United States Air Force Bird Strike Summary (1986-1987)

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UNITED STATES AIR FORCE BIRD STRIKE SUMMARY 1986-1987

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The United States Air Force recorded 5,324 bird strikes during 1986 and 1987. These strikes resulted in the loss of four aircraft, six lives, and over $260,000,000 in damages. Strike records are summarized by aircraft involved in incidents, impact locations, birds involved in strikes, phases of flight, times of day and year when strikes occurred, and altitudes where strikes were reported. These data are used to focus bird strike reduction efforts by the US Air Force.

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1. Major USAF Mishaps.

The USAF suffered five mishaps which resulted in lost aircraft or greater than one million dollars in damages during 1986 and 1987.

a. In October 1986, an F-4 from Moody Air Force Base, Georgia struck a 4.5 pound Black Vulture (Coragyps atratus) near Savannah, Georgia. The bird penetrated the fuselage alongside the engine nacelle, severing fuel lines. An intense fire erupted and the crew ejected. The weapons systems officer escaped without injury, but the pilot was killed during the ejection sequence. This incident cost the Air Force $4,940,393.

b. Another accident in October 1986 occured when an F-16 from Torrejon Air Base, Spain struck a 16 pound Griffon Vulture (Gyps fulvus) on the Bardenas Reales Range. The bird impacted the engine inlet. Pieces of the inlet and bird remains were ingested causing complete destruction of the engine and an in-flight fire. The pilot ejected safely. Total cost of the mishap was reported as $9,512,830.

c. In May 1987, an F-4E on deployment from Spangdahlem Air Base, Germany struck a 16 pound Griffon Vulture (Gyps fulvus) on the Bardenas Reales range in Spain. The bird penetrated the windscreen and canopy of the aircraft striking the pilot and killing him instantly. Bird remains and pieces of canopy ripped through the cockpit impacting the weapons systems officer. His injuries and visual impairment caused by the strike prevented escape from the aircraft and he was killed upon ground impact. Reported costs were $17,000,000 in this incident.

d. In September 1987, a B-1B on a low-level training mission from Dyess Air Force, Base Texas struck a 16 pound American White Pelican (Pelecanus erythrorhynchos) near LaJunta, Colorado. The bird severed fuel and hydraulic lines causing an intense fire. Aircraft control became impossible and the crew initiated ejection. Three crew members ejected successfully. The three remaining crew

members were killed upon impact with the ground. The Air Force lost $215,323,000 in this accident.

e. In December 1987, an E-4 (Boeing 747) struck approximately forty Snow Geese (Chen caerulescens) shortly after takeoff from Offutt Air Force Base, Nebraska. The crew jetisoned fuel and managed to land safely despite extensive damage to the airframe and engines. Both wings, the radome, and two engines sustained significant damage costing over $1,650,000.

These examples are but a few of the devastating effects birds had on our aircraft in 1986 and 1987.

2. Aircraft Involved in Bird Strikes.

Virtually every aircraft in the USAF inventory reported bird strikes during 1986 and 1987, although aircraft mission played a major role in frequency and severity of strikes. Aircraft which flew high-speed low-level missions were much more likely to encounter birds than those which spent more time at higher altitudes. Additionally, aircraft size, configuration, airspeed, geographic location, and type of engines affected susceptibility to strikes.

Figure 1 shows that USAF fighter and cargo aircraft led the list in most strikes. The number of aircraft involved, hours flown, and low-level mission profiles influence this fact, yet other aircraft such as our bombers actually report more strikes per flight hour.

3. Impact Locations.

Any part of an aircraft can be, and has been, struck by birds (Table 1). It appears that the probability of a strike is directly proportional to the frontal surface area exposed to the windstream. Because the severity of damage is often a matter of luck and inches, the USAF requires all strikes, regardless of damage, to be reported. Every effort is made to identify the species involved in the strike to determine appropriate avoidance or control measures.

TABLE 1. Bird Strikes by Impact Location
1986-1987

Impact Point	Percent of Total
Windshield/Canopy	21.4
Engine/Cowling	17.9
Wings	17.0
Radome/Nose	16.1
Multiple Locations	9.8
Fuselage	8.0
External Tanks/Pods/Gear	7.2
Other	2.6

4. Birds

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TABLE 2.

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4. Birds Involved in Collisions With Aircraft.

A wide variety of bird species are involved in collisions with aircraft. Post-strike feather identification is an important aspect of BASH management strategies. Microscopic and macroscopic techniques are used in determining the species involved in bird strike incidents. Table 2 is a partial listing of the most common broad categories of birds involved in bird strikes.

