

**Memorandum of Agreement Between
the Federal Aviation Administration,
the U.S. Air Force,
the U.S. Army,
the U.S. Environmental Protection Agency,
the U.S. Fish and Wildlife Service, and
the U.S. Department of Agriculture
to Address Aircraft-Wildlife Strikes**

PURPOSE

The signatory agencies know the risks that aircraft-wildlife strikes pose to safe aviation.

This Memorandum of Agreement (MOA) acknowledges each signatory agency's respective missions. Through this MOA, the agencies establish procedures necessary to coordinate their missions to more effectively address existing and future environmental conditions contributing to aircraft-wildlife strikes throughout the United States. These efforts are intended to minimize wildlife risks to aviation and human safety, while protecting the Nation's valuable environmental resources.

BACKGROUND

Aircraft-wildlife strikes are the second leading causes of aviation-related fatalities. Globally, these strikes have killed over 400 people and destroyed more than 420 aircraft. While these extreme events are rare when compared to the millions of annual aircraft operations, the potential for catastrophic loss of human life resulting from one incident is substantial. The most recent accident demonstrating the grievous nature of these strikes occurred in September 1995, when a U.S. Air Force reconnaissance jet struck a flock of Canada geese during takeoff, killing all 24 people aboard.

The Federal Aviation Administration (FAA) and the United States Air Force (USAF) databases contain information on more than 54,000 United States civilian and military aircraft-wildlife strikes reported to them between 1990 and 1999¹. During that decade, the FAA received reports indicating that aircraft-wildlife strikes, damaged 4,500 civilian U.S. aircraft (1,500 substantially), destroyed 19 aircraft, injured 91 people, and killed 6 people. Additionally, there were 216 incidents where birds struck two or more engines on civilian aircraft, with damage occurring to 26 percent of the 449 engines involved in these incidents. The FAA estimates that during the same decade, civilian U.S. aircraft sustained \$4 billion worth of damages and associated losses and 4.7 million hours of aircraft downtime due to aircraft-wildlife strikes. For the same period,

¹ FAA estimates that the 28,150 aircraft-wildlife strike reports it received represent less than 20% of the actual number of strikes that occurred during the decade.

USAF planes colliding with wildlife resulted in 10 Class A Mishaps², 26 airmen deaths, and over \$217 million in damages.

Approximately 97 percent of the reported civilian aircraft-wildlife strikes involved common, large-bodied birds or large flocks of small birds. Almost 70 percent of these events involved gulls, waterfowl, and raptors (Table 1).

About 90 percent of aircraft-wildlife strikes occur on or near airports, when aircraft are below altitudes of 2,000 feet. Aircraft-wildlife strikes at these elevations are especially dangerous because aircraft are moving at high speeds and are close to or on the ground. Aircrews are intently focused on complex take-off or landing procedures and monitoring the movements of other aircraft in the airport vicinity. Aircrew attention to these activities while at low altitudes often compromises their ability to successfully recover from unexpected collisions with wildlife and to deal with rapidly changing flight procedures. As a result, crews have minimal time and space to recover from aircraft-wildlife strikes.

Increasing bird and wildlife populations in urban and suburban areas near airports contribute to escalating aircraft-wildlife strike rates. FAA, USAF, and Wildlife Services (WS) experts expect the risks, frequencies, and potential severities of aircraft-wildlife strikes to increase during the next decade as the numbers of civilian and military aircraft operations grow to meet expanding transportation and military demands.

SECTION I.

SCOPE OF COOPERATION AND COORDINATION

Based on the preceding information and to achieve this MOA's purpose, the signatory agencies:

- A.** Agree to strongly encourage their respective regional and local offices, as appropriate, to develop interagency coordination procedures necessary to effectively and efficiently implement this MOA. Local procedures should clarify time frames and other general coordination guidelines.
- B.** Agree that the term "airport" applies only to those facilities as defined in the attached glossary.
- C.** Agree that the three major activities of most concern include, but are not limited to:
 - 1. airport siting and expansion;

² See glossary for the definition of a Class A Mishap and similar terms.

