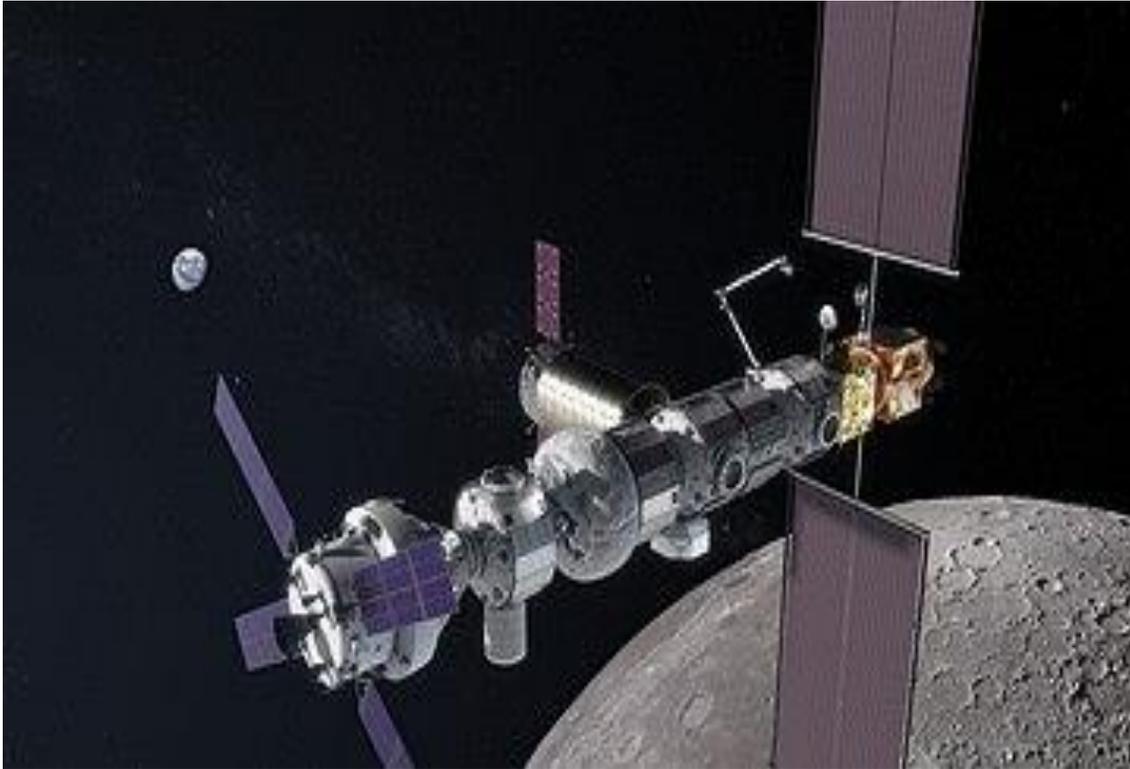


# Spacegate Station

## Episode 3 Resources



### Resource Contents

- Gravity and Drag Work Sheet
- Space Capsule Recording Sheet
- Space Capsule Graphing Sheet
- Teacher Directions and Supplies list
- Florida Next Generation Sunshine State Standards (Florida)

This program was designed specifically to be used as part of science subject instruction, science remediation and science enrichment. The determination of the appropriate science standards that correlate to this program was established by a board of Science Specialists and teachers in Duval County Public Schools, Jacksonville, FL.

## Spacegate Station Episode 3 - The Heat of Re-Entry

### Gravity and Drag Worksheet

#### Gravity

##### Word bank

larger object      mass      smaller object      stronger      towards

- Gravity is the force of attraction that a \_\_\_\_\_, like a space capsule, has towards a \_\_\_\_\_ like the earth.
- This attraction causes the smaller object to fall \_\_\_\_\_ the bigger object.
- The more \_\_\_\_\_ an object has the \_\_\_\_\_ the gravitational attraction.

#### Drag

##### Word Bank

heats up      molecules      resistance      slows down      thick

- Drag is the capsule's \_\_\_\_\_ to it moving through air.
- Anything falling through air hits the molecules that makes up air and therefore \_\_\_\_\_.
- A Capsules entering Earth's atmosphere will be considerably slowed because earth's atmosphere is so \_\_\_\_\_.
- When the capsule comes through the atmosphere, the air in front of it \_\_\_\_\_ to very high temperatures.

