FROM BIRDS ON THE GROUND TO BIRDS IN THE AIR:
DUTCH BIRD AVOIDANCE MODEL FOR LOCAL MOVEMENTS

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Abstract

Although only flying birds collide with aircraft, bird control predominantly focuses on birds on the ground. Comparison of bird numbers on the ground at Eindhoven Airbase with bird strike data showed a mismatch. We then related the bird strike data to the number of flying birds. Therefore, we counted the number of birds flying in a defined air volume (i.e. density of flying birds) above Eindhoven Airbase. The catch volume of aircraft, i.e. the volume of air struck by aircraft taking off and landing at the airbase, was also calculated. Multiplying the density of flying birds with the catch volume gave the expected number of bird strikes. Comparison of this number with the actual bird strike number showed that bird species and age were important factors in determining the probability of bird strikes. We concluded that knowledge of the relation between bird strike data and the density of flying birds could provide tools for bird control. However, bird control has a limited direct effect on the density of flying birds. It is much more effective to implement measures that control the numbers of birds on the ground. As a first step we plan to investigate the relationship between birds on the ground and in the air in more detail. The data will be included in a local bird avoidance model, as part of the Bird Avoidance Model Netherlands, a joint project of the University of Amsterdam, the Dutch Centre for Field Ornithology SOVON and the Royal Netherlands Air Force.

On July 15 1996, a C-130 Hercules crashed after colliding with 150 Starlings and a few Lapwings at Eindhoven Air Force Base in The Netherlands. Thirty-four people were killed and 7 heavily wounded. In the weeks before the crash, the staff planned to halve the bird control unit (BCU) from two people to one. However, the day after the crash, the BCU was doubled to four people. According to the staff at Eindhoven, the measure for failing bird control was a plane crash. In general the number of bird strikes per 10,000 aircraft movements measures the success of bird control.

Although only flying birds collide with aircraft, bird control decisions are predominantly based on birds on the ground. These include birds that frequent the airport for foraging, breeding or resting, and dead birds collected on and near the runway.

The numbers of both alive and dead birds at Eindhoven airbase were studied in detail from August 1998 to August 1999. In that year, the BCU conducted 150 detailed bird counts. Due to problems with draining and mowing of the runway environment, about 300 birds, on average, were present at the airbase in summer and 150 in winter. Since these problems have been dealt with, the numbers of birds have declined.

The BCU checked the runway environment for birds at least 5 times per day. This included intensive surveys for bird remains on and near the runway. According to pilot reports only 5 strikes occurred during that year. However, the BCU found the remains of 53 birds involved in 42 strikes. A comparison of the average number of living birds on the ground per km^2 and the total number of bird strikes showed a mismatch. Although the Starling was the most abundant bird, no collisions with this species were recorded. On the other hand, Kestrels got struck often even though they were present in low numbers.

Since only flying birds collide with aircraft, the number of birds on the ground and the number of bird strikes were not comparable without linking them with the number of birds in the air and the catch volume of aircraft. Therefore, all aircraft movements were recorded and the frontal area and the distance covered above the runway were calculated. Formerly knowledge about bird movements was lacking. Therefore, information was obtained by 1,200 panorama scans conducted during the year August 1998 to August 1999. In these scans the observer counted all birds that flew in his binocular view above the runway environment. The number of birds divided by the volume of the binocular view gave the number of birds per km^3, i.e. the density of flying birds. This density multiplied with the catch volume of aircraft resulted in the number of expected bird strikes.

Comparing this number with the number of actual bird strikes revealed differences among bird species. Swift and Starling were involved in strikes less often than expected, Lapwing and Stock dove struck as often as expected and Kestrel more often than expected. Furthermore, there were differences among seasons. In summer, the number of expected strikes was three times higher than the number of actual strikes while in winter the difference was eightfold. These differences may be explained with avoidance behaviour of the birds, depending on species, age and local experience.

The Irish University of Cork is studying the avoidance behaviour of birds in relation to approaching aircraft. The results will provide tools for aircraft designers to increase the birds' ability to detect a moving aircraft and to predict the time to collision, in order to be able to avoid a fatal one.

To predict whether a bird will fly in the path of aircraft, BCUs need tools to measure the effects of preventive and active measures. The density of both staging and flying birds appeared to vary with season, time of day, type of land use and different weather conditions. Further research will be carried out to quantify these parameters with the aim of entering them into a model that will predict the local movements of birds on the ground taking off and birds in the air staging down. The local model is part of the Dutch Bird Avoidance Model that is collaboration among the Royal Netherlands Air Force, SOVON Bird Census and the University of Amsterdam.

Pilot's view. *Two pictures from an F-16 HUD (Head Up Display) video, showing a Herring gull flying in the path of the aircraft. The pilot did not have time for an evasive manoeuvre. With quicken wing-beat the Herring gull flew himself in safety.*