2. development of conservation/mitigation habitats or other land uses that could attract hazardous wildlife to airports or nearby areas; and
 3. responses to known wildlife hazards or aircraft-wildlife strikes.
- D.** Agree that “hazardous wildlife” are those animals, identified to species and listed in FAA and USAF databases, that are most often involved in aircraft-wildlife strikes. Many of the species frequently inhabit areas on or near airports, cause structural damage to airport facilities, or attract other wildlife that pose an aircraft-wildlife strike hazard. Table 1 lists many of these species. It is included solely to provide information on identified wildlife species that have been involved in aircraft-wildlife strikes. It is not intended to represent the universe of species concerning the signatory agencies, since more than 50 percent of the aircraft-wildlife strikes reported to FAA or the USAF did not identify the species involved.
- E.** Agree to focus on habitats attractive to the species noted in Table 1, but the signatory agencies realize that it is imperative to recognize that wildlife hazard determinations discussed in Paragraph L of this section may involve other animals.
- F.** Agree that not all habitat types attract hazardous wildlife. The signatory agencies, during their consultative or decisionmaking activities, will inform regional and local land use authorities of this MOA’s purpose. The signatory agencies will consider regional, local, and site-specific factors (e.g., geographic setting and/or ecological concerns) when conducting these activities and will work cooperatively with the authorities as they develop and implement local land use programs under their respective jurisdictions. The signatory agencies will encourage these stakeholders to develop land uses within the siting criteria noted in Section 1-3 of FAA Advisory Circular (AC) 150.5200-33 (Attachment A) that do not attract hazardous wildlife. Conversely, the agencies will promote the establishment of land uses attractive to hazardous wildlife outside those siting criteria. Exceptions to the above siting criteria, as described in Section 2.4.b of the AC, will be considered because they typically involve habitats that provide unique ecological functions or values (e.g., critical habitat for federally-listed endangered or threatened species, ground water recharge).
- G.** Agree that wetlands provide many important ecological functions and values, including fish and wildlife habitats; flood protection; shoreline erosion control; water quality improvement; and recreational, educational, and research opportunities. To protect jurisdictional wetlands, Section 404 of the Clean Water Act (CWA) establishes a program to regulate dredge and/or fill activities in these wetlands and navigable waters. In recognizing Section 404 requirements and the Clean Water Action Plan’s goal to annually increase the Nation’s net wetland acreage by 100,000 acres through 2005, the signatory agencies agree to resolve aircraft-wildlife conflicts. They will do so by

avoiding and minimizing wetland impacts to the maximum extent practicable, and will work to compensate for all associated unavoidable wetland impacts. The agencies agree to work with landowners and communities to encourage and support wetland restoration or enhancement efforts that do not increase aircraft-wildlife strike potentials.

- H.** Agree that the: U.S. Army Corps of Engineers (ACOE) has expertise in protecting and managing jurisdictional wetlands and their associated wildlife; U.S. Environmental Protection Agency (EPA) has expertise in protecting environmental resources; and the U.S. Fish and Wildlife Service (USFWS) has expertise in protecting and managing wildlife and their habitats, including migratory birds and wetlands. Appropriate signatory agencies will cooperatively review proposals to develop or expand wetland mitigation sites, or wildlife refuges that may attract hazardous wildlife. When planning these sites or refuges, the signatory agencies will diligently consider the siting criteria and land use practice recommendations stated in FAA AC 150/5200-33. The agencies will make every effort to undertake actions that are consistent with those criteria and recommendations, but recognize that exceptions to the siting criteria may be appropriate (see Paragraph F of this section).
- I.** Agree to consult with airport proponents during initial airport planning efforts. As appropriate, the FAA or USAF will initiate signatory agency participation in these efforts. When evaluating proposals to build new civilian or military aviation facilities or to expand existing ones, the FAA or the USAF, will work with appropriate signatory agencies to diligently evaluate alternatives that may avoid adverse effects on wetlands, other aquatic resources, and Federal wildlife refuges. If these or other habitats support hazardous wildlife, and there is no practicable alternative location for the proposed aviation project, the appropriate signatory agencies, consistent with applicable laws, regulations, and policies, will develop mutually acceptable measures, to protect aviation safety and mitigate any unavoidable wildlife impacts.
- J.** Agree that a variety of other land uses (e.g., storm water management facilities, wastewater treatment systems, landfills, golf courses, parks, agricultural or aquacultural facilities, and landscapes) attract hazardous wildlife and are, therefore, normally incompatible with airports. Accordingly, new, federally-funded airport construction or airport expansion projects near habitats or other land uses that may attract hazardous wildlife must conform to the siting criteria established in the FAA Advisory Circular (AC) 150/5200-33, Section 1-3.
- K.** Agree to encourage and advise owners and/or operators of non-airport facilities that are known hazardous wildlife attractants (See Paragraph J) to follow the siting criteria in Section 1-3 of AC 150/5200-33. As appropriate, each signatory agency will inform proponents of these or other land uses about the land use's potential to attract hazardous species to airport areas.

