

Automotive Engineering

Materials List

AUTOMOTIVE DESIGN 1

Activity 1: As Girls Arrive: What Does a Specialized Vehicle Do?

- **Specialized Vehicle Photos**

Activity 2: Opening Ceremony: Get Moving with Automotive Design

- **Specialized Vehicle Photos** from *As Girls Arrive*
- Flag
- **Optional:** Poster board with the **Girl Scout Promise and Law**

Activity 3: Step One: Choose Special Features for Your Vehicle

- **Specialized Vehicle Photos** from the *Opening Ceremony*
- “Interior Vehicle Parts” and “Exterior Vehicle Parts” from the **Vehicle Parts** handout
- “Vehicle Diagram” from the **Vehicle Parts** handout
- Large sheet of chart paper or poster board
- Marker
- Tape
- **Optional:** If you have a real vehicle available, girls can match the photos of vehicle parts (from the **Vehicle Parts** handout) to the real parts of that vehicle.

Prepare Ahead:

1. Cut out the “Interior Vehicle Parts” and “Exterior Vehicle Parts” from the **Vehicle Parts** handout.
2. Use the “Vehicle Diagram” to draw a larger blank version of the exterior vehicle body on a sheet of chart paper or poster board. Do not label anything. Place the outline at a height on the wall that the Daisies can reach or on the floor.

Activity 4: Step Two: Sketch Your Vehicle

- **Vehicle Sketchbook** for each girl
- Pencil for each girl
- Colored pencils, crayons, or markers for girls to share
- **Optional:** Tracing paper for girls to test different ideas for their vehicle sketches, blank paper if girls need extra

Activity 5: Closing Ceremony: Transportation Around the World

- Photos and world map from the **Transportation Around the World** handout

AUTOMOTIVE DESIGN 2

Activity 1: As Girls Arrive: Quick Design

- 2 sheets of paper for each girl
- Pencil for each girl
- Crayons, colored pencils, or markers for girls to share
- **Optional:** The troop's vehicle diagram with the photos of "Exterior Vehicle Parts" (from the **Vehicle Parts** handout) from Step One in *Automotive Design 1*

Activity 2: Opening Ceremony: Needs and Wants in Automotive Design

- Daisies' vehicle sketches from As Girls Arrive
- Daisies' **Vehicle Sketchbooks** and any other sketches from Step Two in *Automotive Design 1*
- Flag
- **Optional:** Poster board with the **Girl Scout Promise and Law**

Activity 3: Step Three: Sculpt and Share Your Vehicle

- Daisies' **Vehicle Sketchbooks** and any other sketches from the *Opening Ceremony*
- 4 oz. (1/2 small pack) of white modeling foam (not foam beads) for each girl. Alternatively, you can use modeling clay or dough, but it probably won't dry quickly enough for girls to color it during the meeting.
- Extra modeling foam, clay, or dough
- Tools for sculpting the foam/clay/dough, such as rolling pins, cookie cutters, dull plastic knives, hard materials with patterns, etc.
- Safety scissors for girls to share
- Markers for girls to share

Activity 4: Closing Ceremony: Design the Future of Mobility & Awards

- Automotive Design badge for each girl
(**Note to Volunteers:** You can buy the awards from your council shop or the [Girl Scout Shop](#).)

AUTOMOTIVE ENGINEERING 1

Activity 1: As Girls Arrive: Moving Things from Place to Place

- 3 of the following items: books, beads or small blocks, balls (tennis, ping pong, soccer), a BIG box, a pool floatie, etc. These are the "Things TO Carry" for the activity.
- 3 of the following items: a backpack, a muffin tin, a skateboard, a rolling suitcase or cart, a box, a bin, etc. These are the "Things THAT Carry" for the activity.

Activity 2: Opening Ceremony: Engineering for Good

- **Cargo Vehicle Photos**
- Flag
- **Optional:** Poster board with the **Girl Scout Promise and Law**

Activity 3: Step One: Create Your Automotive Engineering Plan

- **How to Prepare for the Automotive Engineering Challenge**
- **Shelter Mobile Criteria Checklist** for each girl
- Doll (to be the driver for a demonstration)
- Stuffed animal (to be the passenger for a demonstration)
- Box with an open top (large enough to hold the doll and stuffed animal)
- Large sheet of paper, chart paper, or poster board for each girl
- Pencil for each girl
- Markers, colored pencils, or crayons for girls to share
- Tape
- **Optional:** Tracing paper for girls to test different ideas for their vehicle sketches

Prepare Ahead: Before the meeting...