TABLE 2. Birds identified in Aircraft Collisions 1986-1987

Birds	Number Identified
Hawks/Vultures	337
Gulls	218
Blackbirds and Starlings	125
Pigeons and Doves	122
Waterfowl	96
Horned Larks	85
Meadowlarks	77
Shorebirds and Herons	56

Raptors and gulls lead the list of most commonly struck birds. Raptors were a major hazard on our low-level flights, while gulls were primarily encountered in the airdrome environment.

5. Bird Strikes by Phase of Flight.

Birds were encountered by USAF aircraft in every flight profile during 1986 and 1987. The majority of strikes occurred in the airdrome environment, but strikes incurred on low-level and range operations vastly outweighed the airfield strikes in damages caused. Figure 2 shows the percentages of strikes reported during various phases of flight. Management of airfield environments to reduce bird populations and the use of dispersal techniques have greatly reduced the severity of airfield bird strikes, and the USAF did not lose any aircraft in this environment during 1986 and 1987. The USAF is beginning to focus its BASH reduction efforts on the areas away from the airfield. Unfortunately we have much less control over these areas and much is to be learned about avoiding birds in these remote areas. Flight scheduling and route development for bird avoidance is increasingly emphasized by the USAF.

6. Times When Bird Strikes Occur.

The USAF does most of its flying during the day; so naturally, most of our bird strikes happen then. Figure 3 shows that nearly 70% of reported strikes occurred during daylight hours in 1986 and 1987. Most strikes repored at night occurred during migratory periods. Flights were frequently scheduled to avoid major bird activity periods such as around dawn and dusk, but a significant number of strikes occurred during these times.

Figure 4 shows bird strikes reported by month. The largest numbers of strikes were recorded during fall migratory periods with smaller peaks occurring during spring. Birds often congregate on even the most well-managed airfields during migrations and must be actively dispersed during these times. Flight scheduling to avoid birds is the only way to limit strikes during migratory seasons away from the airfield.

7. Bird Strikes by Altitude.

Figure 5 shows that over 96% of USAF bird strikes were recorded below 3,000 feet above ground level. These numbers reflect that bird densities increase dramatically as altitude decreases. Raising altitude in the traffic pattern or on low-level flights is important to reduce bird strikes whenever missions permit.

8. Summary.

The United States Air Force continues to suffer tremendous losses to bird strikes each year. 1986 and 1987 were disasterous years in terms of aircraft damage and lost lives. USAF experience in the past 2 years has caused a great deal of interest in BASH reduction efforts. Much needs to be done in reducing the hazards away from our airfields. The USAF considers development of complete bird population and movement data and issuance of bird hazard advisories in our low-level and operating areas among its top priorities for future reduction of bird strike hazards. Armed with this information, we anticipate safer flying conditions and substantial savings of resources throughout the US Air Force.

