



National Transportation Safety Board

Washington, D.C. 20594

Safety Recommendation

Date: Nov 19, 1999

In reply refer to: A-99-86 through -94

Honorable Jane F. Garvey
Administrator
Federal Aviation Administration
Washington, D.C. 20591

On March 4, 1999, at 2200 central standard time, a Douglas DC-9-15F, N195US, operated by USA Jet Airlines, Inc., encountered a flock of large birds while on final approach for landing at Kansas City International Airport, Kansas City, Missouri. During the encounter, several birds were ingested into both engines, resulting in severe engine power loss. The pilot regained enough power in one engine to continue the approach and land the airplane without further incident. There were no injuries. Night visual meteorological conditions prevailed at the time of the encounter, and an instrument flight rules (IFR) flight plan had been filed for the nonscheduled domestic air cargo flight. The flight was conducted under the provisions of 14 Code of Federal Regulations (CFR) Part 121.

On February 22, 1999, about 1455 eastern standard time, a Boeing 757, N682DA, operated by Delta Air Lines Inc., as flight 338, penetrated a flock of birds during takeoff from Cincinnati/Northern Kentucky International Airport, Covington, Kentucky. According to the captain, the takeoff roll was normal until reaching approximately 150 knots, at which time a flock of birds traveling from left to right passed in front of the airplane. The captain alerted the first officer (the pilot flying) to the hazard and asked him to attempt to climb over the flock. The first officer increased the airplane's pitch angle, but just as the main landing gear had lifted off of the runway, the airplane penetrated the flock. The captain advised air traffic control (ATC) of the event and was cleared to land. The captain observed no change in engine performance or flight characteristics during or after the event. There were no injuries, but the airplane was substantially damaged. Visual meteorological conditions prevailed, and an IFR flight plan had been filed for the scheduled passenger flight destined for Washington, D.C. The flight was conducted under 14 CFR Part 121.

Background

The National Transportation Safety Board has been concerned about bird strike hazards to aircraft for many years. Since 1973, it has issued 16 safety recommendations to the Federal Aviation Administration (FAA) to prevent accidents from bird strikes. Most recently, in 1996, the Safety Board issued five safety recommendations based in part on a September 22, 1995, U.S. Air Force (USAF) Boeing E-3B accident in Alaska, which killed all 24 people on board.

The USAF investigation determined that a flock of Canada geese had flown in front of the airplane as it became airborne. Birds were ingested into two of the airplane's four engines, which caused them to lose power. Investigators found the remains of nearly three dozen birds on the runway after the accident and thousands of Canada geese living on the airport grounds.

On July 8, 1996, the Safety Board issued Safety Recommendations A-96-38 through -42. Safety Recommendation A-96-38 asked the FAA to "revise the Aeronautical Information Manual [AIM], paragraph 7-4-2, section B, to advise pilots to delay takeoff whenever a bird hazard exists in the runway environment." Safety Recommendation A-96-39 asked the FAA to "develop a set of 'scare tactic' procedures that can be requested by pilots, air traffic controllers, and/or airport personnel and executed by the proper personnel to disperse birds near runways." The recommendation further asked the FAA to "disseminate these procedures to all parties in the appropriate manuals." Safety Recommendation A-96-40 asked the FAA to "annually brief air traffic controllers on the importance of adhering to the guidance in paragraph 21-1-22 of FAA Order 7110.65, 'Air Traffic Control,' regarding the dissemination of bird hazard information to pilots." Safety Recommendation A-96-41 asked the FAA to "develop and issue guidance to air traffic terminal controllers to include specific information regarding the type, size, and location of bird hazards on automatic terminal information system recordings." Safety Recommendation A-96-42 asked the FAA to "issue appropriate bulletins to urge pilots and maintenance personnel to report all bird strike incidents to the FAA via FAA Form 5200-7."

