

Parts Inventory

Passengers were less likely to be killed or injured in accidents involving FARs Part 121 operations than in Part 135 on-demand accidents, an annual review of U.S. data shows.

BY RICK DARBY

Detailed studies of accident data must wait until all the accidents have been investigated and final reports issued, and 2002 is the most recent year for which an official annual review has been released in the United States. That year, U.S. Federal Aviation Regulations (FARs) Part 121 air carriers had the lowest accident rates among commercial operators, with 2.37 accidents per million flight hours.¹ Accidents involving Part 135 on-demand operations, in comparison, occurred at a rate of 20.6 per million flight hours, nearly nine times greater.² Part 135 scheduled operations resulted in 25.6 accidents per million flight hours.³

About 10 percent of passengers aboard Part 135 on-demand flights involved in an accident were killed. About 5 percent of passengers aboard Part 135 on-demand flights involved in an accident were seriously injured; in Part 121 accidents, about 0.4 percent. There were no fatalities in Part 121 operations or Part 135 scheduled operations. Part 135 on-demand operations produced 6.18 fatal accidents per million flight hours.

The review⁴ was adopted by the U.S. National Transportation Safety Board in September 2006 and received at Flight Safety Foundation in early 2007.

In the 41 accidents in Part 121 operations (Table 1, page 50), 2,709 passengers were

involved, of which 55, or 2 percent, sustained any type of injury. In those accidents, 213 crewmembers were involved, 23 of whom, or 11 percent, were injured. Nine cabin crewmembers received serious injuries, compared with three flight crewmembers.

Part 135 on-demand operations resulted in 72 accidents, with 18 of them, or one-fourth, involving fatalities. Among the 175 passengers involved in accidents, 17 were killed and nine were seriously injured (Table 1). For flight crews, the fatalities included 16 of 72 involved in accidents, or 22 percent.

Among on-demand Part 135 operations, the accident rate was higher for helicopters than for airplanes, at 28.4 accidents per million flight hours versus 20.2. The fatal accident rate was higher for airplanes, with 7.0 fatal accidents per million flights versus 5.0.

“Investigators describe the events that take place during an accident as a sequence of occurrences, each identified with a phase of flight,” the report says. “The first occurrence associated with a phase of flight describes the initiating event for an accident flight and the starting point of the accident.”

For Part 121 accidents, “on-surface collision with object” was the first occurrence in the largest number of accidents (Table 2, page 50), eight of 37 or 22 percent.⁵ “In-flight encounter with weather”

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Fatalities and Injuries, FARs Part 121 Operations and Part 135 On-Demand Operations, 2002

	Fatal		Serious		Minor		None		Total	
	Part 121	Part 135	Part 121	Part 135	Part 121	Part 135	Part 121	Part 135	Part 121	Part 135
Flight crew	0	16	3	6	3	5	78	45	84	72
Cabin crew	0	0	9	0	8	0	102	0	119	0
Other crew	0	2	0	1	0	0	10	2	10	5
Passengers	0	17	11	9	44	10	2,654	139	2,709	175
Total aboard	0	35	23	16	55	15	2,844	186	2,922	252
On ground	0	0	1	0	1	1	0	0	2	1
Other aircraft	—	0	—	0	—	0	—	0	—	0
Total	0	35	24	16	56	16	2,844	186	2,924	253
Accidents	0	18	16	9	1	7	24	38	41	72

FARs = U.S. Federal Aviation Regulations

Source: U.S. National Transportation Safety Board

Table 1

First Occurrences in Accidents, FARs Part 121 Operations, 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Standing	Taxiing	Total
On-surface collision with object	1			2	5	8
In-flight encounter with weather	1	4	2			7
Miscellaneous/other	1	1		2		4
Airframe/component/ system failure	1	1	1			3
Gear collapsed			2		1	3
In-flight collision with object	1	1	1			3
Dragged wing, rotor, pod, float or tail/skid			2			2
Abrupt maneuver		1				1
Collision between aircraft (not midair)					1	1
Fire				1		1
Hard landing			1			1
Loss of control — on ground/water			1			1
Near collision between aircraft			1			1
Propeller contact with person				1		1
Total accident airplanes	5	8	11	6	7	37

FARs = U.S. Federal Aviation Regulations

Source: U.S. National Transportation Safety Board

Table 2

was the second most frequently cited initiating event, cited in seven accidents or 19 percent. The report said that all in-flight encounters with weather during cruise or descent were turbulence, and all resulted in serious injuries. Turbulence was a factor in 19.5 percent of all Part 121 accidents and 50.0 percent of all serious injury accidents.

