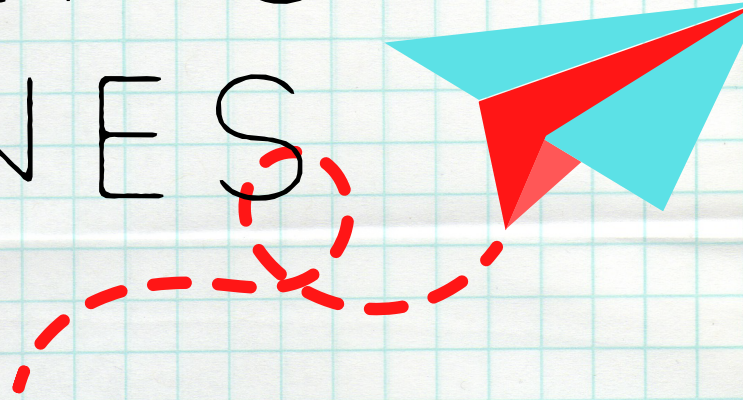


DIY FLYING MACHINES



STEM Lesson

1. What is flight? (the process by which an object moves through a space without contacting any planetary surface)
2. How do objects fly?
3. What are the forces involved in making things fly?
4. Who studies flight and objects that fly?
5. Why would someone want to study flight and flying objects?
6. Other than planes, what are different types of "flying machines" you can think of?
7. How do you think engineers create new flying machines? What steps do they take?
8. Today we are going to explore engineering flying machines, and work to improve designs in order to achieve better flight! Great ideas, however, don't always work – and engineers need to improve their designs.

Materials Needed:

- 2 large buckets
- Kitchen timer
- Measuring tape
- Paper plates
- Dixie cups (use instead of egg carton)
- Straws
- White Paper
- Index cards
- Stop watches
- Scissors
- Scotch tape
- Markers
- Instructions

STEM Careers:

Aerospace Engineer: The main job of an aerospace engineer is to design flying machines. These range from airplanes, jets, and even missiles to spacecrafts, space stations, and satellites. Many aerospace engineers focus their expertise on specific components of a certain flying machine such as the wings of an aircraft or the control system of a spacecraft.

Mechanical Engineer: Mechanical engineers may work on the design, development, testing, or repairing of the systems of flying machines, and may focus on engines, propellers, sensors, and navigation systems.

ACTIVITY DESCRIPTION:

STUDENTS WILL WORK WITH PARTNERS IN ORDER TO CREATE AND IMPROVE THE DESIGN FOR THEIR OWN FLYING MACHINES.

Activity Instructions:

DIY Flying Machine Stations (link) – Allow students to rotate with their group, spending 6 minutes at each station. Students should study the model at each station in order to make their own improved design.

- Stations: Paper Airplanes; Straw Gliders; Paper Plate Frisbees; Dixie cup Helicopters

Inquiry questions:

What are the factors that influence an object's ability to fly?

Lift: the force that directly opposes the weight of an airplane and holds the airplane in the air.

Drag: the force that resists movement of an aircraft through the air. Think of air resistance.

Weight: the force acting on the object due to gravity. The weight of an aircraft affects how long it takes to lift off into the air, how well it balances while in flight, and how much it can carry while in flight.

Thrust: Thrust is mainly used in rockets and airplanes. It occurs when a system (such as a rocket) expels or accelerates mass (such as rocket fuel) in one direction. When this occurs, the accelerated mass (rocket fuel) will cause a force of equal magnitude but opposite direction to be applied to that system. Thrust is used to overcome the drag of an airplane, and to overcome the weight of a rocket.

Flying Machine testing: After each test, have students try to improve their designs to test better!

Distance Test: Have students test all their objects to see 1) Which object flies the farthest and 2) Who has the better performing design of each object (flies straighter, faster, can carry weight?)

Helicopter Test: Have students test their helicopters and see whose helicopter can stay in the air the longest. Encourage them to discuss what might help their design perform better.

Float Test: Have students select the 1 flying machine they think will stay in the air the longest (Frisbee, airplane, straw glider, etc.). Let groups use kitchen timers to time how long they can stay in the air.

Conduct the following tests as a class across the classroom.

Accuracy Test: Use the large blue buckets as targets to hit with their objects. Have each group select 1 of their flying machines (Frisbee, airplane, straw glider, etc.) for the accuracy test. See which group's machine can make it into the bucket (hit the target) first.

Speed Test: Have each group select 1 flying machine (Frisbee, airplane, straw glider, etc.). They will race their objects from one point of the room to the other. Have them observe or use the kitchen timers to time which machine got to the other side of the room first. Encourage them to discuss what they could change to make their machine travel even faster.