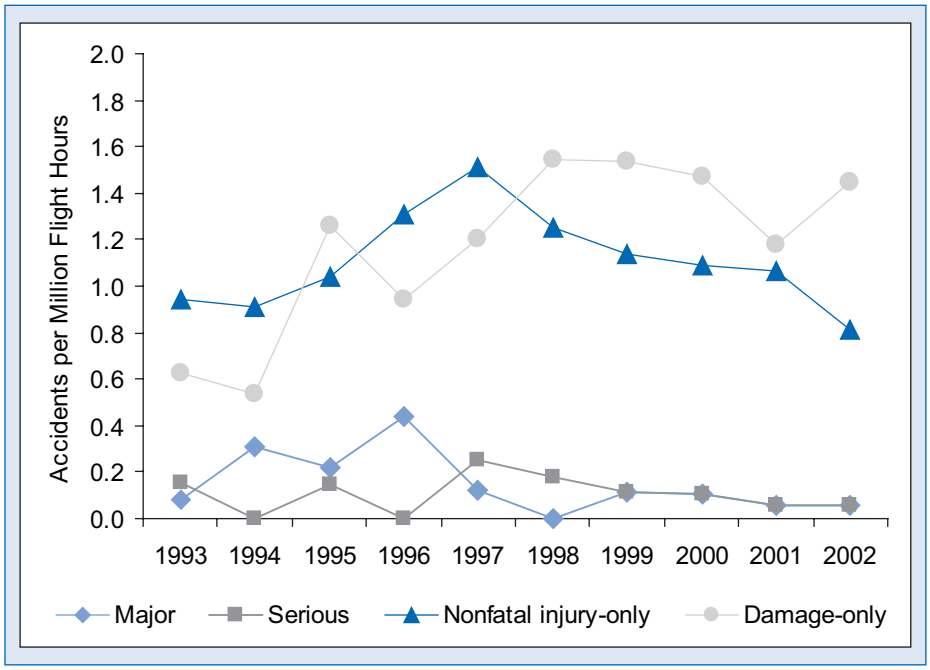

Figure 8: Part 121 Accident Rates (Using Flight Hours) by Severity Classification, 1993-2002

These data, especially injury data, can be dramatically affected by a few severe accidents in a given year. For instance, figure 9 shows that a large number of fatalities (1,053 total) occurred in 1994, 1995, 1996, and 2001; almost all of these injuries (965) were attributed to 6 of the 408 Part 121 accidents[4] that occurred in the decade 1993–2002. In general, however, the proportion of people injured in Part 121 accidents during the 10-year period was small.[5]

[4] USAir flight 427 on September 8, 1994, resulted in 132 fatalities; American Eagle flight 4184 on October 31, 1994, resulted in 68 fatalities; American Airlines flight 965 on December 20, 1995, resulted in 160 fatalities; ValuJet flight 592 on May 11, 1996, resulted in 110 fatalities; TWA flight 800 on July 17, 1996, resulted in 230 fatalities; and American Airlines flight 587 on November 12, 2001, resulted in 265 fatalities.

[5] National Transportation Safety Board, *Survivability of Accidents Involving Part 121 U.S. Air Carrier Operations, 1983 through 2000*, Safety Report NTSB/SR-0101 (Washington, DC: National Transportation Safety Board, 2001).

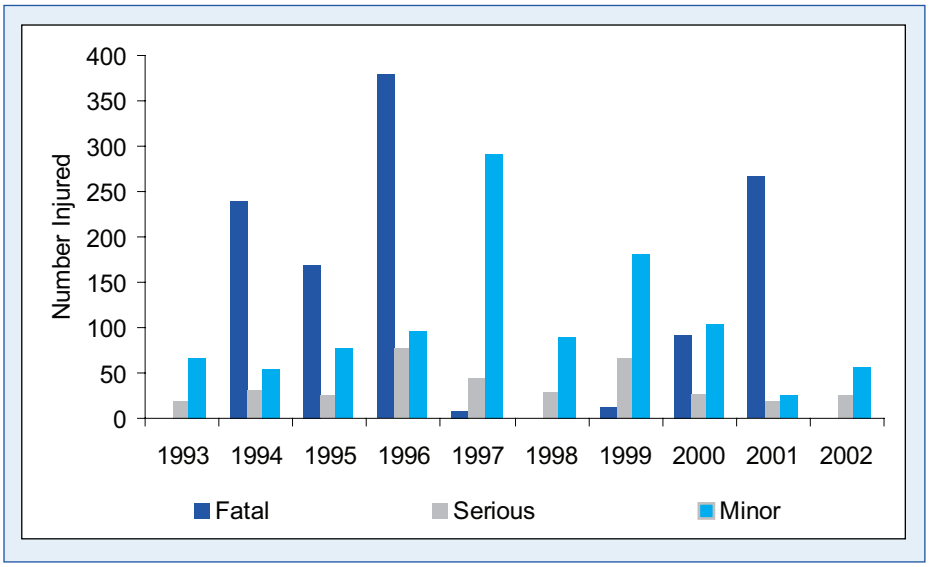

Figure 9: Number Injured by Level of Injury, Part 121 Accidents, 1993-2002

Survivability of serious accidents over the 10-year period remained quite good (table 5); 88% of the accidents producing minor injuries and 94% of the accidents producing no injuries were associated with substantially damaged aircraft (tables 6 and 7). As shown in figure 7, these types of low-injury, damage-producing accidents increased toward the end of the 10-year period.

Table 4: Part 121 Fatal Accidents for Each Level of Damage, 1993 - 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed		3	3	4	1		1	2	1	
Substantial		1		1						
Minor	1				1	1	1	1	1	
None					2					

Table 5: Serious-Injury Accidents for Each Level of Damage, 1993 - 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed	1									1
Substantial	1		2		1	2	1	2		1
Minor	1	3		5	5	6	2	3		2
None	11	9	14	13	19	15	18	17	19	12

Table 6: Minor-Injury Accidents for Each Level of Damage, 1993 – 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed				1	1		1	1		
Substantial	1	3	1	5	6	7		6	6	1
Minor	1									
None										

Table 7: No-Injury Accidents for Each Level of Damage, 1993 - 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed										
Substantial	6	4	15	8	13	19	27	23	15	23
Minor			2	2			1	1	2	
None								1		1

In 2002, 12 serious-injury accidents involved no damage to the aircraft (table 5). Most of those accidents (63%) were the result of encounters with turbulence, a topic discussed in more detail later in this review. On average, 94% of the accidents in 1993–2002 producing serious injuries resulted only in minor damage or no damage to the aircraft. However, in 2002 there was one accident where the airplane was destroyed by a post-crash fire and the three-person crew suffered serious injuries during the evacuation.

Occurrences, Causes, and Factors

Investigators describe the events that take place during an accident as a sequence of occurrences, each identified with a phase of flight. The first occurrence associated with phase of flight describes the initiating event for an accident flight and the starting point of the accident in the time course of the flight. Table 8 shows first occurrence data by phase of flight for the aircraft involved in Part 121 accidents. Appendix C discusses in more detail occurrences and how they are coded. First occurrences for 37 of the 41 accidents were available for this analysis.

Table 8: Part 121 First Occurrences by Phase of Flight for 2001

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Standing	Taxiing	Total
On Surface Collision with Object	1			2	5	8
In-flight Encounter with Weather	1	4	2			7
Miscellaneous/Other	1	1		2		4
Airframe/Component/ System Failure	1	1	1			3
Gear Collapsed			2		1	3
In-flight Collision with Object	1	1	1			3
Dragged Wing, Rotor, Pod, Float Or Tail/Skid			2			2
Abrupt Maneuver		1				1
Collision Between Aircraft (not midair)					1	1
Fire				1		1
Hard Landing			1			1
On Ground/Water Loss of Control			1			1
Near Collision Between Aircraft			1			1
Propeller Contact with Person				1		1
Total Accident Airplanes	5	8	11	6	7	37

On-surface collisions with objects were the most frequently cited accident-initiating event in Part 121 operations. Three of the accidents occurred during pushback, three involved collisions between ramp vehicles and the airplane, one involved the airplane being struck by a deicing boom, and one involved a bird strike during the take-off roll. In fact, events during the two phase-of-flight categories related to ground operations (standing and taxiing) together accounted for one-third of the initiating events in Part 121 accidents in 2002.

In-flight encounters with weather were the second-most frequently cited accident-initiating event in Part 121 operations and occurred most frequently during cruise and descent. In 2002, all in-flight encounters with weather during cruise and descent were attributed to turbulence, and all of these accidents resulted in serious injuries. Turbulence is the single most-often cited cause or factor in Part 121 accidents resulting in serious injuries.

In 2002, turbulence was cited as a factor in about 19% of all Part 121 accidents and was a factor in 50% of all serious-injury accidents. Turbulence typically accounted for a quarter or more of all Part 121 accidents from 1993–2002 and

was the leading cause or factor in all Part 121 accidents producing serious injuries. As tables 9 and 10 show, turbulence accidents typically resulted in little or no damage to the aircraft.

Table 9: Turbulence Accidents by Highest Level of Injury, 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Fatal					1					
Serious	9	6	10	9	13	11	10	14	12	8
None										
Total Accidents	39.1%	21.7%	27.8%	27.0%	28.6%	20.0%	23.5%	23.2%	26.2%	19.5%
Serious Injury Accidents	64.3%	41.7%	62.5%	55.6%	56.0%	43.5%	57.1%	59.1%	57.9%	50.0%

Table 10: Turbulence Accidents for Each Level of Damage, 1993-2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Substantial						1				
Minor	1			2	2	2	1	1		1
None	8	6	10	7	12	8	9	13	10	7

Part 121 accidents occurred most often during approach and landing (30%), followed by cruise and descent (table 11). More than half of the approach and landing accidents resulted from encounters with weather, or from a collapsed gear or a dragged wing or tail skid. The other accidents were associated with different first occurrences, including an airframe/component/system failure and a bird strike.

Table 11 also relates the severity of an accident to phase of flight for the initiating event. Cruise or descent accidents most often resulted in a damaged aircraft but few injuries, while approach/landing was more often associated with injury-only accidents (which is consistent with the discussion of turbulence). More than half of the accidents resulted in injuries only, and all but two of the remaining accidents involved only damage to the aircraft.

Table 11: Part 121 Accidents, Serverity Classification by Phase of Flight for 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Standing	Taxiing	Total
Major			1			1
Serious			1			1
Injury	3	2	7	3	7	22
Damage	2	6	2	3		13
Total	5	8	11	6	7	37

Historically, personnel are cited as a cause or factor in 70–80% of all Part 121 accidents, followed by environment-related causes, and then aircraft-related causes. Calendar year 2002 was consistent with this pattern (as shown in figure 10), with personnel cited in nearly 76% of the Part 121 accidents, environment in 46%, and aircraft in almost 30%. Note that the number of accidents citing the environment averaged about 40% from 1998–2001.

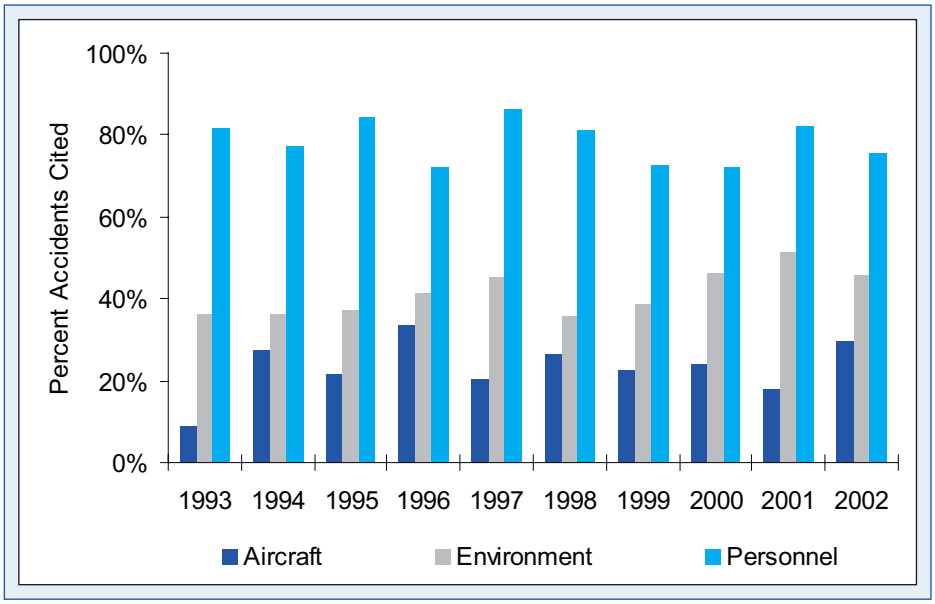

Figure 10: Broad Causes/Factors for Part 121 Accidents, 1993-2002

Figure 11 provides more detail about Part 121 accident causes and factors within the broad categories of personnel, aircraft, and environment. These data show the proportion of accidents where a specific cause or factor was cited at least once in the accident. Although pilots were typically the most frequently cited cause or factor in previous years, that was not the case in 2002. Others not on board were the most frequently cited personnel (43%), reflecting the large number of accidents attributable to ramp personnel. Weather conditions were the most frequently cited environmental cause or factor (24%). No specific aircraft component or equipment could be singled out as the leading cause or factor in aircraft-related accidents.