In response to Safety Recommendations A-96-38 and -39, the FAA stated that paragraph 7-4-4 of the AIM and the airport certification manuals already contain the information requested by the Board in its recommendations and that some effective measures for scaring and controlling wildlife near runways already exist. The Board agreed and classified Safety Recommendations A-96-38 and -39 "Closed—Reconsidered." In response to Safety Recommendations A-96-40 through -42, the FAA issued Notice N3120.117, "Air Traffic Refresher Training;" issued a change to paragraph 2-9-3 of Order 7110.65J, "Air Traffic Control;" and issued Flight Standards Information Bulletin for Air Transportation 96-28, "Bird Hazards." Because these actions met the intent of Safety Recommendations A-96-40 through -42, they were classified "Closed—Acceptable Action." The Kansas City and Covington incidents indicate that despite the considerable government and industry attention that has been focused on this issue over the last 20 years and the safety improvements that have been made in response to Safety Board safety recommendations, bird strike hazards continue to threaten the operation of aircraft and the safety of passengers.

Recently, Safety Board staff held meetings with bird strike experts to identify additional areas in which improvements are needed to reduce bird strike hazards to aircraft. Representatives from the FAA, the U.S. Department of Agriculture (USDA), the USAF Bird Aircraft Strike Hazard (BASH) Team, the Air Line Pilots Association, the Fish and Wildlife Service, and two independent consultants, Geo-Marine Incorporated (GMI) and the Center for Conservation Research and Technology, attended the meetings. The Safety Board has identified several improvements that could significantly reduce bird strike hazards.

Avian Hazard Advisory System

The Avian Hazard Advisory System (AHAS), operated by GMI for the USAF, is designed to track migration patterns, in near real time, using next-generation weather radar (NEXRAD) images from the NEXRAD Information Distribution System and determine if that activity is hazardous to aviation. The AHAS removes radar images consistent with weather and then assumes that the residual radar images are birds. The system correlates the new radar data with the data on the distribution of large migrant birds in the contiguous United States to estimate the migration intensity. The estimate is then extracted and stored in a database for selected military low-level routes, ranges, and airports. The migration information is updated hourly and is available to pilots and air crews via the Internet. Although AHAS is still in development, USAF BASH personnel believe the system will help minimize bird strike hazards.

The Safety Board concludes that AHAS technology, if applied to civil aviation, could provide bird strike risk warnings to ATC and flight crews, and possibly prevent serious bird strike incidents. Therefore, the Safety Board believes that the FAA should evaluate the potential for using AHAS technology for bird strike risk reduction in civil aviation and if found feasible, implement such a system in high-risk areas, such as major hub airports and along migratory bird routes, nationwide.

Other Bird Hazard Technologies

Bird hazard reduction technologies, such as cannon or gun fire and vegetation maintenance, have been of limited effectiveness. USDA and FAA representatives indicated that a need exists for increased research and development for new bird hazard reduction technologies, such as chemical repellents, lasers, thermal imaging, pulsed microwaves, ultraviolet stimuli, vegetation types, and automated (bird-triggered) frightening devices. The Safety Board agrees that such research and development is needed. Therefore, the Safety Board believes that the FAA, in coordination with the USDA, should conduct research to determine the effectiveness and limitations of existing and potential bird hazard reduction technologies.

Wildlife Hazard Assessments

According to the USDA, a critical need exists for many U.S. airports to undergo an initial wildlife hazard assessment to determine the level of bird/wildlife control needed. According to the FAA, the amount of control needed at an airport varies depending on the geographical location of the facility, local and regional wildlife, and aircraft movements. For example, an airport located in a coastal area, with wetlands on the airport and heavy traffic (for example, John F. Kennedy International Airport, New York, New York), may be at a greater risk of a bird strike than a less heavily trafficked airport located in the desert (for example, Tucson International Airport, Tucson, Arizona).

