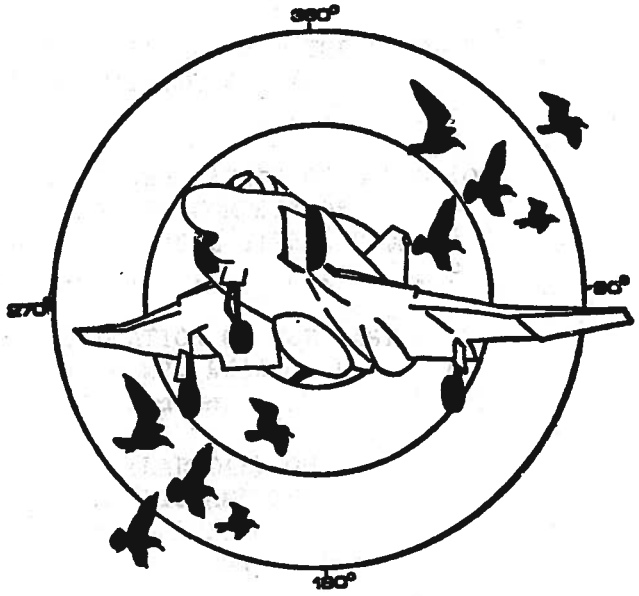
by John L. Seubert

A Conference On The Biological Aspects Of The Bird/Aircraft Collision Problem

February 5-7, 1974



Edited by
Sidney A. Gauthreaux, Jr.

Department of Zoology
Clemson University
Clemson, South Carolina

Sponsored By The Air Force Office of Scientific Research

Proceedings

J 0005

RELATIONSHIPS OF BLACKBIRD/STARLING ROOSTS TO BIRD HAZARDS AT AIRPORTS

John L. Seubert and Brooke Meanley
Department of the Interior
Bureau of Sport Fisheries and Wildlife
Patuxent Wildlife Research Center
Laurel, Maryland 20810

ABSTRACT

Blackbirds and starlings pose serious hazard to aviation when they roost on or near airports. Damage and loss of aircraft and personnel may ensue when bird flightlines cross runways and approach areas and birds are ingested into turbine engines.

About 500 million blackbirds and starlings are found in the United States, three-fourths of them in the East. Blackbird roosts are formed every month; in the Southeast, many winter roosts occur and often contain several million birds each. Roosts usually are established in dense deciduous or pine vegetation, swamp thickets, cane, and marshes. Selection of roosting areas probably is determined by the availability of suitable food and habitat. Dense cover apparently is a primary requirement. Roosting behavior and feeding habits are discussed in relation to the bird-aviation problem.

Blackbird/starling airport hazards have occurred at Moody Air Force Base, Winston-Salem Airport, DeKalb-Peachtree Airport (Atlanta), and elsewhere. Alleviating hazards requires environmental management, effective programs of bird harassment and dispersal, timely warnings to pilots of hazardous bird flights or concentrations, and adjustment in flying schedules where appropriate.

INTRODUCTION

We are participating in this Conference because various birds, and even certain mammals, are hazards to aviation. Hopefully, we have passed the point of having to demonstrate further that certain flying animals are dangerous to aviation, since the extent of the problem has been well documented (World Conference on Bird Hazards to Aircraft 1969). Blackbirds (Icteridae) and starlings (*Sturnus vulgaris*) have caused serious losses of life and aircraft

in the United States (Civil Aeronautics Board 1962, Reed et al. 1973, Wooten 1974). These birds are among the most numerous of North American birds; are widely distributed; feed and move about in large flocks, often numbering in the thousands; are often attracted to short-grass airport areas; and, if occupying roosts on or near airports, cause high hazards to aircraft. Starlings are strongly attracted to garbage, and, if disposal sites are located on or near airports, severe hazards may occur. The purpose of this paper is to relate various aspects of blackbird/starling ecology and behavior to hazards caused by these birds when they roost on or near airports, to present examples of dangerous situations, and to make recommendations for reducing these problems.