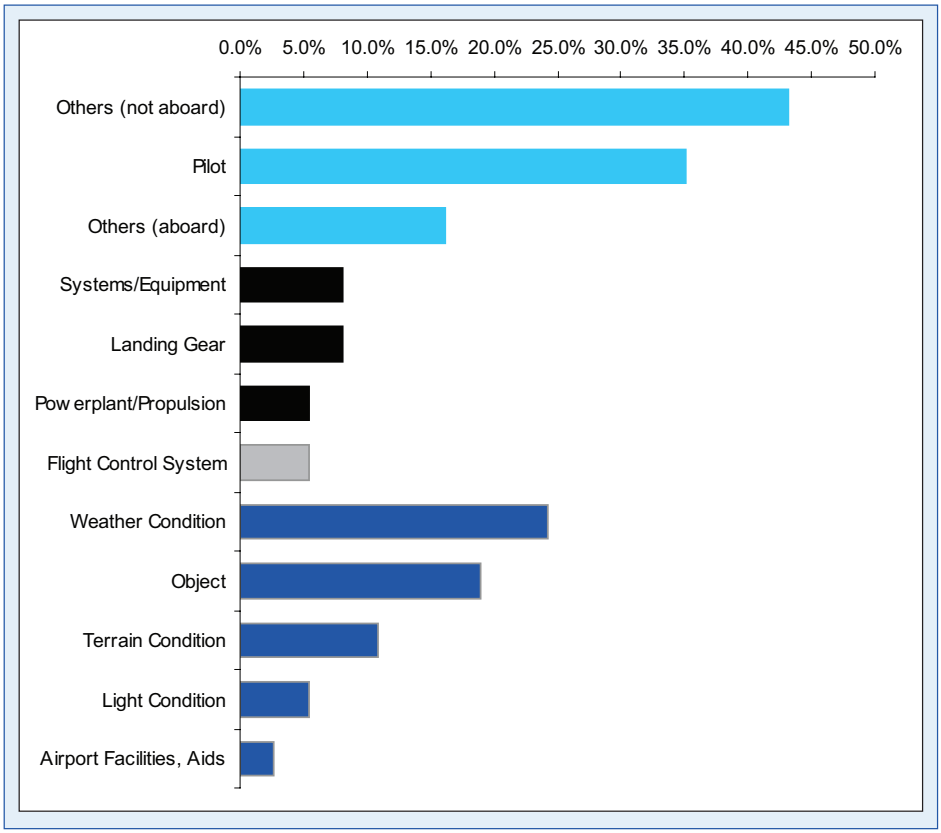

Figure 11: Top Causes/Factors In Part 121 Accidents for 2002

Part 135 Accidents in 2002

Part 135 applies to commercial air carriers that operate commuter flights (scheduled Part 135), charters and air taxis (on-demand Part 135), and cargo flights (which can be either scheduled or on-demand). In 2002, there were 67 Part 135 accidents (table 12). Of these, the 7 scheduled and 60 on-demand accidents produced accident rates of 25.6 and 20.6 accidents per million flight hours, respectively. Part 135 accidents resulted in 35 fatalities (all on-demand Part 135), 16 serious injuries, and 19 minor injuries (table 13). The following three on-demand Part 135 accidents accounted for nearly half the fatalities:

- On July 12, 2002, a float-equipped de Havilland DHC-2 airplane was destroyed during an in-flight collision with terrain near Port Alsworth, Alaska. The airplane was being operated by Bigfoot Air, Anchorage, Alaska, as a charter flight under 14 CFR Part 135 at the time of the accident. The commercial pilot and the three passengers were fatally injured.

- On September 9, 2002, a Bell 206L-1 helicopter was destroyed during a collision with terrain near Doland, South Dakota. The flight was en route to Heart Hospital of South Dakota in Sioux Falls, South Dakota. Night marginal visual meteorological conditions prevailed at the time, and the pilot, nurse, flight paramedic, and patient were fatally injured.

- On October 25, 2002, a Raytheon (Beechcraft) King Air A100, operated by Aviation Charter, Inc., as a charter flight, crashed while attempting to execute the VOR approach to runway 27 at Eveleth-Virginia Municipal Airport, Minnesota. All eight people on board were fatally injured.

Table 12: Part 135 Accidents, Highest Injury by Type of Operation in 2002

	Scheduled	On-Demand	Total
Fatal	0	18	18
Serious	0	5	5
Minor	1	5	6
None	6	32	38
Total	**7**	**60**	**67**

Table 13: Part 135 Occupant Injuries, Injury Severity by Type of Operation in 2002

	Scheduled	On-Demand	Total
Fatal	0	35	35
Serious	0	16	16
Minor	3	16	19
None	34	186	220
Total	**37**	**253**	**290**

Although on-demand accidents accounted for most Part 135 accidents and injuries, accident rates for both types of Part 135 operations were approximately the same in 2002 (figure 12), but that was not always the case in previous years. The on-demand Part 135 accident rate remained generally constant from 1998–2002. During the same period, the scheduled Part 135 accident rate rose considerably above the on-demand rate after the Part 121/ Part135 reclassification in 1997, and then declined substantially from 1999 to 2001. Note that the on-demand Part 135 accident rate peaked in 1994, and then steadily declined until 1998.

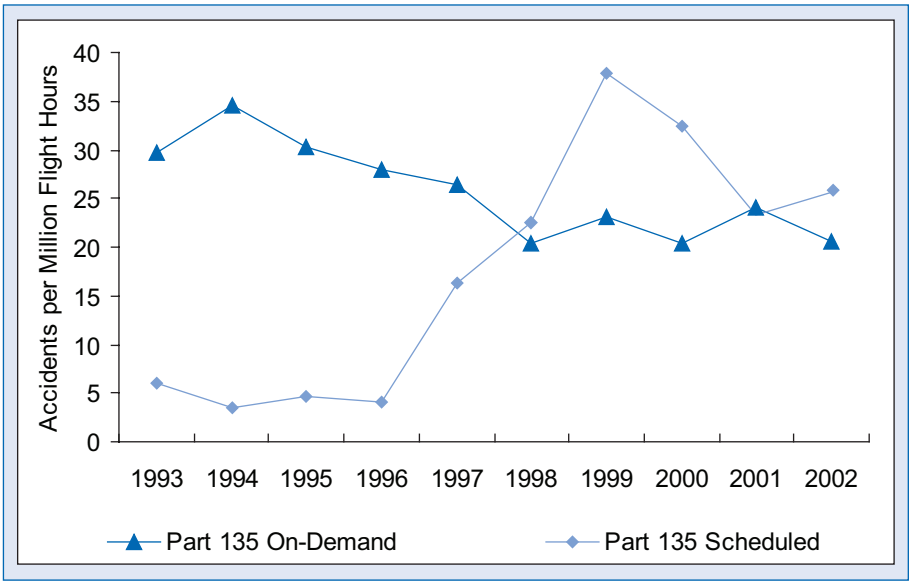

Figure 12: Part 135 Accident Rates, 1993-2002

In general, Part 135 accident rates were substantially higher than Part 121 accident rates in the same years. In 2002, the rates for Part 135 operations were nearly 10 times greater than for Part 121 operations, and historically, the Part 135 fatal accident rates were more than 50 times greater than Part 121 (as shown in tables 1 and 2). In 2002, the scheduled Part 135 accident rate was 25.6 accidents per million flight hours; the on-demand Part 135 accident rate

was 20.6 accidents per million flight hours, and the fatal accident rate was 6.2 accidents per million flight hours. These rates were, however, substantially lower than the rates for general aviation. In 2002, the general aviation accident rate was 66.9 accidents per million flight hours, and the fatal accident rate was 13.3 fatal accidents per million flight hours.[6]

As previously mentioned, the FAA uses the *GAATA Survey* to estimate on-demand Part 135 flight hours. Although the fleet of on-demand Part 135 aircraft comprises both fixed-wing airplanes and helicopters, the FAA's revised flight-hour estimate does not distinguish between the two types of aircraft. To estimate the flight hours associated with airplanes and helicopters, the FAA uses the fleet composition data in the *GAATA Survey* to estimate the proportion of airplanes and helicopters in the charter and air taxi fleet, and then uses that estimate to determine the proportion of flight hours to be assigned to each type of aircraft. In 2002, airplanes accounted for 82% of the fleet, and helicopters accounted for about 16% (table 14). As a result, the flight-hour estimates for fixed-wing airplanes and for helicopters presented in this review are based on the proportion of the fleet accounted for by each type of aircraft. For comparison, table 15 shows 2002 flight hours from the *GAATA Survey* as initially compiled and the estimate reported by the FAA using the revised method, along with the flight hours for each type of aircraft. It is worth noting that, given the larger number of flight hours using FAA's revised method, the overall accident rate is lower than it would be otherwise. See appendix C for a discussion of FAA's revised estimating method.

Table 14: Comparison of On-Demand Part 135 Flight Hours for 2002

	On-Demand Active Fleet Size	Flight Hours Reported in the GAATA Survey	Flight Hours Using FAA Revised Estimate
Airplane	4,226	1,503,339	2,452,620
Helicopter	847	414,777	490,524
Overall[a]	5,153	1,922,383	2,991,000

[a] In addition to airplanes and helicopters, the *GAATA Survey* estimate of the on-demand Part 135 fleet includes 50 lighter-than-air and 30 experimental aircraft.

On-demand Part 135 accident rates for airplanes and helicopters in 2002, based on the FAA revised estimate of flight hours, are shown in table 15. Helicopters accounted for 28% of the on-demand Part 135 accidents and produced an accident rate greater than that for airplanes. The fatal accident rate for helicopters was, however, slightly lower than the rate for airplanes, implying that the more frequent helicopter accidents were perhaps less likely to result

[6] NTSB Press Release SB-05-09, March 29, 2005, Table 10

in a fatality. The proportion of on-demand Part 135 accidents attributable to helicopters steadily increased after 1997 (table 16).

Table 15: On-Demand Part 135 Accidents, Fatal Accidents, and Accident Rates for 2002

	Accidents	Fatal Accidents	Flight Hours	Accidents per million Flight Hours	Fatal Accidents per million Flight Hours
Airplane	43	15	2,127,870	20.2	7.0
Helicopter	17	3	599,400	28.4	5.0
Overall	60	18	2,991,000	20.6	6.2

Table 16: On-Demand Part 135 Accidents, Airplanes, and Helicopters, 1993- 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Airplane	55	68	66	80	73	66	59	63	54	43
Helicopter	14	17	10	11	10	11	15	17	18	17
% Helicopter	20%	20%	13%	12%	12%	14%	20%	21%	25%	28%

On-Demand Part 135 Accident Severity and Injuries

The potential for injury in on-demand Part 135 accidents is much greater than in Part 121 accidents. Almost half the Part 135 accidents in 2002 resulted in injuries and almost a third of the accidents were fatal (table 12). Although less than 10% of the people in Part 121 accident aircraft suffered any injury, fully 25% of the people on board on-demand Part 135 accident aircraft were injured (39% of the crew and 21% of the passengers), and more than half the injuries were fatal (table 17). The total number of injuries in 2002 was the lowest in the period 1993–2002, but the pattern of injuries was consistent with previous years, as shown in figure 13. Although a few accidents can substantially increase the number of injuries in any single year, the relatively small number of passengers carried by on-demand Part 135 aircraft limits the number of people that can be injured in a single accident.[7]

As might be expected, the potential for fatal or serious injury increases with the level of aircraft damage. In 2002, 13 of the 18 fatal on-demand Part 135 accidents occurred when the aircraft was destroyed, and all of the serious-injury accidents occurred when the aircraft was either destroyed or substantially

[7] On-demand Part 135 operators are limited to aircraft with a maximum seating capacity (not including the crew) of 9 passengers in piston-engine airplanes, 30 passengers in turbo-prop or jet airplanes, and 12 passengers in helicopters.

damaged (table 18). The pattern was consistent from 1993–2002: 87% of the fatal accidents occurred when the aircraft was destroyed and approximately 90% of the serious-injury accidents occurred when the aircraft was substantially damaged or destroyed (table 19).

Table 17: On-Demand Part 135 Accident Injuries by Role for 2002

	Fatal	Serious	Minor	None	Total
Flight crew	16	6	5	45	72
Cabin crew					0
Other crew	2	1	0	2	5
Passengers	17	9	10	139	175
Total aboard	**35**	**16**	**15**	**186**	**252**
On ground			1		1
Other aircraft					0
Total	**35**	**16**	**16**	**186**	**253**
Accidents	18	9	7	38	72

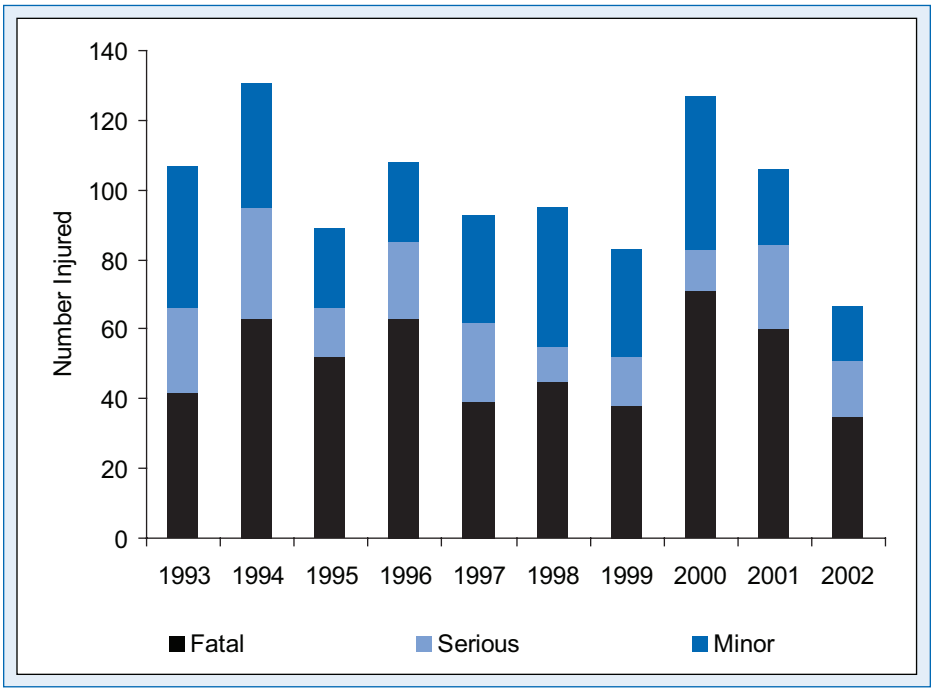

Figure 13: On-Demand Part 135 Accidents, Number Injured by Level of Injury 1993-2002

However, the survivability of on-demand Part 135 accidents can be quite good: all but one of the minor-injury accidents and 98% of the no-injury accidents from 1993–2002 occurred when the aircraft was substantially damaged or destroyed (tables 20 and 21). In 2002, the three accidents that resulted in destroyed aircraft but caused no injuries included a Cessna that was destroyed during a forced landing on a golf course, a Robinson helicopter that started and then was consumed by a brush fire, and a twin-engine Cessna jet destroyed by fire after a runway overrun.

Table 18: On-Demand Part 135 Fatal Accidents for Each Level of Damage, 1993- 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed	19	21	19	28	14	15	11	19	15	13
Substantial		4	5	1	1	2	1	3	2	5
Minor										
None		1							1	

Table 19: On-Demand Part 135 Serious-Injury Accidents for Each Level of Damage, 1993- 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed	19	21	19	28	14	15	11	19	15	13
Substantial		4	5	1	1	2	1	3	2	5
Minor										
None		1							1	

Table 20: On-Demand Part 135 Minor-Injury Accidents for Each Level of Damage, 1993- 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed	2	2	1	1	5	4		2	1	
Substantial	11	11	6	9	9	12	11	12	6	5
Minor										
None				1						

Table 21: On-Demand Part 135 No-Injury Accidents for Each Level of Damage, 1993- 2002

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Destroyed			1	1	1				2	3
Substantial	29	37	38	39	38	41	41	38	36	29
Minor			1		1		1	1		2
None										1

On-demand Part 135 data for 2002 indicate that a person in a helicopter was more likely to be injured than a person in an airplane: 32% of the people on helicopters suffered some form of injury in an accident compared with 25% of the people in airplanes (table 22). A greater proportion of people injured in helicopter accidents (80%) suffered serious or minor injuries, compared with a much smaller proportion, 42%, in airplanes. However, fatalities represented a greater proportion of the injuries in airplanes (57%) than in helicopters (40%).