Title 14 CFR 139.337 currently requires that certificated airport operators must conduct an ecological study¹ only when any of the following events occur on or near an airport: (1) an air carrier aircraft experiences a multiple bird strike or engine ingestion, (2) an air carrier aircraft experiences a damaging collision with wildlife other than birds, or (3) wildlife of a size or number capable of causing one of the events described in paragraph (1) or (2) of this section is observed to have access to any airport flight pattern or movement area. Following its review of the ecological studies, the FAA determines the need for a formal wildlife hazard management program.

However, according to the FAA, some airports in the United States that might have experienced one or more of the events listed in 14 CFR 139.337 have not conducted an ecological study. Because bird/wildlife reporting is voluntary, many events that would require an airport to conduct a study are not reported to the FAA; therefore, many airports have been able to avoid conducting the studies. To prevent this from recurring, the Safety Board concludes that a wildlife hazard assessment should be conducted at all 14 CFR Part 139 airports. Therefore, the Safety Board believes that the FAA, in consultation with the USDA, should require that wildlife assessments be conducted at all 14 CFR Part 139 airports where such assessments have not already been conducted. The Safety Board also believes that the FAA should require the development of a wildlife hazard management program for all airports determined to need one as a result of the wildlife hazard assessment proposed in Safety Recommendation A-99-88. In addition, the FAA should ensure that the wildlife hazard management programs are incorporated into the airport certification manuals and periodically inspect the programs' progress.

Reporting of Bird Strikes and Species Identification

The FAA does not mandate bird strike reporting; however, it does maintain a Wildlife Strike Database, which contains information about bird strikes that have been reported voluntarily. In April 1995, the USDA National Wildlife Research Center, through an interagency agreement with the FAA, initiated a project to obtain more objective estimates of the magnitude and nature of the bird strike problem for civil aviation in the United States. This project included the following: (1) editing and entering all strike reports voluntarily sent to the FAA into a Wildlife Strike Database, (2) supplementing FAA-reported strikes with additional, nonduplicating strike reports from other sources, and (3) producing annual reports summarizing the results. Collected data include the bird species, aircraft and engine types, phase of flight, type of damage, airports, and time of day and year. Such reports are critical to determine the nature and economic costs of wildlife strikes and the magnitude of the problem so that appropriate corrective actions can be implemented.

Currently, the FAA's Wildlife Strike Database contains about 23,000 strikes, which were reported between 1990 and 1998. However, the FAA estimates that less than 20 percent of strikes are reported to the FAA; thus, its database reflects only a fraction of the actual strikes and grossly underestimates the magnitude of the problem. Bird strikes are estimated to

¹Part 14 CFR uses the term "ecological study" synonymously with the term "wildlife hazard assessment" used by the USDA.

cause in excess of 501,560 hours per year of aircraft down time, \$237.43 million per year in direct monetary losses, and \$77.21 million per year in associated costs to the U.S. civil aviation industry. The Safety Board concludes that the voluntary reporting system has not resulted in the provision of adequate data on bird strike hazards and this has hindered the proper evaluation of the problem and implementation of safety improvements. Therefore, the Safety Board believes that the FAA should require all airplane operators to report bird strikes to the FAA.

According to USDA personnel, another problem with the existing reporting system is that over 50 percent of the reports lack the most critical piece of information about a strike, the species of bird. This information is critical because the most effective method of control strongly depends on the species. Further, if identified, the identification is often generic (for example, gull or duck) and does not provide information on body weight or other characteristics that the USAF BASH team believes are needed to better target and support control efforts. Also, according to the USAF, some birds are completely misidentified.

The USAF funds a position at the Smithsonian Institution to identify bird remains from USAF bird strikes. Currently, no funding or program is available to provide this service for civil aviation; thus, civil airport personnel have no place to send bird remains for identification. The Safety Board concludes that civil aviation needs a similar system to properly evaluate the bird strike problem and establish adequate bird hazard control. Therefore, the Safety Board believes that the FAA should contract with an appropriate agency to provide proper identification of bird remains, establish timely procedures for proper bird species identification, and ensure that airport and aircraft maintenance employees are familiar with the procedures.

