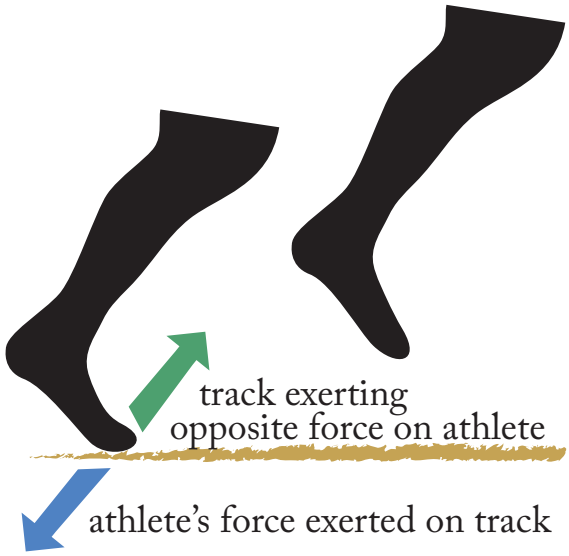
Bobsled

What makes Olympic bobsledding different than just sledding down a hill on a snow day? You might be surprised by all the things bobsledders have to consider to speed past the finish line in the shortest time.

At the beginning of the race is the "pushoff." During the pushoff, bobsledders run as fast as they can while holding onto the sled for 50 meters before jumping inside. As the athletes are running, their feet are applying **force** to the track. This is an example of **Newton's Third Law:** when the athlete exerts a force on the track, the track exerts an equal force on the athlete in the opposite direction. The athletes train and build muscle so that they can create as much force as possible to push the sled forward during that 50 meters and achieve a high **velocity** throughout the race.

After the initial dash, the sledders get into the bobsled one-by-one, keeping it straight and steady so that they don't lose speed.

03:24:46	1st
03:24:84	2nd
03:24:85	3rd



Cool Fact: During a race, bobsledders are going so fast that they experience a force that's five times the force of gravity.

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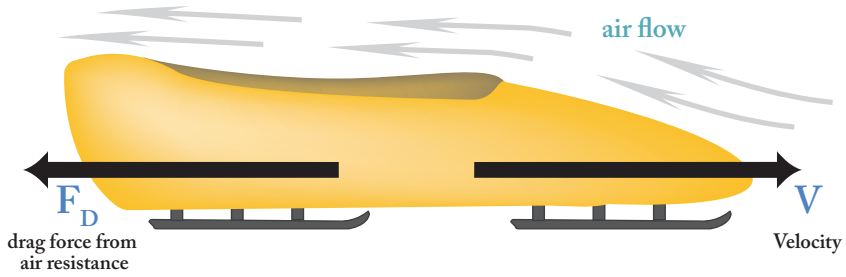
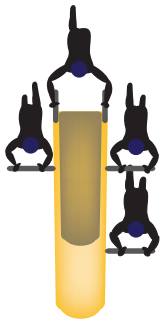
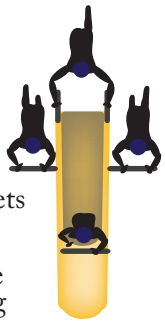
For the rest of the race, the team works together to minimize **drag** due to **air resistance**, which will reduce their speed. They do this by keeping themselves tucked in as tightly as possible. The body of bobsled is **aerodynamic**, which means that it's designed so that air flows over it smoothly. You can experience the force of air resistance by (safely!) sticking your hand out the window of a moving car. Even bobsledders' skin-tight suits are aerodynamic to help the team shave off those hundredths of a second to win the race.



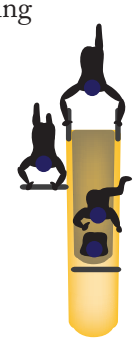


1. Sledders position themselves for the push off.

Starting line



2. The driver gets in first and retracts his pushing handle while preparing to begin steering the sled.



3. Then the pushers, who together apply the most force during the push-off, get in one at a time, also pulling in their handles.

4. The brakeman is the last to get in. He and the pushers tuck their heads in as low as possible to reduce drag on the sled.

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Try This!

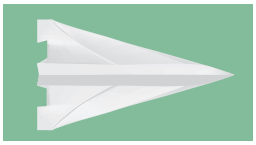
Experiment with aerodynamics using a paper airplane made out of a sheet of 8.5 by 11 inch printer paper.

Think of the time when you're holding the airplane and winding up to send it sailing through the air as the push-off—for the plane to fly, the plane has to accelerate from rest just like the athletes must get the bobsled moving from rest at the starting line. Like the bobsledders during the push-off, you need to keep the motion of the plane straight and steady, or it'll crash right when you release it.

1. If the paper airplane is travelling fast and smoothly when you're holding it, it will continue to travel in the same way when you let it go. Practice throwing your airplane until you can get it to fly straight and steady several times in a row. Right now, your airplane is very aerodynamic.

2. Cut one-inch slits on each wing along the middle fold. Fold the two flaps upward so that they are at a 90 degree angle from the wing. Throw your modified plane several times.

How does the plane fly after you add the flaps? Does it fly as fast and far as before? Why?



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3. If an object has more **mass**, it also has more **inertia**. So when a massive body is in motion, forces of friction have less of an effect on its velocity. For this reason, bobsled teams want to maximize the amount of weight in the bobsled. The weight limit in the four-man bobsled is 630 kg (including athletes and sled). If the team doesn't reach that weight, they are allowed to add metal weights to the sled.

Add a paperclip to the nose of your airplane along the base fold. How does it fly? Why?

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