The signatory agencies will urge facility owners and/or operators about the critical need to consider the land uses' effects on aviation safety.

- L.** Agree that FAA, USAF, and WS personnel have the expertise necessary to determine the aircraft-wildlife strike potentials of various land uses. When there is disagreement among signatory agencies about a particular land use and its potential to attract hazardous wildlife, the FAA, USAF, or WS will prepare a wildlife hazard assessment. Then, the appropriate signatory agencies will meet at the local level to review the assessment. At a minimum, that assessment will:

 1. identify each species causing the aviation hazard, its seasonal and daily populations, and the population's local movements;
 2. discuss locations and features on and near the airport or land use attractive to hazardous wildlife; and
 3. evaluate the extent of the wildlife hazard to aviation.
- M.** Agree to cooperate with the airport operator to develop a specific, wildlife hazard management plan for a given location, when a potential wildlife hazard is identified. The plan will meet applicable FAA, USAF, and other relevant requirements. In developing the plan, the appropriate agencies will use their expertise and attempt to integrate their respective programmatic responsibilities, while complying with existing laws, regulations, and policies. The plan should avoid adverse impacts to wildlife populations, wetlands, or other sensitive habitats to the maximum extent practical. Unavoidable impacts resulting from implementing the plan will be fully compensated pursuant to all applicable Federal laws, regulations, and policies.
- N.** Agree that whenever a significant aircraft-wildlife strike occurs or a potential for one is identified, any signatory agency may initiate actions with other appropriate signatory agencies to evaluate the situation and develop mutually acceptable solutions to reduce the identified strike probability. The agencies will work cooperatively, preferably at the local level, to determine the causes of the strike and what can and should be done at the airport or in its vicinity to reduce potential strikes involving that species.
- O.** Agree that information and analyses relating to mitigation that could cause or contribute to aircraft-wildlife strikes should, whenever possible, be included in documents prepared to satisfy the National Environmental Policy Act (NEPA). This should be done in coordination with appropriate signatory agencies to inform the public and Federal decision makers about important ecological factors that may affect aviation. This concurrent review of environmental issues will promote the streamlining of the NEPA review process.
- P.** Agree to cooperatively develop mutually acceptable and consistent guidance, manuals, or procedures addressing the management of habitats attractive to

hazardous wildlife, when those habitats are or will be within the siting criteria noted in Section 1-3 of FAA AC 5200-33. As appropriate, the signatory agencies will also consult each other when they propose revisions to any regulations or guidance relevant to the purpose of this MOA, and agree to modify this MOA accordingly.

