Birds Never Get Lost

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BOOK REVIEW

Birds Never Get Lost

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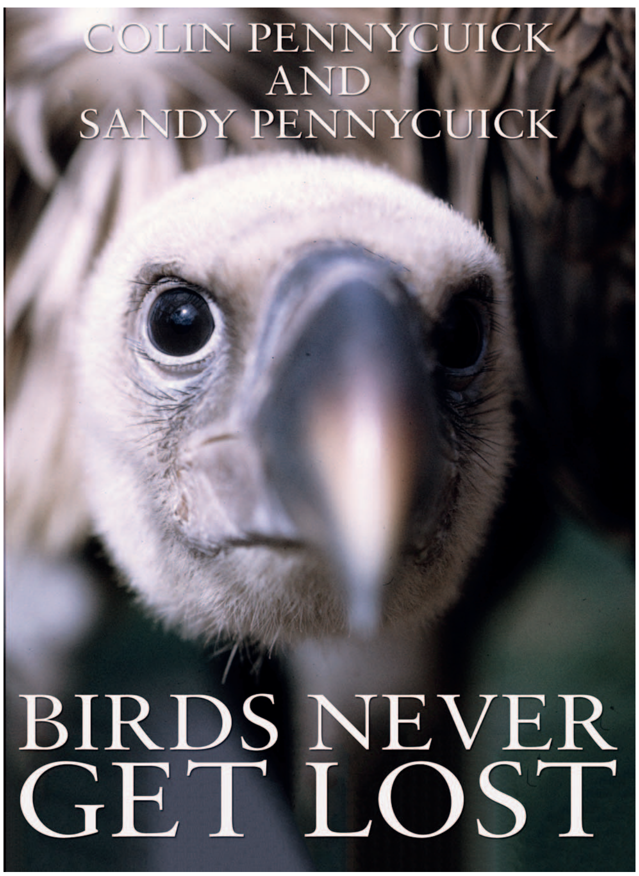
Birds Never Get Lost by Colin Pennycuick and Sandy Pennycuick. 2015. Matador, Leicestershire, UK. 178 pp., 185 color plates, 23 text figures. $10.86 (paperback). ISBN 9781785890482.

Old pilots never die.



Birds Never Get Lost is a collection of Colin Pennycuick's memoirs that focuses on how he used his flying skills to study flight in birds. Colin, a lifelong pilot and biologist, dedicated his life to learning how birds fly and navigate. He knows how aircraft fly from his training as a pilot, and he uses this knowledge to explain the flight of birds, concentrating on the aerodynamics and navigation of mainly large birds. It all started with his seminal work in the Serengeti during the early 1970s using gliders to follow gliding birds from thermal to thermal.

Do not expect to find extensive scientific explanations in this book. Colin's scientific legacy is accumulated in *Modelling the Flying Bird* (2008). Here, he translates his experiences in the air into strategies used by birds and refers to his freely available Flight software program (see Pennycuick 2008) that considers the mechanics of avian flight and derives power curves, glide polar curves, and migration simulations from user-entered information. Body mass, speed, lift, drag, and the ratio between the latter two determine the power required to stay airborne and form "the elementary principles of flight, on which everything in this book is based." There are many back-of-the-envelope calculations, all based on the Flight program, throughout the book.

Colin compares his experiences during heroic long-distance solo flights—with only a magnetic compass and a map as navigational aids in small, single-engine aircraft—with what birds must see and endure during their migrations. One of these adventures took him in a Piper Cruiser (a spare fuel tank on the passenger's seat) from Nairobi to Bristol via Cairo and Crete. Another story is about his solo flight from Miami to Bristol in an elderly Cessna 182. The last leg took him from Søndre Strømfjord across the Greenland ice cap to Iceland, the only stop on the way to England. The idea was to follow the same route taken by satellite-tracked white-fronted geese and to experience the difficulties geese may have during their annual migration along this route. Colin calculates fuel costs for both the Cessna and the geese using Flight, comparing navigational issues and problems like fog and track-keeping between aircraft and bird.