BLACKBIRD/STARLING ROOST ECOLOGY

An estimated 500 million blackbirds and starlings are found in continental United States (Meanley and Webb 1965). This estimate is based on nationwide cooperative roost surveys conducted by Bureau Research Centers of the U.S. Fish and Wildlife Service during 1959-64. The red-winged blackbird (*Agelaius phoeniceus*), starling, common grackle (*Quiscalus quiscula*), and brown-headed cowbird (*Molothrus ater*) make up four-fifths of the total. Other species, together contributing the remaining fifth of the total, include the rusty blackbird (*Euphagus carolinus*), Brewer's blackbird (*Euphagus cyanocephalus*), yellow-headed blackbird (*Xanthocephalus xanthocephalus*), boat-tailed grackle (*Cassidix mexicanus*), tricolored blackbird (*Agelaius tricolor*), and bronzed cowbird (*Tangavius aeneus*).

Three-fourths of the total U.S. blackbird population is found in the East. The winter concentration of blackbirds and starlings in the lower Mississippi Valley is the largest found in any section of the United States at any season. An estimated 200 million blackbirds and starlings winter in that region, based on the estimated number of birds occupying roosts in southeastern Missouri, Arkansas, Louisiana, Mississippi, and Tennessee. The magnitude of that winter population is due to the incursion in late fall of hordes of northern birds and their progeny from the North Central States and Prairie Provinces, together with the resident population. Rice production, concentrated near the southern terminus of the Mississippi Flyway, is an attraction to these birds. The Atlantic Coastal Plain from the Chesapeake Bay southward, the southern Piedmont, the Tennessee Valley Authority area, the Texas coastal rice belt, and the Great Valley of California are other important concentration areas.

A total of 175 major winter roosts, each containing a million or more birds, was known to exist in the United States in the early 1960's (Meanley and Webb 1965). The area east of the Great Plains contained 159 of the 175 major roosts--over 90 percent. About 70 of these roosts were in the lower Mississippi Valley. North Carolina, with 15 major roosts and an estimated 50 million birds, had the largest wintering blackbird-starling population along the Atlantic Coast. The largest known roost, which contained an estimated 31 million birds in December 1961, is in the Dismal Swamp on the Virginia-North Carolina line about 20 miles south of Norfolk.

Blackbirds and starlings form roosts during every month of the year (Meanley 1965). The size of roosts varies considerably from season to season; the minimum population is reached during the breeding season when most of the birds are dispersed. Most large rural roosting populations are composed of starlings and several species of blackbirds, while most urban roosts are composed predominantly of starlings.

The general locality in which large roosts are located is probably influenced by food supply. As an example, 15 roosts, each containing an estimated 1 million or more blackbirds and starlings, were in or within 25 miles of the Arkansas rice belt during the winter of 1962-63 (Meanley 1965). The Dismal Swamp roost is adjacent to a major peanut-producing area.

The precise location of a roost is determined by several factors, chief of which is the nature of the habitat. Dense cover appears to be very important. Roosting vegetation used by blackbirds and starlings was analyzed from reports of 600 U.S. roosts located during the winter of 1969-70 (Webb and Royall 1970). Marshes (26% of the roost-report listings), swamp thickets (22%, including shrub-swamp, pocosin, and willow-cottonwood wet areas), and canebrakes (4%) constituted wetland habitat (52% of all reports). The upland habitat (48%) consisted of deciduous thickets (36%) and coniferous cover (12%, often a young pine plantation). The majority of late summer-early fall roosts are in lake, river, or coastal marshes. Many blackbirds and starlings shift from marsh roosts as the vegetation breaks down in the fall; during the period extending from fall migration through winter and spring migration, brush, pine, and cane are more often utilized for roosting.

Winter roosting aggregations vary in size from a handful of birds to several million. Such roosts are formed in the fall or early winter and may reach their greatest size in midwinter; these

are usually occupied over a longer period of time than roosts at other seasons.