SECTION II. GENERAL RULES AND INFORMATION

- A.** Development of this MOA fulfills the National Transportation Safety Board's recommendation of November 19, 1999, to form an inter-departmental task force to address aircraft-wildlife strike issues.
- B.** This MOA does not nullify any obligations of the signatory agencies to enter into separate MOAs with the USFWS addressing the conservation of migratory birds, as outlined in Executive Order 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*, dated January 10, 2001 (66 *Federal Register*, No. 11, pg. 3853).
- C.** This MOA in no way restricts a signatory agency's participation in similar activities or arrangements with other public or private agencies, organizations, or individuals.
- D.** This MOA does not alter or modify compliance with any Federal law, regulation or guidance (e.g., Clean Water Act; Endangered Species Act; Migratory Bird Treaty Act; National Environmental Policy Act; North American Wetlands Conservation Act; Safe Drinking Water Act; or the "no-net loss" policy for wetland protection). The signatory agencies will employ this MOA in concert with the Federal guidance addressing wetland mitigation banking dated March 6, 1995 (60 *Federal Register*, No. 43, pg. 12286).
- E.** The statutory provisions and regulations mentioned above contain legally binding requirements. However, this MOA does not substitute for those provisions or regulations, nor is it a regulation itself. This MOA does not impose legally binding requirements on the signatory agencies or any other party, and may not apply to a particular situation in certain circumstances. The signatory agencies retain the discretion to adopt approaches on a case-by-case basis that differ from this MOA when they determine it is appropriate to do so. Such decisions will be based on the facts of a particular case and applicable legal requirements. Therefore, interested parties are free to raise questions and objections about the substance of this MOA and the appropriateness of its application to a particular situation.
- F.** This MOA is based on evolving information and may be revised periodically without public notice. The signatory agencies welcome public comments on this MOA at any time and will consider those comments in any future revision of this MOA.

- G.** This MOA is intended to improve the internal management of the Executive Branch to address conflicts between aviation safety and wildlife. This MOA does not create any right, benefit, or trust responsibility, either substantively or procedurally. No party, by law or equity, may enforce this MOA against the United States, its agencies, its officers, or any person.
- H.** This MOA does not obligate any signatory agency to allocate or spend appropriations or enter into any contract or other obligations.
- I.** This MOA does not reduce or affect the authority of Federal, State, or local agencies regarding land uses under their respective purviews. When requested, the signatory agencies will provide technical expertise to agencies making decisions regarding land uses within the siting criteria in Section 1-3 of FAA AC 150/5200-33 to minimize or prevent attracting hazardous wildlife to airport areas.
- J.** Any signatory agency may request changes to this MOA by submitting a written request to any other signatory agency and subsequently obtaining the written concurrence of all signatory agencies.
- K.** Any signatory agency may terminate its participation in this MOA within 60 days of providing written notice to the other agencies. This MOA will remain in effect until all signatory agencies terminate their participation in it.

SECTION III. PRINCIPAL SIGNATORY AGENCY CONTACTS

The following list identifies contact offices for each signatory agency.

Federal Aviation Administration
Office Airport Safety and Standards
Airport Safety and
Compliance Branch (AAS-310)
800 Independence Ave., S.W.
Washington, D.C. 20591
V: 202-267-1799
F: 202-267-7546

U.S. Air Force
HQ AFSC/SEFW
9700 Ave., G. SE, Bldg. 24499
Kirtland AFB, NM 87117
V: 505-846-5679
F: 505-846-0684

U.S. Army
Directorate of Civil Works
Regulatory Branch (CECW-OR)
441 G St., N.W.
Washington, D.C. 20314
V: 202-761-4750
F: 202-761-4150

U.S. Environmental Protection Agy.
Office of Water
Wetlands Division
Ariel Rios Building, MC 4502F
1200 Pennsylvania Ave., SW
Washington, D.C. 20460
V: 202-260-1799
F: 202-260-7546

U.S. Fish and Wildlife Service
Division of Migratory Bird Management
4401 North Fairfax Drive, Room 634
Arlington, VA 22203
V: 703-358-1714
F: 703-358-2272

U.S. Department of Agriculture
Animal and Plant Inspection Service
Wildlife Services
Operational Support Staff
4700 River Road, Unit 87
Riverdale, MD 20737
V: 301-734-7921
F: 301-734-5157

Signature Page

Original Signed by:

