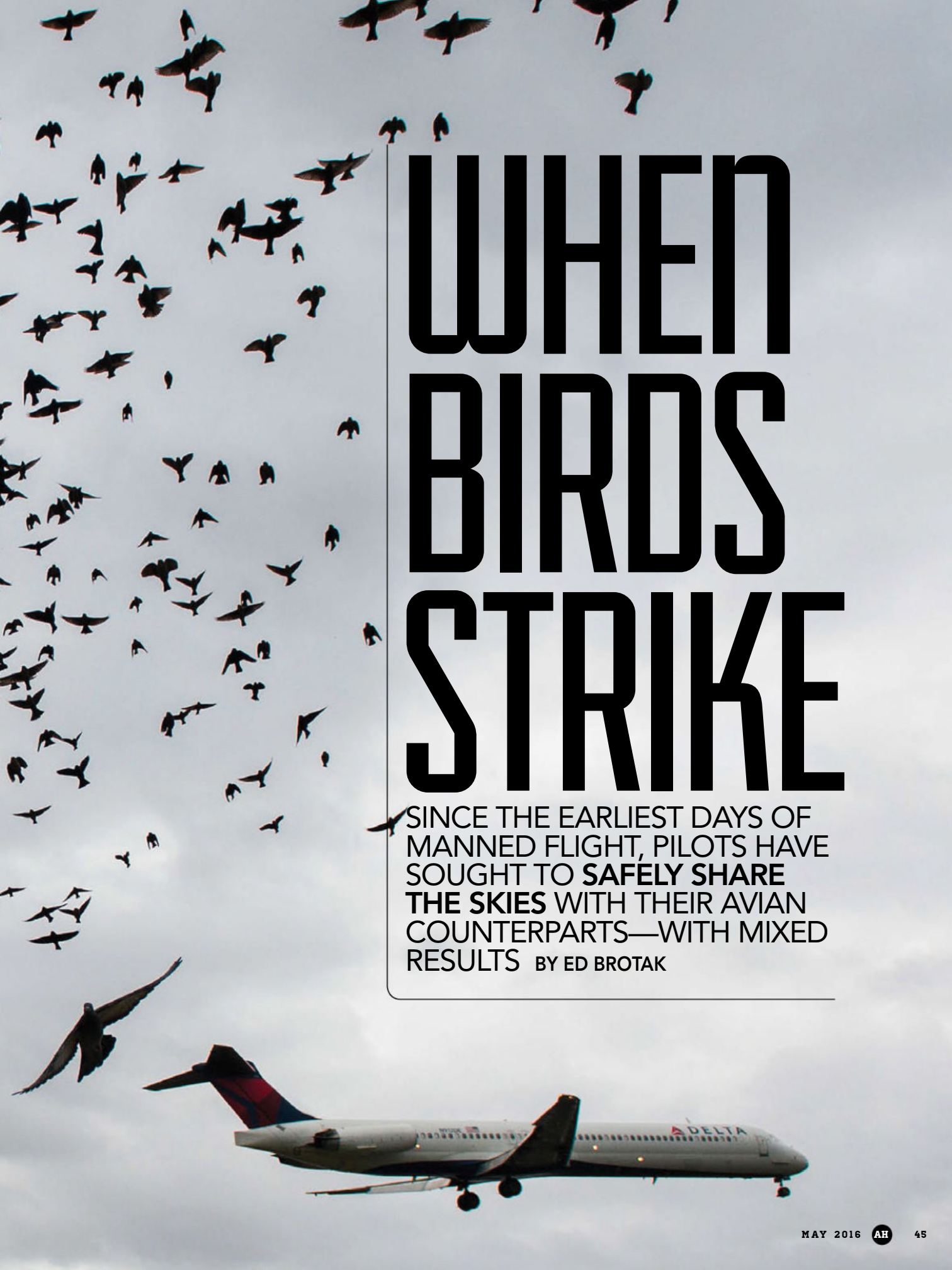




**FLIGHT RISK** A flock of birds steers clear of a Delta Airlines commuter jet landing at Reagan International in 2015.



# WHEN BIRDS STRIKE

SINCE THE EARLIEST DAYS OF MANNED FLIGHT, PILOTS HAVE SOUGHT TO **SAFELY SHARE THE SKIES** WITH THEIR AVIAN COUNTERPARTS—WITH MIXED RESULTS **BY ED BROTA**



