Maryland Engineering Challenges
2026 Paper Airplane Challenge
Elementary Level – Grades 1 to 5

Supported By:
Henry Adams Consulting Engineers

Engineer Contacts:
Rebecca Koch / koch@henryadams.com & James Dark / dark@henryadams.com

Important Dates

Registration Due

- ⇒ **April 17, 2026 Prior to 4:00 PM**
- ⇒ In order to be a registered team, each team must have their adult Coach complete the registration process via the link below with **team name and the names and grades of all the team members**: Register online at https://bit.ly/2026MECRegistration

Written Report Due

- ⇒ **April 24, 2026 Prior to 4:00 PM**
- ⇒ Submit the team's **Written Report** in PDF format and email to challenges@thebmi.org

Paper Airplane Competition

- ⇒ **Saturday, May 2, 2026 Doors open at 9:00 AM**
- Competition will be at the Baltimore Museum of Industry, 1415 Key Highway, Baltimore
- Teams should bring their completed team airplane to the competition ready to be tested.
- Full details about the Challenge event will be emailed to Coaches after the registration deadline.

Questions about Challenge specifications or judging should be sent to the Engineer Contacts at Henry Adams:

Rebecca Koch koch@henryadams.com & James Dark dark@henryadams.com

Other questions? Contact Jessica Celmer challenges@thebmi.org

THE CHALLENGE

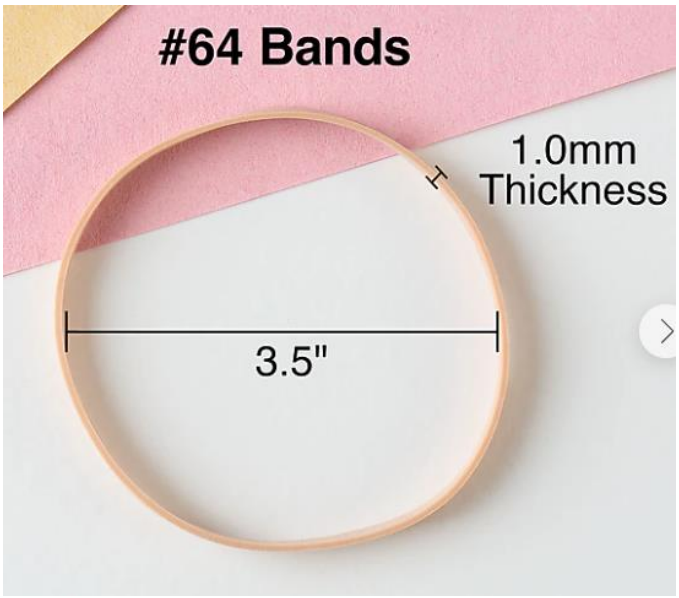
Design a paper airplane to fly as far and as accurately as possible.

ENGINEERING TEAM REQUIREMENTS

1. Each team may consist of 2-6 students.
2. Teams will be judged by grade levels as follows:
    - Division A - 1st & 2nd grade teams
    - Division B - 3rd, 4th, and 5th grade teams
3. There is no limit to the number of teams a school/organization may have.
4. Student teams need to design, launch and test their planes with their coach and select the plane they wish to bring to BMI for the final competition. Only one plane per team will be judged, though teams may opt to bring a backup plane in the event something happens to the original plane.

DESIGN AND CONSTRUCTION REQUIREMENTS

1. Paper airplanes may be constructed of any amount of standard, letter size (8.5" x 11") copier paper, construction paper or card stock and adhesive agents such as masking tape, duct tape, cellophane tape, or glue. Students are encouraged to be creative in their plane designs and the look of the planes.
2. All airplanes must be accompanied by a launch hook assembly capable of accepting a #64 rubber band and strong enough to not bend when the hook is used to extend the rubber band. See the below illustration.



Each Coach for the Paper Airplane Challenge may request one free Paper Airplane kit per team registered. Each kit consists of 8 rubber bands, 5 jumbo (2 inch) paperclips, and 8 Popsicle sticks. To request your kit(s), contact Jessica Celmer at challenges@thebmi.org

The simplest launch hooks can be constructed from popsicle sticks to be mounted along the "keel fold" or base of the paper airplane.

1. Opening the paper clip to an approximately right angle, slide the unperturbed wire over the popsicle stick as shown in Figure 1.
2. Apply paper or masking tape to secure the clip to the wood piece, wrapping it tightly around the wire to firmly affix it to the launcher. Figure 1b.
3. For extended use these single wire launch hooks will tend to bend out further and lose the ability to capture the driving rubber band. This problem can be solved by curving the hook further by using a pair of pliers or a dowel, so that the rubber band stays on.
4. Creating your own design of a launch hook is permitted.

