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Agenda Item 3: Air Navigation Matters
3.6 Other Air Navigation issues

RESEARCH ACTIVITIES FOR MANAGING WILDLIFE HAZARDS TO AIRCRAFT

(Presented by the United States of America)

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. It has been well documented that birds, deer, and other wildlife present significant hazards to aircraft. As air traffic has increased, so too have passenger enplanements in the USA, increasing from about 310 million in 1980 to 731 million in 2005 and commercial air traffic increased from about 17.8 million aircraft movements in 1980 to 29.9 million in 2005.

Worldwide, the total cost of wildlife strikes is estimated at $2 billion USD, including fatalities. However, before the problem can be solved, it must first be understood. A necessary first step toward understanding the complex problem of wildlife strikes is the collection and analysis of data from actual wildlife strike events. A National Wildlife Aircraft Strike Database containing over 88,000 records of strikes involving US military and civil aircraft (if the strike occurred at a joint use facility) and strike data from Transport Canada has been developed. To expedite the dissemination of information in the National Wildlife Strike Database, procedures were developed for searching the database on-line. Accurate species identification is critical for bird-aircraft strike reduction programs. Bird strike remains that cannot be identified by airport personnel or by a local biologist are sent to the Smithsonian Museum in Washington, D.C. for identification. The FAA has established minimum education and training standards for wildlife biologists conducting Wildlife Hazard Assessments while 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.

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 (Dolbeer 2000, MacKinnon et al. 2001). Globally, wildlife strikes have killed more than 194 people and destroyed over 163 aircraft since 1988 (Richardson and West 2000; Thorpe 2003; 2005; Dolbeer, unpublished data). 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 2005, the resident (non-migratory) Canada goose population in the USA and Canada increased at a mean rate of 7.9 percent per year. Other species showing significant mean annual rates of increase included red-tailed hawks (1.9 percent), wild turkeys (12.7 percent), turkey vultures (2.2 percent), double-crested cormorants (4.9 percent), and sandhill cranes (4.3 percent) (Sauer et al. 2006)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 (Dolbeer and Eschenfelder 2003)The white-tailed deer population increased from a low of about 350,000 in 1900 to at least 17 million by 1997 (McCabe and McCabe 1997)

1.2.1 Air traffic has increased substantially since 1980 Passenger enplanements in the USA increased from about 310 million in 1980 to 731 million in 2005 (3.5 percent per year), and commercial air traffic increased from about 17.8 million aircraft movements in 1980 to 29.9 million in 2005 (2.1 percent per year, Federal Aviation Administration 2006) USA commercial air traffic is predicted to continue growing at a rate of at least 2 percent per year to 33 million movements by 2010.

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 (Cleary et al. 2006). 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.

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 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 Agency (FAA): wildlife habitat management and land-use studies, wildlife damage control methods, and avian sensory perception.

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 88,000 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 recently 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.

2.1.2 Access for airport operators, airline operators, engine manufactures, air frame manufactures, and certain other governmental agencies requires a password to access the database and allows retrieval of more detailed wildlife strike information for their specific area of concern. An airport operator's access is limited to strike information for incidents occurring on its particular airport, Airlines may only access strike records involving aircraft owned or operated by them. Comparisons among individual airports and airlines are not made. Airline and airport operators, airframe and engine manufactures, or governmental agencies may gain access to the FAA National Wildlife Aircraft Strike Database by writing the FAA Staff Wildlife Biologist.

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 are 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 that cannot be identified by airport personnel or by a local biologist can be sent to the Smithsonian Museum for 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 is being 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 DAN 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 the 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 (Washburn and Seamans 2004) because it produces gastric distress and inhibits the uptake of nutrients by the digestive system (Oliver 1997).

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 numbers 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. An ongoing research study is designed to determine which features of trash-transfer facilities do not result in an attraction of birds to the site. In addition to fully-enclosed facilities, various 3-sided designs also are being evaluated 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 (Blackwell et al, 2006).

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 at the OFS. 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 2006-2008 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.

2.6 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. A new Federal Aviation Administration 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.

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