

At What Height Do Birds Fly?

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An ancient fable relates that the eagle claimed kingship of birds, by virtue of the fact that it could fly higher than others. The ruse adopted by the wren to surpass the eagle has not been substantiated in recent times, and if ability to fly higher than others constitutes superiority, the eagle probably is still supreme.

During a recent radio 'quiz' programme, one question concerned the maximum height at which insects have been known to fly. One competitor's guess of 15,000 feet occasioned some derisive mirth; however the answer was given at 20,000 feet. I do not know the authority for this astounding piece of information, but suspect that the person had never tested conditions at that altitude. The amount of oxygen is negligible, the cold is intense—many degrees below zero centigrade—and the atmospheric density much reduced. It would take the strongest-flying insect a considerable time to reach such height, during which time it would be subjected to the foregoing conditions in increasing intensity. The amount of energy required to overcome lack of oxygen and sub-zero temperatures, and still maintain altitude in the rarefied air, would be relatively very great.

Regarding the flight of birds, little information is available for several reasons. Most observations are made from ground level, and, even through powerful binoculars, only the largest birds would be visible at more than, say, 5,000 feet. In view of the small number of observers who have done any bird watching from aloft, and the difficulty of detecting small slow-flying objects from fast moving aircraft, the lack of data is not surprising.

My own opinion is that very few species ever attain a height of more than a few hundred feet, and then only for short periods. During several years of flying (1941-1948) I kept this question well in mind, but cannot recall having seen any bird above 1,000 feet. It may be argued that many birds would escape detection, but the fact remains that birds at low altitudes are a common sight to the pilot. Whilst making an approach to, and circuit of, an aerodrome before landing, I often saw such birds as Kestrels and Whistling Eagles, and the same applies to the period immediately after take-off. Under civil flying regulations, the minimum permissible altitude over open country is 500 feet; in fact few aircraft fly at less than 1,000 feet.

A notable exception to this occurred during the winter of 1950. Abnormally heavy rain in southern Queensland and northern New South Wales caused extensive flooding, large numbers of stock were marooned on patches of high ground, and aircraft were pressed into service to feed them with

hay, grain, etc. from the air. It was usually dropped from about 200 feet, and it may be more than coincidence that two 'Dakotas' were struck and damaged by birds during these operations. In each case the bird was stated to be an 'Eaglehawk'. One struck the windscreen of the pilot's cockpit and was captured; a subsequent photograph in the *Brisbane Courier-Mail* showed the pilot holding a Whistling Eagle outstretched.

Many observers have watched such species as the Wedge-tail Eagle, Brolga and Pelican attaining a considerable height by soaring, and these are probably among the highest of fliers. The effortless way in which they maintain and increase altitude without apparent movement of the wings has often provoked comment; the explanation is that they are exceedingly skilful at taking advantage of upward-moving air currents.

Briefly, these currents are of two kinds. The 'willy-willy' or whirlwind is a common phenomenon, cyclonic or anti-cyclonic in origin. Dust and debris picked up from the ground makes it easy to follow the direction in which the air is moving—spirally upwards. The thermal current is less apparent, but no less common. A hot day produces an up-current of relatively hot air over each patch of heated ground (and a corresponding down-current of cool air over lakes, green paddocks etc.). Due to lateral movement of the whole air mass, the path of a thermal is seldom vertical, but the 'bubble' of hot air continues to rise obliquely, often to great heights. By finding and riding these currents, the 'met. wise' birds can increase altitude with no more effort than is required to maintain it in still air. A third and minor form of up-current often occurs when air moving horizontally is deflected upwards by an obstruction, such as the roof of a house, but the effect is soon lost when the obstruction is passed. Kestrels and swallows, in particular, revel in the lift they receive in this way, but only for a few feet.

I recently watched a Wedge-tailed Eagle attracted from about half-a-mile by a whirlwind that had picked up a quantity of dead leaves. It took up a position on the outer perimeter of the spiral, and in forty seconds had risen from 300 to 1,400 feet (estimated). This rate of climb compares favourably with the maximum rate of, say, a 'Kittyhawk' fighter, using 1,500 horsepower, and would be quite beyond the bird's powers in still air. I saw nothing to indicate that the up-current ceased at this point, but the Eagle left it, floated aimlessly for a couple of minutes, and then commenced a gradual descent.

Crows also seem to enjoy riding the whirlwind, and frequently reach about the same height (1,000-1,500 feet). However, their stay at that height is very short and their rate of descent even more rapid.

None of the species mentioned so far would be interested

in high flying insects as a source of food. Generally speaking, most insects do not seem to fly much above the surrounding vegetation and consequently insect-eating species must seek them there. Notable exceptions are the Spine-tailed Swift and Fork-tailed Swift, which possibly concentrate on such insects that do fly higher. Low-flying swifts are often said to be precursors of unsettled weather and a satisfactory meteorological explanation is available. Humid air has a lower density than dry air. Insects which habitually fly at an altitude corresponding to a certain air density would thus tend to fly lower when relative humidity is high, since atmospheric pressure decreases as altitude increases. Consequently the birds which prey on them must seek them at a reduced altitude.

No attempt is made here to analyse bird flight up to about 500 feet. That subject would require very comprehensive treatment, but I believe that sustained flight above that height is very rare and even spasmodic high flights are of short duration.

Broadly speaking, therefore, my subject may be summarized as follows—(1) Available information decreases with increased altitude, partly through lack of data and partly because most birds seem to prefer lower levels; (2) Little is known of the flight height of birds on migration, but in any other circumstance flight at 1,000 feet or above is possibly the result of impulse and opportunity and is usually of short duration; (3) Habitual flight at great heights would not appear to have any 'survival value' under normal conditions.

The probability is, therefore, that the hypothetical insects flying at 20,000 feet do so in splendid isolation.

The foregoing is a 'personal' account, without references to literature on the subject. I should perhaps refer to Richard Meinertzhagen's paper on the altitude of the migratory flight of birds, in *The Ibis*, 1920, p. 920, incorporating summarized answers received from airmen after the 1914-18 war. Pilots were agreed that birds were seldom seen at altitudes above 2,000 feet. In 1936, A. Landsborough Thomson, writing in *The Ibis*, p. 487, said that despite a number of interesting and altitude and velocity records, "nothing has happened to modify in important respects the views previously held on these matters." Finally, as recently as 1950, George G. Williams, writing in *The Auk* of that year, p. 52, states that enquiries show that more than two-thirds of all collisions between birds and airplanes occur below 2,000 feet, and virtually none above 6,000 feet. Practically all of the literature deals with migrating birds, and migratory flight, particularly when mountain ranges are to be traversed, might well be generally higher than non-migratory flying.