Flight Deck

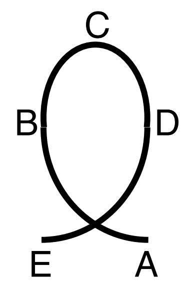
***Flight Deck** is a looping steel coaster with a floorless coach suspended from the track. This design gives you a thrilling ride as you soar along the track at speeds of up to 22 m/s (50 mph).*

Measurements & Observations

A Flight Deck SPOT is provided next to the Great American Outlet to the left of Showtime Theater. There you will find a sign. Copy the information on the sign into the box below.

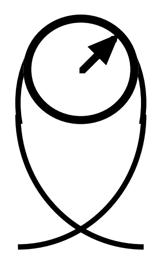
1. From **The SPOT**, measure these **angular** heights:

- The highest point (top of lift hill) ____________
- The height of the bottom of the first hill (A) ____________
- The height of the top of the vertical loop (C) ____________
- The height of the bottom as you exit the loop (E) ____________
- Estimated radius of a rider's path at the top of the vertical loop _________



2. Measurements of time (in seconds):

- How long for the train to pass the top of the lift hill ____________
- How long for the train to pass the bottom of the first drop ____________
- How long for the train to pass the top of the loop ____________
- How long for the train to pass the bottom exiting the loop ____________



3. Measurement of the train (You may need to do this on the loading platform.)

- Length of train ______________

4. Use trigonometry **to calculate** the following:

- The highest point (top of lift hill) ____________
- The height of the bottom of the first hill (A) ____________
- The height of the top of the vertical loop (C) ____________
- The height of the bottom as you exit the loop (E) ___________

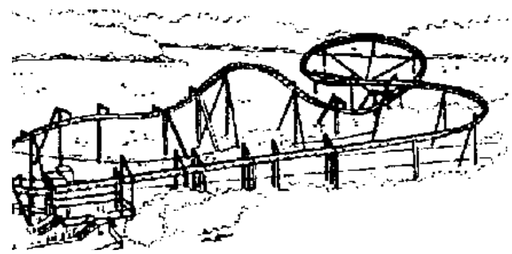
Get in line to ride Flight Deck. While waiting in line, read ALL of the following questions. Plan the measurements you will need to answer each.

5. Remember the accelerations you will felt as you went through the first loop.

(a) Where in the loop was the seat-force the greatest (A, B, C, D or E)? ___________

(b) From the frame of reference of the ground, what was the direction of the force of the seat pushing on you at each point?

(c) The coaster takes a banked curve over the lake. From the frame of reference of the curving track, what was the direction of the force of the seat pushing on you? Explain why it was in that direction.



6. Quantitative Measurements while riding

- Maximum vertical force/mass at bottom of first drop (A) _____________ (g's or N/kg)
- Lowest vertical force/mass at top of vertical loop (C) _____________ (g's or N/kg)
- Maximum vertical force/mass on exiting the loop (E) _____________ (g's or N/kg)

Calculations

7. **Speed** of the train at these locations (show work):

- Top of lift hill
- Bottom of first drop
- Top of vertical loop
- Bottom exiting the loop

Top Gun, continued… More Questions and Calculations

8. Using energy, determine how fast the train should be moving at each of these locations (based on its speed at the top of the lift hill):

- Bottom of first drop
- Top of vertical loop
- Bottom exiting the loop

9. How much centripetal force per unit mass, N/kg, should a rider experience at the top of the vertical loop?

10. If gravity supplies 1-g of this force, what should the net force/mass, N/kg, supplied by the seat be?

11. Compare your measured vertical force reading at the top of the loop with your previous calculation. What is your percent difference? Which of these values do you think is the "better" one? Why?

12. Based on the speed you calculated at the bottom of the first drop and the maximum vertical force/mass reading you obtained on the ride, what is the radius of the ride at this point?

13. Why do you think the radius at the bottom entering the loop (A) is larger than the radius at the top of the loop(C)? What would happen in terms of force/mass ratio if the radius at the bottom (A) were equal or even smaller than the top of the loop(C)?