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BIRD STRIKE ANALYSIS IN LITHUANIA

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ABSTRACT

The paper contains results of analysis of bird strikes for the periods 1958-1978 and 1987-1991. 55 cases of collisions in civil aviation are investigated. Species composition of birds involved in incidents is presented. Annual, seasonal and 24-hour periods of bird strikes have been distinguished. Aircraft types, collision frequency in various flight phases and damages incurred on aviation have been indicated. The present state of affairs in Lithuania is given.

Keywords: Bird strikes, Damage, Civil Statistics

INTRODUCTION

Scientific investigation of bird strikes in Lithuania has been executed since 1971 to order of the former Ministry of Civil Aviation of USSR. The basic executor of the work is Laboratory of Ornithology, Institute of Ecology. Later the work had been cut short due to lack of financing and renewed in 1992 to order of Lithuanian Agency for Higher Education, Research and Development. The work is carried out by the above-mentioned Laboratory of Ornithology, Institute of Ecology. Statistical bird strike analysis as a basis for all further studies was one of the first steps we had undertaken.

MATERIAL AND METHODS

For the given study, the material officially registered in flight inspection of Lithuanian Civil Aviation Board as well as that from separate Lithuanian airdromes have been used. In reality there were more collisions between aircraft and birds in Lithuanian Civil aviation but if not registered they were not included into this analysis. Ornithologists were not always asked to participate in the identification of a dead bird or its remains or in species identification what, of course, told upon the quality of the work.

RESULTS

Bird strikes in Lithuania in 1958 to 1978.

There have been registered 40 bird strikes during the given period with 14 bird species identified. The group of Corvidae (Jackdaw, Rook, Hooded Crow, Raven) were noted to collide with aircraft most often - 9 incidents have been registered. The greatest number of bird strikes fall to June - August. In July, 1968 in Vilnius airport an aircraft AN-24 collided with a flock of Rook in the altitude of 300 m on its take-off, an aircraft TU-124 - with a flock of Jackdaw in the altitude of 10 m. In August, 1975 in Palanga airport AN-24 collided with a Hooded Crow. In Kaunas airport in July the collisions between aircraft AN-24 and TU-124 on take-off and flocks of Rook and Jackdaw in the altitude 10-20 m were registered (Table 1).

TABLE 1. Species composition of birds involved in bird strikes

Species	Number of incidents	%
Corvidae (Rook, Jackdaw, Hooded Crow, Raven)	9	27.3
Rock Dove	7	21.3
Black-headed and Herring Gulls	6	18.2
Birds of prey	2	6.0
Partridge	2	6.0
Duck	1	3.1
Swift	2	6.0
Starling	2	6.0
Swallow	2	6.0
Total:	33	99.9

This series of bird strikes coincided with post-breeding period of young birds leaving their nests and feeding in the territory of airports. It is noteworthy that colonies of Rook in trees, abundance of nests of Jackdaw in buildings in the vicinity of airports as well as plenty of Hooded Crow in adjacent green plantations incur considerable danger for flights. Old local birds, though, get used to aircraft and collisions between them and aircraft are quite rare. Young birds, on the contrary, lack experience and in June-August endanger the safety of flights.

Another dangerous to aviation and worthwhile mentioning species is Rock Dove (7 incidents). In Vilnius airport in summer of 1972 aircraft IL-14 on take-off collided with a flock of Rock Dove at the altitude of 40 m. The upper window of a hatchway had been penetrated and the bird fell into the pilot's cabin. In September, 1969 TU-124 on take-off collided with a flock of Rock Dove at the altitude of 10 m. The aircraft wing was damaged. In November of the same year TU-124 on landing collided with Rock Doves, the incident had entailed a replacement of the engine.

As much as 6 bird strikes have been registered with gulls (*Larus* sp.) all of them in airports of Baltic seacoast: Palanga and Klaipėda. Bird strikes occurred in July-October with AN-24, TU-124 and AN-2. In two cases the engines of AN-24 had to be replaced. The time of bird strikes coincided with intensive gull migration on the seacoast, wandering of young birds as well as a habit of gulls to land for rest on a runway during the storm.

In August 2 bird strikes were registered with birds of prey: kite (*Milvus* sp.) and buzzard (*Buteo* sp.), aircraft AN-2 and IL-14. The wing was struck. 2 incidents on aircraft landing were registered with Partridges and Starlings. In June, 1969 TU-124 on take-off collided with Starlings at altitude of 10 m. A lot of damage was caused by another bird strike. In Vilnius airport on April 17, 1985 at 2.57 p.m. a 4-engine AN-12 struck a flock of more than 100 migrating Starlings at 20 m. At the site of collision remains of 22 Starlings were found. 2 engines were damaged one of which had to be changed. The repair of the airplane lasted over a month. This species is most dangerous when flies in flocks during post-breeding period and seasonal migration.

Bird strikes, however, are not always noticed and identified. Two accidents with Swift are known in Lithuania. One of them, however, was disclosed only in December 1971 when at 2200 m the engine of AN-24 ran down. While repairing it the remains of a Swift were detected though at this time of season this species had long left for South. It is clear that the bird got into the engine in summer but the fact had not been noticed.

Two bird strikes of AN-2 with Swallows were registered in August-September while spraying chemicals on fields of agricultural crops.

Therefore we can state that 75.8% of all bird strikes in Civil aviation in 1958-1978 occurred on aircraft climb and landing in the territory of airports with local and

migrating birds (Table 2). The majority of birds strikes have been registered in Vilnius and Palanga airports. 90% of bird strikes occurred at altitude of less than 400 m mostly at daytime. The majority of bird strikes have been recorded in summer (64%), less number in autumn (16%), spring (8%) and winter (12%) (Table 3). Frequency of bird strikes is dependent upon the speed of aircraft: the numbers of collisions increase with an increase in the speed of aircraft (Table 4). Wings usually suffer the greatest damage. The replacement of engines incurred the largest material loss.