Figure 1.
Bird Strikes By Aircraft Type
1986–1987

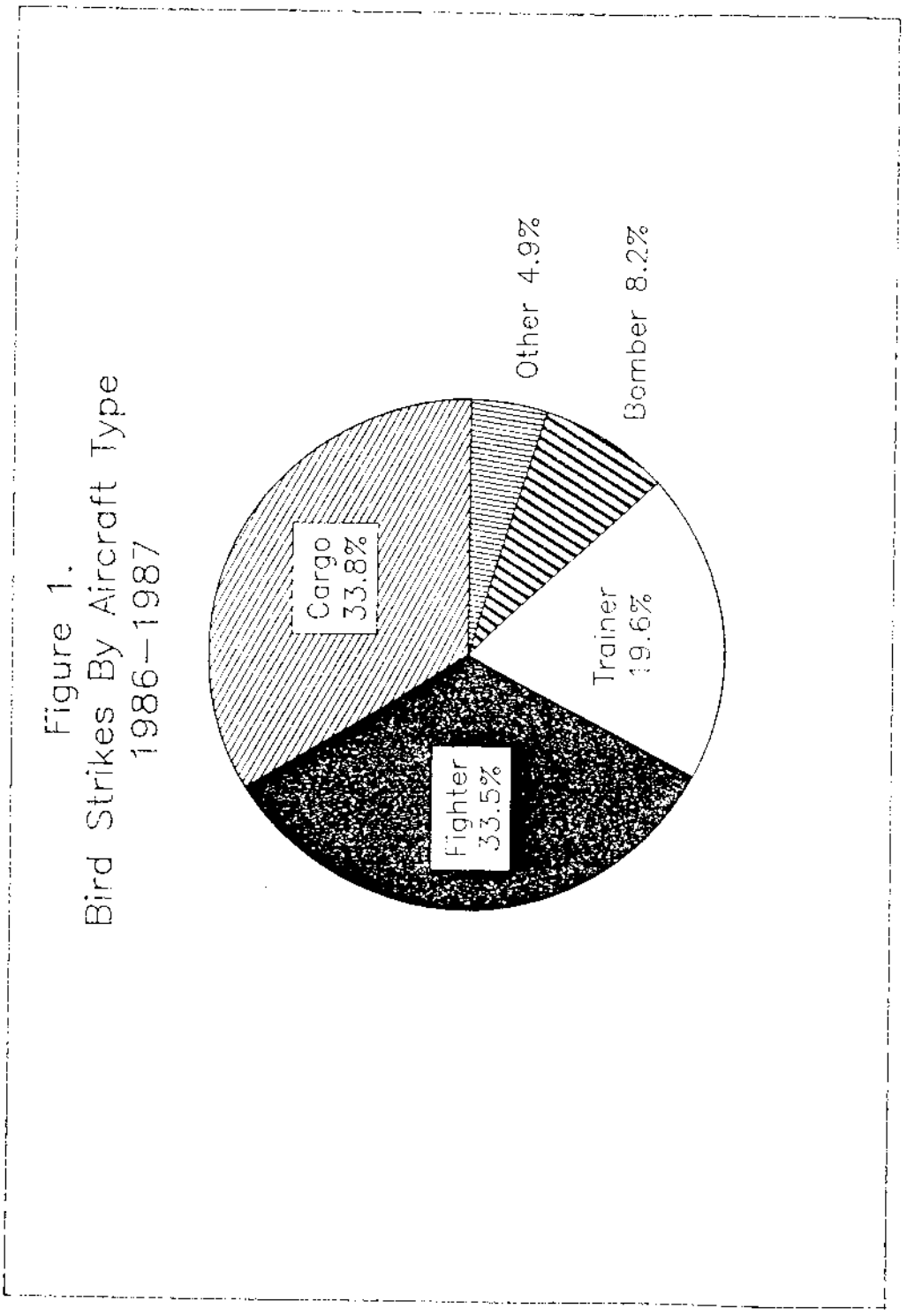
Figure 1.
Bird Strikes By Aircraft Type
1986–1987
Cargo
33.8%
Other 4.9%
Bomber 8.2%
Trainer
19.6%
Fighter
33.5%