Table 22: On-Demand Part 135 Accidents, Injuries by Type of Aircraft in 2002

	Airplane	Helicopter	Total
Fatal	27	8	35
Serious	12	4	16
Minor	8	8	16
None	144	42	186
Total	**191**	**62**	**253**

The difference in injury severity between airplanes and helicopters in 2002 was consistent, for the most part, with data from previous years. Figures 14 and 15 show the proportion of injuries for airplanes and helicopters from 1993–2002, subdivided into fatal and nonfatal injuries. Except for 1996 and 1998,[8] the proportion of fatal injuries was always less in helicopters than in airplanes. In the most recent years, the proportion of fatal injuries declined and exhibited the lowest levels in the 10-year period, while the proportion of nonfatal injuries increased. These data were tempered, however, by a helicopter accident rate greater than that for airplanes. Some of the difference between helicopters and airplanes appears to result from factors underlying on-demand Part 135 accidents, a topic discussed in the next section.

[8] Three accidents accounted for 15 of the 17 fatalities in on-demand helicopters in 1998: a sightseeing flight on the island of Kauai, Hawaii, on June 25 (6 fatalities); an air taxi flight at Indian Trail, North Carolina, on May 25 (5 fatalities); and a medical evacuation flight near Sandy, Utah, on January 11 (4 fatalities).

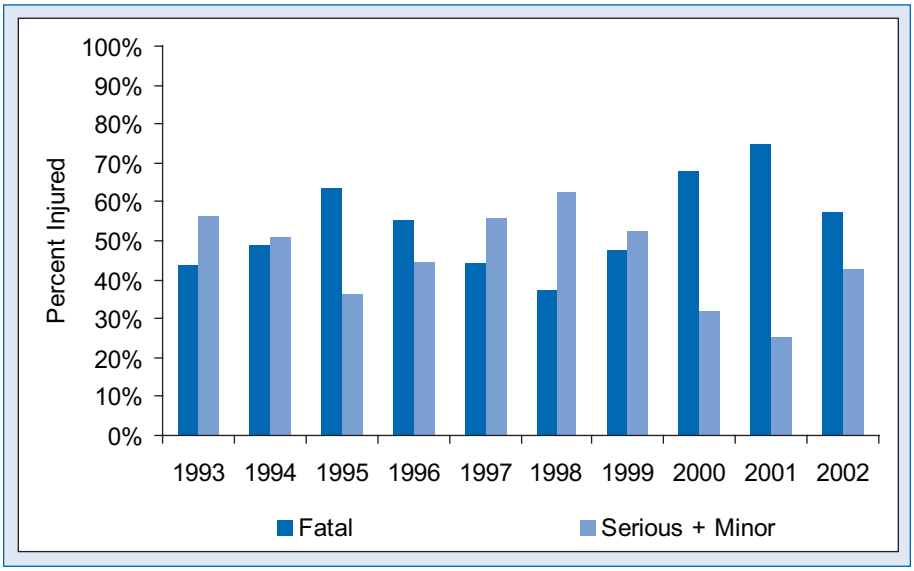

Figure 14: On-Demand Part 135 Airplane Accidents, Percent Injured by Level of Injury 1993- 2002

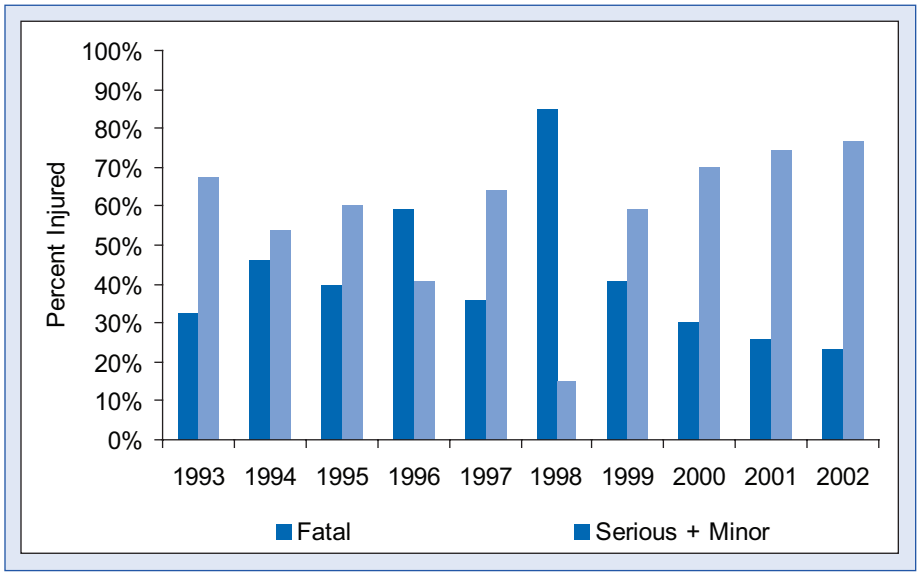

Figure 15: On-Demand Part 135 Helicopter Accidents, Percent Injured by Level of Injury, 1993- 2002

Occurrences, Causes, and Factors

The factors underlying on-demand Part 135 accidents are characterized in the data in the same way as for Part 121 accidents: as a sequence of occurrences, each identified with a phase of flight, that describe the events that took place during the accident. In association with occurrences, investigators also indicate the causes and factors in an accident. The first occurrence associated with phase

of flight describes the initiating event for an accident flight. Tables 23 and 25 show first occurrence data by phase of flight for airplanes and for helicopters involved in on-demand Part 135 accidents. A more detailed discussion of occurrences and how they are used is presented in appendix C.

Initiating events during approach or landing accounted for most (41%) of the airplane accidents, but fatal and serious airplane accidents were as likely to occur in cruise or descent as in approach or landing (table 24). This pattern was consistent with Part 121 accidents with one notable exception: although most of the injury-producing accidents in Part 121 operations occurred in flight and were typically associated with turbulence, turbulence was rarely cited as a cause or factor in on-demand Part 135 accidents.

Although in-flight loss of control was the single most frequently occurring initiating event in on-demand Part 135 airplane accidents in 2002, a number of other types of initiating events, when taken in combination, were equally frequent. For example, all of the different types of in-flight collisions (with an object, terrain, or water) were as likely to initiate an accident as in-flight loss of control (both accounting for approximately 15% of the accidents), as shown in table 23. On-surface collisions with an object, terrain, or water were the next most frequent combination, followed by single initiating events, such as overruns and loss of engine power for nonmechanical reasons.

For on-demand Part 135 helicopter accidents in 2002, most of the initiating events were the result of in-flight loss of control or in-flight collisions with an object, terrain, or water, and usually occurred during approach or landing (table 25). In-flight encounters with weather were the next most frequently cited first occurrence.

In contrast to airplane accidents, the on-demand Part 135 helicopter accidents that produced fatal or serious injuries were distributed across all phases of flight (table 26). Only 3 of the 15 helicopter accidents were fatal, and more than half of the helicopter accidents resulted in either minor injuries or no injuries.

Table 23: On-Demand Part 135 Airplanes, First Occurrences by Phase of Flight for 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver	Taxiing or Standing	Total
Loss of Control - In-flight		1	5			6
Overrun	1		3			4
Airframe, Component, or System Failure	1		2			3
In-flight Collision with Object		2	1			3
In-flight Collision with Terrain or Water	1	1		1		3
In-flight Encounter with Weather	1	1	1			3
On Surface Collision with Terrain or Water	1				2	3
Collision between Aircraft (Not Midair)					2	2
Loss of Control - Surface	2					2
Loss of Engine Power (Total) Nonmechanical		1	1			2
Midair Collision		1	1			2
On Surface Collision with Object					2	2
Gear Collapsed			1			1
Loss of Engine Power			1			1
Loss of Engine Power (Partial) Nonmechanical	1					1
Main Gear Collapsed					1	1
Miscellaneous/Other						1
Undershoot			1			1
Total	8	7	17	1	7	41

Table 24: 2002 On-Demand Part 135 Airplane Accidents by Severity and Phase of Flight

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver	Taxiing	Total
Fatal	1	6	5	1		14
Serious	1		1			2
Minor	1				1	2
None	5	1	11		6	23
	8	7	17	1	7	41

Table 25: On-Demand Part 135 Helicopters, First Occurrences by Phase of Flight for 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver or Hover	Standing	Total
Loss of Control - In-flight	1	1	2			4
In-flight Collision with Object		1	1			2
In-flight Collision with Terrain or Water			2			2
In-flight Encounter with Weather		2				2
Airframe, Component, or System Failure		1				1
Fire					1	1
Loss of Control - On Ground/Water	1					1
Loss of Engine Power (Total) Mechanical		1				1
Roll Over	1					1
Total	3	6	5	0	1	15

Table 26: 2002 On-Demand Part 135 Helicopter Accidents by Severity and Phase of Flight

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Standing	Total
Fatal		2	1		3
Serious	2		1		3
Minor	1	1			2
None		3	3	1	7
	3	6	5	1	15

For each on-demand Part 135 accident, the role played by personnel, aircraft, and the environment is cited by the investigator. In 2002, pilots of on-demand Part 135 accident aircraft were the most frequently cited cause or factor,

as shown in table 27. The environment was the next most frequently cited cause or factor, cited in more than 50% of the airplane accidents and in almost 75% of the helicopter accidents. Weather was cited more often in airplane accidents than in helicopter accidents, while terrain was more likely to be cited as a cause or factor in helicopter accidents than in airplane accidents. Although aircraft-related causes or factors were cited with equal frequency in both airplane and helicopter accidents, the powerplant accounted for proportionally more causes or factors in helicopter accidents than in airplane accidents.

Table 27: On-Demand Part 135 Accidents, Top Causes/Factors in 2002

	Percent Airplane Accidents	Percent Helicopter Accidents
Personnel	97.6%	100.0%
Pilot	80.5%	100.0%
Others (aboard)		
Others (not aboard)	24.4%	13.3%
Aircraft	19.5%	20.0%
Powerplant/propulsion	4.9%	13.3%
Flight control systems		
Aircraft structure		
Landing gear	7.3%	
Systems and equipment	2.4%	6.7%
Environment	53.7%	73.3%
Weather condition	31.7%	26.7%
Terrain condition	19.5%	26.7%
Light condition	14.6%	20.0%
Object	4.9%	13.3%
Airport/airways facilities, aids	4.9%	

The pattern of causes and factors for on-demand Part 135 accidents in 2002 was consistent with previous years, as shown in tables 28 and 29. Pilots were the most frequently cited cause/factor in on-demand Part 135 accidents, followed by the environment. For both airplanes and helicopters, weather and

terrain led the environmental category. For airplanes, the aircraft-related cause or factor cited most often in 2002 was the landing gear, and for helicopters, was powerplant/propulsion. Note that airport facilities and navigation aids were not cited as a cause or factor in helicopter accidents, but were cited in a small proportion of the airplane accidents. Historically, these patterns are consistent with Part 121 data; however, aircraft-related causes/factors were cited less frequently in on-demand Part 135 accidents than in Part 121 accidents, and the recent increase in environment-related causes and factors in Part 121 accidents was not evident in on-demand Part 135 accidents.

Table 28: On-Demand Part 135 Airplane Accidents, Top Causes/Factors, 1998-2002

	1998	1999	2000	2001	2002
Personnel					
Pilot	79.4%	75.0%	80.0%	84.3%	80.5%
Others (aboard)		1.8%			
Others (not aboard)	15.9%	21.4%	23.3%	15.7%	24.4%
Aircraft					
Powerplant/propulsion	15.9%	12.5%	18.3%	11.8%	4.9%
Flight control systems	3.2%	1.8%		2.0%	
Aircraft structure	4.8%	5.4%	3.3%	7.8%	
Landing gear	15.9%	1.8%	5.0%	9.8%	7.3%
Systems and equipment	3.2%	1.8%	8.3%	2.0%	2.4%
Environment					
Weather condition	30.2%	23.2%	36.7%	39.2%	39.2%
Terrain condition	23.8%	25.0%	31.7%	19.6%	19.6%
Light condition	1.6%	7.1%	15.0%	15.7%	15.7%
Object	7.9%	7.1%	8.3%	11.8%	11.8%
Airport/airways facilities, aids	4.8%	7.1%	11.7%	3.9%	3.9%

Table 29: On-Demand Part 135 Helicopter Accidents, Top Causes/Factors, 1998-2002

	1998	1999	2000	2001	2002
Personnel					
Pilot	90.9%	93.8%	70.6%	55.6%	100.0%
Others (aboard)				5.6%	
Others (not aboard)	27.3%	18.8%	17.6%	16.7%	13.3%
Aircraft					
Powerplant/propulsion	36.4%		35.3%	22.2%	13.3%
Flight control systems				5.6%	
Aircraft structure	9.1%			5.6%	
Landing gear		6.3%		5.6%	
Systems and equipment				5.6%	6.7%
Environment					
Weather condition	27.3%	43.8%	35.3%	22.2%	26.7%
Terrain condition	9.1%	31.3%	29.4%	38.9%	26.7%
Light condition	18.2%	18.8%	17.6%	5.6%	20.0%
Object	18.2%		17.6%		13.3%
Airport/airways facilities, aids					

SCHEDULED PART 135 ACCIDENTS

Scheduled Part 135 operations represent a small segment of scheduled air carrier operations and accounted for less than 2% of the total air carrier flight hours in 2002. Seven accidents occurred in 2002, all in Alaska, resulting in 3 injuries; none of these accidents was fatal.[9]

In 2002, only 1 of the 7 scheduled Part 135 accidents resulted in injuries (table 12), and those injuries were minor (table 13). Because both the number of scheduled Part 135 accidents and the number of people involved in those accidents were small, accident and injury data over previous years varied (figure 16). Although the relatively few scheduled Part 135 accidents every year make stable patterns in the data difficult to discern, the number of scheduled Part 135 accidents and injuries declined overall from 1993 through 2002.

In 2002, five scheduled Part 135 accidents occurred during approach, landing, or taxi, and the initiating events ranged from wheels-up landings to collisions with other aircraft and objects (table 30). There were single occurrences of undershooting the runway, and an airframe, component, or system failure. The causes and factors cited in scheduled Part 135 accidents for the year were consistent with on-demand Part 135 accidents, as shown in table 31. The pilot was cited in four of the seven accidents, with the environment (especially terrain and objects) cited in three of the accidents.

