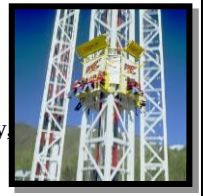
BLAST OFF!



Waves are the repeated motion of a medium carrying energy. An example you can witness every day is sound. Sound is a wave traveling through the air as its medium. Harmonic motion is a closely related type of motion. Lagoon's Rocket Blast Off! is an example of damped simple harmonic motion. If Rocket Blast Off! was moving past you on a big cart horizontally, it would resemble a wave. Likewise, if you were moving past Rocket Blast Off! On a moving sidewalk, its motion would look like a wave. While waiting in line, see if you can understand how simple harmonic motion and relative motion relate to waves through the following activities.

Useful Equations

$$\lambda = \frac{v}{f} \qquad f = \frac{1}{T} \qquad v = \frac{d}{t}$$

Ride Facts

Height of ride: 60 meters (approximately 200 feet)
Force initially: 4.5 g upward and 2 g downward

Use the "Vernier Video Physics" iPhone or iPod application, stand next to Boomerang and record a group riding Blast Off! from beginning to end. Be sure that you can see the entire ride in the video screen, do not pan the video, and keep the device as steady as possible. Watch the ride a second time and use the "Stopwatch Analog+Digital" iPhone or iPod application to time the ride. This worksheet can also be completed using the Android "StopWatch and Timer" application, simply bypass question three.

Questions

1. Using the iPhone or iPod "Stopwatch Analog+Digital" application or Android "StopWatch and Timer" application, how long does it take the ride to first reach the top of the ride in seconds?

2. Draw a graph of the riders' position versus time. Identify the period, *T*, on the graph.

3. Using the "Vernier Video Physics" application, follow the directions in the application and analyze the ride video. In the top right corner, hit the graph icon and compare the distance versus time graphs to your graph. How are they similar and different?

4. Using the "Stopwatch Analog+Digital" application, how long does it take the ride to complete one oscillation (one time to the top and back down)? This is the period, *T*. Assume you are skateboarding past the ride at 1 m/s. Using this information, calculate the wavelength of the first oscillation in meters.