

Collisions with Aircraft and Use of Culverts under Runways by Bats at U.S. Naval Air Station Meridian, Meridian, Mississippi

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Introduction

Collisions of bats with aircraft occur in many regions of the United States. Since 1997, for example, remains from more than 126 bats that collided with military aircraft ("bat strikes") have been processed by the U.S. Geological Survey, Biological Survey Unit, at the National Museum of Natural History, Washington, D.C. (Peurach, 2004). In addition, Eugene LeBoeuf (pers. comm.), of the U.S. Air Force (USAF) Bird Aircraft Strike Hazard (BASH) Team, stated that the location of cave- or bridge-dwelling species of bats, especially large populations of Brazilian free-tailed bats (*Tadarida brasiliensis*), often were considered when the Air Force planned flight exercises; he noted, however, that serious bat incidents were rare in the United States. Similarly, Presuto and Windler (2005) reported that even though 52 bats struck planes of the USAF in 2004, all were considered minor mishaps. Nevertheless, Dove and Peurach (2001) documented the first damaging bat strike to a USAF military aircraft in this country. On 18 November 1999, a USAF T-37-B aircraft sustained a strike, requiring ca. \$10,000 in repairs to the air-conditioning intake, during a flight from Randolph Air Force Base near San Antonio, Texas; hair samples from the dead animal best matched those of a Brazilian free-tailed bat (Dove and Peurach, 2001). Brazilian free-tailed bats and red bats (*Lasiurus* spp.) apparently were the species that most commonly collided with planes of the USAF (Peurach, 2004).

Matthew Klope (U.S. Navy, BASH Program Manager, Port Hueneme, California, pers. comm.) provided records of wildlife strikes occurring since 1982 at installations of the U.S. Navy. These collisions involved a silver-haired bat (*Lasiurus noctivagans*), a hoary bat (*Lasiurus cinereus*), and an unidentified species struck in September 2002 at Whidbey Island, Washington; unidentified species of bats also were struck at Naval Air Station (NAS) Corpus Christi, Texas, in February 2002 and August 2004; NAS Point Mugu, California, in March and September 2004; and NAS Jacksonville, Florida, in June 2004. None of these strikes was considered damaging to the aircraft.

The U.S. Naval Air Station Meridian (NASM) is a training facility located near the city of Meridian, in Lauderdale and Kemper counties, in east-central Mississippi. As part of its pilot-training program, T-2 Buckeye and T-45 Goshawk jets fly year-round, nighttime, take-off-and-landing exercises. Records of collisions on the base between aircraft and large wildlife, especially white-tailed deer (*Odocoileus virginianus*), have been maintained since the early 1980s, and in 2000, personnel at the installation also began recording collisions with smaller animals, including bats. The first bat strikes were logged in fall 2000, and because of these collisions, NASM became concerned about the potential hazard posed by bats that roosted in culverts beneath the installation's runways. This report summarizes our attempt to examine specimens struck by aircraft from NASM during 2000–2004 and to inspect culverts under runways at NASM to determine use by bats.

Bat Strikes at Naval Air Station Meridian

Five strikes were reported on NASM in 2000. Examination of body remnants collected during post-flight inspections revealed that the bats that collided on 29 August, 5 September, and 14 September 2000 were eastern red bats (*Lasiurus borealis*). No material was saved from a bat struck on 26 September, and it was categorized as unknown. Although little was left of a bat hit on 4 October, wing measurements, shape of the tragus, and coloration of the fur most closely fit that of an evening bat (*Nycticeius humeralis*). Three bat strikes were reported in 2001 (7 July, 1 August, and 7 August), and all involved eastern red bats. Six bats were struck by aircraft in 2002; eastern red bats were reported on 19 April, 18 June, and 7 August, and eastern pipistrelles (*Pipistrellus subflavus*) were hit on 9 April, 16 July, and 17 July. No strikes were reported in 2003, which may reflect a breakdown in reporting vigilance rather than total absence of bat strikes. Collisions in 2004 included an unidentified bat on 9 June and an eastern red bat on 22 September.

Inspections of Culverts

Culverts occur under both the north and south runways at NASM for passage of two major streams, Ponta Creek and Big Reed Creek. Culvert complexes at the south runway include three adjoining tunnels, each ca. 7-m high, 5-m wide, and 180-m long. Culverts under the north runway consist of four adjacent units, each of which is ca. 3-m tall, 3-m wide, and 250-m long. Habitat adjacent to the runways consists primarily of narrow strips of riparian hardwoods surrounded by loblolly pine (*Pinus taeda*) and mixed woodlands.

We first inspected the culverts on 11 October 2000. Hand nets were used to collect samples to confirm species identification and determine sex, age, and reproductive condition, and all bats were released following examination. On that date, ca. 50 southeastern bats (*Myotis austroriparius*) were observed in culverts under the south runway, and 15 eastern pipistrelles, 10 southeastern bats, and 5 Rafinesque's big-eared bats (*Corynorhinus rafinesquii*) were counted under the north runway. These species roost in tunnel-like structures in other areas of the Southeast (Keeley and Tuttle, 1999; Mirowsky et al., 2004; Sandel et al., 2001; Walker et al., 1996), so their use of the culverts was not considered unusual. Southeastern bats sampled with hand nets on 11 October included one adult female and six adult males, two of which had distended testes.

We also visited the culverts in 2001 and 2002. A total of 730 southeastern bats were tallied under the south runway on 21 August 2001, but no other species were noted. Eighteen southeastern bats and four eastern pipistrelles were counted beneath the north runway on that day. On 13 June 2002, counts included 233 southeastern bats, one eastern pipistrelle, and one big-brown bat (*Eptesicus fuscus*) at the south runway, and five southeastern bats and one eastern pipistrelle at the north runway. Ten southeastern bats were netted in the culverts, and these included two adult males, six lactating or post-lactating females, and two immature females.

Discussion

Sixteen bat strikes were reported from 2000 to 2004 on NASM; these included ten eastern red bats, three eastern pipistrelles, one evening bat, and two bats of unknown species. Most

2003; Cryan, 2003), and the predominance of strikes during fall may indicate that these bats were migrating. Number of collisions that are recorded probably is an underestimate of the total number of bats that are struck by aircraft at NASM, because animal remains from strikes often go unreported and inspection crews are not always diligent or consistent in their reporting procedures.

The extensive culverts, especially at the south runway, provided roosting habitat for a large population of southeastern bats. A sample of bats using the culverts on 11 October 2000 and 13 June 2002 indicated that culverts served as maternity roosts, and the tunnels were used by both males and females throughout much of the year. Although Rafinesque's big-eared bats also roosted in the culverts, neither Rafinesque's big-eared bat nor the southeastern bat, both of which are protected species in Mississippi (Mississippi Natural Heritage Program, 2001), have been involved in bat strikes at the installation. Hence, these sensitive species did not appear to be hazards to naval aircraft.

Finally similarities were noted in species composition and timing of bat collisions with aircraft and bat collisions with large towers and wind turbines (Johnson, 2005). For both types of collisions, lasiurines, especially eastern and western red bats (*L. blossevillei*) and/or hoary bats, form a large proportion of the victims in North America. In addition, most collisions of bats with aircraft, as well as those with terrestrial structures, take place during autumn migration. Additional research is needed to identify ways to minimize bat collisions with both stationary and moving objects.

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