Overview
In the Fling Flyer Design Challenge, Brownies learn about the forces that affect flight as they design, build, and test a Fling Flyer. Brownies learn how to design an investigation—and fine-tune their designs after testing it.

Step One: Learn about forces that affect flight
Step Two: Design and build a Fling Flyer
Step Three: Test your Fling Flyer (To be completed in Fling Flyer Design Challenge 2)
Step Four: Analyze and share your results (To be completed in Fling Flyer Design Challenge 2)
Step Five: Brainstorm ways to improve your design (To be completed in Fling Flyer Design Challenge 2)

This meeting, Brownies learn about thrust, drag, gravity, and lift before building a Fling Flyer with GoldieBlox. Brownies complete Step One & Step Two of the Fling Flyer Design Challenge badge.

Note to Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you’ll find suggested talking points under the heading “SAY.” Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It’s What Girl Scouts Do!): Each meeting includes a “Prepare Ahead” section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed.

This badge requires the GoldieBlox Making Things Zoom kit. Each kit includes 6 sets of GoldieBlox parts for the badge, (i.e. you can create 6 of any Brownie Design Challenge badge from one kit). Inside the kit are six sets of GoldieBlox parts that allow girls to earn all 3 Brownie Design Challenge badges. Two to four girls can use each set. So if you have 12 girls, buy one kit per them to work in pairs. You can purchase the kit online from the Girl Scout Shop: http://www.girlscoutshop.com/

You will not be able to buy the correct kit from the GoldieBlox website or your council shop.
Fling Flyer Design Challenge 1

**Use Girl Scouts’ Three Processes:** Girl-led, learning by doing, cooperative learning — these three processes are the key to making sure Brownies have fun in Girl Scouts and keep coming back.

“Learning by doing” and “cooperative learning” are built into this Badge, thanks to the hands-on activities and tips. You’ll also find specific “keep it girl-led” tips in the meeting plans. They’ll help you create an experience where Brownies know they can make choices and have their voices heard.

**Fail Fast. Succeed Sooner:** That’s how engineers solve problems. In this badge, Brownies will learn about engineering through hands-on activities. They’ll learn to: Brainstorm ways to solve a problem, design prototypes, test them to see what does and doesn’t work, then improve their designs. To engineers, failure is a good thing because every time a design fails, you learn something and can make it better.

You can help Brownies think this way. When her prototype doesn’t work, ask questions like, “Why do you think it didn’t work? How can you change your design? Try again — that’s what engineers do!” This approach also keeps the activity girl-led and fun because Brownies are free to invent things without feeling the pressure to make them perfect.

**Leave Time for the Closing Ceremony:** If Brownies are having fun doing a Design Challenge, you may be tempted to skip the Closing Ceremony so they can keep going — but the Closing Ceremony is absolutely key to their learning. Here’s why:

When Brownies leave a meeting, they’ll remember how much fun it was to build a Leap Bot or to make a car speed down a ramp. However, they may not realize that they just learned how engineers solve problems or that they’re good at engineering — unless you tell them.

That’s why the Closing Ceremony is so important. It’s where you can connect the dots for Brownies by:

- Pointing out how they acted as engineers. (**For example:** They did rapid prototyping. When one of their prototypes didn’t work, they saw that “failure” as helpful feedback and tried something else. They worked together to find solutions. They shared their designs and offered suggestions.)
- Reminding Brownies that they are *already* engineers — and that it’s fun to solve problems using engineering.
- Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost Brownies’ confidence and interest in STEM — and
end the meeting on an upbeat note!

**Tell Your Troop Story:** As a Girl Scout leader, you’re designing experiences that Brownies will remember their whole lives. Try to capture those memories with photos or videos. Brownies love remembering all they did — and it’s a great way for parents to see how Girl Scouting helps their Brownies!

And please do share your photos and videos with GSUSA by emailing them to STEM@girlscouts.org (with photo releases if at all possible!).

**Prepare Ahead (Roughly 50 minutes)**

**PLEASE NOTE:** You will need the GoldieBlox Making Things Zoom kit for girls to complete the requirements and earn the badges. Details for the kit are listed in this section and on the Materials List.

1. **Review vocabulary (2 minutes)**

   This meeting introduces a new word:

   - **Engineers** – people who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges and cars.
   - **Force** – the strength or energy that creates movement. Push and pull are examples of forces.
   - **Thrust** – the force that pushes something through the air.
   - **Drag** – the force (air molecules) that acts against something in flight.
   - **Gravity** – a force that pulls objects toward each other and towards the earth.
   - **Lift** – a force that pushes back up on the wings during flight.
   - **Balanced forces** – when forces are equal on an object, it does not move.
   - **Unbalanced forces** – when forces are unequal on an object, it moves in the direction of the greater force.

   See the [Glossary for Brownie Design Challenge Badges](#) for more vocabulary and examples.

2. **Read through this guide and handouts (15 minutes)**

   This will help you get familiar with the flow of the meeting.

   The following handouts can be found in Meeting Aids.
Fling Flyer Design Challenge 1

- **Brownie Design Challenge Badges Materials List:** Each meeting has its own materials list, but you can use this handout if you like to do all your supply shopping at one time. It includes all materials needed for the entire badge.

- **Glossary for Brownie Design Challenge Badges:** This is a list of words that Brownies may not know and how to define them.

- **Think, Pair, Share:** These facilitation tips will help you to make sure that every girl’s voice is heard during brainstorming activities.

3. **Gather materials (30 minutes)**

Gather materials using the Materials List for this meeting. If your meeting location doesn’t have a flag, bring a small one that Brownies can take turns holding or hang in the room.

*(Note to Volunteers: You will need the GoldieBlox Making Things Zoom kit for the girls to complete the requirements and earn the badges. You can purchase this from the Girl Scouts Shop: [http://www.girlscoutshop.com/](http://www.girlscoutshop.com/).)*

**Get Help from Your Family and Friends Network**

**Your Friends and Family Network can include:**
- Brownies’ parents, aunts, uncles, older siblings, cousins, and friends
- Other volunteers who have offered to help with the meeting.

**Ask your Network to help:**
- Bring art supplies.
- Assist with Design Challenge activities.

**Award Connection**

Brownies will earn one award:
- Fling Flyer Design Challenge badge

Brownies receive the award following the completion of all three steps of the badge in **Fling Flyer Design Challenge 2**.

