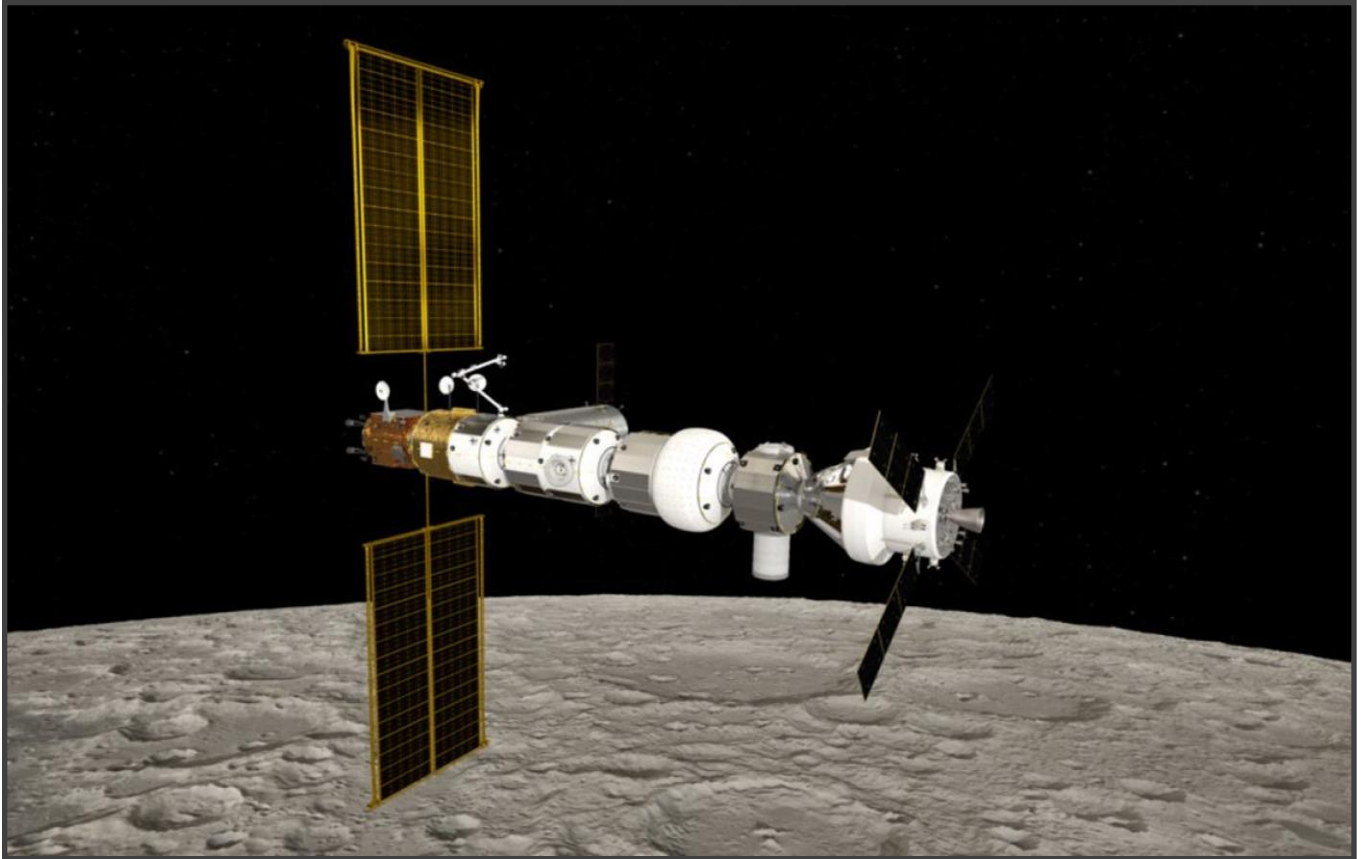


Spacegate Station Season 2

Episode 4 Resources



Resource Contents

- Guided Notes
- Kite Construction Activity
- Next Generation Sunshine State Standards

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 4

Discovery with Drones

Word Bank

autonomously	carbon dioxide	climb	descends
drag	gravitational force	hover	lift
opposite direction	pairs	rotate	rotors
thirty eight percent	thrust	UAV	drones