# ON SEPTEMBER 7, 1905, LESS THAN TWO YEARS AFTER ORVILLE WRIGHT BECAME THE FIRST MAN TO MAKE A CONTROLLED FLIGHT IN A POWERED, HEAVIER-THAN-AIR CRAFT, HE WAS THE FIRST TO REPORT A BIRD STRIKE.

## DANGER ON WING

*Vin Fiz* pilot Cal Rodgers was the first to die in a bird strike accident (above). As shown in a 1921 photo (top right), birds also suffer in collisions. An F-16 (bottom right) demonstrates the grisly outcome of even a glancing encounter.

That first strike wasn't totally accidental, however. According to the Wright brothers' diaries, it happened while Orville was flying circles near a cornfield in Dayton, Ohio. He had apparently been chasing flocks of birds for a while before he hit one. The dead bird lay on the airplane's wing until Orville made a sharp turn and dumped it off.

For aviation pioneer Cal Rodgers, a bird strike resulted in far more serious consequences. Piloting a Wright EX biplane that he called *Vin Fiz*, Rodgers had in 1911 become the first person to cross the United States by air. But during a demonstration flight in Long Beach, Calif., on April 3, 1912, his aircraft collided with a seagull that became

entangled in the control cables. Rodgers then lost control and crashed into the Pacific—the first bird strike fatality.

As time went on, and the number of aircraft plying the skies increased, it became clear that pilots would have to learn to share the skies in order to fully realize the dream of flight. It would turn out to be a hard lesson, one that aviation experts have long struggled to resolve even as airplanes became far faster, and generally safer, to fly.

The first turbojet-powered airplane, the Heinkel He-178, made its maiden flight on August 24, 1939, at Marienehe, Germany, with Erich Warsitz at the controls. On his second flight three days later, Warsitz became the first jet pilot to report a bird strike. A bird was sucked into the engine, causing a loss of thrust, but Warsitz managed to land safely. Birds would become a recurrent problem for jets.

The largest commercial aircraft ever to be destroyed by a bird strike was a DC-10. Attempting to take off from JFK International Airport in New York on November 12, 1975, the airliner flew through a flock of seagulls, some of which were ingested into the no. 3 engine, resulting in a fire in the right wing. Fortunately, the pilot successfully aborted the takeoff and stopped the plane on a taxiway, where all 139 people onboard were safely evacuated. But the fire consumed the DC-10.

By far the worst bird strike accident occurred on October 4, 1960, just after Eastern Air Lines Flight 375, a Lockheed L-188 Electra, took off from Boston's Logan Airport and ran into a flock of

common starlings. Losing power in three engines, the airliner crashed into Boston Harbor. In all, 62 people died—the greatest single loss of life from any bird strike.

The worst bird strike-related accident to military aircraft in the United States occurred on September 22, 1995, when a U.S. Air Force Boeing E-3 Sentry AWACS plane encountered a flock of Canada geese while taking off from Elmendorf Air Force Base in Anchorage, Alaska. After both port-side engines lost power due to ingested material, the E-3 crashed two miles from the runway, killing all 24 crew members. Worldwide, the worst military accident due to a bird strike came nearly a year later in the Netherlands, on July 15, 1996. A Belgian C-130 Hercules with a crew of four carrying 37 army musicians was trying to land at Eindhoven Air Base when several hundred starlings and lapwings, not visible from the control tower, suddenly flew into its path. The pilot attempted a go-around, but both left engines were inoperable due to ingested birds. The Hercules struck the ground and burst into flames, after which communication problems resulted in a delayed response from emergency personnel. Tragically, 34 on board perished.

