U. S. Air Carrier Operations
Calendar Year 2005

Annual Review of Aircraft Accident Data

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Annual Review of Aircraft Accident Data

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Calendar Year 2005

National Transportation Safety Board

490 L'Enfant Plaza, S.W.
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National Transportation Safety Board. 2009. *U.S. Air Carrier Operations, Calendar Year 2005*. Annual Review of Aircraft Accident Data NTSB/ARC-09/01. Washington, DC.

Abstract: The National Transportation Safety Board's Review of Aircraft Accident Data: U.S. Air Carrier Operations Calendar Year 2005 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. Data for the years 1996–2004 are included to provide an historical context for the 2005 statistics. 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.

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INTRODUCTION

The National Transportation Safety Board's *Review of Aircraft Accident Data: U.S. Air Carrier Operations Calendar Year 2005* covers aircraft operated by U.S. air carriers under Title 14[1] Parts 121 and 135 of the *Code of Federal Regulations* (CFR). Data for the years 1996–2004 are included to provide an historical context for the 2005 statistics. Readers who prefer to view or manipulate tabular data may access the data set online at http://www.ntsb.gov/aviation/stats.htm.[2] Air carriers are generally defined as operators that fly aircraft in revenue service.

Part 121	Scheduled Part 135	On-Demand Part 135
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.[3] 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.	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.	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.[4] Also includes medical evacuation flights when a patient is on board.[5]

U.S. air carriers experienced a total of 111 accidents in 2005, up 11% from 2004. (See table 1.) Given the volume of activity—air carriers flew more than 8 billion miles in 2005, recorded more than 11 million departures, and logged more than 22 million flight hours—the number of accidents is quite small.

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1 Title 14 is also known as the *Federal Aviation Regulations* (FARs).

2 Appendix A contains a list of the 2005 air carrier accidents discussed in this review.

3 Title 14 CFR Part 119.3.

4 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; all-cargo operations conducted with airplanes having a payload capacity of 7,500 pounds or less; and all-cargo operations with rotorcraft.

5 In 2008, the Senate introduced language in Senate Bill S.1300, *Aviation Investment and Modernization Act of 2007*, that would require medical evacuation flights to operate under Part 135, even with no patient on board.

Table 1: Accidents and Accident Rates for 2005

	Number of Accidents	Accidents Per Million Flight Hours
Part 121	40	2.1
Scheduled Part 135	6	20.3
On-Demand Part 135	65	17.0

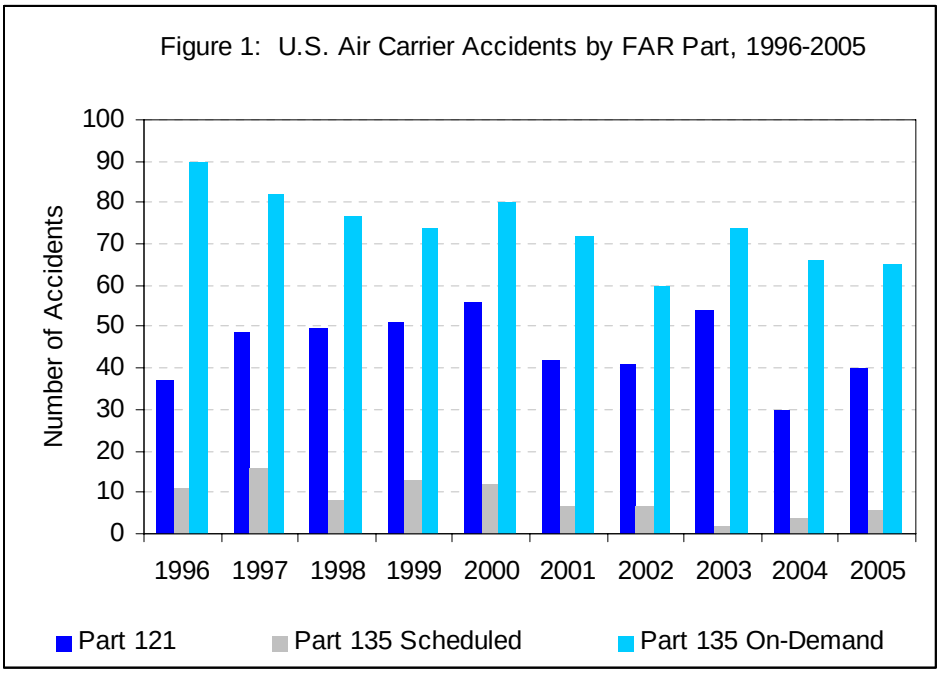
Part 121 air carriers continued to exhibit the lowest accident rates of all commercial operations (tables 1 and 2) in 2005, while the accident rates for both on-demand and scheduled Part 135 air carrier operations were substantially higher. Only 14 of the 111 total air carrier accidents resulted in fatalities—3 of the Part 121 accidents and 11 of the on-demand Part 135 accidents. There were no fatalities in the six scheduled Part 135 accidents.

Table 2: Fatal Accidents, Fatalities, and Fatal Accident Rates for 2005

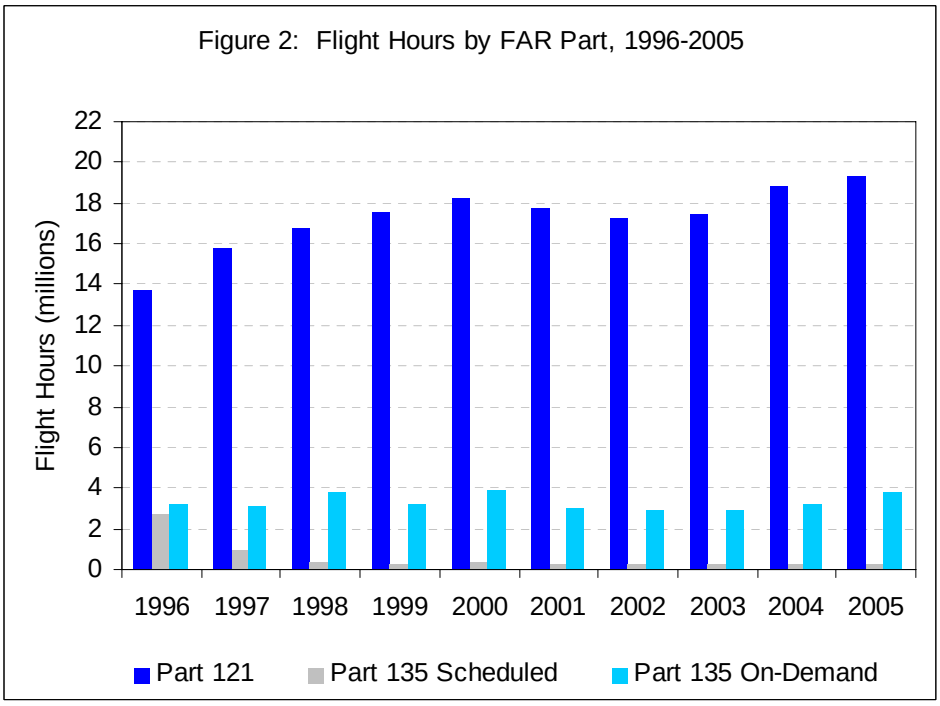
	Number of Fatal Accidents	Fatalities	Fatal Accidents Per Million Flight Hours
Part 121	3	22	0.15
Scheduled Part 135	0	0	0.00
On-Demand Part 135	11	18	2.88
Total	14	40	

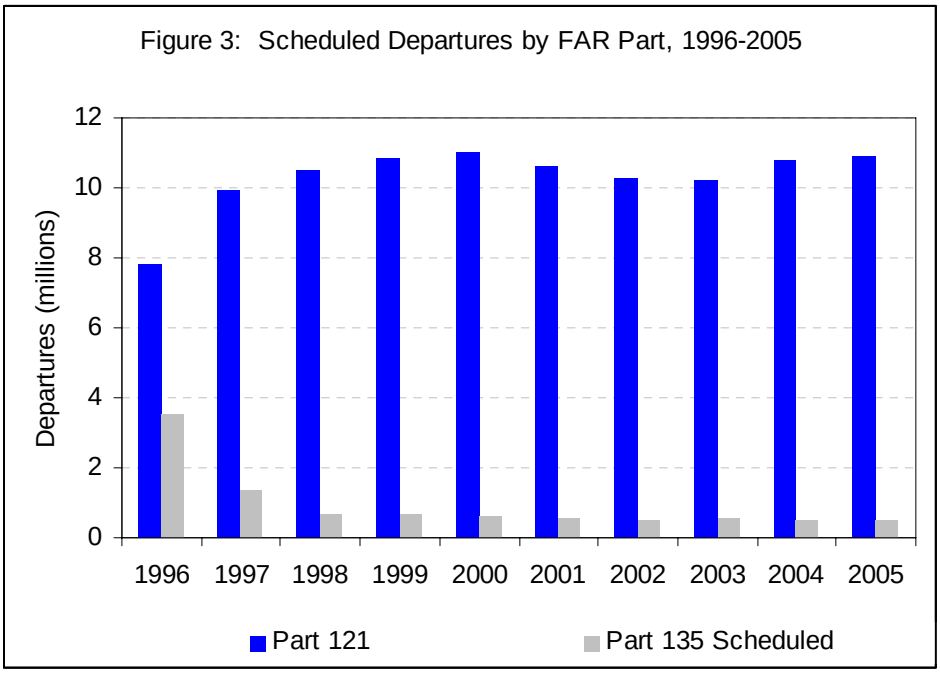
Activity Measures and Accident Rates

The 40 Part 121 accidents in 2005 represented a slight increase from 2004, but was still the third-lowest number of accidents during the period from 1996 through 2005. The number of on-demand Part 135 accidents decreased by one from 2004 to 2005, while and scheduled Part 135 increased by two between the 2 years

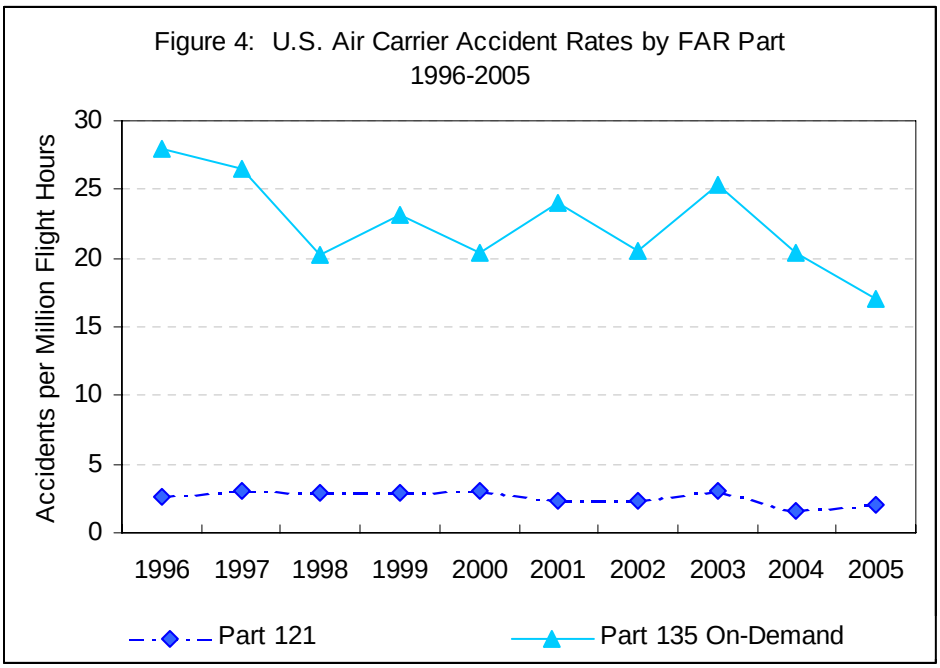


The flight hours for both Part 121 and on-demand Part 135 operations increased in 2005, with Part 121 flight hours reaching a 10-year peak in 2005 (figure 2). This increase in flight hours continued the pattern of increasing flight activity begun in 2003. Scheduled departures among Part 121 operations also increased in 2005, reaching their second-highest number in the 10-year period with 10.9 million departures. Scheduled 135 operations remained stable from 1998 through 2005 at slightly over 0.5 million departures a year (figure 3).



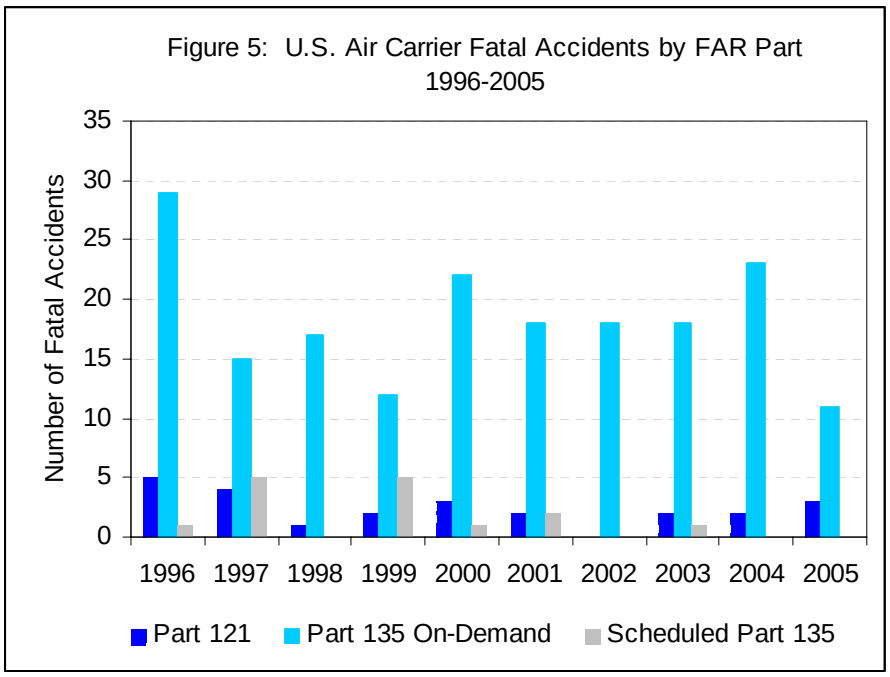


The number of Part 121 accidents varied from 1996 through 2005 (figure 1), but the accident rate remained relatively constant (figure 4). On-demand Part 135 accident rates showed a general decrease across the period, and in 2005 dropped below 20 accidents per million flights. Throughout the period, the accident rate for on-demand Part 135 operations (and for Part 135 operations in general) remained significantly higher than the Part 121 rate.



