

Loop De Loop & Banked Turn Notes

1. An airplane makes a banked turn such that its wings tilt creating a 60 degree angle relative to the horizontal. The plane experiences a constant 7000 N lift force while it turns. What is the magnitude of centripetal force in Newtons on the plane?

2. A 59 kg pilot in a plane does a vertical loop de loop with radius 366 meters at a constant speed of 94 m/s. $g = 10 \text{ m/s}^2$
 - a. What is the centripetal force magnitude in Newtons on the pilot while looping?

 - b. Draw a force diagram for the pilot at the top of the loop de loop.

 - c. What is the force normal magnitude in Newtons from the seat on the pilot at the top of the loop de loop?

 - d. Draw a force diagram for the pilot at the bottom of the loop de loop.

 - e. What is the force normal magnitude in Newtons from the seat on the pilot at the bottom of the loop de loop?

 - f. How many units of g-force does the pilot experience at the bottom of the loop de loop?

3. A curve on a race track has a radius of 79 meters and a banking angle of 25 degrees.
 - a. Draw a force diagram for a car on the banked track.

 - b. What is the ideal speed (the speed for which no friction is required between the car's tires and the surface) in m/s for a car of mass 1,489 kg to continue indefinitely on this curve? $g = 10 \text{ m/s/s}$

4. A 0.075 kg toy airplane is tied to the ceiling with a string. When the airplane's motor is started, it moves with a constant speed of 4.47 m/s in a horizontal circle of radius 1.28 m.
 - a. Draw a force diagram for the toy airplane.

 - b. Find the angle the string makes with the vertical.

 - c. Find the tension in the string.

