

Overview of Aviation Accident Data 1996–2001

Table 1 contains the source data used for the analyses in this section. Aviation accident data from the NTSB are labeled “Accidents” for Parts 121 or 135 and “Accident-involved aircraft” for Part 91. The departure and flight-hour estimates in the table’s middle column are from the FAA. The accident rate data in the last four columns are derived from these source data. Data are shown for all accidents in an aircraft category, all weather-related accidents, fatal accidents from all causes, and weather-related fatal accidents. As noted earlier, “weather-related” includes all accidents in which weather was identified in the NTSB database as a factor.

The accident counts for Part 91 are counts of aircraft involved in accidents, rather than counts of accidents. This distinction affects the “All” and “Fatal” columns, which include collisions between aircraft. According to the NTSB staff who provided the data, weather-related accidents almost always involve a single aircraft, so the number of aircraft involved can be considered the same as the number of accidents.

The September 11, 2001, terrorist actions substantially reduced the level of activity in all three aircraft categories (compare the estimates of departures and flight-hours for 2001 with the estimates for earlier years). This extreme externality to weather as a factor in aviation accidents illustrates the value in using an accident rate statistic to assess accident reduction progress, rather than accident counts. All of the data series graphed in this report use accident rate data, with a denominator of either departures (for Part 121) or flight-hours (for Parts 135 and 91). Following FAA practice, accidents caused by illegal acts have not been counted in the accident rates in Table 1.

Major Commercial Carriers

Figure 1 displays two data series for Part 121 (major commercial carriers) fatal accidents beginning in 1996. The top series is for all fatal accidents; the lower is for weather-related fatal accidents. In addition to annual rate statistics (accidents per 100,000 departures, from the right-hand columns of Table 1), Figure 1 includes three-year moving average curves for each data series. In these curves, the value for a given year represents the average of the observed values for that year and the two preceding years. The FAA uses only a three-year moving average in its graphs of commercial air carrier fatal accident rates (FAA 2001a, 2001b, 2002a, 2002b). For Part 121, the number of accidents per year is small relative to the variation from year to year, and a moving average curve helps in displaying multiyear trends, particularly changes in trend direction. The three-year moving average curve

FIGURE 1. Part 121 aviation, fatal accidents per 100,000 departures

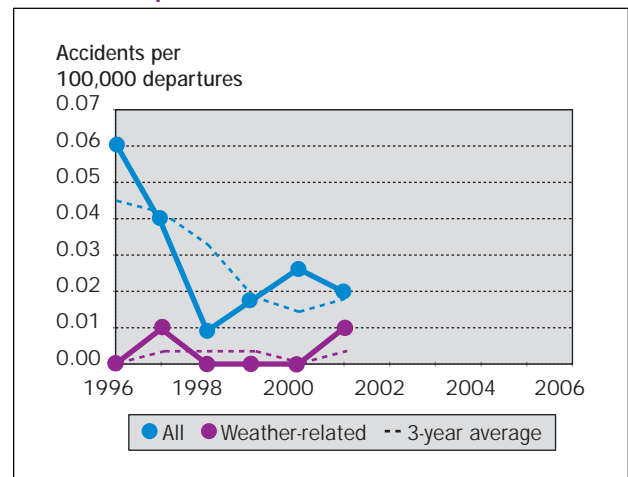


TABLE 1. Accident data by aircraft regulatory category

Part 121, larger commercial air carriers									
Year	Accidents				Departures	Accidents per 100,000 departures			
	All	Weather-related	Fatal	Weather-related fatal		All	Weather-related	Fatal	Weather-related fatal
1994	23 ^a	6	4	0	8,238,306	0.27 ^a	0.073	0.049	0.0000
1995	36	10	3	0	8,457,465	0.43	0.118	0.035	0.0000
1996	37	11	5	0	8,228,810	0.45	0.134	0.061	0.0000
1997	49	18	4	1	10,318,383	0.47	0.174	0.039	0.0097
1998	50	9	1	0	10,979,762	0.46	0.082	0.009	0.0000
1999	51	10	2	0	11,308,762	0.45	0.088	0.018	0.0000
2000	56	16	3	0	11,457,812	0.49	0.140	0.026	0.0000
2001	45 ^a	10	6 ^a	1	10,082,023	0.41 ^a	0.099	0.020 ^a	0.0099