1. A drone, also known as an unmanned aerial vehicle, or _____, is an aircraft without a pilot on board.
2. Its flight is usually controlled in two ways; either _____ by computers in the aircraft which is known as an auto pilot or under the remote control of a pilot on the ground.
3. A drone can be used for capturing images, recording videos, or delivering object. _____ come in different shapes and sizes, from the size of a large car to as small as the palm of a human being's hand.
4. Drones use _____ rotors for propulsion and control. You can think of them as a fan because they work pretty much the same way except in Drones the spinning blades push air down, this is referred to as _____.
5. Normally drones rotors will spin from 400 to 500 rotations per second. Of course, all forces come in _____, which means that as the rotor pushes down on the air the air pushes back.
6. A drone can use these rotors to do four things. It can:
 - a. _____
 - b. _____
 - c. _____
 - d. _____

7. Weight refers to the _____ of planets and other bodies in the Universe, and the effect that this has on objects. In the case of terrestrial flight weight is what pulls a flying vehicle down to Earth, which is a serious problem for air vehicles, which want to stay in the air.
8. To fight gravity, air vehicles like Drones need to produce more _____ than their own weight to stay in the air.
9. _____ is the sum of all the forces on an object, like an aircraft, that allow it to move in each direction in relation to the direction of air flow. Normally in this context lift is considered an upwards action allowing the aircraft to fly however lift can be in any direction.
10. _____ is the force that slows down objects as they travel in air, it is also known as air resistance. It is a force that is caused by air, the force acts in the _____ to an object moving through the air. It is where air particles hit the front of the object slowing it down. The more surface area, the more air particles hit it and the greater the resistance
11. The atmosphere on Mars consists primarily of _____ and has a significantly lower atmospheric density, only 1–2% of Earth's atmosphere. The atmosphere on Mars would be equivalent to altitudes of approximately 100, 000 ft on Earth.
12. In addition, the Martian gravity is approximately _____ of Earth's gravity, therefore if an individual weighed 200 lbs. on the earth, they would only weigh 70 pounds on Mars.

Kite Activity

Pre-assessment

1. Airplanes and kites are heavier than air. What does an airplane use for lift? (engine)
2. What does a kite use for lift (wind)
3. In the beginning if a kite falls to the ground. What can you do to help the kite fly? (Shorten the tail, adjusted the strings, changed the bridle)

Vocabulary

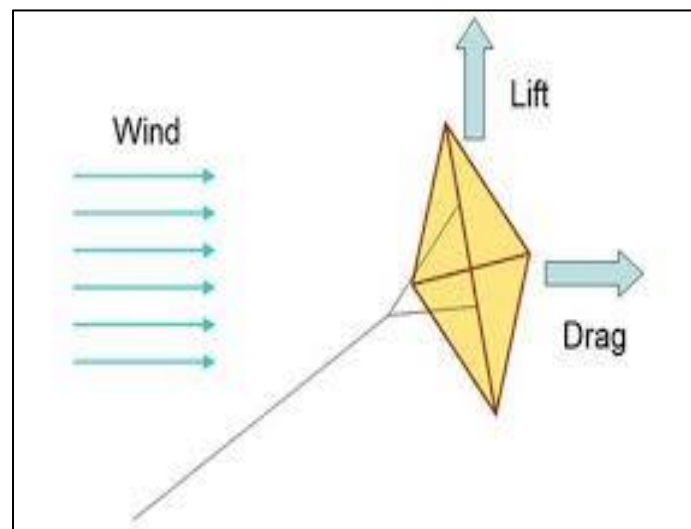
- Lift: the upward force of air that causes an object to fly
- Drag: the force of air that pushes on an object and slows it down
- Thrust: forceful push causing forward movement
- Gravity (weight): a force causing an object to be pulled to the ground
- Bridle: strings that come from the four points of the kite and directs the kite at a proper angle for maximum lift in the wind

Activity

- Allow time for groups to use the supplies to build a kite. Circulate around the room to assist the groups.
- Hang the kites around the room as decoration until a perfect weather day when you can go outside to test the theories of lift, drag, thrust and gravity.
- Before going outside review the concepts of aerodynamics

Follow-up Discussion

- Upon return of the kite-flying excursion, discuss the results.
- What adjustments had to be made to the kite for the best results?
- What techniques were used to get the kites in the air initially?



