EDDY CURRENTS & MAGNETIC BRAKING

During the last part of the fall in the Drop Zone ride, the seat module is brought to a stop by magnetic braking, in which powerful magnets atttached behind the seat move alongside vertical metal fins attached to the tower.

Figures 1 and 2 show demonstrations of magnetic braking that you can do.

In the demonstration shown in Figure 1, a neodymium magnet slides down a piece of wooden molding, and then onto a piece of aluminum angle. The magnet slides rapidly down the wood, but slows down to a crawl when it goes onto the aluminum. (Neodymium magnets are obtainable from Educational Innovations, www.teachersource.com or The Magnet Source, www.magnetsource.com, or other science suppliers, if you don't already have one or know where to get one. The wood and aluminum angles can be obtained at home improvement stores.)

In the demonstration shown in Figure 2, the neodymium magnet falls rapidly when dropped down the PVC tube on the left, but falls dramatically slower when dropped down the aluminum tube on the right. (Both tubes have inside diameters slightly larger than the width of the magnet.)

Figure 1

Figure 2

When a magnet slides down a piece of aluminum or copper, or falls inside an alumninum or copper tube, it moves dramatically slower than it does when it slides along a piece of wood or falls inside a PVC tube. When it moves on or near the aluminum or copper surfaces, the magnet acts as if it is attracted to them, but when not moving, there is no attraction.

As the magnet falls, the metal experiences a changing magnetic field. This changing magnetic field induces electric currents in the metal (the aluminum angle or tube in the demonstration, or the fin on the Drop Zone). These currents are called **eddy currents**. The eddy currents, in turn, have their own magnetic fields, which exert a force on the magnet opposing it's motion. The entire process has the effect of a "magnetic brake."

For further background on the theory behind these demonstrations, try looking up **Lenz's Law**.

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