Part 135, smaller commercial carriers in revenue service									
Year	Accidents				Flight-hours	Accidents per 100,000 flight-hours			
	All	Weather-related	Fatal	Weather-related fatal		All	Weather-related	Fatal	Weather-related fatal
1994	95	31	29	13	5,249,129	1.81	0.59	0.55	0.25
1995	87	25	26	11	5,113,866	1.70	0.49	0.51	0.22
1996	101	29	30	8	5,976,755	1.69	0.49	0.50	0.13
1997	98	30	20	9	4,080,764	2.40	0.74	0.49	0.22
1998	85	26	17	7	4,155,670	2.05	0.63	0.41	0.17
1999	86	25	17	5	3,640,731	2.36	0.69	0.47	0.14
2000	92	28	23	9	3,922,535	2.35	0.71	0.59	0.23
2001	79	18	20	6	3,476,432	2.27	0.52	0.58	0.17

Part 91, general aviation ^b									
Year	Accident-involved aircraft				Flight-hours	Accident-involved aircraft per 100,000 flight-hours			
	All	Weather-related	Fatal	Weather-related fatal		All	Weather-related	Fatal	Weather-related fatal
1994	2,022	344	404	87	22,235,000	9.09	1.55	1.82	0.39
1995	2,056	426	413	109	24,906,000	8.26	1.71	1.66	0.44
1996	1,908	442	361	109	24,881,000	7.67	1.78	1.45	0.44
1997	1,845	383	350	87	25,591,000	7.21	1.50	1.37	0.34
1998	1,904	370	364	91	25,518,000	7.46	1.45	1.43	0.36
1999	1,906	357	340	65	29,713,000	6.41	1.20	1.14	0.22
2000	1,837	356	344	85	29,057,000	6.32	1.23	1.18	0.29
2001	1,726	280	325	38	27,451,000	6.29	1.02	1.18	0.14

All accident data are from the NTSB. Flight-hour and departure estimates are from the FAA.

^aFor 1994, accident count includes one nonfatal accident due to an illegal act. For 2001, count includes four fatal accidents due to the September 11, 2001, terrorist acts. Following FAA practice, these accidents are excluded from the accident rate computations (accidents per 100,000 departures).

^bData for Part 91 aircraft are for numbers of accident-involved aircraft rather than numbers of accidents.

for the top series differs somewhat from the curve used in the FAA's strategic plans because the FAA includes scheduled Part 135 data in its calculation.

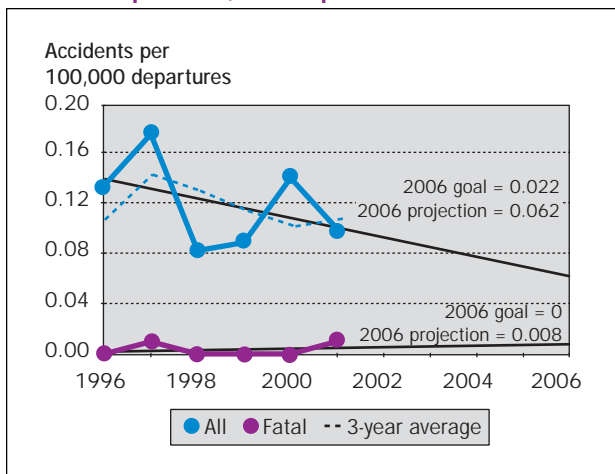
During the six years represented in this graph, there were only two weather-related fatal accidents involving Part 121 aircraft. This small number of occurrences prevents a useful statistical analysis of the trend over this duration. As a surrogate indicator for the trend in fatal accidents, one may look for the trend in all weather-related accidents, which are more frequent. Figure 2 shows that this trend (top data series) is in fact downward. In addition to the three-year moving average used by the FAA

(dashed curves), Figure 2 shows the straight-line regressions calculated for the underlying annual accident rates in each data series.

