

**Gull Hazard Reduction Program
John F. Kennedy International Airport**

FINAL ENVIRONMENTAL IMPACT STATEMENT

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Queens County, New York

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EXECUTIVE SUMMARY

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■ Purpose and Need

John F. Kennedy International Airport (JFKIA) is one of the three major airports in the New York Metropolitan Region, servicing approximately 28 million passengers per year. It is located at the eastern end of Jamaica Bay, immediately adjacent to the Jamaica Bay National Wildlife Refuge, part of Gateway National Recreation Area (administered by the National Park Service). The interaction of birds and aircraft at JFKIA is a serious problem, creating significant hazards to human safety, as well as causing financial losses due to aircraft destruction, equipment damage, runway closures, and associated personnel costs. The proximity of the airport and wildlife refuge in a coastal location has contributed to an unusually high incidence of birdstrikes at JFKIA. As early as 1975, a U.S. Fish and Wildlife Service study concluded that gulls (Herring, Ring-billed, and Great Black-backed) constituted the principal bird hazard at JFKIA. This problem was severely exacerbated by the establishment and rapid growth of a breeding colony of Laughing Gulls on the salt marsh islands in Jamaica Bay located at the southeast end of Runway 22R/4L. As this colony grew from 15 pairs in 1979 to more than 7,000 pairs in 1990, the number of Laughing Gulls involved in birdstrikes increased from 2 to as many as 187, and the percentage of birdstrikes involving Laughing Gulls increased from less than 2 percent to approximately 50 percent. Other gulls constituted approximately 25 percent of JFKIA's birdstrikes. The 58 other bird species together (1979-93) have accounted for approximately 23 percent of the aircraft striking birds and 25 percent of the damage or delays. Gulls (Laughing, Herring, and Great Black-backed) are considered to be the most hazardous species at JFKIA, and are the subjects of this and other analyses. Many studies indicate that gulls pose the greatest threat to aircraft (Blokpoel 1976, Frings 1984) compared to all other threats (e.g., mechanical failure, pilot error, foul weather) (Griffin and Hoopes 1991).

Throughout the 1960s, 1970s, and 1980s, the Port Authority, federal, New York State and New York City natural resource management agencies, the Federal Aviation Administration, and others have conducted activities to evaluate, control, and monitor JFKIA's birdstrike hazard. These activities have included, but are not limited to: conduct of an experimental Laughing Gull egg-oiling project in Jamaica Bay; international panel review of the problem; ecological studies; interim shooting programs; and other activities. Despite implementation by the Port Authority of New York and New Jersey (PA) of a multi-faceted bird hazard reduction program and closure of nearby landfills, strikes by Laughing Gulls continued to increase. In response to this, a temporary, on-airport Gull Hazard Reduction Program was conducted by the Animal Damage Control unit of the U.S. Department of Agriculture from 1991 through 1993. Between May and August of each year, gulls entering JFKIA airspace were shot. Biologists killed 14,191 Laughing Gulls in 1991, 11,847 in 1992, and about 6,500 in 1993. By the third year, this program reduced the number of birdstrikes involving Laughing Gulls by more than 90 percent.

In 1992, the concern for potential cumulative impacts associated with the shooting program led to the desire to further explore issues involved in reduction of the hazards of gull/aircraft interaction at JFKIA. Consequently, the preparation of this Environmental Impact Statement (EIS) was initiated to explore all reasonable alternatives that might be implemented to satisfy the need to reduce the number of gull-aircraft (all 4 gull species) collisions at JFKIA in an effective, safe, environmentally sound manner that is in compliance with all applicable laws and regulations.

■ Hazard Reduction Approaches

There are two principal types of gull hazard reduction: (1) reducing the probability of gull/aircraft interactions; and (2) improving aircraft tolerance of gull strikes. The probability of interactions could be minimized by reducing the presence of gulls in JFKIA airspace or by improving the ability of aircraft to avoid gulls. Gull presence might be reduced by reducing on-airport attractants (such as food sources and water), by reducing similar off-airport attractants that induce flyovers, by inducing abandonment of the Jamaica Bay Laughing Gull colony site (through lethal or nonlethal methods), or by removal of gulls once they have entered JFKIA airspace (through lethal or nonlethal methods). The ability of aircraft to avoid gulls might be improved by changing the airport's operational schedule, or by utilizing gull tracking and warning devices. Improving the tolerance of aircraft for gull strikes could possibly be achieved by preventing ingestion of gulls into engines or by making the engines more tolerant of ingestions, and other aircraft components more resistant to impacts.

■ Alternatives Evaluated

All the alternative gull hazard reduction strategies identified through the public scoping process and further research were evaluated. These alternatives include the following:

- ▶ No-Action Alternative
- ▶ Nonlethal Gull Hazard Reduction Methods
 - Habitat Modification
 - Devegetation
 - Planting
 - Landform Alteration
 - On-Colony Harassment
 - Falconry
 - Dogs
 - Acoustics
 - Display of Dead Gulls or Models
 - Radio-controlled, Model Airplanes
 - Expansion of the On-Airport Bird Control Program
 - Reduction of Off-Airport Attractants
 - Changes in Airport Operations
 - Aircraft Engineering
- ▶ Lethal Gull Hazard Reduction Methods
 - On-Colony
 - Nest/Egg Destruction
 - Egg Oiling
 - Population Reduction of Adults
 - On-Airport Shooting
- ▶ Integrated Management Program (combination of nonlethal and lethal methods)

These alternatives are targeted at control of gull-aircraft collisions. All of the alternatives, except for those on the Jamaica Bay Laughing Gull nesting colony, are targeted at four gull species: Herring Gull, Ring-billed Gull, Great Black-backed Gull, and Laughing Gull. The alternatives that would occur on the Jamaica Bay Laughing Gull colony target Laughing Gulls only.

■ Evaluation of Alternatives

Evaluation of the possible alternatives to achieve the goals of the JFKIA Gull Hazard Reduction Program was conducted in the following tiered manner:

Tier 1 - Feasibility and Effectiveness

The first tier, for which all the alternatives were assessed, was an evaluation of feasibility and effectiveness. If an alternative was determined to be infeasible and/or ineffective, that alternative was eliminated from further consideration.

Tier 2 - Environmental Impacts

Those alternatives which were determined to be feasible and effective were subsequently evaluated for their environmental impacts. Regulatory compliance requirements (permits, authorizations, licenses, and reviews) for each feasible and effective alternative are presented.

Tier 3 - Comparison of Alternatives and Selection of Preferred Alternative

The feasibility, effectiveness and environmental impacts of the separate alternatives were compared and those alternatives which had substantial environmental impacts or low effectiveness or feasibility with relatively high impacts were eliminated from consideration as a preferred alternative. A preferred alternative was selected from among the remaining low-impact alternatives.

■ Evaluation of Feasibility and Effectiveness

The following alternatives were evaluated for their technical feasibility and effectiveness at achieving reduction of the gull hazard at JFKIA.

No-Action Alternative

Under the No-Action Alternative, the shooting program would be discontinued and the Port Authority would continue its current bird hazard reduction program involving vegetation, water, and sanitation management, insect control, and the Bird Control Unit. The No-Action Alternative is feasible, but it does not reduce the gull (all 4 gull species) hazard at JFKIA. Therefore, the No-Action Alternative is advanced for analysis of environmental impacts for comparative purposes only.

Nonlethal Alternatives

Various nonlethal methods aimed at eliminating the Laughing Gull nesting colony in Jamaica Bay were investigated. Modifying the habitat through devegetation of the colony site by mowing, burning, or herbicide application was found to be feasible. Changing the vegetation structure of the site by planting shrubs was considered infeasible. Changing the landform of the colony site by filling the marsh would

likewise be infeasible, as would erecting a physical barrier over the site. Excavation of the marsh to below mean high tide, however, would be feasible. Various forms of harassment to discourage use of the colony site were evaluated. Falconry, harassment by dogs, harassment by radio-controlled model airplanes, and broadcasting of distress calls or ultrasound were found to be infeasible or ineffective. The display of preserved dead gulls or synthetic models representing dead gulls as a deterrent merited further consideration.

Improvements to various elements of the existing on-airport management program at JFKIA (such as vegetation management, insect control, sanitation, and the personnel and equipment of the Bird Control Unit) were considered feasible and likely to be effective to some degree.

Reduction of off-airport attractants at Aqueduct Racetrack (through long-grass management, exclusion devices on ponds, and prohibition of bird feeding) would be feasible, given the cooperation of track management, as would exclusion devices on the ponds at the Jamaica Bay Sewage Treatment Plant. Reduction of other off-airport attractants would require extensive studies to identify the attractants, and the feasibility of implementing controls would depend on the nature of such attractants and the cooperation of the property owners involved.

In examining possible changes to airport operational strategies, preferential use of Runway 13L/13R (where gull activities are less frequent) was found to be infeasible because of operations and safety considerations. Use of interdiction devices such as high-intensity radar or laser beams, while potentially effective, was found to potentially pose an unacceptable hazard to humans and therefore was not considered to be feasible. Current airport radar technology is not suited to tracking small numbers of birds in close proximity to the airport (which would be needed to enable aircraft to avoid gulls); however, marine radars could be developed into a system that could permit monitoring of substantial seasonal migrations, and that might allow arriving aircraft, in particular, to avoid large concentrations of birds. The short lead time inherent in the detection of small, local bird movements (such as gulls crossing the runways) severely constrains the utility of radar in preventing collisions.

Equipping aircraft with screens to prevent ingestion of birds into aircraft engines has not proven to be a feasible technology.

Lethal Alternatives

Evaluation of feasibility and effectiveness of lethal methods in inducing abandonment of the colony site determined the following: physical destruction of nests and eggs and egg oiling are considered feasible and effective; population reduction of adults through toxicant application or shooting from blinds on the colony site is feasible and effective; introduction of predators is infeasible; and on-colony harassment with pyrotechnics combined with occasional shooting is ineffective.

Continuation of the current on-airport shooting program was found to be feasible, and the effectiveness of this method has been demonstrated over the past three years.

Integrated Management Program

The integrated management program is a combination of the most effective, feasible, nonlethal and lethal gull hazard reduction measures.

■ Environmental Impacts of Alternatives

Those alternatives which were determined to be feasible and effective were evaluated for the following environmental impacts:

- ▶ Ecological Resources
 - Wildlife
 - Birds
 - Threatened and Endangered Species
 - Habitat
- ▶ Water Quality
- ▶ Parks and Recreation
- ▶ Socioeconomics
- ▶ Air Quality
- ▶ Noise Levels
- ▶ Airport Operations and Safety
- ▶ Coastal Zone Management

Regulatory compliance requirements are presented for each alternative.

No-Action Alternative

The No-Action Alternative will have no substantial environmental impacts, although it will not sufficiently reduce the strike hazard to address the issue of public safety of the 28 million passengers that use JFKIA on an annual basis.

Nonlethal Alternatives

Large-scale habitat modification or harassment of the Laughing Gull colony site by mowing, burning, herbicide application, or landform alteration would have adverse effects on wildlife species, on the integrity of the salt marsh system (and possibly the entire Jamaica Bay ecosystem), and especially on water quality. The burning alternative would adversely affect visibility for the nearest runway at JFKIA. Habitat modifications on Jamaica Bay would impact local and New York State populations of Laughing Gulls, since it would reduce or eliminate the area's suitability for breeding in the only known viable Laughing Gull nesting colony in New York State. This impact would be averted if Laughing Gulls nested elsewhere in New York either spontaneously or pursuant to proposed mitigation measures. The regional Laughing Gull population would not be significantly adversely impacted. Local, New York, regional and national populations of Herring, Ring-billed, and Great Black-backed gulls would not be adversely affected by these alternatives. Nontarget birds such as common and Forster's tern, clapper rail, American oystercatcher, black duck, seaside and sharp-tailed sparrow, willet, boat-tailed grackle, and others could be adversely impacted by disturbance, inadvertent mortality and other effects of alternatives' activities.

Harassment of Laughing Gulls on the colony site by dogs would involve some disturbance to nontarget species and could cause towering of the disturbed birds, which would temporarily increase the birdstrike hazard at JFKIA. The display of dead gulls to harass the Laughing Gulls could attract scavengers, which

in turn could increase the bird hazard at the airport. Displaying dead gull models has no substantial adverse environmental impacts.

Expansion of the existing on-airport management and reduction of off-airport attractants is not anticipated to create substantial adverse direct, indirect, cumulative, or other impacts on gulls, other birds, other wildlife, or the environment.

Lethal Alternatives

Environmental effects of nest/egg destruction or egg oiling are relatively low, especially in that no nontarget species could be directly affected. Toxicant application (DRC-1339) has the possibility of affecting nontarget organisms and is not licensed for use on Laughing Gulls. Shooting on the colony site may result in incidental kill of some nontarget species. Continuation of the shooting program is unlikely to adversely affect the national or Maine-Virginia breeding populations; however, computer simulations indicate that the Massachusetts/New York/New Jersey population cannot sustain continuous annual losses of more than 14,500 Laughing Gulls. Removing the colony by either lethal or nonlethal means could eliminate the Laughing Gull as a breeding species in New York State, if Laughing Gulls do not relocate within the state.

Use of lethal alternatives to control Laughing Gulls on the Jamaica Bay colony site could have adverse effects on local and New York State populations of Laughing Gulls, since it would reduce or eliminate the area's suitability for breeding and/or survival in the only known viable Laughing Gull nesting colony in New York State. This impact would be averted if Laughing Gulls nested elsewhere in New York either spontaneously or pursuant to proposed mitigation measures. The regional Laughing Gull population would not be significantly adversely impacted as long as fewer than 14,500 Laughing Gulls are removed each year. Local, New York, regional and national populations of Herring, Ring-billed, and Great Back-backed gulls would not be adversely affected by these alternatives. Nontarget birds such as common and Forster's tern, clapper rail, American oystercatcher, black duck, seaside and sharp-tailed sparrow, willet, boat-tailed grackle, and others could be adversely impacted by disturbance, inadvertent mortality and other effects of alternatives' activities.

Integrated Management Program

The Integrated Management Program (IMP) seeks to find the best achievable balance between the highest level of effectiveness in reducing the gull-aircraft strike hazard on an immediate and permanent basis with the lowest level of environmental impacts. Based upon the assessment of environmental impacts for different measures, the following specific components could be part of the IMP:

1. Continued Development of JFKIA's On-Airport Program
2. Reduction of Off-Airport Attractants
3. On-Airport Shooting of Gulls
4. Laughing Gull Nest/Egg Destruction in Jamaica Bay

5. On-Colony Shooting of Laughing Gulls
6. Display of Gull Models to Harass Gulls

The IMP would combine the effectiveness and environmental impacts of its components. In general, these components are those which are expected to have the fewest environmental impacts.

■ Comparison of Alternatives and Selection of Actions

Of the feasible alternatives, the following were eliminated owing to substantial environmental impacts: devegetation by mowing, burning, or herbicide application; landform alteration; all on-colony harassment, except gull models; and toxicant application. Egg oiling and toxicant application were eliminated because nest/egg destruction is more effective in inducing long-term colony abandonment by adults. The No-Action Alternative was eliminated because by itself it did not reduce the gull hazard substantially.

Of the remaining alternatives, no gull management strategy by itself appears likely to provide the control necessary to reduce the gull hazard on an immediate, permanent basis without resulting in environmental impacts or avoiding the necessity of killing large numbers of birds. Therefore, the Integrated Management Program, which couples a high effectiveness with relatively low environmental impacts and which utilizes a combination of nonlethal as well as lethal methods, would be the preferred alternative.

Pursuant to U.S. Department of the Interior policy, which states that IMP components 1-3 (Category 1) must first be conducted and proven ineffective before on-colony components 4-6 (Category 2) could be implemented, the proposed gull hazard reduction program for JFK International Airport, to be conducted in 1994 and beyond (based on annual monitoring), would consist of the following:

Category 1 Components:

1. Continued Development of JFKIA's On-Airport Program
2. Reduction of Off-Airport Attractants
3. On-Airport Shooting of Gulls

Annual review of program effectiveness and impacts will determine the appropriate course of action, and will be based on program data, current laws and regulations, new research and development, and other factors.

■ Mitigation and Monitoring

In the event that Category 2 components would be conducted in the future, and in order to mitigate for the potential removal of the Laughing Gull breeding colony from its current site in Jamaica Bay, active efforts are proposed to attract Laughing Gulls to a new colony site at an adequate distance from the airport in the bays east of Jamaica Bay. Having at least the nucleus of a colony established in another location would probably greatly facilitate natural relocation of the existing colony. The regional (New Jersey-Maine) Laughing Gull population would be monitored to ensure that this population is not being adversely affected by any losses in Jamaica Bay, and periodic productivity studies could be undertaken to ensure that the species' reproductive output remains high enough to compensate for any increased

mortality or decreased reproduction in Jamaica Bay. Potential impacts on other bird species and natural resources from Laughing Gulls would be monitored.

Annual monitoring of the Jamaica Bay Laughing Gull colony would occur via a survey of the colony site during June/July. Results of this survey would be used to infer impacts of gull hazard control activities on the local/New York State Laughing Gull population, and to infer impact of the colony on JFKIA's birdstrike record.

The colony survey would consist of aerial photography of the entire nesting colony surface, and would be attended by establishment and survey of ground plots on the marshes. The number of nests would be estimated as described in Belant et al. (1992).

Annual monitoring of program activities would be conducted by an enhanced Bird Hazard Task Force and the Port Authority to determine the results and impacts of all gull hazard control activities, and to determine the initiation of Category 2 activities.

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1.0 PURPOSE AND NEED

1.1 Background of the Project

John F. Kennedy International Airport (JFKIA) is one of three major airports in the New York Metropolitan Region, servicing approximately 28 million passengers per year. It is operated by the Port Authority of New York and New Jersey (PA) under a lease with the city of New York.

Located in the borough of Queens, New York City, it occupies approximately 2,000 hectares (4,930 acres) at the eastern end of Jamaica Bay (Figures 1-1 and 1-2). The surrounding communities are South Ozone Park, South Jamaica, Springfield Gardens, and Rosedale to the north; Woodmere to the east; Inwood (located in the town of Hempstead, Nassau County) to the south; and Howard Beach to the northwest. Immediately southwest of the airport is the Jamaica Bay Wildlife Refuge (JBWR), part of the Jamaica Bay Unit of Gateway National Recreation Area (GNRA), which is administered by the National Park Service (NPS) and comprises approximately 10,500 ha (26,000 acres).

The JBWR consists of 3,707 hectares (9,155 acres) of estuarine habitats (principally open salt water and salt marsh, plus uplands associated with Cross Bay Boulevard) and receives approximately 7 million visitors each year. As a large relatively undisturbed coastal habitat within the highly developed metropolitan area, it is a major attractant for numerous species of birds at all seasons, including nesting waterbirds, coastal migrants such as shorebirds, and wintering waterfowl. More than 330 species of birds have been recorded at the refuge.

The proximity of the airport and a wildlife refuge in a coastal location has contributed to an unusually high incidence of bird-aircraft interactions (hereafter birdstrikes) at JFKIA.

1.1.1 Collection of Birdstrike Information at JFKIA

JFKIA's Division of Aeronautical Services' Bird Control Unit (BCU) is responsible for coordinating the collection of birdstrike data at the airport. The birdstrike data is maintained in the BCU logbook, and is periodically entered into a database maintained by the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS) Animal Damage Control (ADC). The reporting of birdstrikes to the Federal Aviation Administration (FAA) is voluntary, and birdstrike reports can be submitted to the FAA by JFKIA. The FAA maintains a database of birdstrike records from all FAA-certificated airports within the United States.

The definition of birdstrike that is used operationally at JFKIA, and that occurs throughout this EIS, was developed by Bird Strike Committee Canada, and has been endorsed by the International Civil Aviation Organization (ICAO). ICAO was established by the United Nations, and serves as a coordinating international body regarding aviation issues, including birdstrike hazards. This definition is also employed by Bird Strike Committee USA, Bird Strike Committee Europe, the FAA, the U.S. Air Force, and most airports throughout the U.S. A birdstrike is considered to have occurred when 1) a pilot reports a birdstrike, 2) aircraft maintenance personnel identify damage to an aircraft as having been caused by a bird or birds, 3) personnel on the ground report seeing an aircraft strike one or more birds, or 4) bird remains are found on active runways (pavement) or within 200 feet of an active runway, unless another cause of death is identified. At JFKIA, the BCU is the clearinghouse for the collection of birdstrike data (Figure 1-3). All birdstrikes that are reported under any one part of the birdstrike definition are cross-

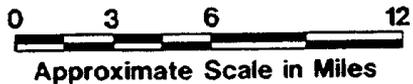
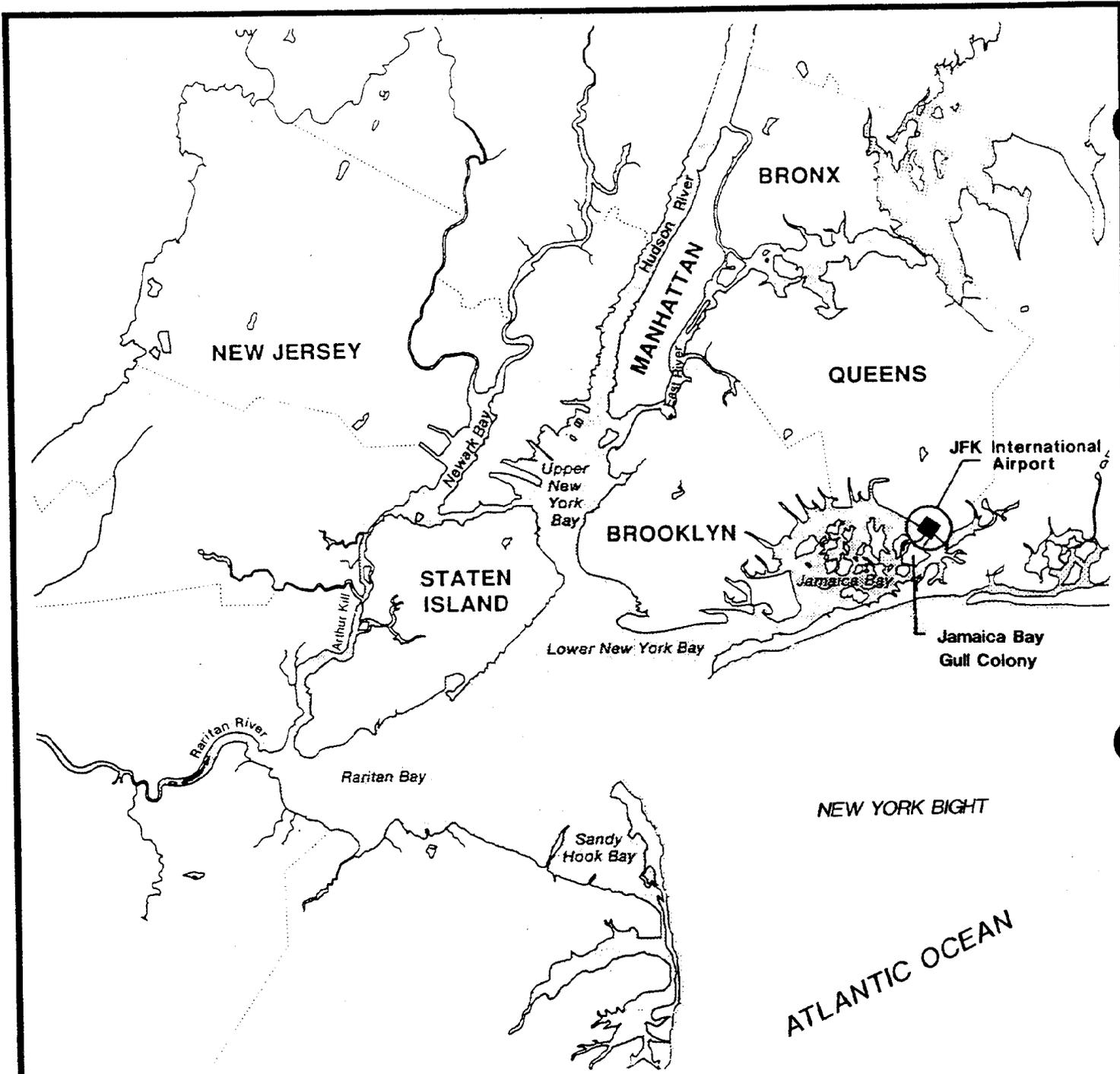