Figure 2.
Bird Strikes by Phase of Flight
1986–1987

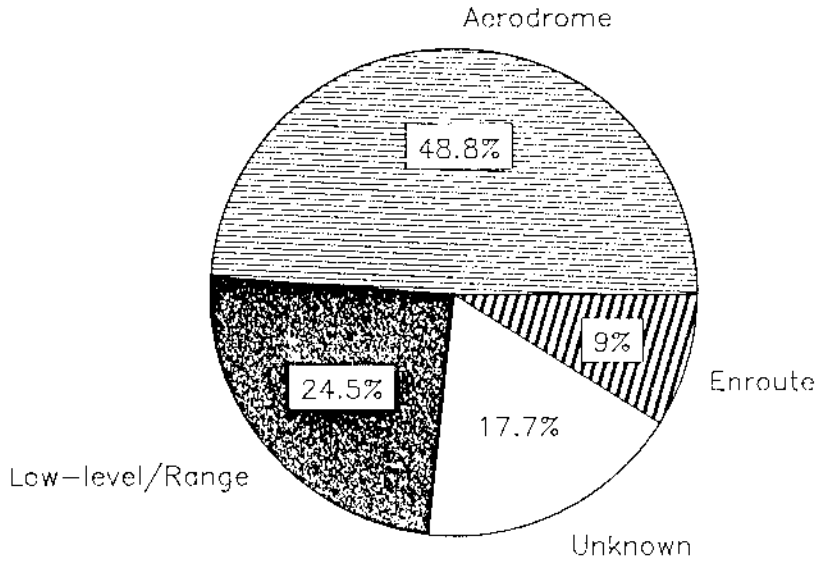

Figure 3.
Bird Strikes by Time of Day
1986–1987

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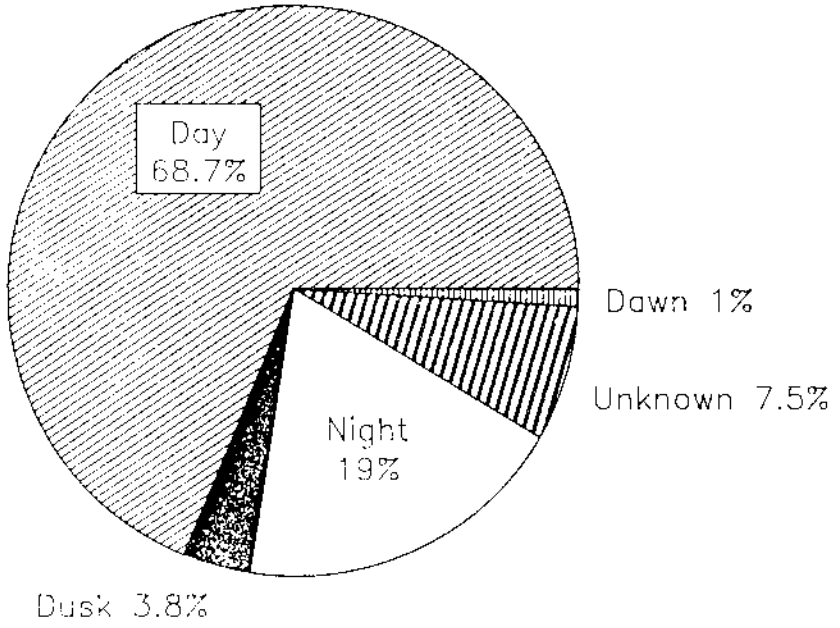
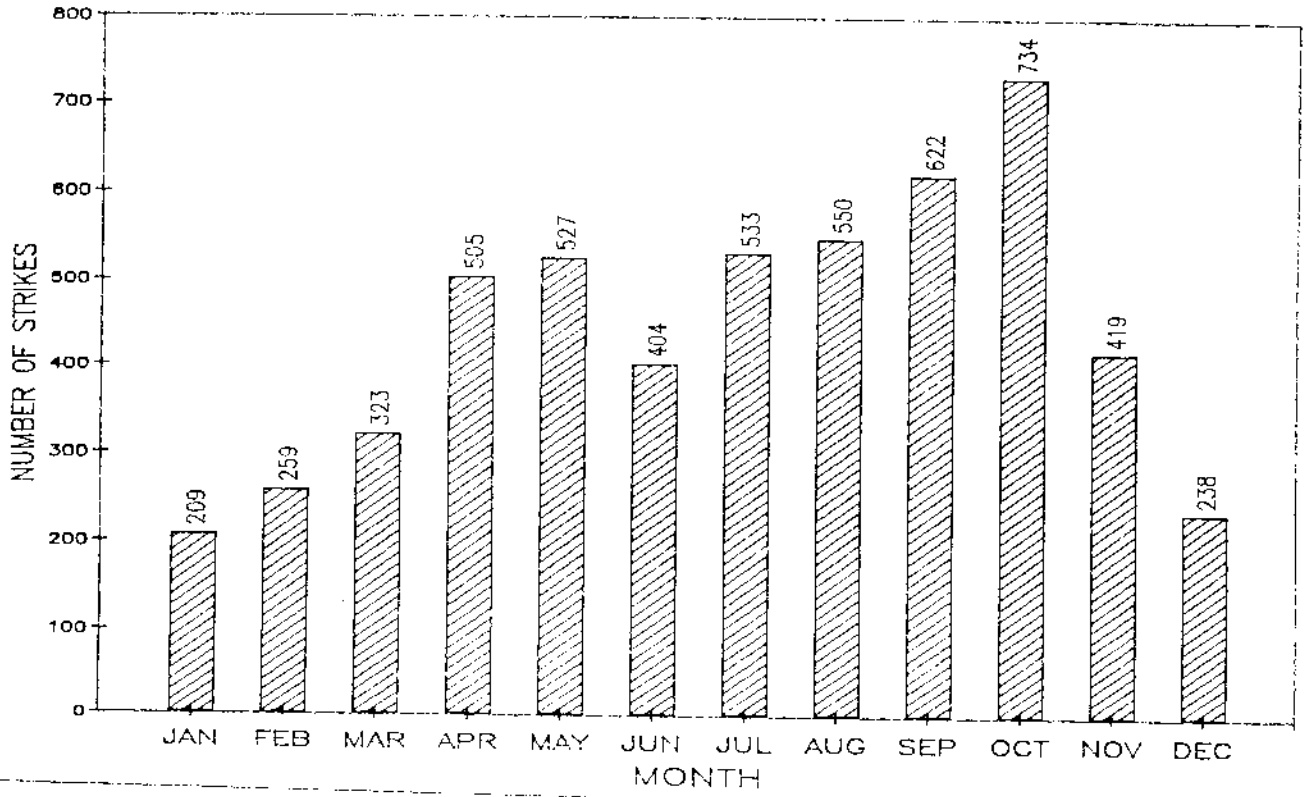


Figure 4.
Bird Strikes by Month
1986–1987



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