Name: \_\_\_\_\_

## Space Capsule Recording

**Directions:** Record how many seconds it took your space capsule to land during each of your trials.

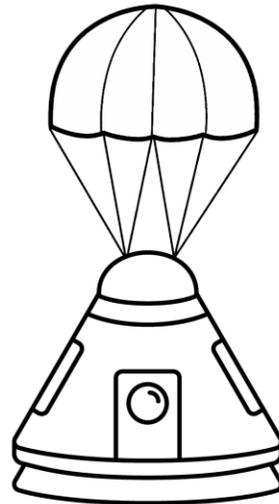
Trial #1: \_\_\_\_\_ seconds

Trial #2: \_\_\_\_\_ seconds

Trial #3: \_\_\_\_\_ seconds

Trial #4: \_\_\_\_\_ seconds

Trial #5: \_\_\_\_\_ seconds



During which trial did your space capsule take the longest to land? What factors do you think contributed to the space capsule slowing down?

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Name: \_\_\_\_\_

## Space Capsule Graphing

**Directions:** Create a bar graph of your data showing how many seconds it took your space capsule to land during each trial.

12					
11					
10					
9					
8					
7					
6					
5					
4					
3					
2					
1					
# of Seconds	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5

## Episode 3 – The Heat of Re-Entry

### Directions

**Teacher Instructions:** During the development and construction phase students may work either individually or in groups depending on the available resources or classroom limitations. Since the goal is to slow down the capsule students should be encouraged to evaluate multiple methods and/or combine methods to achieve the maximum results.

**Recommended Supplies:** (teachers may modify or supplement the supplies as necessary based on availability and their goal for the investigation.)

1. Tape measure or yard stick.
2. Timer or stopwatch
3. Small plastic cup
4. String or yarn
5. Aluminum foil
6. Cardboard / cardstock paper
7. Straws
8. Coffee filter
9. Bubble wrap
10. Tape

**Notes:** During the construction process teachers may want to allow time for the students to decorate their capsule. Students should also seal the bottom of the capsule with paper or cardboard and tape to both help increase the weight and prevent the empty cup from catching the air as it falls creating an air brake effect.

## Episode 3 – The Heat of Re-Entry

### Next Generation Sunshine State Standards (Florida)

**SC.5.N.1.1:** Define a problem, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types such as: systematic observations, experiments requiring the identification of variables, collecting and organizing data, interpreting data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

**SC.5.N.1.3** - Recognize and explain the need for repeated experimental trials.

**SC.6.N.1.1** Define a problem from the sixth grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables and graphics, analyze information, make predictions and defend conclusions.

**SC.6.N.1.4** Discuss, compare, and negotiate methods used, results obtained, and explanations among groups of students conducting the same investigation.

**SC.6.P.13.1** Investigate and describe types of forces, including contact forces and forces acting at a distance, such as electrical, magnetic, and gravitational.

**SC.6.P.13.2** Explore the Law of Gravity by recognizing that every object exerts gravitational force on every other object and that the force depends on how much mass the objects have and how far apart they are.

**SC.6.P.13.3** Investigate and describe that an unbalanced force acting on an object changes its speed, or direction of motion, or both.

**SC.7.N.1.1** Define a problem from the seventh grade curriculum, use appropriate reference materials to support scientific understanding, plan and carry out scientific investigation of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables and graphics, analyze information, make predictions and defend conclusions.

**SC.7.P.11.3** Cite evidence to explain that energy cannot be created or destroyed only changed from one form to another.

**SC.8.N.1.1** Define a problem from the eighth grade curriculum using appropriate reference materials to support scientific understanding, plan and carry out scientific investigations of various types, such as systematic observations or experiments, identify variables, collect and organize data, interpret data in charts, tables, and graphics, analyze information, make predictions, and defend conclusions.

**SC.8.N.1.2** Design and conduct a study using repeated trials and replication.

**SC.8.P.8.2** Differentiate between weight and mass recognizing that weight is the amount of gravitational pull on an object and is distinct from, though proportional to, mass.