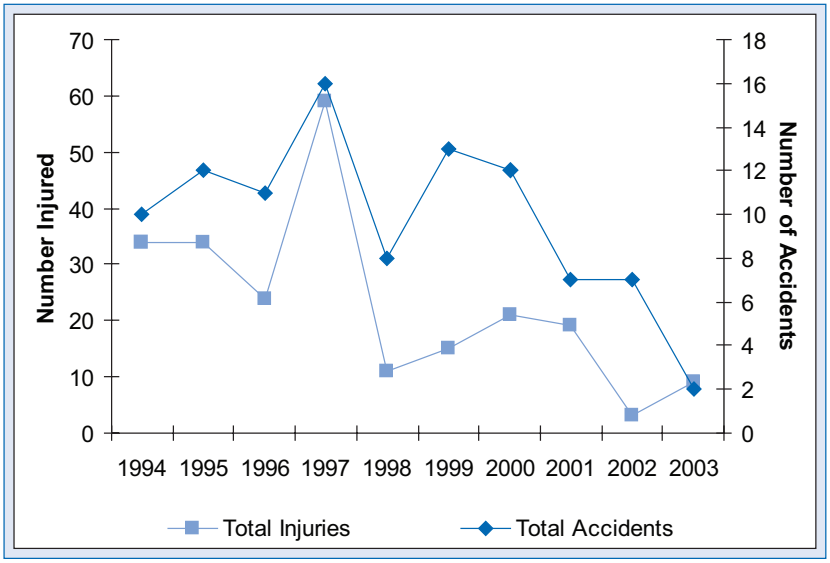

Figure 16: Scheduled Part 135 Accidents and Number People Injured 1993-2002

[9] Over half of all scheduled Part 135 operators were certificated in Alaska in 2002, which may account for -the preponderance of accidents in that state. See *Aviation Safety in Alaska*, Safety Study NTSB/SS-95-03 (Washington, DC: National Transportation Safety Board, 1995).

Table 30: Scheduled Part 135 Accidents, First Occurrences by Phase of Flight for 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Taxi	Total
Wheels Up Landing			2		2
Airframe, Component, or System Failure		1			1
Collision Between Aircraft (Other Than Midair)				1	1
In Flight Collision with Object	1				1
On Surface Collision with Object				1	1
Undershoot			1		1
Total	1	1	3	2	7

Table 31: Scheduled Part 135 Accidents Causes or Factors Cited in 2002

	Causes and Factors Cited
Personnel	**5**
Pilot	4
Others (not aboard)	1
Aircraft	**2**
Powerplant/Propulsion	1
Landing Gear	1
Environment	**3**
Terrain condition	2
Object	1

Appendix A

2002 Air Carrier Accident Data

Date	Registration Number	Type of Operation	Location	Operator of Aircraft	Aircraft Type	Damage to Aircraft	Highest Injury	Accident Severity	Total Fatalities	First Occurrence	Phase of Flight
January 2, 2002	N262FE	Cargo	Greenville, SC	Federal Express	Boeing 727-200	Substantial	None	Damage	0	On Ground/Water Collision With Object	Taxi - Pushback/ Tow
Probable Cause: The tug driver's failure to maintain control of the airplane during pushback resulting in the tug colliding with the airplane. A factor was ice on the ramp.											
January 20, 2002	N837AT	Passenger	Dulles, VA	Air Trans Airways	McDonnell Douglas DC-9-32	Substantial	None	Damage	0	On Ground/Water Collision With Object	Taxi - Pushback/ Tow
January 24, 2002	N754NW	Passenger	Indianapolis, IN	Northwest Airlines	McDonnell Douglas DC-9-41	None	Serious	Injury	0	Fire	Standing - Starting Engine(s)
Probable Cause: The passenger fell off the side of the slide during the emergency evacuation. Factors were the emergency evacuation and the erratic ignition exciter.											
February 14, 2002	N190AJ	Cargo	Kotzebue, AK	Northern Air Cargo Inc.	Boeing 727-100	Substantial	None	Damage	0	Dragged Wing,Rotor,Pod,Float Or Tail/ Skid	Approach - Circling (IFR)
Probable Cause: The pilot's decision to continue an unstabalized approach to landing. A factor associated with the accident is the pilot's failure to attain proper alignment with the runway.											
February 16, 2002	N130FB	Passenger	Paradise Island, Bahamas	Flying Boat Inc., DBA Chalk's Ocean Airlines	Grumman G-73T	Substantial	None	Damage	0		
Probable Cause:											
February 19, 2002	N24736	Passenger and Cargo	Beaumont, TX	Continental Airlines	Boeing 737-724	None	Serious	Injury	0	In Flight Encounter With Weather	Climb - To Cruise
Probable Cause: An inadvertent encounter with convective induced turbulence, which injured a flight attendant. Factors were the failure of the airline to supply direction to the flight crew to indicate when the flight attendants could begin cabin service, and the convective induced turbulence.											
March 2, 2002	N589UA	Passenger	Seattle, WA	United Airlines	Boeing 757-200	Substantial	None	Damage	0	On Ground/Water Collision With Object	Standing - Engine(s) Operating
Probable Cause: The failure of the deicing truck driver to insure that the deicing basket boom remained clear of the aircraft structure as he backed away from the position he had been in while performing deicing procedures.											
March 6, 2002	N1425A	Passenger	Dallas, TX	AMR Corporation, DBA American Airlines	Fokker F-28 MK-100	Substantial	None	Damage	0	Miscellaneous/Other	Standing
Probable Cause: The ground crew inadvertent application of deicing fluid in the auxiliary power unit resulting in an overspeed and turbine wheel burst. A contributing factor was the gusty wind.											
March 9, 2002	N622BR	Passenger	Dulles Airport, VA	Atlantic Coast Airlines	Canadair CL-600-2B19	Substantial	None	Damage	0	On Ground/Water Collision With Object	Takeoff - Aborted
Probable Cause: The airplane's collision with two wild turkeys.											
March 17, 2002	N935AS	Passenger	Anchorage, AK	Alaska Airlines	McDonnell Douglas MD-82	Substantial	None	Damage	0	Collision Between Aircraft (Other Than Midair)	Taxi - Pushback/ Tow
Probable Cause: The failure of the flight crew of the other airplane (MD-11) to maintain clearance while taxiing and the MD-82 ground-marshaling personnel's failure to follow procedures/directives when they did not display an emergency stop signal to the flight crew of the other airplane. Factors contributing to the accident were heavy snow showers and snow-covered terrain.											

March 22, 2002	N234NW	Passenger	Int'l Waters	Northwest Airlines	McDonnell Douglas DC-10-30	Minor	Serious	Injury	0	In Flight Encounter With Weather	Descent
Probable Cause: The flight attendant's injuries were a result of her unsecured lap belt and shoulder harness for undetermined reasons, and the oscillations of the airplane, which were caused by turbulence and large control column inputs by the first officer. Contributing to the flight attendant's injuries was the failure of the flight crew and the lead flight attendant to follow company procedures regarding dissemination of turbulence information.											
March 31, 2002	N809DE	Passenger	Charlotte, NC	Delta Airlines	McDonnell Douglas MD-11	Minor	Serious	Injury	0	Airframe/Component/System Failure/ Malfunction	Cruise
Probable Cause: The failure of the aircraft operator to comply with, in a timely manner, on the No. 2 engine, Boeing Alert Service Bulletin MD11-71A086, resulting in the integrated drive generator feeder cable chaffing through a fire warning loop and failure of the fire warning system due to electrical damage. This resulted in a continuous indication in the cockpit of a No. 2 engine fire, an emergency descent and landing, and injuries to passengers during the subsequent emergency evacuation of the airplane.											
April 5, 2002	N1608	Passenger	Atlanta, GA	Delta Airlines	Boeing 767-332ER	Substantial	None	Damage	0	Airframe/Component/System Failure/ Malfunction	Climb - To Cruise
Probable Cause: Company maintenance personnel inadequate maintenance inspection that resulted in the in-flight separation of the APU inspection doors.											
April 15, 2002	N325NB	Passenger	Reno, NV	Northwest Airlines	Airbus Industrie A319-114	None	Serious	Injury	0	In Flight Encounter With Weather	Approach
Probable Cause: The failure of an undetermined cabin crewmember to securely close an aft galley compartment door, which necessitated the injured crewmember leaving her seat to secure the compartment door.											
April 18, 2002	N516AT	Passenger	Springfield, MO	American Trans Air	Boeing 757-200	None	Serious	Injury	0	In Flight Encounter With Weather	Cruise
Probable Cause: The flightcrew's failure to follow weather avoidance prcedures and their delay in activating the seat belt sign. Factors were the turbulent thunderstorm weather conditions, and the failure of the National Weather Service to issue an applicable in-flight weather advisory.											
April 22, 2002	N68160	Passenger and Cargo	Atlantic Ocean	Continental Airlines	Boeing 767-224	None	Serious	Injury	0	In Flight Encounter With Weather	Cruise - Normal
Probable Cause: The airplane's inadvertent encounter which clear air turbulence during cruise flight.											
April 27, 2002	N141WE	Cargo	San Salvador, El Salvador	Centurion Air Cargo	McDonnell Douglas DC-10-40F	Substantial	None	Damage	0		
Probable Cause:											
May 1, 2002	N182UA	Passenger	Pacific Ocean	United Airlines	Boeing 747-422	None	Serious	Injury	0		
Probable Cause:											
May 11, 2002	N552TZ	Passenger	Chicago, IL	American Trans Air	Boeing 757-33N	Substantial	None	Damage	0	On Ground/Water Collision With Object	Taxi - Pushback/ Tow
Probable Cause: The ground personnel handled the aircraft improperly during pushback from the gate by failing to maintain clearance with the other parked aircraft. The light rain and the parked airplane that was contacted were factors.											
May 29, 2002	N626DL	Passenger	Atlanta, GA	Delta Airlines	Boeing 757-200	None	Serious	Injury	0	In Flight Encounter With Weather	Approach
Probable Cause: In-flight encounter with turbulence during descent, that resulted in an serious injury to the flight attendant.											

June 2, 2002	N601FE	Cargo	Subic Bay, Philippines	Federal Express	McDonnell Douglas MD-11F	Substantial	None	Damage	0	Airframe/Component/System Failure/ Malfunction	Approach - VFR Pattern - Final Approach
Probable Cause: The failure of the lower outboard nut and bolt assembly of the left inboard flap's outboard hinge that resulted from stress corrosion cracking and fatigue. Factors contributing to the accident were the inadequate materials specification of the bolt, and inadequate inspection requirements for the assembly.											
June 2, 2002	N694DL	Passenger and Cargo	Fairfield, IL	Delta Airlines	Boeing 757-232	None	Serious	Injury	0	Miscellaneous/Other	Descent - Normal
Probable Cause: The first officer's abrupt level off.											
June 2, 2002	N849AS	Passenger	Atlanta, GA	Atlantic Southeast Airlines	Bombardier CL600-2B19	Substantial	None	Damage	0	Gear Collapsed	Landing - Roll
Probable Cause: Failure of the left main landing gear fitting due to a fatigue crack that emanated from multiple origins at the external surface of the wall at the shock strut radius run out area for undetermined reasons.											
June 3, 2002	N588FE	Cargo	Subic Bay, Philippines	Federal Express	McDonnell Douglas MD-11	Substantial	None	Damage	0	Abrupt Maneuver	Descent - Normal
Probable Cause: The momentary operation of the airplane outside of the airplane's aerodynamic design stall buffet boundary that resulted from the captain's initiation of a Ground Proximity Warning System (GPWS) escape maneuver. Factor's contributing to the accident were the false readings of both radio altimeters which prompted the false GPWS warning, and the inadequate structural capability of the elevator design to remain intact during momentary operations outside of the stall buffet boundary.											
June 3, 2002	N8986E	Passenger	Minneapolis, MN	Northwest Airlines	Douglas DC-9-31	Substantial	None	Damage	0	Gear Collapsed	Landing - Roll
Probable Cause: The failure of the right main landing gear due to fatigue.											
June 10, 2002	N681FE	Cargo	El Paso, TX	Federal Express	Airbus Industrie A300-600F	Substantial	None	Damage	0		
Probable Cause:											
June 16, 2002	N140NJ	Passenger	Kansas City, MO	Vanguard Airlines	McDonnell Douglas DC-9-82	Substantial	None	Damage	0	Hard Landing	Landing
Probable Cause: The inadequate flare by the flying pilot and the remedial action not performed by the company check airman.											
July 2, 2002	N911DL	Passenger	Houston, TX	Delta Airlines	McDonnell Douglas MD-88	Substantial	None	Damage	0	On Ground/Water Collision With Object	Taxi - From Landing
Probable Cause: The pilot's failure to maintain clearance with the parked vehicles. Factors contributing to the accident were the airport's failure to properly identify the construction area, their failure to publish a notice to airmen.											
July 13, 2002	N885EA	Passenger	Toksook Bay, AK	ERA Aviation	de Havilland DHC-6	Substantial	None	Damage	0	In Flight Collision With Object	Takeoff - Initial Climb
Probable Cause: A bird strike during takeoff, which resulted in damage to the right wing.											
July 16, 2002	N403XJ	Passenger and Cargo	Tupelo, MS	Mesaba Airlines, DBA Northwest Airlines Airlink	Saab-Scania AB (Saab) SF340B	None	Serious	Injury	0	Propeller/Rotor Contact To Person	Standing - Engine(s) Operating
Probable Cause: The failure of the ground agent to follow procedures and directives and to maintain a visual lookout due to a diversion of attention caused by paperwork being sucked toward the rotating propeller, resulting in collision between her hand and the propeller.											

