

**SPECIAL DOUBLE ISSUE**

Wildlife Strikes Are an Increasing Hazard to U.S. Civil-aircraft Operations

A report by the U.S. Federal Aviation Administration shows that wildlife strikes to U.S. civil aircraft increased by more than 50 percent from 1991 through 1997.

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Wildlife strikes to civil aircraft are a serious economic and safety problem in the United States. The following is a synopsis of data on wildlife strikes to U.S. civil aircraft for the years 1991-1997. Unless otherwise noted, all numbers are totals for the seven-year period and percentages are of the known total.

A total of 16,949 strikes (an average of 2,421 strikes each year) were reported to the U.S. Federal Aviation Administration (FAA). Between 1991 and 1997, there was a 53 percent increase in the number of strikes reported annually. Most reports were filed using FAA Form 5200-7, "Bird/Other Wildlife Strike Report" (Table 1, page 4).

Pilots filed 27 percent of the reports; air traffic control tower personnel filed 17 percent of the reports (Table 2, page 5).

Approximately 74 percent of the reported strikes involved commercial aircraft (Table 3, page 5).

Reports originated from all 50 states in the United States, two U.S. territories (Puerto Rico and the U.S. Virgin Islands) and foreign countries when U.S.-registered aircraft were involved. Table 4a (page 6) shows the distribution of reported bird



strikes in the various states and territories. Table 4b (page 7) shows the distribution of reported mammal strikes in the various states and territories.

Most bird strikes (50 percent) occurred between July and October (Table 5, page 8, and Figure 1, page 9). Most mammal strikes (44 percent) occurred between September and November (Table 5, page 8, and Figure 2, page 9).

Sixty-two percent of the bird strikes occurred during the day (Table 6, page 10; Figure 3a, page 11; and Figure 3b, page 11). Fifty-six percent of the mammal strikes occurred at night (Table 6; Figure 4a, page 12; and Figure 4b, page 12).

Forty-nine percent of the bird strikes occurred on approach or landing, and 35 percent occurred during takeoff and climb. Fifty-three percent of the mammal strikes occurred on approach or landing; and 32 percent occurred during takeoff and climb. Nine percent of the mammal strikes occurred when airborne aircraft struck deer with the landing gear or when aircraft struck bats (Table 7, page 13).

Fifty-five percent of the bird strikes occurred at less than 100 feet above ground level (AGL); 78 percent occurred at less

than 900 feet AGL; and 87 percent occurred at less than 2,000 feet AGL (Table 8, page 14, and Figure 5, page 15).

The fixed-wing-aircraft types most often involved in strikes that had a negative effect on flight were the Boeing [B-]737, McDonnell Douglas MD-80/DC-9, British Aerospace Jetstream 31 and Cessna 172 (Table 9a, page 16).

The aircraft types most often involved in strikes that damaged one or more aircraft components and/or caused a loss of time and/or money were the B-737, MD-80/DC-9, Jetstream 31 and B-727 (Table 9b, page 17).

The aircraft components most often struck by birds were windshields, engines, nose sections and wings/rotors. Components most often damaged by bird strikes were engines, wings/rotors, radomes and windshields (Table 10a, page 18).

Aircraft components most commonly struck by mammals were landing gear, propellers, wings/rotors and engines. These components also were most often reported as damaged by mammal strikes (Table 10b, page 19).

Twelve percent of the bird strikes and 43 percent of mammal strikes had adverse effects on the flights (Table 11, page 20). Birds were involved in 97 percent of the reported strikes; mammals were involved in three percent of the reported strikes; and reptiles were involved in less than one percent of the reported strikes.

The bird groups most often struck were gulls, blackbirds, raptors (birds of prey), waterfowl and doves (Table 12a, page 21). The mammals most often struck were deer and coyotes (Table 12b, page 22).

Gulls were involved in 2.6 times more strikes than waterfowl (Table 12a), but gulls and waterfowl were involved in essentially the same number of damaging strikes (Table 13, page 23).

One or more aircraft components were damaged in 2,676 wildlife strikes (Table 13), and 2,045 wildlife strikes had a negative effect on the flight (Table 14, page 24).

Total reported losses from bird strikes were 77,762 hours of aircraft downtime (time in which the aircraft could not be flown because of the wildlife strike; Table 15, page 25) and US\$47.91 million (Table 16, page 26). Total reported losses from mammal strikes were 58,273 hours of aircraft downtime (Table 15) and \$2.27 million (Table 16).

Of the 3,701 reports of wildlife strikes that had an adverse effect on the aircraft and/or an adverse effect on the flight, 717 reports provided an estimate of aircraft downtime (136,035 total hours, or an average of 190 hours per report), and 558 reports provided an estimate of the direct cost and/or other costs (\$50,177,526 total, or an average of \$89,924 per report). Of the 558 reports providing a damage-cost estimate,

493 reports gave an estimate of direct cost of aircraft damage (\$44,277,686 total, or an average of \$89,813 per report) and 202 reports gave an estimate of other monetary losses (\$5,899,840 total, or an average of \$29,207 per report; Table 17, page 27).

Voluntary reports to FAA of wildlife-strike frequency and cost may not be complete and may not show the true magnitude of the wildlife-strike problem. Less than 20 percent of the wildlife strikes that occurred at three major U.S. airports were reported to the FAA.^{1,2,3} Many wildlife-strike reports were provided to FAA before aircraft damage was assessed fully.

Assuming that all 3,701 reported wildlife strikes involving adverse aircraft/flight effects had similar amounts of downtime and/or monetary loss, and assuming that no other damaging strikes occurred, then the minimum annual costs to the U.S. civil aviation industry of wildlife strikes were 100,312 hours of aircraft downtime, \$47.49 million in direct monetary losses and \$15.44 million in associated costs.

Furthermore, assuming that only 20 percent of all wildlife strikes were reported to FAA, the annual costs to the U.S. civil aviation industry of wildlife strikes were more than 501,560 hours of aircraft downtime, \$237.43 million in direct monetary losses and \$77.21 million in associated costs.

The report offers two recommendations:

- Airport managers should be aware of the wildlife hazards on their airports and take appropriate actions, under the guidance of professional biologists trained in wildlife-damage management, to minimize the problems; and,
- Airport-wildlife-management efforts should include consideration of nearby habitats and land uses, such as wetlands, waste-disposal facilities and wildlife refuges that can attract wildlife that are hazardous to aviation. Such land uses and activities often are incompatible with aviation safety and should be prohibited near airports or designed and operated in a manner that minimizes the attraction of hazardous wildlife.

The report said that there is a need for increased reporting of wildlife strikes and more detailed reporting of wildlife strikes. Fifty-two percent of all reported bird strikes in 1991 through 1997 provided no information on the species struck, and 79 percent of strike reports that indicated aircraft damage provided no estimates of costs resulting from the damage.

Besides completing and mailing FAA Form 5200-7, people can report wildlife strikes via the Internet (<http://www.faa.gov/arp/birdstrike>). Bird-strike remains that cannot be identified by airport personnel might be identified by a local biologist or by sending feather remains to Bird Strike — USDA, 6100 Columbus Ave., Sandusky, OH, 44870 U.S. [This address is for the U.S. Department of Agriculture

(USDA) National Wildlife Research Center, which maintains a wildlife-strike database and assists the FAA in preparing periodic reports on wildlife strikes to U.S. civil aircraft.]♦

Editorial note: This article was adapted from *Wildlife Strikes to Civil Aircraft in the United States, 1991–1997*, U.S. Federal Aviation Administration Wildlife Aircraft Strike Database Serial Report No. 4. September 1998. The 36-page report includes acknowledgments, a preface, a black-and-white photograph and numerous tables and figures.

References

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3. Dolbeer, Richard A.; Wright, Sandra E.; Cleary, Edward C. *Bird and Other Wildlife Strikes to Civilian Aircraft in the United States, 1994*. An interim report, DTFA01-91-Z-02004, by the U.S. Department of Agriculture for the U.S. Federal Aviation Administration Technical Center, Atlantic City, New Jersey, United States. 1995.

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Further Reading from FSF Publications

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Razack, A.K. "Bird Hazard Reduction at Kai Tak — Hong Kong International Airport." In *Safety through Interactions and International Standards: Proceedings of the 46th Annual International Air Safety Seminar*. Alexandria, Virginia, United States: Flight Safety Foundation, 1993.

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Table 1
Sources of Information for Reported Wildlife Strikes to U.S. Civil Aircraft, 1991–1997

| Sources | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| FAA Form 5200-7 | 1,863 | 1,900 | 1,799 | 1,834 | 1,844 | 1,771 | 2,251 | 13,262 | 1,895 | 78 |
| Multiple | 82 | 129 | 145 | 180 | 199 | 351 | 315 | 1,401 | 200 | 8 |
| Airport report | 18 | 23 | 104 | 62 | 117 | 126 | 144 | 594 | 85 | 4 |
| AC incident report | 44 | 86 | 106 | 77 | 65 | 75 | 55 | 508 | 73 | 3 |
| Other | 43 | 41 | 36 | 40 | 82 | 109 | 73 | 424 | 61 | 3 |
| PACIR | 0 | 3 | 11 | 22 | 76 | 72 | 74 | 258 | 37 | 2 |
| Airline report | 0 | 0 | 0 | 1 | 0 | 1 | 225 | 227 | 32 | 1 |
| Engine manufacturer | 1 | 1 | 1 | 1 | 63 | 56 | 0 | 123 | 18 | 1 |
| ASRS | 1 | 14 | 15 | 17 | 16 | 7 | 1 | 71 | 10 | <1 |
| AAIPN | 0 | 11 | 17 | 5 | 5 | 4 | 7 | 49 | 7 | <1 |
| NTSB | 6 | 3 | 2 | 2 | 3 | 3 | 0 | 19 | 3 | <1 |
| Daily alert bulletin | 1 | 4 | 3 | 1 | 0 | 0 | 0 | 9 | 1 | <1 |
| Unknown | 1 | 3 | 0 | 0 | 0 | 0 | 0 | 4 | 1 | <1 |
| Total | 2,060 | 2,218 | 2,239 | 2,242 | 2,470 | 2,575 | 3,145 | 16,949 | 2,421 | 100 |

AC = Aircraft
PACIR = U.S. Federal Aviation Administration (FAA) Preliminary Aircraft Incident Report
ASRS = U.S. National Aeronautics and Space Administration Aviation Safety Reporting System
AAIPN = FAA Aircraft Accident/Incident Preliminary Notice
NTSB = U.S. National Transportation Safety Board

Source: U.S. Federal Aviation Administration

Table 2
Person Filing Report of Wildlife Strike to U.S. Civil Aircraft, 1991–1997

| Person/affiliation | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|------------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Pilot | 684 | 649 | 609 | 564 | 513 | 635 | 838 | 4,492 | 642 | 27 |
| Tower | 320 | 383 | 420 | 389 | 411 | 500 | 493 | 2,916 | 417 | 17 |
| Unknown | 351 | 6 | 262 | 9 | 11 | 849 | 958 | 2,446 | 349 | 14 |
| Person finding carcass | 21 | 64 | 121 | 60 | 141 | 157 | 250 | 814 | 116 | 5 |
| Airport operations | 47 | 1 | 40 | 1 | 3 | 228 | 172 | 492 | 70 | 3 |
| Airline operations | 0 | 0 | 46 | 2 | 0 | 79 | 306 | 433 | 62 | 3 |
| Operations | 46 | 24 | 27 | 54 | 45 | 0 | 47 | 243 | 35 | 1 |
| Aircraft maintenance | 3 | 10 | 0 | 12 | 6 | 0 | 5 | 36 | 5 | <1 |
| Other ¹ | 588 | 1,081 | 714 | 1,151 | 1,340 | 127 | 76 | 5,077 | 725 | 30 |
| Total | 2,060 | 2,218 | 2,239 | 2,242 | 2,470 | 2,575 | 3,145 | 16,949 | 2,421 | 100 |

¹ The values in the "Other" category are misleading. Prior to 1996, when multiple reports of a single incident were received, the strike was entered in the "Other" category. The records are being edited to correct this situation. In the future, multiple reports of a single incident will be prioritized by pilot, tower, airport operations or airline operations, and entered in the appropriate category.