For this assessment, a straight-line regression has the advantage of providing a forward projection to an "expected" value in the goal year of 2006—assuming that the trend in observations to date continues. In Figure 2, goals for 2006 for both data series were calculated as 20 percent of the average accident rates for 1994 through 1996. The projected value of the linear trend for 2006 (or zero, if the linear trend reaches the x axis before 2006) is given as the 2006 projection for the data series.

Using all accidents as an indicator of the trend in weather-related fatal accidents, achieving an 80 percent reduction by 2006 for Part 121 aviation will require more improvement than occurred from 1996 through 2001. However, the variability in the annual accident rate is a reminder that a simple linear projection may prove unreliable.¹ The weather factor analysis in Section 3 will identify specific areas of concern where efforts should be focused to meet the 80 percent reduction goal for the major commercial air carriers.

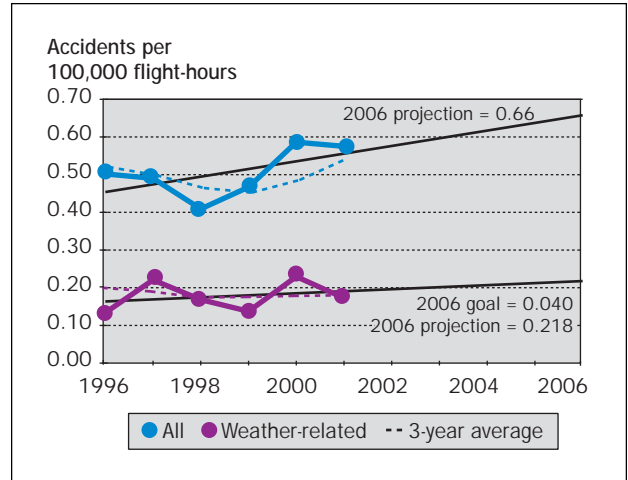
FIGURE 2. Part 121 aviation, weather-related accidents per 100,000 departures



Smaller Aircraft in Revenue Service

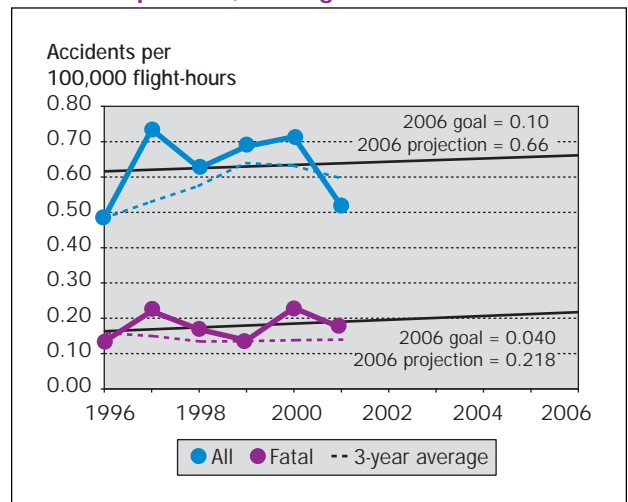
Figures 3 and 4 show data series for Part 135 (smaller aircraft in revenue service) analogous to those shown in Figures 1 and 2 for Part 121. As noted in the discussion of assumptions, estimates of annual departures for non-scheduled Part 135 aviation were not available, so the rates shown are accidents per 100,000 flight-hours. In Figure 3, the linear regression line for weather-related fatal accidents suggests an increasing trend. The projected 2006 value of 0.218 accidents per 100,000 flight-hours is well above the goal of 0.040 accidents per 100,000 flight-hours. The data series for all weather-related accidents (Figure 4, top series) shows a similar upward trend, de-

FIGURE 3. Part 135 aviation, fatal accidents per 100,000 flight-hours



spite a high year-to-year variability. The general impression one can take from these data is that the smaller commercial air carriers that fall under FAR Part 135 are not yet experiencing substantial reductions in weather-related accident rates consistent with the goal set by the NAW/PC.² This impression will be strengthened in Section 3, when we examine how specific weather hazards are affecting Part 135 accident rates.