Fatal Accidents, 1996 through 2005

The number of fatal Part 121 accidents remained relatively constant and low from 1996 through 2005, although the number of on-demand Part 135 fatal accidents exhibited greater year-to-year variability. The number of on-demand Part 135 fatal accidents in 2005 was less than half the number in 2004 despite nearly the same total number of accidents in the 2 years.



Part 121 Accidents in 2005

Part 121 air carriers carried more than 743 million passengers 8.2 billion miles and accumulated 19.4 million flight hours in 2005. The 40 Part 121 accidents involved 44 aircraft[6] and produced an accident rate of 2.1 accidents per million flight hours and a fatal accident rate of .15 accidents per million flight hours. These accidents resulted in 22 fatalities, 14 serious injuries, and 45 minor injuries, as shown in table 3.

Only 1 of every 14.9 million passengers who boarded a Part 121 air carrier flight was injured in an accident, and only 1 of every 200,000 Part 121 passengers was involved in an accident. Of the 3,626 passengers involved in Part 121 accidents, only 1.4% received any type of injury. Four Part 121 accidents occurred outside of the United States and its territories. In addition, 6 of the 40 accidents were cargo-only flights.

Table 3: Part 121 Injuries by Role in 2005

	Fatal	Serious	Minor	None	Total
Flight crew	2	1	1	90	94
Cabin crew		9	7	123	139
Other crew				11	11
Passengers	18	2	30	3,576	3,626
Total aboard	**20**	**12**	**38**	**3,800**	**3,870**
Other aircraft	0	0	0	0	0
On ground	2	2	7	0	11
Total	**22**	**14**	**45**	**3,800**	**3,881**
Accidents	3	13	3	21	**40**

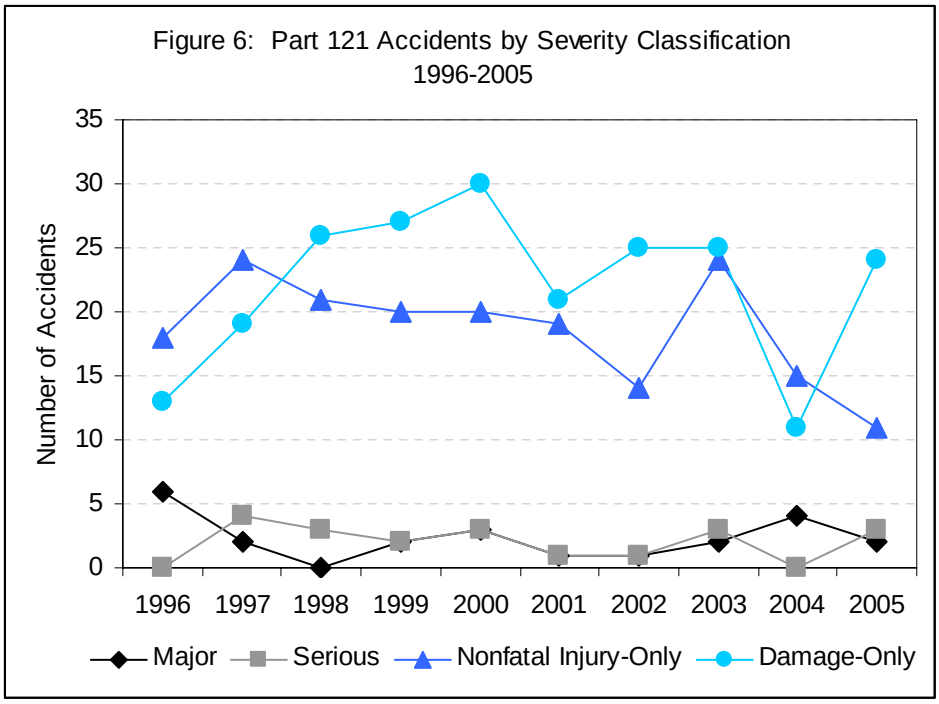
Accidents, Accident Severity, and Injuries

For the 10 years beginning in 1996, the number of Part 121 accidents reached its peak in 2000, and its lowest level in 2004 (table 4). Almost all accidents during that period (90%) were nonfatal injury-only or damage-only accidents. Accident rates based on flight hours (figure 6) show the same pattern and highlight how much higher the rates were for nonfatal injury-only and damage-only accidents than the more severe accidents. Over the decade the rates for major and serious accidents remained low.

[6] Four accidents in 2005 involved the collision of two aircraft. Each of these collisions is recorded as one accident.

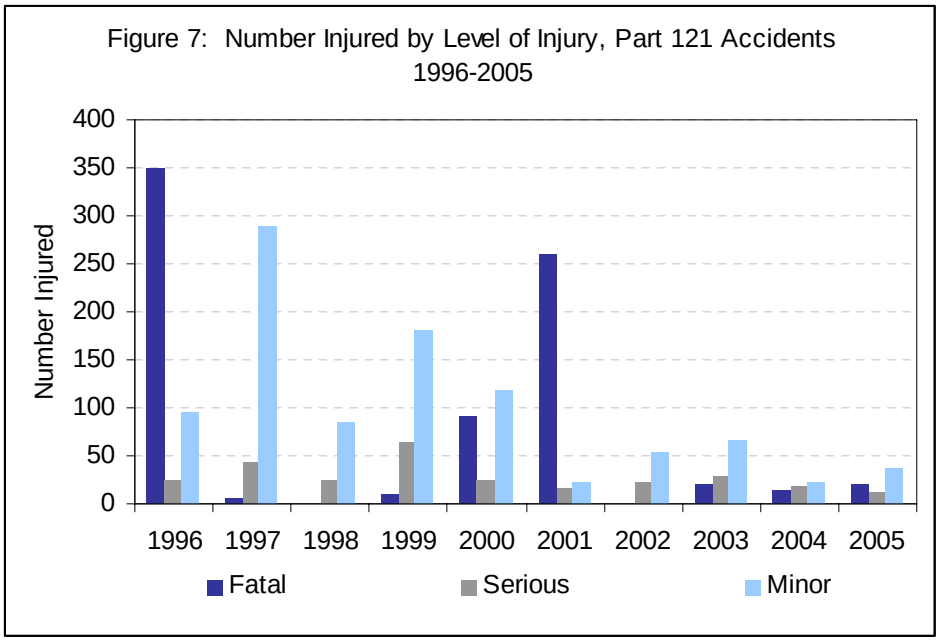
Table 4: Part 121 Accidents by Severity Classification, 1996-2005

Severity Classification	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Major	6	2	0	2	3	1	1	2	4	2
Serious	0	4	3	2	3	1	1	3	0	3
Nonfatal Injury-Only	18	24	21	20	20	19	14	24	15	11
Damage-Only	13	19	26	27	30	21	25	25	11	24
Total	**37**	**49**	**50**	**51**	**56**	**42**	**41**	**54**	**30**	**40**



These data, especially injury data, can be dramatically affected by a few severe accidents. For instance, figure 7 shows that most of the fatalities during the period (605) were attributed to just 3 of the 454 Part 121 accidents[7] that occurred in 1996, 2000, and 2001. In other years the proportion of people injured in Part 121 accidents was small.

[7] 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.



It should also be noted that the survivability of serious accidents over the 10 years remained quite high (tables 5, 6, 7, and 8); all of the accidents producing minor injuries and 94% of the accidents producing no injuries were associated with substantially damaged or destroyed aircraft. Table 4 shows that such low-injury accidents dominate during the 10-year period.

In contrast, 93% of the accidents in 1996–2005 that produced serious injuries resulted in minor or no damage to the aircraft. Nine no-damage accidents resulted in serious injuries in 2005. Most of those accidents (56%) were the result of encounters with turbulence, a topic discussed later in this review.

Table 5: Part 121 Fatal Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	4	1		1	2	1		1	2	1
Substantial	1									1
Minor		1	1	1	1	1		1		1
None		2								

Table 6: Part 121 Serious-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed							1		2	
Substantial		1	2	1	2		1	2		2
Minor	5	5	6	2	3		2	1		2
None	13	19	15	18	17	19	12	23	15	9

Table 7: Part 121 Minor-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	1	1		1	1			1		
Substantial	5	6	7		6	6	1	2	2	3
Minor										
None										

Table 8: Part 121 No-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed										
Substantial	8	13	19	27	23	15	23	23	9	20
Minor	2			1	1	2				3
None					1		1			

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 any phase of flight describes the starting point for an accident. Table 9 shows first occurrence data by phase of flight for Part 121 accidents in 2005. Appendix C discusses occurrences in more detail and how they are coded. First occurrence data for 36 of the 40 Part 121 accidents in 2005 were available for this analysis.

Table 9 relates the type of first occurrence to the phase of flight. On-ground collisions with objects during taxi or standing were the most frequently cited first occurrences for Part 121 operations and accounted for 22% of Part 121 accidents in 2005. The second most frequent first occurrences were in-flight encounters with weather during cruise or descent, accounting for seven Part 121 accidents; airframe, component, and system failure first occurrences accounted for five accidents.

Table 9: Part 121 First Occurrences by Phase of Flight for 2005

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Taxiing or Standing	Total
On Ground Collision with Object	1			7	8
Airframe, Component, System Failure	4		1		5
In-flight Encounter with Weather		7			7
Collision Between Aircraft (Excludes Midair)				3	3
Miscellaneous/Other			1	3	4
Decompression	1			1	2
Abrupt Maneuver			1	1	2
Dragged Wing, Rotor, Pod, Float or Tail/Skid	1		1		2
Loss of Control - On Ground/Water			1		1
Hard Landing			1		1
Overrun			1		1
Total Accidents	7	7	7	15	36

Table 10 relates the severity of an accident to phase of flight for the first occurrence. Standing or taxiing accidents most often resulted in a damaged aircraft but few injuries, while cruise or descent were more often associated with non-fatal injury-only accidents (consistent with turbulence).

Table 10: Part 121 Accident Initiating Event, Severity Classification by Phase of Flight, 2005

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Taxiing or Standing	Total
Major	1		1		2
Serious	1			3	4
Injury	1	6	1	3	11
Damage	5	1	5	9	20
Total	8	7	7	15	37

Within each accident occurrence, any information that helps explain why that event happened is designated as either a "cause" or "factor." For most of the 10-year period, personnel were cited as a cause or factor in 70 to 80% of all Part 121 accidents. Calendar year 2005 was no exception, as shown in figure 8: personnel factors were cited in 78% of the accidents, environmental factors in 44%, and aircraft factors in 19%.

Figure 8: Broad Causes/Factors for Part 121 Accidents 1996-2005

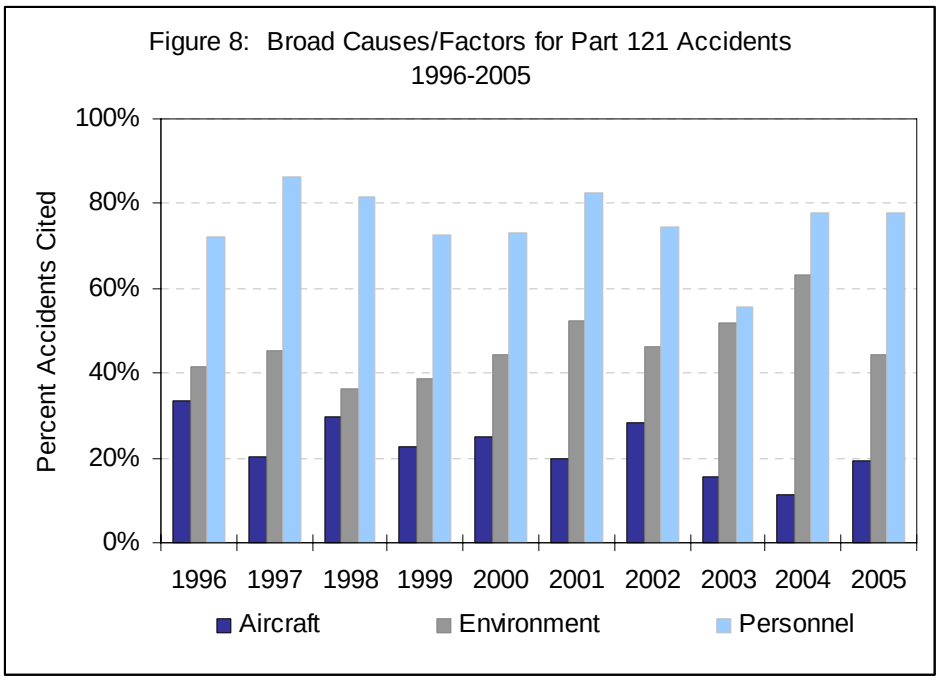
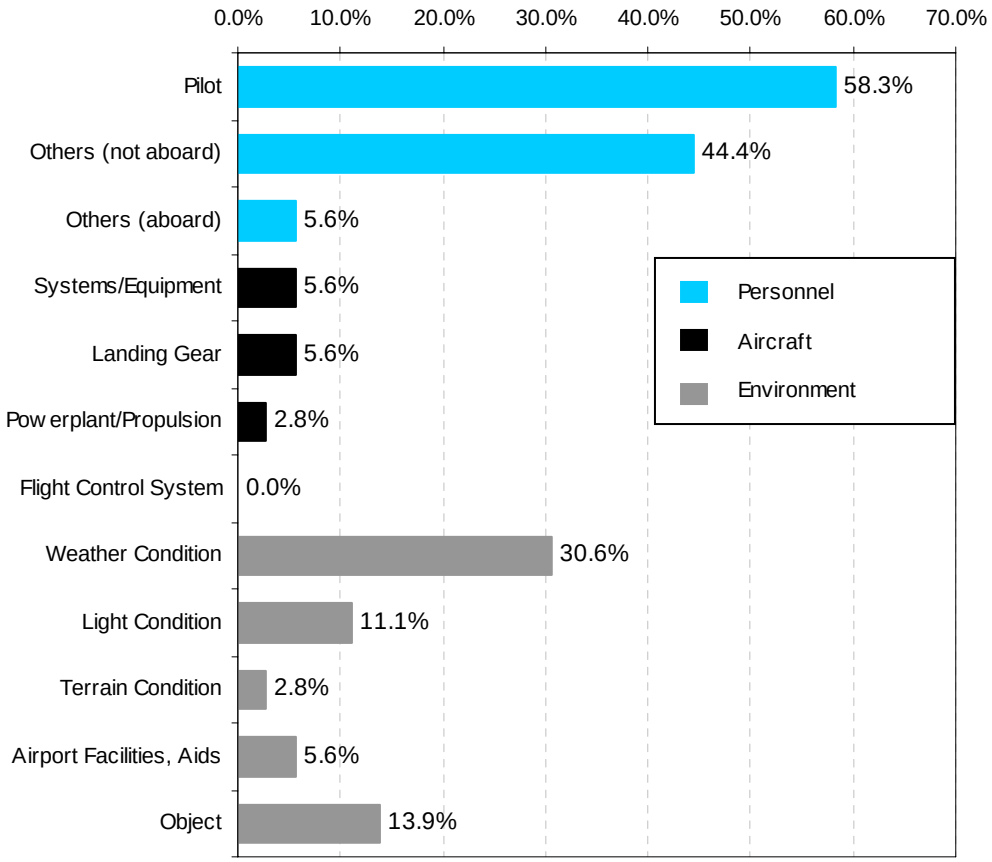


Figure 9 provides more detail about 2005 Part 121 accident causes and factors within the broad categories of personnel, aircraft, and environment. These data show the proportion of accidents where a specific cause or factor was cited at least once in the accident.[8] In the personnel category, pilots were the most frequently cited cause or factor. However, others not on board accounted for a substantial proportion of the accidents (44.4%), reflecting the substantial number of accidents attributable to ramp personnel. In the environment category, weather was the leading cause or factor (30.6%). No specific aircraft component or equipment could be singled out as the leading cause or factor in aircraft-related accidents.