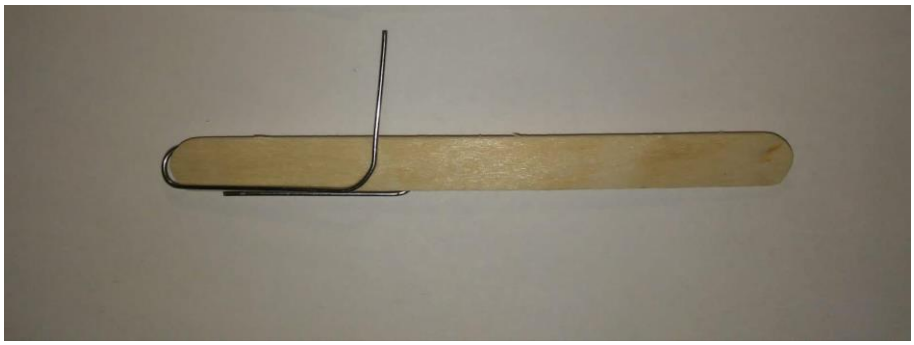


Figure 1a. Basic launch hook assemblies using popsicle sticks, tape and paper clips.

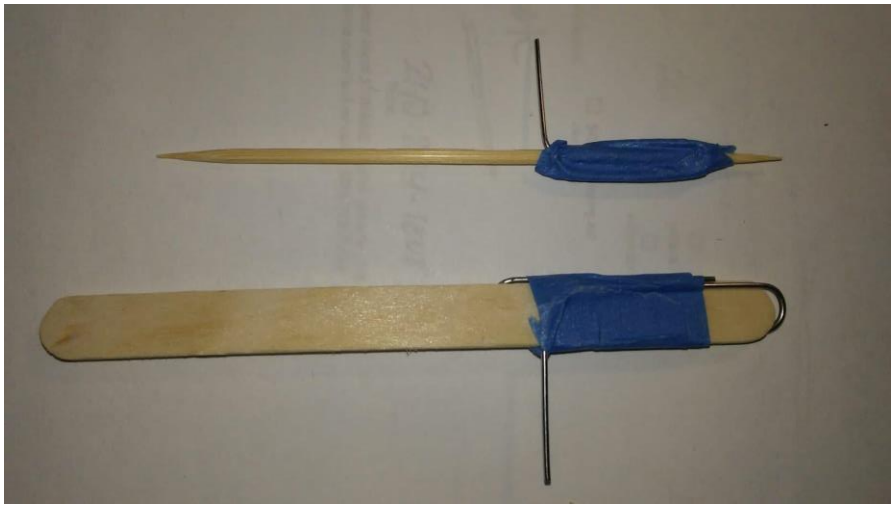


Figure 1b. Securing the wire to the core.

Figure 1c. Multiple popsicle sticks taped together to create a sturdy launch hook.