FIGURE 4. Part 135 aviation, weather-related accidents per 100,000 flight-hours



¹The preliminary NTSB accident data for Part 121 in 2002 show two weather-related accidents (0.019 accidents per 100,000 departures) and no fatal weather-related accidents. If these numbers are confirmed, the trend for all weather-related Part 121 accidents approaches zero before 2006.

²The preliminary NTSB data for Part 135 in 2002 show three weather-related accidents (0.09 per 100,000 flight-hours), of which one was fatal (0.03 per 100,000 flight-hours). If these early data are confirmed, the Part 135 trends are downward rather than upward, but they still fail to achieve the 80 percent reduction goals.

General Aviation

If the trends in Part 135 aviation accident rates are disappointing with respect to meeting reduction goals, general aviation as defined by FAR Part 91 offers a far brighter prospect. Figures 5 and 6 show the data series comparable to those discussed already for Parts 121 and 135. The numbers of accidents per year are larger for this category, and the data series show substantially less variability around the linear trends than do the data series for Parts 121 and 135. But the truly good news is the strong downward trend in both series shown in Figure 6:

FIGURE 5. Part 91 aviation, fatal accidents, aircraft per 100,000 flight-hours

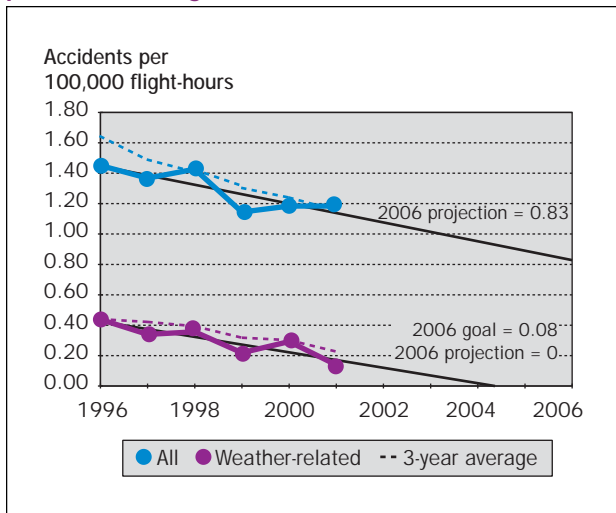
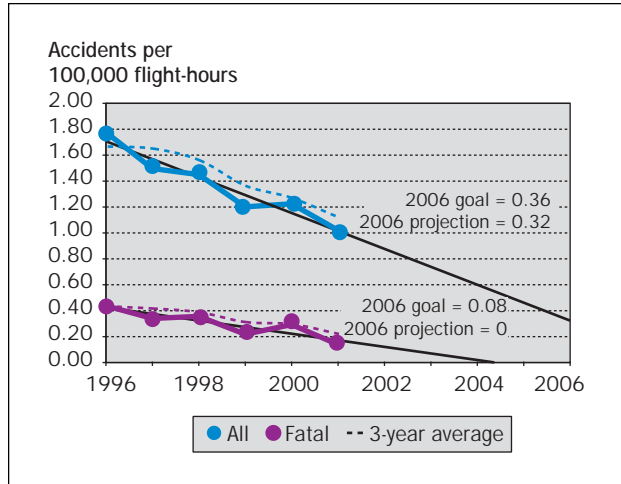


FIGURE 6. Part 91 aviation, weather-related accidents per 100,000 flight-hours



the rates for all weather-related accidents and for weather-related fatal accidents. If the trends can be sustained, the annual rate for weather-related fatal accidents could be brought well below the goal of 0.08 accidents per 100,000 flight-hours—a goal that is already far more ambitious than the 20 percent reduction goal adopted by the FAA for all general aviation accidents. The weather hazard analysis in Section 3 and the portfolio analysis in Section 4 will help identify factors that appear to have contributed to this success story and highlight the efforts that should be sustained and extended to ensure that the downward trends continue.