In regions of the country characterized by ample agricultural crop residues and preferred roosting habitat, the potential always exists for the development of a large blackbird/starling roost. Flightlines near an airport can be a problem, and, if the airport area includes garbage, for example, a very serious hazard probably will develop. The obvious countermeasures are to remove solid-waste disposal sites and dense roosting cover in airport areas. Small but dangerous roosts also can develop at any time--not just during peak winter-roosting season.

Most blackbirds do not begin feeding until a considerable distance from their roosts; some birds travel many miles although an abundance of the same kind of food may be available less than 1 mile from their roost. In Texas, blackbirds were observed to fly 46 and 52 miles from two coastal marsh roosts to their feeding ground in the rice belt (Meanley 1965).

The return flight to a roost may be made by a series of short movements, sometimes beginning in midafternoon or several hours before arrival at the roost. However, birds feeding at a great distance from the roost in late afternoon must make an extended flight to reach the roost by sundown or nightfall. In flying to and from roosts, birds usually follow the same routes, often along natural landmarks, such as drainage systems, hedgerows, or field borders (Meanley 1965).

Starlings, as well as blackbirds, often fly many miles from a roost to a good food source. If garbage disposal sites are located at or near airports, within range of bird flight patterns, serious hazards are apt to develop because of the strong attraction of garbage plus the great mobility of starlings.

Stratification by species has been observed in some roost flights. Starlings flew at the highest elevations; grackles, cowbirds, and redwings were next in order of height. The birds usually fly higher when farther from a roost; at 10 miles from a roost in southwestern Louisiana, the height was estimated at 1,000 to 1,500 feet (Meanley 1965). The later the flight, the closer to the ground all of the birds fly until the last birds flying toward the roost at dusk may just skim over the top of the vegetation. Thus, the altitude at which a bird/plane strike occurs may be influenced by both time of day and distance of birds from a roost.

On cloudy days, blackbirds tend to feed closer to the roost and move into the roost 15 to 30 minutes earlier than on sunny days. On one cloudy day (4 February 1959) at a point 10 miles from a roost in the Dismal Swamp, the main flight to the roost was from 1645 to 1715. The following evening was sunny and the main flight at the same point was between 1710 and 1740 (Meanley 1965). Therefore, on cloudy days, bird densities could be higher in an airport area where there is a roost, and the probability of a strike higher. The complete roostward flight of a large population often takes from 1 to 1½ hours.

Blackbirds move out of roosts each morning at or near sunrise and return in the evening near sunset. The exodus of a large roosting population usually takes about ½ hour, much less than the movement into the roost. In a Louisiana canebrake roost of some 10 million blackbirds and starlings and 1 million robins, the first activity noted on 3 January 1963 was the morning chorus, which began at about 0605. At 0635 some of the blackbirds began moving out of the cane understory and into the overstory of scattered hardwoods, and robins began to leave the roost. By 0638 blackbirds began leaving the roost; the main exodus was from 0640 to 0703 (sunrise). All birds had come up out of the cane roosting cover by 0655, but about 50 percent were still in the hardwood overstory. Starlings appeared to be the last to leave the roost. By 0710 the entire roosting congregation had left the roost. Thus, the total period of departure from the roost lasted 35 minutes (Meanley 1965), which is much less than the 1 to 1½ hours taken for the total arrival flight. These data show that peak hazard times are quite limited and that curtailing airport flight operations during these periods would reduce risks considerably.

EXAMPLES OF AIRPORT HAZARDS INVOLVING BLACKBIRD AND STARLING ROOSTS

To obtain a better idea of the magnitude of the problem, we recently questioned Bureau field employees and Air Force personnel on the whereabouts of airports with safety problems caused by nearby blackbird or starling roosts. Fortunately, we received relatively few reports about airports with nearby blackbird/starling roosts. However, when they do occur, serious danger to aviation often exists. The following brief account of past and present situations should be instructive.

