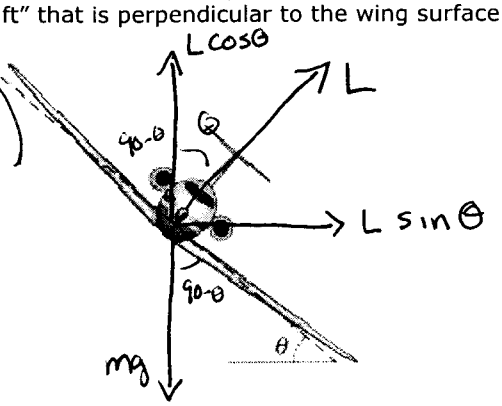
Name_____ SP211 Quiz

An airplane is flying in a horizontal circle at a speed of 500 km/h. If its wings are tilted at angle θ = 37.0° to the horizontal, what is the radius of the circle in which the plane is flying? Assume that the required force is provided entirely by an "aerodynamic lift" that is perpendicular to the wing surface.

$$v = 500 \frac{km}{hr}\left(\frac{1000 m}{km}\right)\left(\frac{1\ hr}{3600\ s}\right)$$

$$= 138.9\ m/s$$



Draw all the forces acting on the plane. Apply the appropriate Newton's Laws to the component directions. Ignore drag. The plane is at a steady altitude during the turn. Remember to convert the speed of the plane to m/s. Centripetal acceleration = v^2/r .

VERTICAL: $\Sigma F_y = 0 = L\cos\theta - mg$

$$L = \frac{mg}{\cos\theta}$$

HORIZONTAL $\Sigma F = ma_c = m\frac{v^2}{r} = L\sin\theta$

$$\cancel{m}\frac{v^2}{r} = \frac{\cancel{m}g}{\cos\theta}\sin\theta$$

$$r = \frac{v^2\cos\theta}{g\sin\theta} = \frac{(138.9\ m/s)^2(.8)}{(9.8\ m/s^2)(.6)}$$

$$= 2620\ m$$

Extra Credit: Who was the lead singer for Genesis before Phil Collins? (1pt)