Source: U.S. Federal Aviation Administration

Table 3
Number of Reported Wildlife Strikes to U.S. Civil Aircraft by Type of Operator, 1991–1997

| Type of Operator | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|-------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Commercial | 1,560 | 1,661 | 1,644 | 1,696 | 1,823 | 1,863 | 2,347 | 12,594 | 1,799 | 74 |
| Business | 273 | 283 | 254 | 293 | 329 | 392 | 362 | 2,186 | 312 | 13 |
| Private | 89 | 121 | 152 | 139 | 119 | 99 | 74 | 793 | 113 | 5 |
| Government/Police | 8 | 9 | 5 | 11 | 11 | 6 | 14 | 64 | 9 | <1 |
| Unknown | 130 | 144 | 184 | 103 | 188 | 215 | 348 | 1,312 | 187 | 8 |
| Total | 2,060 | 2,218 | 2,239 | 2,242 | 2,470 | 2,575 | 3,145 | 16,949 | 2,421 | 100 |

Source: U.S. Federal Aviation Administration

Table 4a
Number of Reported Bird Strikes to Civil Aircraft in U.S. States,
Puerto Rico and the U.S. Virgin Islands, 1991–1997

| State | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------------|----------------------------|-------|-------|-------|-------|-------|-------|--------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Alaska | 22 | 21 | 10 | 17 | 22 | 19 | 39 | 150 | 21 | 1 |
| Alabama | 28 | 22 | 21 | 59 | 30 | 30 | 41 | 231 | 33 | 1 |
| Arkansas | 12 | 20 | 10 | 14 | 16 | 11 | 13 | 96 | 14 | 1 |
| Arizona | 5 | 5 | 12 | 14 | 17 | 31 | 22 | 106 | 15 | 1 |
| California | 161 | 189 | 208 | 224 | 256 | 216 | 282 | 1,536 | 219 | 9 |
| Colorado | 13 | 19 | 19 | 20 | 18 | 25 | 76 | 190 | 27 | 1 |
| Connecticut | 58 | 43 | 23 | 33 | 29 | 38 | 25 | 249 | 36 | 2 |
| District of Columbia | 44 | 43 | 46 | 61 | 63 | 86 | 103 | 446 | 64 | 3 |
| Delaware | 1 | 1 | 1 | 6 | 1 | 1 | 2 | 13 | 2 | <1 |
| Florida | 167 | 146 | 142 | 169 | 218 | 205 | 214 | 1,261 | 180 | 8 |
| Georgia | 55 | 47 | 28 | 66 | 49 | 51 | 46 | 342 | 49 | 2 |
| Hawaii | 54 | 41 | 24 | 17 | 35 | 92 | 97 | 360 | 51 | 2 |
| Iowa | 15 | 22 | 23 | 20 | 24 | 14 | 19 | 137 | 20 | 1 |
| Idaho | 1 | 4 | 2 | 5 | 10 | 6 | 9 | 37 | 5 | <1 |
| Illinois | 57 | 97 | 174 | 124 | 146 | 156 | 141 | 895 | 128 | 5 |
| Indiana | 19 | 23 | 23 | 18 | 30 | 15 | 37 | 165 | 24 | 1 |
| Kansas | 4 | 6 | 10 | 8 | 11 | 8 | 7 | 54 | 8 | <1 |
| Kentucky | 45 | 65 | 76 | 66 | 54 | 56 | 112 | 474 | 68 | 3 |
| Louisiana | 52 | 63 | 70 | 48 | 71 | 69 | 46 | 419 | 60 | 3 |
| Massachusetts | 45 | 32 | 41 | 27 | 29 | 30 | 44 | 248 | 35 | 2 |
| Maryland | 24 | 31 | 26 | 29 | 33 | 28 | 31 | 202 | 29 | 1 |
| Maine | 7 | 15 | 10 | 6 | 16 | 9 | 14 | 77 | 11 | <1 |
| Michigan | 59 | 50 | 53 | 40 | 33 | 43 | 51 | 329 | 47 | 2 |
| Minnesota | 22 | 18 | 25 | 27 | 13 | 15 | 31 | 151 | 22 | 1 |
| Missouri | 34 | 32 | 43 | 34 | 50 | 51 | 43 | 287 | 41 | 2 |
| Mississippi | 13 | 7 | 14 | 11 | 6 | 15 | 11 | 77 | 11 | <1 |
| Montana | 0 | 7 | 6 | 2 | 5 | 2 | 4 | 26 | 4 | <1 |
| North Carolina | 55 | 61 | 47 | 72 | 73 | 49 | 68 | 425 | 61 | 3 |
| North Dakota | 7 | 0 | 3 | 8 | 8 | 4 | 6 | 36 | 5 | <1 |
| Nebraska | 22 | 26 | 27 | 34 | 25 | 17 | 32 | 183 | 26 | 1 |
| New Hampshire | 6 | 4 | 9 | 14 | 8 | 6 | 9 | 56 | 8 | <1 |
| New Jersey | 64 | 74 | 75 | 80 | 87 | 82 | 59 | 521 | 74 | 3 |
| New Mexico | 4 | 4 | 3 | 4 | 10 | 6 | 7 | 38 | 5 | <1 |
| Nevada | 10 | 5 | 2 | 9 | 11 | 14 | 22 | 73 | 10 | <1 |
| New York | 137 | 148 | 149 | 131 | 139 | 180 | 210 | 1,094 | 156 | 7 |
| Ohio | 37 | 58 | 81 | 76 | 84 | 94 | 95 | 525 | 75 | 3 |
| Oklahoma | 10 | 15 | 14 | 11 | 9 | 10 | 54 | 123 | 18 | 1 |
| Oregon | 10 | 22 | 27 | 20 | 25 | 31 | 73 | 208 | 30 | 1 |
| Pennsylvania | 96 | 119 | 102 | 107 | 122 | 111 | 142 | 799 | 114 | 5 |
| Puerto Rico | 6 | 2 | 4 | 0 | 5 | 8 | 3 | 28 | 4 | <1 |
| Rhode Island | 8 | 8 | 7 | 9 | 6 | 2 | 4 | 44 | 6 | <1 |
| South Carolina | 11 | 11 | 12 | 12 | 15 | 14 | 12 | 87 | 12 | 1 |
| South Dakota | 3 | 3 | 0 | 4 | 5 | 3 | 5 | 23 | 3 | <1 |
| Tennessee | 71 | 80 | 62 | 45 | 54 | 62 | 79 | 453 | 65 | 3 |
| Texas | 230 | 211 | 194 | 179 | 158 | 175 | 227 | 1,374 | 196 | 8 |
| Utah | 4 | 32 | 32 | 25 | 21 | 24 | 35 | 173 | 25 | 1 |
| Virginia | 68 | 55 | 42 | 53 | 56 | 56 | 38 | 368 | 53 | 2 |
| U.S. Virgin Islands | 1 | 3 | 4 | 5 | 8 | 4 | 0 | 25 | 4 | <1 |
| Vermont | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 13 | 2 | <1 |
| Washington | 23 | 20 | 57 | 41 | 46 | 64 | 59 | 310 | 44 | 2 |
| Wisconsin | 23 | 42 | 22 | 13 | 26 | 22 | 36 | 184 | 26 | 1 |
| West Virginia | 8 | 14 | 10 | 10 | 10 | 8 | 4 | 64 | 9 | <1 |
| Wyoming | 0 | 3 | 0 | 2 | 0 | 1 | 2 | 8 | 1 | <1 |
| U.S. total | 1,934 | 2,091 | 2,126 | 2,131 | 2,298 | 2,370 | 2,843 | 15,793 | 2,256 | 96 |
| Foreign/unknown | 90 | 71 | 58 | 38 | 94 | 115 | 218 | 684 | 98 | 4 |
| All reports | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | 100 |

Source: U.S. Federal Aviation Administration

Table 4b
Number of Reported Mammal Strikes to Civil Aircraft in U.S. States,
Puerto Rico and the U.S. Virgin Islands, 1991–1997

| State | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------------|----------------------------|------|------|------|------|------|------|-------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Alaska | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | <1 | 1 |
| Alabama | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 3 | <1 | 1 |
| Arkansas | 0 | 0 | 0 | 2 | 2 | 5 | 1 | 10 | 1 | 2 |
| Arizona | 1 | 2 | 2 | 1 | 1 | 2 | 3 | 12 | 2 | 3 |
| California | 2 | 2 | 0 | 1 | 4 | 2 | 2 | 13 | 2 | 3 |
| Colorado | 1 | 0 | 0 | 1 | 2 | 1 | 0 | 5 | 1 | 1 |
| Connecticut | 3 | 2 | 2 | 0 | 2 | 2 | 0 | 11 | 2 | 2 |
| District of Columbia | 4 | 0 | 0 | 0 | 1 | 6 | 3 | 14 | 2 | 3 |
| Delaware | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | <1 | <1 |
| Florida | 0 | 0 | 0 | 2 | 2 | 5 | 5 | 14 | 2 | 3 |
| Georgia | 1 | 1 | 2 | 1 | 1 | 0 | 2 | 8 | 1 | 2 |
| Hawaii | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | <1 | <1 |
| Iowa | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | <1 | 1 |
| Idaho | 2 | 1 | 0 | 0 | 0 | 1 | 0 | 4 | 1 | 1 |
| Illinois | 0 | 3 | 9 | 3 | 9 | 7 | 6 | 37 | 5 | 8 |
| Indiana | 0 | 1 | 0 | 2 | 1 | 0 | 0 | 4 | 1 | 1 |
| Kansas | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | <1 | <1 |
| Kentucky | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 2 | <1 | <1 |
| Louisiana | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 3 | <1 | 1 |
| Massachusetts | 0 | 2 | 0 | 0 | 0 | 3 | 0 | 5 | 1 | 1 |
| Maryland | 2 | 0 | 0 | 2 | 4 | 3 | 1 | 12 | 2 | 3 |
| Maine | 0 | 1 | 0 | 0 | 1 | 0 | 2 | 4 | 1 | 1 |
| Michigan | 0 | 2 | 1 | 8 | 2 | 3 | 3 | 19 | 3 | 4 |
| Minnesota | 1 | 2 | 0 | 0 | 0 | 2 | 1 | 6 | 1 | 1 |
| Missouri | 1 | 1 | 1 | 3 | 1 | 0 | 2 | 9 | 1 | 2 |
| Mississippi | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 2 | <1 | <1 |
| Montana | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | <1 | <1 |
| North Carolina | 0 | 1 | 0 | 4 | 1 | 3 | 1 | 10 | 1 | 2 |
| North Dakota | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Nebraska | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 4 | 1 | 1 |
| New Hampshire | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 4 | 1 | 1 |
| New Jersey | 2 | 3 | 3 | 6 | 1 | 6 | 4 | 25 | 4 | 6 |
| New Mexico | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | <1 | <1 |
| Nevada | 3 | 0 | 4 | 0 | 1 | 1 | 0 | 9 | 1 | 2 |
| New York | 0 | 5 | 0 | 7 | 7 | 3 | 2 | 24 | 3 | 5 |
| Ohio | 0 | 3 | 2 | 1 | 2 | 1 | 2 | 11 | 2 | 2 |
| Oklahoma | 0 | 0 | 1 | 1 | 0 | 0 | 4 | 6 | 1 | 1 |
| Oregon | 2 | 0 | 0 | 0 | 1 | 1 | 2 | 6 | 1 | 1 |
| Pennsylvania | 4 | 7 | 7 | 8 | 6 | 2 | 0 | 34 | 5 | 8 |
| Puerto Rico | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rhode Island | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | <1 | <1 |
| South Carolina | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 2 | <1 | <1 |
| South Dakota | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 3 | <1 | 1 |
| Tennessee | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 4 | 1 | 1 |
| Texas | 1 | 3 | 6 | 4 | 5 | 4 | 3 | 26 | 4 | 6 |
| Utah | 0 | 0 | 1 | 0 | 0 | 0 | 3 | 4 | 1 | 1 |
| Virginia | 1 | 0 | 1 | 0 | 4 | 5 | 5 | 16 | 2 | 4 |
| U.S. Virgin Islands | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vermont | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Washington | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 3 | <1 | 1 |
| Wisconsin | 0 | 1 | 1 | 4 | 0 | 2 | 1 | 9 | 1 | 2 |
| West Virginia | 1 | 6 | 3 | 5 | 2 | 7 | 4 | 28 | 4 | 6 |
| Wyoming | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 2 | <1 | <1 |
| U.S. total | 36 | 54 | 54 | 71 | 70 | 87 | 70 | 442 | 63 | 99 |
| Foreign/unknown | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 4 | 1 | 1 |
| All reports | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |

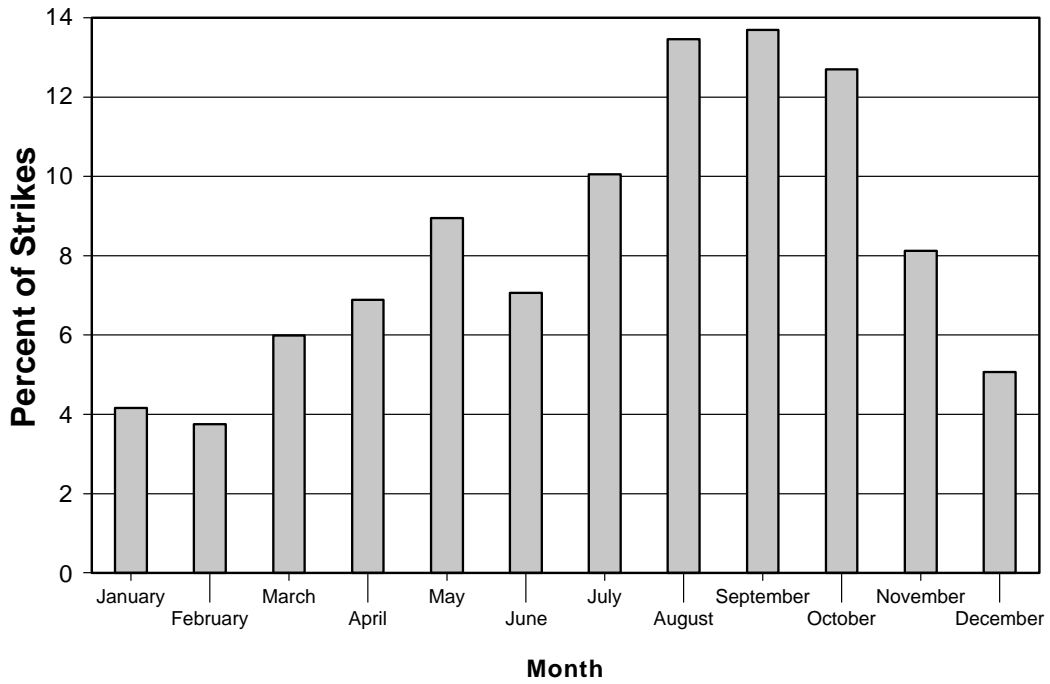
Source: U.S. Federal Aviation Administration

Table 5
Number of Reported Wildlife Strikes to U.S. Civil Aircraft by Month, 1991–1997

| Month | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| January | 93 | 75 | 95 | 87 | 99 | 108 | 128 | 685 | 98 | 4 |
| February | 79 | 83 | 94 | 75 | 73 | 95 | 119 | 618 | 88 | 4 |
| March | 136 | 110 | 132 | 123 | 159 | 125 | 202 | 987 | 141 | 6 |
| April | 145 | 127 | 183 | 147 | 153 | 158 | 223 | 1,136 | 162 | 7 |
| May | 188 | 206 | 196 | 172 | 221 | 227 | 265 | 1,475 | 211 | 9 |
| June | 120 | 191 | 158 | 138 | 160 | 167 | 229 | 1,163 | 166 | 7 |
| July | 194 | 222 | 226 | 227 | 251 | 252 | 284 | 1,656 | 237 | 10 |
| August | 238 | 353 | 289 | 303 | 303 | 323 | 409 | 2,218 | 317 | 13 |
| September | 281 | 298 | 341 | 314 | 291 | 329 | 401 | 2,255 | 322 | 14 |
| October | 253 | 242 | 249 | 269 | 332 | 335 | 412 | 2,092 | 299 | 13 |
| November | 187 | 153 | 127 | 202 | 218 | 215 | 251 | 1,353 | 193 | 8 |
| December | 110 | 99 | 94 | 112 | 132 | 151 | 138 | 836 | 119 | 5 |
| Unknown | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 3 | 1 | <1 |
| Total | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | 100 |
| Mammals | | | | | | | | | | |
| January | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 17 | 2 | 4 |
| February | 1 | 1 | 1 | 2 | 2 | 2 | 0 | 9 | 1 | 2 |
| March | 0 | 1 | 1 | 6 | 11 | 4 | 6 | 29 | 4 | 7 |
| April | 0 | 2 | 4 | 1 | 3 | 2 | 4 | 16 | 2 | 4 |
| May | 0 | 3 | 4 | 3 | 0 | 7 | 5 | 22 | 3 | 5 |
| June | 0 | 5 | 8 | 4 | 6 | 11 | 7 | 41 | 6 | 9 |
| July | 7 | 5 | 5 | 6 | 5 | 6 | 7 | 41 | 6 | 9 |
| August | 3 | 3 | 1 | 4 | 6 | 14 | 8 | 39 | 6 | 9 |
| September | 3 | 9 | 7 | 7 | 10 | 9 | 5 | 50 | 7 | 11 |
| October | 4 | 8 | 9 | 13 | 9 | 12 | 10 | 65 | 9 | 15 |
| November | 10 | 12 | 8 | 17 | 10 | 15 | 8 | 80 | 11 | 18 |
| December | 6 | 4 | 4 | 7 | 6 | 3 | 7 | 37 | 5 | 8 |
| Total | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |

Source: U.S. Federal Aviation Administration

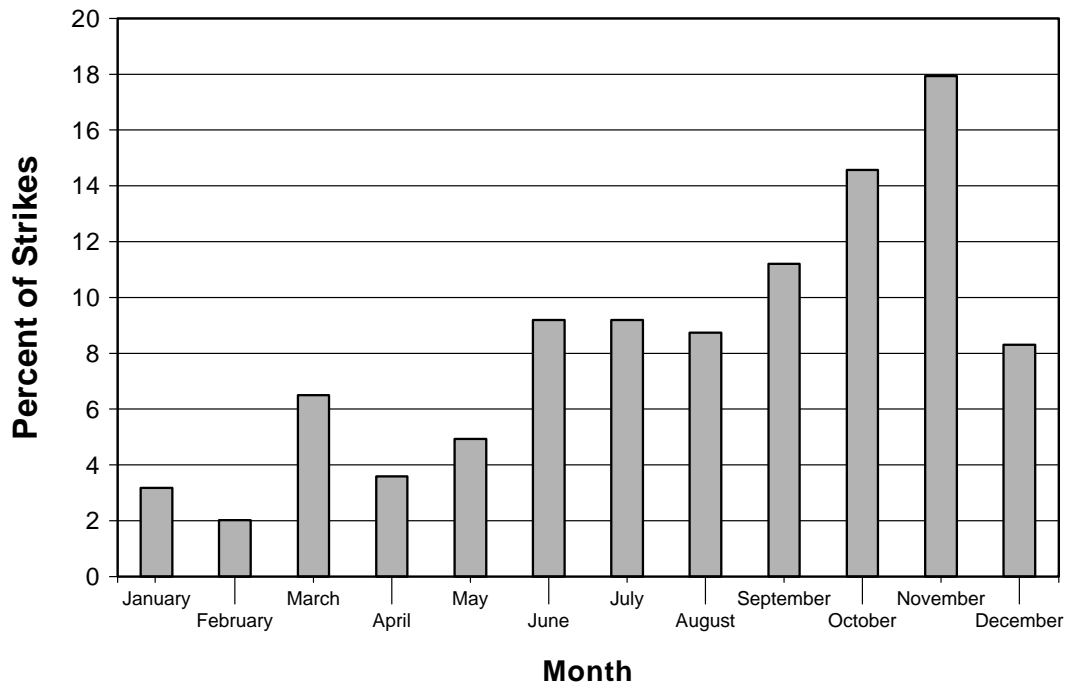
Percentage of Reported Bird Strikes to U.S. Civil Aircraft by Month, 1991–1997



Source: U.S. Federal Aviation Administration

Figure 1

Percentage of Reported Mammal Strikes to U.S. Civil Aircraft by Month, 1991–1997



Source: U.S. Federal Aviation Administration

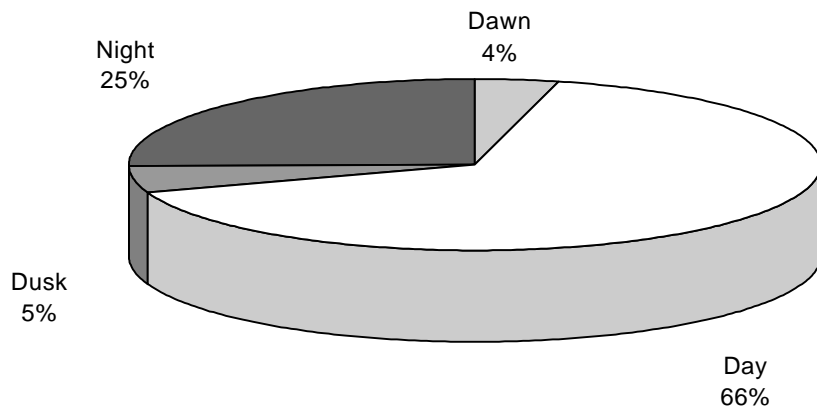
Figure 2

Table 6
Reported Time of Occurrence of Wildlife Strikes to U.S. Civil Aircraft, 1991–1997

| Time | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Dawn | 42 | 80 | 82 | 71 | 106 | 114 | 122 | 617 | 88 | 4 |
| Day | 1,321 | 1,408 | 1,376 | 1,406 | 1,463 | 1,481 | 1,720 | 10,175 | 1,454 | 62 |
| Dusk | 73 | 86 | 123 | 138 | 113 | 126 | 148 | 807 | 115 | 5 |
| Night | 503 | 536 | 517 | 486 | 565 | 548 | 750 | 3,905 | 558 | 24 |
| Unknown | 85 | 52 | 86 | 68 | 145 | 216 | 321 | 973 | 139 | 5 |
| Total | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | 100 |
| Mammals | | | | | | | | | | |
| Dawn | 1 | 2 | 2 | 0 | 1 | 1 | 1 | 8 | 1 | 2 |
| Day | 6 | 9 | 21 | 9 | 16 | 23 | 14 | 98 | 14 | 22 |
| Dusk | 5 | 10 | 2 | 5 | 6 | 9 | 5 | 42 | 6 | 9 |
| Night | 22 | 30 | 25 | 50 | 35 | 45 | 41 | 248 | 35 | 56 |
| Unknown | 2 | 4 | 5 | 8 | 12 | 10 | 9 | 50 | 7 | 11 |
| Total | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |

Source: U.S. Federal Aviation Administration

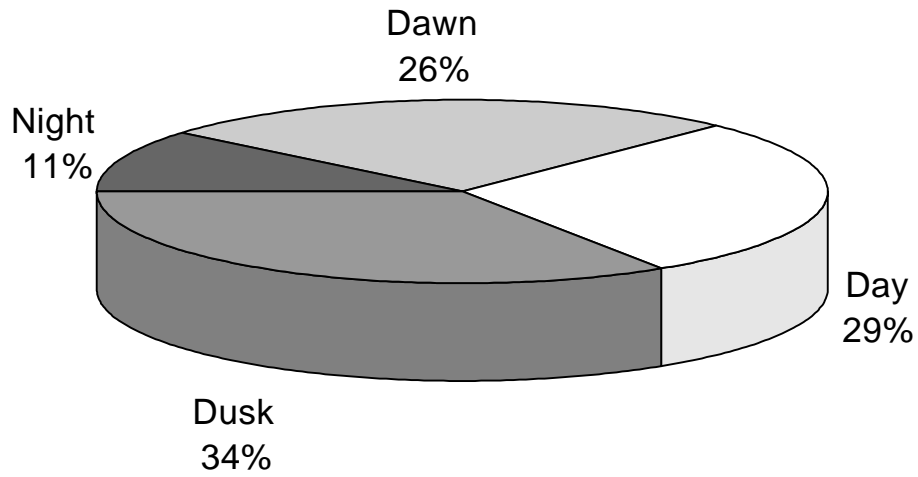
Percentage of Bird Strikes to U.S. Civil Aircraft by Reported Time of Occurrence, 1991–1997