The loss of a Lockheed Electra aircraft and 62 human lives at Boston in 1960, attributed to engine ingestion of starlings, was the first indication of the danger posed by flocking small birds to turbine-powered aircraft (Civil Aeronautics Board 1962). The most recent example of the blackbird/starling hazard is seen in the

loss of a Lear Jet and seven passengers in 1973 at the Atlanta DeKalb-Peachtree Airport (Reed et al. 1973). The ecological situation at this airport was examined by personnel of our Regional Office and by a committee headed by Dr. Gauthreaux, organizer of this Conference. These appraisals resulted in reports that summarize the problem and present recommendations for reducing the hazard (Jackson et al. 1973, Gauthreaux et al. 1973). It was found that a local roosting population of blackbirds and starlings was attracted to the airport for feeding, loafing, and roosting. The airport included such features as trees and brush, standing water, areas of bare soil, and--most important of all--a sanitary landfill that was attracting thousands of birds. In May 1973, a Heil Refuse Pulverizer System replaced the sanitary landfill.

In the Heil System, raw garbage is ground into a shredded mulch-like material (Gauthreaux et al. 1973, Vancil 1973). Even such milled garbage, however, has been an attractant to small birds (Ham and Reichardt 1973), and to blackbirds and starlings at DeKalb-Peachtree. As a result, jet aircraft operations have not been allowed at DeKalb-Peachtree during daylight hours. The two reports on the problem both concluded that the bird hazard at this airport would be reduced substantially if the garbage attractant was eliminated. Other important recommendations to reduce the hazard included manipulating habitat on the airport and at the blackbird/starling roost; initiating a system for detecting and monitoring bird activity; warning pilots of dangerous bird concentrations; and soliciting cooperation from pilots.

Brooke Meanley, co-author of this paper, also examined the DeKalb-Peachtree situation and the blackbird/starling roost in early December 1973 (memo dated 13 February 1974). He found only one major roost in the Atlanta area and estimated the roosting population to be at least 500,000 birds; redwings and cowbirds were the predominant species. Although the majority of the birds observed roosted in a small brushy area 4 miles from the airport, birds also roosted in clumps of vegetation in nearby residential areas. Meanley noted only one species, approximately 1,000 starlings, foraging on the milled garbage at the airport landfill site during his 3 days of observations. Occasionally, the flock, or part of it, flew out over the airfield and returned or landed in the grass close to a runway.

In January 1974, we learned that thousands of starlings were feeding at a landfill located adjacent to a runway at the Winston-Salem Airport (phone comm., D. T. Harke, North Carolina State Supervisor, Division of Wildlife Services, U.S. Fish and Wildlife Service). These birds were part of a large population roosting in pine about 1 mile from the airport. Fast action by those concerned

stopped the dumping of garbage, and Bureau personnel have received reports that the problem has been essentially resolved.

Flightlines of birds from a large late-winter blackbird/starling roost in a white pine (*Pinus strobus*) planting at Mansfield, Ohio, cause hazards at the local airport ½ mile away (January 1974 phone comm., R. O. Winters, Ohio State Supervisor, Division of Wildlife Services, U.S. Fish and Wildlife Service). A garbage dump located next to the airport attracts starlings. This is another example of how an existing bird problem is further compounded by the addition of a food source.

The airport situations discussed above are striking examples of incompatible land use because of the disposal of garbage at or adjacent to the airports. Examples of bird-airport hazards owing to the close proximity of blackbird/starling roosts to airports follow.

A large winter blackbird/starling roost was reported to be 2 miles from the Little Rock, Arkansas, airport (memo dated 11 December 1973 from T. W. Booth, Jr., Arkansas State Supervisor, Division of Wildlife Services, U.S. Fish and Wildlife Service). Bird flightlines can be seen from the airport, but apparently the birds do not create a problem. In this instance, the flightlines follow terrain features (drainages) that do not involve the airport. In certain situations, the location of flightlines may be as important as the proximity of a roost site to an airfield.

