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WHY DO BIRDS COLLIDE WITH AIRCRAFT? – A BEHAVIOURAL PERSPECTIVE

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Abstract

Although sometimes very damaging, bird strikes are relatively rare events, numbering 4-6 per 10,000 commercial aircraft movements. A partial explanation of this statistic is that birds actively avoid moving aircraft. Therefore, it is of crucial importance to understand why this evasive behaviour either fails to occur, or proves to be ineffective in avoiding a collision. The approach in this review is to address the problem from the perspective of recent advances in animal behaviour research, and in our understanding of the neurobiology and sensory physiology of birds. While most species that are struck at airfields in the Palaearctic are sexually monomorphic, birds have evolved a sophisticated system for receiving and responding to multicomponent signals (e.g. sound and colour). The question as to which stimulus is most efficient in eliciting a response is discussed along with the potentiation effects of synergised multicomponent signals. The acoustic properties of different types of noise are reviewed with particular reference to the directional radiation of the stimulus and the accurate locatability of the source by birds. A comparative perspective may be necessary since some hazardous families (e.g. *Corvidae*, the crows and *Laridae*, the gulls) possess distress calls and exhibit intra-flock vocalisations – both on the ground and in flight – whereas others (e.g. *Columbidae*, the pigeons and doves) lack both distress calls and acoustic communication within the flying flock. Similarly with vision, both in terms of colour discrimination and acuity. Although considerable advances have been made in our understanding of avian colour vision including the discovery that birds can detect ultraviolet wavelengths, equal emphasis should be placed on the visual fields – both forward and lateral – and their respective acuity's in detecting approaching commercial and military aviation. The centre for computing "the time to collision" is located in the nucleus rotundus in the mid-brain of pigeons and is stimulated exclusively by visual images. Is this the same for all hazardous species and is the ability to detect and compute the "time to collision" dependant on both the

velocity of the approaching aircraft and varying levels of vigilance? The review also addresses the question of cognition (memory and learning) in explaining age, and distribution-related (i.e. whether or not the bird is a resident or visitor to the local airport environment) levels of risk of being struck by aircraft. There is evidence that juvenile and recently arrived birds are at greater risk than adults and local residents. This suggests that recent advances in measuring the cognitive abilities of birds may be relevant to an interpretation of bird strike pattern. Finally, consideration is also given to circumstances which impair the ability to birds to receive and respond to the "signals" omitted by an approaching aircraft. These include weather conditions (especially poor visibility), nutritional distress, parental duties, trauma (especially to the sensory organs), ecotoxicants (especially neurotoxins) and disease including neurotropic viruses and related pathogens.