*(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)*
Fling Flyer Design Challenge 1

Meeting Length
90 minutes
- The times given for each activity will be different depending on how many Brownies are in your troop.
- There is no snack time scheduled in these meetings, but there are 15 minutes of “wiggle room” built in for snacks or activities that run long.
- Give Brownies 10- and 5-minute warnings before they need to wrap up the last activity so you’ll have time for the Closing Ceremony.

Materials List

Activity 1: As Girls Arrive: Engineering Paper Airplanes
- Paper (Construction, white, etc. A variety of papers gives girls the opportunity to try making planes with different paper weights.)
- Crayons, colored markers

Activity 2: Opening Ceremony: Taking Flight!
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Learn About Forces that Affect Flight
- Paper Airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes

Activity 4: Design and Build a Fling Flyer
- GoldieBlox Making Things Zoom kit (one set for each girl, pair, or small team)
- Sample Fling Flyer
- Paper
- Pencils
- Optional: Fling Flyer Investigation worksheets

For each Fling Flyer, girls will need these GoldieBlox:
- 2 mini axles
- 1 long axle
- 2 star stoppers
- 1 angle joint
- 2 T-joints
Fling Flyer Design Challenge 1

- 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
- 1 rubber band

Activity 5: Closing Ceremony: Fling Flyer Forces
- None

Awards
Girls do not receive any awards in this meeting.

Detailed Activity Plan

Activity 1: As Girls Arrive: Engineering Paper Airplanes

Time Allotment
10 Minutes

Materials
- Paper (Construction, white, etc. A variety of papers gives girls the opportunity to try making planes with different paper weights.)
- Crayons, colored markers

Steps
Welcome Brownies, and ask them to create paper airplanes.

SAY:
*Today, you’re going to engineer a Fling Flyer that flies across the room!*

*To start thinking about flight, can you make a paper airplane?*

*Here are some different types of paper and supplies to try out and decorate your paper airplane.*

Activity 2: Opening Ceremony: Taking Flight!

Time Allotment
10 Minutes

Materials
Fling Flyer Design Challenge 1

- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Steps
Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Introduce Brownies to the Fling Flyer Design Challenge.

SAY:
*Today, we’re starting the Fling Flyer Design Challenge badge!*

You’re going to learn how to create a Fling Flyer, an airplane made with GoldieBlox, and explore what keeps it and other things, like birds, planes, and space ships, in the air.

*Engineers use their imaginations to solve problems. They invent and build things. You’ll do the same thing today!*

Activity 3: Learn About Forces that Affect Flight

Time Allotment
20 Minutes

Materials
- Paper Airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes

Steps
Brownies learn about thrust, drag, gravity, and lift for Step One of the Fling Flyer Design Challenge.

Have Brownies line up (side to side) with their paper airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes.

SAY:
*Let’s see you fly your paper airplanes. On the count of three, release your plane!*

*One, two, three…fly!*

Brownies release their paper airplanes.
Fling Flyer Design Challenge 1

Introduce the forces that affect flight using the paper airplanes as an example.

**SAY:**
*What makes the best paper airplane?*

**Girls may say:** One that flies farthest, stays airborne longest, or does the most flips and tricks.

*In order to design the best paper airplane or a Fling Flyer, we need to know a little bit about the forces that act on things when they fly.*

*What pushes the paper airplane forward through the air?*

**Girls may say:** My arm, I threw it, etc.

*By bending your elbow and throwing the airplane, you are able to add extra strength or force into your airplane’s flight.*

*Does anyone know what force is? (Answer: Force is the strength or energy that creates movement.)*

*Everything in our world moves because of different forces at play. Push and pull are two examples of forces.*

*You threw the paper airplane, propelling it through the air with force. This is called the “thrust”. Thrust is an example of a force, or a push and pull that creates movement.*

*Why do the paper airplanes slow down?*

**Girls may say:** The air stops them, I didn’t throw hard enough, etc.

*The airplanes slow down because there are little molecules of air that act with force against the airplane, slowing it down.*

*When you threw the paper airplane, it came back down, right? Why did that happen? (Answer: Gravity.)*

*Who knows what gravity is?*

**Girls may say:** What makes things fall to the ground or I don’t know.

*Gravity is another force. Gravity is a force that pulls objects toward each other.*
Fling Flyer Design Challenge 1

For example, when you drop a ball, it falls to the ground. That’s because the earth’s gravity pulls the ball toward it.

If you jump up, gravity brings you back down to the ground.

Can you show me how gravity brings you back when you jump? Try it out!

Brownies jump up and down.
Use the paper airplanes to explain lift and balanced forces.

SAY:
Did your airplane fly straight? If it didn’t, why do you think this happened? (Answer: Air is in the way.)

The wings deflect the air, which pushes back up on the wings. It’s why paper flutters to the ground instead of falling straight down. This force is called “Lift.”

For example, if you dropped a ball, would it flutter like dropping a paper airplane? (Answer: No or very little.)

The wings help the airplane to move against and through the air. Even when the airplane is falling, its wings are still at work, slowing its fall to the ground.

Now, whose airplane went the farthest? Raise your hand!

The Brownie whose airplane went the farthest raises her hand.

Explain balanced forces.

SAY:
Great job! You designed the airplane that moved through the air with the most force!

Now, what do you think would happen if you tried to fly your airplane outside on a very windy day?

Girls may say: It would be harder, it wouldn’t fly straight, it wouldn’t go very far, etc.

It would be very windy, adding more force that would act against your airplane, making it very hard to fly straight or even at all!

What way would your airplane move in the wind? (Answer: In the direction of the wind.)
Fling Flyer Design Challenge 1

The force of the wind is stronger than the force you put into throwing your airplane, so your airplane would go in the direction of the wind. This is called an unbalanced force.

When forces are unbalanced, the object moves in the direction of the greater force, like your airplane moving with the wind on a windy day.

What do you think happens when forces are balanced though? (Answer: Neither force moves the object.)

The object, like the airplane, doesn’t move at all! The paper airplane won’t fly itself, so you add force when you throw it.

Now, let’s use all this information to build our own Fling Flyers.

