Soaring Birds

Many birds, including Turkey Vultures, Black Vultures and Red-Tailed Hawks have the ability to seemingly float on air. This ability to fly without flapping their wings is called soaring. Soaring is partially due to the rising air or thermals that the birds ride. As the sun warms the air, the hotter air rises causing the thermals. The birds effortlessly gain altitude while merely circling the sky.

Soaring birds are characterized by the size of the circles in which they soar, the speed at which they soar and the bank angle of their soar. Figure 1 illustrates and compares a soaring bird (black vulture) at two bank angles. The bird will increase its bank angle to increase the amount of lift. This however also increases the horizontal component of the lift thereby potentially causing greater speed and a larger soaring radius.

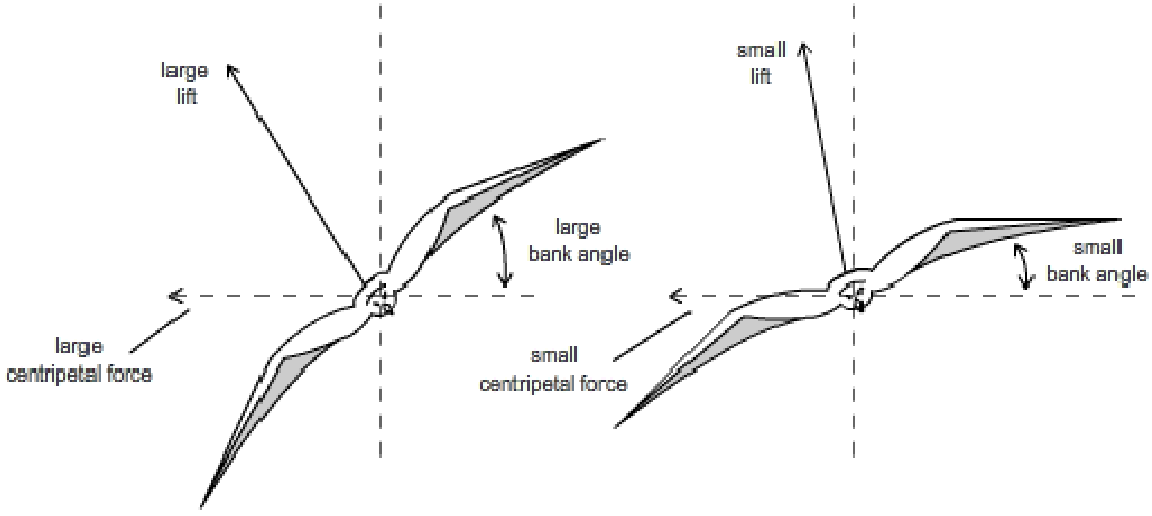

Figure 1 – Black Vulture Bank Angle Comparison

Figure 2 graphically illustrates the bank angle relative to the birds soaring speed and the time it takes to complete a full circle while soaring. In addition, the radius of the birds soaring circle is shown. This can easily be calculated using the speed S meters/sec (y-axis) and time to complete a full circle t seconds (x-axis) as $tS/2\pi$. Using Figure 2, a measured full circle time of 9 seconds and bank angle of 45 degrees, would yield a speed of approximately 14 meters/sec.

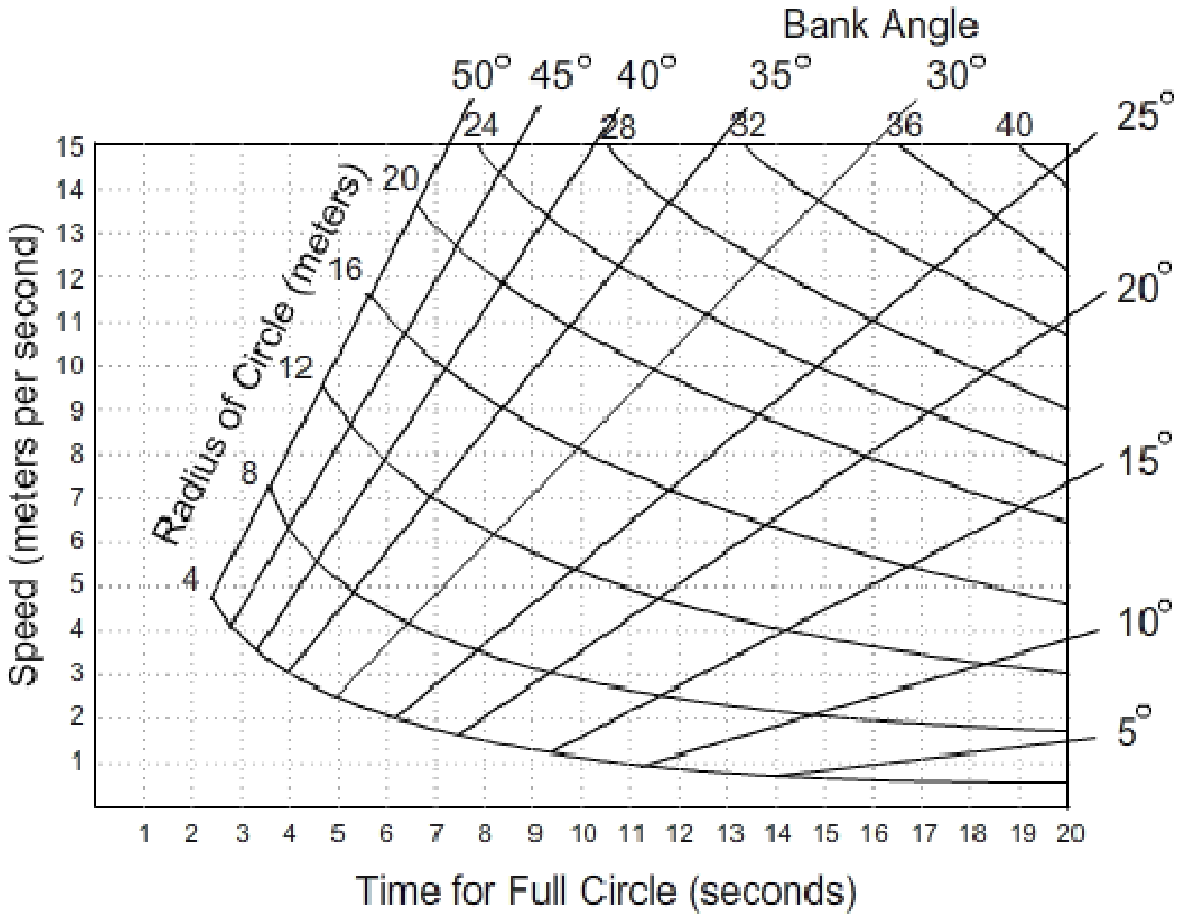

Figure 2 – Speed, Bank Angle and Circle Comparison