FLIGHT SAFETY FOUNDATION
Airport Operations
Vol. 23 No. 4 *For Everyone Concerned with the Safety of Flight* July–August 1997

Airport Land Uses Require Planning to Prevent Wildlife-Aircraft Strikes

Increased wildlife populations on and around airports and changes in aircraft technology have added to the danger of collisions between wildlife and aircraft. A recent U.S. Federal Aviation Administration Advisory Circular makes many recommendations about land uses on or near airports.

—

FSF Editorial Staff

The U.S. Federal Aviation Administration (FAA) has published a new advisory circular (AC) that provides guidance for land use on or near airports so as to minimize the possibility of wildlife-aircraft strikes. AC 150/5200, *Hazardous Wildlife Attractants on or near Airports*, specifies minimum recommended distances between airport areas and wildlife attractants.

The AC defines hazardous wildlife as "species that are commonly associated with wildlife-aircraft strike problems, are capable of causing structural damage to airport facilities or act as attractants to other wildlife that pose a wildlife-aircraft strike hazard."

Although tracts of open land around airports add to the safety margin and reduce noise problems, they can attract species of wildlife that adapt well to such environments.

Other factors also attract wildlife to the airport environment. Chief among them is the use that is made of the land on or near the airport, and it is important for airport operators, planners and land-use developers to be aware of which land-use practices may act as wildlife attractants. Undesirable land-use practices can bring wildlife into the approach or departure airspace, aircraft surface-movement areas and ramp areas of airports.

The increase in wildlife populations, the use of larger turbine engines, the increased number of twin-engine aircraft and the growth of air traffic have all contributed to the growing number and severity of collisions between wildlife and aircraft.

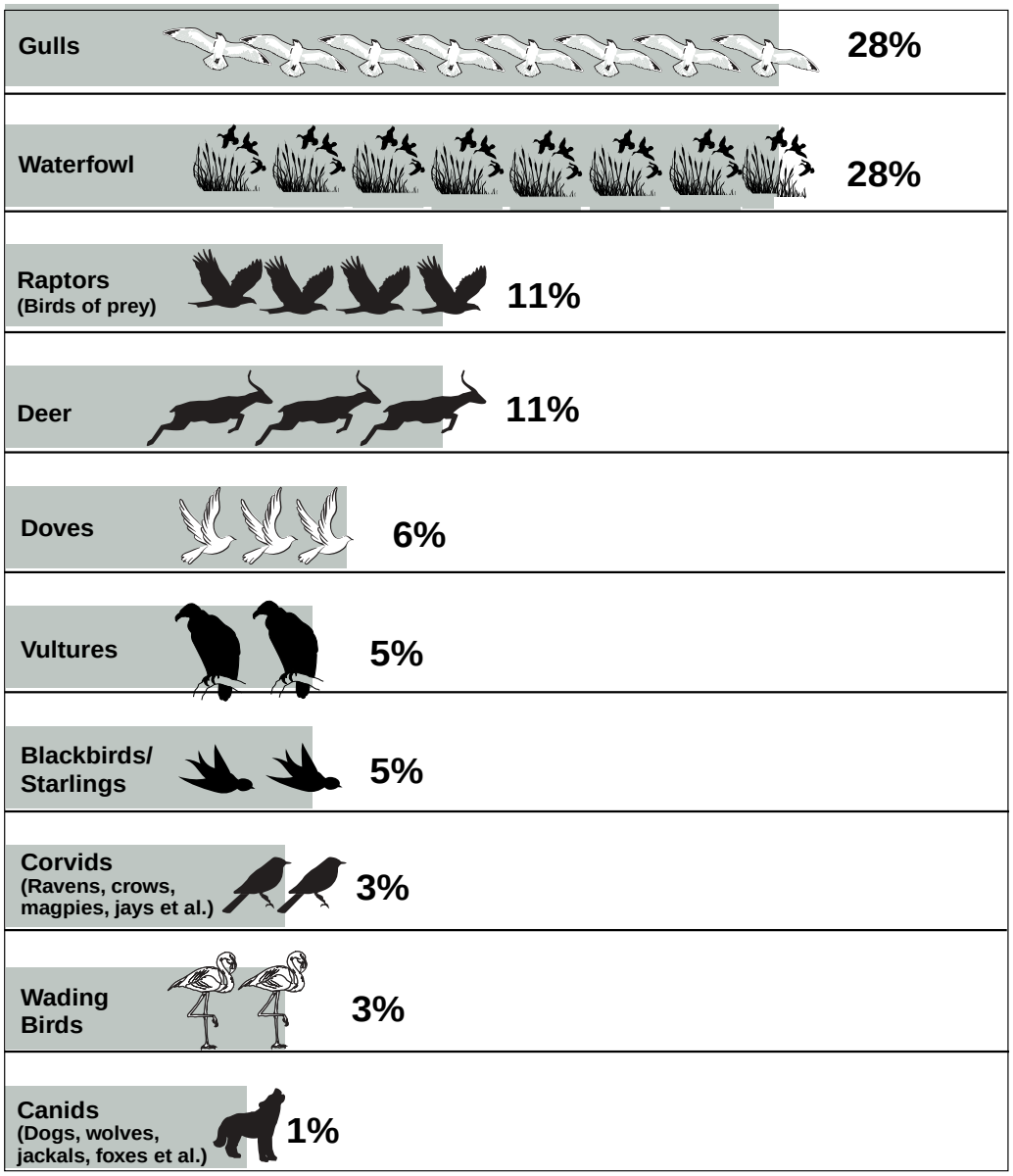
"During the past century," the AC said, "wildlife-aircraft strikes have resulted in the loss of hundreds of lives worldwide, as well as billions of dollars of aircraft damage. Hazardous wildlife attractants near airports could jeopardize future airport expansion because of safety considerations."