FIGURE 1 -1

Regional Context

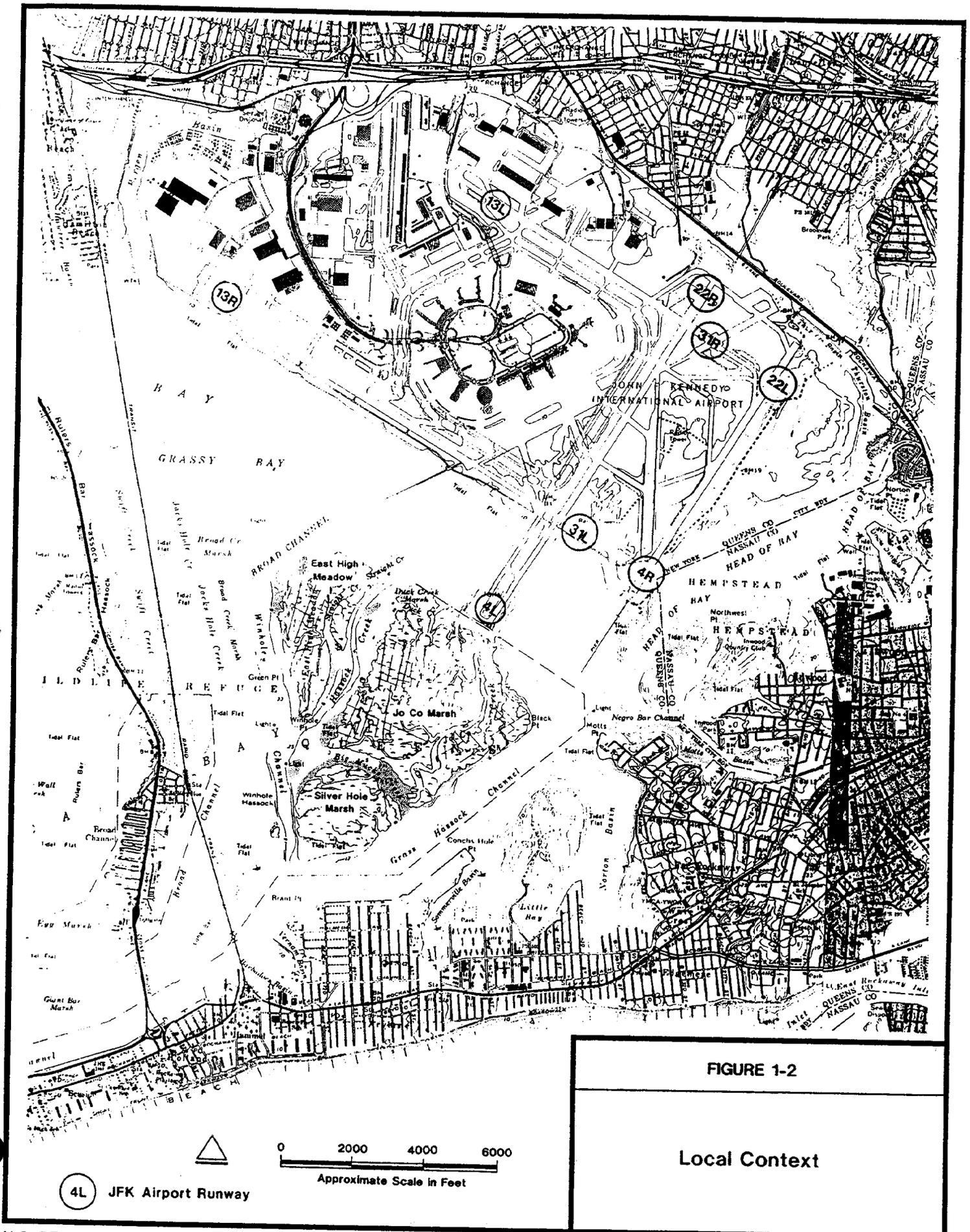


FIGURE 1-2

Local Context

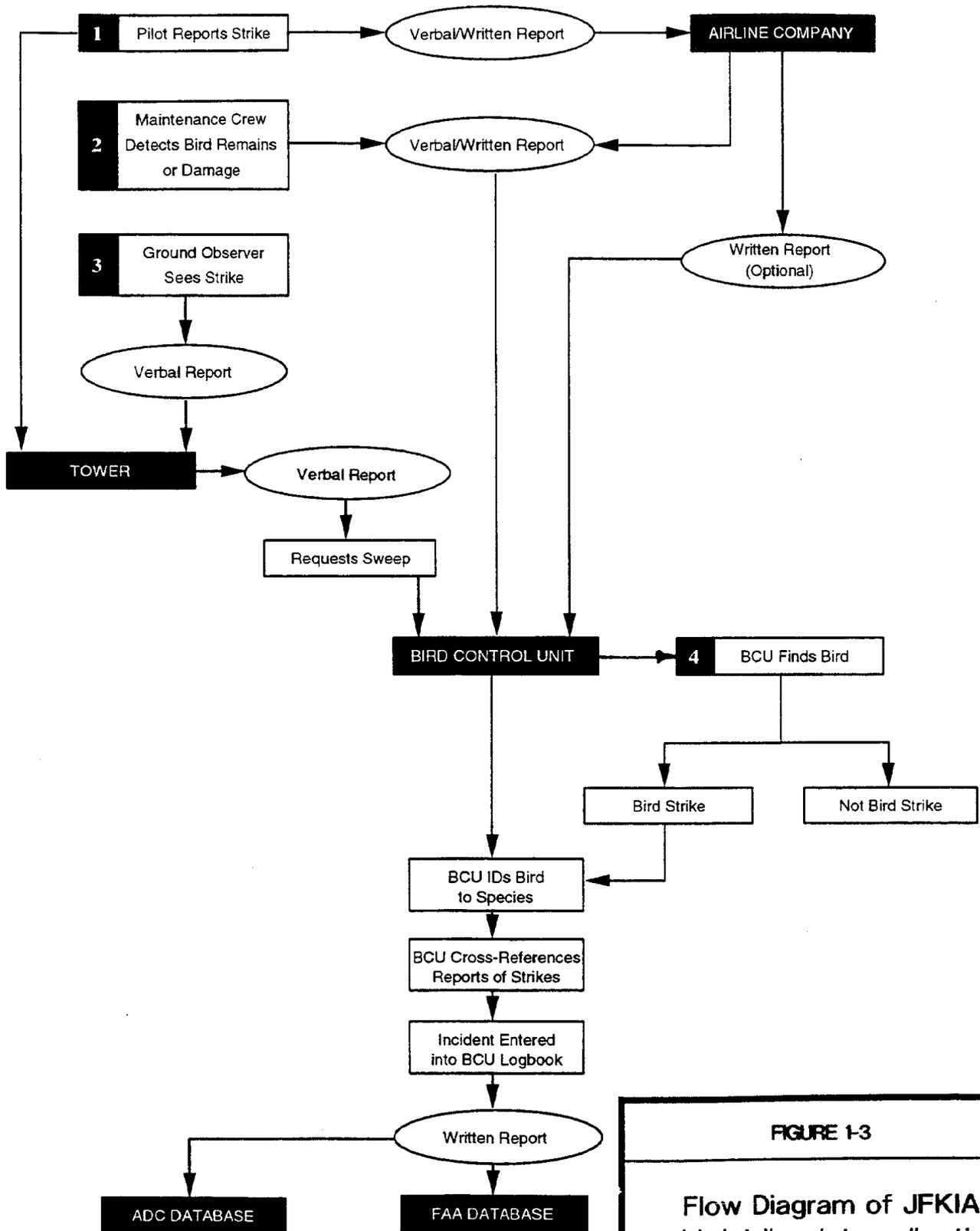


FIGURE 1-3
Flow Diagram of JFKIA's birdstrike data collection procedure

referenced by the BCU with birdstrike data collected via the remaining three parts of the definition, in order to avoid multiple counts of a single birdstrike incident. Birdstrike data collection and analysis procedures in place at JFKIA and other airports are not able to differentiate between actual physical contact and "near misses" where birds are forced to the pavement due to jet wash or other forces. Both physical contacts and near misses are included in the birdstrike definition; the occurrence of near misses present hazards to aviation safety.

When a pilot detects that a birdstrike has occurred, a report is relayed by radio to the tower, which informs the BCU. The BCU then immediately conducts a search of the runway in order to retrieve remains of the struck birds. The bird is identified to species. The BCU records the species, location, date, time, aircraft flight number, and other pertinent information regarding the strike in the BCU logbook.

When aircraft maintenance personnel identify damage to an aircraft as having been caused by a bird or birds, a verbal or written report (voluntary) is submitted to the airline company and sometimes to JFKIA's BCU. Airlines report maintenance personnel's detection of birdstrikes to the FAA and the BCU on a voluntary basis.

When personnel on the ground observe a birdstrike, a verbal report is relayed to the BCU through the control tower, which immediately conducts an inspection of the runway to retrieve bird remains. The bird is identified to species and pertinent data as discussed above is recorded in the BCU logbook. Bird remains found on runways or within 200 feet of active runways are reported as follows. Prior to the opening of a runway and immediately after the closure of a runway, the BCU conducts a "runway sweep," whereby the runway's entire length is driven, pavement areas are inspected for bird remains, and living birds are cleared off the area. Runway sweeps are also conducted at the specific request of certain airlines. Bird remains are also found during routine BCU operations on the airfield. Bird remains retrieved during runway sweeps and those found during BCU operations on or adjacent to active runways of the airport are identified to species as listed above, and unless another cause of death is identified, a birdstrike report is entered in the BCU logbook. The BCU records data on time, date, location, species, and other pertinent information relative to the incident. All data is cross-referenced to eliminate duplicate reporting, as noted above.

When the BCU is unable to identify a bird to species, it contacts the Smithsonian Institution or USDA APHIS ADC, who provide identification based on analysis of bird remains.

The detection and reporting of birdstrike data involves a coordinated effort among the BCU, tower, pilots, airline maintenance personnel and others, and it involves voluntary cooperation at a number of levels. Although a concerted effort is made to document all birdstrikes, there are some sources of possible error. Pilots and flight crews are often unaware that a strike has occurred, and maintenance personnel may not detect damage or bird remains on an aircraft. Damage caused by a birdstrike may be inaccurately reported as due to some other cause, resulting in undercounting. Additionally, the reporting of birdstrikes is voluntary, and airlines may be hesitant to report these incidences to outside sources such as the Port Authority or the FAA. Another possible source of undercounting of the birdstrike problem is that struck birds may fall outside of the 200-foot search boundary near runways, or in the marsh or open water. Additionally, some birds may go undetected in the tall grass within 200 feet of active runways. Other struck birds may be consumed by scavenging birds like turkey vultures, hawks, and crows before they can be retrieved by the BCU. Some possible sources of over-counting of birdstrikes are: incorrectly attributing the cause of a bird's death to collision with aircraft, double-counting of a

single incident, and attributing bird remains found in an engine or other component of the aircraft as having occurred associated with JFKIA when in reality they occurred at another (origin or destination) airport. The cross-referencing of birdstrike data that is conducted by the BCU reduces or eliminates double-counting. The number of birdstrikes compiled by JFKIA BCU personnel is likely an underestimate of the number that has actually occurred. While birdstrike statistics are inexact, they are the best-available measure of the extent to which birds interact with aircraft.

Throughout this document, and in JFKIA's bird management program, a number of bird strike statistics are discussed:

1. Number of Aircraft. In Tables 1-1, 1-2, 1-3, 1-5, 1-6, and 1-7, and in Figure 1-5, the number of aircraft striking birds is listed for various years and species of birds. This is, as the phrase implies, the number of aircraft that have been involved in a strike with one or more birds.
2. Number of Birds. In Tables 1-2, 1-3, 1-5, 1-6, and 1-7, and in Figures 1-5 and 1-8, the number of birds is listed. This is the number of birds involved in strikes with aircraft. For instance, if twenty starlings were involved in a strike with a single aircraft, the number of aircraft is 1 and the number of birds is 20.
3. Number of Aircraft Damaged or Delayed. In Tables 1-1 and 1-3, the number of strikes resulting in damage or delays is listed. This is the number of aircraft that have sustained engine and non-engine damage and/or that have been delayed due to a collision with a bird or birds. This is a subset of the total number of aircraft involved in birdstrikes.
4. Pilot-Reported Strikes. In Table 1-1, the number of pilot-reported strikes is listed. This is the number of birdstrikes that are detected and reported by pilots, and is a subset of the total number of birdstrikes that actually occur. Each year between 1979 and 1993 at JFKIA, pilot-reported birdstrikes are typically no more than 25% of those reported pursuant to all four parts of the definition of a birdstrike.

1.1.2 Brief Overview of JFKIA's Birdstrike Problem

Collisions of birds with aircraft have created substantial hazards to human health and safety, as well as major financial losses due to aircraft destruction, equipment damage, runway closure, personnel costs, and passenger accommodations. In November 1975, Herring Gulls (scientific names of all animals mentioned in the text are listed in Appendix B) were ingested into an engine of a departing DC-10. The engine exploded and separated from the aircraft and the takeoff was aborted; the aircraft caught fire and was destroyed (Figure 1-4). Fortunately, no fatalities occurred, largely because all 139 persons aboard were airline personnel trained in evacuation procedures.

Gulls constitute the greatest threat to human safety from birdstrikes at JFKIA. Herring, Great Black-backed, Laughing and Ring-billed gulls occur within the vicinity of JFKIA, and have occurred in the airport's birdstrike record since at least the 1960's. Recently, and in correlation with the growth of the Jamaica Bay Laughing Gull colony (from 15 pairs in 1979 to 7629 pairs in 1990), Laughing Gulls have constituted an increasing percent of the total birdstrikes that occur at JFKIA (Table 1-2).

Table 1-1

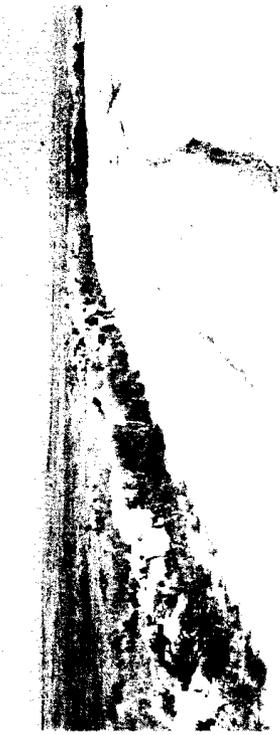
Summary of Known Damage, Delays and Safety Risks Related to Air-Carrier Reported Birdstrikes at JFKIA 1979-1993

Year	No. of air carrier-reported strikes	No. of strikes on departures	No. of aborted take-offs	No. of engines replaced	No. of engines repaired	No. of aircraft with non-engine damage	Total aircraft with reported damage	Total aircraft with damage or delays	No. of damaged or delayed aircraft known to involve:				
									Gulls ^b				Other Birds ^c
									HERG	GBBG	LAGU	UNGU	
1979	21	7	2	2	0	0	2	2	0	0	0	0	2
1980	17	7	1	0	2	0	2	2	0	0	0	2	0
1981	14	6	1	0	2	1	3	3	1	0	0	1	1
1982	20	2	2	1	1	2	4	5	0	0	0	3	2
1983	25	6	2	2	1	2	3	3	0	0	1	2	0
1984	27	11	3	1	1	1	3	3	0	1	0	2	0
1985	37	10	3	1	2	4	6	10	3	1	0	4	2
1986	14	6	3	0	2	1	3	5	0	0	1	3	1
1987	22	13	6	3	4	3	10	10	1	1	2	4	2
1988	26	10	3	0	1	0	1	3	1	0	1	0	1
1989	33	14	7	1	5	3	8	11	2	2	1	3	3
1990	27	16	7	1	4	1	6	9	3	1	2	2	1
1991	23	8	5	2	1	3	6	7	0	0	0	3	4
1992	18	4	3	0	3	0	3	3	2	0	0	1	0
1993	16	7	5	1	2	1	5	6	0	0	2	2	2
Total	340	127	51	15	31	22	65	82	13	6	10	32	21

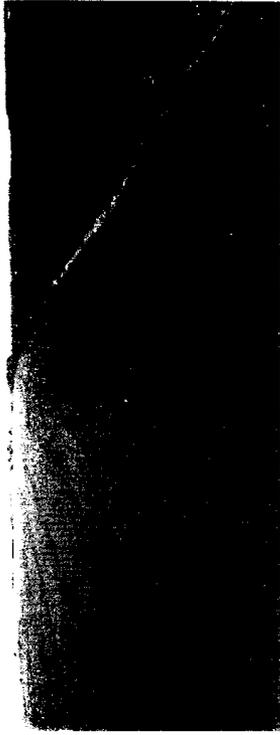
^a Information is reported to Port Authority voluntarily by pilots and air carriers; therefore, data are incomplete and the values presented herein should be considered as minimum estimates of damage, delays and safety risks.

^b HERG = Herring Gull, GBBG = Great Black-backed Gull, LAGU = Laughing Gull, UNGU = unknown gull.

^c Canada Goose-2, Osprey-2, Peregrine Falcon-1, Red-winged Blackbird-1, Ring-necked Pheasant-1, Rock Dove-1, unknown swallow-1, Short-eared Owl-1, Snow Bunting-1, Mourning Dove-1, unknown duck-1, unknown bird-7, Brant-2, Semi-palmated Sandpiper-1, common tern-1.



View of Joco Marsh in Jamaica Bay adjacent to runway 13R-31L.



View of Jamaica Bay estuary from runway.



Panorama view of Joco Marsh nesting habitat located at the end of runway 4L.

Table 1-2

Number of Laughing Gull Nests in Jamaica Bay Wildlife Refuge and Minimum Number of Bird-Aircraft Interactions at JFKIA 1979-1993

Year	No. of LAGU nest (JBWR) ^b	Number of aircraft involved in strikes ^a (Number of birds involved in strikes)			No. (%) of strikes reported by air carriers		No. (%) of dead birds accounted for by air carrier-reported strikes
		Laughing Gulls	Other gulls ^c	Other birds	Total birds		
1979	15	2 (2)	86 (103)	29 (34)	117 (139)	21 (18)	38 (27)
1980	235	19 (19)	98 (98)	29 (44)	146 (161)	17 (12)	27 (17)
1981	325	20 (20)	44 (61)	36 (42)	100 (123)	14 (14)	18 (15)
1982	715	14 (14)	68 (72)	38 (64)	120 (150)	20 (17)	50 (33)
1983	1,805	48 (51)	89 (98)	62 (63)	199 (212)	25 (13)	38 (18)
1984	2,802	58 (61)	114 (136)	79 (91)	251 (288)	27 (11)	62 (22)
1985	2,741	82 (86)	139 (198)	72 (102)	293 (386)	37 (13)	130 (34)
1986		59 (60)	42 (43)	37 (47)	138 (150)	14 (10)	17 (11)
1987		118 (135)	73 (77)	35 (36)	226 (248)	22 (10)	28 (11)
1988		164 (180)	114 (154)	36 (40)	314 (374)	25 (8)	65 (17)
1989		171 (187)	108 (143)	36 (41)	315 (371)	34 (11)	52 (14)
1990	7,629	135 (142)	89 (95)	54 (97)	278 (334)	27 (10)	75 (22)
1991		60 (64)	54 (58)	42 (269) ^d	156 (391)	24 (15)	259 (66)
1992	4,920	22 (22)	37 (39)	42 (49)	101 (110)	18 (18)	27 (25)
1993 ^e	6,000	18 (18)	17 (17)	26 (59)	61 (94)	15 (25)	48 (51)
Total		990 (1,061)	1,172 (1,392)	653 (1,078)	2,815 (3,531)	340 (12)	933 (26)

^a Unpublished data from Fort Authority of New York and New Jersey. See Burger (1985) for method of collection.

^b Data from 1979 to 1984 from Buckley and Buckley (1984), for 1985 from Buckley and Gurien (1986), for 1990 from Griffin and Hoopes (1991), and for 1992 from Belant and Dolbeer (1993).

^c Herring, Great Black-backed and Ring-billed gulls.

^d One incident in 1991 involved an aircraft colliding with 194 European Starlings.

^e Through 30 September.

In 1988-90, the three years prior to the intensive on-airport shooting program at JFKIA, Laughing Gulls constituted 52% of the birdstrikes, and the other three gull species together constituted 34% of the total birdstrikes.

During the 15-year period from 1979-93, at least 3553 birds from 62 species were struck by 2834 aircraft at JFKIA. The most recent serious birdstrike at JFKIA occurred in May 1991, when a B-747 carrying 350 passengers aborted takeoff after ingesting gulls into an engine. The high-energy stop destroyed all 10 tires and the braking mechanisms; costs to the airline totaled \$200,000. Gulls have been the predominant species group struck over this time period, totalling 76.5% of the aircraft incidences and 69.3% of the birds struck (Table 1-3). Gulls were involved in 74.4% of the 82 incidences in which aircraft were damaged or delayed. Laughing Gulls were the most commonly struck species, involved in 35% of all aircraft incidences, even though this species is present for only six months of each year. Considering the 58 non-gull species, common barn owls were the most frequently-struck (4% of all aircraft, no aircraft damaged or delayed). None of the other 57 species individually accounted for more than 2% of the strikes.

Because the four gull species compose more than three-quarters of the recent birdstrikes at JFKIA, and thereby create the greatest threats to human and aircraft safety, they are the subject of analysis contained in this document. Non-gull bird species' occurrence in JFKIA's birdstrike record, and their biology, behavior, and presence in the birdstrike record are presented in Section 1.3, in order to permit full documentation of the birdstrike hazard at JFKIA. The location of JFKIA within a major bird migratory corridor (Atlantic Flyway), and the unique situation of having a large colonial nesting bird colony located at the end of a runway combine to present JFKIA with unique birdstrike hazards. Over the past thirty years, a number of studies, management programs, and environmental analyses have been conducted regarding the birdstrike hazard problems at JFKIA. The documentation and control of these hazards require cooperation among State, Federal and local agencies and the Port Authority of New York and New Jersey. The problem and potential solutions are complex, and require ongoing analysis and management action. Throughout this document, and throughout the developing bird hazard control program, a number of agencies are involved. Their roles and responsibilities are outlined below.

1.2 Agencies' Roles and Responsibilities

The following describes the roles and responsibilities of various state and federal agencies in addressing the strike hazard at JFKIA. It also describes the agencies' participation in ongoing coordination structures to deal with the problem, such as the Bird Hazard Task Force (BHTF), and identifies the specific role the agency has in the completion of this EIS.

1.2.1 Federal Aviation Administration (U.S. Department of Transportation)

The U.S. Department of Transportation's Federal Aviation Administration (FAA) is responsible for certifying airports and insuring their compliance with federal laws pertaining to safe operation, as well as establishing airworthiness criteria for aircraft engines and components. Federal Aviation Regulation 14 CFR Part 139, "Certification and Operations: Land Airports Serving Certain Air Carriers," as per Section 139.337, "Wildlife Hazard Management," requires certificated airports such as JFKIA to develop and implement a Wildlife Hazard Management Plan (Appendix E.1). Section 139.337 (d) (2) states that the plan shall provide measures to alleviate or eliminate wildlife hazards to air carrier operations. The Plan must provide a description of the proposed actions, and include target dates for implementation.

FAA Regulation 14 CFR 33.77 enumerates criteria for airworthiness standards that newly-certificated aircraft engines must satisfy regarding ability to withstand birdstrikes (Appendix E.1).

The FAA has been an active member of the BHTF at JFKIA since the group's inception. On May 14, 1993, the FAA determined that an "urgent situation" existed at JFKIA that required immediate action, and requested the New York State Department of Environmental Conservation (NYSDEC) to issue the state permit necessary for Animal Damage Control (ADC) to conduct the operational gull hazard reduction program (Appendix C.5.7).

Throughout the completion of this FEIS, the FAA has provided technical information, document review, and guidance relative to aircraft safety and risk (Appendix F.2).

1.2.2 Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC) (U.S. Department of Agriculture)

APHIS's Animal Damage Control Program has authority under the Animal Damage Control Act of 1931 (7 USC 426-426b and 426c, as amended) to cooperate with states, individuals, public and private agencies, organizations, and institutions on programs to reduce damage caused by wildlife to agriculture, natural resources, property, and public health and safety. Until 1986, the activities of ADC were performed by the Wildlife Assistance Unit of the USFWS; in 1986, ADC was transferred out of the USFWS and into USDA. ADC works cooperatively with airports to evaluate wildlife hazards to aviation, and to provide technical and operational assistance to alleviate these hazards in order to protect human safety. ADC's work on airports includes conduct of wildlife surveys, evaluation of hazardous situations, development of habitat management recommendations, conduct of harassment and population control programs, and other activities. All ADC activities on airports are carried out pursuant to state and federal permits, coordinated with natural resource management agencies, and conducted in response to requests for assistance from airport management and/or the Federal Aviation Administration (FAA).

Following a 1975 Herring Gull-aircraft collision at JFKIA that resulted in the evacuation of 139 passengers and the total destruction of a DC-10 aircraft, the Port Authority of NY and NJ (PANYNJ) requested that the USFWS's Wildlife Assistance Unit (Since 1986, ADC) conduct an ecological study of the airport. Since that time, ADC has worked closely with JFKIA management to identify and reduce safety hazards associated with birds. Until 1991, this assistance has been consultation, conduct of ecological evaluations, and the provision of technical assistance and training to JFKIA staff. In 1991 ADC was requested by the Port Authority to conduct operational activities to reduce hazards created by gulls, especially Laughing Gulls, within JFKIA airspace. Operational programs to shoot gulls (all four species) that are crossing JFKIA airspace have been conducted by ADC, pursuant to FWS and NYSDEC permits between 1991 and 1993. ADC provides assistance to JFKIA regarding habitat management, bird harassment, insect control, elimination of food and water resources, and other activities (Appendix C.5.3 and C.5.4).

USDA APHIS is serving as Federal Lead Agency on this EIS, in response to a request for assistance from the Port Authority, and pursuant to USDA's NEPA Regulations (Appendix E.3) and correspondence from the Council on Environmental Quality (Appendix F.1).

1.2.3 U.S. Fish and Wildlife Service (U.S. Department of the Interior)

The mission of the U.S. Department of the Interior's Fish and Wildlife Service (FWS) is to "provide the federal leadership to conserve, protect, and enhance fish and wildlife and their habitats for the continuing benefit of people." The FWS enforces the Migratory Bird Treaty Act and federal regulations designed to protect migratory birds, and it issues permits for the capture and handling or take of migratory birds for scientific purposes or to address depredation issues. The FWS works cooperatively with ADC, state natural resource management agencies, the FAA, and airport operators when dealing with bird hazards at airports. Where warranted, the FWS issues permits that allow the take of migratory birds as part of integrated management programs that also include non-lethal techniques such as harassment, habitat modification, and control of food and water resources on and near airports.

The FWS has been an active member of the BHTF at JFKIA since the 1970s, has provided ongoing assistance in the development of bird hazard control programs, and has conducted site visits to JFKIA to review program operation and purposes (Appendix C.5.1). The FWS has been issuing permits to JFKIA personnel to conduct ongoing bird control work, and to ADC to conduct operational gull control activities during May-August, 1991-93. The FWS is a Federal Cooperating Agency with APHIS on this EIS due to its permitting role and its legal responsibilities under the National Environmental Policy Act (NEPA).

1.2.4 National Park Service (NPS) (U.S. Department of the Interior)

The U.S. Department of the Interior's National Park Service (NPS) administers the Gateway National Recreation Area (GNRA), which is immediately south of JFKIA, and which provides abundant nesting habitat for Laughing Gulls and other birds.

Many of the bird species which are involved in bird-aircraft interactions at JFKIA either nest in or are otherwise associated with GNRA, especially the Jamaica Bay Wildlife Refuge Unit. Laughing Gulls nest on three marsh islands within GNRA's Jamaica Bay Wildlife Refuge; the management philosophy and practice at the refuge is one of protection and preservation.

The NPS has been an active member of the BHTF since the 1970s, and has an interest in management plans developed and conducted by JFKIA because they have the potential to affect bird species associated with GNRA. The NPS has conducted several Port Authority-funded studies of the bird/aircraft interaction issues for JFKIA, and has developed management recommendations to assist the airport in addressing the problem. The NPS has the status of a Cooperating Agency on this EIS. Management options involving direct activities on GNRA land would require the participation, support, and authorization of the NPS. The NPS has recognized the threats gulls pose to human safety at JFKIA, and have stated the need to work cooperatively to address the real threat to human safety (Appendix C.5.8)

1.2.5 New York State Department of Environmental Conservation (NYSDEC)

Pursuant to state legislation the NYSDEC issues permits to allow for the take of state-protected birds for scientific investigations or to address human safety problems. The NYSDEC has issued permits to JFKIA to conduct ongoing bird hazard reduction activities, and has issued ADC permits during May-August, 1991-93, to conduct the operational gull hazard control program.

New York's State Environmental Quality Review (SEQR) Act Article 8 of the Environmental Conservation Law (ECL) and the statewide SEQR regulations (6NYCRR Part 617) require completion of environmental review documentation, and permit coordinated documentation of state requirements with the federal NEPA process.

The NYSDEC has been an active member of the BHTF since the 1970s, pursuant to its interest in conserving wildlife populations in New York State, and its role in evaluating applications from the Port Authority and ADC for permits to conduct bird hazard control activities to protect human safety at JFKIA. NYSDEC has issued permits to JFKIA and ADC pursuant to ECL 11-0521 and 6NYCRR Part 175.

1.2.6 Port Authority of New York and New Jersey (PA)

The Port Authority of New York and New Jersey (PA) administers John F. Kennedy International Airport and leases the facilities from the City of New York. As an air carrier airport, JFKIA is administered by the PA pursuant to federal FAA guidelines that include Federal Aviation Regulation 14 CFR Part 139.337 ("Wildlife Hazard Management"). Part 139 mandates that airport authorities assess wildlife hazards at their airports and develop and conduct plans to reduce or eliminate these hazards in the interest of human safety. Since the 1960s, the PA has evaluated and conducted management plans to reduce hazards from wildlife and it has created a Bird Hazard task Force in 1985 to monitor, improve and guide PA actions regarding the wildlife hazards at JFKIA. JFKIA's wildlife hazard plan was developed and accepted by the FAA in 1989. The PA is the managing agency for all on-airport hazard reduction actions that have occurred to date, with the exception of the intensive shooting program activities, which were conducted in 1991-1993 by USDA APHIS ADC. Programs that are conducted by the PA include, but are not limited to: insect control, water management, sanitation, on-airport PA Bird Control Unit, grass management and other nonlethal habitat management activities. The PA has and will continue to conduct these activities pursuant to New York City, State of New York, and federal permits regarding migratory birds, wetlands, disposal of carcasses, use of materials, noise and other concerns.

1.3 Bird Species Struck by Aircraft at JFKIA

All species of birds that are present on and near airports are potentially hazardous to safe aircraft operations. A number of physical, biological, and behavioral characteristics, and the species' historical presence in the airport's birdstrike records are features which permit an evaluation of each species' potential and actual hazards to aircraft. The combination of a species' body size, density, flight characteristics, local abundance and population trends, and flocking and migratory behaviors contribute to the species' potential hazard. The bird's presence in the airport's strike record indicates its actual hazards at the particular airport. It is important to consider all of these factors in order to determine which species warrant what level of management and control.

