

## Pull Back Car

P4-1980



Color and Body Style May Vary

### BACKGROUND:

An object experiences an acceleration when its velocity changes. Since velocity entails both speed and direction, an acceleration occurs when an object's speed, direction of motion, or both change. This means that an object moving in a straight line with increasing or decreasing speed or moving in a circle with constant or variable speed is accelerating.

You would never pay good money to visit an amusement park that only offers rides that move with constant velocity. If you have your eyes closed while moving at a constant velocity, you can't even tell that you're moving. Unlike constant velocity, acceleration is something you can feel. That's why people love roller coasters, swings, and rotors. They provide a change in speed, direction, or both. For many of us, the more abrupt these changes are the better!

Acceleration results when an unbalanced force acts on an object. According to Newton's 2<sup>nd</sup> Law, the acceleration is directly proportional to the unbalanced (or net) force and inversely proportional to the mass. This is consistent with everyday experience. Two cars with the same mass will have different accelerations if one car has a more powerful engine. Likewise, a massive semi will take much longer to get up to the speed limit than a sports car, even though they both have big engines.

### HOTROD TUNER NOTE:

We have discovered that all of our cars can deliver even better acceleration when run without their bodies. To do this, just remove the screw(s) found beneath the car. The top should now lift off easily. Minimizing the mass of an accelerating car is old-school wisdom to hotrod tuners and this real world application will captivate your students with a terrific extension to this  $F=ma$  lab! Some additional mass may be needed to obtain traction without the body.

### ACTIVITIES:

The Pull Back Car lends itself to a number of experiments in mechanics. The net force is supplied by a spring. The spring is wound by dragging the car backward across a floor or other surface.