**W**hile most bird strikes occur at low altitudes (below 500 feet) and close to airports, the danger isn't limited to those areas. On November 23, 1962, after United Airlines Flight 297, a Vickers Viscount 745D, lifted off from Newark International Airport, it flew into a flock of whistling swans at 6,000 feet over Maryland. A strike damaged the horizontal stabilizer, resulting in loss of control of the aircraft, which crashed near Ellicott City, killing all 17 onboard. It was the first major commercial flight to crash due to a bird strike at cruising height.

Even aircraft flying at high altitudes are not necessarily safe. The record for the highest bird strike is 37,000 feet, in an incident on November 29, 1973, during a commercial flight over Abijan, Ivory Coast, in West Africa. Although the airliner lost one engine, it landed safely. The bird was later identified as a Ruppell's griffon vulture, thought to be the highest-flying bird in the world.

Business jets have suffered their share of bird strikes as well. On February 26, 1973, after a Learjet 24 encountered cowbirds following takeoff from Georgia's DeKalb-Peachtree Airport, the left engine shut down and the jet crashed, killing all seven aboard. When a Cessna 500 crashed minutes after leaving Wiley Post Airport in Oklahoma City on March 4, 2008, National Transportation Safety Board (NTSB) investigators determined that the loss of control was due to structural damage to the wing—the result of strikes by one or more American white pelicans. The two pilots and all three passengers died.

Helicopters are less prone to strikes near airports

## THE LARGEST COMMERCIAL AIRCRAFT EVER TO BE DESTROYED BY A BIRD STRIKE WAS A DC-10 ATTEMPTING TO TAKE OFF FROM JFK IN NEW YORK.

than fixed-wing aircraft, as their slower forward speeds on takeoff and landing make collisions far less likely. But the low altitudes at which choppers often fly increases their risk farther from terminals. Although strikes on the rotor assembly have only rarely caused accidents, birds hitting the windshield are more common. A medium to large bird can go right through a standard windshield. Usually the pilot recovers sufficiently to land, but there have been a few fatal encounters.

Seven minutes after a dual-engine Sikorsky S-76C helicopter took off from Amelie, La., on January 4, 2009, on a charter flight to an offshore oil rig, a red-tailed hawk crashed through the windshield. NTSB investigators later said they thought the impact also dislodged a fire extinguisher that struck the engine control levers, reducing power to the engines. The two pilots, understandably disoriented, could not regain control of the helicopter, and they plus six of the seven passengers onboard died when it crashed.

Just two years ago, on January 8, 2014, an American HH-60G Pave Hawk was flying 100 feet above the ground on a nighttime training mission near Cley, in Norfolk, England, when it apparently startled some geese in a game preserve. After several birds crashed through the Pave Hawk's windshield, rendering both pilot and copilot unconscious, the helicopter went down, killing them and two others on board.

Even greater disasters have been averted in recent years, usually due to the skill of the pilots. The best known of these took place on January 15, 2009, when Captain Chesley "Sully" Sullenberger successfully landed a powerless Airbus A320-200 in the Hudson River—the "Miracle on the Hudson." Running into a flock of Canada geese after taking off from LaGuardia, the Airbus ingested so many of the birds that both engines shut down. A similar accident occurred the following year in the Netherlands on June 6, when a Royal Air Maroc Boeing 737-400 with 162 people on board struck a flock of geese after departing Amsterdam's Schip-

### GRIM RECKONING

Investigators examine the wreckage of an E-3, destroyed with its crew after striking a flock of Canada geese.





### FLIGHT DELAYED

After their Airbus A320 struck a flock of geese, passengers await rescue on the wings of the airliner, famously landed in the Hudson River by pilot "Sully" Sullenberger on January 15, 2009.

hol Airport. In that case, the pilot managed to turn the badly damaged airliner around and land back at the airport.

**H**ow big a problem are we really dealing with here? To assess the risk in the U.S., beginning in 1990 the Federal Aviation Administration mandated that all wildlife strikes were to be recorded, regardless of whether damage had resulted from the strike. The official FAA Wildlife Strike Report, which can be filled out on paper or electronically, includes information on the aircraft involved, when and where the strike occurred and the species of bird or animal struck. If only unidentifiable remains are left on an aircraft, feathers or blood/tissue samples can be sent to the Smithsonian Institution's Feather Identification Lab, established in 1960 in response to the fatal Logan Airport crash. The lab has since entered into interagency agreements with the Air Force, Navy and the FAA. The advent of DNA bar coding in 2006 has significantly improved the positive identification ratio.