During the 15-year period from 1979-93, at least 3553 birds from 62 species were struck by 2834 aircraft at JFKIA. Gulls have been the predominant species group struck over this time period, totalling 76.5% of the aircraft incidences and 69.3% of the birds struck (Table 1-3). Gulls were involved in 74.4% of the 82 incidences in which aircraft were damaged or delayed. Laughing Gulls were the most commonly

struck species, involved in 35% of all aircraft incidences, even though this species is present for only six months of each year. Considering the 58 non-gull species, common barn owls were the most frequently-struck (4% of all aircraft, no aircraft damaged or delayed). None of the other 57 species individually accounted for more than 2% of the strikes.

1.3.1 Gulls

Gulls are generally considered to be a primary bird hazard at airports worldwide because of their abundance, wide and expanding distribution, large body size and flocking behavior, and general tendency to concentrate at airports throughout the year and during the nesting season (Burger 1983). Solman (1981b) found that 60% of the more serious birdstrike incidents involving civilian aircraft at airports around the world since 1912 were caused by gulls. Further, most studies indicate that gulls pose the greatest threat to aircraft (Blokpoel 1976, Frings 1984 from Griffin and Hoopes 1991), compared to all other threats (mechanical failure, pilot error, foul weather). At JFKIA between 1979 and 1993, gulls (4 species) posed the greatest threats to aircraft, accounting for: 76.5% of all aircraft striking birds, 69.3% of all birds involved in strikes, 74.4% of aircraft damaged or delayed, and 74% of strikes involving some type of engine damage (Table 1-3). The state, regional and national population trends of the four gull species found at JFKIA are either stable (Herring Gull), increasing (recovering) (Laughing Gull), or increasing (expanding) (Great Black-backed and Ring-billed gulls) (Table 1-4). In many cases, gulls struck by aircraft at JFKIA cannot be identified to species. "Unknown gulls" account for 187 (7%) of the aircraft involved in strikes, and for 239 (7%) of the birds striking aircraft. Unknown gulls have resulted in 32 (39%) of the collisions that resulted in damage or delays (Table 1-1).

Gulls that are involved in collisions with aircraft at JFKIA are, for the most part, not attracted to JFKIA, but traverse JFKIA airspace between nesting colonies and off-airport resources. Most of the Laughing Gulls, which constituted approximately 50% of the strikes in 1988-90, were adult breeding birds that traversed the airport's airspace during forays to provide their young with food (Appendix F.3). Site visits conducted in 1992 and 1993 by FWS (Appendix C.5.1) and ADC (Appendix C.5.2 and 3) personnel accompanied by DEC and NPS personnel indicate that JFKIA does not provide abundant habitat resources for Gulls (4 species).

The principal controllable attractants to gulls have been partially addressed through the closure of nearby landfills, on-airport habitat management and sanitation, and activities of the JFKIA Bird Control Unit.

Since the incidence of gull-aircraft collisions constitute nearly three-quarters of the bird-aircraft collisions at JFKIA, and because these species' populations have changed in the past 15 years, it is useful to examine the birdstrike statistics for these four species in three time frames:

- | | |
|-----------|---|
| 1979-1985 | Between the establishment of the Jamaica Bay Laughing Gull nesting colony and the closure of the Fountain Avenue Landfill. |
| 1986-1990 | Between the closure of the landfill and the initiation of the intensive on-airport shooting program. This encompasses years of Laughing Gull colony growth from 30 to over 15,000 adult Laughing Gulls. |
| 1991-1993 | The years during which an intensive on-airport shooting program was conducted at JFKIA. |

Table I-3

Birds Struck by Species JFKIA, 1979-1993

Bird Species Struck	Aircraft Striking Birds		Birds Involved in Strikes		Aircraft Damaged or Delayed	
	No. of Aircraft	% of Total	No. of Birds	% of Total	No. of Aircraft	% of Total
Laughing Gull	991	35	1,061	30	10	12
Herring Gull	704	25	820	23	13	16
Unknown Gull	187	7	239	7	32	39
Gr. Black-backed Gull	169	6	218	6	6	7
Ring-billed Gull	119	4	123	4	0	0
(ALL GULLS)	(2,170)	(76.5)	(2,461)	(69.3)	(61)	(74.4)
Common Barn Owl	108	4	108	3	0	0
American Kestrel	46	2	46	1	0	0
Short-eared Owl	35	1	35	<1	1	1
Osprey	13	<1	13	<1	2	2
Peregrine Falcon	10	<1	10	<1	1	1
(ALL RAPTORS)	(212)	(7.5)	(212)	(5.9)	(4)	(4.9)
Cattle Egret	64	2	64	2	0	0
Mallard	49	2	47	1	0	0
American Black Duck	31	1	36	1	0	0
Canada Goose	18	<1	31	<1	2	2
Brant	8	<1	48	1	2	2
Unknown duck	17	<1	22	<1	1	1
(ALL WATERFOWL)	(123)	(4.6)	(184)	(5.2)	(5)	(6.1)
Rock Dove	23	<1	42	1	1	1
European Starling	15	<1	263	7	1	1
Snow Bunting	7	<1	62	2	1	1
Red-winged Blackbird	1	<1	12	<1	1	1
(FLOCKING BIRDS)	(46)	(1.6)	(379)	(10.7)	(4)	(4.9)
Ring-necked Pheasant	10	<1	10	<1	1	1
Unknown bird	53	2	58	2	7	9
43 other species	156	all <1	185	all <1	0	0
TOTAL	2,834	100	3,553	100	82	100

Table 1-4

**Regional and National Population Status of Bird Species Involved in Collisions with Aircraft
at JFKIA, 1979-93**

Species	Status		Source
	Regional	National	
Laughing Gull	increasing (R)	increasing (R)	ACCWS
Herring Gull	stable	stable	ACCWS
Great Black-backed Gull	increasing (E)	increasing (E)	ACCWS
Ring-billed Gull	increasing (E)	increasing (E)	ACCWS
Barn Owl ³	declining	declining	SNGP
Kestrel	declining	declining	BBS
Short-eared Owl	declining	declining	RSR
Osprey	increasing (R)	increasing (R)	SNGP
Peregrine Falcon	endangered (I)	endangered (I)	ES
Cattle Egret	stable	stable	BBS
Mallard ¹	increasing	declining	WSR
Black Duck ¹	declining	declining	WSR
Canada Goose			
Atlantic population ¹	declining	declining	WSR
Resident population ²	increasing (E)	increasing (E)	WSR
Brant ¹	stable (F)	stable	WSR
Rock Dove ⁴	increasing (E)	increasing (E)	BBS
European Starling ⁴	increasing (E)	increasing (E)	BBS
Snow Bunting	unknown	unknown	
Red-winged Blackbird	increasing (E)	increasing (E)	BBS
Ring-necked Pheasant ⁴	declining	declining	BBS

Notes:

- ¹ Hunted species, harvest restriction in place
² Hunted species, no restrictions
³ Species of management concern
⁴ Introduced species (not protected by Migratory Bird Treaty Act)

R=recovering E=expanding I=increasing

Sources: ACCWS = Atlantic Coast Colonial Waterbird Survey; SNGP = 13 States' Nongame Programs; WSR = Waterfowl States Report; RSR = Regional Symposia on Raptors; ES = FWS Endangered Species Division; BBS = Breeding Bird Survey.

1.3.1.1 Great Black-backed Gull

During the period of 1979-93, two hundred-eighteen (218) Great Black-backed Gulls (6% of total birds struck) were struck by 169 aircraft (6% of total aircraft struck), resulting in damage or delays to 6 aircraft (7% of total aircraft damaged or delayed) (Table 1-3). The trend in Great Black-backed Gull-aircraft collisions has remained relatively constant between 1979 and 1990 (Table 1-5). The on-airport shooting program conducted in 1991-93 did appreciably reduce strikes involving Great Black-backed Gulls: the average annual number of aircraft striking this species in 1991-93 (5) was 73% lower than in 1988-90 (18.7) (Table 1-6). Although Great Black-backed Gulls are generally migratory, the presence of year-round residents or winter transients results in collisions with aircraft at JFKIA throughout the year (Table 1-6, Figure 1-5).

Regional and national population trends of Great Black-backed Gulls are increasing in size and expanding in distribution (Table 1-4). In New York, the Long Island population of this species, has grown from 50 pairs in 1958 to approximately 7000 pairs at present. Twenty-two of the twenty-three Great Black-backed Gull colonies surveyed on Long Island also contained nests of Herring Gulls, consistent with the close association observed elsewhere between these two species. The range expansion and growth in numbers of the Great Black-backed Gull has created a problem for other shorebirds in New York and New England. Nesting colonies of Common Terns and endangered Piping Plovers are being threatened with displacement by Great Black-backed Gulls and Herring Gulls. Black-backs share habitat and nesting preferences with Herring Gulls but are known more as predators than scavengers.

The large size (males ave. 1829g., females 1488g.) (Dunning 1993), historical presence in JFKIA's strike record, its flocking behaviors, and its high and increasing regional abundance make the Great Black-backed Gull a significant hazard to aircraft at JFKIA. Great Black-backed Gull-aircraft collisions represented 6% of the total birds struck and were responsible for 7% of the total damages and delays to aircraft at JFKIA from 1979-93 (Table 1-3).

The removal of standing water to reduce loafing and drinking opportunities and tall grass management are recommended to reduce favorable habitat. Great Black-backed Gulls are responsive to persistent harassment and habitat modification to reduce attractants. Reinforcement of nonlethal techniques such as habitat modification and harassment with lethal control via shooting is necessary to reduce habituation and reduce birdstrikes involving Great Black-backed Gulls.

1.3.1.2 Herring Gull

During the period of 1979-93, eight hundred twenty (820) Herring Gulls (23% of total birds struck) were struck by 704 aircraft (25% of total aircraft struck), resulting in damage or delays to 13 aircraft (16% of total aircraft damaged or delayed, Table 1-3). The trend in Herring Gull-aircraft collisions has remained relatively constant between 1979-90. The operational shooting program conducted at JFKIA during 1991-93 reduced the number of aircraft striking this species: the average annual number of aircraft striking Herring Gulls in 1991-93 (27.7) was 63% lower than the number in 1988-90. Although Herring Gulls are generally migratory and traditionally winter south to Central America, they are struck, along with Ring-billed Gulls and Great Black-backed Gulls (also migratory) by aircraft at JFKIA throughout the year (average 100 strikes per month combined).

Table 1-5
Minimum Number of Aircraft Striking Gulls and Number of Birds Struck, JFKIA, 1979-1993

Year	Laughing Gull		Herring Gull		Great Black-backed Gull		Ring-billed Gull		Unknown gull		All gulls		Other birds (58 species)*	
	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds
1979	2	2	1	1	1	3	2	2	82	97	88	105	29	34
1980	19	19	51	51	14	14	13	13	20	20	117	117	29	44
1981	20	20	28	43	3	5	7	7	6	6	64	81	36	42
1982	14	14	40	40	7	7	10	10	11	15	82	86	38	64
1983	48	51	54	55	9	9	16	16	10	18	137	149	62	63
1984	58	61	63	68	28	36	16	20	7	12	172	197	79	91
1985	82	86	93	135	20	24	13	13	13	26	221	284	72	102
1986	59	60	25	25	5	5	9	9	3	4	101	103	37	47
1987	118	135	39	41	11	12	9	9	14	15	191	212	35	36
1988	164	180	80	91	24	52	5	5	5	6	278	334	36	40
1989	171	187	78	107	23	27	2	2	5	7	279	330	36	41
1990	135	142	70	76	9	9	8	8	2	2	224	237	54	97
1991	60	64	38	40	9	9	1	1	6	8	114	122	42	269
1992	22	22	29	31	3	3	4	4	1	1	59	61	37	73
1993	18	18	16	16	3	3	4	4	2	2	43	43	26	59
Total	990	1061	705	820	169	218	119	123	187	239	2170	2461	664	1092

* See Table 2 for listing of 15 of these species.

Table 1-6
 Number of Aircraft Striking Gulls (Number of Gulls Struck) at JFKIA, 1979-1993

Month	Large Gulls					All Large Gulls	Total Gulls
	Laughing Gulls	Herring Gulls	Ring-billed Gulls	Great Black-backed Gulls	Unidentified Species		
Jan		43 (44)	3 (3)	13 (13)	8 (10)	67 (70)	67 (70)
Feb		33 (34)	5 (5)	6 (6)	5 (5)	49 (50)	49 (50)
Mar		55 (55)	10 (10)	12 (12)	18 (21)	95 (98)	95 (98)
Apr	4 (4)	64 (82)	4 (4)	24 (40)	11 (13)	102 (139)	107 (143)
May	70 (71)	114 (152)	18 (22)	23 (38)	31 (51)	186 (263)	256 (334)
Jun	444 (468)	80 (99)	12 (12)	8 (9)	17 (23)	117 (143)	561 (611)
Jul	270 (299)	34 (38)	5 (5)	14 (14)	15 (15)	68 (72)	338 (371)
Aug	161 (174)	49 (65)	9 (9)	18 (23)	24 (33)	100 (130)	260 (304)
Sep	38 (41)	63 (78)	7 (7)	14 (25)	20 (21)	104 (131)	142 (172)
Oct	3 (3)	53 (55)	10 (10)	15 (15)	18 (25)	96 (105)	99 (108)
Nov	1 (1)	73 (73)	16 (16)	13 (13)	16 (18)	118 (120)	119 (121)
Dec		44 (45)	20 (20)	9 (10)	4 (4)	77 (79)	77 (79)
TOTAL	991 (1,061)	705 (820)	119 (123)	169 (218)	187 (239)	1,180 (1,400)	2,170 (2,461)

Table 1-6 (Continued)
 Number of Aircraft Striking Gulls (Number of Gulls Struck) at JFKIA, 1979-1985

Month	Large Gulls					All Large Gulls	Total Gulls
	Laughing Gulls	Herring Gulls	Ring-billed Gulls	Great Black-backed Gulls	Unidentified Species		
Jan		11 (11)	2 (2)	9 (9)	6 (6)	28 (28)	28 (28)
Feb		12 (12)	5 (5)	4 (4)	3 (3)	24 (24)	24 (24)
Mar		20 (20)	8 (8)	5 (5)	18 (21)	51 (54)	51 (54)
Apr	2 (2)	29 (42)	1 (1)	13 (20)	7 (9)	50 (72)	52 (74)
May	4 (4)	56 (87)	14 (18)	10 (15)	26 (46)	106 (166)	110 (170)
Jun	110 (114)	51 (64)	10 (10)	6 (6)	15 (20)	82 (100)	192 (214)
Jul	58 (58)	16 (16)	4 (4)	7 (7)	14 (14)	41 (41)	99 (99)
Aug	46 (49)	19 (21)	5 (5)	7 (9)	21 (30)	52 (65)	98 (114)
Sep	19 (22)	31 (35)	2 (2)	2 (4)	14 (14)	49 (55)	68 (77)
Oct	3 (3)	25 (25)	6 (6)	6 (6)	9 (13)	46 (50)	49 (53)
Nov	1 (1)	36 (36)	9 (9)	6 (6)	12 (14)	63 (65)	64 (66)
Dec		24 (24)	11 (11)	7 (7)	4 (4)	46 (46)	46 (46)
TOTAL	243 (253)	329 (393)	77 (81)	82 (98)	149 (194)	638 (766)	881 (1,019)

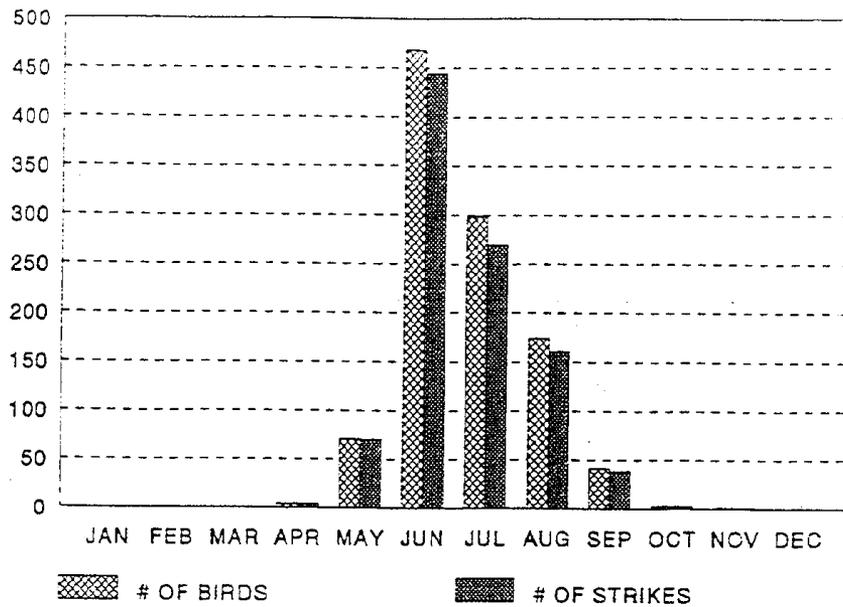
Table 1-6 (Continued)
 Number of Aircraft Striking Gulls (Number of Gulls Struck) at JFKIA, 1986-1990

Month	Large Gulls					All Large Gulls	Total Gulls
	Laughing Gulls	Herring Gulls	Ring-billed Gulls	Great Black-backed Gulls	Unidentified Species		
Jan		23 (23)	1 (1)	2 (2)		26 (26)	26 (26)
Feb		18 (19)				18 (19)	18 (19)
Mar		25 (25)	1 (1)	6 (6)		32 (32)	32 (32)
Apr	1 (1)	24 (28)	3 (3)	7 (16)	3 (3)	37 (50)	38 (51)
May	40 (41)	47 (54)	4 (4)	10 (20)	3 (3)	64 (81)	104 (122)
Jun	301 (321)	27 (33)	1 (1)	2 (3)	2 (3)	32 (40)	333 (361)
Jul	188 (213)	16 (20)	1 (1)	7 (7)		24 (28)	212 (241)
Aug	101 (112)	23 (37)	3 (3)	10 (13)	3 (3)	39 (56)	140 (163)
Sep	16 (16)	22 (33)	4 (4)	12 (21)	6 (7)	44 (65)	60 (81)
Oct		19 (19)		8 (8)	8 (11)	35 (38)	35 (38)
Nov		30 (30)	6 (6)	6 (6)	4 (4)	46 (46)	46 (46)
Dec		18 (19)	9 (9)	2 (3)		29 (31)	29 (31)
TOTAL	647 (704)	292 (340)	33 (33)	72 (105)	29 (34)	426 (512)	1,073 (1,216)

Table 1-6 (Continued)
 Number of Aircraft Striking Gulls (Number of Gulls Struck) at JFKIA, 1991-1993

Month	Laughing Gulls	Large Gulls					All Large Gulls	Total Gulls
		Herring Gulls	Ring-billed Gulls	Great Black-backed Gulls	Unidentified Species			
Jan		9 (10)		2 (2)	2 (4)	13 (16)	13 (16)	
Feb		3 (3)		2 (2)	2 (2)	7 (7)	7 (7)	
Mar		10 (10)	1 (1)	1 (1)		12 (12)	12 (12)	
Apr	1 (1)	11 (12)		4 (4)	1 (1)	16 (17)	17 (18)	
May	26 (26)	11 (11)		3 (3)	2 (2)	16 (16)	42 (42)	
Jun	33 (33)	2 (2)	1 (1)			3 (3)	36 (36)	
Jul	24 (28)	2 (2)			1 (1)	3 (3)	27 (31)	
Aug	13 (13)	7 (7)	1 (1)	1 (1)		9 (9)	22 (22)	
Sep	3 (3)	10 (10)	1 (1)			11 (11)	14 (14)	
Oct		9 (11)	4 (4)	1 (1)	1 (1)	15 (17)	15 (17)	
Nov		7 (7)	1 (1)	1 (1)		9 (9)	9 (9)	
Dec		2 (2)				2 (2)	2 (2)	
TOTAL	100 (104)	83 (87)	9 (9)	15 (15)	9 (11)	116 (122)	216 (226)	

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
LAUGHING GULLS



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
BIG GULLS (HERG, GBBG, RBGU)

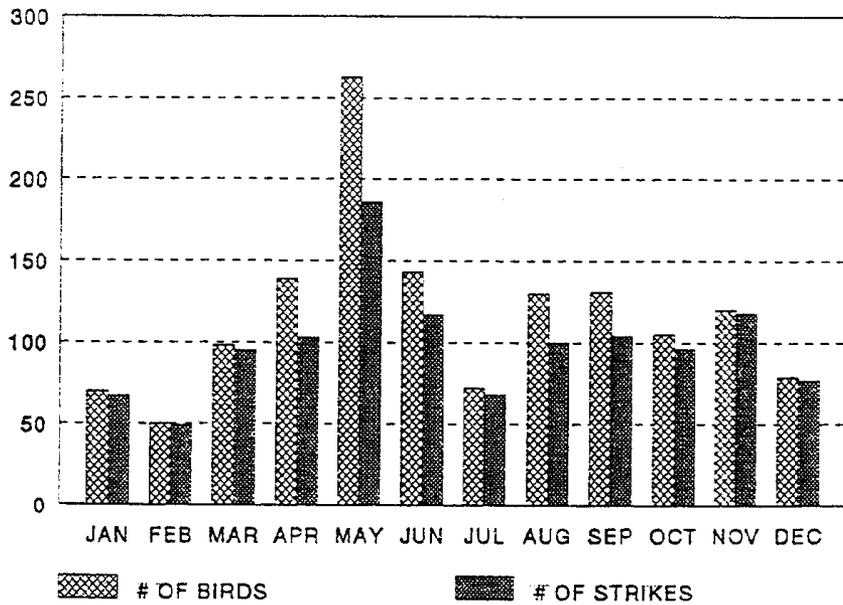


FIGURE 1-5

Number of Laughing Gulls and Big Gulls and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

In New York, Herring Gulls are most abundant on the Coastal Lowlands, where recent surveys have found over 24,000 pairs nesting in 34 colonies (Andrle and Carroll 1988). Most colonies are found along the south shore and eastern tip of Long Island. Regional and National populations of Herring Gulls are stable (Table 1-4). Herring Gulls occupy a wide range of shoreline habitats, nesting primarily on islands, rocks outcroppings, and structures. Notorious scavengers, and predators, Herring Gulls feed on garbage, vegetation, small fruits, insects, worms, grubs, small animals, and other birds/eggs. Opportunistic foraging for these items occurs in areas such as short-grass fields, plowed fields, landfills, beaches, shallow water areas, waste treatment plants, and airports. Many of these flat, open habitats are also attractive as loafing/resting sites.

Herring Gulls are large birds (males average 1226 g., female average 1044 g.) (Dunning 1993). Considering the relatively high potential for damage resulting from an aircraft collision with a bird of this size, birdstrike statistics indicating that Herring Gull-aircraft collisions represent 25% of all birdstrikes recorded at JFKIA during the period of 1979-93 (Table 1-3), and this species' high and increasing regional abundance make the Herring Gull very hazardous to aircraft at JFKIA. The 1975 DC-10 crash that occurred at JFKIA involved Herring Gulls; a disaster was avoided only because the 139 passengers that were on board were airline personnel specially trained in evacuation procedures. The aircraft was completely destroyed by fire.

Although habituation by Herring Gulls to many control methods can be problematic, an integrated control program including tall grass management, removal of garbage sources and standing water, and persistent harassment with pyrotechnics and distress sounds reinforced with live ammunition (removal) can be effective, by both reducing feeding/resting/loafing opportunities and conditioning avoidance of the area. Reinforcement of nonlethal techniques with use of lethal control via shooting is essential to prohibit habituation, and in reducing strikes by Herring Gulls.

1.3.1.3 Ring-billed Gull

During the period 1979-93, 123 Ring-billed Gulls (4% of total birds struck) were struck by 119 aircraft (4% of total aircraft struck), resulting in no damage or delays to aircraft at JFKIA (Table 1-3). The trend in Ring-billed Gull-aircraft collisions has shown a general decrease over the period 1979-93. The number of aircraft striking Ring-billed Gulls in 1991-93 is 66 % lower than the number in 1988-90. Although Ring-billed Gulls are considered migratory, many are now year-round residents of New York. Along with Herring Gulls and Great Black-backed Gulls, Ring-billed Gulls are struck by aircraft at JFKIA throughout the year (average Approx. 100 strikes per month combined).

The regional and national population trends of Ring-billed Gulls are increasing in size and expanding in distribution (Table 1-4). In New York, the Ring-billed Gull population has expanded to the extent that it causes nuisance problems, agricultural damage, and safety hazards in many areas. The Greater Lakes-St. Lawrence River population is estimated to exceed 700,000 pairs, with colonies in the upper Niagara River (Buffalo Harbor), Oneida Lake (Little, Long, and Wantry Islands), and Lake Champlain (The Four Brothers) representing an additional 43,000 pairs. Ring-billed Gulls are colonial and occupy shoreline habitats, nesting on the ground, rocks and structures. Like the Herring Gull, the Ring-billed Gull is an opportunistic scavenger/predator, and is attracted to open foraging and loafing areas such as short-grass or plowed fields, landfills, airports, etc., particularly when driven inland by severe weather.

The medium-large size of the Ring-billed Gull (males ave. 566g., females 471g.) (Dunning 1993), its year-round presence and high local abundance, and its historical presence in JFKIA's strike record make this species moderately hazardous to aircraft at JFKIA. Tall grass management and elimination of refuse and standing water to reduce foraging/loafing opportunities combined with persistent harassment (reinforced with removal by shooting) provide the most-consistent, effective control.

1.3.1.4 Laughing Gull

Between 1979 and 1993, Laughing Gulls accounted for: 35% of aircraft striking birds, 30% of birds involved in strikes, 12% of strikes resulting in damage or delays, and caused 6 instances of engine damage (Table 1-3). The examination of the 15-year birdstrike record gives a good overall picture of species-specific hazards to aircraft. The Laughing Gull population near JFKIA has grown substantially since 1979; the Jamaica Bay Laughing Gull colony has increased from 30 in 1979 to more than 15,200 in 1990. For this reason, it is more relevant to examine the 5-year period, 1986-90, to develop an accurate understanding of the degree to which Laughing Gulls pose hazards to aircraft at JFKIA. The period 1986-90 was when the Laughing Gull colony became well-established in Jamaica Bay but was before the USDA shooting program (1991-93) which greatly reduced the number of Laughing Gull strikes. During the 5-year period, 1986-90, Laughing Gulls were involved in 51% of aircraft striking birds, and resulted in 7 (18%) aircraft being damaged or delayed. All strikes involving Laughing Gulls occur between April and November, with the vast majority occurring in May-August (Table 1-6, Figure 1-5). Laughing Gulls are migratory, and are present in New York only during the nesting season.

In 1979, Laughing Gulls (*Larus atricilla*) established a nesting colony on JoCo Marsh at the southeast end of Runway 22R/4L (Post and Riepe 1979) (Figure 1-6). Table 1-2 illustrates how, as this colony grew from 15 pairs in 1979 to over 7,000 pairs in 1990 (Litwin et al. 1993), the number of Laughing Gulls involved in birdstrikes at JFKIA increased from 2 in 1979 to 135 in 1990. During the same period (1979-1990), the percentage of all birdstrikes at JFKIA involving Laughing Gulls increased from 1.7% in 1979 to 49% percent in 1990 (U.S. Department of Agriculture 1992). A statistical regression analysis was conducted for the 1979-1990 strike and nest data to determine if the increase in birdstrikes and the increase in breeding pairs or nests in the Laughing Gull colony at the end of the runway were related (Figure 1-7). The number of Laughing Gulls involved in birdstrikes at JFKIA were substantially correlated with the number of Laughing Gull nests in the JBWR colony. As the number of breeding Laughing Gulls increased, so did the number of interactions between Laughing Gulls and aircraft.