Military airfields also have had their share of problems caused by nearby blackbird/starling roosts. A major roost in an adjacent 22,000-acre pocosin, or evergreen shrub-swamp, has caused serious hazard at Moody AFB, Valdosta, Georgia, for many years (February 1974 phone comm., Major H. A. Wallace, Moody AFB, Georgia). The Base is located in the midst of an agricultural area that serves as winter feeding grounds for large numbers of blackbirds and starlings that roost only 1 to 3 miles from Base runways. Roost flights intersect runways, and strikes to aircraft have caused considerable damage. Because of its size, physical features, and environmental value, the 22,000-acre pocosin habitat used for roosting is not amenable to ordinary means of problem resolution (i.e., habitat manipulation or moving of the roosting population through harassment). The only technique presently available for controlling the problem is to interrupt flight operations during the two relatively brief roost-flight periods in the morning and evening.

Approximately 3 million blackbirds and starlings are roosting in 18- to 20-year-old loblolly pines (*Pinus taeda*) at Ft. Campbell, Kentucky, and are causing a hazard to aviation (6 February 1974 phone comm., W. J. Francis, Division of Wildlife Research, Patuxent Wildlife Research Center). The roost is about ½ mile from the airport, and two major flightlines intersect the runway. Thousands of acres of pines were planted about 20 years ago; and, with canopy closure, the habitat became attractive to blackbirds and starlings for roosting. Remedial measures have been undertaken. These include moving birds from roost sites through harassment; thinning pine trees, two rows out of every three, to make plantings unattractive as roost sites; and curtailing flight operations during morning and evening roost flights.

The Ft. Campbell and other roost situations involving dense pine plantations point to the need for forestry practices that would permit the growing of pine without the plantations becoming blackbird/starling attractants.

RECOMMENDATIONS ON BLACKBIRD/STARLING HAZARDS AT AIRPORTS

A blackbird/starling roost may become established and present a hazard to aviation when an airport is in an area with suitable blackbird and starling roosting cover and ample food. Therefore, it would not be prudent to select new airport sites near large concentrations of blackbirds and starlings unless the concentrations can be eliminated permanently through habitat alteration. At existing airports, managers should: (1) become familiar with environmental features that attract these species, e.g., tree plantings, brushy areas, garbage, surface water, short grass, grass seeds, and insects; (2) practice environmental management to eliminate such attractants; and (3) become actively involved in land-use planning at both the local and State levels so that aviation safety may influence decisions pertaining to proposed land uses beyond airport boundaries (Seubert 1971).

Solid waste, principally garbage, is a critical factor in the blackbird/starling (and other species) airport problem (Associate Committee on Bird Hazards to Aircraft of the National Research Council, Canada 1969; Solman 1973). We have seen ample evidence of how improperly located solid-waste sites can result in hazards to airports (Reed et al. 1973, Davidson et al. 1971); and since many high risk situations can be directly related to garbage, the matter of where to locate waste sites warrants considerable attention.

One approach has been the development of guidelines to be used by the Environmental Protection Agency, Federal Aviation Administration, and U.S. Department of the Interior to encourage the use of ecological assessment as primary input in selecting solid-waste sites for disposal. The key to compatible land-use planning in relation to solid-waste sites and airport safety is to require that proposed sites in the vicinity of airports be surveyed ecologically before judgments are rendered about their potential attraction to blackbirds and starlings or other birds, and, in turn, the potential hazard to aviation at airports and in approach corridors. Moreover, these assessments should be made regardless of the distance between a proposed site and an airport environment.

A great need today is for responsible implementation of management techniques presently available to handle blackbird/starling (and other species) hazards at airports. These measures primarily involve environmental management, effective programs of bird harassment and dispersal, timely warnings to pilots of hazardous bird flights or concentrations, and adjustments in flying schedules where appropriate (World Conference on Bird Hazards to Aircraft 1969; Associate Committee on Bird Hazards to Aircraft of the National Research Council, Canada, 1969; Nelson and Seubert 1966; Brough 1969; Federal Aviation Administration 1968). Technical assistance can be obtained from the Washington, Regional, or area offices of the U.S. Department of the Interior, Federal Aviation Administration, and Environmental Protection Agency.