Activity 4: Design and Build a Fling Flyer

Time Allotment
20 Minutes

Materials
- GoldieBlox Making Things Zoom kit (one set for each girl, pair, or small team)
- Sample Fling Flyer
- Paper
- Pencils
- Optional: Fling Flyer Investigation worksheets

For each Fling Flyer, girls will need these GoldieBlox:
- 2 mini axles
- 1 long axle
- 2 star stoppers
- 1 angle joint
- 2 T-joints
- 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
- 1 rubber band

Steps
If you don’t have enough supplies for each Brownie to make her own Fling Flyer, divide Brownies into pairs or small groups for Step Two of the Fling Flyer Design Challenge.
Fling Flyer Design Challenge 1

Show Brownies your sample Fling Flyer.

**Optional:** Distribute **Fling Flyer Investigation worksheets** for girls to design their Fling Flyer, thinking and considering the forces at work. Give the girls time to design their investigations.

Hand out paper and pencils to each team for Brownies to design their Fling Flyer.

**SAY:**

*Now, you’re going to use your GoldieBlox to create a Fling Flyer.*

*Before engineers build things, they plan their design. Designing your product before you build allows you to think through any problems and troubleshoot them ahead of time.*

*Draw your fling flyer to help figure out how to build it. If you already have ideas to make the Flyer fly even better, feel free to try them out!*

When they’re finished designing, hand out the GoldieBlox sets.

**(Note to Volunteers:** If you do not have enough craftstruction wings for every Fling Flyer, have girls use one as a template to cut and create others with heavy paper and scissors/hole punch.)

Let the girls build their Fling Flyers and practice flying them.

**Keep It Girl-Led:** By having girls reverse engineer the Fling Flyer, Brownies have a hands-on opportunity to learn about the different parts instead of following directions. If they’re having trouble, ask them questions like, “What GoldieBlox do you recognize in the Fling Flyer? How are they stuck together?”

If girls need help, lead them to connect the angle joint to the long axle. On the other end of the long axle, add a T-Joint, mini axle, and another T-joint. Connect the craftstruction or paper wing by placing the holes on top on the T-joints and attaching the star stoppers.

**Optional:** Show Brownies the “How to Build a Fling Flyer” video [here](#) for video instructions.

Circulate among the groups, asking questions to prompt further exploration.

**(Note to Volunteers:** You may want to save the Brownies’ Fling Flyers for the next meeting, Fling Flyer Design Challenge 2. If you are able to, label each Flyer with the girl or group’s name(s) and put away until the next meeting. If you are unable to keep them...
together, don’t worry, the girls will have a chance to rebuild at the start of the next meeting.)

**Activity 5: Closing Ceremony: Fling Flyer Forces**

**Time Allotment**
10 Minutes

**Materials**
- None

**Steps**

Have Brownies form a Friendship Circle, and discuss with girls how they designed their Fling Flyers.

**SAY:**
*What forces did you think about when designing and building your Fling Flyer?*

*What pushes the Flyer forward through the air?* (Answer: The rubber band. This is called “Thrust.”)

*Why does the Flyer slow down?* (Answer: It has to push air molecules out of the way. This is called “Drag.”)

*What pulls the Flyer back down to the ground?* (Answer: Gravity.)

*Why doesn’t it fall straight down if gravity is pulling on it?* (Answer: Air is in the way—the wings deflect the air, which pushes back up on the wings. It’s why paper flutters to the ground. This force is called “Lift.”)

*When forces on an object are balanced, like a box being pushed equally by two girls on opposite sides, what happens?* (Answer: Neither force moves the object.)

*When forces are unbalanced, like two girls pushing on one side of the box or trying to walk on a windy day, what happens?* (Answer: The object moves in the direction of the greater force.)

End the meeting with a Friendship Squeeze.
Fling Flyer Design Challenge 1

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Design Challenge Badges
Glossary for Brownies

Brownies may not know some of the words used in these badges. Here are definitions you can share with them:

**Engineers** are people who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges and cars.

**Force** is the strength or energy that creates movement. Push and pull are examples of force.

**Gravity** is a force that pulls objects toward each other and towards the earth.

**Potential energy** is the energy stored in your body and everything else in our world.

When potential energy is released, it becomes **kinetic energy** which bring bodies and object to move.

**Thrust** is a force that slows moving objects.

**Drag** is the force (air molecules) that acts against something in flight.

**Lift** is a force that pushes back up on the wings during flight.

**Balanced forces** exist when forces are equal on an object. When the forces are balanced, the object does not move.

**Unbalanced forces** exist when forces are unequal on an object. When the forces are unbalanced, it moves in the direction of the greater force.

**Features** are parts of a product that are designed make them more useful.

**Friction** is a force that slows moving objects.
Brownie Design Challenge Badges: Materials List

Leap Bot Design Challenge 1

Activity 2: Opening Ceremony: All About Solving Problems
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Learn About Springs
- Sample Leap Bot made from the GoldieBlox Making Things Zoom kit

Activity 4: Build Your Leap Bot
- GoldieBlox Making Things Zoom kit (one set for each pair or small team)

For each Leap Bot, girls will need these GoldieBlox:
- 4 mini axles
- 1 long axle
- 2 angle joints
- 2 elbow joints
- 4 spacers
- 4 pegs
- 1 star coupler
- 3 wheel hubs
- 3 small wheel ends
- 2 big wheel ends
- 1 long spring

Leap Bot Design Challenge 2

Activity 1: As Girls Arrive: Prepare For Testing
- Leap Bots created by girls in Leap Bots Design Challenge 1. (Note to Volunteers: If you were unable to save the Bots between meetings, Brownies can rebuild them during this activity.)
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team).

