C/CAR/DCA/10 – IP/17
International Civil Aviation Organization 31/07/09
North American, Central American and Caribbean Office (NACC)
Tenth Meeting of Directors of Civil Aviation of the Central Caribbean (C/CAR/DCA/10)
Grand Cayman, Cayman Islands, 18 to 21 August 2009

Agenda Item 4: Aviation Safety Matters
4.6 Other Aviation Safety Matters

MANAGING WILDLIFE HAZARDS TO AIRCRAFT

(Presented by the United States)

SUMMARY

The civil and military aviation communities widely recognize that the threat to human health and safety from aircraft collisions with wildlife (wildlife strikes) is increasing. Many populations of wildlife species commonly involved in strikes have increased markedly in the last few decades. Air traffic has increased substantially since 1980. Passenger enplanements in the USA increased from about 310 million in 1980 to 749 million in 2007 and commercial air traffic increased from about 17.8 million aircraft movements in 1980 to 28 million in 2007. Birds, deer, and other wildlife present significant hazards to aircraft. Worldwide the total annual cost of such collisions has been estimated at $US 2,000,000,000 and resulted in fatalities annually. The Federal Aviation Administration has established minimum education and training standards for wildlife biologists conducting Wildlife Hazard Assessments or presenting training for airport personnel actively involved in implementing FAA approved Wildlife Hazard Management Plans at certificated airports. These are the first such standards to be established anywhere in the world. The FAA requires certificated airports that have a record of bird strikes to conduct a wildlife hazard assessment. Based on the results of the Wildlife Hazard Assessment the airport may need to develop a Wildlife Hazard Management Plan that documents what procedures the airport will implement to control wildlife at or near the airport.

1. Introduction

1.1 The civil and military aviation communities widely recognize that the threat to human health and safety from aircraft collisions with wildlife (wildlife strikes) is increasing. Globally, wildlife strikes have killed more than 219 people and destroyed over 200 aircraft since 1988. Several factors contribute to this increasing threat.

1.2 Many populations of wildlife species commonly involved in strikes have increased markedly in the last few decades. For example, from 1980 to 2008, the resident (non-migratory) Canada goose population in the USA and Canada increased at a mean rate of 7.3 percent per year. Other species showing significant mean annual rates of increase included wild turkeys (13.0 percent), turkey vultures (2.3 percent), double-crested cormorants (4.9 percent), and sandhill cranes (4.7 percent). Thirteen of the 14 bird species in North America with mean body masses greater than 8 pounds have shown significant population increases over the past three decades. The white-tailed deer population increased from a low of about 350,000 in 1900 to at least 17 million by 1997.

1.2.1 Air traffic has increased substantially since 1980. Passenger enplanements in the USA increased from about 310 million in 1980 to 749 million in 2006 (3.5 percent per year), and commercial air traffic increased from about 17.8 million aircraft movements in 1980 to 28 million in 2007. USA commercial air traffic is predicted to continue growing at a rate of at least 2 percent per year to 36 million movements by 2020.

1.2.2 Collisions with birds and other wildlife cost the airline industry, and ultimately the flying public, approximately $US 2,000,000,000 annually. In addition to the economic losses, some collisions have resulted in loss of human life. While some of the collisions have been with smaller aircraft, large commercial aircraft have also been damaged and the potential for a catastrophic crash of a large commercial airliner remains non-trivial. Unfortunately, on January 15, 2009 this occurred when US Airways Flight 1549 suffered multiple Canada Geese strikes in both engines shortly after departing Laguardia Airport in New York. The aircraft was forced to land in the Hudson River. It was only the skill of the pilot, Captain Sullenberger and the flight crew, that all 155 persons on board were able to safely evacuate the aircraft.

1.2.3 Following the bird strike to US Airways Flight 1549, the FAA issued a certification alert encouraging all certificated airports that have not already done so to conduct a Wildlife Hazard Assessment (WHA). A WHA is conducted by a qualified wildlife biologist. It consists of an analysis of the wildlife on and in the vicinity of the airport, and the wildlife attractants in the area. Conducting a WHA is essential for an airport to know the wildlife situation on and around the airport. It is consistent with the tenants of Safety Management Systems (SMS) that require airports to be proactive, identify risk to airport safety, and mitigate those risks to acceptable levels. The WHA is done over a year to consider the wildlife threats in all seasons. The WHA assessment is submitted to the FAA for approval. Based on the results of the wildlife hazard assessment, the airport may have to develop a Wildlife Hazard Management Plan (WHMP). The WHMP describes the actions the airport will take to mitigate the wildlife hazards, the resources required, and the responsible personnel. The FAA assists airports by providing grant funds to help pay for the WHA and the WHMP. The FAA also provides guidance in the form of Advisory Circulars that describe the methodology for conducting the WHA and developing the WHMP.