Woodie Woodward

12/17/2002

Associate Administrator for Airports,
Federal Aviation Administration

Date

Original Signed by:

Kenneth W. Hess

27 May 2003

Chief of Safety,
U. S. Air Force

Date

Original Signed by:

R.L. Brownlee

December 9, 2002

Assistant Secretary of the Army (Civil Works),
U.S. Army

Date

Original Signed by:

G. Tracy Mehan, III

1/17/03

Assistant Administrator, Office of Water,
U.S. Environmental Protection Agency

Date

Original Signed by:

Paul R. Schmidt

7/29/03

Assistant Director, Migratory Birds
and State Programs,
U.S. Fish and Wildlife Service

Date

Original Signed by:

Richard D Curnow

9 January 2003

Acting Deputy Administrator, Wildlife Services
U.S. Department of Agriculture

Date

GLOSSARY

This glossary defines terms used in this MOA.

Airport. All USAF airfields or all public use airports in the FAA's National Plan of Integrated Airport Systems (NPIAS). Note: There are over 18,000 civil-use airports in the U.S., but only 3,344 of them are in the NPIAS and, therefore, under FAA's jurisdiction.

Aircraft-wildlife strike. An aircraft-wildlife strike is deemed to have occurred when:

1. a pilot reports that an aircraft struck 1 or more birds or other wildlife;
2. aircraft maintenance personnel identify aircraft damage as having been caused by an aircraft-wildlife strike;
3. personnel on the ground report seeing an aircraft strike 1 or more birds or other wildlife;
4. bird or other wildlife remains, whether in whole or in part, are found within 200 feet of a runway centerline, unless another reason for the animal's death is identified; or
5. the animal's presence on the airport had a significant, negative effect on a flight (i.e., aborted takeoff, aborted landing, high-speed emergency stop, aircraft left pavement area to avoid collision with animal)

(Source: *Wildlife Control Procedures Manual*, Technical Publication 11500E, 1994).

Aircraft-wildlife strike hazard. A potential for a damaging aircraft collision with wildlife on or near an airport (14 CFR 139.3).

Bird Sizes. Title 40, Code of Federal Regulations, Part 33.76 classifies birds according to weight:

- small birds weigh less than 3 ounces (oz).
- medium birds weigh more than 3 oz and less than 2.5 lbs.
- large birds weigh greater than 2.5 lbs.

Civil aircraft damage classifications. The following damage descriptions are based on the *Manual on the International Civil Aviation Organization Bird Strike Information System*:

Minor: The aircraft is deemed airworthy upon completing simple repairs or replacing minor parts and an extensive inspection is not necessary.

Substantial: Damage or structural failure adversely affects an aircraft's structural integrity, performance, or flight characteristics. The damage normally requires major repairs or the replacement of the entire affected component. Bent fairings or cowlings; small dents; skin punctures; damage to wing tips, antenna, tires or brakes, or engine blade damage not requiring blade replacement are specifically excluded.

Destroyed: The damage sustained makes it inadvisable to restore the aircraft to an airworthy condition.

Significant Aircraft-Wildlife Strikes. A significant aircraft-wildlife strike is deemed to have occurred when any of the following applies:

1. a civilian, U.S. air carrier aircraft experiences a multiple aircraft-bird strike or engine ingestion;
2. a civilian, U.S. air carrier aircraft experiences a damaging collision with wildlife other than birds; or
3. a USAF aircraft experiences a Class A, B, or C mishap as described below:

A. Class A Mishap: Occurs when at least one of the following applies:

1. total mishap cost is \$1,000,000 or more;
2. a fatality or permanent total disability occurs; and/or
3. an Air Force aircraft is destroyed.

B. Class B Mishap: Occurs when at least one of the following applies:

1. total mishap cost is \$200,000 or more and less than \$1,000,000; and/or
2. a permanent partial disability occurs and/or 3 or more people are hospitalized;

C. Class C Mishap: Occurs when at least one of the following applies:

1. cost of reported damage is between \$20,000 and \$200,000;
2. an injury causes a lost workday (i.e., duration of absence is at least 8 hours beyond the day or shift during which mishap occurred); and/or
3. an occupational illness causing absence from work at any time.