Table 1 (page 2) shows groups of wildlife and the percentage of damaging strikes to civilian aircraft in which they were involved from 1993 to 1995.

"Caution should be exercised to ensure that land use practices on or near airports do not enhance the attractiveness of the area to hazardous wildlife," the AC said. "Particular attention should be given to proposed land uses involving creation or expansion of wastewater treatment facilities, development of wetland mitigation sites or development or expansion of dredge-spoil containment areas.

"FAA recommends separations when siting any of the wildlife attractants mentioned in [the AC] or when planning new airport development projects to accommodate aircraft movement. The

Table 1
Wildlife Involved in Reported Strikes with Damage to Civilian Aircraft, United States, 1993–1995



Groups of wildlife, ranked by percentage, involved in collisions

Percentages total more than 100 percent because of rounding.

Source: U.S. Federal Aviation Administration

distance between an airport's aircraft movement areas, loading ramps or aircraft parking areas and the wildlife attractant should be as [shown in Table 2, page 3]."

The AC first discussed land uses that are known to attract hazardous wildlife and thereby create hazards to flight safety. These include putrescible-waste disposal operations, wastewater treatment operations, wetlands and dredge-spoil containment. (See "Definitions," page 4.)

Putrescible material is rotting organic matter. Putrescible-waste disposal operations include landfills, garbage dumps, underwater waste discharges and other facilities for disposing of rotting organic material, trash or refuse. "Putrescible-waste disposal operations are known to attract large numbers of wildlife that are hazardous to aircraft," the AC said.

Wastewater treatment facilities are used to store and reclaim municipal sewage or liquid industrial waste. In most instances,

Table 2
Minimum Recommended Distances Between Vulnerable Airport Areas* and Wildlife Attractants

- **Airports serving piston-powered aircraft**: A distance of [1,525 meters (5,000 feet)] is recommended;
- **Airports serving turbine-powered aircraft**: A distance of [3,050 meters (10,000 feet)] is recommended; and,
- **Approach or departure airspace**: A distance of eight kilometers (five miles) is recommended if the wildlife attractant may cause hazardous wildlife movement into or across the approach or departure airspace.

* Aircraft movement areas, loading ramps or aircraft parking areas.

Source: U.S. Federal Aviation Administration

settling ponds are associated with the wastewater treatment facilities.

Wastewater treatment operations are grouped into five categories:

- **New wastewater treatment facilities**. The AC recommended against building wastewater treatment facilities or associated settling ponds within the separations given in Table 2.

