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WHICH BIRD?

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Abstract

Where there is a birdstrike, there should have been a bird. Unfortunately, many reports on bird-strikes carefully recording type of aircraft and damage incurred are without reference to the bird. No bird remains had been collected or difficulties in getting these remains identified appeared unsurmountable. They are no longer. By a combination of macroscopical, microscopical and (in special cases) biochemical methods over 95% of bird remains can be identified to type of bird, over 60% to species. Once the species is known, we have an infallible guide to further information. More important still, our birdstrike statistics are immensely more valuable.

Which birds cause strikes? This question can be answered with growing confidence when all bird remains are collected and studied. In order to make the identifications, no bird remains found upon the aircraft should be discarded . This applies to all strikes, whether they did cause damage or not. Even a blood smear and a few minute feathers may contain the key to a correct identification. Bird remains should be collected under the responsibility of the airfieldís safety officer. They should be forwarded to an expert for identification. Experience shows that only a specialist in the field is able to identify bird remains critically and confidently. In countries where an identification system is operating the result is a far better knowledge of the entire birdstrike problem.

Key Words: Identification, Collection, Feathers

Introduction

One of the important variables in the study of aircraft-bird collisions is the species of bird involved. It is common knowledge that some species and groups of birds are much more liable to cause a birdstrike than others. Evaluation of the hazards is only possible when reliable statistics of birdstrikes are available. Such statistics should include data on the species of birds involved, but unfortunately this is often not the case. Defective reporting of birdstrikes distorts the statistical record of the airfield. This may seriously hamper efficient techniques to prevent birdstrikes. These should be aimed at the right species of birds, not at a random selection.

Also, the impact of a birdstrike is, of course, strongly dependent on the weight of the bird causing the collision. Weights of flying birds range from under 5 g to about 20 kg, so the damage caused varies from negligible to the loss of the aircraft. Effective birdstrike prevention requires that any bird causing a collision should be identified as precisely as possible. Fortunately, this identification can go far beyond the superficial impression gained by the pilots or the airfield staff. Sophisticated methods exist to recognise even minute remains of a bird and to identify these, often to the level of the species, but in almost all cases at least to the level of the group to which such a bird belongs.

Methods of identification

The identification of bird remains is fundamentally different from the identification of living birds in the field or even of dead birds found on the runway. Bird remains do not emit any calls or other vocalisations, nor do they show any behaviour. Both these are important clues to the identity of living wild birds. Most bird remains do not consist of a n entire body, but of small and shattered fragments, so a general impression of size, shape and feather coloration to go on is not available either. This implies that the identification of the remains resulting from an aircraft-bird collision is a specialised business. It requires specialised skills, even when it appears easy.

Three techniques for identification have been developed over the years (Shamoun-Baranes 1998). The first of these is close comparison of any feathers or parts of feathers found among the debris with feathers on study skins in a bird collection. When enough characteristic feathers are available, this usually enables the researcher to recognise the species to which the debris belongs. ***E.g.*** the vinous pink tinge of the breast feathers of a male chaffinch is sufficient for ascertaining the identity of the bird. In other cases, a single big flight feather or tail feather may suffice. However, quite often no characteristic feathers are available in the material collected after a birdstrike. As all gulls have extensive parts of their body clad in white feathers, the

presence of a white feather does not tell us very much, the less so as also many other birds, though not predominantly white, have quite a few white feathers. Macroscopical (seen with the naked eye) identification of bird debris becomes easier if more material for comparison is available, particularly when the remains contain a bill or a foot. These are often characteristic of the species.

The second technique has been developed on the basis of earlier work in taxonomy (Chandler 1916) and in the identification remains of prey in the droppings of predators (Day 1966). These workers studied the small downy barbules at the basis of contour feathers with a microscope. At the Smithsonian Institution in Washington DC, Roxy Laybourne (Laybourne 1974, see also Laybourne ***et al.*** 1992) pioneered in using these microscopical characters to identify tiny bird remains, collected after birdstrikes and being sent to her by the American Air Force. Her work laid the foundation of an entire school of scientists developing these methods for routine identification of birdhits. This work was extended by Brom (1986, 1991) and presented at several meetings of the Bird Strike Committee Europe (later: International Bird Strike Committee) (Brom 1992, Prast ***et al.*** 1996, Shamoun-Baranes 1998). In North America Dove (1997) cooperated with Roxy Laybourne and continued her work. The essence is that the downy barbules consist of a regular sequence of nodes and internodes. The nodes may be strongly or weakly developed, thickened, triangular or bell-shaped. In many species they show nodal structures, such as prongs, lobes or rings. These characters of the nodes combined with the size of the barbules, the pigmentation and the distribution along the barbules constitute a complex of features suitable for identification. In all passerine birds (perching birds) and a few other groups, the basal cell of the barbule carries outgrowths, termed ‘villi’ by Chandler (1916), that at once put the specimen among these groups, narrowing down the area of further search.

