

EM375 Project Handout CALCULATING THE LAUNCHER EFFICIENCY

THEORY: The testing of the elastic properties of the tubing made it possible to calculate the potential energy stored in the rubber bands. This energy is transferred into the kinetic energy of the moving masses. In addition, some energy is dissipated. Where and why? When you use the full size launcher, you need to know how much of the original potential energy is transferred into kinetic energy. We call the kinetic-to-potential energy ratio the efficiency of the launcher. We will use the results from the model launcher to estimate the efficiency. We then assume that both the model and full scale launchers have a similar efficiency.

Calculate the strain potential energy in the tubing from its extension using the methods in the “Launch Speed vs. Stretch Ratio” handout and the elastomer properties you determined in the “Rubbers Lab.”

The kinetic energy is determined from the launch speed of the ball and the various masses. We do not know the actual launch speed, so you will “back calculate” it from the measured impact distance using the MathCAD worksheet developed in the “Simulation of Projectile Motion” handout.

What value of efficiency would seem realistic? Where does the ‘missing’ energy go? Is it reasonable to assume that the full-scale launcher has a similar efficiency to the model launcher? What could it mean if you calculate an efficiency greater than 100%?