The regional and national Laughing Gull populations are increasing (recovering) (Table 1-4). The Jamaica Bay Laughing Gull colony is the only viable nesting colony in New York State; in 1993, there were approximately 12,000 adults in the colony (Dolbeer and Sillings 1993). Jamaica Bay's colony is the largest colony in the northeast, with 1 and 9 smaller colonies in Massachusetts and Maine, respectively. In New Jersey, Laughing Gulls are the most abundant nesting gull species; recent surveys indicate that competition at New Jersey nesting colony sites may cause an increased rate of range expansion of this species northward into the Jamaica Bay colony. It is noted that during the summers of 1992 and 1993, several Laughing Gulls were shot at JFKIA that had been color-marked in New Jersey colonies earlier in each of those two summers. Clearly, immigration into the Jamaica Bay colony has happened to a great extent in recent years, and would most likely occur in the future.

Laughing Gulls removed during the USDA shooting programs at JFKIA in 1991 and 1992 had body masses of 344.5 g (males) and 311.9 g (females), which categorizes it as a medium-sized bird. Their diet consisted primarily of insects, garbage and other human-generated materials, and marine foods. Laughing

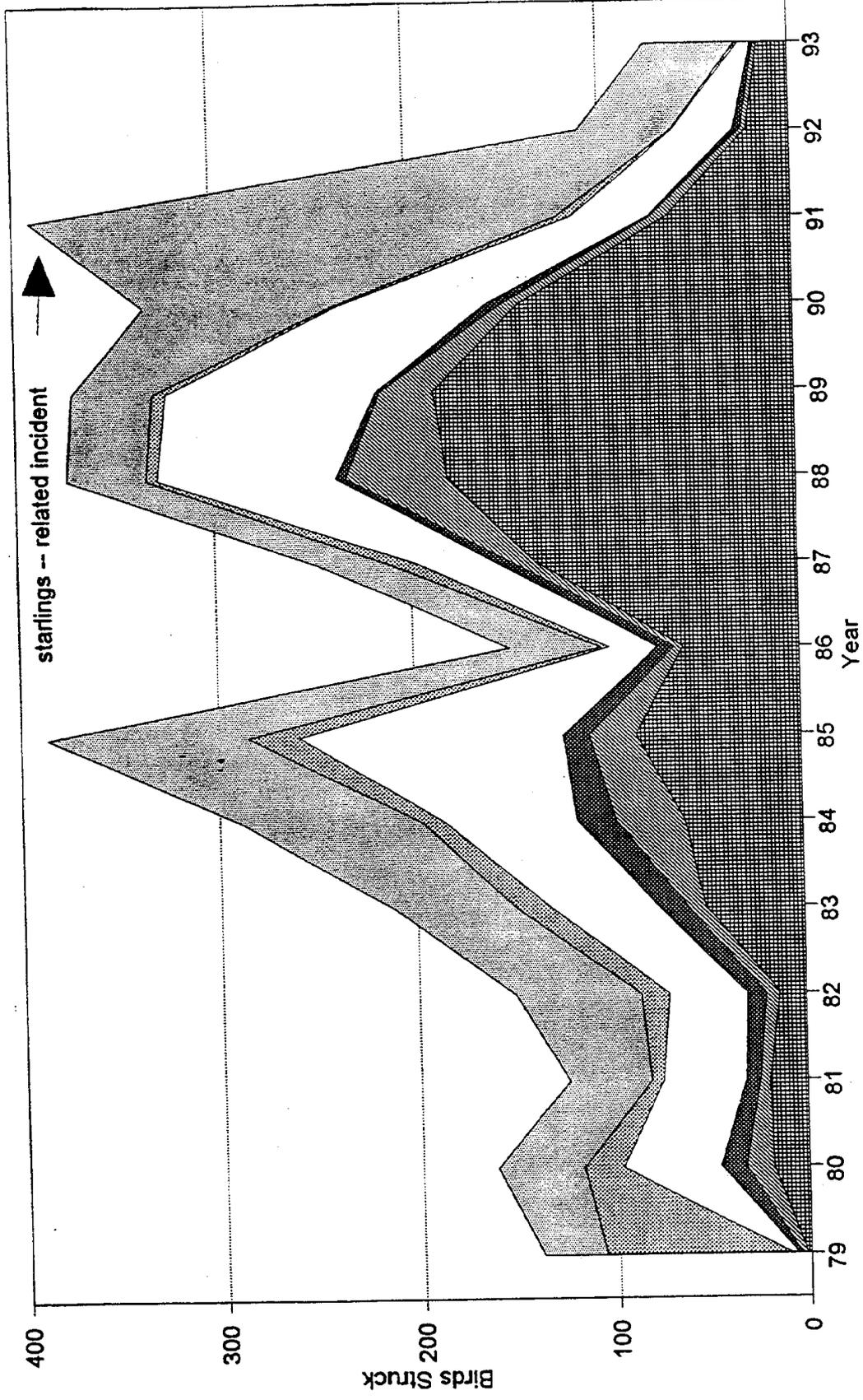
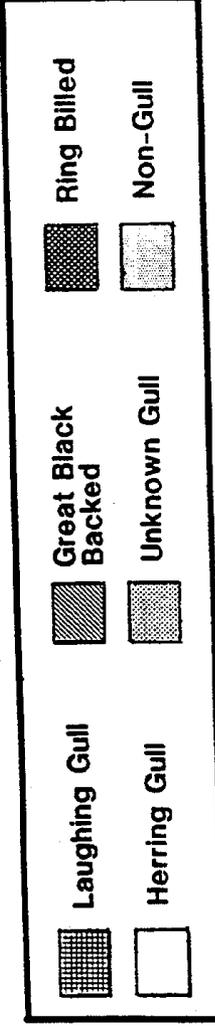


FIGURE 1-6

Total Bird Strikes by Type of Bird
At JFK Airport, 1979 - 1993



Source: Dolbeer, et al. 1993.

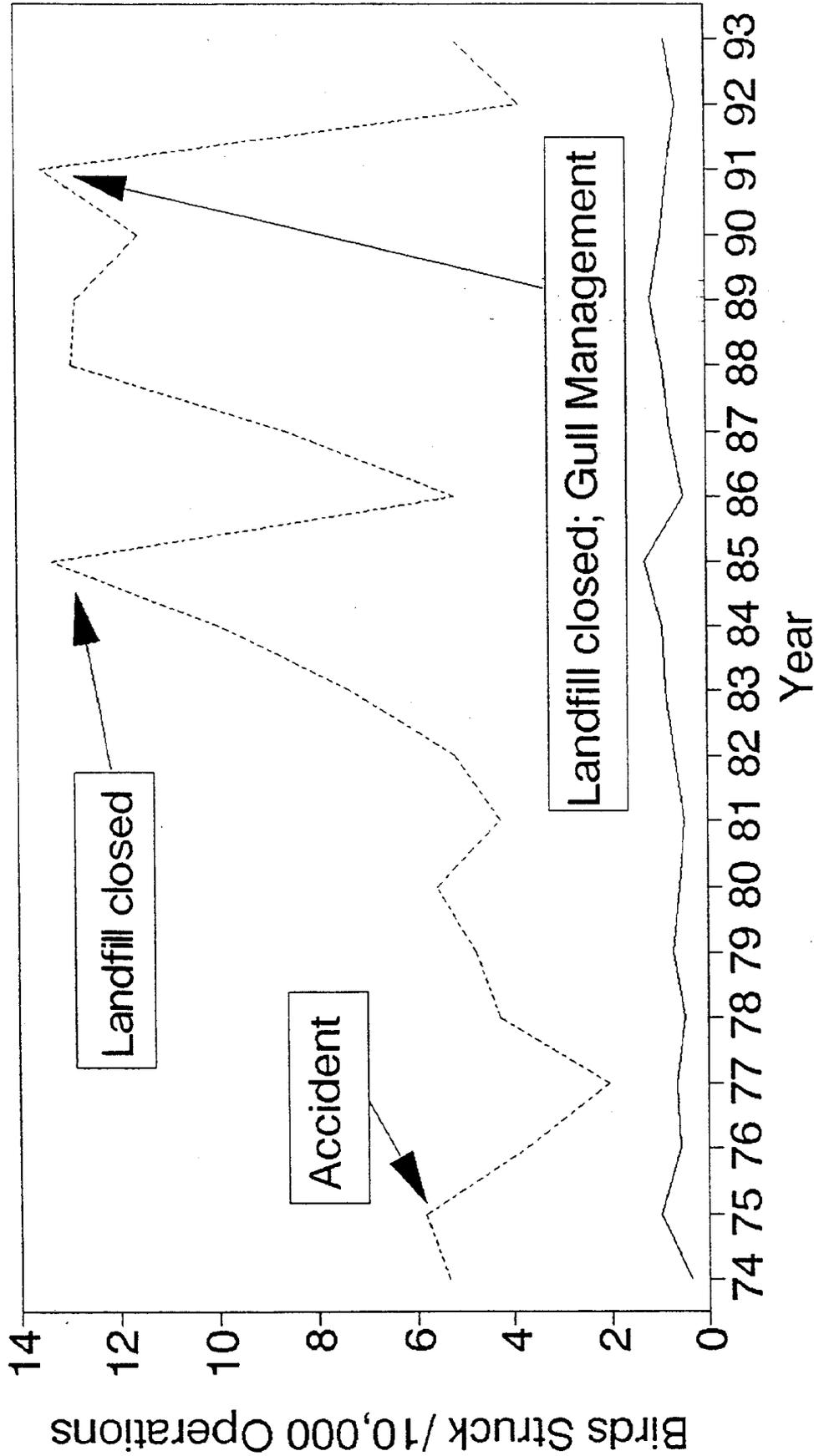


FIGURE 1-7

Bird Strike Rates
At JFK Airport, 1974 - 1993

— Reported Total

Source: Port Authority of NY and NJ; USDA; 1993.

Table 1-7

Minimum Number of Aircraft Striking Various Non-Gull Species of Birds and Number of Birds Struck, JFKIA, 1979-93

Year	<u>Common Barn Owl</u>		<u>American Kestrel</u>		<u>Short-eared Owl</u>		<u>Osprey</u>		<u>Peregrine Falcon</u>	
	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds
1979	2	2	0	0	3	3	0	0	0	0
1980	4	4	0	0	2	2	0	0	0	0
1981	7	7	3	3	0	0	1	1	0	0
1982	4	4	6	6	5	5	1	1	0	0
1983	4	4	5	5	6	6	0	0	0	0
1984	7	7	8	8	4	4	0	0	1	1
1985	17	17	9	9	2	2	0	0	0	0
1986	8	8	2	2	5	5	1	1	0	0
1987	8	8	1	1	1	1	2	2	1	1
1988	15	15	0	0	1	1	1	1	0	0
1989	10	10	0	0	0	0	3	3	2	2
1990	6	6	2	2	1	1	1	1	0	0
1991	7	7	5	5	4	4	2	2	3	3
1992	6	6	3	3	1	1	1	1	2	2
1993	3	3	2	2	0	0	0	0	1	1
Total	108	108	46	46	35	35	13	13	10	10

Table 1-7 (Continued)

Minimum Number of Aircraft Striking Various Non-Gull Species of Birds and Number of Birds Struck, JFKIA, 1979-93

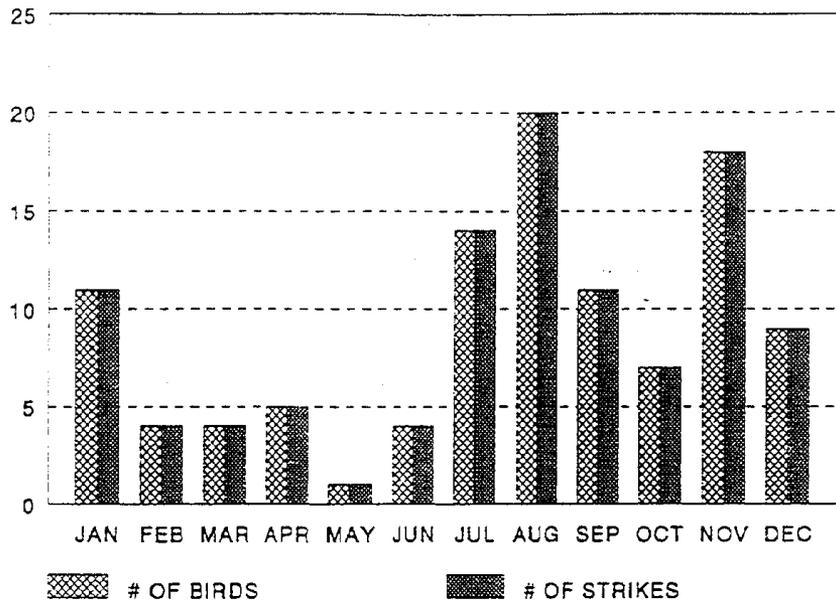
Year	<u>Cattle Egret</u>		<u>Mallard</u>		<u>Am. Black Duck</u>		<u>Canada Goose</u>		<u>Brant</u>	
	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds
1979	1	1	0	0	0	0	3	3	1	1
1980	1	1	2	2	5	5	0	0	0	0
1981	1	1	1	1	2	2	0	0	1	1
1982	2	2	3	3	2	2	0	0	0	0
1983	6	6	10	10	3	3	1	1	0	0
1984	24	24	4	4	2	3	3	5	0	0
1985	12	12	5	5	5	5	1	6	0	0
1986	2	2	4	4	3	3	2	2	1	10
1987	3	3	5	5	0	0	0	0	0	0
1988	1	1	2	3	2	2	1	1	0	0
1989	1	1	2	2	4	7	2	4	0	0
1990	9	9	5	5	3	4	1	1	0	0
1991	1	1	0	0	0	0	2	5	1	2
1992	0	0	1	1	0	0	1	2	1	1
1993	0	0	3	4	0	0	1	1	3	33
Total	64	64	47	49	31	36	18	31	8	48

Table 1-7 (Continued)

Minimum Number of Aircraft Striking Various Non-Gull Species of Birds and Number of Birds Struck, JFKIA, 1979-93

Year	<u>Rock Dove</u>		<u>European Starling</u>		<u>Snow Bunting</u>		<u>Red-winged Blackbird</u>		<u>Ring-necked Pheasant</u>	
	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds	No. Strikes	No. Birds
1979	1	6	1	1	0	0	0	0	0	0
1980	2	2	0	0	3	13	0	0	0	0
1981	3	3	4	8	0	0	0	0	0	0
1982	2	2	0	0	1	10	1	12	0	0
1983	1	1	2	2	0	0	0	0	0	0
1984	5	11	1	3	0	0	0	0	0	0
1985	1	1	2	27	0	0	0	0	1	1
1986	0	0	0	0	0	0	0	0	0	0
1987	0	0	1	2	0	0	0	0	0	0
1988	1	4	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	1	1
1990	1	4	2	8	1	30	0	0	1	1
1991	1	1	2	212	0	0	0	0	1	1
1992	3	3	0	0	1	6	0	0	5	5
1993	2	4	0	0	1	3	0	0	1	1
Total	23	42	15	263	7	62	1	12	10	10

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
BARN OWLS



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
KESTREL

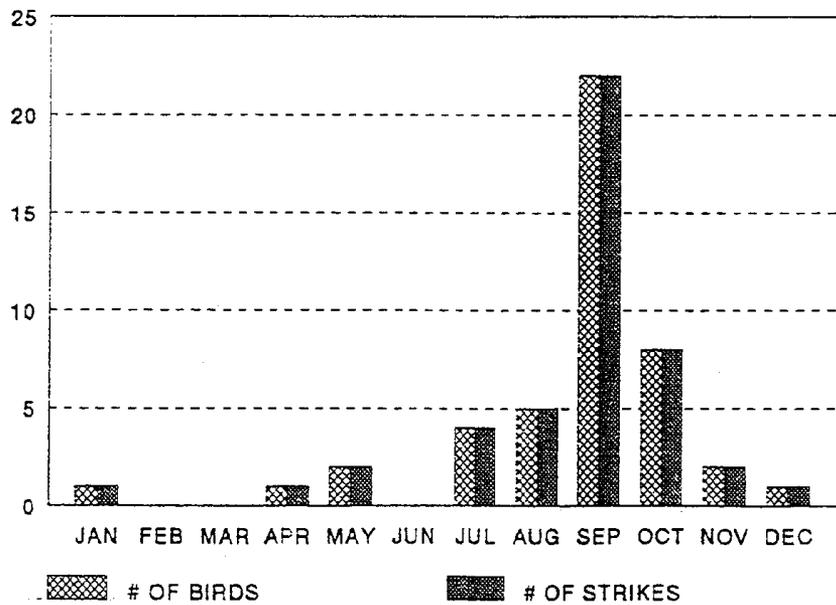


FIGURE 1-8

Number of Barn Owls and Kestrel and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

Although Common Barn-Owls are medium-large-sized birds (males ave. 479g., females 568g.) (Dunning 1993) and habitat management at JFKIA may increase its attractiveness to these birds by increasing the prey base, no damages or delays to aircraft resulting from barn-owl strikes have been recorded since 1979. Common barn owls pose low-moderate hazards at JFKIA, and the trend of bird strikes involving this species appears to be declining. Harassment can be somewhat effective but is difficult when dealing with nocturnal species, and may be limited in the future depending on the species' population and protective status.

1.3.2.2 American Kestrel

A total of 46 American Kestrels (1% of total birds struck) were struck by 46 aircraft (2% of total aircraft struck), resulting in no damage or delays to aircraft during the period 1979-93 (Table 1-3). All kestrel strikes at JFKIA have involved single birds. The trend in Kestrel-aircraft collisions has remained relatively constant over this period, fluctuating between 0 and 9 aircraft and birds struck per year, with an average of 3.1. Two-thirds of Kestrel strikes occurred during Sept. - Oct., coinciding with the fall migration (Figure 1-8).

The American Kestrel is the most common and widely distributed diurnal raptor in New York State. Kestrel populations are monitored annually through the Breeding Bird Survey conducted by the National Biological Survey; regional and national population trends of this species are increasing (recovering) (Table 1-4). Kestrels occur most frequently in open, agricultural areas. It nests in tree cavities or on buildings wherever open foraging areas are present, and are quite tolerant of humans. Diet consists primarily of small vertebrates and insects. American Kestrels are migratory, wintering south to Panama.

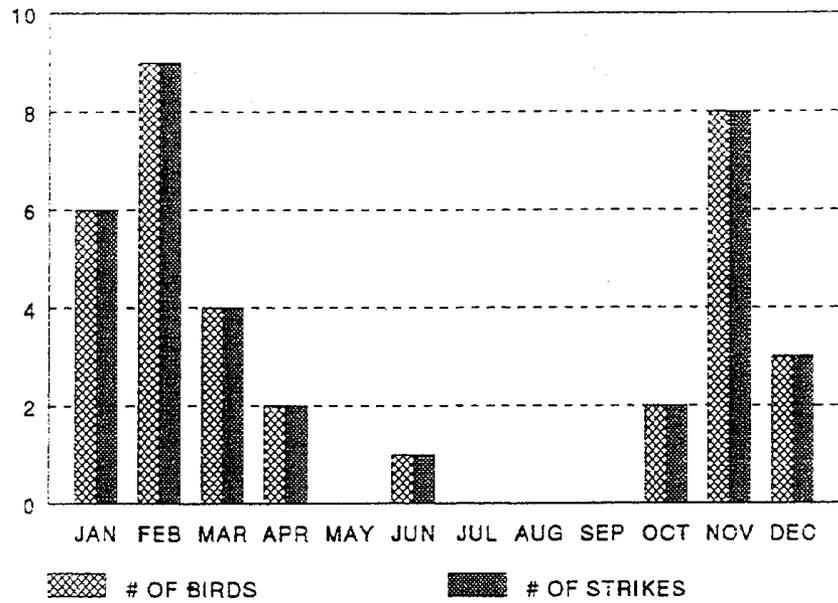
Although current habitat management on JFKIA to deter gulls will likely favor kestrels by supporting high small mammal prey populations and responsiveness to harassment is limited, the potential aviation hazard posed by the species is seasonal and low relative to hazards posed by other birds. Kestrels are small-medium birds (males ave. 110g., females 120g.) (Dunning 1993) and occur singly, and have resulted in no aircraft damage or delays during the period 1979-93.

1.3.2.3 Short-Eared Owl

A total of thirty-five (35) Short-eared Owls (< 1% of total birds struck) were struck by 35 aircraft (1% of total aircraft struck), resulting in damage or delay to one aircraft (1% of total aircraft damaged or delayed) during the period of 1979-93 (Table 1-3). All strikes of short-eared owls at JFKIA have involved single birds. The annual number of aircraft striking this species, and the number of birds involved in strikes has ranged from 0 to 6, and has averaged 2.3 per year. Monthly strike distribution peaks in February and November, with greater than 50% of strikes occurring Jan-March and greater than 30% of strikes occurring Oct-Dec. (Figure 1-9), indicating seasonality of potential hazard due to migratory movement and increased availability of prey (voles) on airport areas coinciding with periods of decreased vegetative cover.

Short-eared owls are medium-sized birds (males ave. 315 g., females ave. 378 g.) (Dunning 1993). It is a rare breeder in the state, with nearly all confirmed breeding recorded on the south shore of Long Island. Regional and National populations of this species are declining (Table 1-4), and it is considered a species of Special Concern in New York State. This owl breeds in meadows and marshes, nesting on

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
SHORT-EARED OWLS



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
OSPREY

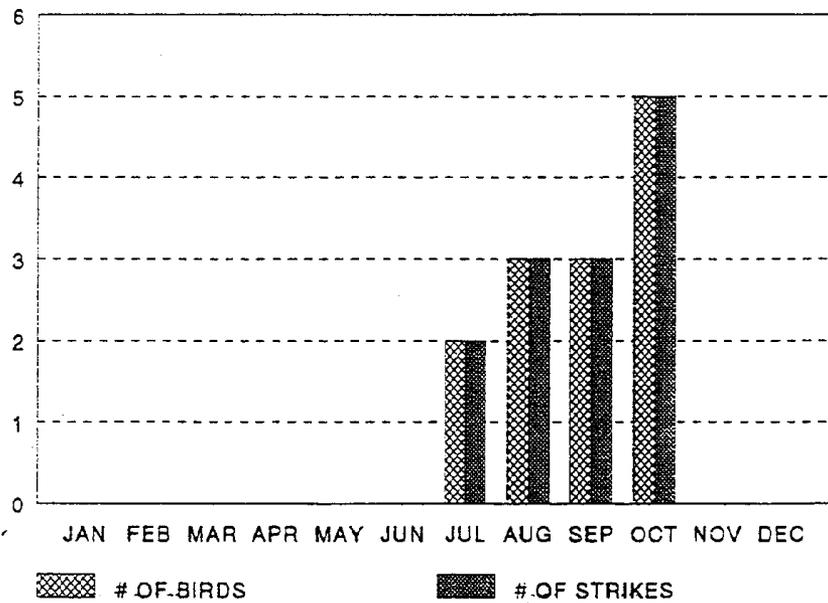


FIGURE 1-9

Number of Short-Eared Owls and Osprey and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

the ground in low vegetation. The primary prey of the Short-eared owl is the meadow vole. Changes in the prey population can trigger responses typical of irruptive predator populations, including nomadic movement, specialized feeding, and flexible fecundity.

Short-eared Owl strikes have resulted in damage or delay to a single aircraft at JFKIA since 1979. Although current habitat management could actually favor the species by increasing vole populations, the threat to aviation at JFKIA is low relative to hazards posed by other species. The Short-eared Owl is sensitive to human disturbance and is quite responsive to harassment.

1.3.2.4 Osprey

During 1979-93, thirteen Osprey (<1% of total birds struck) were struck by 13 aircraft (<1% of total aircraft struck), resulting in damage or delays to two aircraft (2% of total aircraft damaged or delayed) (Table 1-3). All strikes of osprey have involved single birds, and the annual number of strikes has ranged from 0 to 3, with an annual average of less than 1 (Table 1-3). Eighty percent of Osprey strikes occurred during August-Oct., coinciding with migration (Figure 1-9).

In New York, Ospreys have made a dramatic recovery since reproductive failure resulting from DDT toxicity decimated populations in the 1950's and 1960's. Long Island supports a population of approximately 150 pairs, and the regional and national populations are increasing (recovering) (Table 1-4). Ospreys nest along shorelines, usually near mature forests (nests usually built in tall trees). Ospreys are primarily piscivorous but the diet may include rodents and other birds.

Ospreys are migratory and winter south to Chile. Their status in New York was changed from Endangered to Threatened in 1983.

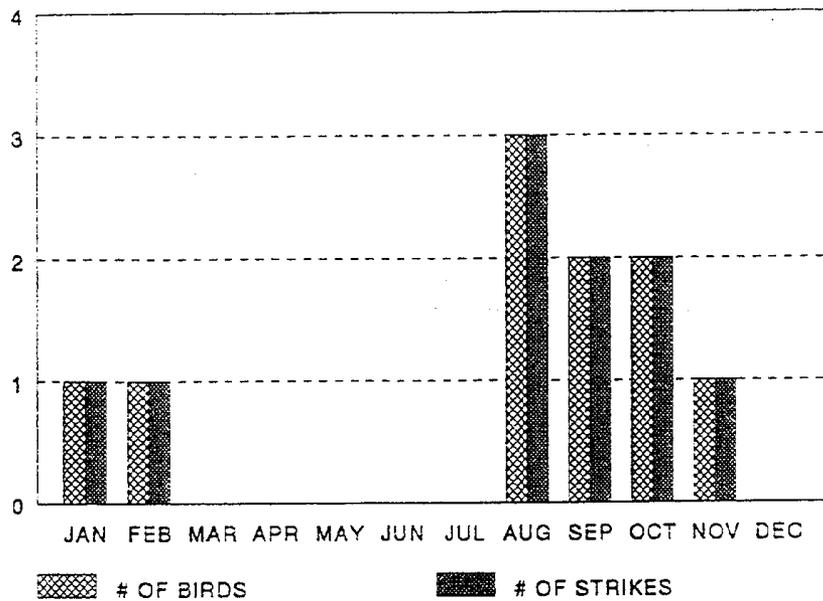
Although Ospreys are large birds (males ave. 1403g., females 1568g.) (Dunning 1993) and can result in aircraft damage when struck (2 aircraft damaged or delayed since 1979), ospreys are very seldom struck at JFKIA. The hazard is seasonal and low relative to hazards posed by other species. Habitat management at JFKIA will probably not influence the Osprey since it feeds primarily on fish. Effectiveness of harassment is limited.

1.3.2.5 Peregrine Falcon

A total of 10 Peregrine Falcons (<1% of total birds struck) were struck by 10 aircraft (<1% of total aircraft struck), resulting in damages or delays to one aircraft (1% of total aircraft damaged or delayed) during the period of 1979-93 (Table 1-3). All strikes involving peregrines involved single birds. The trend in Peregrine-aircraft collisions over this period is generally and gradually increasing, perhaps reflecting re-introduction efforts aimed at re-establishing a breeding population in New York. The regional and national population trends of this Federally Endangered species are increasing (recovering) (Table 1-4). Seventy percent of Peregrine falcon-aircraft collisions occurred during August-October, coinciding with the Fall migration period (Figure 1-10).

