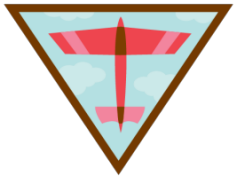

Brownie Mechanical Engineering: Fling Flyer Design Challenge

Pillar: STEM
Outcomes: Seeks challenges and learns from setbacks

Work like an engineer to create a Fling Flyer, an airplane you'll make, and explore what keeps it and other things such as birds, planes, and spaceships in the air.

Brownies will earn their badge by:

1. **Learn about forces that affect flight**
   - Make a paper airplane or hoop glider of any design and fly it. Talk to your family about the forces that help your plane fly.
     - Force: The strength or energy that creates movement (push and pull are examples)
     - Gravity: The force that pulls objects toward each other and towards the earth
     - Thrust: The force that moves an object forward
     - Drag: The force (air molecules) that acts against something in flight
     - Lift: The force that pushes back up on the wings during flight
     - Balanced Forces: These exist when forces are equal on an object – when forces are balanced the object does not move
     - Unbalanced forces: These exist when forces are unequal on an object – the object moves in the direction of the greater force.
     - Friction: The force that slows moving objects.

2. **Design and build a Fling Flyer**
   - A Fling Flyer is a model plane with added thrust, using a rubber band like a slingshot. Here's a sample created with 1 dowel, 8 craft sticks, 1 paperclip, 1 rubber band, paper and tape.
   - Collect your materials from around the house:
     - Drinking straws, a bamboo skewer, a chopstick, a dowel, or a thin piece of wood
     - Heavy card stock, paper, chipboard (cereal boxes), or a paper or Styrofoam plate
     - Glue or a hot glue gun with glue
     - Tape – any type
     - A paperclip, safety pin, medium gauge wire, or a metal coat hanger
     - A rubber band, a hair tie, or a piece of elastic
   - Based on the materials available, design a Fling Flyer, keeping in mind the forces you learned about when making your paper airplane.
   - Have your family members design and make a Fling Flyer, too!

3. **Test your Fling Flyer**
    - Time for lift-off! Take your Fling Flyer outside and test its abilities. Compete with your family members. Fly it multiple times and record the following:
        - Mark how far your Flyer flings
        - Time how long it stays airborne
        - Try to make it do flips

    Need supplies to complete this badge? ScrapsKC has badge kits for sale with supplies for steps 2 and 3.

4. **Analyze and share your results**
    - The results from your flight tests are called data Engineers look at all the data from a test to figure out what works best and what needs improved. If you competed with your family, compare your results.
        - What did the farthest flying Fling Flyers have in common?
        - What did the longest airborne Fling Flyers have in common?
        - What did the most acrobatic (most tricks) Fling Flyers have in common?
    - Talk about the results and share your findings with a family member or troop leader, via phone, text, video call, or letter.

5. **Brainstorm ways to improve your design**
    - If you were going to keep working on your Fling Flyer design, what would you change and why? Repeat the design, build, test, analyze, and improve steps with modifications as many times as you would like.

When you've earned this badge, you'll have learned about the forces that affect flight as you design, build, and test a Fling Flyer. You'll know how to design an investigation, and fine-tune your design after testing, just like engineers.

Online additional resources:

- Brownie Fling Flyer Pinterest Board: https://www.pinterest.com/gprograms/brownie-resources/badge-fling-flyer-mechanical-engineering/
- US Toy will be offering these badge classes online - check their Community Partner page for dates and times: https://www.gsksmo.org/en/events-repository/2050/CP-us-toy.html

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When you're finished: Congratulations, you have earned your badge! You can purchase by emailing shopdept@gsksmo.org or at https://www.girlscoutshop.com/Brownie-Fling-Flyer-Design-Challenge