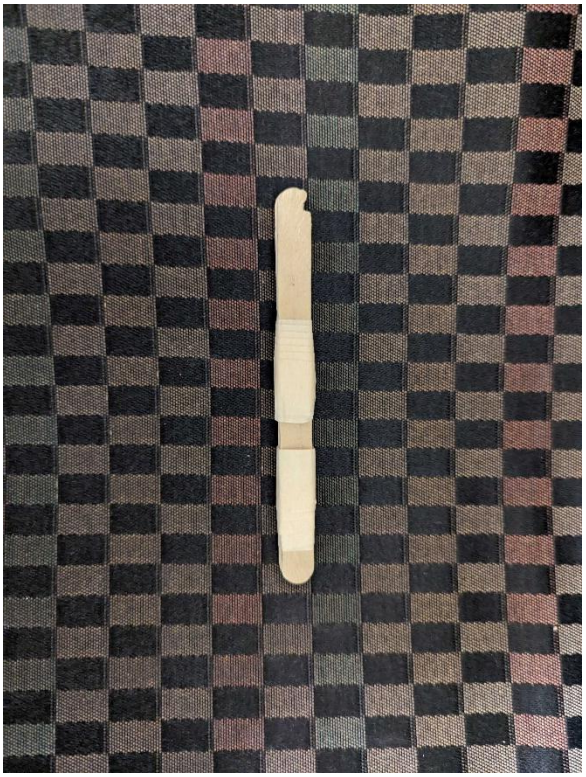
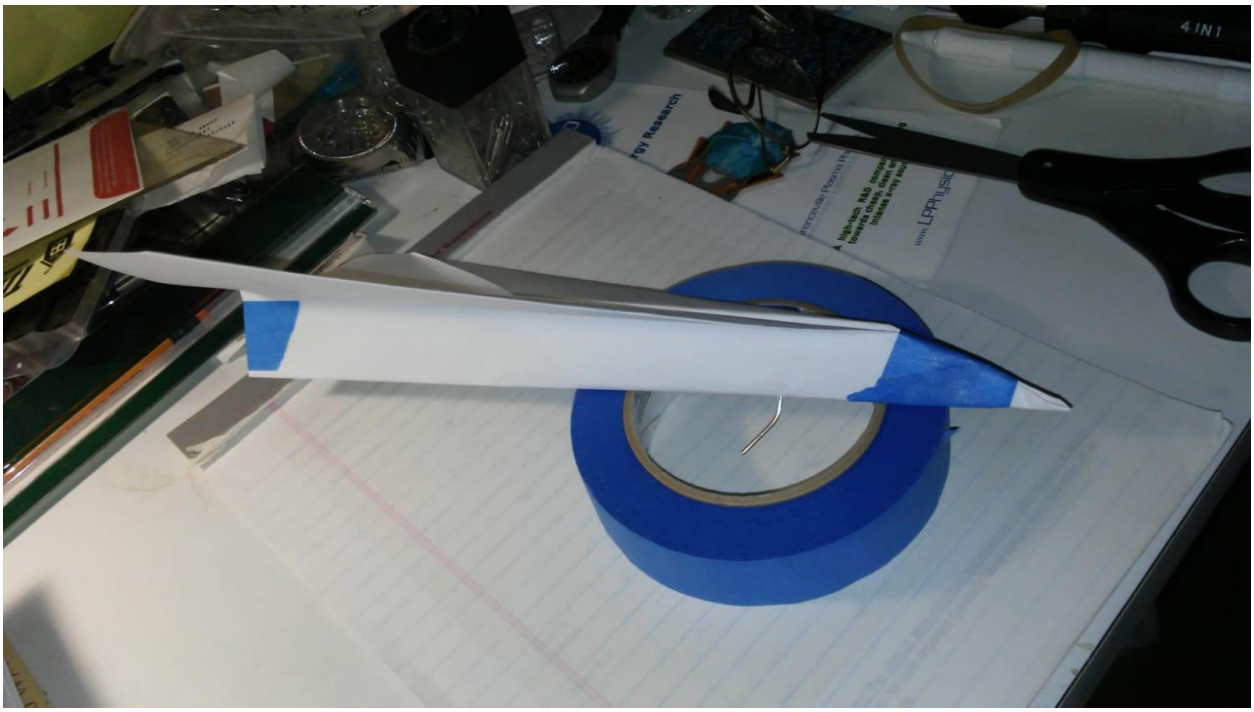


Figure 1d. Notch the popsicle sticks so the rubber band has something to keep it in place until launch.

DESIGN AND TESTING OF AIRPLANES

PAPER AIRPLANE EXAMPLE

A basic airplane design is demonstrated in the photo below. This example shows some typical nose and tail reinforcements and a launch hook (made from a paper clip). Teams should feel free to research and experiment with plane design. There are a plethora of books and downloads available on the internet.



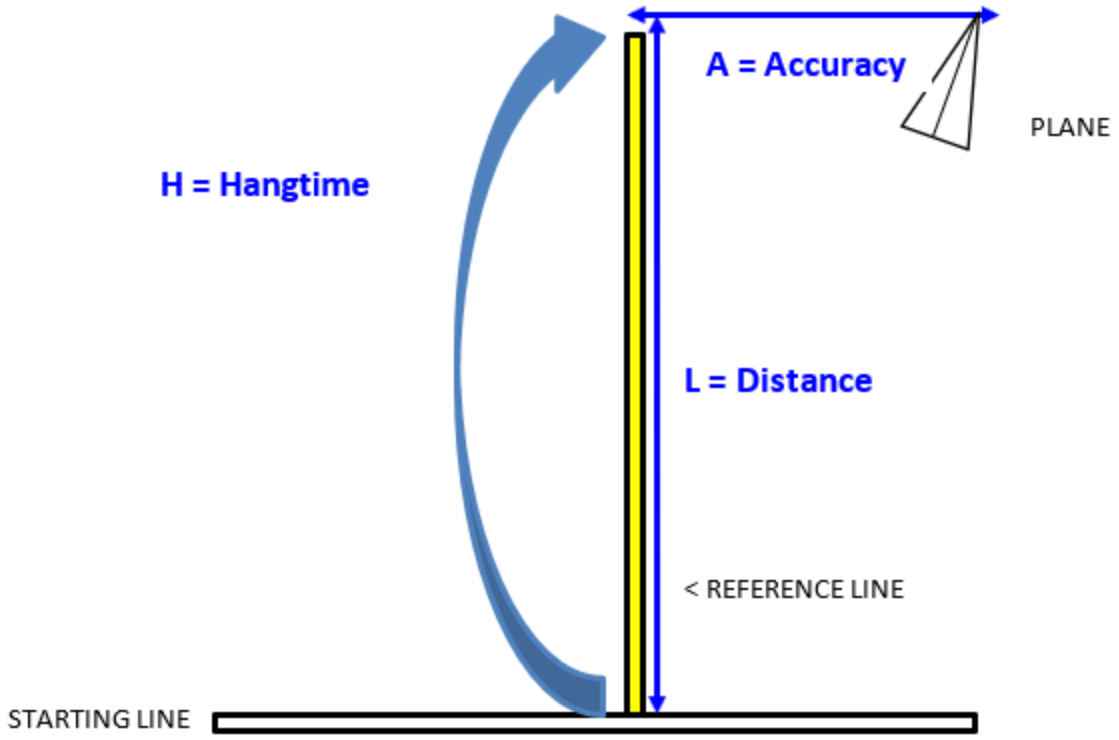
Basic Airplane Design.

