Tetrahedral kite template

Today, we can enjoy the luxury of flying from one location to another jumbo jet airliners. We have state-of-the-art military jets that can travel faster than sound. But, the first form of aviation was kite. In this tutorial, you will learn how to make your very own tetrahedral mite. A kite much similar to an Alexander Graham Bell invented in 1903. Grade Level: 7 (6-8) Time Required: 45 minutes Expendable Cost/Group: US$5.00 Group Size: 4 Activity Dependency: Any Subject Area: Physics, Science and Technology After this activity, students should be able to understand: Basic elements of flight. Basic manufacturing systems and processes. NGSS performance expected MS-ETS1-4. Develop a model to generate data for repeater testing and modification of a proposed object, equipment, or process so as to achieve an optimal design. (Grade 6 - 8) Do you agree with this alignment? Thanks for your feedback! Click to view other courses expected of this performance This activity focuses on the following three-dimensional learning aspects of NGSS: Science and Engineering Practices Disciplinary Core Idea Crosskitting concepts Develop a model to generate data to test ideas about design systems, including those representing input and output. Alignment Agreement: Thanks for your feedback! All types of model solutions are important for testing. Alignment Agreement: Thanks for your feedback! The repetition process of testing the most promising solutions and modifying the proposed based on test results leads to greater refinement and ultimately leads to an optimal solution. Alignment Agreement: Thanks for your feedback! Models can be used to represent systems and their interactions. Alignment Agreement: Thanks for your feedback! Using manual, protocol or information provided by experienced people to see and see how things work. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! Manufacturing systems use mechanical processes that alter the form of materials through processes of separating, forming, combining and conditioning them. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! The manufacturing process involves designing, developing, manufacturing and servicing products and systems. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! Describe and interpret manufacturing systems of custom and mass production. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! Explain basic processes in manufacturing systems, for example, cutting, shaping, assembling, joining, finishing, quality control and safety. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for the feedback! Identify and explain lift, drag, friction, thrust and gravity A vehicle or device, e.g., cars, boats, airplanes, rockets. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! Recognize that gravity is a power that pulls everything towards and near the center of the earth. Gravity plays a major role in the formation of planets, stars and the solar system and determining their speed. (Grade 6 - 8) See more details combine courses Do you agree with this alignment? Thanks for your feedback! The suggestion that an alignment kite string glue is not listed above 7 3/4 per tissue paper 4 full size sheets of paper 7 3/4 tall plastic straws (not flexible kind), 60 per kite pipe cleaner (per kite). 1) Scissor poster board or oak tag (1/4 kite per board) pencil kite template and instructions (attached) kite template and instructions (PDF) kite template and instructions (doctor) travel [www.teachengineering.org/activities/view/tetrahedral_kites] stops to print or download. Do you know how a plane flies? Believe it or not, it's all because of the unique shape of the airplane's wings. Burnouli's theory states that as the speed of moving fluid increases, the pressure within the fluid decreases. As soon as the aircraft flies, the air travelling above and below its wing is considered fluid. The plane's wings are designed in such a way that the top of the wing is curved while the bottom of the wing is flat. This makes a long distance to the air at the top of the wing to travel compared to the wind at the bottom of the wing. Since the air above and below the wing should travel from the front of the wing to the back of the wing at the same time, the wind at the top of the wing should travel faster for a long distance journey. Now applying the principle of Burnouli, as the air at the top of the wing travels faster, it reduces the pressure on the top of the wing. Because there is low pressure at the top of the wing and a high pressure under the wing, it creates an uneven force on the wing thereby lifting it, thus allowing the aircraft to fly. In today's activity, you will apply this mechanism of flight to design tetrahedral kites. Working in teams of four, you will manufacture a tetrahedral moth after a specific set of instructions and using specific provided materials. To build a full tetrahedral kite within the same time frame - you will use basic processes found in multiple manufacturing systems - cutting, shaping, forming, conditioning, assembling, joining, finishing and quality control. Pay attention to the efficiency of your team, the quality of the prepared kite and the time frame. The test of the moth is simple, we will give time to see how long it lasts in flight. The background explains Newton's third rule of action and response that there is a similar and opposite response to every action. Burnouli's principle is the preservation of energy for fluid flowing which has no viscosity. In the case of an aircraft or mite flying in the air, it states that as a fluid As the wind passes down from a wing, the wind also passes over it. The air at the top of the wing travels long distances on the curved surface of the wing, thus it sharply reduces the pressure above the wing. The air under the wing moves more slowly so that the air pressure under the wing becomes larger than the pressure above the wing. This is a change in the relative pressures above and below the moth that allows the lifting of the mite. Figure 1: Example of tetrahedral mite. The kites were the