Source: U.S. Federal Aviation Administration

Figure 3a

Percentage of Bird Strikes to U.S. Civil Aircraft per Hour by Known Time of Day, 1991–1997

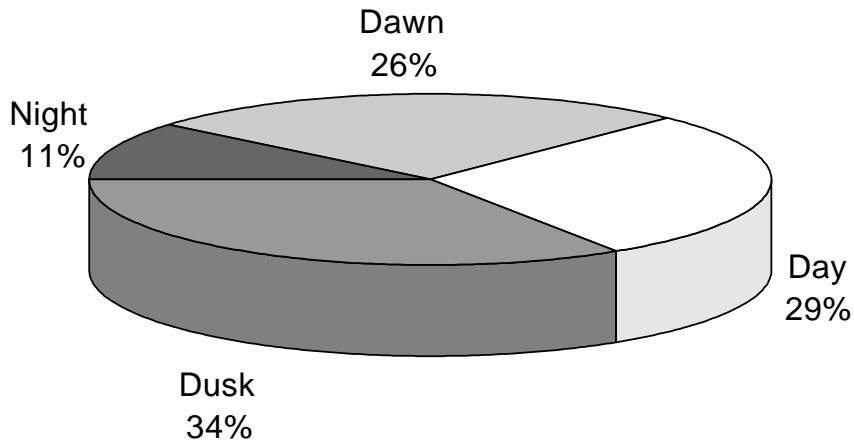


Note: Strikes/hour were calculated using an average day length and night length of 11.25 hours each, and an average dawn length and dusk length of 0.75 hours each.

Source: U.S. Federal Aviation Administration

Figure 3b

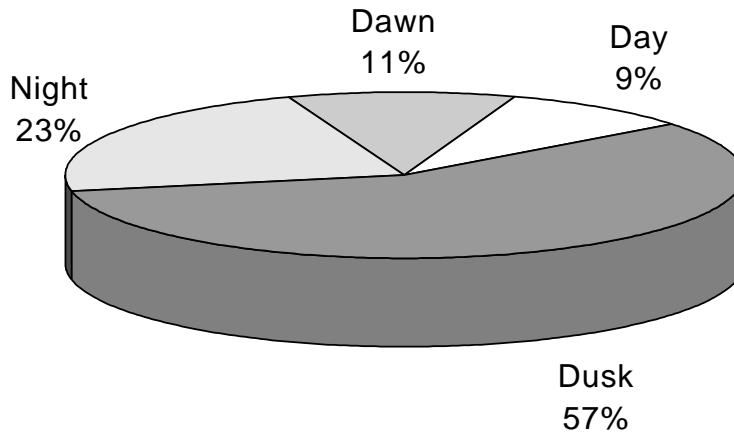
**Percentage of Mammal Strikes to U.S. Civil Aircraft
By Reported Time of Occurrence, 1991–1997**



Source: U.S. Federal Aviation Administration

Figure 4a

**Percentage of Mammal Strikes to U.S. Civil Aircraft per Hour
By Known Time of Day, 1991–1997**



Note: Strikes/hour were calculated using an average day length and night length of 11.25 hours each, and an average dawn length and dusk length of 0.75 hours each.

Source: U.S. Federal Aviation Administration

Figure 4b

Table 7
Reported Phase of Flight at Time of Wildlife Strikes to U.S. Civil Aircraft, 1991–1997

| Phase of Flight | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|-----------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Taxi | 5 | 10 | 8 | 9 | 12 | 9 | 7 | 60 | 9 | <1 |
| Takeoff | 376 | 366 | 516 | 454 | 449 | 454 | 495 | 3,110 | 444 | 19 |
| Climb | 366 | 370 | 233 | 349 | 403 | 413 | 516 | 2,650 | 379 | 16 |
| Cruise | 68 | 78 | 76 | 72 | 81 | 78 | 102 | 555 | 79 | 3 |
| Descent | 70 | 73 | 66 | 65 | 92 | 81 | 101 | 548 | 78 | 3 |
| Approach | 758 | 810 | 768 | 715 | 777 | 800 | 1,011 | 5,639 | 806 | 34 |
| Landing roll | 307 | 351 | 344 | 399 | 347 | 382 | 397 | 2,527 | 361 | 15 |
| Parked | 0 | 3 | 0 | 1 | 3 | 1 | 1 | 9 | 1 | <1 |
| Not reported | 74 | 101 | 173 | 105 | 228 | 267 | 431 | 1,379 | 197 | 8 |
| Total | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | 100 |
| Mammals | | | | | | | | | | |
| Taxi | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 1 |
| Takeoff | 12 | 16 | 12 | 28 | 22 | 23 | 22 | 135 | 19 | 30 |
| Climb | 4 | 0 | 0 | 0 | 0 | 2 | 1 | 7 | 1 | 2 |
| Cruise | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <1 | <1 |
| Descent | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | <1 | <1 |
| Approach | 4 | 4 | 9 | 2 | 7 | 5 | 2 | 33 | 5 | 7 |
| Landing roll | 12 | 30 | 25 | 37 | 30 | 41 | 31 | 206 | 29 | 46 |
| Parked | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Not reported | 2 | 3 | 9 | 4 | 11 | 17 | 13 | 59 | 8 | 13 |
| Total | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |

Source: U.S. Federal Aviation Administration

Table 8
Number of Reported Bird Strikes to U.S. Civil Aircraft by Altitude, 1991–1997

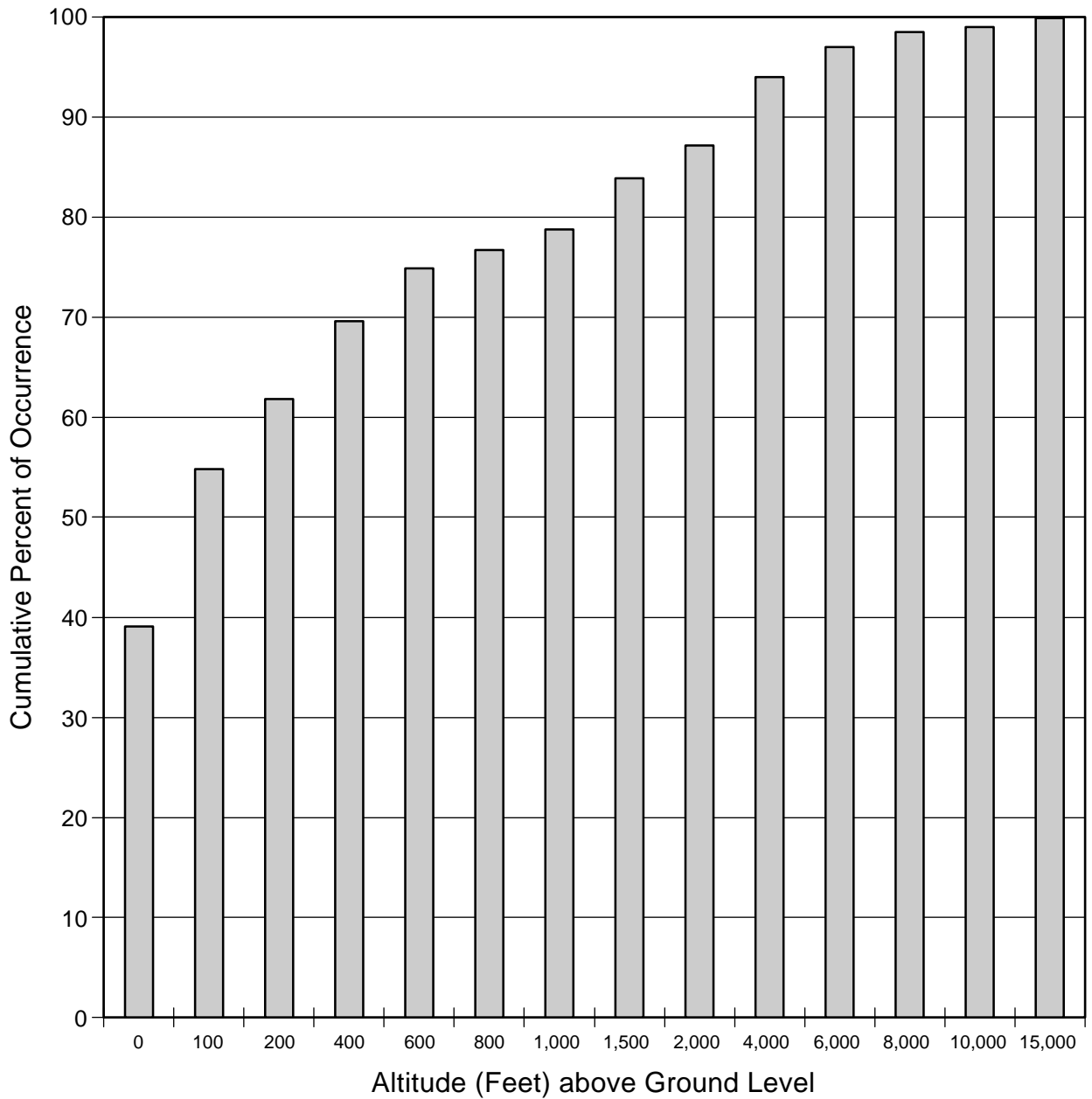
| Altitude of Strike ¹ (Feet AGL) | Number of Reported Strikes | | | | | | | | | | Seven- year Average | Percent of Total | Cumulative Percent of Total |
|---|----------------------------|-------|-------|-------|-------|-------|-------|--------|-------|----|---------------------------|---------------------|-----------------------------------|
| | Years | | | | | | | Total | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | | | | |
| 0 To 0 | 688 | 727 | 675 | 818 | 723 | 833 | 897 | 5,361 | 766 | 39 | 39.1 | | |
| 1 To 99 | 294 | 341 | 305 | 272 | 307 | 292 | 338 | 2,149 | 307 | 16 | 54.8 | | |
| 100 To 199 | 139 | 130 | 127 | 140 | 133 | 126 | 160 | 955 | 136 | 7 | 61.8 | | |
| 200 To 299 | 80 | 94 | 94 | 94 | 102 | 69 | 93 | 626 | 89 | 5 | 66.4 | | |
| 300 To 399 | 60 | 76 | 53 | 65 | 68 | 59 | 63 | 444 | 63 | 3 | 69.6 | | |
| 400 To 499 | 38 | 23 | 49 | 29 | 36 | 37 | 43 | 255 | 36 | 2 | 71.5 | | |
| 500 To 599 | 76 | 61 | 61 | 57 | 60 | 73 | 79 | 467 | 67 | 3 | 74.9 | | |
| 600 To 699 | 25 | 22 | 23 | 18 | 17 | 20 | 17 | 142 | 20 | 1 | 75.9 | | |
| 700 To 799 | 15 | 15 | 14 | 16 | 13 | 19 | 18 | 110 | 16 | 1 | 76.7 | | |
| 800 To 899 | 25 | 36 | 19 | 33 | 25 | 32 | 36 | 206 | 29 | 2 | 78.2 | | |
| 900 To 999 | 16 | 8 | 11 | 4 | 14 | 7 | 22 | 82 | 12 | 1 | 78.8 | | |
| 1,000 To 1,499 | 100 | 103 | 97 | 98 | 96 | 97 | 106 | 697 | 100 | 5 | 83.9 | | |
| 1,500 To 1,999 | 61 | 65 | 67 | 53 | 64 | 55 | 84 | 449 | 64 | 3 | 87.2 | | |
| 2,000 To 2,999 | 74 | 80 | 70 | 65 | 74 | 94 | 93 | 550 | 79 | 4 | 91.2 | | |
| 3,000 To 3,999 | 60 | 45 | 50 | 40 | 61 | 59 | 76 | 391 | 56 | 3 | 94.0 | | |
| 4,000 To 4,999 | 31 | 20 | 26 | 25 | 47 | 30 | 52 | 231 | 33 | 2 | 95.7 | | |
| 5,000 To 5,999 | 19 | 22 | 24 | 29 | 19 | 31 | 25 | 169 | 24 | 1 | 97.0 | | |
| 6,000 To 6,999 | 20 | 17 | 22 | 16 | 14 | 9 | 22 | 120 | 17 | 1 | 97.8 | | |
| 7,000 To 7,999 | 11 | 14 | 8 | 7 | 15 | 12 | 20 | 87 | 12 | 1 | 98.5 | | |
| 8,000 To 8,999 | 3 | 8 | 8 | 3 | 9 | 10 | 7 | 48 | 7 | <1 | 98.8 | | |
| 9,000 To 9,999 | 2 | 4 | 3 | 6 | 2 | 6 | 8 | 31 | 4 | <1 | 99.1 | | |
| 10,000 To 14,999 | 18 | 18 | 10 | 10 | 11 | 18 | 21 | 106 | 15 | 1 | 99.8 | | |
| 15,000 To 19,999 | 8 | 2 | 2 | 0 | 1 | 0 | 0 | 13 | 2 | <1 | 99.9 | | |
| 20,000 To 29,999 | 0 | 0 | 0 | 0 | 2 | 2 | 1 | 5 | 1 | <1 | 100.0 | | |
| 30,000 To 39,000 | 4 | 1 | 0 | 0 | 1 | 0 | 0 | 6 | 1 | <1 | 100.0 | | |
| Total known | 1,867 | 1,932 | 1,818 | 1,898 | 1,914 | 1,990 | 2,281 | 13,700 | 1,957 | | | | |
| Unknown | 157 | 230 | 366 | 271 | 478 | 495 | 780 | 2,777 | 397 | | | | |
| Grand total | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | | | | |

¹ On Oct. 23, 1991, a Douglas DC-8-62 struck a "blue bird with red feet" at 39,000 feet. This is the highest reported altitude for a bird strike in the United States.

AGL = Above ground level

Source: U.S. Federal Aviation Administration

Cumulative Percentage of Reported Bird Strikes to U.S. Civil Aircraft by Altitude, 1991–1997



Source: U.S. Federal Aviation Administration

Figure 5

Table 9a
Number of Reported Wildlife Strikes that Had a Negative Effect on the Flight for the
24 Most Commonly Involved U.S. Fixed-wing Aircraft Types, 1991–1997

| Aircraft | Engine ¹ | Number of Reported Strikes | | | | | | | | Total | Seven-year Average | Percent of Total | | |
|--------------------|---------------------|----------------------------|------------|------------|------------|------------|------------|------------|--------------|------------|--------------------|--------------------------|-------------------------|--|
| | | Years | | | | | | | Strikes | | | Flight Time ² | U.S. Fleet ³ | |
| | | 1991 | 1992 | 1993 | 1994 | 1994 | 1996 | 1997 | | | | | | |
| Boeing 737 | TF/TJ | 30 | 36 | 41 | 60 | 57 | 75 | 74 | 373 | 53 | 20 | 18 | 15 | |
| MD-80/DC-9 | TF | 9 | 15 | 16 | 30 | 36 | 33 | 27 | 166 | 24 | 9 | 18 | 16 | |
| BAe Jetstream 31 | TP | 10 | 14 | 10 | 19 | 15 | 15 | 10 | 93 | 13 | 5 | 3 | 3 | |
| Cessna 172 | PS | 7 | 12 | 7 | 14 | 7 | 8 | 7 | 62 | 9 | 3 | - | - | |
| Saab 340 | TP | 5 | 7 | 6 | 10 | 9 | 11 | 7 | 55 | 8 | 3 | 3 | 3 | |
| Piper PA-28 | PS | 4 | 4 | 5 | 11 | 8 | 9 | 13 | 54 | 8 | 3 | - | <1 | |
| Boeing 727 | TJ | 5 | 5 | 10 | 9 | 4 | 11 | 9 | 53 | 8 | 3 | 12 | 14 | |
| Boeing 757 | TF | 1 | 8 | 7 | 12 | 11 | 3 | 10 | 52 | 7 | 3 | 7 | 6 | |
| Beech 1900 | TP | 4 | 3 | 7 | 4 | 12 | 10 | 7 | 47 | 7 | 2 | 3 | 4 | |
| Learjet | TJ | 6 | 4 | 5 | 5 | 8 | 8 | 7 | 43 | 6 | 2 | <1 | <1 | |
| Boeing 747 | TF | 3 | 4 | 6 | 5 | 10 | 8 | 2 | 38 | 5 | 2 | 4 | 3 | |
| Cessna Citation | TF | 6 | 6 | 3 | 8 | 7 | 4 | 4 | 38 | 5 | 2 | - | - | |
| ATR 42/72 | TP | 4 | 3 | 3 | 3 | 7 | 4 | 8 | 32 | 5 | 2 | <1 | - | |
| Cessna 152 | PS | 5 | 3 | 3 | 3 | 5 | 5 | 8 | 32 | 5 | 2 | - | - | |
| Bombardier Dash 8 | TP | 0 | 3 | 2 | 4 | 7 | 4 | 10 | 30 | 4 | 2 | 2 | 2 | |
| EMB 120 | TP | 3 | 0 | 2 | 6 | 3 | 5 | 5 | 24 | 3 | 1 | 3 | 3 | |
| Fokker 100 | TF | 0 | 3 | 3 | 7 | 4 | 3 | 2 | 22 | 3 | 1 | 0 | 0 | |
| Beech 55 | PS | 1 | 1 | 5 | 6 | 4 | 0 | 3 | 20 | 3 | 1 | 0 | 0 | |
| Cessna 150 | PS | 3 | 0 | 1 | 4 | 7 | 2 | 3 | 20 | 3 | 1 | - | - | |
| Boeing 767 | TF | 2 | 2 | 3 | 2 | 5 | 5 | 0 | 19 | 3 | 1 | 4 | 3 | |
| Beech 35 | PS | 1 | 3 | 1 | 1 | 5 | 7 | 1 | 19 | 3 | 1 | - | - | |
| Cessna 310 | PS | 0 | 2 | 2 | 2 | 5 | 5 | 3 | 19 | 3 | 1 | 0 | <1 | |
| Beech 200 | TP | 2 | 1 | 0 | 0 | 3 | 4 | 5 | 15 | 2 | 1 | <1 | <1 | |
| Airbus A300 | TF | 3 | 1 | 2 | 4 | 1 | 1 | 2 | 14 | 2 | 1 | 1 | 1 | |
| Total | | 114 | 140 | 150 | 229 | 240 | 240 | 227 | 1,340 | 191 | 70 | 79 | 73 | |
| Unknown/other | | 45 | 73 | 59 | 86 | 102 | 100 | 106 | 571 | 82 | 30 | 21 | 27 | |
| Grand total | | 159 | 213 | 209 | 315 | 342 | 340 | 333 | 1,911 | 273 | 100 | 100 | 100 | |

¹ TF = Turbofan, TJ = Turbojet, TP = Turboprop, PS = Piston

² Percentage of the total flight hours for U.S. civil air carrier aircraft by aircraft type, reported to be in operation by U.S. commercial air carriers, 1991–1996. Data for 1997 were not available.

³ The number of aircraft is the monthly average reported in use for the last three months of the year, 1991–1996. Data for 1997 were not available.

ATR = Avions de Transport Regional

BAe = British Aerospace

DHC = de Havilland Canada

EMB = Empresa Brasileira de Aeronautica (Embraer)

MD = McDonnell Douglas

Source: U.S. Federal Aviation Administration

Table 9b
Number of Reported Wildlife Strikes that Damaged an Aircraft Component or
Resulted in Lost Time or Money for the 24 Most Commonly Involved
U.S. Fixed-wing Aircraft Types, 1991–1997

| Aircraft | Engine ¹ | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of total | | |
|-------------------|---------------------|----------------------------|------|------|------|------|------|------|-------|--------------------|------------------|--------------------------|-------------------------|
| | | Years | | | | | | | | | Strikes | Flight Time ² | U.S. Fleet ³ |
| | | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | | | |
| Boeing 737 | TF/TJ | 59 | 52 | 61 | 76 | 101 | 130 | 108 | | 84 | 20 | 18 | 15 |
| MD-80/DC-9 | TF | 28 | 30 | 31 | 41 | 48 | 38 | 52 | 268 | 38 | 9 | 18 | 16 |
| BAe Jetstream 31 | TP | 16 | 26 | 20 | 22 | 14 | 13 | 14 | 125 | 18 | 4 | 3 | 3 |
| Boeing 727 | TJ | 17 | 12 | 14 | 15 | 16 | 16 | 18 | 108 | 15 | 4 | 12 | 14 |
| Boeing 757 | TF | 5 | 9 | 15 | 12 | 24 | 16 | 21 | 102 | 15 | 4 | 7 | 6 |
| Beech 1900 | TP | 2 | 8 | 12 | 9 | 13 | 14 | 26 | 84 | 12 | 3 | 3 | 4 |
| Cessna 172 | PS | 12 | 16 | 11 | 15 | 12 | 13 | 4 | 83 | 12 | 3 | - | - |
| Piper PA-28 | PS | 13 | 9 | 10 | 9 | 6 | 15 | 14 | 76 | 11 | 3 | - | <1 |
| Boeing 747 | TF | 7 | 6 | 14 | 6 | 13 | 12 | 10 | 68 | 10 | 2 | 4 | 3 |
| Cessna Citation | TF | 9 | 8 | 5 | 12 | 15 | 5 | 8 | 62 | 9 | 2 | - | - |
| Learjet | TJ | 12 | 8 | 7 | 7 | 8 | 10 | 6 | 58 | 8 | 2 | <1 | <1 |
| Saab 340 | TP | 3 | 6 | 4 | 7 | 9 | 11 | 9 | 49 | 7 | 2 | 3 | 3 |
| Boeing 767 | TF | 8 | 1 | 7 | 2 | 9 | 12 | 8 | 47 | 7 | 2 | 5 | 3 |
| Fokker 100 | TF | 1 | 1 | 4 | 6 | 8 | 9 | 14 | 43 | 6 | 1 | 0 | 0 |
| Beech 55 | PS | 3 | 3 | 9 | 7 | 4 | 3 | 6 | 35 | 5 | 1 | <1 | 0 |
| Cessna 152 | PS | 6 | 6 | 3 | 2 | 9 | 4 | 4 | 34 | 5 | 1 | - | - |
| ATR 42 | TP | 7 | 5 | 6 | 6 | 4 | 2 | 1 | 31 | 4 | 1 | <1 | - |
| Cessna 310 | PS | 3 | 3 | 3 | 4 | 8 | 6 | 4 | 31 | 4 | 1 | <1 | <1 |
| EMB 120 | TP | 3 | 2 | 6 | 7 | 2 | 4 | 7 | 31 | 4 | 1 | 3 | 3 |
| Beech 35 | PS | 3 | 3 | 6 | 4 | 5 | 6 | 3 | 30 | 4 | 1 | - | - |
| Cessna 182 | PS | 2 | 2 | 3 | 5 | 3 | 7 | 7 | 29 | 4 | 1 | - | - |
| Piper PA-31 | PS | 3 | 3 | 5 | 3 | 4 | 5 | 6 | 29 | 4 | 1 | <1 | 1 |
| Airbus A320 | TF | 2 | 0 | 2 | 4 | 6 | 4 | 9 | 27 | 4 | 1 | <1 | 1 |
| Bombardier Dash 8 | TP | 1 | 2 | 1 | 3 | 4 | 7 | 9 | 27 | 4 | 1 | 2 | 2 |
| Total | | 225 | 221 | 259 | 284 | 345 | 362 | 368 | 2,064 | 295 | 71 | 79 | 75 |
| Unknown/other | | 103 | 106 | 111 | 114 | 129 | 136 | 137 | 836 | 119 | 29 | 21 | 25 |
| Grand total | | 328 | 327 | 370 | 398 | 474 | 498 | 505 | 2,900 | 414 | 100 | 100 | 100 |

¹ TF = Turbofan, TJ = Turbojet, TP = Turboprop, PS = Piston

² Percentage of the total flight hours for U.S. civil air carrier aircraft by aircraft type, reported to be in operation by U.S. commercial air carriers, 1991–1996. Data for 1997 were not available.