The extirpation of the Peregrine Falcon from New York began around 1950, with the last successful nesting reported in 1956. Captive breeding and re-introduction efforts by the Peregrine Fund resulted in 148 peregrines released in New York by 1986. From 1983-1986, 26 young were produced at 5 eyries

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
PEREGRINE FALCON



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
CATTLE EGRETS

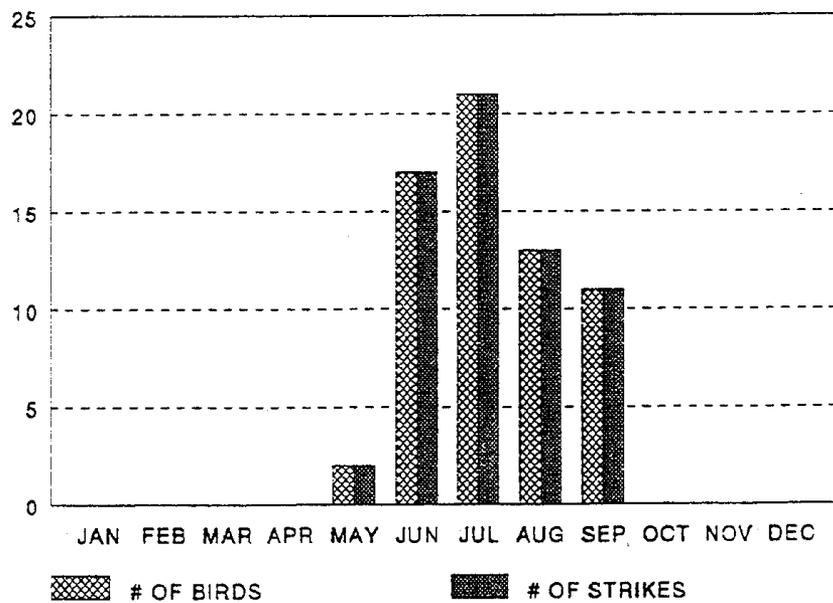


FIGURE 1-10

Number of Peregrine Falcon and Cattle Egret and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

in the state (New York City/Long Island - 2, Adirondack Mountains - 2, Lake Champlain - 1). Peregrine eyries are commonly found at cliff ledges or escarpments overlooking the surrounding countryside. Nests are shallow scrapes. Peregrines feed on small to medium size birds including pigeons, mourning doves, ducks, gulls, and other birds it catches in flight.

Peregrine Falcons are large birds (males ave. 611g., females 952g.) (Dunning 1993) and occur at JFKIA infrequently. Peregrines accounted for less than 1% of birdstrikes and damage or delay to only one aircraft at JFKIA from 1979-93. Overall, peregrines are considered to pose low hazards to aircraft at JFKIA. Habitat management and harassment to reduce gull use of airport areas will most likely serve to discourage Peregrine Falcons as well, by reducing avian prey availability.

1.3.3 Wading Birds

Wading birds such as herons and egrets can pose hazards to aircraft due to their large body size, low and slow flight characteristics, and presence near bodies of water.

1.3.3.1 Cattle Egret

Cattle egrets can be a significant and growing concern as birdstrike hazards at airports, especially along the U.S. Gulf Coast and in the Caribbean Islands. They can be present in flocks on airports, foraging on insects, rodents and other small prey items. The regional and national trend of cattle egret population is stable (Table 1-4).

At JFKIA, a total of 64 Cattle Egrets (1.8% of total birds struck) were struck by 64 aircraft (2.2% of total aircraft struck), resulting in no damage or delays to aircraft during the period 1979-93 (Table 1-3). All of these strikes involved single birds. The trend in Cattle Egret-aircraft collisions at JFKIA is irregular. The number of aircraft striking cattle egrets averaged 4 per year; the numbers ranged from 0 to 12, except for 1984, when 24 aircraft struck cattle egrets (Table 1-7). None of these strikes resulted in engine damage. Cattle Egret strikes were limited to May-September.

In New York, Cattle Egrets nest in association with other species of wading birds. Although isolated breeding occurs in eastern Lake Ontario and Lake Champlain, Cattle Egrets are most abundant on Long Island, where the population exceeds 350 pairs in four colonies and continues to grow. Diet consists primarily of mollusks, crustaceans, and earthworms. Cattle Egrets are migratory and winter south to South America.

Cattle Egrets are medium-sized birds (ave. 338g.) (Dunning 1993) and occur singly, representing a relatively low, seasonal hazard to aviation at JFKIA (no aircraft damaged or delayed as a result of Cattle Egret - aircraft collisions since 1979). Current habitat management to reduce gull hazards should also reduce Cattle Egret use of airport areas. Harassment can be effective in deterring this species away from the airport.

1.3.4 Waterfowl

Waterfowl are ducks, geese, and swans. This species group can be hazardous to aircraft where they are locally abundant, and because of their wide distribution during migration periods, flocking behaviors, medium-large size, and by the tendency of some waterfowl species to feed and rest in open grassy areas

near water bodies. Some of the waterfowl species that have been struck by aircraft at JFKIA are: mallard duck, black duck, Canada goose, unknown duck, and brant. At JFKIA between 1979 and 1993, waterfowl have posed some threats to safe aircraft operation, and have accounted for: 4.6% of aircraft striking birds, 5.2% birds involved in strikes, 6.1% of the aircraft damaged or delayed, and approximately 6.5% of strikes that resulted in some type of engine damage (Table 1-3).

1.3.4.1 Mallard Duck

A total of 47 Mallards (1% of total birds struck) were struck, resulting in no damage or delays to aircraft during the period of 1979-93 (Table 1-3). The annual number of aircraft striking mallards at JFKIA between 1979 and 1993 has fluctuated between 0 and 10, and has averaged 3.1 (Table 1-7). Fifty-five percent of Mallard strikes occurred during the breeding/nesting season (April-June), with the remaining incidents distributed evenly throughout the year (Figure 1-11).

Mallards are common breeders in wetland habitats throughout New York State. They breed in virtually all types of wetlands, usually nesting on the ground among weeds, cattails, reeds, etc. Diet consists of seeds and sprouts of marsh grass, aquatic vegetation, insects, invertebrates, and occasionally fish. The regional population trend of mallards is increasing, but the national trend is decreasing (Table 1-4). Although Mallards are large birds (both sexes average 1082g.) (Dunning 1993) and some potential for hazard exists year-round due to local resident populations, the hazard to aircraft at JFKIA is primarily seasonal and relatively low (Mallard strikes have resulted in no damages or delays to aircraft at JFKIA since 1979) compared to hazards from other species. Current grass and water management and harassment efforts are effective in discouraging Mallard use of airport areas.

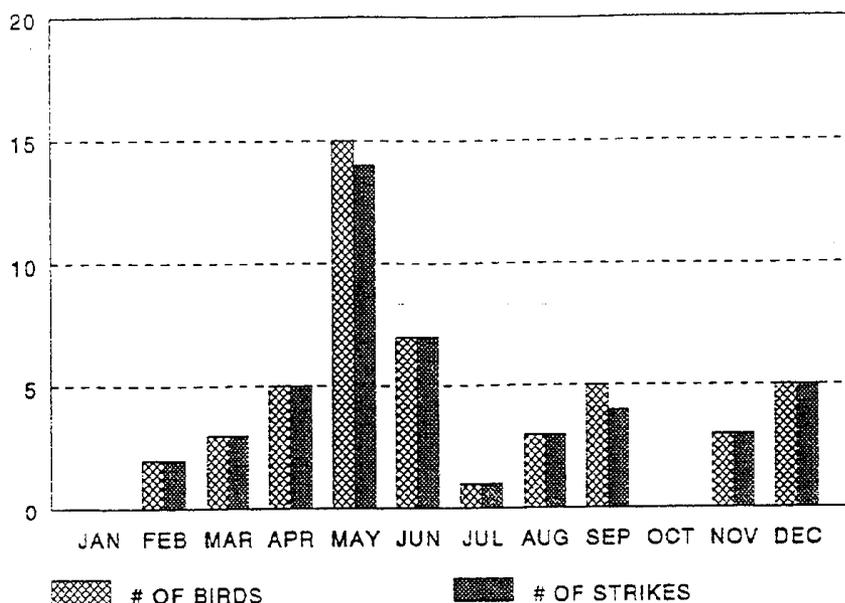
1.3.4.2 Black Duck

During the period of 1979-93, thirty-six (36) Black Ducks (1% of total birds struck) were struck by 31 aircraft (1% of total aircraft struck), resulting in no damage or delays to aircraft (Table 1-3). The annual number of aircraft striking black ducks in 1979-93 has ranged from 0 to 5, with an average of 2 (Table 4). Seventy percent of black duck strikes occurred during winter (Dec-Feb) and late spring/early summer (May-June) (Figure 1-5).

Black Ducks breed throughout much of New York but are most abundant in coastal salt marshes and freshwater marshes, bogs, lakes and ponds in the eastern portion of the state. Although the statewide population of this duck declined by nearly 60% between the early 1950's and the early 1980's (acid deposition resulting in habitat degradation, hybridization with expanded Mallard populations), the coastal salt-marsh population has remained stable. The regional and national populations of black ducks have generally declined (Table 1-4). Black ducks nests are shallow depressions found in wooded swamps and marsh thickets. Diet consists of insects, aquatic vegetation, seeds, grasses and grains.

Although black ducks are large birds (males ave. 1030g., females 968g.) (Dunning 1993), their potential hazard to aviation at JFKIA is seasonal and relatively low. No damage or delays to aircraft have occurred as a result of black duck-aircraft collisions since 1979. Current grass and water management aimed at reducing gull hazards also reduces attraction of airport areas to black ducks. Because the black duck is particularly wary of humans, harassment is very effective, and this species is easily deterred by harassment with pyrotechnics and other scare tactics.

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
MALLARDS



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
AMERICAN BLACK DUCK

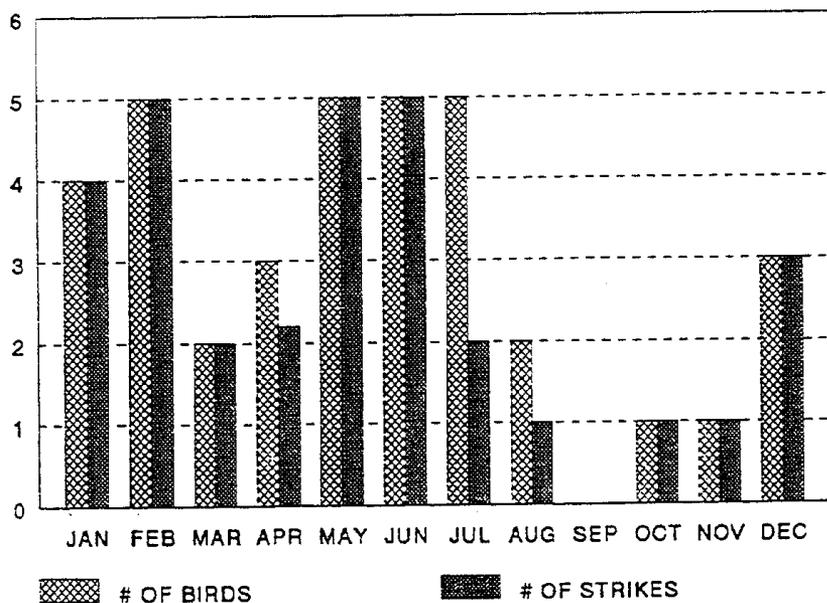


FIGURE 1-11

Number of Mallards and American Black Duck and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93

1.3.4.3 Canada Goose

During the period 1979-93, thirty-one (31) Canada geese (< 1% of total birds struck) were struck by 18 aircraft (< 1% of total aircraft struck), resulting in damage or delays to two aircraft (2% of total aircraft damaged or delayed) (Table 1-3). The trend in Canada Goose-aircraft collisions has remained relatively constant over this period, averaging 1.2 aircraft striking geese each year (range 0 to 3)(Table 1-7). Canada goose strikes have been distributed fairly evenly from early spring through late fall (March-Nov.) (Figure 1-12), with potential hazards associated with the local breeding population as well as migrants (JFKIA is located within the Atlantic Flyway).

New York's Canada Goose population has experienced a dramatic increase in the last 30 years. The current resident breeding population is estimated at 24,000 and it continues to grow (Andrle and Carroll 1988). The regional and national migratory goose populations are declining, but the resident populations are increasing (Table 1-4). Resident population geese are variably migratory and the number of year-round residents is increasing. Canada geese prefer to nest on islands, muskrat houses, beaver dams, old stumps, or nesting structures with a clear view of the surrounding area. Based on a one-year systematic survey of Jamaica Bay Wildlife Refuge, Burger (1983) reported that Canada geese are present in the Refuge throughout the year, and were concentrated around freshwater ponds.

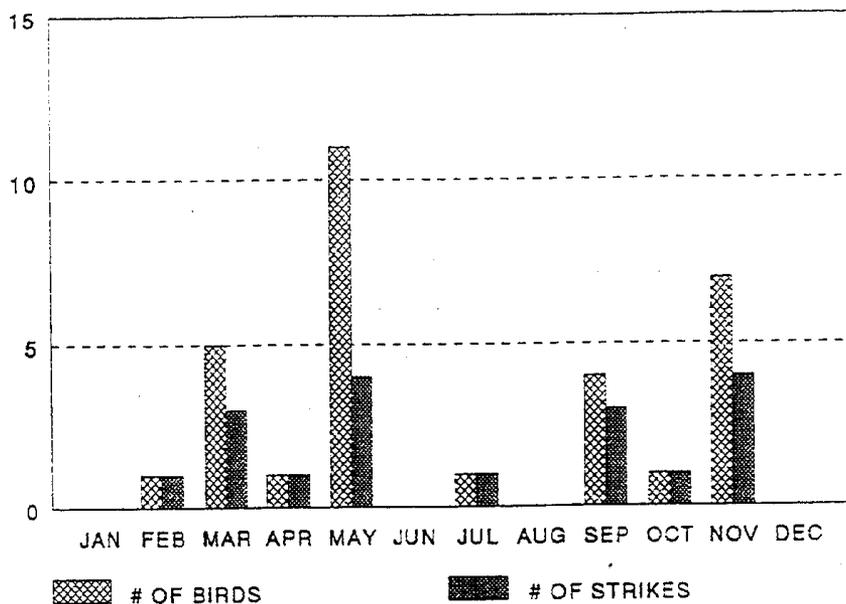
Because the Canada Goose is a large bird (males ave. 3814g., females 3314g.) (Dunning 1993) and strikes may involve flocks, Canada geese can cause significant damage when struck by aircraft (two aircraft damaged or delayed by goose strikes at JFKIA since 1979). Canada Goose-aircraft collisions can occur throughout much of the year. Overall, Canada geese pose low levels of hazards to aircraft at JFKIA, although during migration periods, the hazard may increase. Current long-grass and water management aimed at reducing gull hazards is also effective in reducing attractiveness to Canada geese, and harassment is usually effective in airport situations. Canada geese are a hunted species; both New York and New Jersey have initiated special September hunts aimed at the resident populations. These hunts may further improve this species' response to nonlethal harassment techniques, especially the use of pyrotechnics.

1.3.4.4 Brant

A total of 48 Brant (1% of total birds struck) were struck by 8 aircraft (< 1% of total aircraft struck), resulting in damage or delays to 2 aircraft (2% of total aircraft damaged or delayed) during the period of 1979-93 (Table 1-3). The trend in Brant - aircraft collisions over the period may be increasing (Table 1-7). Six of the eight strikes recorded, involving over 90% of the total Brant struck over the period, occurred during April-May (Figure 1-12), coinciding with migration to the northern breeding grounds.

Although Brant do not breed in New York, flocks of brant occur at JFKIA during winter. Regional and national brant populations are stable though yearly populations fluctuate widely around this stable population trend (Table 1-4). Burger (1983) reported that Brant were present in Jamaica Bay Wildlife Refuge between October and May, with peak abundance in November and May. Brant were concentrated in tidal areas of the Bay; diet consisted of submerged aquatic plants. Burger (1983) also reported flocks of Brant in excess of 1900 birds in the Bay, with smaller groups (less than 100 birds) located in the freshwater ponds. Diet consists of sedges, grasses, insects, and mollusks. Brant are large birds (males

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
CANADA GEESE



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
BRANT

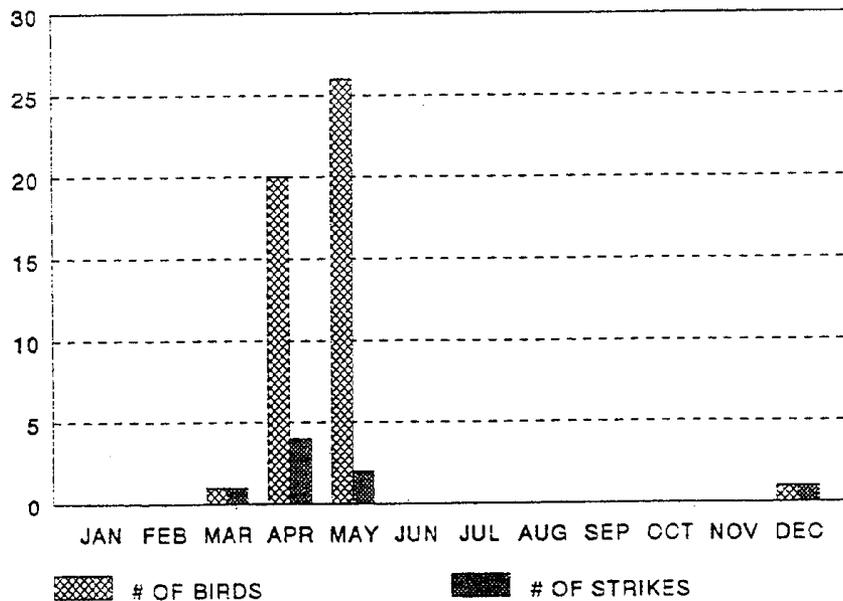


FIGURE 1-12

Number of Canada Geese and Brant
and number of aircraft involved in
birdstrikes at JFKIA by month,
1979-93.

ave. 1370g., females 1230g.) (Dunning 1993) and collisions often involve migrating flocks. Overall, brant pose low levels of hazard to aircraft at JFKIA, but during winter this hazard may increase. Habitat management on airport areas will have little effect on wintering flocks, and harassment can be effective on those flocks on or over the airport.

1.3.5 Other Flocking Birds

Other flocking species include rock doves, blackbirds, snow buntings, and starlings. When these species are hazardous to aircraft, it is probably due to their flocking behaviors and high local abundance, and not their body size, which is relatively small. Species in this group whose population trends are examined are generally increasing and expanding (Table 1-4). At JFKIA between 1979 and 1993, these species posed some threat to aircraft, and have accounted for: 1.6% of aircraft striking birds, 10.7% of birds involved in strikes, 4.9% of the aircraft damaged or delayed, and approximately 4% of the strikes that resulted in engine damage (Table 1-3).

1.3.5.1 Rock Dove

A total of 42 Rock Doves (1% of total birds struck) were struck by 23 aircraft (<1% of total aircraft struck), resulting in damage or delay to one aircraft (1% of total aircraft damaged or delayed) during the period 1979-93 (Table 1-3). The annual number of aircraft striking rock doves at JFKIA between 1979-93 has ranged from 0 to 5, and has averaged 1.5 (Table 1-7). Although the Rock Dove is a non-migratory year-round resident, collisions with aircraft at JFKIA have been recorded only during the months of April-October, (Figure 1-13) when seeds and grasses appear in the diet and the bird is less dependent on stored grains and heat sources associated with man-made structures.

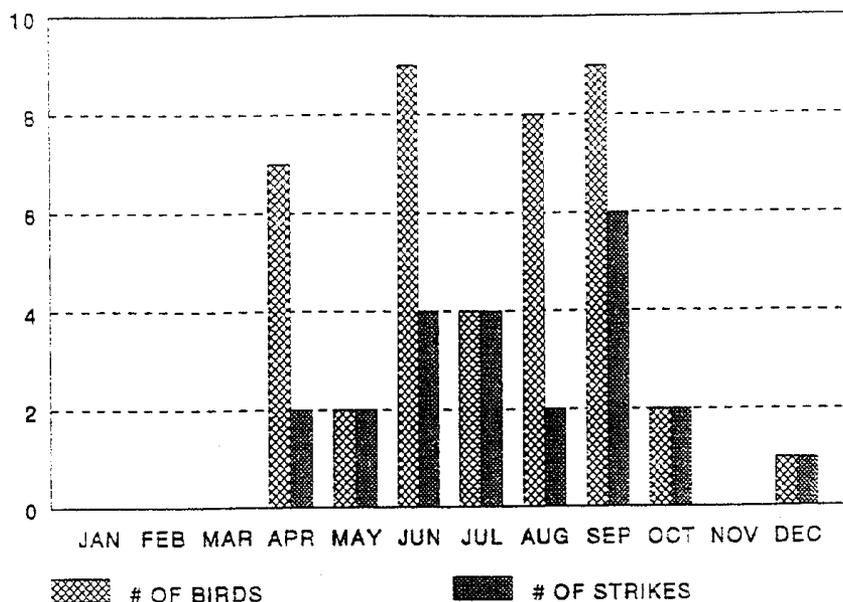
Rock Doves, commonly known as domestic pigeons, are abundant, and prolific breeders throughout most of New York (less frequent in the Adirondack and Catskill Regions). As an introduced species, they are not protected by federal or state law, and their regional and national populations are increasing and expanding (Table 1-4). Rock Doves breed throughout the year in many areas and nest and roost almost exclusively on man-made structures. At JFKIA, rock doves can be attracted to trash and areas with high pedestrian traffic. Accumulations of droppings at these roosts often create health and safety hazards.

The Rock Dove is a medium-sized bird (males ave. 369g., females 340 g.) (Dunning 1993), and one aircraft has been damaged or delayed by Rock Dove strikes at JFKIA since 1979. Overall, hazards posed by this species at JFKIA are low. Tall grass and reduction or elimination of standing water and handouts of food from humans aimed at reducing gull hazards will also be effective in discouraging Rock Doves.

1.3.5.2 European Starling

During the period 1979-93, a total of 263 European Starlings (7% of total birds struck) were struck by 15 aircraft (<1% of total aircraft struck), resulting in damage or delay to one aircraft (1% of total aircraft damaged or delayed) (Table 1-3). The number of aircraft struck should be considered the more meaningful statistic, since 194 of the total 263 starlings struck were involved in a single incident in 1991, in which the aircraft was not damaged or delayed. The annual number of aircraft striking starlings has been relatively constant (range from 0 to 4), and has averaged 1 (Table 1-7). Nearly all starling-aircraft collisions occurred during Aug-Sept. or Nov.-Dec. (Figure 1-13).

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
ROCK DOVE (PIGEON)



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
EUROPEAN STARLING

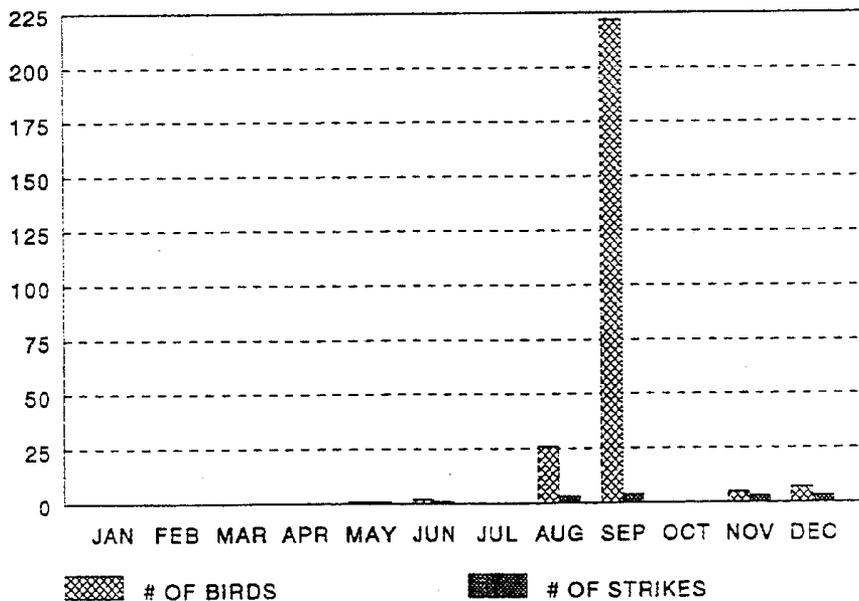


FIGURE 1-13

Number of Rock Dove (Pigeon) and European Starling and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

The European Starling is found virtually everywhere in New York except portions of the Adirondack Region, where heavy forest cover makes these areas unsuitable. The regional and national populations of starlings are increasing in size and expanding in distribution (Table 1-4). Starlings occupy various open and semi-open habitats, including lightly wooded areas, and this species is most abundant near cities and towns. Starlings nest in a variety of cavities and have aggressively displaced other cavity-nesting species.

European Starlings are small-medium birds (males ave. 84.7g., females 79.9g.) (Dunning 1993), and most aircraft collisions involve more than one bird. The overall potential hazard to aviation at JFKIA is low and limited relative to hazards posed by other species (damage or delay to only one aircraft resulting from starling-aircraft collisions has occurred since 1979). The hazards posed by starlings, however, in September increase, probably due to flocking behaviors associated with staging and migration. Elimination of short-grass areas to reduce gull hazards will also effectively deter European Starlings. Harassment using pyrotechnics and distress sounds is also effective. Historical habitat modifications conducted at JFKIA in the 1960s and 1970s such as a vegetation management (removal of Australian pines that were used as a starling roost) have functioned to reduce starlings, although they are still present to some degree.

1.3.5.3 Snow Bunting

During the period of 1979-93, sixty-two (62) Snow Buntings (2% of total birds struck) were struck by 7 aircraft (4% of total aircraft struck), resulting in damage or delay to one aircraft (1% of total aircraft damaged/delayed) (Table 1-3). Between 1979 and 1993, the annual number of aircraft striking snow buntings has ranged from 0 to 3, and has averaged .5 (Table 1-7). All strikes occurred during the month of November, in at least five different years (Figure 1-14).

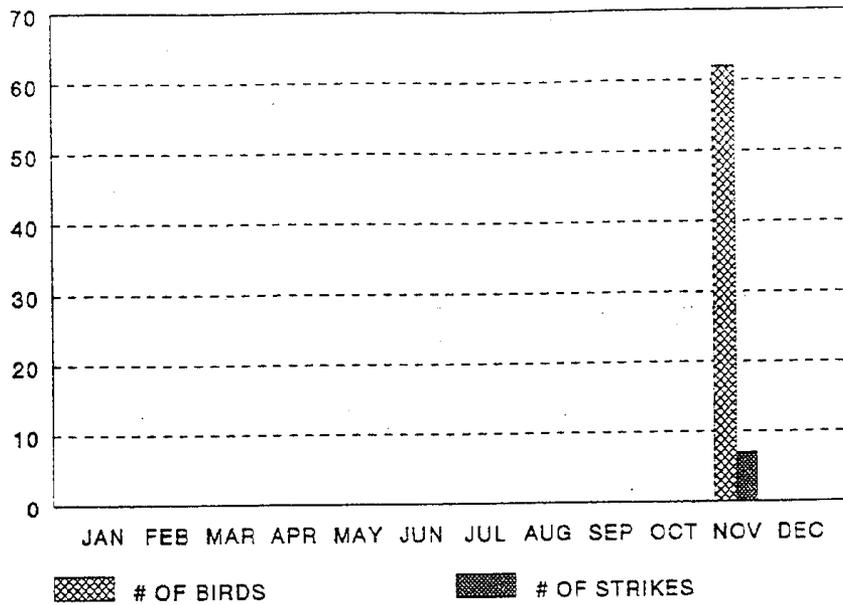
Snow Buntings breed in the Arctic (cliffs and tundra) and winter in New York and elsewhere in North America. The regional and national status of snow buntings are unknown (Table 1-4). These birds typically occur in flocks of 50-100 and prefer open fields with exposed weeds and low bushes. Roadsides and runway edges, where seeds and grit collect, are favorite feeding sites.