Activity 2: Opening Ceremony: Leap Bot Forces
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Create a Way to Test How Well Your Leap Bot Performs
- Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Rulers, yardsticks, etc.
- Tape
- Paper

Activity 4: Record the Results of Your Test
- Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Leap Bot Testing Stations created by girls in Activity 3: Create a Way to Test How Well Your Leap Bot Performs
- Leap Bot Recording Sheet
- Long and Short springs from the GoldieBlox Making Things Zoom kit (3 or more from each set for each pair or small team)
- Leftover pieces from the GoldieBlox Making Things Zoom kit (for each pair or small team)
Brownie Design Challenge Badges: Materials List

Leap Bot Design Challenge 2 (continued)

Activity 5: Share Your Results
• Leap Bot Recording Sheets, filled out by girls in Activity 4: Record the Results of Your Test

Activity 6: Closing Ceremony: Awards
• Leap Bot Design Challenge award
( Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Fling Flyer Design Challenge 1

Activity 1: As Girls Arrive: Engineering Paper Airplanes
• Paper (Construction, white, etc. A variety of papers gives girls the opportunity to try making planes with different paper weights.)
• Crayons, colored markers

Activity 2: Opening Ceremony: Taking Flight!
• Flag
• Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Learn About the Forces that Affect Flight
• Paper Airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes

Activity 4: Design and Build a Fling Flyer
• GoldieBlox Making Things Zoom kit (one set for each girl, pair, or small team)
• Sample Fling Flyer
• Paper
• Pencils
• Optional: Fling Flyer Investigation worksheets

For each Fling Flyer, girls will need these GoldieBloxs:
• 2 mini axles
• 1 long axle
• 2 star stoppers
• 1 angle joint
• 2 T-joints
• 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
• 1 rubber band
Brownie Design Challenge Badges: Materials List

Fling Flyer Design Challenge 2

Activity 1: As Girls Arrive: Prepare for Testing
• Fling Flyers created by girls in Fling Flyer Design Challenge 1. (Note to Volunteers: If you were unable to save the Flyers between meetings, Brownies can rebuild them during this activity.)

Activity 2: Opening Ceremony: Forces that Affect Flight
• Flag
• Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Test Your Fling Flyer
• Fling Flyers created by girls in Fling Flyer Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
• Cardstock, construction paper, or copy paper (the heavier the better)
• Scissors or hole punches
• Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)
• Masking tape
• Cone, rock, or anything else to mark the furthest distance flown

Activity 5: Brainstorm Ways to Improve Your Design
• Fling Flyers from Activity 3: Test Your Fling Flyer
• Cardstock, construction paper, or copy paper (the heavier the better)
• Scissors or hole punches
• Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)

Activity 6: Closing Ceremony: Awards
• Fling Flyer Design Challenge award
(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Race Car Design Challenge 1

Activity 1: As Girls Arrive: Playing with Force and Friction
• Sports and game balls (one for each pair of girls). Bring different types of balls for girls to roll and observe friction. For example, you might bring a marble, tennis ball, basketball, ping pong ball, baseball, etc.
• Create two lines with masking tape on the floor. Each Brownie should sit on the line, facing their partner.

Activity 2: Opening Ceremony: Engineering Speed
• Flag
• Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Learn How Design Can Affect Speed
• Toy car to demonstrate force and friction
Race Car Design Challenge 1 (continued)

Activity 4: Design and Build Your Race Car
- GoldieBlox Making Things Zoom kit (one set for each pair or small team.) Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.

Activity 5: Closing Ceremony: Share Your Design
- Race Cars built by Brownies in Activity 4: Design and Build Your Race Car

Race Car Design Challenge 2

Activity 1: As Girls Arrive: Build A Simple Ramp
- Race cars created by girls in Race Car Design Challenge 1. (Note to Volunteers: If you were unable to save the race cars between meetings, Brownies can rebuild their cars during this activity.)
- Folders, poster boards, cardboard, etc., to lean against something to create a ramp
- Books, boxes, tables, etc. to create the height and top of a ramp

Activity 2: Opening Ceremony: Reviewing Force and Friction
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Your Racetrack
- Poster boards, cardboard, etc., to lean against something to create ramps
- Table(s) or books to create the top of ramps
- Paper or newspaper
- Masking tape

Activity 4: Conduct a Fair Test and Record Results
- Yardstick
- Ramp created by girls in Activity 3: Design Your Racetrack
- Race cars created by girls in Race Car Design Challenge 1 or rebuilt in Activity 1: As Girls Arrive: Build a Simple Ramp
- Optional: Phone or camera to capture “photo finishes”

Activity 5: Share What You Learned
- Race cars redesigned by girls in Activity 4: Conduct a Fair Test and Record Results

Activity 6: Closing Ceremony: Awards
- Race Car Design Challenge award

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)
Brainstorming Tips: Think, Pair, Share

How to Run a Think, Pair, Share Activity:

Tell girls that they’re going to brainstorm answers to your question using “Think, Pair, Share.”

Lead girls through the basic steps by telling them they will:

1. **Break into small groups.**
2. **Listen to the question or prompt.**
3. **Think about their answers.**
   - Girls may want to write their answers down.
   - Twenty seconds should be enough time, since girls will need to sit quietly.
4. **Pair with other girls.**
   - Girls talk with one to three other girls (depending on group size), making sure everyone has a chance to share their answers. If there’s time, it’s OK for girls to ask questions about each other’s answers.
   - For pairs, 20 seconds should be enough time. If your troop enjoys discussion, consider extending this to 1 to 2 minutes.
5. **Share with the group.**
   - Girls share their answers with the larger group.
   - This can be completed in 20 – 30 seconds, but will run longer based on group size and how the group sharing is done.

There are two ways to set up group sharing:

- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you’re running short on time. It also helps develop conflict resolution and compromise skills.
- **Optional:** Each girl shares her partner’s answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.
Fling Flyer

engineering concept: AERODYNAMICS

build date:

I built it!

Bloxsome!

Fling Flyer Design Challenge badge

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Fling Flyer Investigation

1. Choose the criteria for success (Response Variable). Circle one or write your own:
   - Flies farthest
   - Stays airborne longest
   - Does the most flips

2. Which forces do you need to maximize? Which do you need to reduce?

<table>
<thead>
<tr>
<th>MAXIMIZE</th>
<th>reduce</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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3. Choose a design to test (Independent Variable). Circle one or write your own:
   - Tail Width
   - Tail Length
   - Tail Shape
   - Bend Tips Up
   - Bend Tips Down
   - Cut Slits Along the Back

4. Write your research question:
   How does __________________ affect __________________? 
   independent variable response variable

5. Predict how you think the shape of your Fling Flyer will affect its motion. This is your hypothesis.

6. How will you measure your Fling Flyer’s motion?

7. How will you make your trials “fair tests”?

8. How many times will you measure your design to be sure of your results?
   Draw a table on the back of this page to record your data.
The Girl Scout Promise

On my honor, I will try:

To serve God and my country,
To help people at all times,
And to live by the Girl Scout Law.

