Rocket Sled

Getting Ready

Navigate to the Rocket Sledder Interactive at TPC (http://www.physicsclassroom.com).

Home Page ==> Physics Interactives ==> Newton's Laws ==> Rocket Sledder

Click/tap the **Launch Interactive** button. Resize the Interactive as desired.

Explore

Use the Interactive to explore the following questions:

1. With Friction and Air Drag *turned off*, describe the effect that an applied force has upon the velocity? Also, draw the force diagram at the right. Label the forces using $\mathbf{F_{app}}$ for Applied force, $\mathbf{F_{norm}}$ for Normal force from the ground, and $\mathbf{F_{grav}}$ for the Weight of the sled.

Force Diagram

2. Now *turn off the jets* so that there are no horizontal forces acting on the rocket sled. Describe how a moving rocket sled moves when there are no horizontal forces. Also draw the force diagram at the right. Use the same labels as before: $\mathbf{F_{norm}}$ and $\mathbf{F_{grav}}$.

Force Diagram

3. Now stop the rocket sled. What do you have to do to stop a rightward moving rocket sled? (Reloading the page doesn't count as a method.)

4. Draw the force diagram for a rightward-moving rocket sled that is slowing down to a stop. Use the labels $\mathbf{F_{frict}}$ for Friction force and $\mathbf{F_{air}}$ for Air Drag Force.

Force Diagram

5. Can an object be moving to the right even though there are no rightward forces acting upon the object? Yes No

   If you answer Yes, then describe how the object is moving. If you answered No, then write an apology letter to the people of Europe who just suffered a momentary earth tremor as Isaac Newton rolled over in his grave.

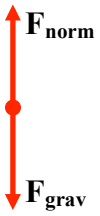
6. Consider the two resistance forces in this diagram: Friction Force ($\mathbf{F_{frict}}$) and Air Drag Force ($\mathbf{F_{air}}$). Do they ever act in the same direction as the object moves? _____ Experiment for a while before you describe your answer below.

7. Finally, turn Friction and Air Drag off and try the following: Get the rocket sled moving to the right until the speed-o-meter reaches the *red zone*. Then reverse the direction of the applied force so that it is directed to the left. Does the rocket sled immediately change direction? _____ Explain your answer.

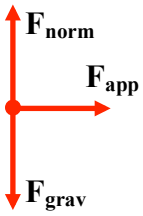
Assessment:

Consider the force diagrams below for five different situations.

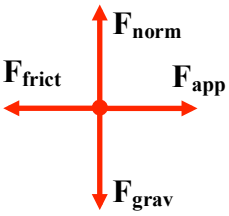
Object A



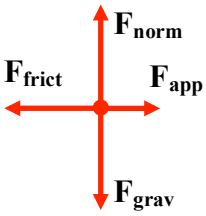
Object B



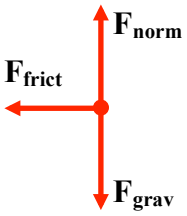
Object C



Object D



Object E



1. Which object(s) could be moving to the right at a constant speed? _____
2. Which object(s) could be moving to the right and speeding up? _____
3. Which object(s) could be moving to the right and slowing down? _____
4. Which object(s) could be moving to the left and slowing down? _____
5. Which object(s) could be moving to the right? _____