The third group of techniques for identification can be summarised under the heading ‘biochemical’. Ouellet (1990, 1994) developed a method for extracting proteins (keratin) from feathers. The samples obtained can be analysed by electrophoresis. The resulting keratin profiles are compared with a collection of profiles of which the origin is known. More recently is has become feasible to isolate DNA from minute tissue samples, blood smears or feather fragments. PCR amplification of part of the mitochondrial cytochrome-b gene and sequence determination of the product allows identification of the origin of the sample to the species level (Hermans ***et al.*** 1996, Allan ***et al.*** 1998). Use of DNA analysis has the advantage that even a very small amount of material (which needs not contain any feathers) is sufficient. It is at present still limited in its application by the cost of carrying out the analysis, but particularly by the requirement of having a large database of sequences of the same region in the gene available for comparison. In future, both drawbacks will become less

important by the rapid developments in the field of DNA sequencing and aligning of the found sequences.

Practical issues

In order to make these identifications, it is of vital importance that bird remains found upon inspection of the aircraft or the runway are not discarded. This applies to collisions which have damaged the aircraft, but also to those in which only the bird was killed and the plane escaped unscathed. Officers servicing or cleaning aircraft after a flight should be fully aware of the importance of reporting and collecting remains of birdstrikes. Rarely big pieces of the bird, or even nearly complete carcasses are found. In many cases the remains of the bird involved in the hit amount to little more than a blood smear and a few small feathers. In all cases these bird remains should be collected, even when they are very small. Of course, the more can be found, the better for the identification, but it is far more important that any remains are saved. Feathers and small pieces of dried blood or tissue scraped from a plane or found in an engine, packed into little polythene bags and stored at room temperature will easily survive handling by the postal service and can be sent by ordinary mail to the scientist engaged in performing the identification.

In all aerodromes, a system should be in operation for reporting birdstrikes, also minor ones. The system should operate under the responsibility of the airfield's safety officer. It should be obligatory to collect all bird remains and forward them to an expert for identification. Airfield personnel, however knowledgeable they may be, should not rely on their own expertise. A recent study in which identifications made by aerodrome personnel were compared with those made by trained ornithologists has shown that the proportion of misidentified specimens is about 50% (Round Table Discussion IBSC 24, 1998).

An expert charged with the task of bird remains identification for one or more aerodromes should by no means be isolated in her or his laboratory. Regular contacts between airfield personnel and scientists is the only way to make sure that a good standard of reporting and collecting of remains is reached. All results of the identification process should be reported to the responsible safety officer and to the national aviation authorities. Files should be kept to document the risks of bird collision and to serve in future statistical analysis of these risks.

An institute, department or laboratory where birdstrike remains are to be identified should be equipped with a collection of entire birds, readily recognisable feathers and microscopical slides of the downy barbules of birds

which may be expected to cause strikes. Identifications should be made by trained experts, knowledgeable about the macroscopically visible characters of a bird's plumage and the microscopical characters of the downy barbules of the contour feathers. In many countries, the bird department in a national or regional museum of natural history will have the necessary collections or the capability of building them up. An important aid in making and checking identifications is the multimedia expert bird remains identification system BRIS available on CD-ROM in a version for Windows and a version for Macintosh computers. In BRIS the existing knowledge about bird remains identification has been brought together in digital form (Prast ***et al.*** 1996, Prast & Shamoun 1997, Prast ***et al.*** 1998). For DNA sequence analysis the identification expert should have access to sequencing equipment and to the international databases of gene sequence information.

Funding of the work involved is the heel of Achilles in any system of bird remains identification. A system in which the costs of identification are charged to the reporting aerodrome or airline company is sure to fail in getting a real picture of the birdstrike risk. Considerations of economy will militate against reporting of minor strikes. As minor strikes constitute the overwhelming majority of bird-aircraft collisions, any resulting statistical analysis will be severely distorted. The conclusion is that the costs of operating an identification centre should be carried by the national authorities for either the civil or military aviation or both. This conclusion has been reached time and again during discussions of the subject at meetings of Internation Bird Strike Committee.

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