The Girl Scout Law

I will do my best to be
honest and fair,
friendly and helpful,
considerate and caring,
courageous and strong, and
responsible for what I say and do,
and to
respect myself and others,
respect authority,
use resources wisely,
make the world a better place, and
be a sister to every Girl Scout.
Overview
In the Fling Flyer Design Challenge, Brownies learn about the forces that affect flight as they design, build, and test a Fling Flyer. Brownies learn how to design an investigation—and fine-tune their designs after testing it.

Step One: Learn about forces that affect flight (completed in Fling Flyer Design Challenge 1)
Step Two: Design and build a Fling Flyer (completed in Fling Flyer Design Challenge 1)
Step Three: Test your Fling Flyer
Step Four: Analyze and share your results
Step Five: Brainstorm ways to improve your design

This meeting, Brownies test, record and analyze data, and improve their Fling Flyers. Brownies complete Step Three, Step Four & Step Five, earning the Fling Flyer Design Challenge badge.

Note to Volunteers:

Use the Talking Points (But Make Them Your Own): In each session, you’ll find suggested talking points under the heading “SAY.” Some volunteers, especially new ones, find it helpful to follow the script. Others use the talking points as a guide and deliver the information in their own words. Either way is just fine.

Be Prepared (It’s What Girl Scouts Do!): Each meeting includes a “Prepare Ahead” section that includes a materials list and what kind of set-up is required. Read it in advance so you have enough time to gather supplies and enlist help, if needed.

This badge requires the GoldieBlox Making Things Zoom kit. Each kit includes 6 sets of GoldieBlox parts for the badge, (i.e. you can create 6 of any Brownie Design Challenge badge from one kit). Inside the kit are six sets of GoldieBlox parts that allow girls to earn all 3 Brownie Design Challenge badges. Two to four girls can use each set. So if you have 12 girls, buy one kit per them to work in pairs. You can purchase the kit online from the Girl Scout Shop: http://www.girlscoutshop.com/

You will not be able to buy the correct kit from the GoldieBlox website or your council shop.
Use Girl Scouts’ Three Processes: Girl-led, learning by doing, cooperative learning — these three processes are the key to making sure Brownies have fun in Girl Scouts and keep coming back.

“Learning by doing” and “cooperative learning” are built into this Badge, thanks to the hands-on activities and tips. You'll also find specific “keep it girl-led” tips in the meeting plans. They'll help you create an experience where Brownies know they can make choices and have their voices heard.

Fail Fast. Succeed Sooner: That’s how engineers solve problems. In this badge, Brownies will learn about engineering through hands-on activities. They’ll learn to: Brainstorm ways to solve a problem, design prototypes, test them to see what does and doesn’t work, then improve their designs. To engineers, failure is a good thing because every time a design fails, you learn something and can make it better.

You can help Brownies think this way. When her prototype doesn’t work, ask questions like, “Why do you think it didn’t work? How can you change your design? Try again — that’s what engineers do!” This approach also keeps the activity girl-led and fun because Brownies are free to invent things without feeling the pressure to make them perfect.

Leave Time for the Closing Ceremony: If Brownies are having fun doing a Design Challenge, you may be tempted to skip the Closing Ceremony so they can keep going — but the Closing Ceremony is absolutely key to their learning. Here’s why:

When Brownies leave a meeting, they'll remember how much fun it was to build a Leap Bot or to make a car speed down a ramp. However, they may not realize that they just learned how engineers solve problems or that they’re good at engineering — unless you tell them.

That’s why the Closing Ceremony is so important. It’s where you can connect the dots for Brownies by:

- Pointing out how they acted as engineers. (For example: They did rapid prototyping. When one of their prototypes didn’t work, they saw that “failure” as helpful feedback and tried something else. They worked together to find solutions. They shared their designs and offered suggestions.)
- Reminding Brownies that they are already engineers — and that it’s fun to solve problems using engineering.
• Letting them know that they have what it takes to continue exploring STEM.

These simple messages can boost Brownies’ confidence and interest in STEM — and end the meeting on an upbeat note!

Tell Your Troop Story: As a Girl Scout leader, you’re designing experiences that Brownies will remember their whole lives. Try to capture those memories with photos or videos. Brownies love remembering all they did — and it’s a great way for parents to see how Girl Scouting helps their Brownies!

And please do share your photos and videos with GSUSA by emailing them to STEM@girls scouts.org (with photo releases if at all possible!).

Prepare Ahead (Roughly 50 minutes)

PLEASE NOTE: You will need the GoldieBlox Making Things Zoom kit for girls to complete the requirements and earn the badges. Details for the kit are listed in this section and on the Materials List.

1. Review vocabulary (2 minutes)

This meeting introduces a new word:

• **Engineers** – people who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges and cars.
• **Force** – the strength or energy that creates movement. Push and pull are examples of forces.
• **Thrust** – the force that pushes something through the air.
• **Drag** – the force (air molecules) that acts against something in flight.
• **Gravity** – a force that pulls objects toward each other and towards the earth.
• **Lift** – a force that pushes back up on the wings during flight.
• **Balanced forces** – when forces are equal on an object, it does not move.
• **Unbalanced forces** – when forces are unequal on an object, it moves in the direction of the greater force.

See the Glossary for Brownie Design Challenge Badges for more vocabulary and examples.
2. Read through this guide and handouts (15 minutes)

This will help you get familiar with the flow of the meeting.

The following handouts can be found in Meeting Aids.

- **Brownie Design Challenge Badges Materials List**: Each meeting has its own materials list, but you can use this handout if you like to do all your supply shopping at one time. It includes all materials needed for the entire badge.

- **Glossary for Brownie Design Challenge Badges**: This is a list of words that Brownies may not know and how to define them.

- **Think, Pair, Share**: These facilitation tips will help you to make sure that every girl’s voice is heard during brainstorming activities.

3. Gather materials (30 minutes)

Gather materials using the Materials List for this meeting. If your meeting location doesn’t have a flag, bring a small one that Brownies can take turns holding or hang in the room.

*Note to Volunteers: You will need the GoldieBlox Making Things Zoom kit for the girls to complete the requirements and earn the badges. You can purchase this from the Girl Scouts Shop: [http://www.girlscoutshop.com/](http://www.girlscoutshop.com/).*

Get Help from Your Family and Friends Network

Your Friends and Family Network can include:

- Brownies’ parents, aunts, uncles, older siblings, cousins, and friends
- Other volunteers who have offered to help with the meeting.

Ask your Network to help:

- Bring art supplies.
- Assist with Design Challenge activities.

