

The Philosophy of Gliding and Soaring

by D. G. Manges

A soaring type of bird has from six to seven propelling feathers at the outer portion or tip of each wing. These propelling feathers open and close, fan like, relatively to soaring and gliding. In the act of soaring the bird opens these propelling feathers so that the air currents, and air pressures may flow through the open spaces, thereby creating motive or driving energy.

These propelling feathers are unlike the other feathers that make up the structure of the wings. The difference being that the propelling feathers have a web or flap member on the rear or back edge of the quill or stem. The rest of the feathers that make up the greater and main gliding portion of the wings have a web on each side of the quill or stem. The propelling feathers being flexible and elastic, both longitudinally and laterally permits them to automatically adjust themselves, to get the maximum efficiency from the various air currents and air pressures.

A bird gets its propelling energy from three sources as follows: Up currents of air, horizontal currents of air, and centripetal air pressure produced in spiralling, or when flying a circular direction.

Taking up the first mentioned source of propelling energy, up currents, when an up current strikes the under part of one of the propelling feathers, it being very flexible on the rear edge, and being in a horizontal position, the up current will flex the rear portion of the web structure of the feather causing it to take the shape similar to the vane on a windmill. The effect will be a forward driving motion, and the result will be a forward driving energy for the bird. As an illustration: When I was a boy living in Pennsylvania, many were the times I watched the buzzards heading south in the fall of the year. There the Allegheny mountains run in a southwesterly direction for miles, and these birds in great numbers flew along the brow of the mountain taking advantage of the up current to propel them.

The second source of propelling energy, horizontal air currents, is demonstrated as follows: Let us assume that a bird is soaring in a general southerly direction and the air current is from the west. The bird will spiral in a southerly direction, or in other words, he will make continued letter S curves, this, in conjunction with the throw of centrifugal force, causes a heavy air pressure to flow through the open spaces between the propelling feathers, the driving force ahead being accomplished in the same manner as up currents, due to these facts. The angle of wings to the body, plus the angle caused by banking, plus the angle at the tips of the propelling feathers, resulting from the air pressure against the longitudinal flexible feathers, it will be seen that the sum of these angles will result in an almost perpendicular position of the tips of the propelling feathers, causing them to give a forward driving energy the same as the vanes on a windmill.

The third fundamental principle involved in soaring is very complex, and to grasp the principle involved we

have to consider the following natural forces: Gravitation, centrifugal and centripetal forces. The sun and planets of the whole universe are held in their relative positions by the action of these three forces. For instance, the effect of gravitation force is balanced by centrifugal force created by one heavenly body revolving around another. The same law holds good when a bird is flying in a circular course. To demonstrate this the weight of the bird, the wing surface, the speed, and the radius of the circle. The result of this will be the amount of centrifugal force per square inch or square foot of wing surface. To balance this centrifugal force it will be seen that there must be an equivalent centripetal force, which is an air pressure. This air pressure caused by the bird flying in a circular direction acts the same as gravitation force balancing the centrifugal force resulting when a heavenly body revolves around another. Thus in each case, we see that the effect of gravitation is balanced by centrifugal force.

It will be seen from the above that when a bird soars in a circular course that there is a centripetal air pressure upon the bottom of the wing, and this air pressure flowing between the open spaces of the propelling feathers drives the bird ahead in the same manner as in the other two instances already set forth.

It should be remembered that the bird only closes these propelling feathers when gliding and when they are closed the natural result is loss of altitude.

Sun Valley Soaring

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peaks but soon thought better of it and swung around the one to the right through a lower pass and made the field comfortably, but without too much to spare. Later that evening we heard that Johnny had made a perfect bulls-eye with the flowers, landing them in the center of the arena. After that we made only a few sorties out and back over the rodeo grounds, devoting most of our time to short passenger soaring flights over the slopes at the north end of the field. One of my passengers was Mrs. Charles Davidson who in professional life is Mrs. Jean Austin, Editor of the *American Home Magazine*.

Of the eleven flights made on Sunday the 18th, one was outstanding for me. With me I had Mr. Dean, an old-time commercial pilot from Twin Falls. At 4:40 P. M. we took off on a good straight car tow to 800 feet. When down to 400 along the slope we caught a weak combination of thermal and slope lift and hung on with what might have been called "grass cutting" if those arid hills had had any grass. Then we caught a thermal and worked it up to 800 feet. Dean said later that the first few minutes of our 20-minute flight scared him considerably—he just couldn't reconcile himself to the lack of engine noise. After that he got the greatest kick of his many years in the air, especially when he took the controls and did some soaring. He agrees that this was the only true "real flying."