³ The number of aircraft is the monthly average reported in use for the last three months of the year, 1991–1996. Data for 1997 were not available.

ATR = Avions de Transport Regional

BAe = British Aerospace

DHC = de Havilland Canada

EMB = Empresa Brasileira de Aeronautica (Embraer)

MD = McDonnell Douglas

Source: U.S. Federal Aviation Administration

Table 10a
U.S. Civil Aircraft Components Reported as Being Struck and as
Being Damaged by Birds, 1991–1997

| Parts of Aircraft | Number of Reported Strikes | | | | | | | Total | Seven-year Average |
|----------------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|
| | Years | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | |
| Windshield | | | | | | | | | |
| Struck | 269 | 345 | 365 | 405 | 402 | 403 | 584 | 2,773 | 396 |
| Damaged | 22 | 28 | 25 | 38 | 42 | 31 | 40 | 226 | 32 |
| Engine | | | | | | | | | |
| Struck | 227 | 267 | 260 | 297 | 390 | 377 | 428 | 2,246 | 321 |
| Damaged | 106 | 100 | 120 | 123 | 152 | 180 | 140 | 921 | 132 |
| Nose | | | | | | | | | |
| Struck | 191 | 225 | 253 | 265 | 306 | 300 | 444 | 1,984 | 283 |
| Damaged | 24 | 17 | 26 | 19 | 18 | 30 | 34 | 168 | 24 |
| Wing/rotor | | | | | | | | | |
| Struck | 219 | 244 | 249 | 258 | 312 | 284 | 353 | 1,919 | 274 |
| Damaged | 85 | 83 | 88 | 91 | 110 | 81 | 98 | 636 | 91 |
| Radome | | | | | | | | | |
| Struck | 160 | 196 | 201 | 226 | 255 | 238 | 385 | 1,661 | 237 |
| Damaged | 39 | 24 | 25 | 41 | 47 | 35 | 56 | 267 | 38 |
| Fuselage | | | | | | | | | |
| Struck | 171 | 224 | 215 | 230 | 222 | 257 | 328 | 1,647 | 235 |
| Damaged | 14 | 12 | 10 | 10 | 9 | 17 | 19 | 91 | 13 |
| Landing Gear | | | | | | | | | |
| Struck | 79 | 104 | 92 | 123 | 127 | 114 | 168 | 807 | 115 |
| Damaged | 9 | 16 | 10 | 15 | 17 | 14 | 25 | 106 | 15 |
| Propeller | | | | | | | | | |
| Struck | 50 | 86 | 75 | 84 | 98 | 74 | 98 | 565 | 81 |
| Damaged | 5 | 7 | 13 | 9 | 7 | 8 | 16 | 65 | 9 |
| Other | | | | | | | | | |
| Struck | 25 | 58 | 81 | 90 | 112 | 68 | 73 | 507 | 72 |
| Damaged | 20 | 24 | 37 | 41 | 49 | 30 | 38 | 239 | 34 |
| Tail | | | | | | | | | |
| Struck | 21 | 26 | 26 | 27 | 38 | 41 | 37 | 216 | 31 |
| Damaged | 12 | 10 | 13 | 13 | 15 | 18 | 18 | 99 | 14 |
| Light | | | | | | | | | |
| Struck | 15 | 11 | 23 | 18 | 18 | 16 | 36 | 137 | 20 |
| Damaged | 11 | 8 | 21 | 15 | 16 | 12 | 29 | 112 | 16 |
| Total parts struck | 1,427 | 1,786 | 1,840 | 2,023 | 2,280 | 2,172 | 2,934 | 14,462 | 2,066 |
| Total parts damaged | 347 | 329 | 388 | 415 | 482 | 456 | 513 | 2,930 | 419 |

Source: U.S. Federal Aviation Administration

Table 10b
U.S. Civil Aircraft Components Reported as Being Struck and as
Being Damaged by Mammals, 1991–1997

| Parts of Aircraft | Number of Reported Strikes | | | | | | | Total | Seven-year Average |
|----------------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|--------------------|
| | Years | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | |
| Landing Gear | | | | | | | | | |
| Struck | 11 | 11 | 15 | 28 | 23 | 21 | 29 | 138 | 20 |
| Damaged | 7 | 11 | 11 | 15 | 16 | 19 | 20 | 99 | 14 |
| Propeller | | | | | | | | | |
| Struck | 3 | 6 | 2 | 13 | 11 | 18 | 10 | 63 | 9 |
| Damaged | 3 | 5 | 3 | 13 | 7 | 18 | 7 | 56 | 8 |
| Other | | | | | | | | | |
| Struck | 4 | 3 | 10 | 18 | 5 | 10 | 2 | 52 | 7 |
| Damaged | 5 | 3 | 10 | 15 | 5 | 11 | 2 | 51 | 7 |
| Wing/rotor | | | | | | | | | |
| Struck | 3 | 3 | 4 | 11 | 8 | 12 | 9 | 50 | 7 |
| Damaged | 1 | 3 | 3 | 12 | 8 | 14 | 9 | 50 | 7 |
| Engine | | | | | | | | | |
| Struck | 3 | 3 | 2 | 8 | 5 | 8 | 5 | 34 | 5 |
| Damaged | 5 | 3 | 2 | 7 | 4 | 6 | 6 | 33 | 5 |
| Fuselage | | | | | | | | | |
| Struck | 0 | 1 | 3 | 8 | 6 | 5 | 4 | 27 | 4 |
| Damaged | 0 | 0 | 3 | 7 | 6 | 6 | 5 | 27 | 4 |
| Nose | | | | | | | | | |
| Struck | 0 | 1 | 3 | 3 | 4 | 2 | 6 | 19 | 3 |
| Damaged | 0 | 1 | 3 | 3 | 3 | 2 | 5 | 17 | 2 |
| Tail | | | | | | | | | |
| Struck | 0 | 5 | 0 | 3 | 2 | 6 | 1 | 17 | 2 |
| Damaged | 0 | 5 | 1 | 4 | 1 | 7 | 1 | 19 | 3 |
| Light | | | | | | | | | |
| Struck | 0 | 0 | 2 | 2 | 0 | 1 | 1 | 6 | 1 |
| Damaged | 0 | 0 | 1 | 2 | 0 | 1 | 1 | 5 | 1 |
| Radome | | | | | | | | | |
| Struck | 0 | 0 | 0 | 2 | 1 | 0 | 1 | 4 | 1 |
| Damaged | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 4 | 1 |
| Windshield | | | | | | | | | |
| Struck | 0 | 1 | 0 | 1 | 2 | 0 | 0 | 4 | 1 |
| Damaged | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 3 | <1 |
| Total parts struck | 24 | 34 | 41 | 97 | 67 | 83 | 68 | 414 | 59 |
| Total parts damaged | 21 | 31 | 38 | 81 | 51 | 84 | 58 | 364 | 52 |

Source: U.S. Federal Aviation Administration

Table 11
Reported Effect on Flight of Wildlife Strikes to U.S. Civil Aircraft, 1991–1997

| Effect on Flight | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|-----------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| None | 853 | 1,444 | 1,525 | 1,707 | 1,760 | 1,487 | 1,853 | 10,629 | 1,518 | 65 |
| Precautionary landing | 69 | 85 | 121 | 109 | 124 | 165 | 160 | 833 | 119 | 5 |
| Other | 25 | 38 | 141 | 93 | 105 | 42 | 53 | 497 | 71 | 3 |
| Aborted takeoff | 44 | 51 | 52 | 64 | 65 | 86 | 80 | 442 | 63 | 3 |
| Engine shutdown | 11 | 15 | 8 | 12 | 16 | 11 | 12 | 85 | 12 | 1 |
| Not reported | 1,022 | 529 | 337 | 184 | 322 | 694 | 903 | 3,991 | 570 | 24 |
| Total | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | 100 |
| Mammals | | | | | | | | | | |
| None | 7 | 10 | 11 | 21 | 24 | 14 | 15 | 102 | 15 | 23 |
| Precautionary landing | 2 | 1 | 2 | 5 | 7 | 5 | 3 | 25 | 4 | 6 |
| Other | 5 | 15 | 18 | 19 | 13 | 20 | 11 | 101 | 14 | 23 |
| Aborted takeoff | 5 | 7 | 3 | 12 | 10 | 11 | 9 | 57 | 8 | 13 |
| Engine shutdown | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 4 | 1 | 1 |
| Not reported | 17 | 21 | 20 | 15 | 15 | 38 | 31 | 157 | 22 | 35 |
| Total | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |

Source: U.S. Federal Aviation Administration

Table 12a
Identified Bird Groups Commonly Involved in Reported Wildlife Strikes
To U.S. Civil Aircraft, 1991–1997