- **Print and cut out the “Photos of Vehicle Parts”** in the “Automotive Engineering Nuts N’ Bolts” section of the **How to Prepare for the Automotive Engineering Challenge** handout to use in a demonstration.
- **Use the “Vehicle Materials List”** in the “Automotive Engineering Nuts N’ Bolts” section of the **How to Prepare for the Automotive Engineering Challenge** handout to choose what materials girls will use for the vehicle bodies and wheels.
- **Gather a sample set of vehicle materials for the meeting**, including: 1) 1 body in your choice of material, 2) 4 wheels in your choice of material, and 3) 2 wooden skewers (or thin dowels) and 2 plastic straws for the axles.

Activity 4: Closing Ceremony: Engineering For a Better World

- None

AUTOMOTIVE ENGINEERING 2

Activity 1: As Girls Arrive: Gather Your Vehicle Materials

- **How to Prepare for the Automotive Engineering Challenge**
- Materials for each team (pair of girls) to create one vehicle, including 1 body, 4 wheels, and 2 axles (2 wooden skewers and 2 plastic straws). See the **How to Prepare for the Automotive Engineering Challenge** handout for more information.

Activity 2: Opening Ceremony: Explore the Design Thinking Process

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

Activity 3: Step Two: Build a Vehicle Prototype

- **How to Prepare for the Automotive Engineering Challenge**
- **Prepare Ahead:** Follow the “Automotive Engineering Nuts N’ Bolts” in **How to Prepare for the Automotive Engineering Challenge** to build 1 sample vehicle. See the handout for more information.
- Daisies’ **Shelter Mobile Criteria Checklists** and sketches from *Automotive Engineering 1*
- Daisies’ vehicle materials from *As Girls Arrive*. Each pair of girls will need 1 body, 4 wheels, and 2 axles (2 wooden skewers and 2 plastic straws). See the **How to Prepare for the Automotive Engineering Challenge** handout for more information on vehicle materials.
- 1 full set of vehicle materials (1 body, 4 wheels, 2 skewers, 2 straws) for you to model each step to build a vehicle during the activity
- Modeling clay, rubber bands, and/or cut up sponges for girls to attach wheels to the skewers
- Masking tape, glue, markers, and safety scissors for girls to share
- **Optional:** Other materials for girls to build features, such as thin cardboard, egg cartons, foam, bubble wrap, paperclips, packing peanuts, etc.

Activity 4: Step Three: Test Your Vehicle Prototype

- **How to Prepare for the Automotive Engineering Challenge**
- **Prepare Ahead:** Create 1 testing ramp for every 2–4 engineering teams (4–8 girls) by leaning a piece of cardboard or a baking sheet on something like a stack of books or blocks.
- Daisies’ vehicle prototypes, **Shelter Mobile Criteria**, and sketches from Step Two
- The sample vehicle you prepared for Step Two. See the **How to Prepare for the Automotive Engineering Challenge** handout for more information.
- Extra vehicle materials (bodies, wheels, straws, and skewers) and building materials (clay, rubber bands, pieces of sponge, tape, and glue) from Step Two for repairs
- Objects to represent 2 people, 3 animals, and at least 2 pieces of cargo for each ramp. These can be items such as small toy animals or people, spools of thread or wine corks to represent people or animals, little boxes to represent cages, small blocks to represent cages or supplies, etc.
- Paper for each girl
- Pencil for each girl
- **Optional:** Cell phone(s) to record tests, additional volunteers available to support girls at the testing stations

Want More Challenge? Try This!

If you want to add difficulty with a third round of testing, bring a tape measure and masking tape to measure how far the vehicles can travel. Then, after teams have tested their vehicles for forward motion and carrying cargo, they can (or you can help them to) measure how far their vehicles travelled.

Activity 5: Closing Ceremony: Share Your Vehicle Prototype & Awards

- Daisies' final vehicle prototypes from Step Three
- Automotive Engineering badge for each girl
(**Note to Volunteers:** You can buy the awards from your council shop or the [Girl Scout Shop](#).)

AUTOMOTIVE MANUFACTURING 1**Activity 1: As Girls Arrive: Experiment with Die Presses**

- 1 small tub of modeling clay or dough for each girl (or enough for girls to share)
- Cookie cutters or other items that can make an impression in the modeling clay or dough
- **Optional:** Small rolling pin(s) for girls to share

Activity 2: Opening Ceremony: Jump Into Manufacturing

- Modeling clay or dough, cookie cutters, and any other tools from *As Girls Arrive*
- Flag
- **Optional:** Poster board with the **Girl Scout Promise and Law**

Activity 3: Step One: Explore Efficient Manufacturing and Assembly Lines

- Modeling clay or dough (enough for each team of 4 girls to make 4 shapes of the same cutter size and color)
- 1 cookie cutter for each team of 4 girls
- Stopwatch, phone, or other timer
- Paper
- Pencil or marker

Activity 4: Closing Ceremony: Teamwork in Manufacturing

- None

AUTOMOTIVE MANUFACTURING 2**Activity 1: As Girls Arrive: Examine Your Vehicle Parts**

- 4 containers filled with the different vehicle materials. See the “Prepare Ahead” section and box below for more information.