For Part 135 on-demand airplane operations, “loss of control in flight” — a category not found among first occurrences in Part 121 accidents

— was the most common first occurrence, in six of the 41 accidents (Table 3). Although loss of control was the largest single category, it was equaled by the combination of “in-flight collision with object” and “in-flight collision with terrain or water.” The same was true for Part 135 on-demand helicopter operations (Table 4).

“Although most of the injury-producing accidents in Part 121 operations occurred in flight and were typically associated with turbulence,

First Occurrences in Accidents, FARs Part 135 On-Demand Airplane Operations, 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver	Taxiing or Standing	Total
Loss of control — in-flight		1	5			6
Overrun	1		3			4
Airframe, component, or system failure	1		2			3
In-flight collision with object		2	1			3
In-flight collision with terrain or water	1	1		1		3
In-flight encounter with weather	1	1	1			3
On-surface collision with terrain or water	1				2	3
Collision between aircraft (not midair)					2	2
Loss of control — surface	2					2
Loss of engine power (total) nonmechanical		1	1			2
Midair collision		1	1			2
On-surface collision with object					2	2
Gear collapsed			1			1
Loss of engine power			1			1
Loss of engine power (partial) nonmechanical	1					1
Main gear collapsed					1	1
Miscellaneous/other						1
Undershoot			1			1
Total	8	7	17	1	7	41

FARs = U.S. Federal Aviation Regulations

Source: U.S. National Transportation Safety Board

Table 3

First Occurrences in Accidents, FARs Part 135 On-Demand Helicopter Operations, 2002

	Takeoff or Climb	Cruise or Descent	Approach or Landing	Maneuver or Hover	Standing	Total
Loss of control — in-flight	1	1	2			4
In-flight collision with object		1	1			2
In-flight collision with terrain or water			2			2
In-flight encounter with weather		2				2
Airframe, component, or system failure		1				1
Fire					1	1
Loss of control -on ground/water	1					1
Loss of engine power (total) mechanical		1				1
Rollover	1					1
Total	3	6	5	0	1	15

FARs = U.S. Federal Aviation Regulations

Source: U.S. National Transportation Safety Board

Table 4

turbulence was rarely cited as a cause or factor in on-demand Part 135 accidents,” said the report.

More detail about Part 121 and Part 135 on-demand accident causes and factors is shown in Figure 1 (page 52). In Part 121 accidents, people who were not aboard the airplane — primarily

ramp personnel, the report said — ranked highest as causes or factors in accidents. Weather, cited in about 24 percent of accidents, was the most frequent environmental cause.

Compared with Part 121 accidents, pilots ranked higher as causes or factors in Part 135

Causes and Factors, FARs Part 121 Accidents and FARs Part 135 Airplane and Helicopter On-Demand Accidents, 2002