[8] Each accident can have more than one cause or factor identified.

Figure 9: Top Causes/Factors in Part 121 Accidents for 2005



Among weather causes, turbulence was cited as a cause or factor in 15.0% of all Part 121 accidents in 2005 and accounted for 46.2% of all serious-injury accidents (table 11). Turbulence accounted for 22.1% of all Part 121 accidents from 1996–2005 and produced roughly 49% of the serious-injury accidents. Table 12 shows that turbulence resulted in serious injuries, but caused little or no damage to the aircraft.

Table11: Part 121 Turbulence Accidents by Highest Level of Injury, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fatal		1								
Serious	9	12	8	11	12	9	7	14	10	6
% Total Accidents	24.3%	26.5%	16.0%	21.6%	21.4%	19.6%	17.1%	25.9%	33.3%	15.0%
% Serious Injury Accidents	50.0%	48.0%	34.8%	52.4%	54.5%	47.4%	43.8%	53.8%	58.8%	46.2%

Table 12: Part 121 Turbulence Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Substantial			1							
Minor	2	2	1	2	2		1			1
None	7	11	6	9	10	9	6	14	10	4

International Major Air Carrier Accidents

The Part 121 accidents that occurred in the United States accounted for about 40% of all scheduled major air carrier accidents that occurred worldwide in 2005. According to the International Civil Aviation Organization (ICAO),[9] 58 reportable major air carrier accidents occurred outside the United States and Canada (table 13).[10] A summary of the accidents by world region is shown in table 13.[11]

[9] ICAO was established in 1944 by 52 member states to secure international cooperation in establishing uniformity in regulations and standards, procedures, and organization in civil aviation. One of ICAO's activities is to provide the aviation community with safety-related information, including accident and activity data. More about ICAO can be found at http://www.icao.int/.

[10] ICAO collects data on accidents involving aircraft over 12.5 tons whereas Safety Board numbers refer to air carrier accidents by operation.

[11] Three nonfatal accidents occurred over oceans. Two of the accidents occurred over the North Atlantic Ocean and one over the North Pacific Ocean.

Table 13: International Reportable Accidents by World Region in 2005

	Number of Accidents	Number of Fatal Accidents
United States & Canada	38	3
Central & South America	9	2
Europe & Russian Federation	19	5
Africa & Middle East	14	6
Asia & Pacific	16	4
Total	**96**	**20**

The fact that the United States accounts for such a large proportion of the worldwide accident total is not surprising when air carrier activity is considered. Flight hours and departures as reported by ICAO for the top 10 countries in 2005 are shown in tables 14 and 15, respectively. The data show that Part 121 air carriers in the United States reported over 6 times more flight hours and departures than China, the next most active country in the world.

Table 14: 2005 Top 10 Most Active Countries Based on Flight Hours

	Domestic	International	Total
United States	14,690,326	3,065,328	17,755,654
China	2,264,212	407,532	2,671,744
United Kingdom	389,003	1,782,842	2,171,845
Germany	286,112	1,782,425	2,068,537
Japan	725,123	604,359	1,329,482
France	270,470	953,557	1,224,027
Spain	533,926	514,409	1,048,335
Canada	288,013	508,624	796,637
Italy	247,840	441,494	689,334
India	442,516	218,852	661,368

Table 15: 2005 Top 10 Most Active Countries Based on Departures

	Domestic	International	Total
United States	9,079,020	876,780	9,955,800
China	1,242,664	97,853	1,340,517
United Kingdom	393,900	624,218	1,018,118
Germany	266,451	689,355	955,806
Japan	515,442	107,216	622,658
Spain	414,889	170,196	585,085
France	207,133	294,249	501,382
Italy	200,495	157,955	358,450
India	293,429	50,192	343,621
Ireland	0	278,560	278,560

Accident rates provide a way to compare accident risk in different parts of the world. Tables 16 and 17 show the accident rates and fatal accident rates based on the number of fatal accidents, flight hours, and departures reported by ICAO. North America, Europe, and Asia produced the lowest fatal accident rates in 2005, while Central and South America, Africa, and the Middle East produced the highest rates. Further, the fatal accident rates for Africa and the Middle East were at least 14 times greater than the North American rates by both flight hours and departures.

Table 16: 2005 Accident Rates by World Region

	Accidents per Million Flight Hours	Accidents per Million Departures
United States & Canada	2.05	3.73
Central & South America	5.94	11.32
Europe & Russian Federation	1.57	3.18
Africa & Middle East	5.30	13.44
Asia & Pacific	1.95	4.66

Table 17: 2005 Fatal Accident Rates by World Region

	Fatal Accidents per Million Flight Hours	Fatal Accidents per Million Departures
United States & Canada	0.16	0.29
Central & South America	1.32	2.52
Europe & Russian Federation	0.41	0.84
Africa & Middle East	2.27	5.76
Asia & Pacific	0.49	1.17

Part 135 Accidents in 2005

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). Of the 71 Part 135 accidents that occurred in 2005 (table 18), 6 scheduled and 65 on-demand accidents produced accident rates of 20.3 and 17.3 accidents per million flight hours, respectively. Part 135 accidents resulted in 18 fatalities (including 2 fatalities in an aircraft that collided with a Part 135 aircraft), 20 serious injuries (including two injuries to persons not on the aircraft), and 38 minor injuries (table 19), all occurring in on-demand operations. The five on-demand Part 135 accidents that resulted in multiple fatalities are described below and details about these accidents can be found in appendix A:

- On September 23, 2005, an Aerospatiale AS350BA helicopter, operated by HeliUSA Airways, encountered adverse weather and crashed into the Pacific Ocean off the coast of Kauai, Hawaii. The sightseeing tour flight was carrying a pilot and five passengers. Three passengers were killed.

- On November 8, 2005, a twin engine Piper PA-31-350 was destroyed by impact with terrain. The aircraft was returning to the departure airport in Emmetsburg, Iowa, with an engine problem. The pilot and one passenger were killed.

- On October 6, 2005, a Bell 206-L3 was assumed to have departed an unmanned offshore platform in the Gulf of Mexico with a pilot and two passengers. When the pilot failed to make his required 30-minute position report, a search for the aircraft was initiated. The U. S. Coast Guard conducted search and rescue efforts for 4 days to no avail. To date, the helicopter is still missing and the occupants are presumed dead.

- On February 10, 2005, a Cessna P210N entered a mountain wave[12] with severe turbulence that resulted in an uncontrollable descent and terrain impact in Lebec, California. The pilot and his passenger were killed in the impact.

- On August 4, 2005, a de Havilland Beaver DHC-2 collided in flight with a Cessna 150 while both aircraft were approaching Renton, Washington, to land. The two occupants of the Cessna were killed.

[12] Mountain waves refer to turbulence on the leeside of a mountain that results when strong winds cross mountains in a near perpendicular direction.

Table 18: Part 135 Accidents, Highest Injury by Type of Operation in 2005

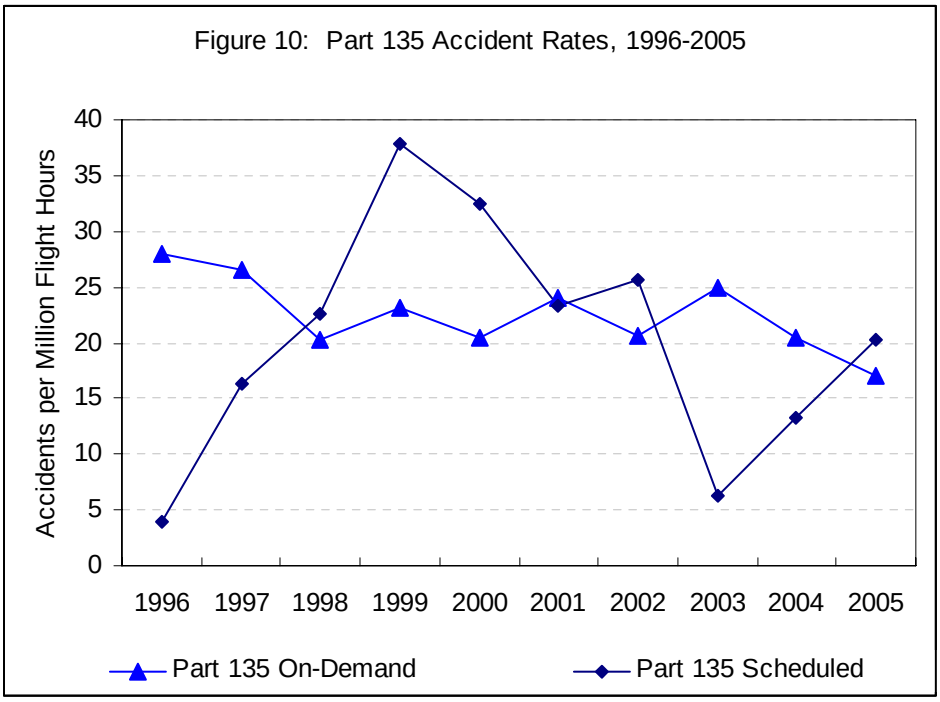
	Scheduled	On-Demand	Total
Fatal	0	11	11
Serious	0	8	8
Minor	1	12	13
None	5	34	39
Total	**6**	**65**	**71**

Table 19: Part 135 Occupant Injuries, Injury Severity by Type of Operation in 2005

	Scheduled	On-Demand	Total
Fatal	0	16	16
Serious	0	18	18
Minor	1	37	38
None	19	150	169
Total	**20**	**221**	**241**

Although on-demand accidents accounted for most Part 135 accidents and injuries, the accident rates for both types of Part 135 operations demonstrated considerable variability from 1996 through 2005 (figure 10). The on-demand Part 135 accident rate fluctuated from 20 to 25 accidents per 1,000,000 flight hours between 1998 and 2004. The 2005 accident rate for on-demand Part 135 accidents was the lowest during the 10 years at 17.3 accidents per million flight hours. The small number of scheduled Part 135 accidents resulted in large variation in the accident rates during the same period, rising above the on-demand rate after the Part 121/Part135 reclassification in 1997, peaking in 1999, and then falling to a near record low in 2003.

Figure 10: Part 135 Accident Rates, 1996-2005



The FAA uses the *General Aviation and Air Taxi Activity and Avionics Survey* (*GAATAA Survey*) to estimate on-demand Part 135 flight hours. The 2005 estimates of flight hours and fleet size for on-demand Part 135 airplanes and helicopters are shown in table 20. In 2005, airplanes accounted for 76% of the fleet, and helicopters accounted for about 22%.

Table 20: 2005 On-Demand Part 135 Flight Hours and Fleet Size

	On-Demand Active Fleet Size	GAATAA Survey Flight Hour Estimates
Airplane	6,457	2,648,915
Helicopter	1,840	1,125,800
Overall[a]	8,515	3,814,671

On-Demand Part 135 Accidents

On-demand Part 135 accident rates for airplanes and helicopters in 2005, based on the FAA estimate of flight hours, are shown in table 21. Helicopters accounted for 20% of the on-demand Part 135 accidents and produced accident and fatal accident rates lower than those for airplanes. The proportion of on-demand Part 135 accidents involving helicopters steadily increased after 1997, to a high of 36% in 2003 (table 22).

Table 21: On-Demand Part 135 Accidents, Fatal Accidents, and Accident Rates for 2005

	Accidents	Fatal Accidents	Flight Hours	Accidents per Million Flight Hours	Fatal Accidents per Million Flight Hours
Airplane	48	8	2,648,915	18.1	3.0
Helicopter	17	3	1,125,800	15.1	2.7
Overall	65	11	3,814,671	17.0	2.9

Table 22: On-Demand Part 135 Accidents, Airplanes and Helicopters, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Airplane	80	72	66	59	63	54	43	47	46	48
Helicopter	11	10	11	15	17	18	17	26	20	17
% Helicopter	12%	12%	14%	20%	21%	25%	28%	36%	30%	26%

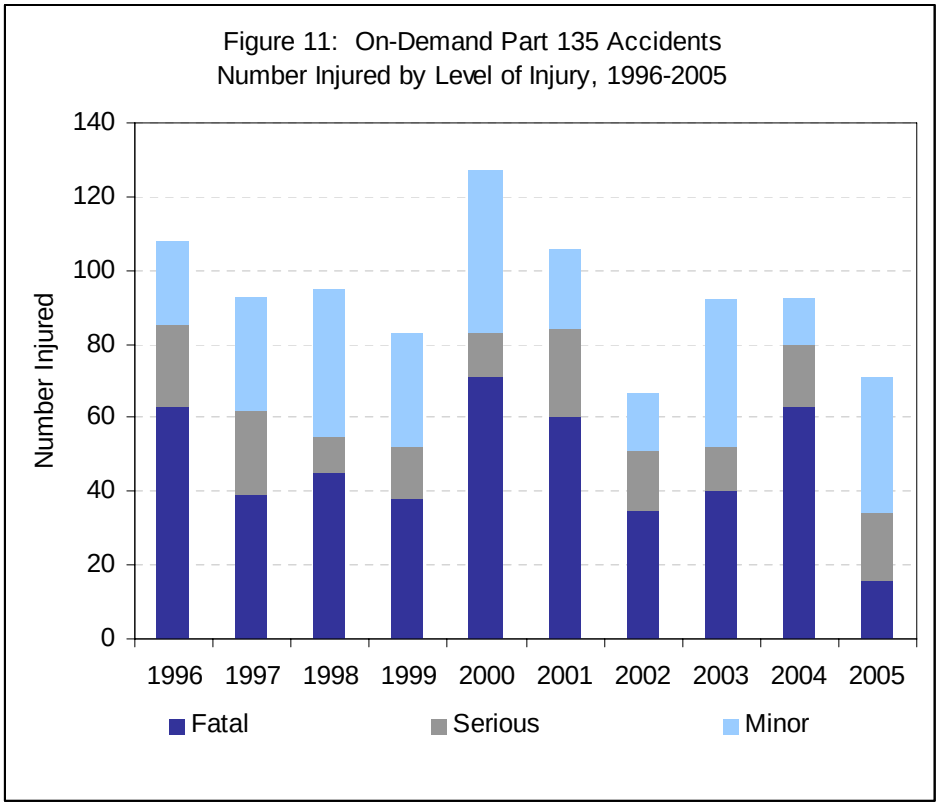
On-Demand Part 135 Accident Severity and Injuries

Data for 2005 demonstrate that the potential for injury in on-demand Part 135 accidents is much greater than in Part 121 accidents. About half of the Part 135 accidents in 2005 resulted in injuries and 17% of the accidents were fatal (table 18). Although less than 3% of the people on board Part 121 accident aircraft suffered any injury, 32% of the people on board on-demand Part 135 accident aircraft were injured (41% of the crew and 27% of the passengers), and 23% of the injuries were fatal (table 23). The smallest percentage of fatalities over the 10-year period occurred in 2005, while the largest percentage was in 2000, as shown in figure 11. Although a few accidents can substantially increase the number of injuries in 1 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.[13]

[13] 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 turboprop or jet airplanes, and 12 passengers in helicopters.