| Wildlife Group | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|-----------------------|----------------------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Gulls/Terns | 367 | 367 | 360 | 321 | 317 | 346 | 371 | 2,449 | 350 | 31 |
| Gulls | 352 | 351 | 332 | 304 | 296 | 304 | 323 | 2,262 | 323 | 29 |
| Herring gulls | 9 | 7 | 6 | 3 | 6 | 8 | 23 | 62 | 9 | 1 |
| Laughing gulls | 5 | 3 | 5 | 5 | 4 | 8 | 9 | 39 | 6 | <1 |
| Ring-billed gulls | 1 | 3 | 13 | 3 | 8 | 22 | 14 | 64 | 9 | 1 |
| Bonaparte's gull | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 2 | <1 | <1 |
| Terns | 0 | 3 | 2 | 6 | 3 | 4 | 2 | 20 | 3 | <1 |
| Blackbirds | 135 | 140 | 147 | 135 | 135 | 146 | 172 | 1,010 | 144 | 13 |
| Starlings | 51 | 54 | 56 | 61 | 48 | 64 | 75 | 409 | 58 | 5 |
| Blackbirds | 77 | 77 | 82 | 63 | 72 | 64 | 78 | 513 | 73 | 7 |
| Meadowlarks | 7 | 9 | 9 | 11 | 14 | 16 | 17 | 83 | 12 | 1 |
| Myna | 0 | 0 | 0 | 0 | 1 | 2 | 2 | 5 | 1 | <1 |
| Raptors | 103 | 119 | 114 | 128 | 149 | 145 | 181 | 939 | 134 | 12 |
| Vultures | 27 | 22 | 15 | 23 | 18 | 23 | 23 | 151 | 22 | 2 |
| Eagles | 3 | 2 | 2 | 6 | 4 | 4 | 2 | 23 | 3 | <1 |
| Osprey | 3 | 1 | 2 | 2 | 0 | 1 | 6 | 15 | 2 | <1 |
| Hawks | 54 | 70 | 71 | 82 | 102 | 83 | 121 | 583 | 83 | 7 |
| Owls | 16 | 24 | 24 | 15 | 23 | 33 | 29 | 164 | 23 | 2 |
| Kites | 0 | 0 | 0 | 0 | 2 | 1 | 0 | 3 | <1 | <1 |
| Waterfowl | 106 | 107 | 142 | 145 | 139 | 144 | 146 | 929 | 133 | 12 |
| Ducks | 53 | 51 | 67 | 63 | 52 | 66 | 79 | 431 | 62 | 5 |
| Geese | 53 | 56 | 75 | 80 | 87 | 77 | 67 | 495 | 71 | 6 |
| Swans | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 3 | <1 | <1 |
| Doves | 118 | 107 | 117 | 140 | 112 | 137 | 130 | 861 | 123 | 11 |
| Doves | 52 | 45 | 62 | 85 | 42 | 72 | 51 | 409 | 58 | 5 |
| Rock doves | 62 | 49 | 39 | 38 | 53 | 47 | 49 | 337 | 48 | 4 |
| Mourning doves | 4 | 13 | 16 | 17 | 17 | 18 | 30 | 115 | 16 | 1 |
| Sparrows ¹ | 94 | 86 | 88 | 91 | 82 | 84 | 78 | 603 | 86 | 8 |
| Shorebirds | 26 | 23 | 21 | 31 | 29 | 38 | 52 | 220 | 31 | 3 |
| Unknown shorebirds | 4 | 4 | 1 | 2 | 1 | 4 | 4 | 20 | 3 | <1 |
| Pelicans | 3 | 4 | 1 | 3 | 3 | 2 | 1 | 17 | 2 | <1 |
| Cormorants | 0 | 3 | 1 | 0 | 2 | 5 | 0 | 11 | 2 | <1 |
| Plovers | 4 | 2 | 1 | 2 | 3 | 9 | 12 | 33 | 5 | <1 |
| Killdeer | 8 | 8 | 13 | 16 | 17 | 14 | 31 | 107 | 15 | 1 |
| Sandpipers | 7 | 2 | 4 | 8 | 3 | 4 | 4 | 32 | 5 | <1 |
| Swallows | 17 | 35 | 31 | 23 | 32 | 24 | 52 | 214 | 31 | 3 |
| Swallow | 12 | 15 | 17 | 14 | 23 | 12 | 19 | 112 | 16 | 1 |
| Purple martin | 2 | 12 | 3 | 3 | 1 | 5 | 4 | 30 | 4 | <1 |
| Barn swallow | 2 | 7 | 9 | 5 | 4 | 4 | 15 | 46 | 7 | 1 |
| Tree swallow | 1 | 1 | 2 | 0 | 4 | 3 | 14 | 25 | 4 | <1 |
| Cliff swallow | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <1 | <1 |
| Wading Birds | 30 | 17 | 27 | 21 | 29 | 36 | 38 | 198 | 28 | 3 |
| Hérons | 7 | 4 | 7 | 7 | 6 | 10 | 15 | 56 | 8 | 1 |
| Egrets | 21 | 10 | 17 | 13 | 16 | 18 | 18 | 113 | 16 | 1 |
| Cranes | 2 | 2 | 3 | 1 | 4 | 8 | 4 | 24 | 3 | <1 |
| Loons | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | <1 | <1 |
| Storks | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | <1 | <1 |
| Ibises | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | <1 | <1 |
| Corvids | 20 | 19 | 24 | 31 | 32 | 15 | 16 | 157 | 22 | 2 |
| Crows | 18 | 17 | 21 | 28 | 31 | 14 | 16 | 145 | 21 | 2 |
| Ravens | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 4 | 1 | <1 |
| Blue jays | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | <1 | <1 |
| Magpie | | 2 | 2 | 2 | | | | 6 | 1 | <1 |
| Gallinaceous | 8 | 7 | 8 | 3 | 3 | 7 | 8 | 44 | 6 | 1 |
| Turkey | 1 | 1 | 1 | 0 | 0 | 3 | 2 | 8 | 1 | <1 |
| Pheasant | 6 | 3 | 4 | 2 | 2 | 1 | 2 | 20 | 3 | <1 |
| Ptarmigan | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 2 | <1 | <1 |
| Quail | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 4 | 1 | <1 |
| Hungarian partridge | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | <1 | <1 |
| Guinea fowl | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | <1 | <1 |
| Grouse | 0 | 1 | 1 | 0 | 1 | 1 | 3 | 7 | 1 | <1 |
| American robin | 19 | 10 | 12 | 9 | 5 | 8 | 7 | 70 | 10 | 1 |
| Larks | 2 | 4 | 4 | 2 | 6 | 3 | 4 | 25 | 4 | <1 |
| Misc. birds | 6 | 23 | 17 | 21 | 40 | 26 | 34 | 167 | 25 | 2 |
| Total known | 1,051 | 1,064 | 1,112 | 1,101 | 1,110 | 1,159 | 1,289 | 7,886 | 1,127 | 100 |
| Unknown | 973 | 1,098 | 1,072 | 1,068 | 1,282 | 1,326 | 1,772 | 8,591 | 1,227 | |
| Total birds | 2,024 | 2,162 | 2,184 | 2,169 | 2,392 | 2,485 | 3,061 | 16,477 | 2,354 | |

¹Some of the birds identified on strike reports as "sparrows" probably belong to other groups such as snow buntings, finches, juncos, etc.

Source: U.S. Federal Aviation Administration

Table 12b
Identified Mammal Groups and Reptile Groups Commonly Involved in
Reported Wildlife Strikes to U.S. Civil Aircraft, 1991–1997

| Wildlife Group | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|---------------------------|----------------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Mammals | | | | | | | | | | |
| Ungulates | 26 | 46 | 36 | 56 | 39 | 59 | 44 | 307 | 44 | 69 |
| Deer | 21 | 28 | 29 | 50 | 32 | 28 | 13 | 201 | 29 | 45 |
| White-tailed Deer | 5 | 16 | 4 | 5 | 5 | 28 | 26 | 89 | 13 | 20 |
| Mule Deer | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | <1 | <1 |
| Elk | 0 | 1 | 2 | 1 | 0 | 2 | 1 | 7 | 1 | 2 |
| Cattle | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 3 | <1 | 1 |
| Moose | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 2 | <1 | <1 |
| Pronghorn | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 3 | <1 | 1 |
| Horse | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | <1 | <1 |
| Carnivores | 5 | 5 | 6 | 14 | 19 | 24 | 15 | 88 | 13 | 20 |
| Coyote | 3 | 1 | 4 | 10 | 11 | 11 | 8 | 48 | 7 | 11 |
| Dog | 0 | 1 | 0 | 1 | 4 | 4 | 0 | 10 | 1 | 2 |
| Fox | 2 | 1 | 0 | 2 | 2 | 5 | 3 | 15 | 2 | 3 |
| Raccoon | 0 | 0 | 2 | 1 | 1 | 0 | 3 | 7 | 1 | 2 |
| Striped Skunk | 0 | 0 | 0 | 0 | 1 | 4 | 1 | 6 | 1 | 1 |
| Domestic Cat | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 2 | <1 | <1 |
| Chiropteras | 3 | 2 | 6 | 1 | 4 | 1 | 1 | 18 | 3 | 4 |
| Bat | 3 | 2 | 6 | 1 | 4 | 1 | 1 | 18 | 3 | 4 |
| Rodents | 0 | 1 | 4 | 0 | 6 | 0 | 2 | 13 | 2 | 3 |
| Woodchuck | 0 | 1 | 4 | 0 | 5 | 0 | 2 | 12 | 2 | 3 |
| Muskrat | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | <1 | <1 |
| Marsupials | 0 | 0 | 3 | 0 | 1 | 1 | 4 | 9 | 1 | 2 |
| Opossum | 0 | 0 | 3 | 0 | 1 | 1 | 4 | 9 | 1 | 2 |
| Lagomorphs | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | <1 | 1 |
| Rabbit | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | <1 | 1 |
| Armadillo | 0 | 0 | 0 | 0 | 0 | 3 | 2 | 5 | 1 | 1 |
| Peccary | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | <1 | <1 |
| Unknown | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 2 | <1 | <1 |
| Total mammals | 36 | 55 | 55 | 72 | 70 | 88 | 70 | 446 | 64 | 100 |
| Reptiles | | | | | | | | | | |
| Turtles | 0 | 1 | 0 | 0 | 6 | 1 | 10 | 18 | 3 | 69 |
| Turtle | 0 | 1 | 0 | 0 | 4 | 0 | 7 | 12 | 2 | 46 |
| Florida soft shell turtle | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 3 | <1 | 12 |
| Box turtle | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 3 | <1 | 12 |
| Alligators | 0 | 0 | 0 | 1 | 2 | 1 | 4 | 8 | 1 | 31 |
| Total reptiles | 0 | 1 | 0 | 1 | 8 | 2 | 14 | 26 | 4 | 100 |

Source: U.S. Federal Aviation Administration

Table 13
Number of Reported Wildlife Strikes Causing Damage to One or More
Components of a U.S. Civil Aircraft by Wildlife Group, 1991–1997

| Wildlife Group | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|---------------------|----------------------------|------------|------------|------------|------------|------------|------------|--------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Gulls/terns | 53 | 63 | 60 | 58 | 69 | 63 | 70 | 436 | 62 | 32 |
| Waterfowl | 52 | 52 | 57 | 64 | 72 | 61 | 64 | 422 | 60 | 31 |
| Raptors | 32 | 28 | 30 | 41 | 29 | 30 | 35 | 225 | 32 | 17 |
| Doves | 19 | 7 | 14 | 15 | 16 | 15 | 8 | 94 | 13 | 7 |
| Blackbirds | 5 | 4 | 11 | 8 | 8 | 9 | 13 | 58 | 8 | 4 |
| Wading birds | 6 | 2 | 8 | 4 | 3 | 7 | 10 | 40 | 6 | 3 |
| Shorebirds | 5 | 6 | 3 | 4 | 3 | 2 | 6 | 29 | 4 | 2 |
| Corvids | 0 | 2 | 0 | 6 | 4 | 1 | 3 | 16 | 2 | 1 |
| Sparrows | 2 | 1 | 3 | 4 | 2 | 3 | 1 | 16 | 2 | 1 |
| Gallinaceous | 1 | 2 | 2 | 1 | 0 | 2 | 1 | 9 | 1 | 1 |
| Miscellaneous birds | 1 | 1 | 1 | 2 | 2 | 3 | 1 | 11 | 2 | 1 |
| Total known | 176 | 168 | 189 | 207 | 208 | 196 | 212 | 1,356 | 194 | 100 |
| Unknown | 118 | 108 | 135 | 130 | 204 | 209 | 201 | 1,105 | 158 | |
| Total birds | 294 | 276 | 324 | 337 | 412 | 405 | 413 | 2,461 | 352 | |
| Mammals | | | | | | | | | | |
| Ungulates | 12 | 25 | 24 | 38 | 30 | 47 | 31 | 207 | 30 | 97 |
| Carnivores | 1 | 1 | 0 | 1 | 1 | 1 | 0 | 5 | 1 | 2 |
| Chiropteras | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <1 | <1 |
| Total mammals | 13 | 26 | 24 | 40 | 31 | 48 | 31 | 213 | 30 | 100 |
| Reptiles | | | | | | | | | | |
| Alligators | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <1 | 50 |
| Turtles | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | <1 | 50 |
| Total reptiles | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | <1 | 100 |
| Grand total | 307 | 302 | 348 | 378 | 444 | 453 | 444 | 2,676 | 382 | |