LITERATURE CITED

Associate Committee on Bird Hazards to Aircraft of the National Research Council, Canada. 1969. Bird hazard reduction. Pp. 117-179 in International Civil Aviation Organization. Equipment, procedures, and services. Aerodrome Manual, Part 5, Vol. II, 4th ed. (Doc 7920-AN/865).

Brough, T. 1969. The dispersal of Starlings from woodland roosts and the use of bio-acoustics. J. Appl. Ecol. 6: 403-410.

Civil Aeronautics Board. 1962. Accident report SA-358, Eastern Air Lines, Inc., Lockheed Electra L-188, N 5533, Logan Int. Airport, Boston, Massachusetts, October 4, 1960.

Davidson, G. R., Jr., T. V. Degeare, Jr., T. J. Sorg, and R. M. Clark. 1971. Land disposal sites near airports reporting bird/aircraft hazards. Open-File Report (TSR 1.6.004/0), U.S. Environmental Protection Agency, Solid Waste Management Office. 33 pp.

Federal Aviation Administration. 1968. Bird reactions and scaring devices. U.S. Department of Transportation, FAA Advisory Circular 150/5200-9. 4 pp.

Gauthreaux, S. A., Jr., L. O. Walker, and R. L. Carlton. 1973. Bird-aircraft hazards at DeKalb-Peachtree Airport, Atlanta, Georgia: a survey for the Federal Aviation Administration. 21 pp. [Processed.]

Ham, R. K., and J. J. Reinhardt. 1973. Refuse milling in Europe ...A study of 22 sites. Pp. 2-11 in NCRR (National Center for Resource Recovery, Inc.) Bull. 3(1).

[Jackson, A. W., J. W. Hardy, and L. O. Walker.] 1973. Recommendations for alleviation of bird problems at DeKalb-Peachtree Airport, DeKalb County, Georgia. Report prepared by U.S. Department of the Interior, Bur. Sport Fish. and Wildl., for DeKalb Co. Comm. [Processed.]

Meanley, B. 1965. The roosting behavior of the Red-winged Blackbird in the southern United States. Wilson Bull. 77: 217-228.

Meanley, B., and J. S. Webb. 1965. Nationwide population estimates of blackbirds and Starlings. Atlantic Nat. 20: 189-191.

Nelson, S. O., and J. L. Seubert. 1966. Electromagnetic and sonic energy for pest control. Pp. 135-166 in Scientific aspects of pest control, Publ. 1402. National Academy of Sciences--National Research Council, Washington, D.C.

Reed, J. H., L. M. Thayer, I. A. Burgess, and W. R. Haley. 1973. Aircraft accident report, Machinery Buyers Corp., Learjet Model 24, N454RN, Atlanta, Georgia, February 26, 1973. File No. 3-0186, National Transportation Safety Board, Washington, D.C. 20591. 11 pp.

Seubert, J. L. 1971. Birds and airport safety. Typescript. (Paper presented at Environmental Planning Conference, Airport Operators Council, New Orleans, Louisiana, March 24, 1971.) 6 pp.

Solman, V. E. F. 1973. Influence of garbage dumps near airports on the bird hazard to aircraft problem. Typescript. (Paper presented at Natl. Conf. on Urban Engineering Terrain Problems, Montreal, Canada, May 7, 1973.) 8 pp.

[Vancil, R.] 1973. Shredders...processing our solid wastes. Pp. 12-18 in NCRR Bull. 3(1).

Webb, J. S., and W. C. Royall, Jr. 1970. National survey of blackbird-starling roosts. Pp. 134-135 in Proc. 5th Bird Control Seminar, September 15-17, 1970, Bowling Green State Univ., Bowling Green, Ohio.

Wooten, R. C. 1974. Current bird control technologies and the military pest control problem. (Paper presented at Tri-Services Conf. of Military Entomologists, February 4-8, 1974, at Brooke Army Med. Center, Ft. Sam Houston, Texas.) [In preparation for publication.]

World Conference on Bird Hazards to Aircraft. 1969. Proc. World Conf. Bird Hazards to Aircraft, Queen's Univ., Kingston, Ontario, 2-5 September 1969. 542 pp.