July 21, 2002	N110XJ	Passenger and Cargo	Charleston, WV	Mesaba Aviation Inc., DBA Northwest Airlink	Saab-Scania AB (Saab) 340A	Substantial	None	Damage	0	On Ground/Water Collision With Object	Standing
Probable Cause: The vehicle driver's failure to maintain clearance of the airplane.											
July 26, 2002	N497FE	Cargo	Tallahassee, FL	Federal Express	Boeing 727-232	Destroyed	Serious	Major	0	In Flight Collision With Object	Approach
Probable Cause: The captain's and first officer's failure to establish and maintain a proper glidepath during the night visual approach to landing. Contributing to the accident was a combination of the captain's and first officer's fatigue, the captain's and first officer's failure to adhere to company flight procedures, the captain's and flight engineer's failure to monitor the approach, and the first officer's color vision deficiency.											
August 28, 2002	N635AW	Passenger	Phoenix, AZ	America West Airlines	Airbus Industrie A320-231	Substantial	Serious	Serious	0	Loss Of Control - On Ground/Water	Landing - Roll
Probable Cause: The captain's failure to maintain directional control and his inadvertent application of asymmetrical engine thrust while attempting to move the #1 thrust lever out of reverse. A factor in the accident was the crew's inadequate coordination and crew resource management.											
September 9, 2002	N534US	Passenger and Cargo	Baltimore, MD	Northwest Airlines	Boeing 757-251	Substantial	None	Damage	0	Dragged Wing,Rotor,Pod,Float Or Tail/Skid	Landing - Flare/ Touchdown
Probable Cause: The captain's failure to follow existing company procedures for stabilized approach, and use of speed brakes.											
September 15, 2002	N240GL	Passenger	Rock Springs, WY	Great Lakes Airlines	Beech 1900D	None	None	Damage	0	Near Collision Between Aircraft	Landing - Roll
Probable Cause: The flight crew of the Beech and the pilot of the Piper's failure to attain proper clearance from the other during their respective landings. Factors contributing to the accident were the crew's and the pilot of the other airplane's inadequate visual lookout for each other.											
September 22, 2002	N941N	Passenger	Minneapolis, MN	Northwest Airlines	McDonnell Douglas DC-9-32	Substantial	None	Damage	0	Gear Collapsed	Taxi - To Takeoff
Probable Cause: The fatigue failure of the main landing gear strut due to inclusions in the material, residual stresses, and dissolved hydrogen content.											
October 14, 2002	N847EX	Passenger and Cargo	Albany, NY	Allegheny Airlines, DBA US Airways Express	de Havilland DHC-8-102	Substantial	None	Damage	0	In Flight Collision With Object	Descent - Normal
Probable Cause: An in-flight collision with birds. A factor was the night conditions.											
October 24, 2002	N681BR	Passenger	Chicago, IL	Atlantic Coast Airlines, DBA United Express	Bombardier CL-600-2B19	Substantial	Minor	Damage	0	On Ground/Water Collision With Object	Taxi - To Takeoff
Probable Cause: The driver of the bus not maintaining clearance from the taxiing airplane.											
November 6, 2002	N479AA	Passenger	Orlando, FL	American Airlines	McDonnell Douglas MD-82	None	Serious	Injury	0	In Flight Encounter With Weather	Descent - Normal
Probable Cause: The airplane's inflight encounter with turbulence that resulted in injuries to the number two flight attendant.											
November 9, 2002	N452AA	Passenger and Cargo	Flushing, NY	American Airlines	McDonnell Douglas MD-82	None	Serious	Injury	0	Miscellaneous/Other	Standing
Probable Cause: An inadvertent trauma to the passenger's foot during an emergency evacuation.											
November 28, 2002	N324US	Passenger	Minneapolis, MN	Northwest Airlines	Airbus Industrie A320-211	None	Serious	Injury	0	Miscellaneous/Other	Takeoff - Initial Climb
Probable Cause: The cabin flight crew not verifying the galley service cart had been properly stowed prior to departure, which resulted in the inadvertent deployment of the galley service cart during initial climb after takeoff.											

Date	Registration Number	Type of Operation	Location	Operator of Aircraft	Aircraft Type	Damage to Aircraft	Highest Injury	Total Fatalities	First Occurrence	Phase of Flight
March 1, 2002	N7373U	Passenger	Kotlik, AK	Hageland Aviation Services	Cessna 207A	Substantial	None		Undershoot	Approach - VFR Pattern - Final Approach
Probable Cause: The failure of the pilot-in-command to maintain the proper glide path to the runway during the final approach for a VFR landing.										
March 13, 2002	N3527U	Passenger	Fairbanks, AK	Warbelow Air Ventures	Piper PA-31-350	Substantial	None		Wheels Up Landing	Landing - Flare/Touchdown
Probable Cause: The pilot's failure to complete his prelanding checklist, and a subsequent inadvertent wheels up landing.										
June 25, 2002	N2947N	Passenger	Kake, AK	L A B Flying Service	Piper PA-32-300	Substantial	Minor		Airframe/Component/ System Failure/ Malfunction	Cruise
Probable Cause: The in-flight separation of the upper engine cowling from the airplane. A factor contributing to the accident was the soft, sandy terrain of the landing area.										
July 30, 2002	N3527U	Passenger	Fairbanks , AK	Warbelow's Air Ventures	Piper PA-31-350	None	None		Collision Between Aircraft (Other Than Midair)	Taxi - From Landing
Probable Cause: The failure of both pilots to maintain adequate visual outlook while taxiing.										
August 24, 2002	N3535F	Passenger	Nuiqsut, AK	Cape Smythe Air Service	Piper PA-31-350	Substantial	None		Wheels Up Landing	Landing - Flare/Touchdown
Probable Cause: The pilot's inadvertent wheels-up landing. Factors contributing to the accident were the pilot's failure to complete the prelanding checklist, his diverted attention, and a delayed gear warning horn alarm.										
September 4, 2002	N335AK	Passenger	Tenakee Springs, AK	Alaska Juneau Aeronautics, DBA Wings of Alaska	de Havilland DHC-3	Substantial	None		On Ground/Water Collision With Object	Taxi - From Landing
Probable Cause: The pilot's misjudgment of the airplane's speed/distance from a dock resulting in the airplane drifting into a wooden piling during a taxi from landing. A factor in the accident was the presence of a tidal current.										
September 4, 2002	N40449	Passenger	Manley Hot Spgs, AK	Bidzy Ta Hot Aana Corporation, DBA Tanana Air Service	Piper PA-32R	Substantial	None		In Flight Collision With Object	Takeoff - Initial Climb
Probable Cause: A bird strike during takeoff, which resulted in substantial damage to the right wing.										

Date	Registration Number	Type of Operation	Location	Operator of Aircraft	Category	Aircraft Type	Damage to Aircraft	Highest Injury	Total Fatalities	First Occurrence	Phase of Flight
January 1, 2002	N3525Y	Passenger	Hollywood, FL	Air Taxi Inc.	Airplane	Piper PA-31-350	Substantial	Fatal	1	Loss Of Engine Power(Total) - Nonmechanical	Descent - Normal
Probable Cause: The pilot's inadequate planning for a Title 14 CFR Part 135 on-demand air taxi flight, and his failure to refuel the airplane, which resulted in fuel exhaustion while en route over the Atlantic Ocean, a power off glide, and ditching in the ocean.											
January 8, 2002	N556UP	Cargo	Covington, KY	Ameriflight Inc.	Airplane	Swearingen SA-227-AT	Substantial	Minor	0	On Ground/Water Collision With Object	Taxi - To Takeoff
Probable Cause: The tug driver's inadequate visual lookout which resulted in his failure to see the airplane in time to prevent the collision.											
January 15, 2002	N30004	Passenger	Haines, AK	Skagway Air Services	Airplane	Piper PA-32	Substantial	Fatal	1	In Flight Collision With Object	Cruise
Probable Cause: The pilot's continued VFR flight into instrument meteorological conditions, and subsequent collision with trees while in cruise flight. Factors in the accident were weather conditions consisting of freezing rain, mist, and low ceilings.											
January 18, 2002	N616GL	Passenger	British Virgin	Fly BVI	Airplane	Britten-Norman BN2-A	Substantial	None	0		
Probable Cause:											
January 24, 2002	N8RQ	Cargo	Waterville, ME	Telford Aviation	Airplane	Cessna 208B	Substantial	Minor	0	Loss Of Control - On Ground/Water	Takeoff - Roll/Run
Probable Cause: The pilot's improper decision to attempt a takeoff from a snow-covered runway with a quartering tailwind.											
February 1, 2002	N27MR	Passenger and Cargo	Ouzinkie, AK	Island Air Services, DBA Redemption Inc.	Airplane	Britten-Norman BN2A-26	Substantial	None	0	On Ground/Water Encounter With Terrain/ Water	Takeoff - Roll/Run
Probable Cause: The pilot's selection of unsuitable terrain for takeoff. Factors associated with the accident are a slush covered runway, and rough/uneven terrain.											
February 4, 2002	N756HL	Mail	Bethel , AK	Flight Alaska, Inc., DBA Yute Air Alaska	Airplane	Cessna 206	Destroyed	Fatal	1	In Flight Encounter With Weather	Cruise
Probable Cause: The pilot's continued VFR flight into instrument meteorological conditions, and his failure to maintain adequate ground clearance, which resulted in an in flight collision with terrain. Factors associated with the accident were flat light conditions, and snow-covered terrain.											
February 7, 2002	N6080D	Passenger	Girdwood, AK	Coastal Helicopters	Helicopter	Aerospatiale AS350-B	Substantial	None	0	In Flight Collision With Object	Landing
Probable Cause: The pilot's failure to maintain adequate distance from a radio antenna during landing. A factor was the presence of an antenna.											
February 16, 2002	N23PJ	Passenger	New Smyrna Bch., FL	Universal Air Service	Helicopter	Bell 206L-1	Destroyed	Fatal	2	In Flight Encounter With Weather	Cruise - Normal
Probable Cause: The pilot continued visual flight into instrument conditions that resulted in the in-flight collision with trees. Factor were the pilot's alcohol impaired condition, and low cloud conditions.											

February 24, 2002	N454SF	Cargo	Tununak, AK	Grant Aviation	Airplane	Cessna 208B	Substantial	None	0	On Ground/Water Encounter With Terrain/ Water	Taxi - From Landing
Probable Cause: The pilot's selection of unsuitable terrain for landing. Factors associated with the accident are snow drifts across the runway, and excessive braking during the rearward roll.											
March 6, 2002	N208TF	Passenger and Cargo	Barrow, AK	Tatonduk Outfitters, Ltd, DBA Tatonduk Flying Service	Airplane	Cessna 208B	Substantial	None	0	In Flight Encounter With Weather	Approach
Probable Cause: The pilot's continued flight into adverse weather conditions, and an inadvertent stall. Factors associated with the accident are fog, obscuration, and icing conditions.											
March 8, 2002	N355D	Passenger	Savannah, GA	Sk Logistics, Inc.	Helicopter	Eurocopter France AS355 F1	Substantial	Fatal	2	In Flight Collision With Terrain/Water	Approach
Probable Cause: The pilot's failure to follow operating procedures and, experienced spatial disorientation while attempting a night landing to an offshore platform. A factor was a dark night.											
March 12, 2002	N38CJ	Cargo	Albuquerque, NM	Aero Charter & Transport	Airplane	Cessna 402C	Substantial	None	0	Gear Collapsed	Landing - Flare/Touchdown
Probable Cause: The failure of the left main landing gear scissors assembly which resulted from improper maintenance.											
March 13, 2002	N596DM	Cargo	Albuquerque, NM	Aero Charter & Transport	Airplane	Cessna 402C	Substantial	None	0	On Ground/Water Collision With Object	Taxi - From Landing
Probable Cause: The failure of the tug driver to stop at the stop sign resulting in a collision with a taxiing airplane. A contributing factor was the dark night light conditions.											
March 13, 2002	N948CC	Passenger	Reno, NV	Pilot Services Corporation, DBA Regent Air, Inc.	Airplane	Beech E90	Destroyed	Serious	0	Loss Of Control - In Flight	Approach - Faf/Outer Marker To Threshold (IFR)
Probable Cause: The pilot's inadequate approach airspeed for the existing adverse meteorological conditions followed by his delayed remedial action to avert stalling and subsequent loss of airplane control. Contributing factors were the pilot's reduced visibility due to the inclement weather and the icing conditions.											
March 14, 2002	N4451X	Cargo	Broadway, NC	Ram Air Freight	Airplane	Piper PA32R-300	Destroyed	Fatal	1	In Flight Collision With Object	Cruise - Normal
Probable Cause: The pilot's inadequate visual lookout and his failure to maintain obstacle clearance.											
March 15, 2002	N228PA	Cargo	Alma, WI	Priority Air Charter	Airplane	Cessna 208B	Substantial	Fatal	1	Miscellaneous/Other	Other
Probable Cause: The pilot not removing the ice contamination from the airplane prior to departure and the pilot intentionally flying into known severe icing conditions, resulting in the aircraft not being able to maintain altitude/clearance from the terrain. Factors to the accident included the icing conditions and the trees encountered during the forced landing.											
March 25, 2002	N617BG	Passenger	Anderson, IN	Corporate Flight Management	Airplane	Mitsubishi MU-300	Substantial	None	0	Overrun	Landing - Roll
Probable Cause: Missed approach not executed and flight to a destination alternate not performed by the flight crew. The tail wind and snow/ice covered runway were contributing factors.											
April 11, 2002	N917JT	Passenger	Valdez, AK	Evergreen Helicopters of Alaska	Helicopter	Eurocopter AS-350-B2	Substantial	None	0	Airframe/Component/ System Failure/ Malfunction	Cruise - Normal
Probable Cause: The pilot's failure to disengage the hydraulic system, and maintain forward airspeed during landing as delineated in the emergency procedures section of the helicopter's operations manual, which resulted in a loss of control while hovering. Factors contributing to the accident were the separation of the hydraulic pump drive belt, and the subsequent lockup of the flight control system.											

May 18, 2002	N3894Q	Passenger	Salem, UT	Classic Helicopters, Inc.	Helicopter	Bell 206L-1	Substantial	Serious	0	Loss Of Control - In Flight	Takeoff
Probable Cause: A loss of tail rotor effectiveness during takeoff. A contributing factor was the wind gusts.											
May 24, 2002	N80PH	Passenger	Fort Lauderdale, FL	Pompano Helicopters, Inc.	Helicopter	Bell 206L-1	Substantial	None	0	Loss Of Engine Power(Total) - Mech Failure/Malf	Cruise - Normal
Probable Cause: The excessive rate of descent by the pilot-in-command during the autorotative landing resulting in a hard landing, following a total loss of engine power caused by failure of the No. 4 bearing.											
May 24, 2002	N9243K	Cargo	Noorvik, AK	Larry's Flying Service Inc.	Airplane	Piper PA-32R-300	Substantial	None	0	Loss Of Engine Power(Partial) - Nonmechanical	Climb - To Cruise
Probable Cause: The partial loss of engine power during the climb to cruise for an undetermined reason, which resulted in a forced landing in soft terrain. A factor associated in the accident was the lack of suitable terrain for the forced landing.											
May 28, 2002	N4672Y	Cargo	Orlando, FL	Flight Express Inc.	Airplane	Cessna T210N	Destroyed	None	0	Loss Of Engine Power	Approach
Probable Cause: The pilot's inadequate planning decision that resulted in fuel exhaustion and subsequent loss of engine power.											
May 31, 2002	N78336	Passenger and Cargo	Roseau, Dominica	Bevins Air Services Inc.		Aero Commander 500-B	Destroyed	Fatal	2		
Probable Cause:											
June 6, 2002	N7130G	Passenger	Galena, AK	Quicksilver Air Inc.	Helicopter	Robinson R-44	Destroyed	None	0	Fire	Standing - Idling Rotors
Probable Cause: The pilot's selection of unsuitable terrain for landing which precipitated a grass fire. Factors contributing to the accident were the manufacturer's inadequate design of the helicopter's exhaust system, placing it low to the ground, and terrain conditions consisting of dry tussock grass.											
June 13, 2002	N62197	Passenger	Talkeetna , AK	Doug Geeting Avaition	Airplane	de Havilland DHC-2	Substantial	None	0	On Ground/Water Encounter With Terrain/ Water	Taxi
Probable Cause: The pilot's selection of an unsuitable taxi area, which resulted in substantial damage to the left elevator when the tailwheel encountered a hole. A factor associated with the accident was rough/uneven terrain.											
June 14, 2002	N333DG	Passenger	Talkeetna, AK	Doug Geeting Aviation	Airplane	Cessna 185F	Substantial	None	0	Airframe/Component/ System Failure/ Malfunction	Takeoff - Roll/Run
Probable Cause: A fracture failure of the lower end of the spring steel landing gear strut. Factors contributing to the accident were the manufacturer's and the FAA's insufficient standards/requirements for inspection procedures.											
June 19, 2002	N235SA	Passenger	Ketchikan, AK	Promech Inc., DBA Seaborne Seaplane Adventures	Airplane	de Havilland DHC-6-300	Substantial	None	0	Collision Between Aircraft (Other Than Midair)	Standing - Engine(s) Not Operating
Probable Cause: The failure of a ground handler to follow company proceedure/directives, and his premature release of a mooring line. Factors associated with the accident were the congested operations area, and the operator's failure to provide adequate safe zones for the airplanes.											