1.3 The ICAO recognizes the hazard wildlife present to aircraft in Annex 14, Volume I; Section 9.4.3 requires airport authorities to “take action to decrease the risk to aircraft operations by adopting measures to minimize the likelihood of collisions between birds/wildlife and aircraft on, or in the vicinity of, an aerodrome.” Amendment No. 7 to this document, which became effective on 24 November 2005, requires that bird strikes be reported to the ICAO Bird Strike Information System. Additional changes require that wildlife be excluded from airfields through the use of fences or other barriers.

1.3.1 Because they can fly and overcome barriers, birds present a special hazard to aviation. The first step in reducing the risk of a wildlife collision is to maintain an environment that does not attract them. Attractants include food, water, nesting sites, and loafing areas. Although an airfield might be made unattractive, some birds utilize it because it might be a convenient location to perch when not feeding. In this case, perching must be deterred or the birds must be dispersed away from the airfield.

1.3.2 The US Dept. of Agriculture’s (USDA) National Wildlife Research Center (NWRC) conducts research on techniques to reduce wildlife hazards to aviation in the United States. Research in three areas is funded in part through an Interagency Agreement with the Federal Aviation Administration (FAA): wildlife habitat management, land-use studies, and wildlife harassment techniques.

2. Discussion

2.1 Before a problem can be solved, the problem must first be understood. A necessary first step toward understanding the complex problem of aircraft collisions with wildlife is the collection and analysis of data from actual wildlife strike events. The FAA, through an interagency agreement with the United States Department of Agriculture's (USDA) National Wildlife Research Center, has developed a National Wildlife Aircraft Strike Database. The database currently contains over 100,000 records of strikes involving USA civil aircraft, and USA military aircraft if the strike occurred at a joint use facility. This is allowing us to develop an accurate picture of the situation in the USA. Strike data from Transport Canada was incorporated into the database. This allows development of the economic cost of wildlife strikes, the magnitude of safety issues, and most importantly, the nature of the problems (e.g., bird species, aircraft and engine types, airports, and seasonal patterns) through out North America.

2.1.1 To expedite the dissemination of information in the National Wildlife Strike Database, the FAA has developed procedures for searching the database on line at: http://wildlife-mitigation.tc.faa.gov. The public may access the database without a password and retrieve basic information on the number of strikes by year, by state, and by species of wildlife.

2.2 Accurate species identification is critical for bird-aircraft strike reduction programs. Wildlife biologists must know what species of animal they are dealing with in order to make proper management decisions. The FAA, the U.S. Air Force, and the U.S. Department of Agriculture Wildlife Services is working closely with the Feather Identification Lab at the Smithsonian Institution, Museum of Natural History, to improve the understanding and prevention of bird-aircraft strike hazards. Bird strike remains which cannot be identified by airport personnel or by a local biologist can be sent to the Smithsonian Museum for DNA identification. Feather identification of birds involved in bird-aircraft strikes will be provided free of charge to all U.S. airport operators, all U.S. aircraft owners/operators (regardless of where the strike happened), or to any foreign air carrier if the strike occurred at a U.S. airport. The feather identification program has been augmented by the development of a DNA database for all North American Birds. So far, over 700 North American birds have been entered into the DNA database.

2.3 Airfield vegetation should be selected such that it does not attract wildlife. There are few, if any, species of plants that are repellent or toxic to birds that would not also be hazardous to humans. The first, and probably most important, criterion for selecting airfield vegetation is that it not be suitable for use as food by hazardous wildlife. If an animal does not use vegetation for foraging, it will be less likely to use it for resting because it will spend little time at that location. Many varieties of tall fescue contain a fungal endophyte, which produces noxious chemicals. Many animals, including Canada geese (*Branta canadensis*) avoid feeding on such plants because it produces gastric distress and inhibits the uptake of nutrients by the digestive system.

2.3.1 The Ohio Field Station (OFS) of the NWRC is actively investigating species and varieties of vegetation that are suitable for planting on airfields for their suitability as forage for wildlife, especially Canada geese. Previous research has shown that specific vegetation that is unattractive to wildlife will not necessarily grow in all environments. Consequently, vegetation must be suitable for the local climatic and soil conditions of airfields in different geographic locations to be successful.

2.3.2 During 2005 two varieties of grass were compared with Kentucky bluegrass and an endophyte containing variety of tall fescue to determine whether they are avoided for foraging by Canada geese. In 2006 additional varieties were tested. The results of these tests are being prepared.

2.4 Facilities on and near airfields can also attract hazardous wildlife. Refuse management facilities provide sources of food; water impoundments provide sources of water. Movements to and from such facilities can result in birds flying over an airfield on a regular basis. The other end of these movements might be roosts or breeding sites. Often it is not possible to move roosts or breeding locations; consequently, it is important to design water and trash management facilities in such a way that they do not attract birds.

