

The Parachute Drop

Newton's Toy Box Activity 4
air resistance

Air resistance

Air resistance is the force exerted by air against an object moving through it; it acts in the opposite direction of the object's motion.

If an object is falling, air resistance is upward. If a plane is flying eastward, air resistance is westward.

Think about it:

We observed that two similarly shaped/sized objects (wooden ball and steel ball) fell at the same rate, even though they had different masses. We explained that with Newton's 2nd Law: $a=F/m$ (the gravity force was different for each ball).

What will happen when two objects with the same mass have different shapes/sizes?

Dropping flat versus crumpled paper

The flat paper falls slower than the crumpled paper because the flat paper has more surface area.

The crumpled paper experiences less air resistance than the flat paper.

Design and Construct a Parachute

Materials:

- plastic sheet
- kite string
- masking tape

Think about how to construct the parachute so that the ball can be easily removed.

Why does the wooden ball fall faster?

Without a parachute, the wooden and table tennis ball would hit the ground at the same time ($a=F/m$).

The upward acceleration caused by the air resistance acting on the parachutes is called *drag*.

The resulting acceleration of each ball is a combination of the downward acceleration due to gravity (which is equal) and the upward acceleration due to drag.

Why does the wooden ball fall faster? (cont.)

Drag causes an acceleration that is proportional to the mass. The upward acceleration will be less for a greater mass.

The ball with more mass (wooden ball) has less upward acceleration than the ball with less mass, but the same downward acceleration. The ball with more mass will fall more quickly than the ball with less mass.

**Remove the air resistance/drag and Newton's
2nd Law becomes more apparent**



Apollo 15 astronaut David Scott (1971)