Another heroic story told in a highly understated way is about his time spent at Bird Island, South Georgia, in the summer of 1979–1980. Tube-nosed birds, from the 9 kg Wandering Albatross (*Diomedea exulans*) to the 20 g Wilson's Storm Petrel (*Oceanites oceanicus*), were the focus of interest there. The tube-nose gives these birds the unique ability to measure airspeed. In 1994, on board the British Antarctic Survey ship *James Clark Ross*, Colin observed how albatrosses made use of this instrument. High winds provide flow patterns in the boundary layer above the waves, which the large tube-nosed birds use to extract enough kinetic energy to enable them to soar continuously without flapping. Behind each wave to leeward is a region of calm created by the wave crest. He observed how albatrosses glide there and occasionally dive up from that region into the severe wind above the wave, banking up to 70 degrees (without turning) exposing the belly side to the high wind. The maneuver increases the bird's speed substantially. This wind-energy-extracting behavior deviates completely from the classical view (known since Lord Rayleigh's 1883 article) in which albatrosses are described as climbing up facing the wind, exchanging kinetic for potential energy. Albatrosses could be using both methods to stay airborne without flapping, but real proof for either of the free-wind-energy strategies does not exist. Colin suggests attaching a data logger that records the instantaneous airspeed together with a forward-facing camera showing the degree of banking of an albatross to get at answers to this question.

Colin offers the use of Flight (the subject of Chapter 11) to calculate aerodynamic performance of any bird. You only need to know the bird's body mass, wing span, and wing area to calculate a power curve: plotting power against speed. The calculations are based on the idea that the power to generate lift is inversely proportional to flight speed, and the power needed for thrust increases with the speed cubed. The total mechanical power is the sum of the two and follows a U-shaped curve. The aerodynamic fundament underlying this idea is based on the performance of a conventional wing originally discovered by Otto Lilienthal at the end of the 19th century. He studied the lift- and drag-generating properties of the arm wing of storks and found that a cross-sectional wing profile with a rounded leading edge, convex upper surface, and a flat or even concave lower surface can generate more lift than drag in an oncoming flow of air. This led to the development of the wing still used by conventional fixed-wing aircraft. Flight uses the conventional aerodynamic laws to predict the flight performance of all birds. Most birds, however, cannot be compared with fixed-wing aircraft. In most cases, a bird wing consists of an "arm part," a "hand part," and an alula or "bastard wing." The arm profile usually meets the requirements of the conventional profiles, but the hand part is flat and has a razor-sharp leading edge (the narrow vane of primary X). Furthermore, birds use complicated flapping wing movements, the kinematics of the hand wings being intrinsically complex. The program Flight probably will provide reasonable estimates for large soaring birds but cannot be expected to cater for smaller birds in fast-flapping flight. Albatrosses and giant petrels are the ideal group of birds for Flight since they have extremely long arm wings and the primary feathers of the hand wing are modified to form a reasonably conventional, aerodynamic, cross-sectional shape. Other species cannot be considered to fly like conventional aircraft. The knowledge of bird aerodynamics has developed fundamentally over the past decades with the discovery, using flow visualization techniques, of alternative means of lift generation by flapping and gliding wings. Forlornly, Flight represents the state of the art during the end of the last century and must be considered outdated.

Overall, full appreciation of Pennycuick's experiences and encounters are at times overwhelmed by the disappointing lack of editorial guidance by the book's publisher. The text and layout are highly impressionistic, and the poor layout and lack of logical thought make the book difficult to read. Chapter and paragraph headings expose an inconsistent mixture of historical and biological facts, assumptions, and stories. The font size of the two-column text is extremely small (approximately 10 point font), and the figure headings are even smaller (9 point italic). The quality of the 158 photographs from the family collection and 23 diagrams varies greatly, and the font size of the abundant text inside many diagrams varies between 18 point (p. 65) and 5 point (p. 135). The book is particularly difficult to read when black letters are printed against a dark blue sky (p. 84). Such detractions aside, Colin's main achievements are derived from his experiences flying with soaring birds while estimating the forces involved. The detailed accounts of encounters with storks, cranes, flamingos, vultures, marabous, and eagles in the air are fascinating to read.

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