**Award Connection**

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Brownies will earn one award:
- Fling Flyer Design Challenge badge

Brownies receive the award following the completion of the final three steps of the badge this meeting.

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Meeting Length
90 minutes
- The times given for each activity will be different depending on how many Brownies are in your troop.
- There is no snack time scheduled in these meetings, but there are 15 minutes of “wiggle room” built in for snacks or activities that run long.
- Give Brownies 10- and 5-minute warnings before they need to wrap up the last activity so you’ll have time for the Closing Ceremony.

In the Fling Flyer Design Challenge, Brownies learn about the forces that affect flight as they design, build, and test a Fling Flyer. Brownies learn how to design an investigation—and fine-tune their designs after testing it.

Step One: Learn about forces that affect flight (completed in Fling Flyer Design Challenge 1)
Step Two: Design and build a Fling Flyer (completed in Fling Flyer Design Challenge 1)
Step Three: Test your Fling Flyer
Step Four: Analyze and share your results
Step Five: Brainstorm ways to improve your design

This meeting, Brownies test, record and analyze data, and improve their Fling Flyers. Brownies complete Step Three, Step Four & Step Five, earning the Fling Flyer Design Challenge badge.

Materials List
Activity 1: As Girls Arrive: Prepare for Testing
- Fling Flyers created by girls in Fling Flyer Design Challenge 1. (Note to Volunteers: If you were unable to save the Flyers between meetings, Brownies can rebuild them during this activity.)

For each Fling Flyer, girls will need these GoldieBlox:
- 2 mini axles
- 1 long axle
- 2 star stoppers
- 1 angle joint
- 2 T-joints
- 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
- 1 rubber band

Activity 2: Opening Ceremony: Forces that Affect Flight
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Test Your Fling Flyer
- Fling Flyers created by girls in Fling Flyer Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)
- Masking tape
- Cone, rock, or anything else to mark the furthest distance flown

Activity 4: Analyze and Share Your Results
- None

Activity 5: Brainstorm Ways to Improve your Design
- Fling Flyers from Activity 3: Test Your Fling Flyer
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
Fling Flyer Design Challenge 2

- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)

Activity 6: Closing Ceremony: Awards
- Fling Flyer Design Challenge award

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Detailed Activity Plan

Activity 1: As Girls Arrive: Prepare for Testing

Time Allotment
10 Minutes

Materials
- Fling Flyers created by girls in Fling Flyer Design Challenge 1. (Note to Volunteers: If you were unable to save the Flyers between meetings, Brownies can rebuild them during this activity.)

For each Fling Flyer, girls will need these GoldieBlox:
- 2 mini axles
- 1 long axle
- 2 star stoppers
- 1 angle joint
- 2 T-joints
- 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
- 1 rubber band

Steps
Welcome Brownies, and have them practice with their Fling Flyer before the Troop Fling Flyer Competition.

Optional: If you were unable to save the Fling Flyers between meetings, Brownies can rebuild them.
SAY:
Today, we’re going to have a competition to see how your Fling Flyers perform!

Take a few minutes to practice flinging your Flyer to get ready.

If there’s anything you’d like to change about your Flyer from last time, feel free to try it out!

Activity 2: Opening Ceremony: Forces that Affect Flight

Time Allotment
10 Minutes

Materials
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

Steps
Recite the Pledge of Allegiance and the Promise and Law.

Conduct any troop business.

Review the forces that affect the Fling Flyer’s ability to fly with Brownies.

SAY:
What forces affect your Fling Flyer? (Answer: Thrust, drag, lift, gravity.)

What force pushes the Flyer forward through the air? (Answer: The thrust from the rubber band.)

Why does the Flyer slow down? (Answer: The drag pushes air molecules out of the way.

What pulls the Flyer back down to the ground? (Answer: Gravity.)

Why doesn’t it fall straight down if gravity is pulling on it? (Answer: Lift. Air is in the way—the wings deflect the air, which pushes back up on the wings.)
What happens when forces are unbalanced, like throwing a paper airplane on a windy day? (Answer: The object moves in the direction of the greater force.)

What happens when forces on an object are balanced? (Answer: Neither force moves the object.)

Introduce Brownies to today’s activities.

**SAY:**
Today, we’re going to test our Fling Flyers in a Troop Fling Flyer Competition!

First, we’ll decide what we want to test our Fling Flyers for, or our goals.

After, you’ll have a chance to test and improve your Fling Flyers in a Troop Fling Flyer Competition!

Engineers test and redesign their new creations multiple times to find a design that works well for their goals, whether it’s solving a problem or creating a brand new product.

Now that we know we want our Fling Flyers to fly far, stay in the air, and try to do tricks, we have a better idea of how to build them to fit these goals.

**Activity 3: Test Your Fling Flyer**

**Time Allotment**
15 Minutes

**Materials**
- Fling Flyers created by girls in Fling Flyer Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)
- Masking tape
- Cone, rock, or anything else to mark the furthest distance flown
Steps
Brownies test their Flying Flyers in a Troop Fling Flyer Competition for Step Three of the Fling Flyer Design Challenge.

Create goals for the Troop Fling Flyer Competition with Brownies.

**SAY:**
*Engineers design and build things to meet goals or needs in the world.*

*For our competition, what should we test?*

**Girls may say:** Which Fling Flyer goes farthest, which Flyer goes highest, which Flyer stays in the air longest, etc.

*Today, let’s test to see whose Fling Flyer goes the farthest, whose stays in the air (or stays airborne) the longest, and who can do the most flips or tricks!*

Have Brownies improve their Fling Flyers before the Troop Fling Flyer Competition. They can test fling their Flyers to see how different materials work.

**SAY:**
*Now that we know we want our Fling Flyers to fly far, stay in the air, and try to do tricks, we have a better idea of how to build them to fit these goals. Do you want to rebuild your Fling Flyer? Here are some other types of paper you could try for wings. Feel free to add or take off any GoldieBlox!*

Give the girls time to test and improve their designs.

Hold the Troop Fling Flyer Competition. Create a masking tape line for girls to stand on to fling their Flyers.

**SAY:**
*Now it’s time to see how your Fling Flyers fling! Let’s start by standing on the line to see which Fling Flyer flies the farthest!*

Brownies fling their Flyers, either by taking turns or all at once.
(Note to Volunteers: If taking turns, mark how far the Flyer flings with a cone, rock, or anything else to mark the distance flown. As girls take turn, move the object to the new Flyer’s distance if it is farther than the last distance marked.)