In 1995 the FAA, in conjunction with the Department of Agriculture Wildlife Services, started work on a bird strike database. The FAA serial report "Wildlife Strikes to Civil Aircraft in the United States" was first published in 1996 and is now issued every year, offering an extremely comprehensive look at the problem. The July 2014 report noted that between 1990 and 2013, 66 aircraft were reported as being destroyed by encounters with wildlife. The annual cost in the U.S. of damage and downtime due to wildlife strikes is estimated to be as high as \$937 million. From 2004 through 2013, there were 72 fatal accidents caused by wildlife strikes, while another 264 incidents resulted in injuries but no deaths.

The total number of strikes soared from 1,851 in 1990 to 11,315 in 2013, a new record and an increase of more than 600 percent. Certainly part of this can be attributed to pilots becoming more amenable to reporting strikes, but an increase in bird populations has also been noted. The vast majority of bird strikes, however, don't harm aircraft or passengers. In 2013 only 601 strikes produced any damage, 5 percent of the total strikes.

On the military side, the U.S. Air Force alone has reported more than 69,000 bird/wildlife strikes since 1995. There have been 23 fatalities, 12 aircraft destroyed and more than \$400 million in damage. Worldwide since 1988, 255 people have died and 243 aircraft were destroyed due to collisions with wildlife. The European Space Agency estimates that bird/wildlife strikes around the world cost airlines over \$1 billion a year.

Birds of all types fall victim to strikes. The latest FAA report listed 482 different species involved in collisions, most of them smaller birds that did little if any damage to aircraft. Of the strikes that did cause damage, waterfowl led the list, involved in 30 percent of incidents. They were followed by gulls (22 percent), raptors (20 percent) and pigeons or doves (7 percent). The most damaging species include snow geese, vultures, northern pintails and Canada geese. A single large bird can take down a medium-size plane. After a Dornier 228-200 carrying 19 people struck a vulture and crashed in Nepal in September 2012, all onboard died. But the greatest threat comes from flocks of larger birds, particularly geese. While the Miracle on the Hudson and Holland incidents had happy endings, that hasn't always been the case.

Of course, birds aren't suicidal monsters looking for planes to crash into. In fact, birds don't hit aircraft—aircraft, which fly much faster, hit birds. Either a bird or flock doesn't hear a plane coming, or the bird can't get out of the way in time.

**I**f birds weren't enough, however, pilots also have to worry about other critters that wander onto runways, the reason official reports refer to "wildlife strikes." Fewer than 5 percent of all strikes reported involve something other than a bird, but they still cause significant problems. Moose and caribou have been struck by aircraft in Alaska, while in Florida collisions with alligators happen almost every year, and gopher tortoise strikes have recently been increasing. Armadillos have been hit in Texas, pronghorn antelope in Arizona. Leading the list are white-tailed deer, whose U.S. population is estimated at 15 million. More than 1,000 deer strikes were recorded in the FAA's 24-year study period, and significant dam-

age is typical. Next on the list is the coyote, with more than 400 collisions. In all, the FAA listed 42 species of terrestrial mammals and 11 species of reptiles involved in accidents.

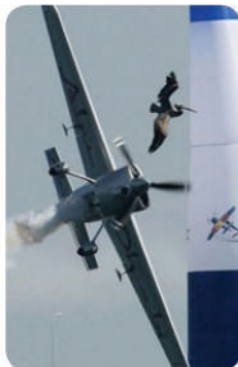
Even domesticated animals have run afoul of aircraft. Collisions with cattle have destroyed airplanes, and yes, dogs and cats have had encounters too. In fact, the first recorded terrestrial wildlife strike involved a dog. On July 25, 1909, the same day he would become the first person to fly a plane across the English Channel, Louis Blériot was warming up the engine of his Blériot XI when an unfortunate farm dog ran into his propeller blades.