- **Existing wastewater treatment facilities**. The AC recommended taking immediate steps to counteract any wildlife hazards that arise from existing wastewater treatment facilities located on or near airports. Operators of the wastewater treatment facilities should incorporate appropriate wildlife-hazard mitigation techniques into their operations. Measures should be developed in consultation with a wildlife damage-management biologist (WDMB).

- **Artificial marshes**. "Wastewater treatment facilities may create artificial marshes," the AC said, "and use submergent (partly submerged) and emergent (mostly above-water) aquatic vegetation as natural filters. These artificial marshes may be used by some species of flocking birds, such as blackbirds and waterfowl, for breeding and roosting activities."

- **Wastewater discharge and sludge disposal**. The AC said, "FAA recommends against the discharge of wastewater or sludge [dewatered effluent] on airport property. Regular spraying of wastewater or sludge disposal on unpaved areas may improve soil moisture and quality. The resultant turf growth requires more frequent mowing, which in turn may mutilate or flush insects or small animals and produce straw. The maimed or flushed organisms and the straw can attract hazardous wildlife ... . In addition, the improved turf may attract grazing wildlife such as deer and geese."

- **Underwater waste discharge**. The underwater discharge of food waste can be a strong attraction for scavenging wildlife.

Wetlands on or near airports pose another type of wildlife-attractant hazard, and the AC addressed three specific issues: existing airports, airport development and wetland mitigation.

- **Existing airports**. "Normally, wetlands are attractive to many wildlife species," the AC said. "Airport operators with wetlands located on or nearby airport property should be alert to any wildlife use or habitat changes in these areas that could affect safe aircraft operations."

- **Airport development**. The AC recommended using the separations identified in Table 2 when siting new airports. The AC said, "Where alternative sites are not practicable or when expanding existing airports in or near wetlands, the wildlife hazards should be evaluated and minimized through a wildlife management plan prepared by a [WDMB], in consultation with the U.S. Fish and Wildlife Service (USFWS) and the U.S. Army Corps of Engineers (COE)."

- **Wetland mitigation**. Under U.S. environmental protection laws, mitigation of a wetlands area (designation of a replacement wetlands area of the same size and quality) may be necessary when new airport development projects result in unavoidable wetland disturbances.

The AC recommended that wetland mitigation projects that could attract hazardous wildlife should be sited outside of the separations identified in Table 2. Exceptions may be considered if the affected wetlands provide unique ecological functions, such as critical habitat for threatened or endangered species. Such mitigation must be compatible with safe airport operations. On-site mitigation plans may be reviewed by the FAA to determine compatibility with safe airport operations.

"Wetland mitigation projects that are needed to protect unique wetland functions ... and that must be located in the siting criteria in [Table 2] should be identified and evaluated by a [WDMB] before implementing the mitigation," the AC said.

Dredge-spoil containment areas. If the dredge spoil contains materials that would attract wildlife, the AC recommended against locating the dredge spoil within the separations identified in Table 2.

Areas on or near airports need not be kept empty or idle in the interest of aviation safety. The AC listed a number of land uses that can be compatible with safe airport operations.

Definitions

Clearway: A defined rectangular area beyond the end of the runway, cleared or suitable for use in place of the runway to satisfy takeoff-distance requirements.

Dredge spoil: Sand, rocks, mud and materials dredged up from the bottom of a body of water and placed on land.

OFA (object-free area): A two-dimensional ground area surrounding runways, taxiways and taxi lanes that is clear of objects except for objects whose location is fixed by function.

OFZ (obstacle-free zone): Includes the airspace above the runway centerline, the airspace above the extended runway centerline (for approach-lighting systems) and the airspace above the outer edges of the first two areas (for precision instrument runways).

RPZ (runway protection zone): A trapezoidally shaped area that is centered on the extended runway centerline. The RPZ dimension for a particular runway is a function of the type of aircraft and the approach visibility minimum associated with that runway end. The OFA is a component of the RPZ.

RSA (runway safety area): A defined ground surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot or excursion from the runway.

RVZ (runway visibility zone): The area that must be visible to a pilot using a runway, including the runway in use and any runways that intersect it.