Table 23: On-Demand Part 135 Accident Injuries by Role for 2005

	Fatal	Serious	Minor	None	Total
Flight crew	8	9	12	42	71
Cabin crew	0	0	0	1	1
Other crew	0	2	1	3	6
Passengers	8	7	24	104	143
Total aboard	**16**	**18**	**37**	**150**	**221**
On ground	0	2	0	0	2
Other aircraft	2	0	0	0	2
Total	**18**	**20**	**37**	**150**	**225**
Accidents	11	8	12	34	65



As might be expected, the potential for fatal or serious injury increases with the level of aircraft damage. In 2005, all 11 fatal on-demand Part 135 accidents involved aircraft that were destroyed (table 24), and 7 of the serious-injury accidents were associated with aircraft that were either destroyed or substantially damaged (table 25). This pattern was consistent from 1996 through 2005: 84% of the fatal accidents were associated with aircraft that were destroyed and 89% of

the serious-injury accidents involved aircraft that were substantially damaged or destroyed. However, the survivability of on-demand Part 135 accidents can be quite good: all but one of the minor-injury accidents and 98%[14] of the no-injury accidents from 1996–2005 involved aircraft that were substantially damaged or destroyed.

Table 24: On-Demand Part 135 Fatal Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	28	14	15	11	19	15	13	11	20	7
Substantial	1	1	2	1	3	2	5	5	3	4
Minor								2		
None						1				

Table 25: On-Demand Part 135 Serious-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	7	3		2	2	1	2	2	2	3
Substantial	2	9	3	6	3	7	3	1	4	4
Minor				1						1
None	2	2		1		1				

Table 26: On-Demand Part 135 Minor-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	1	5	4		2	1		5	1	2
Substantial	9	9	12	11	12	6	5	12	4	10
Minor										
None	1									

Table 27: On-Demand Part 135 No-Injury Accidents for Each Level of Damage, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Destroyed	1	1				2	3		2	
Substantial	39	38	41	41	38	36	29	35	30	33
Minor		1		1	1		2			1
None							1			

[14] Six of the seven minor damage accidents shown in table 27 were the result of collisions with other aircraft that caused at least substantial damage or serious or fatal injuries.

In 2005, a person in an airplane was as likely to be injured in an accident as a person in a helicopter: 52% of the people in airplanes suffered some form of injury in an accident compared with 50% of the people in helicopters (table 28). Although more people were fatally injured in airplanes than in helicopters in 2005, fatalities represented the same proportion of the injuries in helicopters (23% in airplanes to 26% in helicopters).

Table 28: On-Demand Part 135 Accident Injuries by Type of Aircraft in 2005

	Airplane	Helicopter	Total
Fatal	11	7	18
Serious	11	9	20
Minor	26	11	37
Total Injuries	**48**	**27**	**75**
Total Onboard	**44**	**27**	**225**

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. Investigators also indicate the causes and factors associated with occurrences. The first occurrence associated with phase of flight describes the initiating event for an accident flight. Appendix C discusses occurrence data and how they are coded by Safety Board investigators.

Table 29: On-Demand Part 135 Airplanes, First Occurrences by Phase of Flight for 2005

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver	Standing or Taxiing or Other	Total
Loss of Engine Power	1	4	2			7
Loss of Control - On Ground/Water	1		3			4
Airframe, Component, System Failure	1	1	1			3
In-flight Collision with Object	2		1			3
Loss of Control - In-flight	2		1			3
On Ground Encounter with Terrain/Water			3			3
Overrun	2		1			3
On Ground Collision with Object			2		1	3
Fire		2				2
In-flight Collision with Terrain/Water	1		1			2
In-flight Encounter with Weather		2				2
Loss of Engine Power (Total) Mechanical	1	1				2
Miscellaneous/Other		1	1			2
Undershoot			2			2
Dragged Wing, Rotor, Pod, Float or Tail/Skid				1		1
Gear Collapsed			1			1
Hard Landing			1			1
Loss of Engine Power (Partial) Nonmechanical	1					1
Midair				1		1
Wheels Up Landing			1			1
Total	12	11	21	2	1	47

Table 29 shows first occurrence data by phase of flight for airplanes involved in on-demand Part 135 accidents. Approach or landing accounted for 45% of the airplane accidents and, as shown in table 30, 23% of fatal and serious airplane accidents that occurred in 2005. Cruise or descent accounted for 46% of the fatal accidents, a pattern 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. Instead, engine power loss and loss of control on ground or water were the most frequent initiating events in on-demand Part 135 airplane accidents in 2005.

Table 30: 2005 On-Demand Part 135 Airplane Accidents by Severity and Phase of Flight

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver	Taxiing Standing	Total
Fatal	1	4	2	1		8
Serious	2	2	1			5
Minor	4	2	5			11
None	5	3	14		1	23
Total	12	11	22	1	1	47

Table 31: On-Demand Part 135 Helicopters, First Occurrences by Phase of Flight for 2005

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver or Hover	Other	Total
In-flight Collision with Object	1		2			3
Airframe, Component, System Failure, Malfunction		1		1		2
In-Flight Collision with Terrain or Water			1	1		2
Loss of Engine Power (Total) - Nonmechanical	1		1			2
Hard Landing			1			1
In-flight Encounter with Weather				1		1
Loss of Control - In-flight				1		1
Loss of Engine Power (Partial) - Nonmechanical	1					1
Loss of Engine Power (Total) - Mechanical	1					1
Missing Aircraft					1	1
Roll Over	1					1
Total	5	1	5	4	1	16

The initiating events for on-demand 2005 Part 135 helicopter accidents were evenly distributed with the most frequent event involving in-flight collisions with object (table 31). Most accidents occurred during takeoff/climb and approach/landing. Only 3 of the 16 helicopter accidents were fatal, and 75% resulted in minor injuries or no injuries (table 32).

Table 32: 2005 On-Demand Part 135 Helicopter Accidents by Severity and Phase of Flight

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver Hover	Other	Total
Fatal				2	1	3
Serious	1					1
Minor	1					1
None	3	1	5	2		11
	5	1	5	4	1	16

Pilots of on-demand Part 135 accident aircraft were the most frequently cited cause or factor, (table 33), followed by the environment. Aircraft-related causes or factors were cited in fewer airplanes than helicopter accidents, with powerplants accounting for more causes or factors in helicopter accidents than in airplane accidents. Because multiple factors in an accident are coded only once at the level of personnel, aircraft, or environment, the sum of the individual percentages may be greater than the broad/cause factor percentage.

Table 33: On-Demand Part 135 Accidents, Top Causes/Factors in 2005

	Percent Airplane Accidents	Percent Helicopter Accidents
Personnel	87.2%	75.0%
Pilot	74.5%	68.8%
Others (aboard)		
Others (not aboard)	25.5%	12.5%
Aircraft	31.9%	43.8%
Powerplant/propulsion	12.8%	31.3%
Flight control systems	2.1%	
Aircraft structure	6.4%	6.3%
Landing gear	4.3%	
Systems and equipment	6.4%	6.3%
Environment	46.8%	37.5%
Weather condition	21.3%	12.5%
Terrain condition	23.4%	12.5%
Light condition	8.5%	6.3%
Object	10.6%	6.3%
Airport/airways facilities, aids	10.6%	

The pattern of causes and factors for on-demand Part 135 accidents in 2005 was consistent with years 2001 through 2004, as shown in tables 34 and 35, although the proportions varied considerably from year to year. Pilots were the most frequently cited cause/factor for on-demand Part 135 accidents, followed by the environment. For both airplanes and helicopters, weather and terrain led the environmental category. In 2005, the powerplant was the most frequently cited aircraft-related cause or factor for airplanes and helicopters. Note that airport facilities and navigation aids were rarely cited as a cause or factor in helicopter accidents. These patterns are consistent with Part 121 data; however, aircraft-related causes/factors were cited more frequently in on-demand Part 135 accidents than in Part 121 accidents (see figure 9).

Table 34: On-Demand Part 135 Airplane Accidents, Top Causes/Factors, 2001 - 2005

	2001	2002	2003	2004	2005
Personnel					
Pilot	84.3%	80.5%	80.4%	93.2%	74.5%
Others (aboard)					
Others (not aboard)	15.7%	24.4%	15.2%	11.4%	25.5%
Aircraft					
Powerplant/propulsion	11.8%	4.9%	6.5%	2.3%	12.8%
Flight control systems	2.0%		2.2%		2.1%
Aircraft structure	7.8%		4.3%	11.4%	6.4%
Landing gear	9.8%	7.3%	8.7%	6.8%	4.3%
Systems and equipment	2.0%	2.4%	4.3%	4.5%	6.4%
Environment					
Weather condition	39.2%	31.7%	28.3%	25.0%	21.3%
Terrain condition	19.6%	19.5%	28.3%	11.4%	23.4%
Light condition	15.7%	14.6%	15.2%	9.1%	8.5%
Object	11.8%	4.9%	6.5%	9.1%	10.6%
Airport/airways facilities, aids	3.9%	4.9%		2.3%	10.6%

Table 35: On-Demand Part 135 Helicopter Accidents, Top Causes/Factors, 2001 - 2005

	2001	2002	2003	2004	2005
Personnel					
Pilot	55.6%	100.0%	84.6%	90.0%	75.0%
Others (aboard)	5.6%		3.8%		68.8%
Others (not aboard)	16.7%	17.6%	7.7%	20.0%	12.5%
Aircraft					
Powerplant/propulsion	22.2%	11.8%	23.1%	5.0%	31.3%
Flight control systems	5.6%				
Aircraft structure	5.6%		3.8%	5.0%	6.3%
Landing gear	5.6%				
Systems and equipment	5.6%	11.8%	11.5%	10.0%	6.3%
Environment					
Weather condition	22.2%	23.5%	30.8%	40.0%	12.5%
Terrain condition	38.9%	23.5%	15.4%	15.0%	12.5%
Light condition	5.6%	17.6%	3.8%	30.0%	6.3%
Object		11.8%	7.7%	15.0%	6.3%
Airport/airways facilities, aids				5.0%	

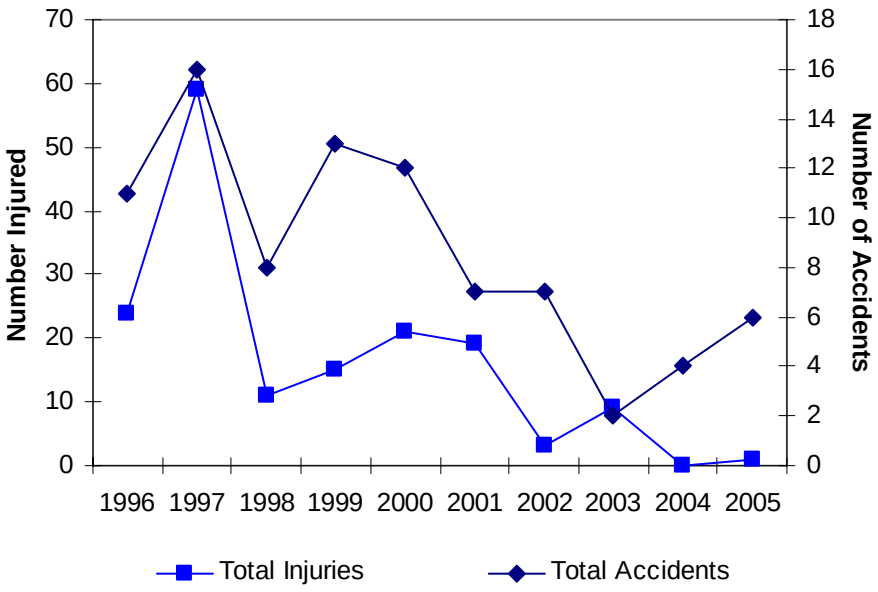
Scheduled Part 135 Accidents

Scheduled Part 135 operations represent a small segment of commercial air carrier operations, accounting for less than 1.5% of total air carrier flight hours in 2005. Six scheduled Part 135 accidents occurred in 2005, all in Alaska and none resulting in injuries.[15]

Because both the number of scheduled Part 135 accidents and the number of people involved in those accidents is small each year, accident and injury data vary considerably over the years (figure 12). This relatively small number each year makes stable patterns in the data difficult to discern, but it is clear that the number of scheduled Part 135 accidents and injuries declined overall from 1996 through 2005.

Three of the accidents occurred as a result of aircraft component failure, two involved landing gear, and one involved fuel lines. The remaining three accidents occurred while the aircraft was maneuvering on the ground. In one taxi accident, a wing hit the ground as a result of crosswinds. The remaining two accidents resulted when the aircraft landed on ice/snow-covered runways and veered off the runways. Pilots were causes or factors in three of the six accidents.

Figure 12: Scheduled Part 135 Accidents and Number People Injured, 1996 - 2005



[15] Over half of all scheduled Part 135 operators were certificated in Alaska in 2005, 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).