June 19, 2002	N353PM	Passenger	Ketchikan, AK	Promech Inc., DBA Seaborne Seaplane Adventures	Airplane	de Havilland DHC-6-300	Substantial	None	0	Collision Between Aircraft (Other Than Midair)	Taxi
Probable Cause: The failure of a ground handler to follow company procedures/directives, and his premature release of a mooring line. Factors associated with the accident were the congested operations area, and the operator's failure to provide adequate safe zones for the airplanes.											
June 20, 2002	N663VL	Passenger	Isla De Vieques, PR	Vieques Air Link Inc.	Airplane	Britten-Norman BN-2B-26	None	None	0	Midair Collision	Approach - VFR Pattern - Final Approach
Probable Cause: The failure of both pilots to see and avoid, also causal was the failure of the pilot of the Britten-Norman Islander (N663VL) to yield right of way to an aircraft in the traffic pattern.											
June 20, 2002	N786DM	Passenger	Isla De Vieques, PR	Isla Nena Air Service, Inc.	Airplane	Cessna 208B	Substantial	None	0	Midair Collision	Approach - VFR Pattern - Final Approach
Probable Cause: The failure of both pilots to see and avoid, also causal was the failure of the pilot of the Britten-Norman Islander (N663VL) to yield right of way to an aircraft in the traffic pattern.											
June 26, 2002	N197EH	Passenger	Denali Park, AK	Era Aviation	Helicopter	Eurocopter France AS-350-B2	Substantial	Minor	0	Loss Of Control - On Ground/Water	Takeoff
Probable Cause: The pilot's failure to maintain aircraft control during takeoff, which resulted in dynamic rollover of the helicopter. A contributing factor was the frozen terrain.											
June 30, 2002	N7384U	Cargo	Chevak, AK	Flight Alaska Inc.	Airplane	Cessna 207	Substantial	None	0	Undershoot	Landing - Flare/Touchdown
Probable Cause: The pilot's failure to attain the proper touchdown point resulting in an undershoot, and subsequent collision with gravel terrain.											
July 7, 2002	N141MK	Passenger	Honolulu, HI	Schuman Aviation Company LTD	Helicopter	Aerospatiale AS350 BA	Substantial	None	0	In Flight Collision With Terrain/Water	Landing - Flare/Touchdown
Probable Cause: The pilot's failure to maintain adequate tail rotor clearance from the sloping terrain in unfavorable wind conditions.											
July 12, 2002	N3129F	Passenger	Port Alsworth, AK	Minta, Inc. DBA Bigfoot Air of Alaska, LLC	Airplane	de Havilland DHC-2	Destroyed	Fatal	4	In Flight Collision With Terrain/Water	Maneuvering
Probable Cause: The pilot's failure to maintain clearance from terrain while maneuvering inside a box/blind canyon, resulting in an in-flight collision with terrain. A factor contributing to the accident was the box/blind canyon.											
July 18, 2002	N158GA	Cargo	Columbus, IN	Grand Aire Express Inc.	Airplane	Piper PA-60	Destroyed	Fatal	1	Loss Of Control - In Flight	Missed Approach (IFR)
Probable Cause: The pilot's failure to maintain control of the airplane during a missed approach. Additional factors included the operator's inadequate oversight, the pilot's improper in-flight decision, conditions conducive to pilot fatigue, fog, and night.											
July 23, 2002	N22PB	Cargo	St. Louis, MO	Corporate Aircraft Resources Inc.	Airplane	Cessna 402B	Substantial	None	0	Main Gear Collapsed	Taxi - From Landing
Probable Cause: The landing gear collapsed for undetermined reasons.											
July 23, 2002	N491HL	Passenger	Deadhorse, AK	Air Logistics of Alaska Inc.	Helicopter	MBB BO-105S	Substantial	None	0	Loss Of Control - In Flight	Landing - Flare/Touchdown
Probable Cause: The pilot's failure to correct a settling-with-power condition during a helicopter landing flare/touchdown, resulting in a hard landing and roll over.											

July 25, 2002	N3174Y	Passenger and Cargo	Eugene Is 192, GM	Air Logistics, L L C	Helicopter	Bell 206L-3	Substantial	Minor	0	In Flight Collision With Object	Cruise
Probable Cause: The loss of tail rotor control due to an in-flight collision with an object.											
July 26, 2002	N756BW	Cargo	Old Harbor , AK	Island Air, DBA Island Air Service	Airplane	Cessna 206	Substantial	None	0	In Flight Collision With Terrain/Water	Takeoff - Initial Climb
Probable Cause: The pilot's failure to maintain altitude/clearance from terrain during initial climb, which resulted in an in-flight collision with water. A factor associated with the accident was the pilot's diverted attention.											
August 1, 2002	N25GH	Passenger and Cargo	E Cameron 190, GM	Helitrans Company	Helicopter	Bell 206L-1	Substantial	None	0		
Probable Cause:											
August 13, 2002	N50BK	Passenger	Big Bear City, CA	Corporate Flight International	Airplane	Cessna S550	Destroyed	None	0	Overrun	Landing - Roll
Probable Cause: The pilot's failure to obtain the proper touchdown point which resulted in an overrun. Contributing factors were the pilot's improper in-flight planning, improper use of performance data, the tailwind condition, failure to perform a go-around, and the pilot-induced porpoising condition.											
August 19, 2002	N409PA	Passenger	Ketchikan, AK	Promech	Airplane	de Havilland DHC-3	Substantial	None	0	Midair Collision	Climb - To Cruise
Probable Cause: The pilot's failure to maintain an adequate visual outlook during cruise climb, which resulted in a midair collision between the two airplanes.											
August 19, 2002	N64393	Passenger	Ketchikan, AK	Promech	Airplane	de Havilland DHC-2	Minor	None	0	Midair Collision	Cruise - Normal
Probable Cause: The failure of the pilot of the other airplane to maintain an adequate visual lookout, which resulted in a midair collision between the two airplanes.											
August 19, 2002	N897M	Passenger	Palmer , AK	Grasshopper Aviation	Airplane	Maule M-7-235	Substantial	None	0	Airframe/Component/ System Failure/ Malfunction	Landing - Roll
Probable Cause: The fracture of the right main landing gear axle during landing roll. Factors associated with the accident were corrosion of the landing gear axle, failure of company maintenance personnel to adequately inspect the axle and detect the corrosion, and rough and uneven terrain.											
August 27, 2002	N7300R	Passenger	Kodiak, AK	C-Air	Airplane	Cessna A185F	Substantial	Fatal	2	Loss Of Control - In Flight	Approach - VFR Pattern - Base Leg/ Base To Final
Probable Cause: The pilot's failure to maintain adequate airspeed and his operation of the airplane in an over gross condition. A contributing factor was noncompliance with written company weight and balance procedures.											
August 30, 2002	N45CP	Passenger	Lexington, KY	American Air Network, Inc., DBA Care Flight International	Airplane	Gates Learjet 25C	Destroyed	Fatal	1	Overrun	Landing - Roll
Probable Cause: The captain's addition of forward thrust during the landing rollout, which resulted in a lack of braking effectiveness and a subsequent runway overrun. A factor was the captain's inability to deploy the thrust reversers for undetermined reasons.											

September 9, 2002	N400SL	Passenger	Doland, SD	Omniflight Helicopters, Inc.	Helicopter	Bell 206L-1	Destroyed	Fatal	4	Loss Of Control - In Flight	Cruise
Probable Cause: Pilot spatial disorientation while flying in dark night conditions, resulting in a loss of aircraft control; and the company's inadequate remedial actions after identifying the pilot's night flying deficiency over areas without lighted references. A factor to the accident was the dark night conditions.											
September 11, 2002	N357NT	Passenger	Peach Springs, AZ	Heli USA Airways	Helicopter	Aerospatiale AS350BA	Substantial	Minor	0		
Probable Cause:											
September 15, 2002	N207DG	Passenger	Circle, AK	40 Mile Air Ltd.	Airplane	Cessna 207	Substantial	None	0	Overrun	Takeoff - Aborted
Probable Cause: The pilot's inadequate wind evaluation during takeoff resulting in a downwind takeoff and subsequent overrun during an aborted takeoff. Factors in the accident were a tailwind and the pilot's failure to verify the selected flap setting.											
September 29, 2002	N343AE	Passenger	Hawthorne, CA	C.A.T.S. Tours, Inc., DBA Skylink Charter, LLC	Airplane	Fairchild SA227-AC	Substantial	Serious	0	Loss Of Control - On Ground/Water	Takeoff - Roll/Run
Probable Cause: The pilot-in-command's failure to maintain directional control during the rejected takeoff. The loss of directional control was caused by the crew's failure to follow prescribed pretakeoff and takeoff checklist procedures to ensure the both propellers were out of the start locks. Contributing factors were the failure of the crew to follow normal company procedures during takeoff, the failure of the flightcrew to recognize an abnormal propeller condition during takeoff, and a lack of crew coordination in performing a rejected takeoff.											
October 17, 2002	N303CH	Passenger	Edinburg, TX	Central Helicopter Service Inc.	Helicopter	Bell 206L-1	Substantial	Serious		Loss Of Control - In Flight	Approach
Probable Cause: The loss of tailrotor effectiveness due to the right quartering tailwind, which resulted in a hard landing. Factors were the lack of suitable surrounding terrain for landing, which included numerous surrounding obstacles, and the tailwind.											
October 22, 2002	N31657	Passenger	Bethel, AK	Larry's Flying Service, Inc.	Airplane	Piper PA-32	Substantial	None		Collision Between Aircraft (Other Than Midair)	Taxi - From Landing
Probable Cause: The failure of both pilot's to maintain a visual outlook during taxi operations on the ramp.											
October 22, 2002	N76RL	Cargo	Bethel, AK	Bellair Inc.	Airplane	Piper PA-32	Minor	None		Collision Between Aircraft (Other Than Midair)	Taxi - To Takeoff
Probable Cause: The failure of both pilot's to maintain a visual outlook during taxi operations on the ramp.											
October 23, 2002	N76U	Cargo	Spanish Fort, AL	Mid Atlantic Freight Inc.	Airplane	Cessna 208B	Destroyed	Fatal	1	Loss Of Control - In Flight	Cruise - Normal
Probable Cause: the pilot's spatial disorientation, which resulted in loss of airplane control. Contributing to the accident was the night instrument meteorological conditions with variable cloud layers.											
October 25, 2002	N41BE	Passenger	Eveleth, MN	Aviation Charter Inc.	Airplane	Beech King Air 100	Destroyed	Fatal	8	Loss Of Control - In Flight	Approach - Faf/Outer Marker To Threshold (IFR)
Probable Cause: The flight crew's failure to maintain adequate airspeed, which led to an aerodynamic stall from which they did not recover.											

October 29, 2002	N220AL	Passenger	Kaaawa, Oahu, HI	Cherry Helicopters, Inc.	Helicopter	Hughes 369D	Destroyed	Serious	0	Roll Over	Takeoff
Probable Cause: Dynamic rollover during an attempted takeoff, due to the combined effects of the soft sloping terrain and the pilot's failure to redistribute the passengers to a more favorable lateral CG condition.											
November 3, 2002	N32TN	Cargo	Port Alsworth , AK	Transnorthern Aviation, Inc.	Airplane	Douglas DC-3	Substantial	None	0	In Flight Collision With Object	Landing - Flare/Touchdown
Probable Cause: The flightcrew's failure to maintain clearance while landing, which resulted in an in-flight collision with a 25-foot high iron mast. Contributing factors were a downdraft, and a 25-foot high iron mast attached to a tractor.											
November 27, 2002	N224BD	Cargo	Elko, NV	Reno Flying Service, Inc.	Airplane	Piper PA-34-220T	Substantial	None	0	Loss Of Engine Power(Total) - Nonmechanical	Approach - VFR Pattern - Final Approach
Probable Cause: The pilot's inadequate in-flight planning/decision resulting in fuel exhaustion.											
December 3, 2002	N3855C	Cargo	Tajique, NM	Air Transport Inc.	Airplane	Cessna 421C	Destroyed	Fatal	1	In Flight Collision With Terrain/Water	Descent
Probable Cause: The pilot's failure to maintain terrain clearance. Factors contributing to the accident were the high mountains, mountain obscuration, the dark night condition, and the pilot's improper in-flight planning/ decision making.											
December 4, 2002	N210CT	Cargo	Harrison, AR	Flight Express Inc.	Airplane	Cessna 210L	Destroyed	Fatal	1	In Flight Encounter With Weather	Takeoff - Initial Climb
Probable Cause: The pilot's failure to maintain control of the aircraft and the exceedance of the manufactured limits, which resulted in an in flight break-up. Contributing factors were the dark night conditions and the clouds.											
December 4, 2002	N7660E	Mail	Cincinnati, OH	Flight Express Inc.	Airplane	Cessna 210M	Substantial	None	0	Airframe/Component/ System Failure/ Malfunction	Emergency Landing
Probable Cause: Rupture of the left side, landing gear down hydraulic line due to repeated contact with the aileron cable, which resulted in a loss of hydraulic pressure, a partial extension of the main landing gear, and the inability to utilize the landing gear hand pump.											
December 17, 2002	N277PM	Cargo	Rockford, IL	Planemasters	Airplane	Cessna 208B	Destroyed	Fatal	1	Loss Of Control - In Flight	Approach - Faf/Outer Marker To Threshold (IFR)
Probable Cause: The pilot's failure to maintain control of the airplane during the ILS approach. Factors associated with the accident were the low ceilings, high winds, crosswind, and wind shear conditions that existed.											
December 17, 2002	N311MS	Passenger	Loon Lake, WA	Metro Aviation	Helicopter	Eurocopter Deutschland EC-135 P1	Substantial	None	0	In Flight Encounter With Weather	Cruise
Probable Cause: The pilot's inadvertent flight into instrument meteorological conditions (IMC) while in cruise flight, and an excessive descent rate. Factors include falling snow, whiteout conditions and dark night conditions.											