first flying equipment made by humans. The term comes from a bird in the Kite Hawk family known for its grace in the air. Kites come in a wide variety of shapes and sizes and have been used for many purposes throughout history, although today, kite flying is largely used for entertainment. See Figure 1 for the example of a tetrahedral mite, the way students will manufacture in activity. Recommended Resources: et3m-tkkw/history-table.html Collect preparation materials. Make copies of kite templates and instructions. Students with Stage 1: Pyramid making received six straws, measure and cut a 72 (182.88 cm) long piece of kite string. Thread 4 straws on the kite string. Hold at the ends. Place approximately 3 (7.62) arrange straws on a diamond shape toward the end A of the string and use the pipe cleaner needle to feed the string through the starter straw, so that it comes out between straw 1 and straw 2. Add the fifth straw and place it in the center of the diamond. Feed the needle back through the third straw so that it comes out between straw 2 and 3. Add the sixth straw. Drag the straws up so that a triangle can be formed. Turn it off so that your triangles create a static pyramid shape. Now, create 9 more pyramids using steps 1-5! Step 2: The construction of kite paintings of each stage can be seen on (ref 1). Using the template, carefully trace and cut 20 tissue paper sizes. Cover the two sides of each pyramid with tissue paper. Fold the edges of the tissue paper around the straw and glue in place. Collect the moth. Start with the bottom layer. The three pyramids arrange side by side so that they only touch from one corner and each has a cover panel in front (all of the cover panel must lie in a plane). Other cover panels should be lying flat on the table. Pyramid knots at the points where they meet. The two pyramids behind those three arrange so that the front cover panels of the two new pyramids face the same direction as the front three. The rear corners of the front three meet the corners just in front of the back two. Touch that two pyramid knots at all points. Attach another pyramid to the back corners of the row with two, again facing the cover panel ahead. Make sure all knots are safe! Add the second layer of the pyramid. Arrange two pyramids together Sure the cover panels are at the bottom and front). Knot them for each other. Align the corners beneath these two with the peaks of the front five pyramids on the bottom layer. Knot these two pyramids in the lower layer. Arrange and attach a third triangle behind the two you just attached. Make sure all knots are safe! Add the third and last layer. Attaching a pyramid to the top of the second level is still facing the cover panel ahead. The prepared moth itself looks like a giant pyramid. Make sure all knots are safe! Corners where the front panel meets the back panel attach kite strings. With strings here, the panels will face down when in flight and the triangle will look like birds in flight. Add a tail to keep the mite properly oriented towards the wind. Step 3: Check notting by flying your kite. Attach flying string. Go out and fly your kite! Start a stopwatch as soon as you let your kite go (or when your partner lets go), and then turn off the stopwatch when the kite touches down on the ground. It won't be a fair trial as long as the air changes too much. Groups can see improvements in flight times as they modify and improve their kite design. Step 4: Analyze manufacturing assemble the classroom for a closing discussion. Ask the inquiry question, and the following question: How well did your team work together to make their kites? Were you skilled? Where was the time wasted? What were the problems? Which improvement was made to the biggest difference in flight time? Did you follow specific instructions and use specified materials? Did you finish on time? What was the quality of the final product? Describe all the basic manufacturing system processes you use (cutting, shaping, forming, conditioning, assembling, joining, finishing and quality control). What improvements will you make in the process of making kites? What is Industrial Engineering? (After listening to student suggestions, read the definition.) How did your kite-making team do a kind of industrial engineering today? Drag: A frictional force that is parallel to the direction of a fluid (as wind) and motion on the body (as airplanes). Gravity: The force of attraction between two objects due to the mass of objects and the distance separating them. Industrial Engineering: A branch of engineering related to the optimization of complex processes or systems. It relates to the development, reform, implementation and evaluation of the integrated system. Originally the term applicable to manufacturing, but any systematic or quantitative approach to being efficient in how to operate a process, system or organization has become involved. Lift: A component of a total aerodynamic force acting on an airplane or airfoil that is perpendicular to relative air and an upward force for airplanes that resist the pull of gravity. Relative Air: Produced by Airflow Running through the air. Relative air is parallel to the direction of flight and in the opposite direction. Tension: Two stretching forces stretch an object that directly resist each other. The tension in the string keeps preventing the mite from flying away. Example Performance Evaluation Rubric Criteria: 4 (Advanced) project meets the guidelines set by the teacher 3 (efficient) the project meets the guidelines 2 (developing) the project meets certain guidelines 1 (beginner) the project fails to meet the guidelines or is incomplete 0 Project does not attempt to use flight time kite design is a simple quantitative way to track improvements. How and why do things grow upwards? Why does the mite fly? How can a team of students produce a finished product most efficiently - tetrahedral kite - using manufacturing processes? How will the modifications of the initial design of the project change the performance of the kite? Last Revised: December 14, 2020 2020