TSS (threshold siting surface): The threshold siting surface starts at the beginning of the full-strength runway pavement, at the threshold elevation, and slopes upward (away from the runway) from that point at a gradient of 20 (horizontally) to one (vertically). The dimensions of the individual TSS and any displacement of the TSS depend on operational criteria.

Source: U.S. Federal Aviation Administration

Enclosed waste facilities. The AC said, "Enclosed trash-transfer stations or enclosed waste-handling facilities that receive garbage indoors; process it via compaction, incineration or similar manner; and remove all residue by enclosed vehicles, generally would be compatible, from a wildlife perspective, with safe airport operations, provided they are not located on airport property or within the runway protection zone (RPZ). No putrescible waste should be handled or stored outside at any time, for any reason, in a partially enclosed structure accessible to hazardous wildlife."

Recycling centers. "Recycling centers that accept previously sorted, nonfood items such as glass, newspaper, cardboard or aluminum are, in most cases, not attractive to wildlife," the AC said.

Composting operations. The AC did not recommend that composting operations occur at airports. If they do, however, the AC said that they should be at least 366 meters (1,200 feet) from any aircraft movement area, loading ramp or aircraft parking space, or the distance called for by airport design requirements, whichever is greater. This separation is intended to prevent composting-operations material, personnel or equipment from penetrating any obstacle-free area (OFA), obstacle-free zone (OFZ), threshold siting surface (TSS) or clearway.[1]

"Components of the compost should never include any municipal solid waste," the AC said. "Nonfood waste such as leaves, lawn clippings, branches and twigs generally are not considered a wildlife attractant."

The AC called for the airport operator to monitor composting operations "to ensure that steam or thermal rise does not affect air traffic in any way. Discarded leaf-disposal bags or other debris must not be allowed to blow onto any active airport area. Also, the airport operator should reserve the right to stop any operation that creates unsafe, undesirable or incompatible conditions at the airport."

Ash disposal. Fly ash is a fine, sand-like residue that is caused by incomplete burning of organic fuel. "Fly ash from resource recovery facilities that are fired by municipal solid waste, coal or wood," the AC said, "is generally considered not to be a wildlife attractant because it contains no putrescible matter. FAA generally does not consider landfills accepting only fly ash to be wildlife attractants ... ."

Construction and demolition (C&D) debris landfills. The AC said, "FAA generally does not consider C&D landfills to be hazardous wildlife attractants, if those landfills are maintained in an orderly manner; admit no putrescible waste of any kind; and are not co-located with other disposal operations."

Water detention or retention ponds. Providing for the runoff of storm water from runways, taxiways and aprons is a normal and necessary function at airports. Detention ponds hold storm water for short periods, and retention ponds retain water indefinitely. "Retention ponds are more attractive to hazardous wildlife than detention ponds because they provide a more reliable source of water," the AC said.

"To facilitate hazardous wildlife control, FAA recommends using steep-sided, narrow, linearly shaped, rip-rap [large broken stones]-lined water detention basins rather than retention basins. When possible, these ponds should be placed away from aircraft movement areas to minimize aircraft-wildlife interactions. All [surrounding] vegetation ... that provides food or cover for hazardous wildlife should be eliminated.

"If soil conditions and other requirements allow, FAA encourages the use of underground storm water infiltration systems ... because they are less attractive to wildlife."

Hazardous wildlife may be drawn to the airport environment by natural habitat, such as the wooded area adjacent to this runway. (Photo: © 1997 PhotoDisc Inc.)

Landscaping. "FAA recommends that airport operators approach landscaping with caution and confine it to airport areas not associated with aircraft movement," the AC said. "All landscaping plans should be reviewed by a [WDMB]. Landscaped areas should be monitored on a continuing basis for the presence of hazardous wildlife. If hazardous wildlife is detected, corrective actions should be taken immediately."

Golf courses. The open space provided by a golf course aids in noise prevention and can be used for emergency landing. An on-airport golf course may also be a revenue source for the airport. Nevertheless, the large grassy areas and open water found on most golf courses attract waterfowl. The AC said, "Because waterfowl and gulls occur throughout the [United States], FAA recommends that airport operators exercise caution and consult with a [WDMB] when considering proposals for [golf] course construction or expansion on or near airports."