Appendix B

Definitions of Terms Used in the Review

Air Carrier Operations

Air carriers are generally defined as operators that fly aircraft in revenue service. The *Review of 2002 Aircraft Accident Data: U.S. Air Carrier Operations* covers accidents involving aircraft operated by U.S. air carriers under Title 14[1] Parts 121 and 135 of the *Code of Federal Regulations* (CFR). This review does not discuss general aviation aircraft,[2] foreign-operated aircraft, ultralight vehicles, experimental aircraft, and commercial space launches.

Part 121 Operations

Part 121 operations are any scheduled or non-scheduled passenger-carrying operations that adhere to regulations that limit operations to controlled airspace and controlled airports for which specific weather, navigational, operational, and maintenance support are available. These operations usually include operators that fly large transport-category aircraft. An operation is scheduled if an air carrier or operator offers in advance the departure location, departure time, and arrival location.[3] As a result, Part 121 typically applies to major airlines and cargo carriers that fly large transport-category aircraft serving large airports. The operating rules for scheduled and nonscheduled Part 121 operators are generally the same.

Part 135 Operations

Part 135 operations must adhere to requirements that are similar to those of Part 121 operations (with some notable differences with respect to aircraft and airport characteristics, and to crew training and experience). However, Part 135 operations are allowed to service routes to smaller airports that do not have the weather, communications, and navigational capabilities required of the larger airports serving Part 121 operations. Part 135 typically applies to commercial carriers flying smaller jet and turboprop aircraft commonly referred to as commuter airlines (*scheduled* Part 135) and air taxis (*on-demand* Part 135).

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[1] Title 14 is also known as the *Federal Aviation Regulations* (FAR).

[2] A separate review, published annually by the Safety Board, summarizes accident statistics for these aircraft.

[3] Title 14 *Code of Federal Regulations* (CFR) Part 119.3.

In March 1997, the regulations defining Part 121 operations changed to include scheduled aircraft with more than 10 seats. Previously, scheduled aircraft with fewer than 30 passenger seats were operated under Part 135. As a result, after 1997, most carriers popularly known as "commuters" began operating under Part 121.

Scheduled Part 135 Operations

According to 14 CFR Part 119.3, a *scheduled* operation is any "passenger-carrying operation for compensation or hire conducted by an air carrier or commercial operator for which the certificate holder or its representative offers in advance the departure location, departure time, and arrival location." Scheduled Part 135 carriers typically fly aircraft with single/twin turbine engines or single/twin piston engines. Such carriers are more likely to fly short routes and are concentrated for the most part in Alaska.

On-Demand Part 135 Operations

An *on-demand* Part 135 operation is any operation for compensation or hire for which the departure location, departure time, and arrival location are negotiated with the customer. Customers can charter an entire aircraft or book a single seat on an air taxi. According to the FAA, there are about 3,000 on-demand Part 135 operators; of those operators, approximately 2,500 offer service in airplanes and 500 offer service in helicopters.[4] On-demand Part 135 air carriers are typically characterized as offering one of three types of services: air taxi or charter; air tour; or air medical. Historically, on-demand Part 135 operations represent about half of the air carrier fleet and account for about 15% of all air carrier flight hours.

Its *on-demand* nature is the important characteristic of this type of operation. On-demand Part 135 operators offer charter or air taxi flights on a flexible schedule and carry passengers or cargo (and in some cases, both) to a variety of airports that are not usually serviced by scheduled airlines.[5] An on-demand operation can serve corporate customers who need a flexible schedule but do not wish to support their own corporate flight department. On-demand Part 135 operations also include medical evacuation flights when a patient is on board the aircraft, and helicopter flights serving offshore drilling platforms in the Gulf of Mexico. On-demand Part 135 operations are evenly distributed throughout the United States and include both short and long routes that serve the specific needs of charter and air taxi customers. On-demand Part 135 aircraft range from single-engine piston aircraft to large corporate jets that are typically smaller than those used in Part 121 operations.

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[4] Accurate data for on-demand Part 135 operators and aircraft are difficult to obtain. The figures cited in this review are from *Chartering an Aircraft: A Consumer Guide* (Washington, DC: Federal Aviation Administration, Office of Public Affairs). The 2000 *General Aviation and Air Taxi Activity (GAATA) Survey,* shows a total of 4,000 air taxi and air tour aircraft (not separated into airplanes and helicopters) in Table GA 00 1-3.

[5] FARs restrict on-demand Part 135 operations to passenger-carrying operations conducted as a public charter; scheduled passenger-carrying operations of less than five round trips per week on at least one route between two or more points according to the published flight schedules; and all-cargo operations conducted with airplanes having a payload capacity of 7,500 pounds or less, or with rotorcraft.

Safety Board Severity Classification of Part 121 Accidents

Since 1997, the Safety Board has used a classification system for Part 121 and other air carrier accidents based on accident severity. Developed in response to a congressional requirement,[6] the system uses classifications that characterize both injury and damage. Definitions for level of injury and level of damage in Part 121 accidents are the same as those used to classify Part 135 accidents. The definitions of Safety Board Severity Classifications for Part 121 accidents are provided below:

Major

An accident in which any of three conditions is met:

- Part 121 aircraft was destroyed, or
- there were multiple fatalities, or
- there was one fatality and a Part 121 aircraft was substantially damaged.

Serious

An accident in which at least one of two conditions is met:

- there was one fatality without substantial damage to a Part 121 aircraft, or
- there was at least one serious injury and a Part 121 aircraft was substantially damaged.

Injury

A nonfatal accident with at least one serious injury and without substantial damage to an aircraft.

Damage

An accident in which no person was killed or seriously injured, but in which any aircraft was substantially damaged.

Safety Board Classification of Part 135 Accidents

Like Part 121 accidents, Part 135 accidents (both scheduled and on-demand) are classified by highest *level of injury* (fatal, serious, minor, or none) and *level of aircraft damage* (destroyed, substantial, minor, or none), as summarized below.

[6] The classification system was introduced in 1997 as a requirement of the FAA Reauthorization Act of 1996 (and put into effect by Public Law 104-264, Sec. 407; amendment to *United States Code*, Title 49, Subtitle II, Chapter 11, Section 1119) for the Safety Board to provide "clearer descriptions of accidents associated with air transportation, including a more refined classification of accidents which involve fatalities, injuries, or substantial damage and which are only related to the operation of an aircraft." Before 1997, accident severity was characterized in terms of injuries (fatal, serious, minor, or none) or aircraft damage (destroyed, substantial, minor, or none).

Definitions for Level of Injury

Fatal Any injury that results in death within 30 days of the accident.

Serious 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% of the body surface.

Minor Any injury that is neither fatal nor serious.

None No injury.

Definitions for Level of Aircraft Damage

Destroyed Damage due to impact, fire, or in-flight failures to an extent not economically repairable.

Substantial 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.[7]

Minor Any damage that neither destroys the aircraft nor causes substantial damage.

None No damage.

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[7] See Title 49 CFR 830.2. On December 27, 2004, the Safety Board published in the *Federal Register* a proposal to change Title 49 CFR 830.2 to include reporting of certain events that are not currently covered by the regulation. In the proposed change, reference to ground damage to helicopter rotor blades would be removed from the list of exclusions. If adopted, the change would bring events involving ground damage to main or tail rotor blades within the definition of an accident and make them reportable events. For more detail, see Notice of Proposed Rulemaking, "Notification and Reporting of Aircraft Accidents and Incidents and Overdue Aircraft, and Preservation of Aircraft Wreckage, Mail, Cargo, and Records," *Federal Register*, Vol. 69, No. 247, December 27, 2004.

Appendix C

How Accident Data in the Review Are Collected and Analyzed

National Transportation Safety Board aircraft accident data reviews present accident data in two ways: by the number of accidents and by accident rate. For Part 121 and scheduled Part 135 operations, accident rates are calculated using three flight activity measures: flight hours, departures, and miles flown. Appendix C describes the data collection process, how those data are coded, and how the flight activity measures are compiled and used to calculate accident rates.

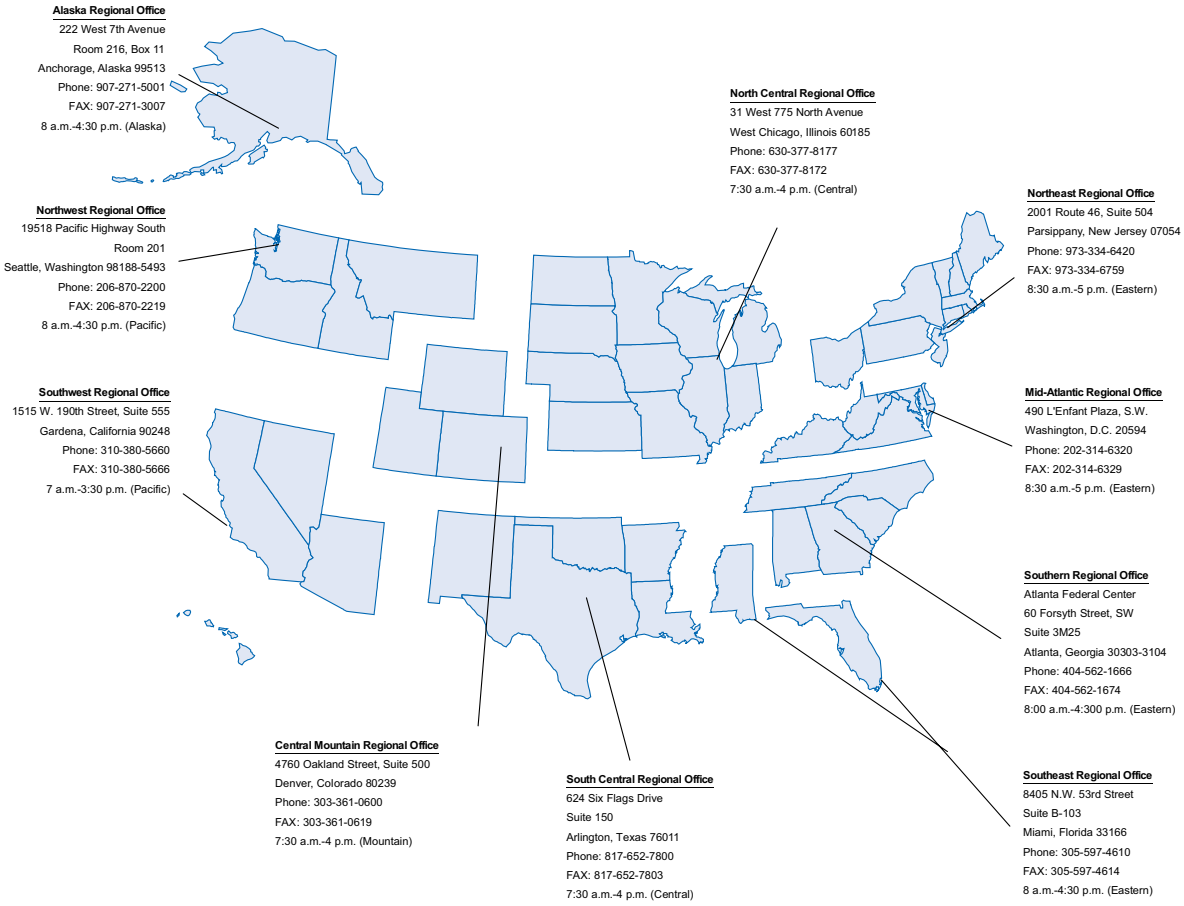
Accident Data: The Safety Board's Investigative Process

The Safety Board investigates every civil aviation accident that occurs in the United States. It also provides investigators to serve as U.S. Accredited Representatives, as specified in international treaties and agreements, for aviation accidents that occur overseas and that involve aircraft registered in the U.S. or aircraft or major components of U.S. manufacture.[1] Investigations are conducted by Safety Board Headquarters staff based in Washington, D.C., or by staff based in one of the regional offices.

Although the Safety Board investigates all civil aviation accidents that occur on U.S. soil (including those involving domestic and foreign operators), the *Review of 2002 Aircraft Accident Data: U.S. Air Carrier Operations* describes accidents that occur among U.S.-operated aircraft in all parts of the world.

[1] For more detailed information about the criteria for Safety Board investigation of an aviation accident or incident, see Title 49 *Code of Federal Regulations* (CFR) 831.2.

National Transportation Safety Board Regional Offices



The Safety Board's Aviation Accident/Incident Database

The Safety Board maintains the Accident/Incident Database, the government's official repository of aviation accident data and causal factors for civil aviation accidents. The database was established in 1962 by the Safety Board's predecessor agency, the Civil Aeronautics Board, and approximately 1,900 new event records are added each year. Each record contains data about the aircraft, environment, injuries, sequence of accident events, and other topics. The database is available to the public at <ftp://www.ntsb.gov/avdata/>. A database query tool is also available at <http://www.ntsb.gov/ntsb/query.asp#query_start> to search for sets of accidents using such information as date, location, and category of aircraft.

The Safety Board's database is primarily composed of aircraft accidents. An "accident" is defined in 49 CFR Part 830.2 as—

> 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.[2]

The database also contains fields for documenting selected aviation "incidents," defined in 49 CFR Part 830.2 as "an occurrence other than an accident, associated with the operation of an aircraft, which affects or could affect the safety of operations."

During an investigation, Safety Board investigators collect information from a variety of sources, including the aircraft crew, the FAA, manufacturers, and witnesses. Investigators use the Board's Accident Data Management System (ADMS) to document those data in the Accident/Incident Database. There are five types of data in the database:

- Factual information that documents the accident situation.
- Occurrence codes to document what happened during an accident.
- Phase-of-flight codes to designate when each occurrence took place.
- Explanatory causes, factors, and findings to identify the cause-and-effect relationships that help explain why the accident happened.
- Narrative data that describe the accident in natural language and state the probable cause of the accident.

