

Problem Set 11: Angular Momentum, Rotation and Translation

Design Engineering Challenge: “The Big Dig” 2.007 Contest ***Paddle Spinning Concepts***

We are going to assume that we are going to drop the shot-puts into the mass scoring bin, and accelerate hockey ball(s) onto the paddle. Two concepts come to mind, a bat that hits a ball, and a spring-loaded launcher (like in a pin-ball machine):

1. If a fixed amount of energy is stored in a spring, does it make a difference if the energy is applied to a bat which accelerates and then impacts a hockey ball that then travels to hit the paddle, or if the spring pushes directly on the hockey ball in order to launch it?
2. Holding the ball so it undergoes a pure downward trajectory might be difficult, especially for multiple balls. What else might you do?
3. Estimate the final velocity of the ball in each of two concepts: a) the balls are shot horizontally and hit a deflector placed at an angle so their horizontal motion is converted to vertical motion; and b) The balls are shot horizontally and roll around a curved track so they exit vertically
4. What is the best concept (or are there other better ones)?