Snow Buntings are small birds (ave. 42g. both sexes) (Dunning 1993), and although strikes are likely to involve flocks, their presence at JFKIA is limited (1 month/year). Only one aircraft was damaged or delayed as a result of a Snow Bunting-aircraft collision between 1979-93. Overall, hazards posed by snow buntings at JFKIA is low, but the seasonal hazard in November increases. Tall grass management can reduce foraging opportunities if seeding is prevented. Harassment can be effective but must be persistent.

1.3.5.4 Red-winged Blackbird

During the period 1979-93, twelve (12) Red-winged Blackbirds (<1% of total birds struck) were struck by a single aircraft in 1982 (<1% of total aircraft struck) resulting in damage or delay to that aircraft (1% of total aircraft damaged or delayed) (Table 1-3). In New York, the Red-winged Blackbird is one of the most abundant and widespread breeding birds, found in virtually every wetland area. Regional and national Red-winged Blackbird populations are increasing (Table 1-4). The species has adapted to

BIRD STRIKES BY MONTH, 1979-1993, JFKIA
SNOW BUNTING



BIRD STRIKES BY MONTH, 1979-1993, JFKIA
RING-NECKED PHEASANT

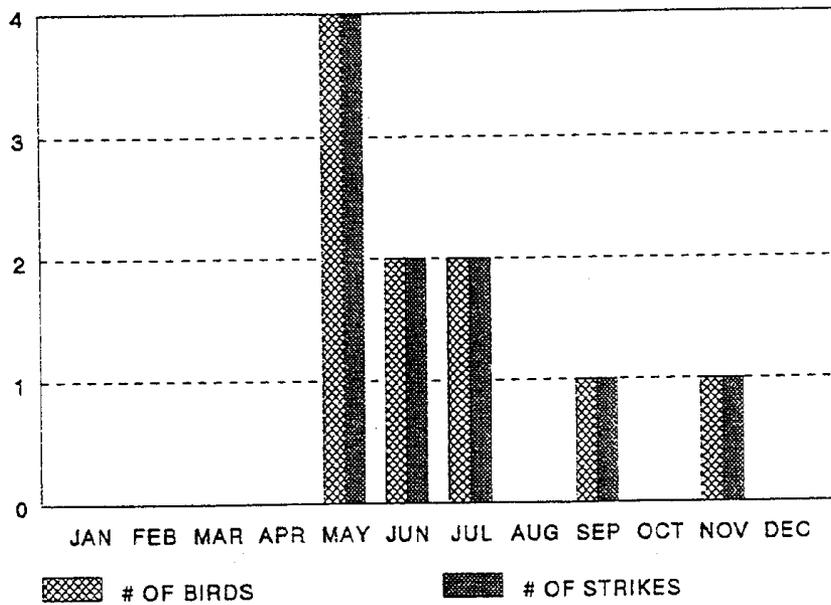


FIGURE 1-14

Number of Snow Bunting and Ring-necked Pheasant and number of aircraft involved in birdstrikes at JFKIA by month, 1979-93.

breed in upland locations and presents a major threat to corn crops. In wet areas the red-winged blackbird builds its nest above the ground or water level in cattails, bulrush, common reed or other aquatic plants or shrubs. In dry areas it may nest on the ground. Diet consists of insects, spiders, grasses and seeds. Red-winged blackbirds migrate from New York in the Fall and return in the Spring.

Red-winged Blackbirds are small-medium (males ave. 63.6g., females 41.5g.) (Dunning 1993). The single red-winged blackbird-aircraft collision which occurred at JFKIA between 1979-83 involved twelve birds and resulted in slight damage to the aircraft. The overall hazard posed by Red-winged Blackbirds at JFKIA is considered low. Long grass management (4-6") reduces foraging opportunities for this species. Harassment with pyrotechnics is effective but habituation may occur.

1.3.6 Ring-necked Pheasant

During the period 1979-93, 10 pheasants (<1% of total birds struck) were struck by aircraft (<1% of total aircraft struck), resulting in damage and delays to one aircraft (Table 1-4). Eighty percent of pheasant-aircraft strikes occurred during May-July (Figure 1-14). In New York, pheasants are year-round residents, and their regional and national populations are declining (Table 1-4). Pheasants are a large bird (1317 g males, and 953 g females)(Dunning 1983).

Pheasants usually occur singly or in small groups. When harassed, pheasants tend to run and hide rather than evacuate an area. For this reason, harassment with noise makers such as pyrotechnics and propane cannons are of limited effectiveness in ridding an area of pheasants. The long-grass management conducted at JFKIA most likely benefits this species by providing cover and nesting habitat.

Since pheasants have resulted in relatively few strikes at JFKIA, and have caused a single aircraft damage or delay, this species is considered to be a low hazard overall. Since habitat management to deter pheasants (mowing the grass) would undoubtedly increase hazards from much more numerous species (gulls), it is not recommended.

1.3.7 The Gull-Aircraft Interaction Hazard at JFKIA

Proposed alternatives in the document are directed primarily at gulls because this group of four species present the greatest hazards to safe aircraft operation at JFKIA. Laughing Gulls comprised approximately 50% of all strikes between 1988-90, and the other three gull species comprised approximately 25% of the strikes. The remaining approximately 25% of birdstrikes between 1988-90 involved more than 50 other bird species; no other single bird species accounted for more than 4% of the strikes. Between 1979-90, gulls accounted for more than three times the damage or delays due to birdstrikes than did non-gull species (see Table 1-1).

The presence of the majority of gulls within JFKIA airspace is not a result of attraction to the airport, but of the gulls' behavior of traversing the airport's airspace on flights between off-airport attractants and the Laughing Gull nesting colony and other off-airport loafing and feeding sites. The presence of a large Laughing Gull breeding colony at the end of Runway 4L in Jamaica Bay (Appendix F.3) means that the hazard attributable to Laughing Gulls is localized and clearly identifiable. Except for alternatives directly related to the manipulation of the Laughing Gull nesting colony, all considered alternatives are directed at reducing birdstrikes involving all four of the gull species located in the JFKIA area: Herring Gulls, Ring-billed Gulls, Laughing Gulls, and Great Black-backed Gulls.

Due to the hazardous characteristics of gulls at JFKIA, and because JFKIA's current on-airport nonlethal control measures do not successfully reduce hazards to human safety created by gulls, a wide range of long- and short-term alternatives are being evaluated to reduce the gull-aircraft hazard in order to protect human safety at JFKIA.

1.4 Port Authority Response to the Birdstrike Problem

As an air carrier airport that must be certified by the FAA, JFKIA is required to remain in compliance with FAA Certification Rules 14 CFR Section 139.337 (Appendix E.1 in DEIS). These rules require the airport to provide measures to alleviate or eliminate wildlife hazards to air carrier operations. JFKIA must also maintain compliance with Aeronautical Standards B1-1: Bird Control at Airports (Appendix E.2 in DEIS). In meeting these obligations, the PA has developed and carried out a bird hazard reduction program that has included a number of phases and components.

In order to provide a safer environment for air passengers and residents of the greater New York City metropolitan area, the Port Authority has, since the 1960's worked to reduce hazards posed by birds. Federal and State agencies including the FAA, FWS, NPS, USDA APHIS ADC, NYSDEC, and others have participated in this process pursuant to each agencies' roles and responsibilities. The first comprehensive evaluation of JFKIA's birdstrike problem was sponsored by the U.S. Fish and Wildlife Service's Patuxent Research Center in 1965, and was conducted by J. Bull of the American Museum of Natural History. Herring Gulls and greater scaup were identified as posing severe hazards to aircraft, and a number of management recommendations were submitted to the airport, including: 1) elimination of nearby landfills, 2) elimination of water from the airport, 3) modification of JFKIA's shoreline with Jamaica Bay, and 4) employment of a shotgun patrol to harass birds, and other recommendations. Early bird hazard control activities involved bird harassment with carbide cannons and pyrotechnics, removal of vegetation and water from the airport, and other activities. In 1968, the airport authority conducted an experimental Avitrol program at JFKIA to determine its effectiveness in repelling gulls. The FWS monitored the experiment, and determined that Avitrol was not effective, and could possibly increase hazards to aircraft. Beginning in early 1975, and at the request of the U.S. Environmental Protection Agency, more intensive interagency meetings were conducted by the Port Authority, in order to examine and determine methods of reducing nearby landfills' attractiveness to gulls in order to control the incidence of gull-aircraft strikes at JFKIA. In November of 1975, a Herring Gull-aircraft collision that resulted in the total loss of the aircraft and emergency evacuation of 139 people, motivated a reevaluation of JFKIA's bird hazard management program. Immediately following the crash, new and more intensive bird control methods were either mandated or recommended by the FAA, and were initiated at JFKIA, including:

- increased use of carbide cannons,
- better-equipped vehicles for the bird patrol,
- increased emphasis on the patrol's use of pyrotechnics and shooting,
- placement of a full-time person in the FAA Control Tower to monitor airport bird presence and hazards,
- improved drainage and filling to reduce water,
- salting of the Chapel Pool until it could be permanently drained, and
- evaluation of the use of insecticides and pesticides to control bird presence on the airport. Additionally, the FWS (Wildlife Assistance Program) ecological study of JFKIA that was originally planned in 1969, was begun in 1975.

The following sections provide a detailed account of JFKIA's bird hazard control work since the 1970's, with some historical references to pre-1970's.

In 1993, the Port Authority created the Office of Environmental Policy and Management which is responsible for providing policy guidance to Port Authority operating departments and facilities in environmental matters. The Office operates under the Port Authority's Environmental Policy which, among other things, insures that programs provide for the "prudent protection" of natural resources.

1.4.1 Port Authority Sponsored and Funded Ecological Evaluations, Research and Operational Programs

In order to document the hazards posed by birds at JFKIA, to gather recommendations for control of the hazard, and to implement control measures, the Port Authority has provided for the support and funding of a number of studies and projects that were conducted on JFKIA, on Gateway National Recreation Area, and in the immediate vicinity of JFKIA. The five major studies are summarized in Appendix C.5.5, and are listed below:

1. Title: An Ecological Study of Kennedy International Airport and Vicinity with Recommendations to Alleviate Bird Hazards to Aircraft Operations.
Investigator: U.S. Fish and Wildlife Service (Wildlife Assistance Program) (A. Godin).
Date: March, 1976
2. Title: An Ecological Approach to the Control of Laughing Gulls at John F. Kennedy International Airport, New York City.
Investigator: National Park Service (Cooperative Research Unit Center for Coastal Environmental Studies at Rutgers University) (P.A. Buckley and M. Gurien).
Date: December, 1986.
3. Title: Bird Hazards to Aircraft at JFK International Airport.
Investigators: International Panel (L.S. Buurma, V.E.F. Solman, C.S. Thomas, and J.E. Karlson).
Date: August, 1989.
4. Title: Birds and the Potential for Bird Strikes at John F. Kennedy International Airport.
Investigators: National Park Service (University of Massachusetts) (C.R. Griffin and E. M. Hoopes).
Date: December, 1991.
5. Title: Shooting Gulls to Reduce Strikes with Aircraft at JFKIA, 1991-93.
Investigators: USDA APHIS Animal Damage Control (R.A. Dolbeer and J.L. Sillings).
Date: November, 1993.

In response to the increasing bird-aircraft interaction hazard an ecological study was conducted in 1976 by the U.S. Fish and Wildlife Service on behalf of the Port Authority.

1.4.2 Establishment of the Bird Hazard Task Force

The Port Authority has participated in interagency meetings (PA, FAA, FWS, NPS, City of New York, Army Corps of Engineers) regarding bird hazard control since at least 1975. In 1985, the Bird Hazard Task Force (BHTF) was established to serve as a clearinghouse of information relative to JFKIA's then-increasing birdstrike hazards. The BHTF provides an opportunity for agencies and other parties to exchange ideas and discuss initiatives to address JFKIA's birdstrike hazard. Members are scientists and administrators from: U.S. Department of Transportation (USDOT), Federal Aviation Administration (FAA); U.S. Department of the Interior (USDI), Fish and Wildlife Service (USFWS); U.S. Department of the Interior, National Park Service (NPS); Port Authority of New York and New Jersey (PA); U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), Animal Damage Control (ADC); New York State Department of Environmental Conservation (NYSDEC); Rutgers University (RU); New York City Department of Sanitation (NYCDS); and the New York City Department of Environmental Protection (NYCDEP). The Task Force is chaired by the JFKIA Manager of the Division of Aeronautical Services, and meets approximately twice annually, or as special needs arise.

1.4.3 Reduction of Potential On-Airport Attractants

Modification of airport grounds to reduce habitat resources for birds is recommended as one of the essential components of any airport's birdstrike reduction program (Aldrich 1961, Thomas 1987, Burger 1983, Wright 1968, Thomas 1972, and others), and particularly for JFKIA (Bull 1965, USDI FWS 1976, Buckley and Gurien 1986, Griffin and Hoopes 1991, and Dolbeer et al. 1993). Removal of habitat components (attractants) from the airport grounds is one of the most effective long-term approaches to reducing birdstrike problems that are caused by birds congregating on airports. Habitat modifications reduce bird presence on airports by eliminating attractants such as food, water, nesting, loafing, and roosting sites, and cover. Throughout the late 1970s and 1980s, the Port Authority conducted activities such as: elimination of water and food, reduction of short-grass areas and other attractive vegetation, improvement of on-airport sanitation and prohibition of bird-feeding, conduct of the Bird Control Unit, and demonstrations and experimentation with developing bird control techniques and equipment.

During the 1990s, the Port Authority has continued to employ these approaches, and has supported operational bird control programs and environmental reviews to assist agency and Port Authority decision-makers in developing long-term solutions to the airport's birdstrike problem.

Overflights by gulls to off-airport destinations was identified by Buurma et al. (1989) as the main contributor to Laughing Gull-aircraft collisions at JFKIA. Reduction of on-airport attractants was therefore anticipated to reduce gull presence at the airport marginally at most. However, in the interest of public safety and in the context of an increasing strike hazard, it has been the PA's policy to eliminate any potential on-airport attractants to the greatest extent possible, in order to reduce the presence of non-gull bird species as well as gulls. On-airport habitat modifications such as long-grass management, elimination of bird feeding, and insect and water management, and other actions, are employed pursuant to JFKIA's operating plans, and as recommended by the five major JFKIA birdstrike hazard reports (Appendix C.5.5).

1.4.3.1 Elimination of Fresh Water Areas On-Airport a Potential Attractant

The goal of JFKIA's bird management activities is to eliminate all accumulations of water on the airport, since studies have noted that gulls and other birds are attracted to pools of water and may contribute to an airport's strike hazard (Blokpoel 1976). JFKIA's shoreline location and the structural instability of its soil (i.e., filled wetland) result in continuous settlement of the airport surface and are conducive to irregular terrain conditions and water accumulation. However, in recent years (after 1990) JFKIA has not been shown to provide extensive attraction to birds because of areas of standing water.

In 1976, the FWS recommended to the Port Authority that the Chapel Pool, located in the Central Terminal Area, be drained due to its attractiveness to gulls. The Chapel Pool was drained in 1977. Drainage and fill projects have been completed at JFKIA continually since the 1970's. These measures have been expanded during the past few years and include implementation of specific drainage and fill projects as an immediate response to water accumulation; design and construction of a new and extensive stormwater management and drainage system; continuation of day-to-day storm water management practices by airport personnel; and application of an avian taste repellent to any remaining standing water before removal.

■ Drainage and Fill Projects

The PA implements drainage and fill projects in response to temporary accumulations of water, and consistent with recommendations made by PA-funded studies in the past (Buckley and Gurien 1986, Griffin and Hoopes 1991). This includes the filling of the wet area by the 31R middle marker and drainage (wick system, Figure 3-3) of the wet area between Taxiways H and J, both of which were conducted in 1991. The Port Authority is continually conducting drainage and filling projects (Appendix C.4.1).

■ Construction of A New Drainage System

The PA has taken a preventive approach to on-airport water accumulation by initializing the construction of a new drainage system running the full length of the north/south runways and taxi network. During 1992, the PA completed eight major projects to improve drainage including the installation of styrofoam wicks to drain low spots, and large repaving and filling projects. A detailed listing of the PA's completed and planned drainage and fill projects for 1993 and 1994 is provided in Appendix C.4.1.

■ Day-to-Day Stormwater Reduction Management Practices

In addition to structural improvements of the airport's drainage conditions, the PA conducts day-to-day stormwater management practices to reduce the accumulation of any areas of standing water as a result of continuous airport subsidence. The Bird Control Unit monitors drainage and pooling of water on pavement areas, and identifies areas with persistent problems for management attention. Port Authority personnel disperse small pools of water immediately after precipitation to achieve more rapid evaporation, and submit work requests for the carving of grooves in the pavement in areas of temporary ponding to direct water to drains. Monitoring of water accumulation is conducted by the PA Bird Control Unit, which patrols the airport throughout the day, and submits work requests for draining or filling where ponding is observed.

■ Application of the Avian Taste Repellent, Methyl Anthranilate (MA) to Standing Water

In 1991 and 1992, JFKIA was one of the few airports in the U.S. that served as a test site for the development of the avian taste repellent, methyl anthranilate (MA) (Appendix C.4.2)(Dolbeer, Belant, and Clark 1993). Experimentation was conducted by USDA APHIS ADC, and the data collected at JFKIA contributed to the data set that has been forwarded to the U.S. EPA for product registration. The results of these studies are preliminary, and indicated that birds avoided water that had been treated with MA. Final registration of MA for operational use on airports and landfills may occur as soon as May, 1994.

MA, which will be sold under the trade name, ReJeX-iT™ AP-50 (PMC Specialties Group) has a grape-like odor, is used in the perfume and food industries and is listed as "Generally Recognized As Safe (GRAS)" by the U.S. Food and Drug Administration. Once it becomes EPA-registered and commercially available, MA application to temporary pools of standing water will become an operational part of the PA's on-going water management program, and will be applied to temporary pools of standing water to repel birds until long-term drainage, filling, and pavement grooving projects can be accomplished. Operationally, MA will be used at JFKIA whenever temporary pools of water develop on operational surfaces. MA applications will be used to repel birds until more-permanent solutions are conducted (filling, drainage, pavement grooves, etc.).

1.4.3.2 Reduction of Potential Attractiveness of On-Airport Vegetation

As early as 1961, the FWS and operators of Idlewild Field (JFKIA) worked to reduce potential vegetative attractants on the airport to reduce birdstrikes. At that time, work included reducing bayberry plantings due to their attractiveness to tree swallows. Since the FWS's 1976 recommendations to develop alternative landscaping that would be unattractive to birds, the Port Authority has removed plantings, conducted an evaluation of its vegetation relative to birds (Hanna/Olin 1988), and has developed and complied with a review procedure for proposed landscaping plans to ensure that new plantings do not attract birds. Throughout the 1970s and early 1980s, the Port Authority worked to remove vegetation such as the Austrian pines that lined the Van Wyck Expressway and the Chapel Pool area, the bayberry bushes, cherry trees, and other plants that occurred throughout the airport. These plants had provided roost and food resources for starlings, blackbirds, mourning doves, and other bird species. In 1985, the Port Authority funded a study to evaluate the attractant value of short grass on the airport and to develop management recommendations for reducing grassy areas' value for birds, especially gulls.

■ Initiation of the 1985-86 Grass Management Study (complete summary included in Appendix C.5.5)

Airports typically conduct a grass cutting regimen to maintain airport operation safety conditions, including the reduction of fire hazard potential, improvement of visibility, and facilitation of the use of navigational aids. In 1985, in response to the potential attraction effect of short grass on Laughing Gulls, the Port Authority funded the NPS-managed vegetation management study (Buckley and Gurien 1986). This study concluded that the potential attractiveness of short grass for Laughing Gulls is a result of the opportunities it creates for foraging and roosting. It further concluded that the foraging opportunities were mostly related to the presence of insects, especially Japanese and Oriental Beetles. The study recommended that long-grass management practices be implemented to avoid the availability of foraging

and roosting opportunities for gulls. The study recommended that cutting be discontinued particularly during the time of beetle emergence (Mid-June to Mid-July) and if possible also during the period of June to mid-August to reduce any other vegetation-related gull presence not linked to the presence of beetles.

■ **Implementation of Long-grass Management Practices**

Since 1987, the PA has implemented several long-grass management practices. Consistent with the Buckley and Gurien (1986) study, airside areas of JFKIA have been excluded from grass cutting from May 1 through August 1, in order to maintain long grass conditions which reduce the attractant value of the vegetation for birds, especially gulls. In 1992, the only airside grass-cutting occurred in late August, and no airside cutting occurred during the spring of 1993.

Aviation safety and fire hazard concerns require that grass is cut on a regular basis in small areas around propane scare guns, approach lighting, and signs. As part of the PA's long-grass management, grass-cutting in these small areas is limited to a total of four times per year.

Recently, landside areas adjacent to the Van Wyck Expressway, cargo areas and North Boundary Road have not been shown to provide substantial attractant to birds, as reported in several site visits by ADC staff (Appendices C.5.1 and C.5.2). These recent observations are somewhat contrary to findings presented by Griffin and Hoopes (1991). Weekly surveys will continue at JFKIA during 1994 to continue the monitoring of these areas for bird attractant values. Furthermore, these areas represent a very small percentage of all grass areas at JFKIA. Grass cutting occurs on landside areas adjacent to the Van Wyck Expressway, cargo areas, and at North Building Road at 1-week intervals.

■ **Implementation of an Insect Control Program**

In 1970, the Port Authority experimented with the use of insecticides to halt the spread of insects, such as Japanese Beetles and European Chafers. In order to reduce the potential attractiveness of grassy areas on the airport for foraging by gulls, the PA has, since the 1970s investigated several options to reduce the insect population at the airport. In addition to long-grass management, the PA has investigated the possibility of reducing the insect population directly via the application of chemicals and bacterium to the soil, and seasonal spraying of vegetated areas on the airport.

Seasonal spraying of insecticides is implemented at JFKIA to selectively apply treatment and to permit incremental application of product that is scaled to the size of the developing problem. These applications do not permanently alter soil conditions, and are directed at several life stages and types of insects.

The insect control program implemented by the Port Authority over the past decade seeks to achieve the following objectives: 1) prevention of the local spreading of the disease and damage of mosquitoes, 2) prevention of transport by aircraft of Japanese Beetles, which can cause ecological and crop damage in other parts of the country, 3) Prevention of the presence of insect populations, that are food sources for gulls and could attract gulls to the airport. In addressing these objectives simultaneously, the PA conducts the following phased approach.

To prevent the emergence of a large insect population, the PA implements a spraying program that aims to kill insect larvae prior to emergence of the new population. The PA contracts with a private helicopter service to conduct spraying; the service complies with all state and federal regulations relative to spraying of insecticides.

The PA conducts a first spraying with the insecticide (larvacide) ABATE-4-E of selected areas of the airport by helicopter every year in late May (Figure 1-15). Areas sprayed are the grassy areas between runways 4L and 4R, the Waxman property north of the airport, and the area of the tank farm near Bergen Basin. Subsequent spraying is conducted with Di-Brome-14, an insecticide which affects both mosquitoes and beetles in the adult stage. Helicopter spraying is repeated once every two weeks for a total of ten applications during the summer.

The presence of Japanese beetles at JFKIA is monitored by USDA APHIS. Each year, APHIS installs beetle traps at strategic locations at the airport to closely monitor the development of the beetle population. An intensive spraying program is initiated whenever a resurgence in the beetle population is noted from these trapping activities. Helicopter spraying and on-ground hydraulic spraying of infested areas is conducted at these times. If these efforts do not sufficiently control the insect population, the airport is assigned the status of "regulated airport." This designation requires departing aircraft to be fully fumigated prior to departure. To date, the PA's insect control program has successfully held populations in check so as to preclude this designation.

■ **Initiation of Landscaping Study of Non-bird Attracting Plantings**

In addition to grass management, the PA Office of Environmental Policy and Management reviews landscaping plans and vegetation management conducted by itself and its airport tenants. To reduce the potential attraction of birds by on-airport plantings, the PA initiated a landscaping study (Hanna/Olin 1988) as part of the JFKIA Redevelopment Program. The report identified a series of landscape design principles, including species lists, layouts, maintenance, etc., geared to minimizing the attractiveness of the landside of JFKIA to birds, including gulls. The recommendations of the report have formed the basis for landscape design projects which are undertaken as part of the Port Authority's Capital Improvement Program and Redevelopment Program at JFKIA. Capital improvement projects on the landside can be reviewed by USDA APHIS Animal Damage Control biologists to ensure that bird attractants are not created at JFKIA through landscaping. JFKIA's Office of Environmental Policy and Management reviews landscaping programs proposed by airport tenants for conformance with the recommendations of the Hanna/Olin report through the JFKIA Tenant Alteration Process. Currently, the Port Authority is evaluating a redesign of the landscaping at the Van Wyck entrance to JFKIA and at Federal Circle.

■ **Utilization of Non-Bird Attracting Plantings and Design Structures**

The airport's design and construction program, as part of its redevelopment program, was and is being implemented consistent with the recommendations of the above study and any landscaping selected conforms with the list of approved plantings. Furthermore, the design of on-airport structures such as canopies, which are necessary to shelter passengers, cargo and equipment, is such that it does not provide roosting opportunities for birds (Appendix C.3).

The Port Authority uses and requires contractors to use a seed mixture of either tall fescue or hard fescue which encourages growth to a uniform acceptable height.

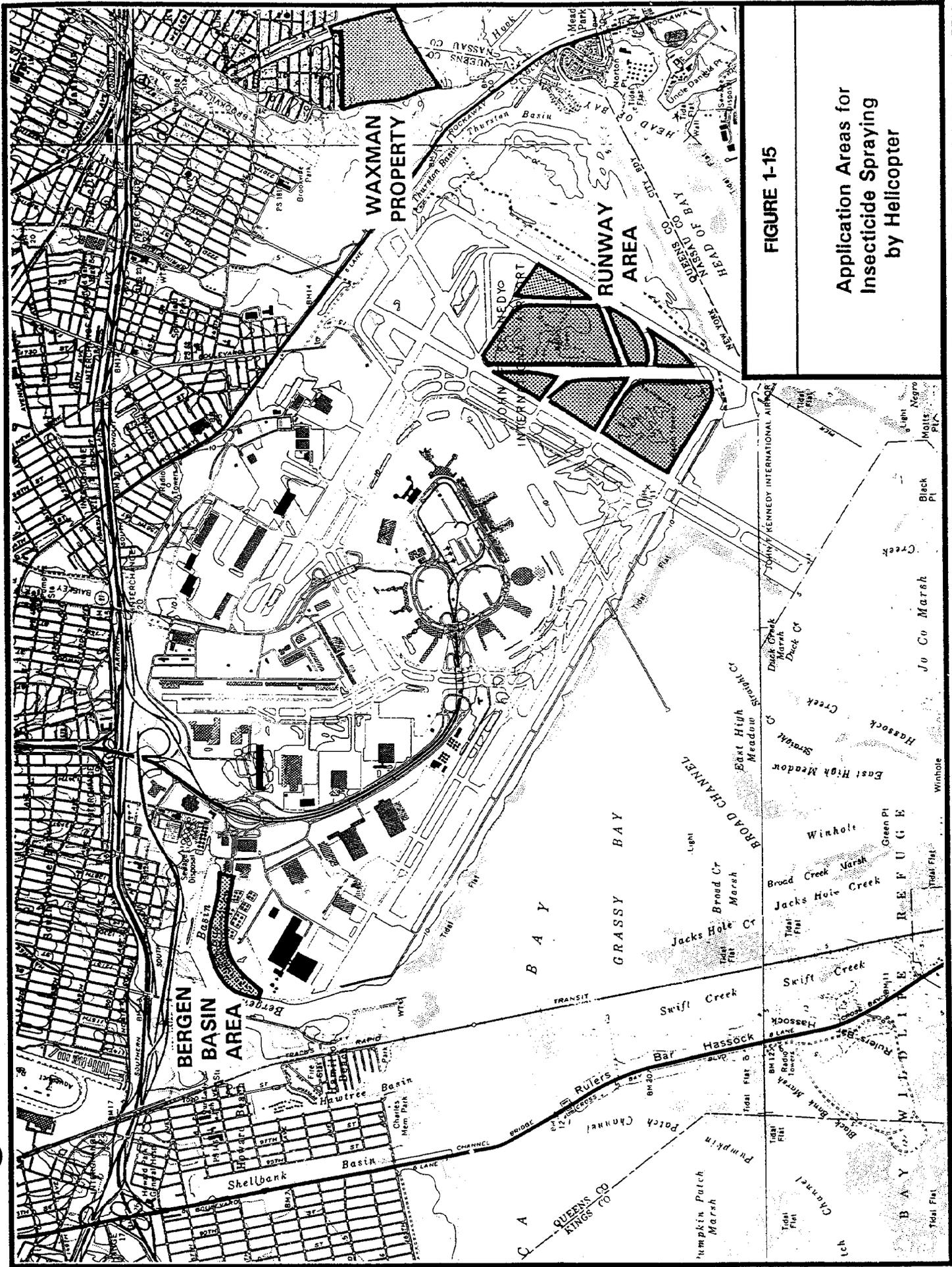


FIGURE 1-15

**Application Areas for
Insecticide Spraying
by Helicopter**

1.4.3.3 Improvement of On-Airport Sanitation and Prohibition of Bird-Feeding

The availability of human-generated (anthropogenic) food sources on JFKIA could contribute to the presence of birds and the incidences of birdstrikes at the airport. In order to reduce the possibility of waste products attracting gulls to JFKIA, since 1976, the Port Authority has conducted waste reduction activities. These activities consist of refuse containment measures, a taxi driver education program and monitoring and enforcement of compliance with PA sanitation directives by airport tenants (Appendix C.1). In 1993, a weekly (June-August) survey of taxi hold areas by BCU personnel was conducted to monitor food availability to birds at these sites.