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APPENDIX A: 2005 Air Carrier Accident Data

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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 8, 2005	N16732	Passenger	Gunnison, CO	Continental Airlines	Boeing 737-724	Substantial	Minor	Damage	0	Miscellaneous/Other	Standing-Engine(s) Operating
Probable Cause: The snowplow driver's failure to see the airplane during plowing operations. Factors contributing to the accident were the snowplow driver's excessive speed and the snow.											
January 17, 2005	N373DL	Passenger	Covington, KY	Delta Airlines	Boeing 737-247	Substantial	None	Damage	0	On Ground/Water Collision with Object	Standing
Probable Cause: The catering truck driver's failure to maintain clearance of the parked airplane by his inadvertent depressing the accelerator. A factor in this accident was the catering truck driver's diverted attention.											
January 27, 2005	N201EH	Passenger	Toksook Bay, AK	ERA Aviation	de Havilland DHC-6-200	Substantial	None	Damage	0	Loss of Control - On Ground/Water	Landing - Roll
Probable Cause: The pilot's inadequate compensation for the gusty crosswind wind condition, which resulted in a loss of control during the landing roll, and the collapse of the nose landing gear. Factors associated with the accident were the crosswind and wind gusts.											
January 24, 2005	N808MC	Cargo	Dusseldorf, Germany	Atlas Air	Boeing B-747-200	Substantial		Damage	0		
Probable Cause:											
February 11, 2005	N394AE	Passenger	Los Angeles, CA	American Eagle Airlines	Saab-Scania 340B	None	Serious	Injury	0	In-flight Encounter with Weather	Descent - Normal
Probable Cause: The in-flight encounter with turbulence.											
March 2, 2005	N78008	Passenger and Cargo	Newark, NJ	Continental Airlines	Boeing 777-200	Substantial	None	Damage	0	Dragged wing, Rotor, Pod, Float or Tail/skid	Takeoff
Probable Cause: The captain's failure to follow company procedures, which resulted in a tail strike. Contributing were the gusty crosswind and tailwind conditions, and the manufacturer's failure to provide adequate performance planning data to account for gusty crosswinds during takeoff.											
March 6, 2005	N6710E	Passenger	Boston, MA	Delta Airlines	Boeing 757-232	None	Serious	Injury	0	Abrupt Maneuver	Taxi - To Takeoff
Probable Cause: The first officer's misjudgment of a perceived threat, which resulted in the captain's excessive braking and subsequent injury to a flight attendant. A factor was the night lighting conditions.											
March 11, 2005	N8932C	Passenger	Milwaukee, WI	Pinnacle Airlines	Bombardier CL-600-2B19	Substantial	None	Damage	0	Airframe/Component/System Failure/Malfunction	Climb - To Cruise
Probable Cause: The captain's failure to adequately compensate for the crosswind conditions, and his failure to maintain directional control during landing. Contributing factors include the captain's failure to land at the nearest suitable airport after an in-flight mechanical problem, the airport operation's failure to conduct runway friction tests and to issue NOTAMS in accordance with existing regulations, the crosswind, the snow-covered runway, the runway sign, and night conditions.											
March 11, 2005	N790AN	Passenger	Buenos Aires, Argentina	American Airlines	Boeing B777	Substantial	Minor	Damage	0		
Probable Cause:											

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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
March 20, 2005	N733KR	Passenger	Raleigh, NC	American Eagle Airlines	Embraer EMB-135LR	None	Serious	Injury	0	Airframe/Component/System Failure/Malfunction	Takeoff - Initial Climb
Probable Cause: An oily smell in the airplane shortly after takeoff for undetermined reasons that resulted in a return to the airport and a passenger injury during the emergency evacuation.											
April 29, 2005	N727SW	Passenger	Little Rock, AR	Southwest Airlines Company	Boeing 737-700	None	Serious	Injury	0	In-flight Encounter with Weather	Cruise - Normal
Probable Cause: An encounter with moderate turbulence during cruise flight.											
May 10, 2005	N368NB	Passenger	Minneapolis, MN	Northwest Airlines	Airbus Industrie A-319-114	Substantial	Serious	Serious	0	Collision Between Aircraft (Other Than Midair)	Taxi - Pushback/tow
Probable Cause: The Captain of the other aircraft's decision to shutdown the left engine during taxi with no hydraulic pressure on the right side hydraulic system to effectively operate the brakes, steering, or thrust reversers. A factor was the fatigue fracture of the rudder shutoff valve which resulted in the loss of right side hydraulic pressure of the other aircraft.											
May 10, 2005	N763NC	Passenger	Minneapolis, MN	Northwest Airlines	McDonnell Douglas DC-9-51	Substantial	Serious	Serious	0	Airframe/Component/System Failure/Malfunction	Climb - To Cruise
Probable Cause: The Captain's decision to shutdown the left engine during taxi with no hydraulic pressure on the right side hydraulic system to effectively operate the brakes, steering, or thrust reversers. A factor was the fatigue fracture of the rudder shutoff valve which resulted in the loss of right side hydraulic pressure.											
May 13, 2005	N949DL	Passenger	Denver, CO	On FIle, doing business as	McDonnell Douglas MD-88	Substantial	None	Damage	0	Airframe/Component/System Failure/Malfunction	Takeoff - Initial Climb
Probable Cause: The failure of the nose gear actuator resulted in penetration of the forward pressure bulkhead and a loss of pressurization.											
May 31, 2005	N417AW	Passenger	Chicago O'Hare, IL	Air Wisconsin Airlines, DBA United Express	Bombardier, Inc. CL-600-2B19	Minor	Serious	Injury	0	Decompression	Standing - Preflight
Probable Cause: The opening of the service door when the airplane was pressurized. Contributing to the accident was the captain's failure to ensure that one of the airplane doors was open while a ground-cooling cart was connected, which resulted in pressurizing the airplane on the ground.											
June 5, 2005	N602AN	Passenger	New Chicago, IN	American Airlines	Boeing 757-223	None	Serious	Injury	0	In-flight Encounter with Weather	Descent - Normal
Probable Cause: The inadvertent encounter with convectively induced turbulence (CIT) while the aircraft was descending into the terminal area.											

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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
June 7, 2005	N803MD	Passenger	Washington, DC	USAirways, DBA US Airways Express	Embraer 170	Minor	Fatal	Serious	1	Miscellaneous/Other	Standing - Engine(s) Not Operating
Probable Cause: The inexperience of the driver (fleet service agent) in the operation of a belt loader, which resulted in the belt loader being driven under, and colliding with, the airplane.											
June 7, 2005	N250UP	Cargo	Louisville, KY	United Parcel Service	McDonnell Douglas MD-11F	Substantial	None	Damage	0	Hard Landing	Landing
Probable Cause: The flying pilot's improper aircraft handling after main landing gear touchdown, which resulted in the collapse of the nose landing gear assembly. Conributing to the accident was the pilot-in-command's inadequate supervision during the landing.											
June 10, 2005	N302NB	Passenger	Scottsbluff, NE	Northwest Airlines	Airbus Industrie A-319-114	Minor	Serious	Injury	0	In-flight Encounter with Weather	Cruise
Probable Cause: The inflight encounter with moderate turbulence.											
June 12, 2005	N960SW	Passenger	Los Angeles, CA	Skywest Airlines	Bombardier Aerospace, Inc. CL-600-2B19	Substantial	None	Damage	0	Airframe/Component/System Failure/Malfunction	Approach
Probable Cause: Failure of the nose landing gear to extend to the down and locked position for undetermined reasons.											
June 15, 2005	N42NC	Cargo	Anchorage, AK	Northern Air Cargo	Aerospatiale ATR-42-300	Substantial	None	Damage	0	In-flight Encounter with Weather	Descent - Normal
Probable Cause: A lightning strike during a normal descent for landing, which resulted in structural damage to the airplane's left aileron.											
June 27, 2005	N357KP	Cargo	San Diego, CA	Capital Cargo International	Boeing 727-230	Substantial	None	Damage	0	On Ground/Water Collision with Object	Standing - Engine(s) Operating
Probable Cause: The inadvertent throttle movement by one of the flight crew and the captain's inadequate supervision during the engine start sequence.											
July 8, 2005	N494WN	Passenger	Chicago, IL	Southwest Airlines	Boeing 737-7H4	Minor	None	Damage	0	On Ground/Water Collision with Object	Taxi - Pushback/tow
Probable Cause: The pushback tow driver not maintaining visual lookout for the wing walker's visual signal, and the driver not maintaining clearance from the vehicle during the pushback for taxi. Factors to the accident were the standing vehicle behind the airplane, the inadequate group/crew coordination for the pushback, and the lack of guidance in the company's manuals to stop the tow when visual lookout is not maintained.											
July 11, 2005	N113DA	Passenger	Raleigh-Durham, NC	Delta Airlines	Boeing 767-232	None	Serious	Injury	0	In-flight Encounter with Weather	Cruise
Probable Cause: An inadvertent in-flight encounter with clear air turbulence.											

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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
August 8, 2005	N10575	Passenger	Newark, NJ	Continental Express	Embraer EMB-145LR	Substantial	None	Damage	0	Collision Between Aircraft (Other Than Midair)	Taxi - To Takeoff
Probable Cause: The airport's failure to install markings on a parking "block" that bordered the taxiway, which failed to provide adequate clearance between taxiing airplanes and airplanes parked in the block. Factors in the accident were air traffic control's use of the unmarked parking "block," and the flight crew's misjudgement of the clearance between their airplane and the parked airplanes in the block, during taxi.											
August 8, 2005	N73270	Passenger	Newark, NJ	Continental Airlines	Boeing 737-824	Substantial	None	Damage	0	Collision Between Aircraft (Other Than Midair)	Taxi - To Takeoff
Probable Cause: The airport's failure to install markings on a parking "block" that bordered the taxiway, which failed to provide adequate clearance between taxiing airplanes and airplanes parked in the block. Factors in the accident were air traffic control's use of the unmarked parking "block," and the flight crew's misjudgement of the clearance between their airplane and the parked airplanes in the block, during taxi.											
August 19, 2005	N627US	Passenger	Agana, Guam	Northwest Airlines	Boeing 747-200	Substantial	Minor	Damage	0	Wheels up landing	Landing
Probable Cause: The flight crews' failure to verify that the number of landing gear annunciations on the second officer's panel was consistent with the number specified in the abnormal/emergency procedures checklist, which led to a landing with the nose gear retracted.											
August 20, 2005	N557TZ	Passenger	Chicago, IL	American Trans Air	Boeing 757-33N	Substantial	None	Damage	0	On Ground/Water Collision with Object	Taxi - To Takeoff
Probable Cause: The flightcrew's failure to maintain clearance from a fence while taxiing.											
August 29, 2005	N363PH	Passenger	Portland, OR	Horizon Air	Bombardier, Inc. DHC-8-202	Substantial	None	Damage	0	Collision Between Aircraft (Other Than Midair)	Standing - Engine(s) Operating
Probable Cause: The failure of the flightcrew of the other airplane to maintain clearance while taxiing.											
August 29, 2005	N855NW	Passenger	Portland, OR	Northwest Airlines	Airbus Industrie A330-223	Minor	None	Damage	0	Collision Between Aircraft (Other Than Midair)	Taxi - To Takeoff
Probable Cause: The failure of the flight crew to maintain adequate clearance while taxiing.											
September 18, 2005	N583NK	Passenger	Fort Lauderdale, FL	Spirit Airlines	Airbus A321-231	Substantial	None	Damage	0	Dragged wing, Rotor, Pod, Float or Tail/skid	Landing - Flare/Touchdown
Probable Cause: Following a bounced landing, the pilot in command activated his sidestick controller while the first officer was in control of the airplane, which subsequently resulted in the overcontrol of pitch and a tailstrike. Contributing to the circumstances of this accident were the pilot-in-command's failure to properly activate his sidestick takeover push button prior to his remedial action, and the operator's insufficient emphasis on bounced landing recovery techniques and tailstrike avoidance procedures.											

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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
October 3, 2005	N650RW	Passenger	Dulles, VA	Shuttle America, DBA United Express	Embraer 170	None	Serious	Injury	0	Abrupt Maneuver	Approach - VFR Pattern - Downwind
Probable Cause: The flight crew's excessive maneuver in response to a traffic alert during the landing approach.											
October 12, 2005	N624SW	Passenger	Phoenix, AZ	Southwest Airlines	Boeing 737-3H4	Substantial	None	Damage	0	On Ground/Water Collision with Object	Standing - Engine(s) Operating
Probable Cause: The failure of the other flight crew to maintain an adequate clearance from obstructions while taxiing.											
October 12, 2005	N755SA	Passenger	Phoenix, AZ	Southwest Airlines	Boeing 737-7H4	Minor	None	Damage	0	On Ground/Water Collision with Object	Taxi - From Landing
Probable Cause: Failure of the flight crew to maintain an adequate clearance from a stationary Boeing 737.											
October 16, 2005	N144ZV	Passenger	Ogdensburg, NY	Air Midwest, DBA US Airways Express	Beech 1900D	Substantial	None	Damage	0	On Ground/Water Collision with Object	Takeoff - Roll/run
Probable Cause: A collision with a coyote during the takeoff roll, which resulted in a nosegear collapse and subsequent impact with the runway. A factor was the nighttime condition.											
October 22, 2005	N378DA	Passenger	Atlantic Ocean, AO	Delta Airlines	Boeing 737-832	None	Serious	Injury	0	In-flight Encounter with Weather	Cruise - Normal
Probable Cause: An encounter with turbulence during cruise flight.											
October 26, 2005	N391CA	Passenger	Covington, KY	Comair Airlines	Bombardier, Inc. CL-600-2C10	None	Serious	Injury	0	Miscellaneous/Other	Standing - Engine(s) Not Operating
Probable Cause: The passenger falling while exiting the aircraft using the door-stair during normal deplaning.											
November 6, 2005	N781AN	Passenger	Heathrow IAP, England	American Airlines Commercial Flight Operations	Boeing B-777	Substantial	None	Damage	0		
Probable Cause:											