Source: U.S. Federal Aviation Administration

Table 14
Number of Reported Wildlife Strikes Having a Negative Effect on Flight
Of a U.S. Civil Aircraft by Wildlife Group, 1991–1997

| Wildlife Group | Number of Reported Strikes | | | | | | | Total | Seven-year Average | Percent of Total |
|---------------------|----------------------------|------|------|------|------|------|------|-------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Gulls/terns | 35 | 39 | 63 | 51 | 58 | 61 | 54 | 361 | 52 | 35 |
| Waterfowl | 23 | 17 | 32 | 40 | 37 | 31 | 25 | 205 | 29 | 20 |
| Raptors | 14 | 20 | 29 | 25 | 18 | 20 | 26 | 152 | 22 | 15 |
| Doves | 11 | 12 | 23 | 18 | 17 | 20 | 11 | 112 | 16 | 11 |
| Blackbirds | 5 | 6 | 16 | 8 | 17 | 17 | 12 | 81 | 12 | 8 |
| Wading birds | 3 | 0 | 7 | 5 | 3 | 7 | 10 | 35 | 5 | 3 |
| Sparrows | 3 | 5 | 5 | 7 | 6 | 2 | 0 | 28 | 4 | 3 |
| Shorebirds | 1 | 2 | 5 | 2 | 1 | 3 | 4 | 18 | 3 | 2 |
| Corvids | 1 | 1 | 0 | 4 | 3 | 1 | 3 | 13 | 2 | 1 |
| Gallinaceous | 1 | 3 | 2 | 0 | 0 | 2 | 4 | 12 | 2 | 1 |
| Miscellaneous birds | 0 | 1 | 1 | 2 | 5 | 4 | 5 | 18 | 3 | 2 |
| Total known | 97 | 106 | 183 | 162 | 165 | 168 | 154 | 1,035 | 148 | 100 |
| Unknown | 52 | 83 | 138 | 116 | 144 | 136 | 151 | 820 | 117 | |
| Total birds | 149 | 189 | 321 | 278 | 309 | 304 | 304 | 1,855 | 265 | |
| Mammals | | | | | | | | | | |
| Ungulate | 11 | 23 | 24 | 32 | 26 | 32 | 10 | 158 | 23 | 84 |
| Carnivores | 1 | 1 | 0 | 3 | 5 | 4 | 2 | 16 | 2 | 9 |
| Rodents | 0 | 0 | 0 | 0 | 1 | 0 | 12 | 13 | 2 | 7 |
| Unknown | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 |
| Total mammals | 12 | 24 | 24 | 36 | 32 | 36 | 24 | 188 | 27 | 100 |
| Reptiles | | | | | | | | | | |
| Alligators | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | <1 | 50 |
| Turtles | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | <1 | 50 |
| Total reptiles | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 2 | 0 | 100 |
| Grand total | 161 | 213 | 345 | 315 | 342 | 340 | 329 | 2,045 | 292 | |

Source: U.S. Federal Aviation Administration

Table 15
Reported Aircraft Downtime Resulting from Wildlife Strikes
To U.S. Civil Aircraft by Wildlife Group, 1991–1997

| Wildlife Group | Reported Downtime (Hours) | | | | | | | Total | Seven-year Average | Percent of Total |
|----------------------|---------------------------|--------------|---------------|---------------|--------------|---------------|---------------|----------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Waterfowl | 1,512 | 2,940 | 2,504 | 2,373 | 3,038 | 2,970 | 6,241 | 21,578 | 3,083 | 34 |
| Raptors | 766 | 1,268 | 705 | 4,021 | 1,394 | 3,518 | 6,849 | 18,521 | 2,646 | 29 |
| Gulls/terns | 685 | 290 | 7,864 | 517 | 1,370 | 783 | 3,228 | 14,737 | 2,105 | 23 |
| Doves | 143 | 30 | 12 | 24 | 39 | 110 | 4,585 | 4,943 | 706 | 8 |
| Wading birds | 0 | 2 | 1,387 | 173 | 49 | 326 | 0 | 1,937 | 277 | 3 |
| Blackbirds | 0 | 2 | 83 | 739 | 7 | 150 | 13 | 994 | 142 | 2 |
| Shorebirds | 0 | 580 | 6 | 97 | 0 | 10 | 51 | 744 | 106 | 1 |
| Corvids | 0 | 0 | 0 | 73 | 3 | 0 | 1 | 77 | 11 | <1 |
| Gallinaceous | 1 | 24 | 2 | 0 | 0 | 39 | 1 | 67 | 10 | <1 |
| Miscellaneous birds | 6 | 17 | 0 | 31 | 4 | 2 | 8 | 68 | 10 | <1 |
| Total known | 3,113 | 5,153 | 12,563 | 8,048 | 5,904 | 7,908 | 20,977 | 63,666 | 9,095 | 100 |
| Unknown | 1,404 | 776 | 2,410 | 790 | 1,453 | 2,745 | 4,518 | 14,096 | 2,014 | |
| Total birds | 4,517 | 5,929 | 14,973 | 8,838 | 7,357 | 10,653 | 25,495 | 77,762 | 11,109 | |
| Mammals | | | | | | | | | | |
| Ungulates | 12 | 2,920 | 3,602 | 25,668 | 152 | 9,251 | 8,718 | 50,323 | 7,189 | 86 |
| Carnivores | 0 | 0 | 0 | 5,760 | 2,160 | 6 | 24 | 7,950 | 1,136 | 14 |
| Total mammals | 12 | 2,920 | 3,602 | 31,428 | 2,312 | 9,257 | 8,742 | 58,273 | 8,325 | 100 |
| Grand total | 4,529 | 8,849 | 18,575 | 40,266 | 9,669 | 19,910 | 34,237 | 136,035 | 19,434 | |

Source: U.S. Federal Aviation Administration

Table 16
Reported Monetary Losses in U.S. Dollars, Resulting from Wildlife Strikes
To U.S. Civil Aircraft by Wildlife Group, 1991–1997

| Wildlife Group | Reported Monetary Losses (U.S. \$) | | | | | | | Total | Seven-year Average | Percent of Total |
|---------------------|------------------------------------|-----------|-----------|-----------|------------|-----------|-----------|------------|--------------------|------------------|
| | Years | | | | | | | | | |
| | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | | | |
| Birds | | | | | | | | | | |
| Waterfowl | 1,127,389 | 56,850 | 65,400 | 1,453,706 | 16,445,471 | 1,177,173 | 1,004,295 | 21,330,284 | 3,047,183 | 59 |
| Gulls/terns | 527,000 | 905,204 | 434,762 | 722,440 | 718,504 | 841,776 | 2,116,263 | 6,265,949 | 895,136 | 17 |
| Raptors | 803,000 | 241,259 | 447,500 | 2,175,648 | 269,763 | 101,775 | 34,600 | 4,073,545 | 581,935 | 11 |
| Doves | 168,965 | 155,661 | 75,100 | 400 | 1,509,900 | 11,000 | 1,041,600 | 2,962,626 | 423,232 | 8 |
| Wading birds | 66,540 | 1,000 | 65,000 | 511,000 | 0 | 4,360 | 0 | 647,900 | 92,557 | 2 |
| Blackbirds | 0 | 200 | 7,900 | 163,000 | 11,000 | 27,000 | 238,050 | 447,150 | 63,879 | 1 |
| Miscellaneous birds | 5,500 | 19,020 | 6,000 | 362,405 | 1,050 | 7,030 | 51,672 | 452,677 | 64,668 | 1 |
| Total known | 2,698,394 | 1,379,194 | 1,101,662 | 5,388,599 | 18,955,688 | 2,170,114 | 4,486,480 | 36,180,131 | 5,168,590 | 100 |
| Unknown | 638,775 | 1,847,200 | 3,080,279 | 953,068 | 1,291,305 | 2,000,434 | 1,919,168 | 11,730,229 | 1,675,747 | |
| Total birds | 3,337,169 | 3,226,394 | 4,181,941 | 6,341,667 | 20,246,993 | 4,170,548 | 6,405,648 | 47,910,360 | 6,844,337 | |
| Mammals | | | | | | | | | | |
| Ungulates | 0 | 6,000 | 192,250 | 463,342 | 153,600 | 780,976 | 530,878 | 2,127,046 | 303,864 | 94 |
| Carnivores | 0 | 0 | 0 | 105,000 | 35,000 | 0 | 120 | 140,120 | 20,017 | 6 |
| Total mammals | 0 | 6,000 | 192,250 | 568,342 | 188,600 | 780,976 | 530,998 | 2,267,166 | 323,881 | 100 |
| Grand total | 3,337,169 | 3,232,394 | 4,374,191 | 6,910,009 | 20,435,593 | 4,951,524 | 6,936,646 | 50,177,526 | 7,168,218 | |

Note: Monetary losses include cost to repair damage, lost revenue and other monetary losses.

Source: U.S. Federal Aviation Administration

Table 17
Number of Reported Wildlife Strikes and Reported Losses by Category of Effect and Category of Losses to U.S. Civil Aircraft, 1991–1997

| Year | | Adverse Effect from Strike | Strike Effected Flight | Strike Damaged Aircraft Component | Lost Time (Hours) | Cost (U.S. \$) | | |
|---------------------------|-------------------|----------------------------|------------------------|-----------------------------------|-------------------|--------------------|---------------|--------------|
| | | | | | | Total ¹ | Direct | Other |
| 1991 | Number of reports | 393 | 161 | 307 | 60 | 56 | 50 | 23 |
| | Losses reported | | | | 4,529 | \$3,337,169 | \$2,570,284 | \$766,885 |
| 1992 | Number of reports | 431 | 213 | 302 | 78 | 63 | 49 | 29 |
| | Losses reported | | | | 8,849 | \$3,232,394 | \$3,150,627 | \$81,767 |
| 1993 | Number of reports | 479 | 345 | 348 | 67 | 62 | 56 | 21 |
| | Losses reported | | | | 18,575 | \$4,374,191 | \$4,268,844 | \$105,347 |
| 1994 | Number of reports | 511 | 315 | 378 | 103 | 84 | 77 | 25 |
| | Losses reported | | | | 40,266 | \$6,910,009 | \$5,311,314 | \$1,598,695 |
| 1995 | Number of reports | 613 | 342 | 444 | 93 | 75 | 64 | 29 |
| | Losses reported | | | | 9,669 | \$20,435,593 | \$18,933,889 | \$1,501,704 |
| 1996 | Number of reports | 626 | 340 | 453 | 143 | 96 | 86 | 35 |
| | Losses reported | | | | 19,910 | \$4,951,524 | \$4,327,631 | \$623,893 |
| 1997 | Number of reports | 648 | 329 | 444 | 173 | 122 | 111 | 40 |
| | Losses reported | | | | 34,237 | \$6,936,646 | \$5,715,097 | \$1,221,549 |
| Total | Number of reports | 3,701 | 2,045 | 2,676 | 717 | 558 | 493 | 202 |
| | Losses reported | | | | 136,035 | \$50,177,526 | \$44,277,686 | \$5,899,840 |
| Seven-year Average | Number of reports | 529 | 292 | 382 | 102 | 80 | 70 | 29 |
| | Losses reported | | | | 19,434 | \$7,168,218 | \$6,325,384 | \$842,834 |
| Average loss per incident | | | | | 190 | \$119,020 | \$89,813 | \$29,207 |
| Estimated annual losses | | | | | | | | |
| Minimum ² | | | | | 100,312 | \$62,927,510 | \$47,485,284 | \$15,442,226 |
| Maximum ³ | | | | | 501,560 | \$314,637,552 | \$237,426,421 | \$77,211,131 |

¹ Numbers of reports giving direct costs and other costs do not equal total reports because of variations in the reporting of direct costs and other costs.

² Minimum values are based on the assumption that all 3,701 reported strikes having an adverse effect on the flight and/or aircraft engendered similar amounts of damage and/or downtime, and that these reports are all of the damaging strikes that occurred.

³ Maximum values are based on the assumption that the 3,701 reported strikes having an adverse effect represent 20 percent of the total.

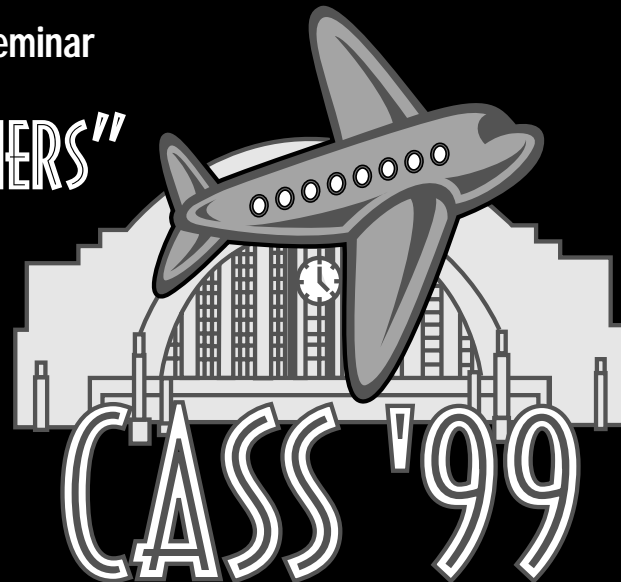
Source: U.S. Federal Aviation Administration

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