■ Refuse Containment Practices

Over a several year period between the late 1980's and the early 1990's, the PA replaced traditional trash dumpsters with completely-enclosed trash compactors which, in combination with a clearly dictated protocol for refuse disposal to airlines, prevent or reduce the presence of refuse on the airport. It is also the PA's policy that all organic matter is placed in plastic garbage bags and maintained in closed trash compactors, which are emptied five to seven times per week. In 1993, PA issued directives to airport tenants that they continually review their trash container's adequacy in handling trash flow, and to the Port Authority Police to similarly comply and monitor airport tenants' compliance with the clean housekeeping directive.

■ Taxi Driver Education Program/Highway Debris Collection

The PA conducts activities to minimize attractants to birds at taxi stands by posting signs prohibiting the feeding of birds and mandating the placement of trash in trash cans. In addition, a taxi driver education program was implemented via the posting of additional signs and handbills. In 1993, JFKIA's Transportation Services Division contacted the Taxi Drivers Union Local to emphasize the importance of not feeding birds, and to identify human safety hazards this may create. Beginning in 1993, BCU supervisors conducted periodic daily inspections of taxi hold areas, and when required, initiated emergency cleanup efforts in addition to regular cleaning routines. In 1993, ADC surveyed taxi hold areas to determine bird presence, and the occurrence of bird feeding by taxi drivers and others. No incidences of feeding were observed (Appendix C.5.3). Constant monitoring of this situation is necessary and conducted by JFKIA management. As part of the sanitation program, the PA also assigned three roving trucks to collect any bulk debris along airport highways and side roads.

■ Sanitation Policy Enforcement

The long-standing policies at JFKIA to report airside and landside bird observations, to place trash in closed containers, and to prohibit bird feeding will continue to be communicated to airport users with increased vigor. The Port Authority periodically reminds commissaries to use waste management equipment and methods that do not attract birds, and monitors compliance with PA waste management directives.

1.4.4 Conduct of JFKIA Bird Control Unit

JFKIA's Bird Control Unit (BCU) was established as required by the FAA after the 1975 crash of the DC-10 subsequent to its collision with Herring Gulls. For the past twenty years, the BCU has conducted bird hazard reduction programs at JFKIA.

The Port Authority is a bi-state agency that also administers Newark and LaGuardia International Airports, as well as a number of ground-based transportation facilities in New York and New Jersey. JFKIA is within the Port Authority's Aviation Department; JFKIA's Aeronautical Services Division oversees conduct of the Bird Control Unit.

The Division of Aeronautical Services Manager is responsible for administration of the bird control activities conducted at JFKIA, and oversees development and conduct of most aspects of the program. The Division Manager interacts with other Division Managers (such as Facilities and Landside Operations) to communicate bird hazard control needs within their authority (landside habitat management, airport tenant activities, sanitation, runway maintenance and construction projects, etc.). The Aeronautical Services Manager also chairs the Bird Hazard Task Force meetings and serves as the primary liaison of JFKIA in its dealing with Federal, State and local agencies and organizations regarding the bird hazard control program. The Aeronautical Services Division Manager completes a JFKIA Bird Control Report (Appendix C.2.1) each month, and distributes it to the FAA, NPS, USDA APHIS ADC, Air Transport Association, and Airline Pilots Association International. The report summarizes reported birdstrikes and damage, number of birds found by the BCU, birds shot pursuant to permits, and compares this data to the previous year's; it is a monthly summary of birdstrikes and direct bird control actions taken by the BCU.

The Aeronautical Services Manager receives Bird Strike Reports (Appendix C.2.2) from airlines whose aircraft have been involved in a birdstrike when the pilot or crew are aware of the strike. It should be noted that many strikes go undetected by pilots and crew, and in those cases, a Bird Strike Report may not be filed. Submission of this form is voluntary; airlines submit these forms to communicate to Port Authority management the human safety and financial costs of birdstrikes, and to permit development of the birdstrike database. On this form, airlines report aircraft information (flight no., aircraft make, and amount of fuel dumped on return), location of strike (arrival/departure, runway, time of last departure on that runway, and time of last sweep), aircraft damage and estimated costs, crew statement, number and species of bird, and additional remarks. Bird Strike Reports are retained by the Operational Services Supervisor, who cross-references all birdstrikes with pilot-reported birdstrikes to reduce or eliminate multiple-counting of single strikes.

The roles and responsibilities of the BCU include: 1) maintain records of birdstrikes, 2) conduct of constant roving patrols of airport grounds to reduce bird presence, 3) monitor degree to which airport features are attractive to birds, and 4) recommend and institute changes to reduce airport attractants. The BCU is responsible for notifying upper management within the Port Authority of developing birdstrike trends, emerging attractants, rules violations of airport tenants, and other issues related to the birdstrike hazard.

■ BCU Staffing

A total of twenty-six (26) Port Authority personnel work on the BCU. All aspects of the BCU are coordinated by the Operations Services Supervisor. BCU field personnel are divided into two groups: Shift Supervisors (10 individuals) and Shift Agents (15 individuals). Constant roving patrols are conducted during two shifts per day, every day of the year. Each shift is staffed by 1 agent and 1 supervisor. Shifts are as follows:

<u>Season</u>	<u>Shift</u>	<u>Supervisor</u>	<u>Agent</u>
Summer	A	5 am - 1 pm	6 am - 2 pm
	B	1 pm - 9 pm	2 am - 10 pm
Winter, Spring, and Autumn	A	6 am - 2 pm	6 am - 2 pm
	B	2 pm - 10 pm	2 pm - 10 pm

Agents and supervisors rotate in to work on the BCU for 2 week periods at approximate 4-6-week intervals. Summer shift hours of supervisors begin one hour earlier than at other times, in order to provide BCU coverage of the airport beginning at sunrise, when many birds are active. Shift supervisor and agent breaks do not overlap, to provide coverage of the airport by BCU personnel during all daylight hours.

■ BCU Staff Training

New BCU agents and supervisors receive on-the-job training for several days prior to their independent conduct of bird control activities. For 1-3 days, a new agent or supervisor is accompanied on their patrols by a supervisor, who provides the trainee with directions on duties, protocols, safety and driving instructions, and all other aspects of BCU work. Each agent has a Training and Qualification Record whereby the evaluator tracks progress and qualification of the agent for various work activities.

All BCU supervisors receive USDA-conducted Airport Bird Hazard Training at least every two years, as required by the New York State DEC. All personnel listed as subpermittees under the Port Authority's DEC-issued depredation permit must have successfully completed the 8-hour training class. Topics covered in the USDA training are: state and federal laws, permits and reporting; bird identification; bird dispersal techniques; habitat management to deter birds; and other issues related to the airport birdstrike hazard.

■ BCU Staff Duties and Responsibilities

There are three levels of BCU personnel: The Operations Services Supervisor (O.S. Supervisor), Shift Supervisor, and Shift Agent. Each level has different duties and responsibilities.

The Operations Services Supervisor

The O.S. Supervisor is assigned to BCU duties on a full-time basis, and does not rotate into other positions as do the Shift Supervisors and Agents. The O.S. Supervisor serves as field-level coordinator of JFKIA's bird control activities, and as immediate supervisor to the Shift Supervisors and agents; he serves as liaison between the BCU and the Manager of JFKIA's Aeronautical Services Division. The

O.S. Supervisor is responsible for overseeing training and accomplishment of all work activities of the BCU: identification of difficult-to-identify bird carcasses, reporting of birdstrike statistics to USDA APHIS ADC and the FAA, communication of habitat management needs to Port Authority maintenance (mowing, drainage, etc.), record-keeping and submission of annual reports to the Manager of the Aeronautical Services Division for subsequent submission to permitting agencies. The O.S. Supervisor keeps a record of all Bird Strike Reports (Appendix C.2.2) that are submitted to JFKIA's Division of Aeronautical Services by airlines, and is responsible for cross-referencing all birdstrike records reported by pilots, persons on the ground, airline maintenance personnel, and by BCU personnel, in order to reduce or eliminate multiple-counting of strikes.

Shift Supervisors

The ten individuals that serve as BCU shift Supervisors spend two-week intervals working on the BCU, and rotate into the BCU at approximate 4 to 6-week intervals. Shift supervisors conduct constant roving patrols of the airport, and are authorized to carry firearms and to use pyrotechnics and live rounds to rid the airport of birds deemed hazardous to aircraft, and to collect dead birds and report birdstrikes. Shift Supervisors monitor airport tenants, and issue breach of rules violations in situations where careless housekeeping practices create bird attractants on the airport. Shift supervisors are listed as subpermittees under JFKIA's Federal and State depredation permits that allow the shooting of protected birds; supervisors receive the USDA training and on-the-job training prior to their use of live rounds. Other activities of shift supervisors include: playing of species-specific bird distress call tapes, use of visual scare tactics (driving towards flock, waving arms, etc.), dispersement of small temporary puddles after rainfall, and monitoring of new or developing attractants and bird species response to control methods.

Shift Supervisors are responsible for completing a number of forms (Appendix C.2), all of which are maintained by the S.O. Supervisor in files at JFKIA :

- Daily Mileage Log (Appendix C.2.3)

The Daily Mileage Log is completed each day, and is submitted to the O.S. Supervisor after seven days. The date, shift, vehicle number, and starting/ending mileage are recorded. This log enables the O.S. Supervisor to track daily mileage and ensure that proper coverage of the airport is conducted for both daily shifts, every day. The average mileage covered by a single shift in one day is approximately 70 miles.

- Bird Control Report (Appendix C.2.4)

The Bird Control Report is completed and submitted to the O.S. Supervisor each day, and is used to document bird presence, action taken, runway use/closures and sweeps, and birds taken pursuant to permits. Also recorded on this form are times of high and low tides and sunrise.

The number of birds observed on or over each specific runway, and the Supervisor's action taken are recorded for each bird observation and each BCU use of an active control technique (pyrotechnic, live round, distress call, visual scare tactic, etc.). This form enables the O.S. Supervisor to monitor Shift Supervisor and Agent work activities, and to identify trends in time and location of birds, and response of birds to control techniques.

Daily Ammunition Control Form (Appendix C.2.5)

The Daily Ammunition Control Form is completed by the Shift Supervisor each day, and is submitted to the O.S. Supervisor each week. Numbers of pyrotechnics and blanks, and live ammunition are recorded for each shift each day. The numbers used, added, and in stock, and weapon use is recorded to permit monitoring of work activities by the O.S. Supervisor, and to ensure security of these potentially-dangerous supplies.

Bird Form (Appendix C.2.6)

The Bird Form is completed by any member of the BCU who finds a dead bird on or near an active runway/taxiway, that is deemed to have collided with an aircraft. This form is submitted to the O.S. Supervisor, who cross-references all reports of strikes to eliminate over counting. The date, location, species, and additional remarks are recorded. Data from this form becomes part of JFKIA's birdstrike record.

Shift Agents

The fifteen (15) individuals that serve on the BCU as Shift Agents spend two-week intervals on the BCU, at approximate 4 to 6-week intervals. Agents are not authorized to carry firearms, or to use live ammunition or pyrotechnics. Agents remain in radio contact with the Shift Supervisor at all times, and are responsible for notifying the Shift Supervisor when there is a need to dispense pyrotechnics or live rounds to disperse birds. Agents are permitted to use bird distress calls, visual scare tactics, and for collecting birds and reporting birdstrikes. Agents fill out the Bird Form to document birds found dead on JFKIA that are deemed to have interacted with an aircraft. Agents work closely with the Shift Supervisor, and are responsible for coordinating their constant roving patrols with the supervisor.

■ **BCU Equipment**

BCU equipment includes: three vehicles, bird identification guides and binoculars, bird distress call tapes, tape players and speakers, propane cannons, pyrotechnics, firearms, ammunition, and miscellaneous supplies.

Vehicles

Three vehicles are dedicated to BCU work: 4WD Pickup truck, 2WD Pickup Truck, and Jeep Cherokee. These vehicles are equipped with gun holders, tape players, roof-mounted speakers, distress tapes, and supplies of pyrotechnics and live ammunition, bird ID guides and binoculars.

Bird ID Guides

All BCU personnel are instructed to carry and use a bird identification guide to permit accurate identification of birds on/over the airport, or that have been struck by aircraft.

Distress Call Tapes

Tapes of Herring Gull, Ring-billed Gull, Great Black-backed Gull, starling, crow, and red-winged blackbird are in stock, and used by BCU personnel to deter birds.

Propane Cannons

Propane cannons are located at approximate 50-yard intervals along JFKIA's border with Jamaica Bay. They are maintained by the Maintenance Department, which supplies the equipment with propane.

Firearms and Pyrotechnic Pistols

12-gauge shotguns, 12 gauge flare pistol, and 6 mm starter pistols are employed by the BCU to dispense live rounds and pyrotechnics. These firearms are stored in a locked gun safe at JFKIA

■ **BCU Daily Procedures**

The first activity conducted by the BCU each day is to conduct patrols of the active runways to clear the area of birds and to collect bird carcasses that may have been involved in collisions with aircraft during the night. The BCU is in radio-contact with the FAA Control Tower, and the Shift Supervisor or Active Duty Manager notifies the FAA Control Tower once the active runway is clear of birds or debris, and is ready for use. During non-daylight hours, the JFKIA Active Duty Manager conducts runway sweeps whenever they are requested by the FAA Control Tower.

The BCU works under the general rule that even a single bird on or over an active runway poses a potential hazard to safe aircraft operation. The exact action taken by the BCU to rid the area of even a single bird depends on a number of factors, including: wind speed and direction, bird species, activity, and location, bird species historic response to harassment or lethal control, weather, runway usage, and other factors. These decisions are made by either Shift Agents or Supervisors, depending on the exact conditions of the situation. Shift Supervisors are trained and permitted to use firearms; agents are not. The final decisions leading to the use of firearms are always made by the Shift Supervisor. Supervisors and Agents make decisions to use non-firearm methods and techniques. New or developing bird hazard conditions or situations that require more detailed decision-making are brought to the Operations Services Supervisor, who in turn may confer with the Manager of the Aeronautical Services Division for complex situations and decisions. JFKIA personnel have and will continue to confer with wildlife biologists within the USDA APHIS ADC program and other State and Federal agencies regarding bird hazard control techniques and situations that arise at JFKIA.

In general, a progressive approach is taken in order to rid the airport of birds. The approach of the BCU vehicle or waving of arms is enough to cause some birds to leave the airport. In other cases, more direct methods are necessary. The next step is often the use of distress calls of the particular bird species. When employing distress call tapes, the BCU vehicle is stopped and positioned in a safe location relative to active runways. Since many bird species, especially gulls, will first move towards the source of the distress calls, the vehicle must be located away from the aircraft movement area. The distress tape is then played for a 10-20-second period. The initial response of some species will be to approach the source of the sound. When this happens, the distress call is played again and the birds usually will disperse. In some instances, the use of pyrotechnics is employed to direct the birds away from the airport. Pyrotechnics are never fired towards the runway, or during playing of recorded distress tapes. Birds that have gathered into a tight flock in response to the distress calls can often be effectively directed away from the airport through use of pyrotechnics after discontinuing distress calls. In some instances, these nonlethal techniques are not effective in deterring birds; the use of live rounds is employed when all other techniques have been exhausted and a safety hazard still exists. Shooting limited numbers of birds, pursuant to state and federal permits, serves to reinforce the scaring effects of nonlethal techniques,

such as approach of the BCU vehicle, waving of arms, playing distress call tapes, deployment of propane cannons, and shooting of pyrotechnics. Shooting is not employed by the BCU as a means of population reduction, but rather to reinforce nonlethal techniques. Shooting is also employed to remove persistent individuals that have shown no avoidance in response to other techniques. To date, gulls have been the only bird species shot by the BCU at JFKIA.

BCU personnel are in radio contact with the Airport Duty Manager (ADM), who relays pertinent information to the FAA Control Tower. When birds are creating hazards near active runways, and they cannot be dispersed, the BCU Shift Supervisor notifies the ADM of the situation. The ADM, in turn, contacts the FAA Control Tower to issue a NOTAM (Notice to Airmen) to pilots alerting them of bird hazards on the active runway. When an active runway cannot be cleared of bird hazards, the runway may be closed. Runway closure is determined by the ADM and is communicated to the FAA Control Tower immediately. At JFKIA, runway closures due to birds are most common during the summer months, usually numbering less than 5 per year. Most closures have been associated with flocks of gulls over runway 4L/22R, near the Jamaica Bay nesting colony.

Runway Sweeps Performed by the BCU (1979-93)

The BCU conducts runway sweeps prior to activation and immediately after closure of a runway; whenever there is a change in runway direction; when requested to do so by the FAA tower; when requested to do so by an individual pilot or airline; when the BCU detects bird concentrations; and prior to a Concord departure or landing. A runway sweep is a complete and swift patrol (by vehicle) of the entire length of the runway to detect and remove birds and other foreign objects that pose potential hazards to a safe aircraft take-off or landing.

Since 1976, a total of 60,117 runway sweeps have been requested by the tower and conducted by the BCU (Table 1-8). The annual total number of these sweeps has ranged from 1,750 in 1976 to 4,005 in 1988. The monthly number of tower-requested sweeps is relatively constant among months, with 18-year averages ranging between 231 (February) and 313 (May and July).

Birds Taken Pursuant to Permits (1979-93)

The BCU shoots birds with shotguns pursuant to state and federal permits that have been issued to the General Manager of the Airport each year since 1976. Since 1976, a total of 2459 birds have been shot (average of 140 birds per year) (Table 1-9). The annual number of birds shot has ranged from 43 in 1982 to 296 in 1989. The months during which the greatest and lowest total numbers of birds were shot between 1976 and 1993 are June and January, respectively. The average number of birds shot each month ranged from 4 (January) to 31 (June). The species of birds shot by BCU personnel have been Herring Gulls, Great Black-backed Gulls, Ring-billed Gulls, and Laughing Gulls. No non-gull species have been shot by JFKIA personnel.

Bird Presence, BCU Response, and Bird Reaction to BCU Control Activities

Any bird present on, over, or near an airport has the potential to pose hazards to safe aircraft operation. Therefore, it is a general rule that even a single bird poses a potential hazard, and requires BCU attention

Table 1-8

Number of Tower-Requested Runway Sweeps by Port Authority Personnel at JFKIA, 1976-1993
(as part of the bird harassment program to reduce birdstrikes to aircraft)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
1976	74	110	166	137	146	178	166	184	154	138	144	153	1,750
1977	126	120	183	196	292	283	331	306	227	207	203	166	2,640
1978	151	175	311	276	302	260	349	294	264	235	235	163	3,015
1979	139	161	235	295	317	330	366	300	277	301	347	254	3,322
1980	258	261	300	414	256	308	409	431	329	344	262	281	3,853
1981	221	259	303	243	298	181	200	208	242	239	209	225	2,828
1982	226	251	278	258	289	292	300	345	298	269	231	234	3,271
1983	267	232	289	339	357	367	394	386	351	327	297	314	3,920
1984	288	273	282	281	318	310	307	311	257	287	285	317	3,516
1985	276	241	300	347	365	346	344	201	308	247	223	267	3,465
1986	266	278	348	367	362	312	316	295	218	277	263	262	3,564
1987	206	244	321	345	391	381	402	315	364	296	297	268	3,830
1988	273	304	339	366	358	315	355	358	346	356	316	319	4,005
1989	340	228	328	345	385	292	327	369	378	352	326	324	3,994
1990	305	303	349	353	328	351	361	366	348	291	289	286	3,930
1991	289	262	280	254	279	294	131	275	242	264	173	270	3,013
1992	245	249	258	278	306	278	268	267	263	267	280	257	3,216
1993	251	206	231	214	289	245	315	241	259	253	262	219	2,985
18-Yr. Total	4,201	4,157	5,101	5,308	5,638	5,323	5,641	5,452	5,125	4,950	4,642	4,579	60,117
18-Yr. Avg.	233	231	283	295	313	296	313	303	285	275	258	254	3,340

Table 1-9

Number of Gulls Killed by Shotgun by Port Authority Personnel at JFKIA, 1976-1993
(as part of the bird harassment program to reduce birdstrikes to aircraft)

Year	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Annual Total
1976	8	2	1	3	14	102	5	17	13	5	10	13	193
1977	5	0	6	4	6	2	0	5	29	0	0	0	57
1978	0	0	2	0	0	10	2	6	13	1	6	5	45
1979	0	0	17	3	7	3	1	7	12	0	2	1	53
1980	3	1	13	6	16	2	4	3	1	7	0	0	56
1981	0	0	0	2	3	18	18	10	6	0	0	2	59
1982	0	0	2	2	4	22	5	5	1	0	1	1	43
1983	0	0	0	9	12	12	12	3	1	2	10	0	61
1984	1	1	0	1	12	81	50	36	39	30	16	2	269
1985	0	7	13	4	21	17	4	11	5	15	5	3	105
1986	0	6	7	16	20	62	33	8	18	25	13	3	211
1987	0	9	9	1	13	15	10	18	9	22	15	20	141
1988	13	11	13	9	19	46	12	9	9	8	5	10	164
1989	10	7	9	8	40	83	26	15	9	41	33	15	296
1990	9	12	12	6	12	31	13	22	5	9	10	9	150
1991	6	11	14	29	86	14	1	18	18	29	15	24	265 ^a
1992	8	12	8	9	18	14	4	27	11	70	19	11	211 ^a
1993	10	21	6	3	27	8	2	2	1	0	0	0	80 ^a
18-Yr. Total	73	100	132	115	330	542	202	222	200	264	160	119	2,459
18-Yr. Avg.	4	5	7	7	18	31	12	13	12	16	9	7	140

^a These totals do not include the 35,693 gulls killed by shotgun by U.S. Department of Agriculture biologists in 1991-1993 as part of a special interim management program directed primarily at Laughing Gulls.

when it is detected. The primary emphasis is placed on keeping active runways clear of birds. The general BCU response to birds present on or over JFKIA has been described above. Below are described specific BCU response and bird reaction to control activities for the bird species groups that have been involved in bird-aircraft collisions at JFKIA between 1979 and 1993.

Gulls

Gulls are considered the most hazardous species-group at JFKIA; between 1979-93, gulls accounted for 74% of aircraft damaged or delayed, 69% of all birds involved in strikes, and 76% of all aircraft striking birds. The nature of species presence, hazard, and response to BCU activities differs between Laughing Gulls and the other three gull species. Laughing Gulls are present at JFKIA during April-October, and are most-often passing through JFKIA airspace between the adjacent nesting colony and off-airport locations. The other three gull species (Herring, Ring-billed, and Great Black-backed gulls), however, are year-round residents in the New York City Area, and the majority of these birds are not associated with a single, large, or identifiable nesting colony very near the airport.

Gull Presence at/over JFKIA. Previous studies and observations of BCU personnel indicate that the majority of Laughing Gull presence associated with JFKIA is attributed to the large nesting colony located adjacent to the airport at the end of runway 4L/22R. Most Laughing Gulls involved in strikes are passing through JFKIA airspace between the nesting colony and off-airport sites. These flights are most prevalent during the June-July period after Laughing Gull eggs have hatched and prior to fledgling. A smaller number of Laughing Gulls are sometimes observed loafing on airport pavement areas.

Other gull species have been observed at JFKIA involved in clamming activities over pavement areas on the airport. When tides are low, clam beds in Jamaica Bay are exposed, making them available to gulls. Gulls pose hazards to aircraft when they hover above airport pavement areas to drop clams on the hard surfaces to permit feeding. In addition to direct hazards posed by circling gulls, the shell debris poses foreign object hazards to aircraft as well. Clamming activities are most prevalent during the winter months.

All four gull species are routinely observed flying over or loafing on the waters of Jamaica Bay adjacent to the airport.

BCU Response and Gull Reaction. Gulls that are observed roosting on airport grounds can usually be dispersed through use of distress call tapes and firing of pyrotechnics. Shooting is employed if gulls do not disperse away from active runways after nonlethal techniques have been employed and if a hazardous situation still exists.

Specific procedures are implemented when gulls engage in clamming activities. When gulls are observed in clamming activities, BCU activity is increased in the patrol areas near runways 4R and 4L, where clamming activity has historically occurred most frequently. Gulls that are actively involved in clamming are often difficult to move away from the airport. Use of distress call tapes, pyrotechnics, and shooting are necessary to deter gulls in this situation. If gulls are persistent and do not leave the area, a NOTAM is issued and the runway may be closed. The S.O. Supervisor notifies the maintenance department to clear the area of shells whenever shell debris accumulates.

Gulls that are observed flying through JFKIA airspace are difficult to affect by action taken on the ground by BCU personnel. Their flight can sometimes be controlled through use of pyrotechnics and shooting

to hasten their flight through the JFKIA airspace or to cause them to change their direction and fly around the airport. In most cases, however, flyovers cannot be controlled. NOTAMS are issued and runways are closed when gulls cannot be cleared away from the active runway and are posing direct hazards to aircraft.

Raptors

The raptors present at JFKIA pose low-moderate or low hazards to aircraft, based on their presence in the 1979-93 strike record, their tendency to occur singly, and their relative low abundance.

Raptor Presence at JFKIA. Common barn owls, kestrels, short-eared owls, ospreys, and peregrine falcons have all been struck at least once at JFKIA. The owls and kestrels feed on small mammals, and therefore benefit from JFKIA's long-grass management practice. These species have been observed perched near or hovering over long-grass areas, often utilizing navigation aides, pilings, signs, and other structures as perches. The owls are active mostly at night, while the kestrel is active during the day. The osprey is a fish-eating raptor, and BCU personnel observe this species actively fishing over Jamaica Bay, or perched on fence posts along the southeastern boundary of the airport. Peregrine falcons eat birds that they catch in flight. This species is rarely observed by BCU personnel, but has been seen over Jamaica Bay adjacent to the airport and over airport grounds.