Repeat, but have Brownies test for longest time airborne, measuring seconds by counting.

Repeat once more, with Brownies having their Flyers do flips or other tricks.

Activity 4: Analyze and Share Your Results

Time Allotment
10 Minutes

Materials
- None

Steps

Brownies review their results and come to conclusions about what it all means for Step Four of the Fling Flyer Design Challenge.

SAY:
Okay, you’ve tested your Fling Flyers and we have results from the Troop Fling Flyer Competition.

Let’s take a look at what you’ve learned.

Our results from the Fling Flyer Competition are called data.

Engineers look at all the data from a test to figure out what works best and what needs to be improved.

It’s a little bit like solving a puzzle! Now you get a chance to do that, too.

Divide girls into small groups of 3-4 to brainstorm and analyze their results.

SAY:
Let’s take a few minutes to think about our results and see what you can figure out from our data.

Figuring out what our data means is called analysis.

Engineers work together to brainstorm and analyze their data and results to form bigger ideas on how to improve their designs.

Here are some questions to get you started:

- 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?

Give girls 5 minutes or so to brainstorm and discuss in groups.

SAY:
Okay, what did you figure out?

Give girls time to report on what they think their results showed.

SAY:
Very interesting!

Now take another look and see if you can answer these questions:

- How did your Fling Flyer move when gravity and lift were balanced?
- How did it move when gravity is stronger? When lift was stronger?
- Did weight matter?

Give girls time to report on what they think their results showed.

After they’re done, move right to the next step (Activity 5: Brainstorm Ways to Improve Your Design).

Activity 5: Brainstorm Ways to Improve Your Design
Materials
- Fling Flyers from Activity 3: Test Your Fling Flyer
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)

Steps
Have Brownies form a Friendship Circle.

SAY:
You did a great job of gathering data and results and analyzing them.

That’s what engineers do, too! Then they used what they’ve learned to make their design even better.

As you tested your Fling Flyers, did you change the design to improve them? How?

If you were going to keep working on your Fling Flyer design, what would you change and why?

Let girls answer. Make sure every girl gets a chance to speak.

SAY:
Those are great ideas. Remember, no matter what you’re building or what project you’re working on, you can always keep making it better. That’s what engineers do.

If there’s extra time, Brownies can redesign their Flyers.

Activity 5: Closing Ceremony: Awards

Time Allotment
10 Minutes

Materials
- Fling Flyer Design Challenge award
Fling Flyer Design Challenge 2

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Steps

Brownies earn the Fling Flyer Design Challenge badge.

SAY:
You’ve now earned the Fling Flyer Design Challenge badge.

Please step forward when I say your name to accept your award.

Lead a round of applause for each Brownie as she steps forward.

SAY:
You have earned your Fling Flyer Design Challenge award, which means you have learned about the forces that affect flight as you designed, built, and tested a Fling Flyer. You also learned how to design an investigation—and fine-tune your design after testing it, just like engineers.

When you leave here, who do you want to tell about what you learned?

Girls may say: My parents, my brothers and sisters, my friends at school.

That’s great! When you learn something, it’s fun to pass it on to others. We can all learn from each other.

End the meeting with a Friendship Squeeze.

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Now that I’ve earned this badge, I can give service by:

- Showing Daisies that engineering can be fun by demonstrating my Fling Flyer.
- Sharing what I learned about the forces that affect flight with my friends or family.
- Showing friends how to make a fling flyer and then having a contest to see how far they can fly.
Brownies may not know some of the words used in these badges. Here are definitions you can share with them:

**Engineers** are people who like to know how things work. They design and build things people use every day, like computers, phones, roads, bridges and cars.

**Force** is the strength or energy that creates movement. Push and pull are examples of force.

**Gravity** is a force that pulls objects toward each other and towards the earth.

**Potential energy** is the energy stored in your body and everything else in our world.

When potential energy is released, it becomes **kinetic energy** which bring bodies and objects to move.

**Thrust** is a force that slows moving objects.

**Drag** is the force (air molecules) that acts against something in flight.

**Lift** is a force that pushes back up on the wings during flight.

**Balanced forces** exist when forces are equal on an object. When the forces are balanced, the object does not move.

**Unbalanced forces** exist when forces are unequal on an object. When the forces are unbalanced, it moves in the direction of the greater force.

**Features** are parts of a product that are designed to make them more useful.

**Friction** is a force that slows moving objects.
Brownie Design Challenge Badges: Materials List

**Leap Bot Design Challenge 1**

**Activity 2: Opening Ceremony: All About Solving Problems**
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

**Activity 3: Learn About Springs**
- Sample Leap Bot made from the GoldieBlox Making Things Zoom kit

**Activity 4: Build Your Leap Bot**
- GoldieBlox Making Things Zoom kit (one set for each pair or small team)

For each Leap Bot, girls will need these GoldieBlox:
- 4 mini axles
- 1 long axle
- 2 angle joints
- 2 elbow joints
- 4 spacers
- 4 pegs
- 1 star coupler
- 3 wheel hubs
- 3 small wheel ends
- 2 big wheel ends
- 1 long spring

**Leap Bot Design Challenge 2**

**Activity 1: As Girls Arrive: Prepare For Testing**
- Leap Bots created by girls in Leap Bots Design Challenge 1. *(Note to Volunteers: If you were unable to save the Bots between meetings, Brownies can rebuild them during this activity.)*
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team).