APPENDIX A: 2005 Air Carrier Accident Data
Part 121 Operations

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
November 19, 2005	N734MA	Passenger	State College, PA	Miami Air International	Boeing 737-800	Substantial	None	Damage	0	Miscellaneous/Other	Approach
Probable Cause: The pilot's improper touchdown and recovery from a bounced landing. Factors to the accident were the operator's failure to provide sufficient information on the use of autothrottles and bounced landing recovery techniques, along with the Federal Aviation Administration's failure to require the inclusion of mixed-mode flight control guidance and bounced landing recovery techniques in operator pilot training programs and flight manuals.											
November 28, 2005	N359FE	Cargo	Chicago, IL	Federal Express	McDonnell Douglas MD-10	Substantial	None	Damage	0	On Ground/Water Collision with Object	Taxi - To Takeoff
Probable Cause: The failure of the flight crew to see and avoid the crew stairs and the failure of unknown persons to properly secure the stairs after use. Factors associated with the accident were the dark light conditions and the gusty winds.											
December 8, 2005	N471WN	Passenger	Chicago, IL	Southwest Airlines	Boeing 737-700	Substantial	Fatal	Major	1	Overrun	Landing -roll
Probable Cause: Contributing to the accident were Southwest Airline's 1) failure to provide its pilots with clear and consistent guidance and training regarding company policies and procedures related to arrival landing distance calculations; 2) programming and design of its onboard performance computer, which did not present inherent assumptions in the program critical to pilot decision making; 3) plan to implement new autobrake procedures without a familiarization period; and 4) failure to include a margin of safety in the arrival assessment to account for operational uncertainties. Also contributing to the accident was the pilots' failure to divert to another airport given reports that included poor braking action and a tailwind component greater than 5 knots. Contributing to the severity of the accident was the absence of an engineering materials arresting system, which was needed because of the limited runway safety area beyond the departure end of runway 31C.											
December 14, 2005	N213FE	Cargo	Memphis, TN	Federal Express	Boeing 727-2S2F	Substantial	Serious	Serious	0	On Ground/Water Collision with Object	Taxi - Pushback/tow
Probable Cause: The improper towing of the airplane by the tug operator which resulted in the shearing of the towbar shear pin and subsequent collision of the airplane and tug.											
December 19, 2005	N2969	Passenger	Miami, FL	Flying Boat, DBA Chalks Ocean Airways	Grumman G-73T	Destroyed	Fatal	Major	20	Airframe/Component/System Failure/Malfunction	Climb - To Cruise
Probable Cause: The in-flight failure and separation of the right wing during normal flight, which resulted from (1) the failure of the Chalk's Ocean Airways maintenance program to identify and properly repair fatigue cracks in the right wing and (2) the failure of the Federal Aviation Administration to detect and correct deficiencies in the company's maintenance program.											
December 26, 2005	N979AS	Passenger	Seattle, WA	Alaska Airlines	McDonnell Douglas MD-83	Substantial	None	Damage	0	Decompression	Climb - To Cruise
Probable Cause: The ground personnel baggage handler failed to maintain clearance from the aircraft with cargo handling equipment during ground operations and inadvertently damaged the airplane's pressure bulkhead which subsequently decompressed during climb to cruise.											

APPENDIX A: 2005 Air Carrier Accident Data
Scheduled Part 135 Operations

Date	Registration Number	Type of Operation	Location	Operator of Aircraft	Aircraft Type	Damage to Aircraft	Highest Injury	Total Fatalities	First Occurrence	Phase of Flight
February 15, 2005	N36CF	Passenger and Cargo	Kipnuk, AK	Flight Alaska Inc., DBA Yute Air Alaska	Cessna 207	Substantial	Minor	0	Loss of Control - Ground/Water	Landing - Roll
Probable Cause: The pilot's failure to maintain directional control of the airplane during the landing roll, which resulted in a departure from the runway and collision with a snow bank. A factor contributing to the accident was snow-covered terrain.										
April 6, 2005	N29884	Passenger	Klawock, AK	L A B Flying Service	Britten-Norman BN-2A Islander	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Landing - Roll
Probable Cause: The fracture of the aluminum alloy landing gear bracket assembly, which resulted in a loss of control during the landing roll.										
May 9, 2005	N3535F	Passenger	Elim, AK	Cape Smythe Air Service Inc.	Piper PA-31-350	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Cruise
Probable Cause: An improper installation of a fuel line fitting by company maintenance personnel, which resulted in a fuel leak and subsequent in-flight engine compartment fire during cruise flight that was discovered during the landing roll.										
September 2, 2005	N9964M	Passenger	Kotzebue, AK	Bering Air Inc.	Cessna 207	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Landing - Roll
Probable Cause: The failure of the nose gear steering mechanism during the landing roll, which resulted in a loss of control and subsequent encounter with the runway.										
December 13, 2005	N454SF	Passenger	Newtok, AK	Grant Aviation Inc.	Cessna 208B	Substantial	None	0	Loss of Control - Ground/Water	Takeoff - Roll/Run
Probable Cause: The pilot's inadequate compensation for gusting crosswind conditions, which resulted in the airplane exiting the runway, encountering snow, and the nose gear collapsing. Factors associated with the accident were the gusting wind and the icy runway.										
December 19, 2005	N303GV	Passenger	Brevig Mission, AK	Hageland Aviation Services, Inc.	Cessna 208	Substantial	None	0	Loss of Control - Ground/Water	Taxi - From Landing
Probable Cause: The pilot's inadequate compensation for crosswind conditions, which resulted in the left wing striking the ground while taxiing. A factor in the accident was a crosswind.										