TABLE 2. Distribution of bird strikes in relation to flight phase

Flight phase	Number of incidents	%
Take-off	9	31.0
Landing	13	44.8
Approach	2	6.8
During agricultural work	3	10.6
Total:	29	100.0

TABLE 3. Distribution of bird strikes in different seasons

Month	Number of incidents	%
January	0	
February	0	
March	0	
April	1	4.0
May	1	4.0
June	5	20.0
July	7	28.0
August	4	16.0
September	2	8.0
October	1	4.0
November	1	4.0
December	3	12.0
Total:	25	100.0

TABLE 4. Bird strikes with respect to aircraft type

Aircraft type	Number of incidents	%
AN-2	5	20.0
IL-14	2	8.0
AN-24	9	36.0
TU-124	9	36.0
Total:	25	100.0

Analysis of bird strikes in 1987-1991.

The analysis of five recent years has been chosen because of changes in aircraft type, flight conditions, intensity and speed. In current five years aircraft of Lithuanian Civil aviation had collided with birds and were seriously damaged 15 times, 12 of

which fall to territory of Lithuania. This is a much greater number as against the period of 1958-1978 and can be readily explained by increased speed of aircraft and higher flight intensity.

The majority of incidents occurred in flight-rich Vilnius airport which is to become international and its approaches (10 incidents), this number is less for Palanga airport (2).

It is regretful that in 14 out of 15 incidents the bird species has not been identified. It was only in one case that gulls were identified up to genus (the species remaining unknown). Such situation has a negative impact on our work it being unclear what aircraft collide with. Thus implementation of one or other precautionary measure becomes problematic. All this calls for supplementary investigation, additional analysis of bird strikes. Based on bird strike protocols we determined that most often aircraft collide with birds on landing in the territory of the airport (50% of incidents) (Table 5). 28.5% of incidents have been registered on aircraft take-off in the airport. Thus, even 78.5% of incidents (more than three fourths) could be avoided provided that special precautionary measures have been taken in the territory of the airport. A single bird strike has been registered en route and 14.3% at the first stage of landing. At this time the aircraft is nearing the airport and operators from control tower with radar are able to inform the crew about the birds in their way (en route and height). It is a harder task when an aircraft is en route at high altitudes (7.2%).

TABLE 5. Distribution of bird strikes in different flight phases (1987-1991)

Flight phase	Number of incidents	%
Take-off	4	28.5
Landing	7	50.0
En-route	1	7.2
Beginning of landing	2	14.3
Total:	14	100.0

TABLE 6. Distribution of bird strikes in different seasons (1987-1991)

Month	Number of incidents	%
January	0	0
February	0	0
March	1	8.3
April	1	8.3
May	0	0
June	2	16.7
July	3	25.0
August	0	0
September	0	0
October	4	33.3
November	1	8.4
December	0	0
Total:	12	100.0

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Distribution of bird strikes in different seasons in Lithuania (Table 6) shows the highest frequencies during spring and autumn bird migrations as well as in June - July when young birds arrive to an unaccustomed airport territory from the surroundings and collide with aircraft. This information greatly facilitates the solution of the given problem.

Table 7 shows that most frequently birds collide with aircraft of JAK-42 and AN-24 types which are most popular in Lithuania and have the greatest number of flights in the year.

TABLE 7. Distribution of bird strikes in Lithuania with respect to aircraft type (1987-1991)

Aircraft type	Number of incidents	%
AN-24	5	33.3
AN-26	2	13.3
JAK-42	6	40.1
TU-134	2	13.3
Total:	15	100.0

The analysis of altitudes of bird strikes showed that in 65% of incidents aircrafts were lower than 100 m (on landing and take-off), in 7% - 400 to 1000 m, 14% - 2000 to 5000 m.

All the bird strikes (except 2 cases) occurred at night: 4 - during the first hour after sunset, 1 - during the third hour after sunset, 1 - in the middle of the night, 1 - during the second hour before sunrise, 1 - during the third hour before sunrise. One incident happened at midday and one in the evening - during the third hour before sunset. The distribution of bird strikes is in harmony with peaks of bird migrations in the season or during the night which shows that most often aircraft collide with migrating birds.

In 1986-1992 bird strikes incurred greater and lesser damages on aircraft in Lithuania, including engine damage and its replacement. An engine replacement was executed in Vilnius airport in spring of 1985. Usually fuselages, wings, empennage, chassis have sustained damages or modules and rivets used in fuselage fastening have been ripped. Other losses include obstruction of air intake, breaking of radiators, damaging of the whole fire-prevention system and other components of vital importance. Fortunately, this time there were not any fatalities, though damages always result in significant repair and other costs, too.

DISCUSSION

The analysis accomplished on bird strikes in Lithuanian Civil aviation elucidated the regularities characteristic to aviation of various countries. The number of bird strikes in Lithuania was determined to increase with increased intensity of bird migration in the season and 24-h period (relevant for both spring and autumn bird migration). Summer is another season of raised hazard for bird strikes when young birds leave nests and start their wandering and bird summer migrations commence. As a rule, the most abundant species of migrants as well as birds who frequent the territory of airports cause most of the bird strikes. It has been ascertained that currently the number of bird strikes increases as a consequence of higher flight intensity and strikes occur on aircraft take-off and landing in the territory of airport and its approaches.

Based on comparison of separate aircraft types we forecast a 5-fold increase of bird strikes in Lithuania when such types of aircraft as Airbus and Boeing start to fly.

On the other hand, the number of bird strikes could be significantly reduced provided that special research work and organizational measures are taken in the airports enabling to grasp and control the situation.

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