**Activity 2: Opening Ceremony: Leap Bot Forces**
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

**Activity 3: Create a Way to Test How Well Your Leap Bot Performs**
- Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Rulers, yardsticks, etc.
- Tape
- Paper

**Activity 4: Record the Results of Your Test**
- Leap Bots created by girls in Leap Bot Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Leap Bot Testing Stations created by girls in Activity 3: Create a Way to Test How Well Your Leap Bot Performs
- Leap Bot Recording Sheet
- Long and Short springs from the GoldieBlox Making Things Zoom kit (3 or more from each set for each pair or small team)
- Leftover pieces from the GoldieBlox Making Things Zoom kit (for each pair or small team)
Leap Bot Design Challenge 2 (continued)

**Activity 5: Share Your Results**
- Leap Bot Recording Sheets, filled out by girls in Activity 4: Record the Results of Your Test

**Activity 6: Closing Ceremony: Awards**
- Leap Bot Design Challenge award

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)

Fling Flyer Design Challenge 1

**Activity 1: As Girls Arrive: Engineering Paper Airplanes**
- Paper (Construction, white, etc. A variety of papers gives girls the opportunity to try making planes with different paper weights.)
- Crayons, colored markers

**Activity 2: Opening Ceremony: Taking Flight!**
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

**Activity 3: Learn About the Forces that Affect Flight**
- Paper Airplanes from Activity 1: As Girls Arrive: Engineering Paper Airplanes

**Activity 4: Design and Build a Fling Flyer**
- GoldieBlox Making Things Zoom kit (one set for each girl, pair, or small team)
- Sample Fling Flyer
- Paper
- Pencils
- Optional: Fling Flyer Investigation worksheets

For each Fling Flyer, girls will need these GoldieBlox:
- 2 mini axles
- 1 long axle
- 2 star stoppers
- 1 angle joint
- 2 T-joints
- 1 craftstruction wing (Alternatively, you can prepare or have girls create their own wings using cardstock, construction, or copy paper and scissors/paper hole push.)
- 1 rubber band
Brownie Design Challenge Badges: Materials List

Fling Flyer Design Challenge 2

**Activity 1: As Girls Arrive: Prepare for Testing**
- Fling Flyers created by girls in Fling Flyer Design Challenge 1. *(Note to Volunteers: If you were unable to save the Flyers between meetings, Brownies can rebuild them during this activity.)*

**Activity 2: Opening Ceremony: Forces that Affect Flight**
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

**Activity 3: Test Your Fling Flyer**
- Fling Flyers created by girls in Fling Flyer Design Challenge 1 or Activity 1: As Girls Arrive: Prepare for Testing
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)
- Masking tape
- Cone, rock, or anything else to mark the furthest distance flown

**Activity 5: Brainstorm Ways to Improve Your Design**
- Fling Flyers from Activity 3: Test Your Fling Flyer
- Cardstock, construction paper, or copy paper (the heavier the better)
- Scissors or hole punches
- Leftover pieces from the GoldieBlox Making Things Zoom kit (one set for each pair or small team)

**Activity 6: Closing Ceremony: Awards**
- Fling Flyer Design Challenge award

*(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)*

Race Car Design Challenge 1

**Activity 1: As Girls Arrive: Playing with Force and Friction**
- Sports and game balls (one for each pair of girls). Bring different types of balls for girls to roll and observe friction. For example, you might bring a marble, tennis ball, basketball, ping pong ball, baseball, etc.
- Create two lines with masking tape on the floor. Each Brownie should sit on the line, facing their partner.

**Activity 2: Opening Ceremony: Engineering Speed**
- Flag
- Optional: Poster Board with the Girl Scout Promise and Law

**Activity 3: Learn How Design Can Affect Speed**
- Toy car to demonstrate force and friction
Brownie Design Challenge Badges: Materials List

Race Car Design Challenge 1 (continued)

Activity 4: Design and Build Your Race Car
• GoldieBlox Making Things Zoom kit (one set for each pair or small team.) Feel free to add additional pieces from personal GoldieBlox kits that you or your Girl Scouts may own.

Activity 5: Closing Ceremony: Share Your Design
• Race Cars built by Brownies in Activity 4: Design and Build Your Race Car

Race Car Design Challenge 2

Activity 1: As Girls Arrive: Build A Simple Ramp
• Race cars created by girls in Race Car Design Challenge 1. (Note to Volunteers: If you were unable to save the race cars between meetings, Brownies can rebuild their cars during this activity.)
• Folders, poster boards, cardboard, etc., to lean against something to create a ramp
• Books, boxes, tables, etc. to create the height and top of a ramp

Activity 2: Opening Ceremony: Reviewing Force and Friction
• Flag
• Optional: Poster Board with the Girl Scout Promise and Law

Activity 3: Design Your Racetrack
• Poster boards, cardboard, etc., to lean against something to create ramps
• Table(s) or books to create the top of ramps
• Paper or newspaper
• Masking tape

Activity 4: Conduct a Fair Test and Record Results
• Yardstick
• Ramp created by girls in Activity 3: Design Your Racetrack
• Race cars created by girls in Race Car Design Challenge 1 or rebuilt in Activity 1: As Girls Arrive: Build a Simple Ramp
• Optional: Phone or camera to capture “photo finishes”

Activity 5: Share What You Learned
• Race cars redesigned by girls in Activity 4: Conduct a Fair Test and Record Results

Activity 6: Closing Ceremony: Awards
• Race Car Design Challenge award

(Note to Volunteers: You can buy these awards from your council shop or on the Girl Scouts’ website.)
Brainstorming Tips: Think, Pair, Share

How to Run a Think, Pair, Share Activity:

Tell girls that they’re going to brainstorm answers to your question using “Think, Pair, Share.”

Lead girls through the basic steps by telling them they will:

1. **Break into small groups.**

2. **Listen to the question or prompt.**

3. **Think about their answers.**
   - Girls may want to write their answers down.
   - Twenty seconds should be enough time, since girls will need to sit quietly.

4. **Pair with other girls.**
   - Girls talk with one to three other girls (depending on group size), making sure everyone has a chance to share their answers. If there’s time, it’s OK for girls to ask questions about each other’s answers.
   - For pairs, 20 seconds should be enough time. If your troop enjoys discussion, consider extending this to 1 to 2 minutes.

5. **Share with the group.**
   - Girls share their answers with the larger group.
   - This can be completed in 20 – 30 seconds, but will run longer based on group size and how the group sharing is done.

There are two ways to set up group sharing:

- **Strongly Recommended:** One girl shares the best/most interesting/summary answer for the group. This approach is great if you’re running short on time. It also helps develop conflict resolution and compromise skills.

- **Optional:** Each girl shares her partner’s answer. This helps girls develop active listening skills, but will run longer because all girls are sharing.
Fling Flyer Design Challenge badge
The Girl Scout Promise

On my honor, I will try:

To serve God and my country,
To help people at all times,
And to live by the Girl Scout Law.

The Girl Scout Law

I will do my best to be
honest and fair,
friendly and helpful,
considerate and caring,
courageous and strong, and
responsible for what I say and do,
and to
respect myself and others,
respect authority,
use resources wisely,
make the world a better place, and
be a sister to every Girl Scout.