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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 5, 2005	N364BW	Cargo	Polkton, NC	Package Express	Airplane	Piper PA-32-300	Substantial	None	0	Loss of Engine Power (Total) - Mech Fairlure/Malf	Cruise
Probable Cause: A loss of engine power due to the failure of the engine-driven fuel pump, which resulted in fuel starvation.											
January 13, 2005	N49BA	Cargo	Swanzey, NH	Business Air Inc. DBA Airnow Inc.	Airplane	Embraer EMB-110-P1	Destroyed	Fatal	1	Loss of Engine Power	Cruise
Probable Cause: The pilot's improper decision to attempt a single-engine missed approach with the airplane in a slow airspeed, full flap configuration, which resulted in a minimum control speed (Vmc) roll. Contributing factors included an inoperative engine for undetermined reasons, the pilot's in-flight decision to divert to an airport with low ceilings and visibility while better conditions existed elsewhere, the pilot's failure to advise or seek assistance from air traffic control or his company, and the low cloud ceilings, fog, and night lighting conditions.											
January 14, 2005	N8313Q	Passenger	Prevost, WA	West Isle Air, DBA San Juan Airlines	Airplane	Cessna U206F	Substantial	None	0	On Ground/Water Encounter with Terrain/Water	Landing/Roll
Probable Cause: The pilot not identifying unsafe landing conditions, and his subsequent intentional swerve during the landing roll resulting in impacting a ditch. Contributing factors were the ice/frost on the grass/dirt one-way runway (1,560 feet in length), the unexpected tail wind gust, and the ditch he encountered after he swerved to avoid going past the end of the runway into trees.											
January 21, 2005	N142MK	Passenger	Pahoa, HI	K & S Helicopters, Inc., DBA Paradise Helicopters	Helicopter	MDHI 369E	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Cruise
Probable Cause: The in-flight separation of the tail rotor blade abrasion strip due to a degraded adhesive bond and fatigue fracture of the metallic abrasion strip. The ultimate cause for the degraded bond is unknown.											
February 2, 2005	N370V	Passenger	Teterboro, NJ	Platinum Jet Management	Airplane	Bombardier CL-600-1A11	Substantial	Serious	0	Overrun	Takeoff - Aborted
Probable Cause: The pilots' failure to ensure the airplane was loaded within weight and balance limits and their attempt to takeoff with the center of gravity well forward of the forward takeoff limit, which prevented the airplane from rotating at the intended rotation speed.											
February 3, 2005	N9118F	Passenger	Provo, UT	W. Enterprises, Inc.,	Helicopter	Hughes 369HS	Substantial	None	0	In-flight Collision with Terrain/Water	Landing - Flare/Touch-down
Probable Cause: The pilot's improper in-flight planning and decision making, his failure to maintain terrain clearance, and the total failure of the tail rotor drive shaft as a result of the tail rotor strike.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
February 8, 2005	N364BW	Cargo	Concord, NC	Race City Aviation, DBA Package Express	Airplane	Piper PA-32-300	Substantial	Minor	0	Loss of Engine Power	Approach - VFR Pattern - Final Approach
Probable Cause: The loss of engine power due to the failure of the fuel pump which resulted in fuel starvation.											
February 10, 2005	N432AR	Passenger	Lebec, CA	Action Air Express, Inc.	Airplane	Cessna P210N	Destroyed	Fatal	2	In-flight Encounter with Weather	Cruise - Normal
Probable Cause: The pilot's in-flight loss of control due to the flight's encounter with unforecasted localized mountain wave activity with severe to potentially extreme turbulence, downdrafts, and rotors.											
February 18, 2005	N512RA	Passenger	Cameron, LA	Rotorcraft Leasing Company, LLC.	Helicopter	Bell 206L-3	Minor	None	0	Loss of Engine Power (Total) - Nonmechanical	Takeoff
Probable Cause: Fuel starvation due to a blocked and collapsed fuel nozzle screen, resulting from a contaminated fuel source/facility. Factors were the inadequate maintenance/inspection of fuel sources, and the lack of suitable terrain (high sea state) for the forced landing at sea.											
February 21, 2005	N5734M	Passenger	Gentry, AR	Air Evac Lifeteam	Helicopter	Bell 206-L1	Substantial	Fatal	1	Loss of Control - In-flight	Hover - Out of Ground Effect
Probable Cause: The pilot's improper decision to maneuver in an environment conducive to a loss of tail rotor effectiveness, and his failure to properly execute an autorotation, which resulted in a hard landing. A contributing factor was the prevailing crosswind.											
February 21, 2005	N905BK	Passenger	Lihue, HI	Ohana Aviation Inc., DBA Ohana Helicopter Tours	Helicopter	Aerospatiale AS350BA	Substantial	None	0	In-flight Collision with Terrain/Water	Hover - In Ground Effect
Probable Cause: The pilot's failure to maintain adequate terrain clearance, which resulted in the in-flight collision with terrain.											
February 28, 2005	N6465V	Cargo	Fairbanks, AK	Wright Air Service	Airplane	Helio H-295	Substantial	None	0	Undershoot	Approach - VFR Pattern - Final Approach
Probable Cause: The pilot's delay in performing a go-around, and his failure to maintain obstacle clearance.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
February 28, 2005	N97VB	Passenger	San Juan , PR	Clair Aero	Airplane	Aero Commander 500-S	Destroyed	Serious	0	Loss of Engine Power (Partial) - Nonmechanical	Takeoff - Initial Climb
Probable Cause: The fuel truck operator's improper refueling of a gasoline engine powered airplane with jet (turbine) fuel, and the pilot's inadequate preflight, which resulted in a loss of power in both engines and subsequent collision with trees. Factors associated with the accident were the unclear communications between the Spanish-speaking fuel truck operator and the English-speaking pilot, and the fuel truck operator's lack of familiarity with the accident airplane's fueling requirements. An additional factor was the absence of the required placards adjacent to the fuel filler caps indicating that only gasoline (av-gas) should be used.											
March 7, 2005	N3307S	Passenger	Talkeetna, AK	Fly Denali	Airplane	de Havilland DHC-2	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Cruise - Normal
Probable Cause: Aerodynamic flutter of the ailerons during normal cruise flight due to their improper maintenance/balancing, which resulted in structural damage to the airplane's wings.											
March 11, 2005	N333WF	Passenger	Blythe, CA	Jaax Flying Service, Inc.	Airplane	Mitsubishi MU-2B-26A	Substantial	None	0	Wheels Up Landing	Landing
Probable Cause: The pilot's failure to lower the landing gear prior to landing. A factor to the accident was the pilot's diverted attention due to the flap system anomaly.											
March 18, 2005	N231SK	Cargo	Panama City, FL	Jim Hankins Air Service Inc.	Airplane	Beech C-45H	Substantial	None	0	Gear Collapsed	Landing - Roll
Probable Cause: The overload failure of the left main landing gear for undetermined reasons during the landing roll resullting in collapse of the left main landing gear.											
April 20, 2005	N2AK	Passenger	Kalispell, MT	Felts Field Aviation Inc.	Airplane	Cessna T210N	Destroyed	Minor	0	Airframe/Component/System Failure/Malfunction	Approach - VFR Pattern - Base Turn
Probable Cause: An airborne fire which was fueled by leaking hydraulic fluid (the ignition source for the fire was undetermined) from the landing gear hydraulic system located under the cockpit instrument panel due to inadequate maintenance from other maintenance personnel. Contributing factors were the hydraulic fluid and the pilot's hard landing due the airplane's control not being possible subsequent to the loss of external visibility caused by smoke in the cockpit.											
April 20, 2005	N2285B	Passenger	Coral Springs, FL	Heliworks, Inc.	Helicopter	Bell 206B	Substantial	Serious	0	Roll Over	Takeoff
Probable Cause: The pilot encountered dynamic rollover while lifting off from an area in the everglades with 6-7 foot tall sawgrass nearby.											
May 23, 2005	N1087A	Cargo	Delta Junction, AK	WRAM	Airplane	Piper PA-18	Substantial	None	0	Overrun	Landing - Roll
Probable Cause: The pilot's selection of unsuitable terrain for landing, which resulted in an overrun. A factor contributing to the accident was rough and uneven terrain.											
May 31, 2005	N333TG	Cargo	Fort Myers, FL	Ram Air Freight	Airplane	Piper PA-32R-300	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Takeoff - Initial Climb
Probable Cause: Inadequate maintenance and repair of the engine top cowling by company maintenance personnel, resulting in failure and separation of the cowling in flight.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
June 8, 2005	N2761X	Passenger	Moulton Cove, LA	Omni Energy Services	Helicopter	Bell 206L-1	Substantial	None	0	Loss of Engine Power (Partial) - Nonmechanical	Takeoff - Initial Climb
Probable Cause: The loss of engine power due to foreign object ingestion into the compressor. A contributing factor was the lack of suitable terrain (swampy) for the forced landing.											
June 9, 2005	N81659	Cargo	Telluride, CO	American Aviation Inc.	Airplane	Piper PA-34-200T	Destroyed	Fatal	1	In-flight Collision with Terrain/Water	Climb - To Cruise
Probable Cause: The pilot's failure to maintain clearance from terrain. Contributing to the accident were the high, rising terrain and fatigue.											
June 12, 2005	N51205	Cargo	Skwentna, AK	Alaska Airborne Adventures	Airplane	Cessna U206F	Substantial	Serious	0	Fire	Cruise
Probable Cause: The pilot's improper loading of externally carried lumber that caught fire due to exposure to hot exhaust gases during cruise flight, which resulted in an emergency descent/landing and subsequent collision with a gravel bar. A factor contributing to the accident was the operator's lack of FAA approval for the external lumber rack that was installed under the belly of the airplane.											
June 20, 2005	N7KF	Cargo	Houston, TX	Amigo Aviation	Airplane	Cessna 401A	Substantial	Minor	0	Loss of Engine Power	Approach - VFR Pattern - Final Approach
Probable Cause: The loss of engine power to both engines due to fuel starvation as a result of the pilot's improper fuel management. A contributing factor was the lack of suitable terrain for the forced landing.											
June 30, 2005	N21835	Cargo	Kansas City, MO	Safewing Aviation Company, Inc.	Airplane	Piper PA-32RT-300	Destroyed	Minor	0	In-flight Collision with Object	Takeoff
Probable Cause: The pilot not maintaining climb airspeed leading to the airplane's impact with the fence and terrain during takeoff. Factors in the accident were the pilot's inaccurate preflight planning calculations, the fence, and the levee.											
July 3, 2005	N39AK	Passenger	Excursion Inlet, AK	Wings of Alaska	Airplane	Cessna 207A	Substantial	None	0	On Ground/Water Collision with Object	Taxi - From Landing
Probable Cause: The pilot's failure to maintain clearance from a building during taxi from landing, which resulted in structural damage to the left wing when it struck the building.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
July 8, 2005	N9428G	Cargo	Stuart Island, WA	Aeronautical Services	Airplane	Cessna 206E	Substantial	None	0	On Ground/Water Encounter with Terrain/Water	Landing - Roll
Probable Cause: The pilot's excessive airspeed on final for the current runway surface conditions, and the intentional obstruction avoidance maneuver he executed when it became clear the aircraft was about to go off the end of the runway. Factors include the pilot's improper decision to land on a surface that he had not first inspected from the air, clouds and rain in the area, and a wet, muddy landing surface.											
July 8, 2005	C-GLHQ	Passenger	Ambler , AK	Prism Helicopters, Inc.	Helicopter	Hughes 500D	Substantial	None	0	In-flight Collision with Object	Landing
Probable Cause: The pilot's failure to maintain clearance from an object while landing, which resulted in the main rotor blades striking a tree.											
July 9, 2005	N73788	Passenger	Akiachak, AK	Inland Aviation	Airplane	Cessna 172	Substantial	None	0	On Ground/Water Encounter with Terrain/Water	Landing - Aborted
Probable Cause: The pilot's delay in aborting the landing, which resulted in the airplane running off the end of the runway and nosing over. A factor associated with the accident was the rough/uneven terrain off the end of the runway.											
July 11, 2005	N430CV	Passenger	Gulf of Mexico,	Chevron USA, Inc.	Helicopter	Bell 430	Substantial	None	0	In-flight Collision with Object	Landing
Probable Cause: The helicopter's tail rotor blade's contact with an unknown object during landing.											
July 14, 2005	N365S	Passenger	Valparaiso, IN	CJ Systems Aviation Group	Helicopter	Aerospatiale AS365N	Substantial	None	0	Airframe/Component/System Failure/Malfunction	Hover - In Ground Effect
Probable Cause: The loose tail rotor drive shaft coupling due to its improper installation by the operator's maintenance personnel, which resulted in the failure of the tail rotor drive shaft. An additional cause was the inability of the pilot to maintain control of the hover following the drive shaft failure.											
July 14, 2005	N8152Z	Passenger	Karluk, AK	Island Air	Airplane	Piper PA-32-301	Substantial	None	0	On Ground/Water Collision with Object	Landing - Roll
Probable Cause: A collision with a deer on the runway during the landing roll, which resulted in substantial damage to the tail of the airplane.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
July 15, 2005	N620JM	Passenger	Eagle, CO	Aspen Base Operation, Inc.,DBA Aspen Aviation	Airplane	Gates Learjet 35A	Substantial	Serious	0	Hard Landing	Landing
Probable Cause: The pilot's improper flare resulting in the hard landing and the fractured nose gear attachment, and the subsequent loss of control. Factors contributing to the accident were the high airspeed on approach, the pilot's improper in-flight planning/decision, and the pilot's inability to maintain directional control after the gear failure.											
July 22, 2005	N717BT	Cargo	Globe , AZ	Baltimore Air Transport, DBA CorpJet	Airplane	Cessna 208B	Substantial	Minor	0	Loss of Engine Power (Total) - Mech Failure/Malf	Takeoff - Initial Climb
Probable Cause: The fatigue failure of the compressor turbine stator vane, the liberation of vane material into the compressor turbine, and the total loss of engine power. Also causal was the operator's failure to inspect the compressor turbine vane during fuel nozzle checks.											
July 24, 2005	N332DG	Passenger	Talkeetna, AK	Doug Geeting Aviation Inc.	Airplane	Cessna 185	Substantial	None	0	Loss of Control - On Ground/Water	Landing - Roll
Probable Cause: The pilot's failure to compensate for wind conditions and his failure to maintain directional control of the airplane during the landing roll, which resulted in an excursion off the side of the runway and a nose over.											
July 25, 2005	N57958	Passenger	Juneau, AK	Temsco Helicopters Inc.	Helicopter	Aerospatiale AS-350BA	Substantial	None	0	Loss of Engine Power (Total) - Mech Failure/Malf	Takeoff - Initial Climb
Probable Cause: A loss of engine power during takeoff initial climb due to the separation of the engine power turbine shaft, the failure of which was due to a disconnected adjacent leaf spring, which resulted in an emergency landing after takeoff and subsequent hard landing.											
July 28, 2005	N6868B	Passenger	Ketchikan, AK	Promech Inc., DBA Promech Air	Airplane	de Havilland DHC-3	Minor	Serious	0	Fire	Cruise
Probable Cause: An electrical arc on the exterior of a fuel pressure line that initiated a fuel leak and fire during cruise flight, which resulted in serious injuries to the pilot as he performed an emergency landing on the water. A factor contributing to the accident was an inadequate annual inspection of the airplane by company maintenance personnel.											
August 4, 2005	N454MA	Cargo	Parker, CO	Flight Line, Inc.	Airplane	Mitsubishi MU-2B-60	Destroyed	Fatal	1	In-flight Collision with Terrain/Water	Approach - FAF/Outer Marker to Threshold (IFR)
Probable Cause: The pilot's failure to fly a stabilized instrument approach at night which resulted in controlled flight into terrain. Contributing factors were; the dark night, low clouds, the inadequate design and function of the airport facility's Minimum Safe Altitude Warning System (MSAW), and the FAA's inadequate procedure for updating information to ATC controllers.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
August 4, 2005	N741DB	Passenger	Renton, WA	Sound Flight Inc.	Airplane	de Havilland Beaver DHC-2	Substantial	Fatal	2	Midair Collision	Maneuvering
Probable Cause: The failure of the DHC-2 Beaver pilot to understand air traffic advisory information and the failure of the Cessna pilot to maintain visual separation, resulting in a midair collision. A factor contributing to the accident was the inadequate traffic advisory information provided by air traffic controllers.											
August 13, 2005	N318JL	Passenger	Fort Lauderdale, FL	Twin Town Leasing Co. Inc., DBA Twin Air Calypso	Airplane	Piper PA-31-350	Substantial	Minor	0	Loss of Engine Power	Cruise - Normal
Probable Cause: The reported loss of engine power from the left engine, and the failure of the left propeller to feather for undetermined reasons, resulting in the inability to maintain altitude, and subsequent ditching.											
August 21, 2005	N9138M	Passenger	Skwentna, AK	Alaska Air Taxi LLC	Airplane	Cessna U206E	Substantial	Minor	0	Undershoot	Approach - VFR Pattern - Final Approach
Probable Cause: The pilot's misjudged distance/altitude on final approach, which resulted in a noseover following an undershoot and in-flight collision with rough/uneven terrain. A factor associated with the accident was the rough/uneven terrain.											
August 29, 2005	N4714F	Passenger	Tyonek, AK	Great Northern Air LLC	Airplane	Cessna 172	Substantial	None	0	Loss of Control - In-flight	Takeoff - Initial Climb
Probable Cause: The pilot's inadequate compensation for wind conditions during takeoff-initial climb, which resulted in a loss of control, and subsequent in-flight collision with a creek. A factor associated with the accident is a sudden windshift.											
September 1, 2005	N821AA	Cargo	Lorain, OH	USA Jet Airlines Inc.	Airplane	Dassault/Sud Falcon 20D	Substantial	Minor	0	In-flight Collision with Object	Takeoff
Probable Cause: The ingestion of multiple birds in each engine at takeoff, which resulted in a complete loss of engine power.											
September 6, 2005	N90421	Passenger	Gulf of Mexico, TX	Houston Helicopters, Inc.	Helicopter	Sikorsky S-76A	Destroyed	Serious	0		
Probable Cause:											
September 10, 2005	N349MC	Passenger	New Braunfels, TX	Harter Aviation LLC	Airplane	Israel Aircraft Industries 1124	Substantial	None	0	On Ground/Water Collision with Object	Landing - Roll
Probable Cause: The airplane's collision with a coyote during the landing roll. A contributing factor was the prevailing night conditions.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
September 11, 2005	N58316	Passenger	Bettles, AK	Brooks Range Aviation	Airplane	Cessna 185F	Substantial	None	0	Loss of Control - On Ground/Water	Landing - Roll
Probable Cause: The pilot's inadequate compensation for a gusty crosswind, which resulted in a loss of control and an inadvertent ground-loop during the landing roll. Factors associated with the accident were the ground-loop and gusts.											
September 23, 2005	N355NT	Passenger	Haena, HI	Heli USA	Helicopter	Aerospatiale AS350BA	Substantial	Fatal	3	In-flight Encounter with Weather	Maneuvering
Probable Cause: The pilot's decision to continue flight into adverse weather conditions, which resulted in a loss of control due to an encounter with a microburst. Contributing to the accident was inadequate Federal Aviation Administration surveillance of Special Federal Aviation Regulation 71 operating restrictions. Contributing to the loss of life in the accident was the lack of helicopter flotation equipment.											
October 3, 2005	N31MH	Passenger	Grand Canyon, AZ	Maverick Helicopters Inc.	Helicopter	Aerospatiale AS350B	Substantial	None	0	Hard Landing	Landing - Flare/Touchdown
Probable Cause: The pilot's failure to maintain control of the helicopter during landing in gusty wind conditions, which resulted in a hard landing and ground resonance.											
October 5, 2005	N4UT	Cargo	Jacksonville, FL	Ram Air Freight Inc.	Airplane	Beech 58	Substantial	None	0	Miscellaneous/Other	Landing - Roll
Probable Cause: The pilot's improper use of the normal brakes during the landing roll and his delay in performing a go-around resulting in an emergency descent/landing on grass past the departure end of the runway and subsequent collapse of the left main landing gear.											
October 6, 2005	N6560K	Passenger	Gulf of Mexico, TX	Industrial Helicopters Inc.	Helicopter	Bell 206-L3	Destroyed	Fatal	3	Missing Aircraft	Unknown
Probable Cause: Undetermined. The aircraft is missing.											
October 6, 2005	N206DB	Passenger	Denver, CO	Air Logistics LLC, DBA AIRCAM	Helicopter	Bell 206L-4	Substantial	None	0	Loss of Engine Power (Total) - Nonmechanical	Landing
Probable Cause: The pilot's improper preflight planning and preparation resulting in him taking the helicopter into the air with insufficient fuel to accomplish the flight, and the subsequent fuel exhaustion leading to the hard landing.											
October 13, 2005	N310SK	Passenger	Ottumwa, IA	B & F Aviation, Inc., DBA Brown Flying School	Airplane	Cessna 310R	Substantial	Minor	0	Loss of Control - In-flight	Landing - Flare/Touchdown
Probable Cause: The pilot misjudged his altitude and airspeed while landing which resulted in the airplane stalling 20 feet above the runway. A factor associated with the accident was the pilot's execution of the approach when reported weather conditions were below the minimums required for the approach.											
October 18, 2005	N978FE	Cargo	Round Rock, TX	Baron Aviation Services	Airplane	Cessna 208	Substantial	Minor	0	Loss of Engine Power	Cruise
Probable Cause: The loss of engine power due to the failure of the engine-driven fuel pump. A contributing factor was the inadequate inspection of the engine driven fuel pump.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
October 19, 2005	N564BR	Passenger	Houston , TX	Kaleidoscope Aviation Corp.	Airplane	Hawker Siddeley 125-700	Substantial	None	0	Dragged Wing, Rotor, Pod, Float or Tail/Skid	Approach - VFR Pattern - Final Approach
Probable Cause: The pilot-in-command's failure to attain proper runway alignment.											
October 28, 2005	N950AL	Passenger	Olympia, WA	Airlift Northwest	Helicopter	Agusta A109E	Substantial	Minor	0	In-flight Collision with Object	Takeoff
Probable Cause: The pilot's improper positioning of the number 2 Power Flight Control switch and his inability to obtain the proper climb rate to clear a concrete wall barrier. Contributing factors included the checklist not being followed and the limit override switch not being activated.											
November 8, 2005	N7801Q	Cargo	Manchester, NH	Business Air, Inc., DBA Air Now	Airplane	Embraer 110P1	Destroyed	Serious	0		
Probable Cause:											
November 8, 2005	N27177	Passenger	Ankeny, IA	Exec 1 Aviation	Airplane	Piper PA-31-350	Destroyed	Fatal	2	Miscellaneous/Other	Cruise
Probable Cause: The pilot's failure to preflight the airplane, the pilot's improper in-flight decision not to land the airplane on the runway when he had the opportunity, and the inadvertent stall when the pilot allowed the airspeed to get too low. Factors that contributed to the accident were the lineman's improper servicing of the airplane when he left the oil dipstick out and the subsequent oil leak.											
November 9, 2005	N4319P	Cargo	Bloomington, IL	Blackstone Rotorcraft Inc.	Airplane	Piper PA-23-160	Substantial	Fatal	1	Loss of engine power	Cruise
Probable Cause: The aircraft control not possible by the pilot during a visual approach to the runway due to the physical impairment of the pilot.											
November 15, 2005	N5094C	Cargo	Fergus Falls, MN	Airmax Airlines	Airplane	Cessna T310R	Substantial	None	0	In-flight Encounter with Weather	Cruise
Probable Cause: The presence of wing ice during landing. Contributing factors were the icing conditions and flight into known adverse weather by the pilot.											
November 16, 2005	N1153C	Cargo	Gaylord, MI	Central Air Southwest Inc.	Airplane	Aero Commander 500B	Destroyed	Fatal	1	In-flight Collision with Object	Approach - FAF/Outer Marker to Threshold (IFR)
Probable Cause: The clearance not maintained with terrain during a nonprecision approach. Contributing factors were the ceiling, visibility, night conditions, and trees.											
December 7, 2005	N8403F	Cargo	Pierre, SD	Air Max Airlines	Airplane	Cessna 310Q	Substantial	None	0	Loss of Control - On Ground/Water	Landing - Roll
Probable Cause: The pilot's failure to maintain control of the airplane during the landing roll due to the icy runway. Factors were the compacted snow and ice along the edges of the runway and at the taxiway intersection, and the snow banks adjacent to the runway and taxiway.											
December 8, 2005	N997BW	Cargo	Columbia, SC	Package Express, DBA Bellefonte Incorporated	Airplane	Piper PA-34-200	Substantial	None		Loss of Control - In-flight	Takeoff
Probable Cause: Maintenance personnel's improper installation of the stabilator trim arm which resulted in separation of a bolt, loss of control during takeoff, and a subsequent hard landing.											