Factual Information. Investigators enter information in the database that describes the accident aircraft, crew and passengers, and accident environment. These data typically include aircraft type, make and model, aviation-related demography of flight and cabin crew, weather conditions, and accident site details.

Occurrence Data. The circumstances of an accident are documented in the Safety Board's accident report as accident "occurrences" within a "sequence of events." As stated above, occurrence data indicate *what* happened during the accident. A total of 54 occurrence codes[3] are available to describe the events for any given accident. Because aviation accidents are rarely limited to a single event, each accident is coded as a sequence (that is, occurrence 1, occurrence 2, etc.), with as many as five different occurrence codes. For accidents that involve more than one aircraft, the list of occurrences is unique to each aircraft.

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[2] The definitions of a "death" (fatality), "serious injury," or "substantial damage" are presented in appendix B.

[3] Two of the codes, "missing aircraft" and "undetermined," do not represent operational events.

Occurrence data do not include any information about why an accident may have happened; the first occurrence can instead be considered the first observable link in the accident chain of events. First occurrence data are used with phase-of-flight data to characterize the initiating event in an accident sequence.

Phase-of-Flight Data. Investigators use phase-of-flight codes to describe *when* an occurrence takes place in the chronology of flight. These 50 distinct codes are classified into six major categories describing typical flight operations: takeoff or climb, approach or landing, maneuvering or hovering, cruise or descent, standing, and taxiing. Each category contains more specific detail about that phase of flight; for example, the category "standing" includes standing with engines operating, standing with engines not operating, and standing while starting engines.

Findings, Factors, and Probable Cause Data. In addition to coding accident occurrences and phase-of-flight data, the Safety Board determines probable cause. The objective of this determination is to discern the cause-and-effect relationships in the accident sequence. This could be described as *why* the accident happened. In determining probable cause, the Safety Board considers all facts, conditions, and circumstances associated with the accident. Within each accident occurrence, any information that contributes to the Board's determination of probable cause is identified as a "finding" and may be further designated as either a "cause" or "factor." The term "factor" is used to describe situations or circumstances that contribute to the accident cause. The details of probable cause are coded as the combination of all causes, factors, and findings associated with the accident. Just as accidents often include a series of events, several causes and factors can help explain why an accident occurred. For this reason, a single accident report can include multiple cause and factor codes. Hundreds of unique codes are available to document probable cause information. These codes have been grouped into three broad cause/factor categories: aircraft, environment, and personnel.

Narrative Data. Natural language textual descriptions of the accident and accident probable cause are maintained in the database and can be retrieved with other specific information about the accident.

The five types of data can also be related to the factual component of the accident investigation and the analysis component of the investigation. The factual information and the narratives describing the accident represent the encoding in the database of the factual component of the investigation. The narrative describing the probable cause, and the occurrence codes, phase-of-flight codes, and causes, factors, and findings represent the encoding of the analysis component of the investigation.

Shortly after completing the on-scene investigation, investigators submit a preliminary factual report containing limited information about the accident or incident, such as date, location, aircraft operator, and type of aircraft. Once investigators have finished gathering and compiling information, they submit a factual report. After the investigation is complete, a final report is issued, which includes an analysis of the factual information, statement of probable cause and other contributing factors, and, if appropriate, a list of recommendations. For major accident investigations, the probable cause is approved by the five Members of the Safety Board or their designees; for general aviation accident investigations, approval authority may be delegated to the Director of Aviation Safety. Information about the accident and the investigation is available to the public after approval by the Safety Board or their designees.

Accident Rate Data: Compiling Aircraft Flight Activity

All Part 121 and scheduled Part 135 carriers are required by regulation to report revenue flight activity[4] data to the Department of Transportation,[5] while on-demand Part 135 carriers are not. As a result, accident data in this review—and the method used to calculate accident rates—differ depending on the type of operation.

Part 121 and scheduled Part 135 flight activity data, including flight hours, number of departures, and miles, are maintained by the Bureau of Transportation Statistics (BTS). These data are aggregated by the FAA's Systems Process Audit staff (AFS-40) to produce annual reports of flight activity. The flight activity measures are based on a full census of the active Part 121 and scheduled Part 135 fleet.

In contrast, flight activity data for on-demand Part 135 operations are estimated using the voluntary *General Aviation and Air Taxi Activity (GAATA) Survey*, which is compiled annually by the FAA. The *GAATA Survey* was established in 1978 to gather a sampling of information from owners of general aviation and on-demand Part 135 aircraft. The information includes flight hours, avionics, base location, and use, but does not include miles flown or number of departures. To conduct the survey, the FAA selects registered aircraft from its Civil Aviation Registry using a stratification procedure based on aircraft type and geographic region. Note that the small proportion of on-demand Part 135 aircraft in the survey, combined with low survey response rates and the fact that the survey goes to aircraft owners rather than operators, results in an imprecise activity estimate.

[4] Activity data include revenue aircraft hours, revenue aircraft departures, revenue aircraft miles flown, and several others.

[5] Part 121 operators report activity monthly using Traffic Reporting System Form 41, Schedules T-100 and T-100(f), and quarterly using Scheduled Part 135 Operators Report, U.S. Bureau of Transportation Statistics (BTS) Form 298-C, Schedules A-1 and T-1.

Once *GAATA Survey* data are compiled, the FAA estimates flight hours, which the Safety Board includes in its annual reviews. Prior to 2002, the FAA estimated flight hours based strictly on *GAATA Survey* data. In 2002, the FAA changed its estimating method and revised its flight-hour estimates for on-demand Part 135 operations for 1992–2000. The revised activity estimate uses calculations that are based on the number of aircraft assumed to operate on-demand operations[6] and the average number of flight hours reported on the *GAATA Survey*. FAA's flight-hour estimates as revised for on-demand Part 135 flight operations are substantially higher than they would be using the previous method. For example, before the FAA changed its estimating method, the flight-hour estimate for the year 2000 would have been 2,430,000; estimated using the revised method, it is 3,552,881, an estimate that is 46.2% higher. This change in estimated flight activity results in a consistently lower accident rate calculation for the years 1992-2004. The change is so dramatic that the Safety Board maintains on its website[7] a comparison of flight-hour estimates for each year using both estimating methods. This review uses the revised activity measures for on-demand Part 135 operations.

The only flight-activity measure that is common for Part 121, scheduled Part 135, and on-demand Part 135 operations is flight hours. Although the number of departures is available for Part 121 and scheduled Part 135 operations, the flight-hour-per-departure rates for those operations differ greatly. Accordingly, this review calculates accident rates for Part 121 and scheduled Part 135 operations using the number of flight hours and departures. The number of departures or miles flown is not available for on-demand Part 135 operations and cannot therefore be used to calculate rates for those operations.

Prior to the 1998 review, activity rates were presented in units of hundred-thousands for flight hours and departures and in millions for miles flown. Because of an increase in activity and a decrease in accident numbers, and to facilitate interpretation of rate data, this review now presents aircraft activity data in units of millions for flight hours and departures and billions for miles flown; accident rates are calculated using flight hours and number of departures only.[8] Any comparisons with Safety Board data published before the 1998 review should take this change into account.

[6] Data are derived from the FAA's Vital Information Subsystem (VIS), a database used to track commercial aircraft operating certificates.

[7] See table 9a at <http://www.ntsb.gov/aviation/Table9a.htm>.

[8] From BTS, 2002 National Transportation Statistics (BTS-02-08), Table 2-9 for Part 121 Operations, Table 2-10 for Scheduled Part 135 Operations, and Table 2-13 for On-Demand Part 135 Operations.

Appendix D

Characteristics of the Air Carrier Fleet

The number of major air carriers did not change greatly between 1995 and 2002, ranging from 11 in 1995 to 14 in 2002 (table D1). However, the number of other carriers (including national, large regional, and medium regional) decreased after 1995 from a peak of 85 carriers.

Table D1: Number of Air Carriers, 1995 – 2002[1]

	1995	1996	1997	1998	1999	2000	2001	2002
Major Air Carriers	11	12	13	13	13	15	15	14
Other Air Carriers	85	84	83	83	81	76	72	66
Total	**96**	**96**	**96**	**96**	**94**	**91**	**87**	**80**

The number of air carrier aircraft in the fleet increased 14% from 1993 to 2002 to a peak of 8,497 in 2001 (table D2). All of the increase was in turbojets, which increased almost 40% in that period, while the number of turboprop airplanes, piston airplanes, and helicopters declined.

Table D2: Air Carrier Aircraft Characteristics, 1993–2002[2]

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Fixed Wing	7,173	7,242	7,293	7,357	7,482	7,994	8,106	8,016	8,370	8,161
Turbojet	4,584	4,636	4,832	4,922	5,108	5,411	5,630	5,956	6,296	6,383
Turboprop	1,868	1,782	1,713	1,696	1,646	1,832	1,788	1,475	1,494	1,250
Piston	721	824	748	739	728	751	688	585	580	528
Helicopter	124	128	118	121	134	117	122	39	127	33

[1] U.S. Bureau of Transportation Statistics (BTS), 2006 National Transportation Statistics, Table 1-2 (June 2005). Air carrier groups are categorized based on their annual operating revenues as major, national, large regional, and medium regional. The thresholds were last adjusted July 1, 1999, and the threshold for major air carriers is currently $1 billion. The other air carrier category contains all national, large regional, and medium regional air carriers.

[2] BTS, 2006 National Transportation Statistics, Table 1-13 (January 2006).

Between 1990 and 2000, air carrier passenger miles increased 49.2%, and the average number of miles flown per aircraft increased 12.8%. Similarly, per-passenger-mile revenues for domestic scheduled air carriers increased steadily over the last two decades, with a record average high of 14.6 cents per mile in 2000.

The number of enplanements is another indicator of the aviation environment. In 2002, 639 million passengers boarded airplanes at U.S. airports. Figure D1 lists the number of enplanements at the top 20 airports in the United States in 2002.[3] As in previous years, Hartsfield Atlanta International Airport had the highest traffic volume with 39.4 million enplanements.

The number of jet transport aircraft deliveries was cyclical in the period 1993 through 2002 (see figure D2); total deliveries to U.S. and foreign customers peaked in 1999.[4] Deliveries to U.S. customers peaked in 2001, with deliveries in 2002 down 44% from that year. An average of 48% of all deliveries went to U.S. customers from 1993 through 2002, with a low of 39% in 1994 and a high of 69% in 2001. The least number of aircraft were delivered in 1995 (256 to all customers), and the most were delivered in 1999. The overall increase in aircraft deliveries after 1996 was accompanied by more deliveries to U.S. customers and a steady decrease in deliveries to foreign customers.

[3] BTS, 2004 National Transportation Statistics, Table 1-41 (January 2005).

[4] Includes 707, 737, 747, 757, 767, 777, MD-11, MD-80, MD-90, MD-95, DC-8, DC-9, DC-10, and L-1011. From Aerospace Industries Association website www.aia-aerospace.org/stats/aero_stats/aero_stats.cfm. Data are from Series 21, April 18, 2006.

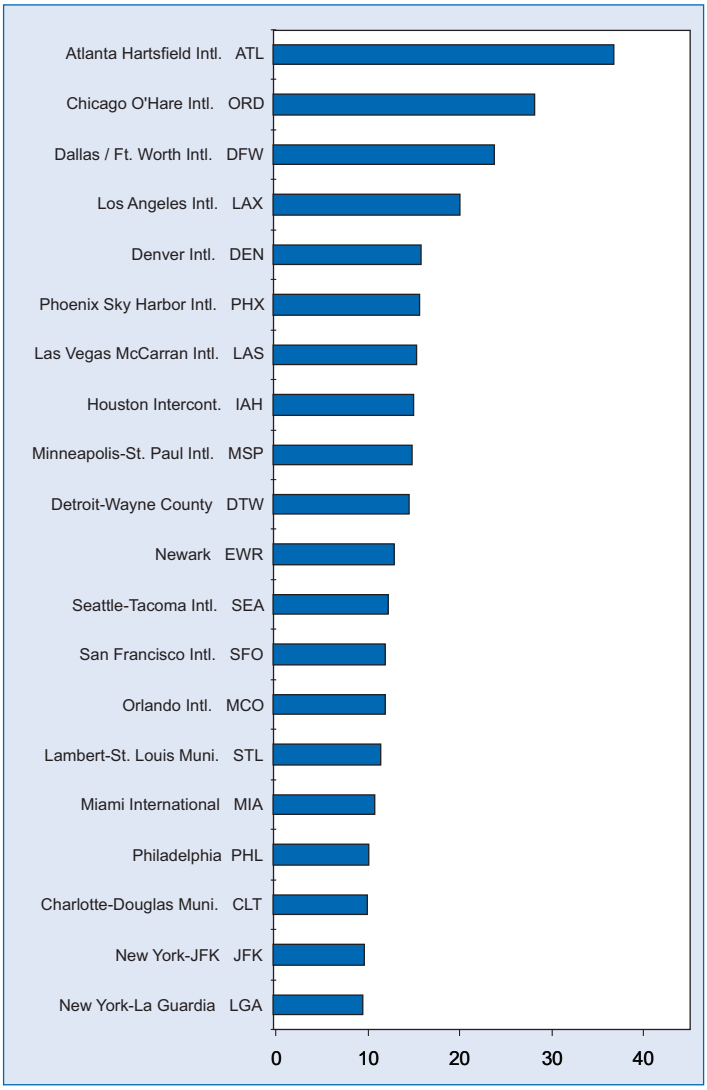

Figure D1: Enplanements (Millions) in 2002 Top 20 U.S. Airports

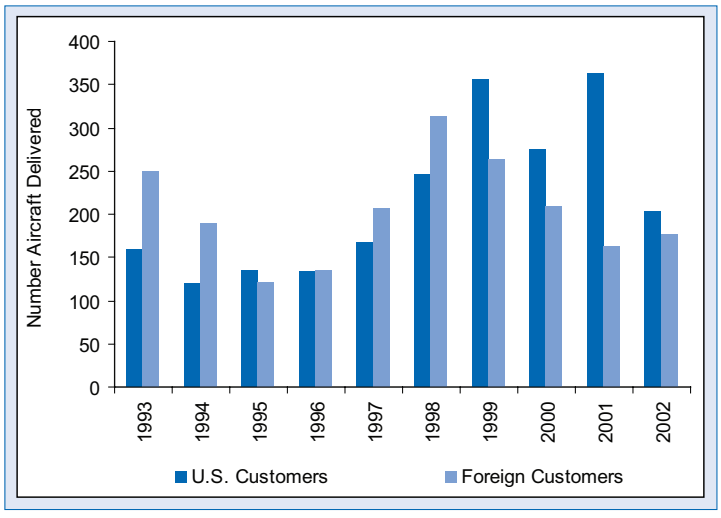

Figure D2: Number of Jet Transport Aircraft Deliveries, 1993-2002