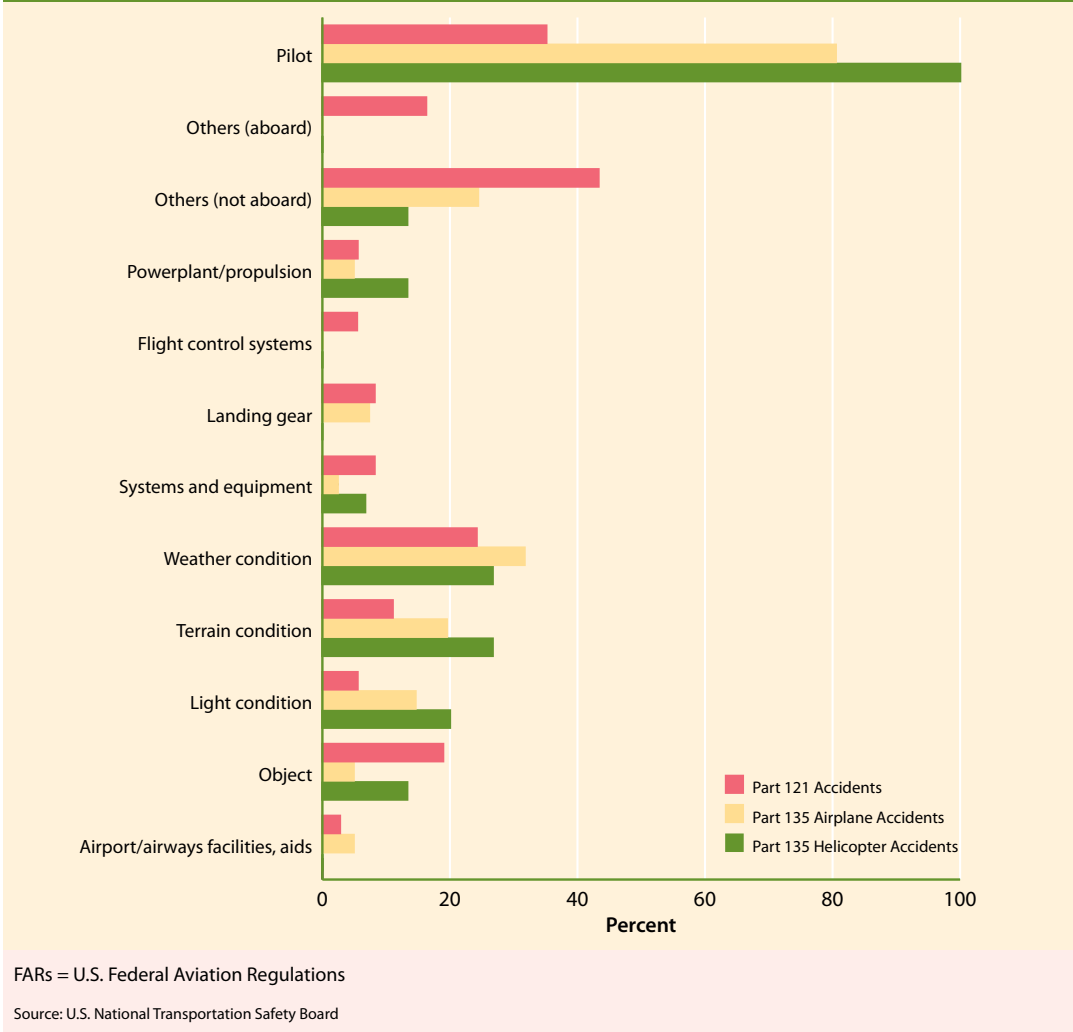


Figure 1

on-demand accidents, both for airplane accidents and helicopter accidents. Powerplant/propulsion and aircraft systems other than landing gear were factors in larger percentages of Part 135 helicopter accidents than airplane accidents. “Terrain condition,” “light condition” and “object” were also determined to be factors in a larger proportion of helicopter accidents than airplane accidents. ●

Notes

1. U.S. Federal Aviation Regulations (FARs) Part 121, *Operating Requirements: Domestic, Flag, and Supplemental Operations*, applies to operators that fly large transport-category aircraft.
2. FARs Part 135, *Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons On Board Such Aircraft*, typically applies to commercial carriers flying smaller jet and turbo-prop aircraft. “On-demand” means that the flights are unscheduled or “air taxi” operations.
3. FARs Part 135 scheduled operations typically involve aircraft with single or twin turbine engines or piston engines on short routes.
4. U.S. National Transportation Safety Board. *Annual Review of Aircraft Accident Data: U.S. Air Carrier Operations, Calendar Year 2002*. NTSB/ARC-06/02. Adopted Sept. 14, 2006.
5. First occurrences could be determined for analysis in 37 of the 41 accidents involving Part 121 operations.