ATC Procedures

The Safety Board has also learned that the FAA is considering allowing new high-speed, low-level airplane operations to facilitate air traffic flow (over 250 knots, below 10,000 feet mean sea level [msl]), including air carrier turbo-jet airplane operation. At the Safety Board's 1996 bird strike briefing, takeoff and initial climb were identified as the phases of flight during which bird hazards pose the greatest threat. USAF research concluded that over 50 percent of its bird strikes, over a 10-year period, occurred on or near runways.² In addition, a 1994 Transport Canada study concluded that the typical bird strike occurs during takeoff or landing and results in consequences ranging from engine fires to obscured vision, followed by rejected takeoffs or emergency landings.³ The Safety Board concludes that because the majority of bird strikes occur at altitudes lower than 10,000 feet msl, increasing the exposure times of air carrier turbo-jet airplanes to that altitude range at higher speeds may markedly increase the risk of bird strikes to those airplanes. Therefore, the Safety Board

²Griffen, Thomas, Captain. 1996. *The Mobility Forum*. "Bird Strikes - A Seasonal Danger." Volume 5, Number 1.

³Transport Canada Environmental Services Office. 1994. *Bird Strikes Canadian Aircraft: 1994 Summary Report*.

believes that before allowing high-speed, low-level airplane operations, the FAA should evaluate the potential risk of increased bird strike hazards to air carrier turbo-jet airplanes.

Combined Agency Effort

Various Federal agencies involved in aviation and wildlife protection have different missions and, sometimes, conflicting responsibilities and mandates. For example, the goals of improving aviation safety and promoting wildlife conservation through habitat protection, restoration, and enhancement sometimes conflict. The Safety Board concludes that the various agencies need to meet to consider a unified approach to the problem of bird strike hazards and to reconcile their different agendas. Therefore, the Safety Board believes that with representatives from the USDA, the Department of the Interior, the Department of Defense, and the U.S. Army Corps of Engineers, the FAA should convene a task force to establish a permanent bird strike working group to facilitate conflict resolution and improve communication between aviation safety agencies and wildlife conservation interests.

Therefore, the National Transportation Safety Board recommends that the Federal Aviation Administration:

Evaluate the potential for using Avian Hazard Advisory System technology for bird strike risk reduction in civil aviation and if found feasible, implement such a system in high-risk areas, such as major hub airports and along migratory bird routes, nationwide. (A-99-86)

In coordination with the U.S. Department of Agriculture, conduct research to determine the effectiveness and limitations of existing and potential bird hazard reduction technologies. (A-99-87)

In consultation with the U.S. Department of Agriculture, require that wildlife assessments be conducted at all 14 Code of Federal Regulations Part 139 airports where such assessments have not already been conducted. (A-99-88)

Require the development of a wildlife hazard management program for all airports determined to need one as a result of the wildlife hazard assessment proposed in Safety Recommendation A-99-88. (A-99-89)

Ensure that the wildlife hazard management programs are incorporated into the airport certification manuals and periodically inspect the programs' progress. (A-99-90)

Require all airplane operators to report bird strikes to the Federal Aviation Administration. (A-99-91)

Contract with an appropriate agency to provide proper identification of bird remains, establish timely procedures for proper bird species identification, and

ensure that airport and aircraft maintenance employees are familiar with the procedures. (A-99-92)

Before allowing high-speed, low-level airplane operations, evaluate the potential risk of increased bird strike hazards to air carrier turbo-jet airplanes. (A-99-93)

With representatives from the U.S. Department of Agriculture, the Department of the Interior, the Department of Defense, and the U.S. Army Corps of Engineers, convene a task force to establish a permanent bird strike working group to facilitate conflict resolution and improve communication between aviation safety agencies and wildlife conservation interests. (A-99-94)

Chairman HALL, Vice Chairman FRANCIS, and Members HAMMERSCHMIDT, GOGLIA, and BLACK concurred with these recommendations.

By: Jim Hall
Chairman