Materials

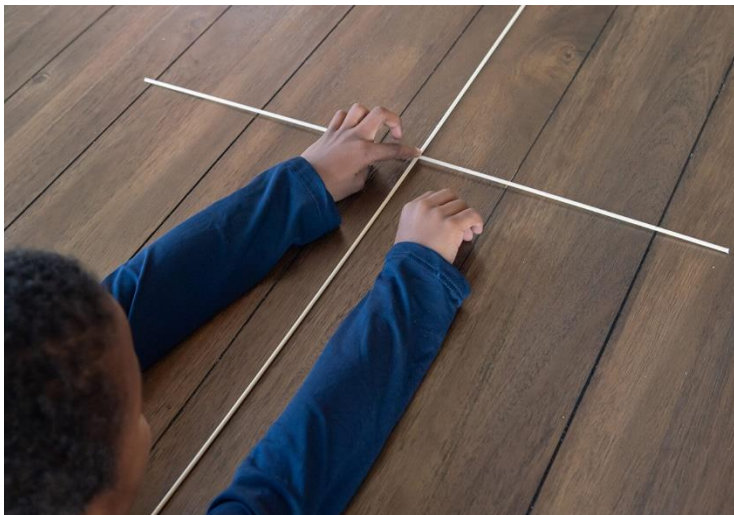
- 2 straight sticks about 2-3 feet long, one slightly shorter than the other
- String, yarn, or ribbon
- Craft knife or small knife to cut into wood
- Newspaper or large pieces of paper
- Markers
- Scissors
- Glue or tape
- Additional art supplies for decoration (optional)

Directions

1. Carefully carve a small notch into both ends of each wooden stick, depending on the age of the student you may want to pre-notch these. The notches must be cut in the same direction.



2. Lay the slightly shorter wooden stick across the other stick to form a "t." Help your student use the string to tie the sticks at the center if necessary. Make sure the notches are lined up.



3. Have the student pull the string into the notches around the ends of the sticks.



4. Have the student unfold the newspaper or large paper and cut a pattern to match the shape of the kite frame. Have them make it an inch or two larger than the frame all the way around so that they can fold the edges over the string and glue them in place.



5. Have them spread the newspaper over the stick frame, fold the edges over the string and glue them in place.



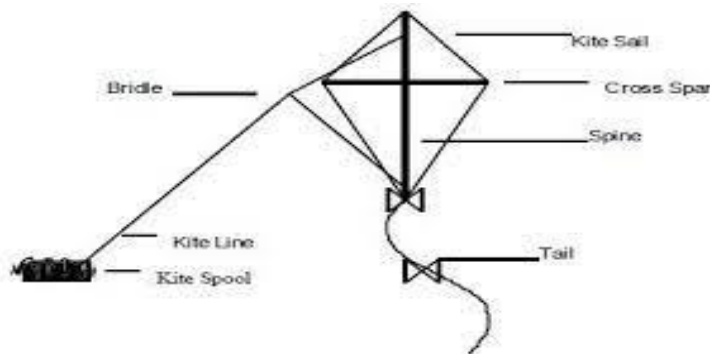
6. Once the glue is dry, tie a long string to the kite where the sticks cross.



7. Finally, have the student decorate the outside of the kite with art supplies! They can use a giant piece of paper to create any shape to glue to the outside as well.



8. To improve aerodynamics a tail should be added to the bottom of the kite. A tail stabilizes the kite in stronger winds by adding drag to the kite. In light winds the kite will need less tail or maybe no tail at all. Depending on the kite's design, trying to fly it without a tail may result in the kite spinning, veering to one side, or crashing because the kite is unstable.



9. Now it's time to fly!



Next Generation Sunshine Standards

SC.3.E.5.4 Explore the Law of Gravity by demonstrating that gravity is a force that can be overcome.

SC.3.P.10.2 Recognize that energy has the ability to cause motion or create change.

SC.4.P.10.2 Investigate and describe that energy has the ability to cause motion or create change.

SC.4.P.12.1 Recognize that an object in motion always changes its position and may change its direction.

SC.5.P.10.2 Investigate and explain that energy has the ability to cause motion or create change.

SC.5.P.13.1 Identify familiar forces that cause objects to move, such as pushes or pulls, including gravity acting on falling objects.

SC.5.P.13.2 Investigate and describe that the greater the force applied to it, the greater the change in motion of a given object

SC.5.P.13.4 Investigate and explain that when a force is applied to an object but it does not move, it is because another opposing force is being applied by something in the environment so that the forces are balanced

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

SC.7.P.11.2 Investigate and describe the transformation of energy from one form to another.