BCU Response and Raptor Reaction. BCU response to the presence of raptors depends on the activity of the bird. Raptors actively involved in hunting are not easily dissuaded by the use of pyrotechnics. Long-grass management benefits many raptors, but must be continued at JFKIA to control hazards associated with the much more numerous gulls. Non-essential structures used by raptors for perches are removed whenever possible. Persistent individual birds, especially owls, are removed by trapping and relocated to less hazardous sites. Trapping and removal has been conducted at JFKIA pursuant to state and federal permits.

Wading Birds

Wading birds like cattle egrets pose low and seasonal hazards to aircraft at JFKIA.

Wading Bird Presence at JFKIA. Egrets and herons are observed wading in the shallow waters of Jamaica Bay adjacent to the airport, and are sometimes observed flying low over the airport.

BCU Response and Wading Bird Reaction. BCU activities to rid the airport of gulls also serves to control wading birds such as egrets; long-grass management reduces egret use and active harassment of gulls deters egrets to some extent.

Waterfowl

Hazards posed to aircraft by waterfowl are low and seasonal at JFKIA: waterfowl have accounted for 5-6% of the aircraft and birds involved in collisions between 1979 and 1993.

Waterfowl Presence at JFKIA. Most of the ducks, geese, and swans that are observed by the BCU are in Jamaica Bay, or flying over the airport. Flocks of 100 or more brant have been observed during late winter/early spring, concentrated in the water along the southeastern shores of the airport.

BCU Response and Waterfowl Reaction. The BCU does not attempt to harass waterfowl away from the waters adjacent to the airport. However, when waterfowl are observed on or flying over the airport, the use of pyrotechnics has some effect on waterfowl, especially the hunted species like mallards and Canada geese. Long-grass management effectively deters waterfowl from loafing, feeding and nesting on airport grounds.

Other Flocking Birds

Flocking birds such as pigeons, starlings, snow bunting, and red-winged blackbirds pose low and seasonal hazards to aircraft. These species are more abundant at and near JFKIA during late summer or autumn, when they are staging and migrating.

Flocking Bird presence at JFKIA. Pigeons and starlings are most commonly associated with structures and locations that are frequented by people. When present at JFKIA, blackbirds and buntings are usually observed in small groups or flocks associated with runways and adjacent grassy areas.

BCU Response and Flocking Bird Reaction. The BCU utilizes distress call tapes and pyrotechnics to rid the airport of these flocking species. These techniques work to some degree, but are less effective during September-November, when large flocks of migrating birds pass through the area. In September of 1991, a total of at least 194 starlings struck an arriving B-747 on Runway 22L (Figure 1-8). As is true with the gull species, these flocking birds are not deterred from flying through JFKIA airspace by ground-based activities of the BCU. Several airline terminals have installed pigeon control devices such as wire mesh, screens and other barriers to deter nesting of pigeons and starlings on their structures.

Ring-necked Pheasants

Ring-necked Pheasants are usually observed in 2 to 3-bird groups in the western long-grass area of the airport near Bergen basin, and in the grass/shrub area east of runway 22L/4R. Because they tend to run away from disturbance, pheasants are difficult to harass away from the airport. They pose relatively low hazards to aircraft at JFKIA, and they actually benefit from long-grass management.

1.4.5 Dialogues With Off-Airport Agencies to Reduce Bird Attractants in the Vicinity of JFKIA

The area surrounding JFKIA is a highly-urbanized environment predominated by residential areas, ballfields, city parks, shopping malls, and other areas that provide habitat resources for birds, especially scavenging species like gulls, crows, starlings, and pigeons. The removal of these resources could potentially reduce the number of birds traversing JFKIA airspace to exploit these resources. Gulls exploit a wide variety of food resources, in addition to the natural foods found in the marine environment: hand-outs from park visitors and others, garbage from trash cans, dumpsters, and waste-handling facilities, and other sources. In 1989, the International Panel of experts that reviewed JFKIA's birdstrike problem stated that the majority of gulls involved in collisions with aircraft at JFKIA were traversing the airport's airspace between the Jamaica Bay Laughing Gull nesting colony and off-airport sites in order to provision nestlings with food. To whatever extent possible, the removal of off-airport food and roosting/nesting resources could serve to reduce flyovers and birdstrikes at JFKIA. It is noted that the Port Authority has no authority to force compliance with recommendations to reduce habitat features for birds at these off-airport sites.

1.4.5.1 Waste-Handling Facilities

The contribution of waste-handling facilities to JFKIA's birdstrike problem was noted as early as 1965 by the American Museum of Natural History in their special report to the U.S. Fish and Wildlife Service (Bull 1965). Throughout the 1960's and 1970's, personnel in the Port Authority and the natural resource management agencies continued to recognize the importance of landfills near JFKIA in providing food for birds, especially gulls, that were involved in collisions with aircraft at the airport. One facility, the Fountain Avenue Landfill, was located within the boundaries of the NPS's Gateway National Recreation Area, and was deemed to be an important contributing factor to the incidence of gull-aircraft collisions at JFKIA. In 1978, the National Park Service Regional Director, requested that the landfill operators (New York City Department of Sanitation) conduct bird control measures, including a shotgun patrol and selective shooting of gulls on the landfill site, since the matter was one of public safety at JFKIA. This requirement was pursuant to a Memorandum of Understanding between the NPS and the City of New York, and provided for compliance with U.S. Environmental Protection Agency and FAA regulations. Subsequent field evaluations conducted by the FWS (Wildlife Assistance Program) indicated that shotgun patrols at the landfill could actually increase hazards at JFKIA; the patrol was terminated prior to May, 1979.

The Edgemere Landfill is another facility located next to JFKIA that has contributed to the presence of gulls at the airport. The closure of the Fountain Avenue Landfill in 1985 prompted some concern by the PA, FAA, and FWS relative to increased bird use of the Edgemere Landfill. In 1985-86, site visits were performed and recommendations submitted to The City of New York; an overhead grid was installed, and provision for a bird reporting system was put in place whereby Edgemere operators would notify the FAA Control Tower at JFKIA if birds are observed flocking and soaring over the landfill. Continued monitoring and eventual closure of the Edgemere Landfill to putrescible wastes was stated as probable future activities.

In response to continuation of landfill operations near JFKIA in the late 1980s, and the increasing birdstrike hazard at the airport, the PA continued coordination with the New York City Department of Sanitation (NYCDOS) through conduct of JFKIA's Bird Task Force meetings and other communications. The PA's efforts contributed to those of other agencies (FWS, FAA and others) and the City of New York to the closure of the Fountain Avenue Landfill in 1985, and the termination of utilization of the Edgemere landfill for putrescible waste in 1991. The closure of the Fountain Avenue Landfill in 1985 resulted in a decline in birdstrikes at JFKIA (Figure 1-9). In 1991, the change in operations of the Edgemere Landfill (no putrescible waste) may have contributed in part to the 68% reduction in gull-aircraft strikes that was primarily attributed to the intensive on-airport shooting program (Figure 1-9).

In 1974, the U.S. Federal Aviation Administration (FAA) issued FAA Order 500.5 to prohibit the siting of new waste disposal sites within 3,000 meters (10,000 feet) of runways used by turbine-powered aircraft. This order was revised in 1990 (FAA Order 5200.5A) to include landfills from 3,000 meters (10,000 feet) to 8 kilometers (5 miles) of runways that "attract or sustain hazardous bird movements from feeding, water or roosting areas into, or across the runway and/or the approach and departure patterns of aircraft". These FAA regulations will continue to reduce the chance of a new waste-handling facilities being sited near JFKIA in such a manner as to pose increased bird hazards to safe aircraft operations.

1.4.5.2 Aqueduct Race Track

During the summer of 1993, Port Authority personnel met with representatives of the Aqueduct Race Track (Appendix D.2) to review the Track's attractiveness to birds, and discuss its potential contributing effects on birdstrikes at JFKIA. Interviews with track personnel and direct observations by ADC biologists on the day of the visit (8/5/93) indicated that there is some use of the infield areas by gulls and waterfowl. Recommendations were submitted to the New York Racing Association, Inc. at Aqueduct to: 1) stop all feeding of birds, 2) manage for long grass, 3) plant alternate ground covers, 4) install grid wires over ponds, and 5) harass birds with pyrotechnics. ADC also offered technical assistance and demonstrations of techniques if requested by Aqueduct. The Port Authority has no regulatory authority over these facilities, but will continue to invite personnel from the Track to Bird Task Force meetings and conduct dialogues with them relative to the airports safety concerns.

1.4.5.3 Jamaica Sewage Treatment Plant

During the summer of 1993, the PA met personnel from the Jamaica Sewage Treatment Plant and the New York City Department of Environmental Protection (managing agency) (Appendix D.1) to review the Plant's attractiveness to birds and discuss its potential contributing effects on birdstrikes. Interviews with Plant personnel and direct observations by ADC, DEP and PA personnel indicated that there is some use of the site by gulls. Site personnel indicated that there has been no obvious seasonal or annual pattern of gull use, and that there has been no recent increase in the number of gulls using the site.

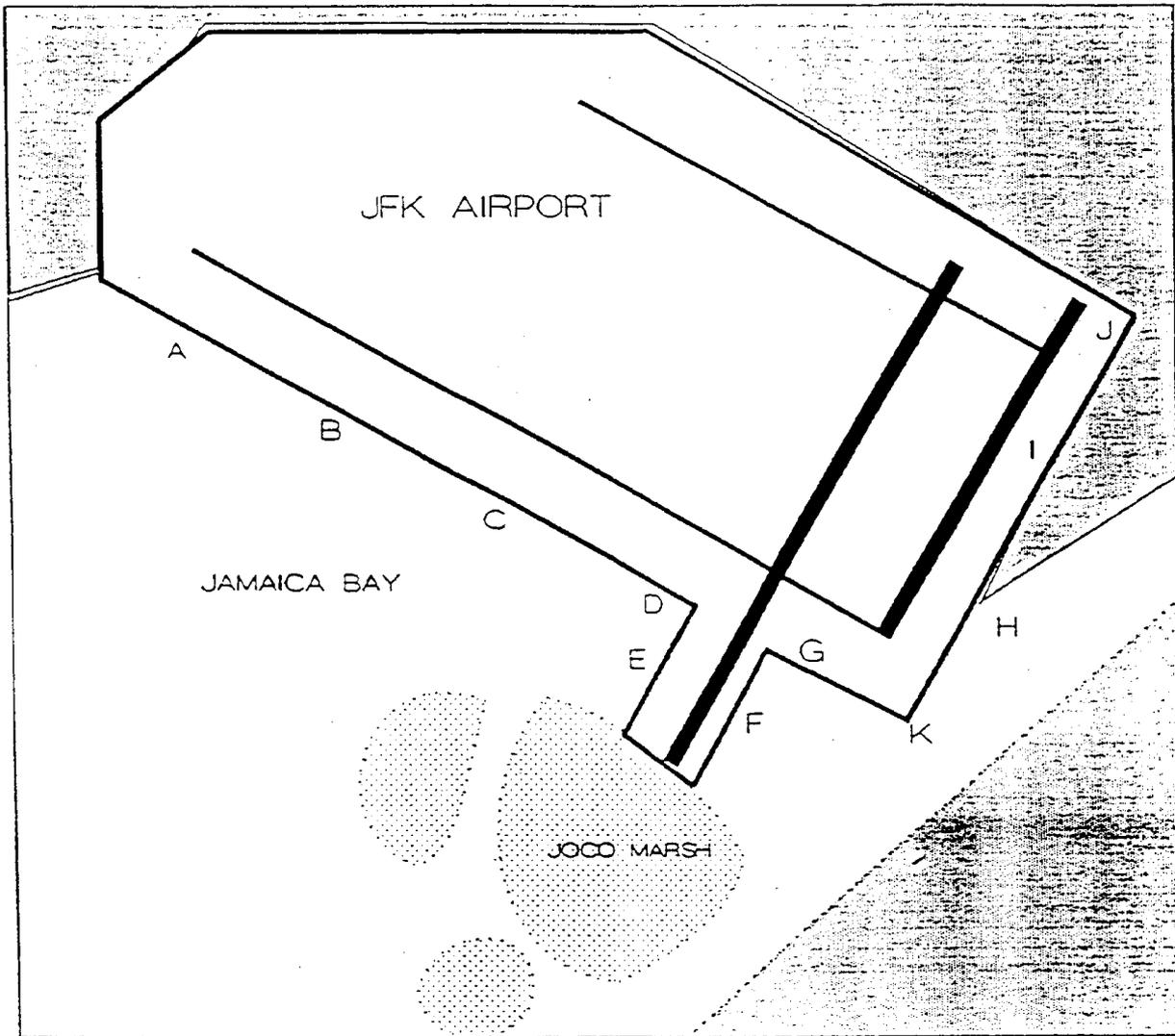
Additionally, Plant personnel agreed to notify the PA and ADC if there are changes in the pattern of bird presence at the site, and will continue open communications with the PA relative to its safety concerns. The Plant permitted ADC to conduct weekly bird survey during the summer of 1993. The Port Authority has no regulatory authority over the Plant, but will continue to invite personnel from the Plant to Bird Task Force meetings and conduct dialogues with them relative to airport safety concerns.

1.5 Interim Shooting Program

In May 1991, the Port Authority requested assistance from ADC in order to reduce the number of gull-aircraft collisions at JFKIA. In 1991, ADC conducted an experimental on-airport gull hazard reduction program to determine the effectiveness of shooting gulls as they entered JFKIA airspace in reducing gull-aircraft collisions. This activity was conducted pursuant to permits from USFWS (Special Purpose and Depredation) and NYSDEC (License to Collect or Possess) that provide for the control of birds creating a hazard to aircraft. Between May and August, two to five ADC biologists stationed on the airport along active runways (Figure 1-16) shot gulls attempting to enter JFKIA airspace.

Monitoring of Program Results: Early in the 1991 breeding season (April and May) and prior to implementation of the program, the number of Laughing Gull/aircraft interactions was already three times the average annual rate of the preceding three years (1988-1990).

However, upon implementation of the program, the number of Laughing Gull strikes in 1991 decreased to 32 percent of the mean level for the same period in the preceding three years (Figure 1-17), representing a 68 percent decrease. The activities were continued in subsequent years and resulted in a further reduction in Laughing Gull strikes to a level of 11 percent of the mean 1988-1990 level in 1992



LEGEND

A: Shooting Location



Approximate Scale in Kilometers

FIGURE 1-16

**Interim Management Program:
Shooting Zones at JFKIA.
(1991-1993)**

Source: Dolbeer et al, 1992.

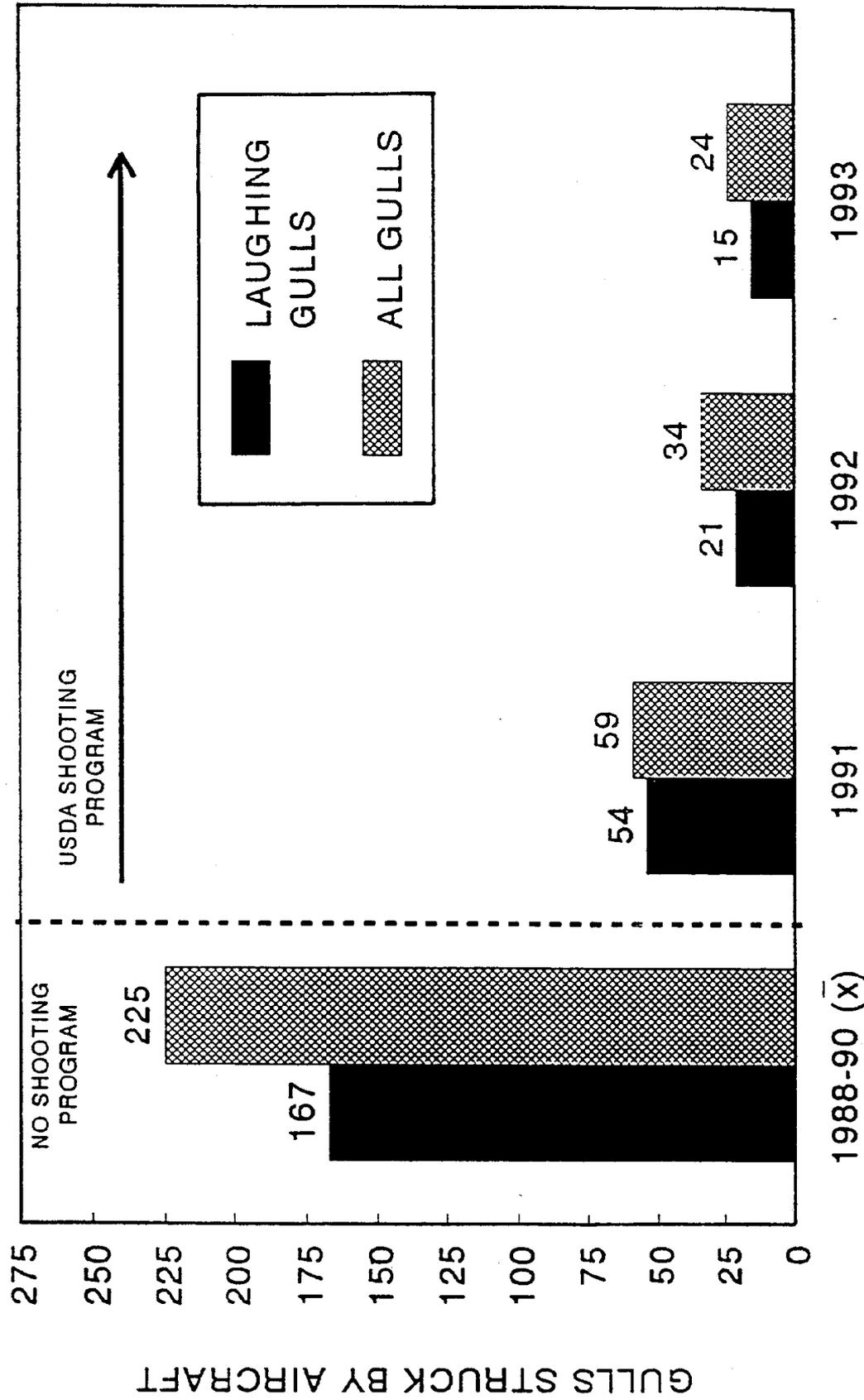


FIGURE 1-17

Effect of
Interim Shooting Program on
Gull Strikes at JFKIA

Note: Number of laughing gulls and all gulls (laughing, herring, great black-backed, ring-billed) colliding with aircraft at John F. Kennedy International Airport, 20 May to 15 August, 1988-1993. Gull shooting program occurred between 20 May and 8 August 1991 and between 20 May-30 September, 15 May and 4 August 1992.

Source: Dolbeer et al, 1992.

and 10 percent of the mean 1988-90 level in 1993 (Dolbeer, 1993). The reduction of Laughing Gull strikes by 90 percent over the 1990-1993 period resulted in the taking of a decreasing number of Laughing Gulls over the three-year period: 14,191 Laughing Gulls were taken in 1991, 11,847 in 1992, and 6,496 in 1993. The size of the Laughing Gull nesting colony in Jamaica Bay remained approximately the same during implementation of the program in 1991 and 1992. In 1993, the colony increased from 4920 nests to 6000 nests despite the taking of Laughing Gulls on the airport (Table 1-2). Although such a situation might be explained by recruitment by the colony of Laughing Gulls and/or by behavioral changes in the colony population, no empirical data existed to support these hypotheses. The number of Laughing Gull-aircraft strikes has been reduced through the removal of those individual birds that flew across JFKIA boundaries.

In addition to the measures and programs described above, the PA has experimented with other less traditional techniques, such as the use of eyespot balloons, and the use of radio-controlled model airplanes.

The activities were continued in 1992, when 11,847 Laughing Gulls were shot, resulting in a reduction of 89% in the number of birdstrikes by Laughing Gulls relative to the mean level for the same period in 1988-1990. In 1993, the number of Laughing Gulls shot declined to 6,496, while the reduction in the number of birdstrikes continued to be reduced by more than 90%.

Interestingly, the total number of nests at the colony site did not decrease substantially from the 1990 level (7629 nests) during the period when the shooting program was in effect (1991-1993), and in fact increased during the 1993 season (Table 1-2) compared to 1992. Due to the lack of available data no conclusive determination could be made as to whether the effects of recruitment by the colony of Laughing Gulls, or behavioral changes in the colony population, could explain this situation. The total number of laughing gulls associated with the Jamaica Bay colony includes nesting adults (inferred from annual nesting surveys, and is two times the number of nests), and non-nesting adults and immature birds. Non-nesting adults and immature laughing gulls are most likely attracted to the site by the activities of the nesting birds, and their abundance. The removal of the nesting colony birds could reduce the number of non-nesters and immature laughing gulls in the immediate vicinity. Overall, the reduction of nesting laughing gulls could reduce laughing gull-aircraft strikes by also reducing nonbreeders and immature birds.

1.6 Potential Alternatives and Other Issues Identified During Public Scoping

In 1992, concern for potential cumulative impacts associated with the temporary shooting measures and in an effort to research more long-term approaches, it was decided to further explore issues involved in reduction of the birdstrike hazard at JFKIA. Preparation of this EIS was initiated to explore all reasonable alternatives. The following represents the issues which were identified during the public scoping process that occurred from Autumn, 1992 through Spring 1994.

- (1) What are the positive and negative effects and impacts of each alternative action on the environment, wildlife species, including gulls other than Laughing Gulls?
- (2) Loss of individual animals, wildlife habitat, and other natural resources should be minimized wherever possible and practical.

- (3) Actions related to habitat management should consider future effects, such as influx of new species into the area, and the potential impacts of these species on airport safety. This issue should be considered relative to planned future airport development and habitat changes that will result from this development, as well as relative to current conditions.
- (4) What are the relative reductions in risk to human safety for each of the alternative actions?
- (5) What are the time frames and costs for each alternative action to be initiated, accomplished, and evaluated, especially impacts? Projections in timing, costs, and impacts should be made based on past control efforts and other information.
- (6) What will be the probable effects of alternative actions on Laughing Gulls in New York State and in the northeastern United States? This analysis should include examination of the age structure of the Laughing Gull population, pertinent biological and ecological information, distribution and interrelationships of regional Laughing Gull populations, and the extent to which Laughing Gulls from New Jersey are ranging northward into New York.
- (7) The scope of the EIS should adequately address the birdstrike hazard at JFKIA; all species that create hazards to safe aviation at the airport should be analyzed in the document. Present information on the relative contribution of these species to the overall birdstrike hazard at JFKIA, and identify the ecological and biological factors that contribute to those hazards.
- (8) Present an unbiased and thorough discussion of the current JFKIA bird hazard control program and of the on- and off-airport programs that have been conducted to reduce birdstrikes at JFKIA.
- (9) Present a thorough description of the term "birdstrike," and identify the strengths and limitations of this definition.

1.7 Purpose and Need for the Proposed Action

The collision of birds with aircraft at JFKIA has the potential to result in loss of human life. Analysis of JFKIA's birdstrike record indicates that gulls present the greatest hazards to human safety there. In 1990, before the Interim Shooting Program went into effect, more than 70% of the bird-aircraft collisions at JFKIA involved gulls, especially Laughing Gulls (43% of all strikes in 1990). The majority of the Laughing Gulls originated from the nesting colony on JoCo, East High Meadow, and Silver Hole marshes within the NPS's Gateway National Recreation Area. The close proximity of JFKIA and the Jamaica Bay Wildlife Refuge Unit of the Gateway National Recreation Area creates a hazard to human safety (Bear letter June 25, 1993, Appendix F.1).

In order to protect human safety, and because current on-airport nonlethal measures have not successfully reduced the Laughing Gull-aircraft collision hazard, the alternatives evaluated here include on- and off-airport actions that are nonlethal as well as lethal. The alternatives address hazards created by the four gull species present in the JFKIA area; with the exception of alternatives specifically related to the Jamaica Bay Laughing Gull nesting colony, all alternatives are directed at the four gull species that pose hazards to safe aircraft operation at the airport. The considered alternative actions involve properties that are managed by private (i.e., Aqueduct Racetrack), State of New York (Jamaica Bay Sewage Treatment Plant), bi-state (Port Authority of New York and New Jersey's, JFKIA), and federal (NPS's Gateway National Recreation Area) agencies and organizations.

The federal cooperating agencies (USDA (APHIS, ADC), USDI (FWS, NPS)) and the NYSDEC Division of Fish and Wildlife propose to develop and enact a plan to meet the need to reduce to the maximum extent possible, the potential for gull-aircraft interactions, particularly those posed by the proximity of the Laughing Gull nesting colony in Jamaica Bay to JFKIA, in order to protect human safety.

The need is to significantly reduce the number of gull-aircraft interactions at JFKIA in order to protect human safety.

The purpose of this NEPA/SEQRA process is to evaluate potential gull management strategies at JFKIA and in the Jamaica Bay that are effective, safe, environmentally sound, and in compliance with applicable policies, laws and regulations.

1.8 Description of the Proposed Action

In order to reduce the gull hazard at JFKIA, an Integrated Management Program (IMP) is proposed which seeks to establish the best achievable balance between the highest level of effectiveness in reducing the gull hazard at JFKIA on both a short-term and a long-term basis, with the lowest level of environmental impacts. The recommended IMP consists of the following components:

(1) **Expansion of the Existing JFKIA On-Airport Bird Hazard Control Program**

This component seeks to deter gulls from entering JFKIA airspace through active nonlethal harassment by means of pyrotechnics, and management of potential on-airport attractants, including water, insects, and refuse.

(2) **Reduction of Off-Airport Attractants**

This component seeks to reduce flyovers of gulls through JFKIA airspace by reducing potential attractants at off-airport locations.

(3) **On-Airport Shooting of Gulls**

This component seeks to reduce the number of gulls within JFKIA airspace.

(4) **Destruction of Laughing Gull Nests and Eggs on the Colony Site**

This component seeks to avoid emergence of a generation of Laughing Gulls that will return to the site to nest in subsequent years, as well as to deter Laughing Gulls from nesting and induce them to abandon the colony site.

(5) **Shooting of Adult Laughing Gulls on the Colony**

This component seeks to induce colony abandonment by deterring Laughing Gulls from nesting through active lethal harassment, while also reducing the adult gull population overflying the airport on an immediate basis.

(6) **Harassment Display of Synthetic Models of Dead Gulls on the Colony**

This component seeks to induce colony abandonment by deterring Laughing Gulls from nesting through nonlethal passive harassment with models of dead gulls.

These six components fall within the jurisdiction of many different agencies and organizations. With the exception of component 2, the Reduction of Off-Airport Attractants, the component is with the jurisdiction of: Port Authority of New York & New Jersey, National Park Service, U.S. Fish and Wildlife Service, USDA APHIS ADC, and the NYS Department of Environmental Conservation. Each one of these components involves more than one agency action or decision. The removal of off-airport attractants from the New York City Metropolitan area would require coordination among the agencies and any number of private and public organizations, companies, individuals, and facilities.

Category 2 components (4 through 6) would occur on NPS property in Jamaica Bay Wildlife Refuge, and would require the support and authorization of the NPS; current NPS policy states that all off-NPS components (Category 1) (1-3) must first be employed and determined to be ineffective in reducing birdstrikes at JFKIA before any on-NPS component could be pursued. In order for any of the three on-NPS components to be initiated, USDI-required reviews and permits would have to be conducted or obtained.

The analysis contained in this EIS indicates the feasibility, effectiveness, and environmental impacts of the 6 components of the Integrated Management Program. In light of the recent USDI policy, the components of the IMP that may be implemented to reduce gull-aircraft strikes at JFKIA in 1994 and in subsequent years are the Category 1 components, and are as follows:

1. Continued Development of JFKIA's On-Airport Program
2. Reduction of Off-Airport Attractants
3. On-Airport Shooting of Gulls