2.4.1 Airport environments are poorly suited for residential and most commercial enterprises because of the noise from aircraft movements. Historically, this has resulted in land-fills and other solid waste facilities being located near airfields. Most solid waste facilities, especially landfills, attract many types of birds and other wildlife, which present hazards to aircraft during takeoff and landing. The increased number of birds moving near and across the airfield increase the risk of a collision. Because of continued interest in placing solid waste facilities near airports, the question of which, if any, solid waste facilities does not increase the risk of a collision. *A priori* the only structures that might be considered are limited to fully enclosed trash-transfer facilities. A research study was recently completed that studied various forms of trash–transfer facilities, including fully enclosed facilities and various 3-sided designs, as to whether or not they attract feeding or loafing birds.

2.4.2 Because of legal and environmental requirements airports must have catch basins to hold water runoff without allowing contaminants into the local water system. Some such catchments attract water birds, especially waterfowl but others are less attractive. An ongoing study is designed to determine which facility designs are more attractive to birds and what features make those designs attractive. This knowledge can be used to develop future designs to minimize the attraction of birds and other wildlife to water detention facilities on and near airfields. Research to analyzing the characteristics of storm water-management ponds that contribute to avian hazards to aviation at airports was recently completed and the results were presented at the 8th Joint meeting of Bird Strike Committee USA/Bird Strike Committee Canada.

2.5 Birds and other wildlife that are present on an airfield must be dispersed and discouraged from using the airport in order to prevent them from colliding with an aircraft. Several dispersal and wildlife deterrent devices and techniques have been evaluated. Some target single species or a small group of species, others are designed for a broad spectrum of species.

2.5.1 Research studies anticipated for 2007-2009 include investigating additional vegetation species for potential use on airfields. Typically airfield vegetation types are limited to grasses but other types of plants might also be suitable if they do not attract wildlife and require no more maintenance than grasses. A variety of repellents and repellent techniques will be examined and those that appear to have the greatest potential of reducing the number of animals on airfield will be tested. For example, species specific effigies of dead birds have proven successful in some cases but other hazardous taxa need to be tested, including crows and gulls. Research into the visual sensory capabilities and behavioral responses to visual stimuli will continue. The results of these studies will the development of new deterrent devices for attachment to aircraft and new repellent devices for use on airfield structures and elsewhere. Other research studies will be focused on reducing food sources, such as rodents and earthworms, which are used by predaceous species of birds.

2.5.2 The FAA also publishes a manual for Wildlife Hazard Management. It contains the results of all our research and provides practical information that airport operators can use to control wildlife. It is available on the FAA web site also.

2.6 FAA has been researching the ability of marine radars to detect and track birds on airports or in the vicinity (6 miles) of the airport. The original goal was to determine if low cost radars could reliably detect birds at or near (three to possibly six miles) to airports and be used to develop an airport bird strike advisory system. Through the course of research activities, and based on preliminary findings, the short term goal has shifted away from the development of an advisory system to the development of standards for using bird detection radar systems at civil airports to enhance hazardous wildlife control and management activities. The processed radar data is displayed on an airport geographic information system map. As many airports routinely have birds in the area, we do not yet know if this system would be capable of providing alerts that would be operationally suitable for making specific decisions on landing or takeoff. It may be of most use for airport operators to manage their wildlife control programs. The research is continuing to address these operational type issues.

2.7 The FAA is conducting radar evaluations with two Bird Radar systems at Seattle-Tacoma International Airport. FAA plans additional bird radar testing starting in summer 2009 at John F. Kennedy and Chicago O'Hare airports. FAA will use the results of the radar evaluations to develop a performance specification for bird radars that airports in the United States can use to procure bird radars using FAA grant funds.

2.8 At least 95 percent of all birds struck by aircraft are protected under the Migratory Bird Treaty Act of 1918, as amended. Wildlife biologist working on airports and airport personnel working to control hazardous wildlife must meet certain minimal education and training standards. An FAA Advisory Circular, 150/5200-36 *Qualifications for Wildlife Biologist Conducting Wildlife Hazard Assessments and Training Curriculums for Airport Personnel Involved in Controlling Wildlife Hazards on Airports* establishes the minimum education and training standards for wildlife biologists conducting Wildlife Hazard Assessments or presenting training for airport personnel actively involved in implementing FAA approved Wildlife Hazard Management Plans at certificated airports. These education and training standards are the first such standards to be established anywhere in the world.

3. Conclusion

3.1 The meeting is invited to

a) Review the information in this paper and to consider developing and implementing effective airport wildlife hazard mitigation plans within individual States.

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