There have also been some downright strange mishaps. On September 10, 2013, when a Gulfstream IV flown by the National Oceanic and Atmospheric Administration hit something on the runway at MacDill AFB in Florida, it turned out to be a fish—a sheephead that had most likely been dropped by an osprey.

A small homebuilt aircraft was landing at North Carolina's Miller Air Park Airport on March 13, 2006, when the pilot felt the plane hit something. As the aircraft rolled down the grass runway, its nose gear began to collapse. When the nose hit the ground, the plane flipped over—a total loss. The pilot, OK aside from a cut to the head, scrambled out and discovered the remains of a cottontail rabbit.

**S**o what has been done to lessen the risk? In the 1980s, the FAA started taking steps to address the problem, hiring its first staff biologist in 1983. In 1989 FAA officials began collaborating with the Department of Agriculture Wildlife Services, which developed an Airport Wildlife Hazards Program and provided direct assistance to airports across the country. The National Wildlife Research Center's Ohio field station works to develop management strategies to reduce wildlife hazards to aircraft and produce science-based recommendations, policies and procedures to control wildlife at airports and other locations where they present a hazard to aviation safety. Wildlife Services personnel began working with officials at major airports such as JFK and ORD to address their wildlife issues. The two agencies published the first manual on mitigating wildlife strikes at civil airports in 1999, at which time they were assisting 363 airports. By 2010, more than 800 airports were provided assistance.

Since most bird strikes occur when aircraft are close to the ground, either taking off or landing, much of the control effort has been centered around airports and nearby areas. In fact, the FAA has addressed the issue of wildlife strikes in its airport certification process, which includes an explanation of wildlife control strategies. And since 2004, the FAA has required every airport that meets or exceeds a certain size to conduct a Wildlife Hazard Assessment. Airport officials must survey



**THE ANNUAL COST IN THE U.S. OF DAMAGE AND DOWNTIME DUE TO WILDLIFE STRIKES IS ESTIMATED TO BE AS HIGH AS \$937 MILLION.**

#### RACE TO SURVIVE

A pelican flew into Hannes Arch's prop during the 2009 Red Bull Air Race World Championship (above). This Beechcraft (right) landed with a smashed windshield after hitting a western grebe at 11,000 feet on November 4, 2009.

their site, determining the types and numbers of birds and other wildlife typically found there and the threats they pose to aircraft. Then the airport must produce a Wildlife Hazard Management Plan and submit it to the FAA for approval.

The Bird Strike Committee USA is a volunteer organization formed in August 1991 to promote the collection of data on wildlife strikes, facilitate the exchange of that information and foster the development of systems to reduce the hazard. The group includes representatives from the FAA, USDA, Department of Defense, aviation industry and airports. It holds conferences to exchange ideas, and also works closely with the Bird Strike Association of Canada. Both groups meet annually at the Bird Strike North America Conference. It is particularly important that both nations work together because migratory birds that spend time north and south of the border are a major hazard. About 90 percent of all bird strikes in the U.S. involve species federally protected under the Migratory Bird Treaty Act.

Many other countries also have bird strike committees, and there's also the World Birdstrike Association, headquartered in the Netherlands. Officially formed in June 2012, the WBA was the successor to the International Bird Strike Committee, established in November 2008 to coordinate information between nations.

Progress is clearly being made in identifying strike zones and warning pilots and airports about how to make flying safer. Efforts to reduce the bird and wildlife strike threat will continue worldwide, but this is a problem sure to challenge aviators as long as birds and beasts lurk nearby. †

*Retired meteorology professor Ed Brotak has written extensively on the effects of weather, biology/ecology and natural hazards to aviation. Further reading: Bird Strike: The Crash of the Boston Electra, by Michael Kalafatas. Online resources include the FAA Wildlife Strike Database ([wildlife.faa.gov](http://wildlife.faa.gov)) and websites of the Bird Strike Committee USA ([birdstrike.org](http://birdstrike.org)), Bird Strike Association of Canada ([canadianbirdstrike.ca](http://canadianbirdstrike.ca)) and World Birdstrike Association ([worldbirdstrike.com](http://worldbirdstrike.com)).*