Wetlands. An ecosystem requiring constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or

near the surface and the presence of physical, chemical, and biological features indicating recurrent, sustained inundation, or saturation. Common diagnostic wetland features are hydric soils and hydrophytic vegetation. These features will be present, except where specific physiochemical, biotic, or anthropogenic factors have removed them or prevented their development.

(Source the 1987 Delineation Manual; 40 CFR 230.3(t)).

Wildlife. Any wild animal, including without limitation any wild mammal, bird, reptile, fish, amphibian, mollusk, crustacean, arthropod, coelenterate, or other invertebrate, including any part, product, egg, or offspring there of (50 CFR 10.12, *Taking, Possession, Transportation, Sale, Purchase, Barter, Exportation, and Importation of Wildlife and Plants*). As used in this MOA, “wildlife” includes feral animals and domestic animals while out of their owner’s control (14 CFR 139.3, *Certification and Operations: Land Airports Serving CAB-Certificated Scheduled Air Carriers Operating Large Aircraft (Other Than Helicopters)*)

Table 1. Identified wildlife species, or groups, that were involved in two or more aircraft-wildlife strikes, that caused damage to one or more aircraft components, or that had an adverse effect on an aircraft's flight. Data are for 1990-1999 and involve only civilian, U.S. aircraft.

Birds	No. reported strikes
Gulls (all spp.)	874
Geese (primarily, Canada geese)	458
Hawks (primarily, Red-tailed hawks)	182
Ducks (primarily Mallards.)	166
Vultures (primarily, Turkey vulture)	142
Rock doves	122
Doves (primarily, mourning doves)	109
Blackbirds	81
European starlings	55
Sparrows	52
Egrets	41
Shore birds (primarily, Killdeer & Sandpipers)	40
Crows	31
Owls	24
Sandhill cranes	22
American kestrels	15
Great blue herons	15
Pelicans	14
Swallows	14
Eagles (Bald and Golden)	14
Ospreys	13
Ring-necked pheasants	11
Hérons	11
Barn-owls	9
American robins	8
Meadowlarks	8
Buntings (snow)	7
Cormorants	6
Snow buntings	6
Brants	5
Terns (all spp.)	5
Great horned owls	5
Horned larks	4
Turkeys	4
Swans	3
Mockingbirds	3
Quails	3
Homing pigeons	3
Snowy owls	3
Anhingas	2

Birds	No. reported strikes
Ravens	2
Kites	2
Falcons	2
Peregrine falcons	2
Merlins	2
Grouse	2
Hungarian partridges	2
Spotted doves	2
Thrushes	2
Mynas	2
Finches	2
Total known birds	2,612

Mammals	No. reported strikes
Deer (primarily, White-tailed deer)	285
Coyotes	16
Dogs	10
Elk	6
Cattle	5
Bats	4
Horses	3
Pronghorn antelopes	3
Foxes	2
Raccoons	2
Rabbits	2
Moose	2
Total known mammals	340

Ring-billed gulls were the most commonly struck gulls. The U.S. ring-billed gull population increased steadily at about 6% annually from 1966-1988. Canada geese were involved in about 90% of the aircraft-geese strikes involving civilian, U.S. aircraft from 1990-1998. Resident (non-migratory) Canada goose populations increased annually at 13% from 1966-1998. Red-tailed hawks accounted for 90% of the identified aircraft-hawk strikes for the 10-year period. Red-tailed hawk populations increased annually at 3% from 1966 to 1998. Turkey vultures were involved in 93% of the identified aircraft-vulture strikes. The U.S. Turkey vulture populations increased annually at 1% between 1966 and 1998. Deer, primarily white-tailed deer, have also adapted to urban and airport areas and their populations have increased dramatically. In the early 1900's, there were about 100,000 white-tailed deer in the U.S. Current estimates are that the U.S. population is about 24 million.