Prepare Ahead:

1. Gather 1 set of vehicle materials for each girl: 1 body, 4 wheels, 2 axles, and 4 small pieces of sponge. You'll also need one set of materials for you to build a sample in Step Two. See the box below for more information.
2. Sort the materials into 4 containers, one for each part, i.e. 1 for the bodies, 1 for the wheels, 1 for the axles—including the toothpicks and straws, and 1 for the sponge pieces to connect the wheels and axles.

For each vehicle, you will need to prepare and/or bring the following:

- **1 body:** Toilet paper roll or paper towel roll cut in half (to make it toilet paper roll sized). Using a hole punch, make four holes in each end of the body (2 in the front and 2 in the back) for the axles.
- **4 wheels:** Use the **Wheel Template** to cut out 4 cardboard circles. Then, poke holes in the center of each wheel with a push pin.
- **2 axles:** Cut 2 pieces of plastic straws that are 2 inches each AND 2 toothpicks. The pieces of straws need to be wider than the width of the body, but shorter than the toothpick (so the wheels can be attached to the ends of the toothpick).
- **4 pieces of sponge:** Cut 4 small pieces of sponge. Girls will stick each piece to each end of the toothpicks and secure the cardboard circles to the toothpicks.

Activity 2: Opening Ceremony: Match Your Parts and Materials

- **Prepare Ahead:** Follow the instructions on the **How to Assemble a Vehicle** handout to build a sample vehicle.
- Containers of vehicle parts from *As Girls Arrive*
- Flag
- **Optional:** Poster board with the **Girl Scout Promise and Law**

Activity 3: Step Two: Create an Assembly Line to Manufacture Vehicles

- **Vehicle Parts Checklist** for each girl
- **How to Assemble a Vehicle** for each team of 4 girls
- Sample vehicle from the *Opening Ceremony*
- Containers with vehicle materials from *As Girls Arrive*. Each girl will need: 1 body, 4 wheels, 2 axles (straws and toothpick), and 4 small pieces of sponge. You'll also need 1 additional set of materials for you to build another sample during the activity. See the box below for more information.
- Extra vehicles bodies, wheels, axles, and any other building materials for girls to make repairs. See the box below for more information.
- Glue and masking tape for girls to share
- **Optional:** Markers and/or stickers for girls to decorate the vehicles.

For each vehicle, you will need to prepare and/or bring the following:

- **1 body:** Toilet paper roll or paper towel roll cut in half (to make it toilet paper roll sized). Using a hole punch, make four holes in each end of the body (2 in the front and 2 in the back) for the axles.
- **4 wheels:** Use the **Wheel Template** to cut out 4 cardboard circles. Then, poke holes in the center of each wheel with a push pin.
- **2 axles:** Cut 2 pieces of plastic straws that are 2 inches each AND 2 toothpicks. The pieces of straws need to be wider than the width of the body, but shorter than the toothpick (so the wheels can be attached to the ends of the toothpick).
- **4 pieces of sponge:** Cut 4 small pieces of sponge. Girls will stick each piece to each end of the toothpicks and secure the cardboard circles to the toothpicks.

Activity 4: Step Three: Examine and Test Your Vehicles for Quality

- **Prepare Ahead:** Before the meeting, set up 1 ramp for every 2 manufacturing teams (8 girls) by leaning a piece of cardboard or a baking sheet on something like a stack of books or blocks. Teams will take turns to test their prototypes by rolling them down the ramp.
- Daisies' manufactured vehicles from Step Two
- The sample vehicle you built in Step Two
- Extra vehicles bodies, wheels, axles, and any other building materials from Step Two for repairs
- Paper for each girl
- Pencil for each girl

Activity 5: Closing Ceremony: Brainstorm Process Improvements & Awards

- Daisies' final manufactured vehicles from Step Three
 - **Daisy Automotive Engineering Badges—Family Guide** for each girl
 - Automotive Manufacturing badge for each girl
- (**Note to Volunteers:** You can buy the awards from your council shop or the [Girl Scout Shop](#).)