Agricultural crops. The AC generally did not object to agricultural crop production on airports when the agricultural operation is closely monitored by the airport operator or sponsor to ensure compliance with guidelines. The AC said:

1. "FAA recommends that no agricultural activities be conducted in the runway safety area (RSA), OFA and the OFZ ... ."

2. "Restricting agricultural operations to areas outside the RSA, OFA, OFZ and runway visibility zone (RVZ) will normally provide the minimum object clearances required by FAA's airport design standards. FAA recommends that farming operations not be permitted within areas critical to the proper operation of localizers, glideslope indicators or other visual or electronic navigational aids ... . If navigational aids are present, farm leases for on-airport agricultural activities should be coordinated with FAA's Airway Facilities Division.[2]

3. "The OFA normally extends the farthest [into approach areas] and is usually the controlling surface ... . However, for some runways, the TSS may be more controlling than the OFA.[1] The TSS may not be penetrated by any object.

4. "FAA recommends that no agricultural activities be permitted within the RVZ. If the terrain is sufficiently below the runway elevation, some types of crops or equipment may be acceptable ... ."

5. "Farming activities should not be permitted within a taxiway's OFA. The outer portions of aprons are frequently used as a taxi lane ... . Farming operations should not be permitted between runways or parallel taxiways."

6. "If a problem with hazardous wildlife develops, FAA recommends that a professional ... [WDMB] be contacted and an on-site inspection be conducted. The ... [WDMB] should be requested to determine the source of the hazardous wildlife attraction and suggest remedial action."

The AC included a detailed table showing the minimum distances between certain airport features and any on-airport agricultural crops.

"Whenever on-airport operations are stopped due to wildlife hazards or annual harvest, FAA recommends plowing under all crop residue and harrowing the surface smooth," the AC said. "This will reduce or eliminate the area's attractiveness to foraging wildlife. FAA recommends that this requirement be written into all on-airport farm use contracts and clearly understood by the lessee."

The AC described procedures by which airport developers, land developers and owners in the United States should notify the FAA about "known or reasonably foreseeable" practices in or near airports that attract, or could attract, wildlife. In addition, the AC said, "If an existing land use practice creates a wildlife hazard, and the land use practice cannot be immediately eliminated, the airport operator should issue a Notice to Airmen (NOTAM) and encourage the land owner or manager to take steps to control the wildlife hazard and minimize further attraction."♦

Editorial note: This article was adapted from U.S. Federal Aviation Administration Advisory Circular (AC) 150/5200-33, *Hazardous Wildlife Attractants on or near Airports,* May 1, 1997.

References

1. FAA Advisory Circular (AC) 150/5300-13, *Airport Design*, Nov. 10, 1994.

2. FAA Order 6750.16, *Siting Criteria for Instrument Landing Systems*, Oct. 31, 1995.

Further Reading from FSF Publications

Hewes, V. B. "Rapid Response of Airport Emergency Services Hindered by Weather and Other Factors." *Airport Operations* Volume 21 (November–December 1995).

Martin, M. "Bird-strike Solutions Spurred by Imagination, Innovation." *Airport Operations* Volume 21 (March–April 1995).

Koenig, R. "Canadian Study Finds Greatest Frequency of Bird Strikes to Turbofan and Turboprop Aircraft Below 100 Feet in Summer." *Airport Operations* Volume 22 (January–February 1995).

"Airports — Breeding Grounds for Birdstrikes." *Airport Operations* Volume 18 (July–August 1992).

Spence, C. "How Airports Reduce Dangers of Bird Strikes." *Airport Operations* Volume 16 (January–February 1990).

AIRPORT OPERATIONS

Staff: Roger Rozelle, director of publications; Rick Darby, senior editor; Douglas Greenwood, senior editor; Todd Lofton, editorial consultant; Karen K. Ehrlich, production coordinator; Ann L. Mullikin, assistant production coordinator; and David A. Grzelecki, librarian, Jerry Lederer Aviation Safety Library.

Subscriptions: US$60 (U.S.-Canada-Mexico), US$65 Air Mail (all other countries), six issues yearly. • Include old and new addresses when requesting address change. • Flight Safety Foundation, 601 Madison Street, Suite 300, Alexandria, VA 22314 U.S. • Telephone: (703) 739-6700 • Fax: (703) 739-6708