When an object moves through a fluid, it pushes the molecules of the fluid out of the way. At the same time, the molecules of the fluid exert an equal and opposite force on the object that slows it down. This force resisting motion through a fluid is a type of friction that is often called drag. Friction in fluids depends on the shape of the moving object. Objects can be designed either to increase or reduce the friction caused by a fluid. Airplane designs, for example, improve as engineers find ways to reduce drag.

The friction due to air is often called **air resistance**. Air resistance differs from the friction between solid surfaces. Air resistance depends on surface area and the speed of an object in the following ways:

- An object with a larger surface area comes into contact with more molecules as it moves than an object with a smaller surface area. This increases the air resistance.
- The faster an object moves through air, the more molecules it comes into contact with in a given amount of time. As the speed of the object increases, air resistance increases.

When a skydiver jumps out of a plane, gravity causes the skydiver to accelerate toward the ground. As the skydiver falls, his body pushes against the air. The air pushes back—with the force of air resistance. As the skydiver’s speed increases, his air resistance increases. Eventually, air resistance balances gravity, and the skydiver reaches terminal velocity, which is the final, maximum velocity of a falling object. When the skydiver opens his parachute, air resistance increases still further, and he reaches a new, slower terminal velocity that enables him to land safely.

**CHECK YOUR READING**

How do speed and surface area affect air resistance?

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**KEY CONCEPTS**

1. How does friction affect forward motion? Give an example.
2. Describe two ways to change the frictional force between two solid surfaces.
3. How does air resistance affect the velocity of a falling object?

**CRITICAL THINKING**

4. Infer What two sources of friction do you have to overcome when you are walking?
5. Synthesize If you push a chair across the floor at a constant velocity, how does the force of friction compare with the force you exert? Explain.

**CHALLENGE**

6. Synthesize If you push a book against a wall hard enough, it will not slide down even though gravity is pulling it. Use what you know about friction and Newton’s laws of motion to explain why the book does not fall.