APPENDIX A: 2005 Air Carrier Accident Data
On Demand Part 135

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
December 15, 2005	N62497	Cargo	State College, PA	Northeast Aviation Co Inc.	Airplane	Piper PA-23-250	Substantial	None		Loss of Control - On Ground/Water	Takeoff - Roll/Run
Probable Cause: The pilot's failure to maintain directional control during the takeoff run. A factor was the snow-covered runway.											
December 19, 2005	N3199H	Passenger	Fallon, NV	Fallon Airmotive	Airplane	Beech A36	Substantial	None		Overrun	Takeoff - Roll/Run
Probable Cause: The pilot's failure to abort the takeoff. A factor in the accident was the snow covered runway.											
December 24, 2005	N753FE	Cargo	Portland, OR	Empire Airlines, Inc.	Airplane	Cessna 208B	Substantial	Minor		Loss of Engine Power	Takeoff - Initial Climb
Probable Cause: A partial loss of engine power for an undetermined reason during the initial takeoff climb resulting in an in-flight collision with objects.											

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 2005 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 (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).

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 once popularly known as "commuters" began operating as Part 121 flights.

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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.

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. The FAA estimates the number of on-demand Part 135 operators at about 3,000; 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 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[6] 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.

[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* (*GAATAA*) *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.

[6] As previously mentioned, Congress is considering legislation that would make medical flights comply with Part 135 regulations even when no patient is on board.

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,[7] 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 at least one of the 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 the 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.

[7] 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 that: (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.
Minor	Any damage that neither destroys the aircraft nor causes substantial damage.
None	No damage.

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.

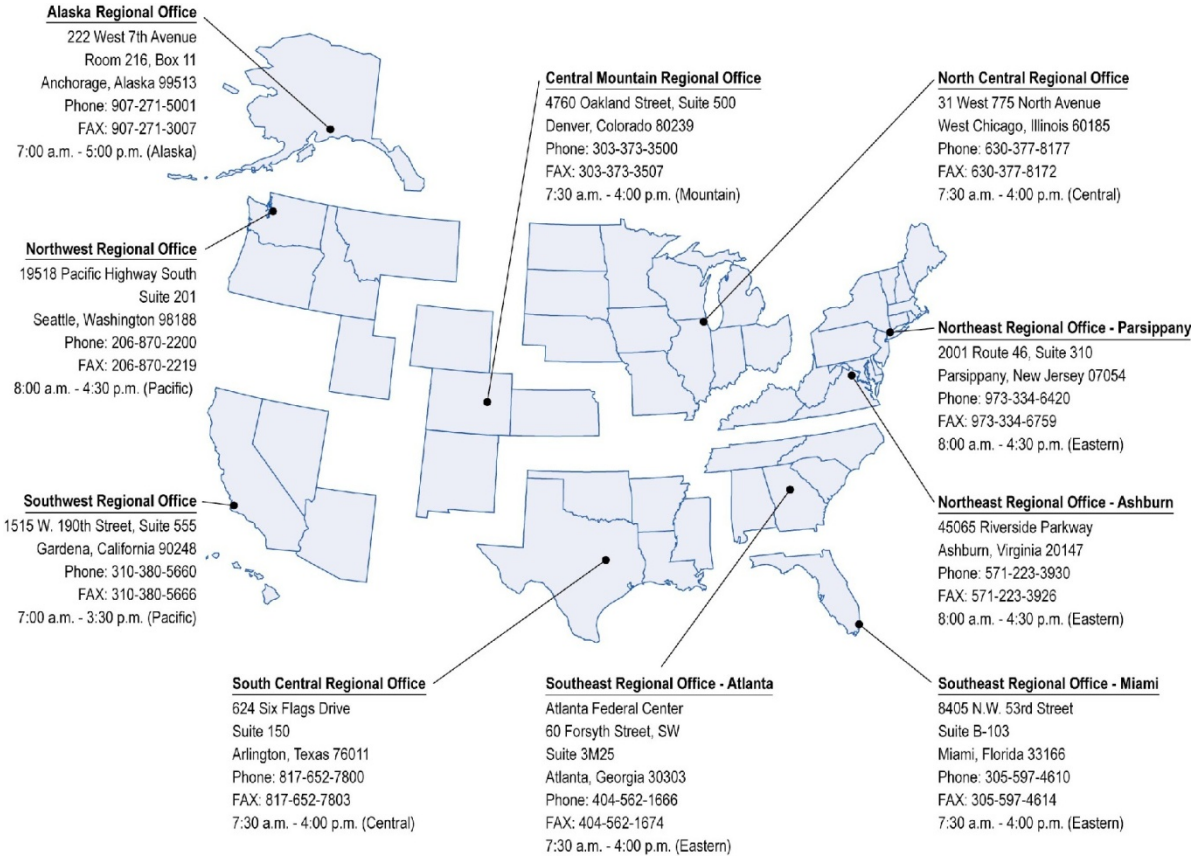
Accident Data: The Safety Board's Investigative Process

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 2005 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 Federal Aviation Administration (FAA), manufacturers, and witnesses. Investigators use the Board's Accident Data Management System (ADMS) to document those data in the Accident/Incident Database, which contains five types of data:

- 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 into 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.

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.

[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.

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 helps explain why that event happened is designated as either a "cause" or "factor." The term "factor" is used to describe situations or circumstances that contribute to the accident cause. In addition are findings that provide additional information of interest to the investigation. 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 and analysis components of an accident 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.

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 Members 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 *GAATAA Survey*, which is compiled annually by the FAA. The *GAATAA 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.

Once *GAATAA 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 *GAATAA 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 *GAATAA Survey*. FAA's flight-hour estimates as revised for on-demand Part 135 flight operations are substantially higher than they would have been 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

[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.

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

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.

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

[8] The data on flight hours and departures for 2005 were obtained from U.S. Bureau of Transportation Statistics (BTS), National Transportation Statistics, 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 grew slightly between 1996 and 2005, ranging from 12 in 1996 to 17 in 2005 (table D1[1]). However, the number of other carriers (including national, large regional, and medium regional) decreased after 1996 from a peak of 84.

Table D1: Number of Air Carriers, 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Major Air Carriers	12	13	13	13	15	15	15	14	14	17
Other Air Carriers	84	83	83	81	76	72	68	66	69	65
Total	**96**	**96**	**96**	**94**	**91**	**87**	**83**	**80**	**83**	**82**

The number of air carrier aircraft in the fleet increased 14% from 1996 to a peak of 8,497 in 2001 (table D2[2]). All of the increase was in turbojets, which increased 30% in that period, while the number of turboprop airplanes, piston airplanes, and helicopters declined.

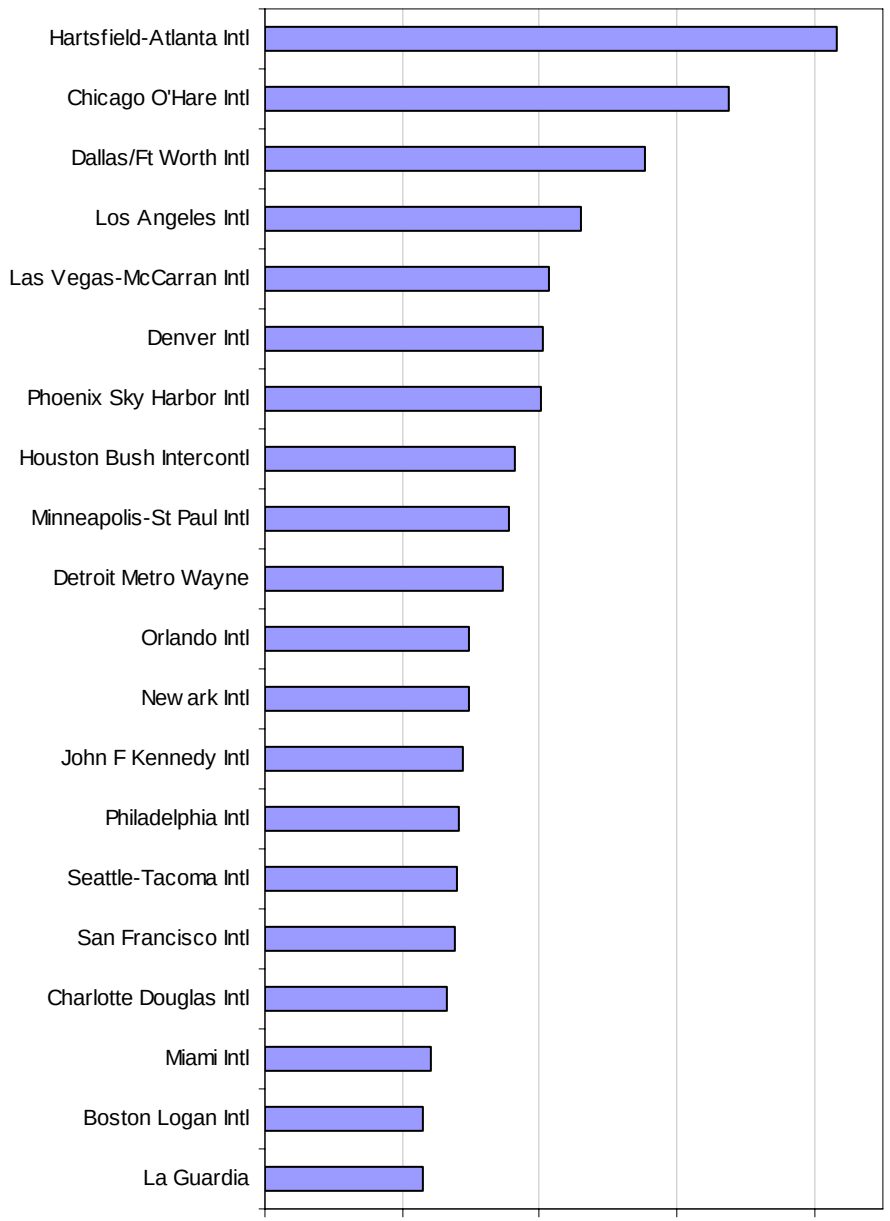
Table D2: Air Carrier Aircraft Characteristics, 1995-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Fixed Wing	7,357	7,482	7,994	8,106	8,016	8,370	8,161	8,144	8,150	8,182
Turbojet	4,922	5,108	5,411	5,630	5,956	6,296	6,383	6,523	6,691	6,839
Turboprop	1,696	1,646	1,832	1,788	1,475	1,494	1,250	1,123	984	889
Piston	739	728	751	688	585	580	528	498	475	454
Helicopter	121	134	117	122	39	127	33	32	36	43

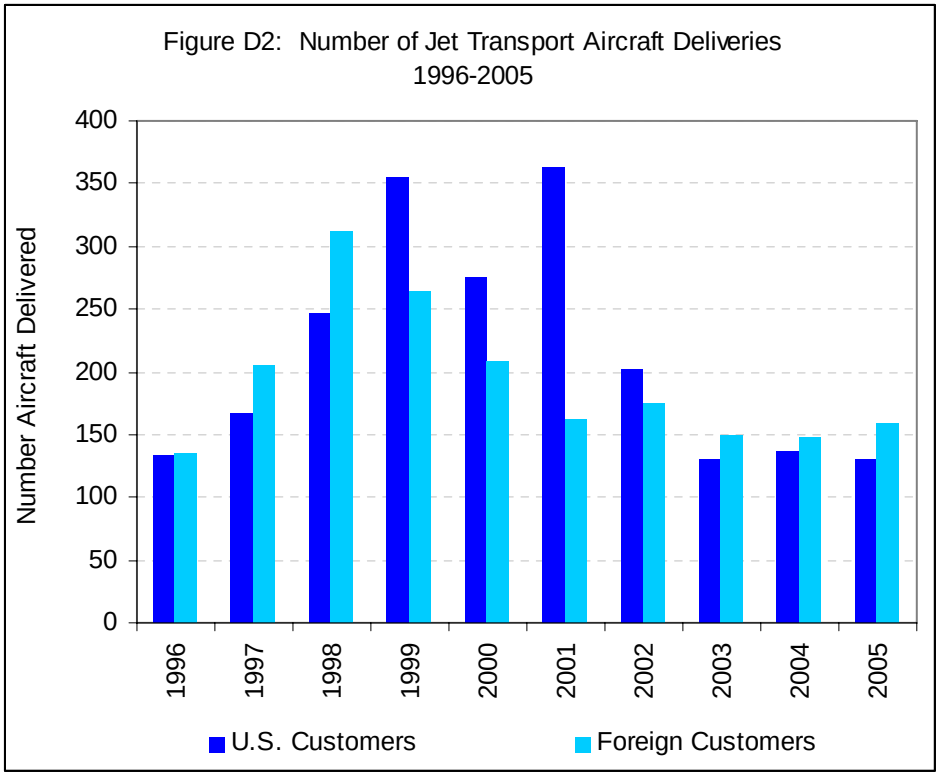
[1] BTS, National Transportation Statistics, table 1-2 (December 2007). Air carrier groups are categorized based on their annual operating revenues as major, national, large regional, and medium regional. The thresholds were last adjusted July 1, 1999, and the threshold for major air carriers is currently $1 billion. The other air carrier category contains all national, large regional, and medium regional air carriers.

[2] BTS, National Transportation Statistics, table 1-13 (December 2007).

Figure D1: Enplanements (millions) in 2005
Top 20 U.S. Airports



The number of enplanements is another indicator of the aviation environment. In 2005, 743 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 2005.[3] As in previous years, Hartsfield Atlanta International Airport had the highest traffic volume with 41.6 million enplanements.



The latest figures for the number of jet transport aircraft shipments show a cyclical pattern from 1996 through 2005 (figure D2); total deliveries to U.S. and foreign customers peaked in 1999.[4] Shipments to U.S. customers peaked in 2001, with shipments in 2002 down 44% from the previous year. An average of 52% of all shipments went to U.S. customers from 1996 through 2005, with a low of 44% in 1998 and a high of 69% in 2001. The least number of aircraft were shipped in 1996 (269 to all customers), and the most were shipped in 1999.

[3] BTS, National Transportation Statistics, table 1-41 (July 2007).

[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 Web site www.aia-aerospace.org/stats/aero_stats/aero_stats.cfm. Data are from Series 21, January 28, 2008.

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Adopted: March 9, 2009