PERFORMANCE DEMONSTRATION GUIDELINES

Individual score is based on Length, Accuracy and Hangtime (see diagram on page 6.

- L = Length = Length of Flight (along Reference Line to tip of plane)
- H = Hang Time (duration of time in the air)
- A = Accuracy (deviation from Reference Line)

Students will be able to make 2 launches of the airplane. The highest scoring flight will be counted.



EVALUATION STANDARDS

This elementary school-level competition involves four main components: the design and construction of the project, a written report, oral presentation of their process and what they learned, and the performance demonstration.

1. Design & Construction	Competition value: 20 points
2. Written Report*	Competition value: 30 points
3. Oral Interview	Competition value: 20 points
4. Performance Demonstration	Competition value: 30 points

Each TEAM should complete the "Student Design Report" at the end of this document.

General guidance on how to participate in the Maryland Engineering Challenges can be found here: https://www.thebmi.org/wp-content/uploads/2017/11/Elementary-School-Information-Sheet.pdf

CURRICULUM TIES-- Maryland Engineering Challenges and the Next Generation Science Standards

1st --2nd Grade - S1.0 Skills and Processes - Topic A. Constructing Knowledge Raise questions about the world around them and be willing to seek answers to some of them by making careful observations and trying things out. ***3rd-5th Grade - S1.0 Skills and Processes - Topic A. Constructing Knowledge*** Gather and question data from many different forms of scientific investigations which include reviewing appropriate print resources, observing what things are like or what is happening somewhere, collecting specimens for analysis, and doing experiments.	**In preparing for the challenge, students will:** ● Seek information through reading, observation, exploration, and investigations. Objective b ● Use tools such as thermometers, magnifiers, rulers, or balances to extend their senses and gather data. Objective c ● Participate in multiple experiences to verify that science investigations generally work the same way in different places. Objective e ● Support investigative findings with data found in books, articles, and databases, and identify the sources used and expect others to do the same. Objective a ● Recognize that the results of scientific investigations are seldom exactly the same, and when the differences are large, it is important to try to figure out why. Objective d ● Follow directions carefully and keep accurate records of one's work in order to compare data gathered. Objective e
PK-2nd Grade - S1.0 Skills and Processes - Topic B. Applying Evidence and Reasoning People are more likely to believe your ideas if you can give good reasons for them. ***3rd-5th Grade - S1.0 Skills and Processes - Topic B. Applying Evidence and Reasoning***	**In designing their projects, students will:** ● Provide reasons for accepting or rejecting ideas examined. Objective a ● Develop reasonable explanations for observations made, investigations completed, and information gained by sharing ideas and listening to others' ideas. Objective b

Seek better reasons for believing something than "Everybody knows that..." or "I just know" and discount such reasons when given by others.	● Offer reasons for their findings and consider reasons suggested by others. Objective b ● Keep a notebook that describes observations made, carefully distinguishes actual observations from ideas and speculations about what was observed, and is understandable weeks or months later. Objective d
PK-2nd Grade - S1.0 Skills and Processes - Topic C. Communicating Scientific Information Ask, "How do you know?" in appropriate situations and attempt reasonable answers when others ask them the same question. ***3rd-5th Grade - S1.0 Skills and Processes - Topic C. Communicating Scientific Information*** Recognize that clear communication is an essential part of doing science.	**In composing the written and oral reports, students will:** ● Describe things as accurately as possible and compare observations with those of others. Objective a ● Describe and compare things in terms of number, shape, texture, size, weight, color, and motion. Objective b ● Have opportunities to work with a team, share findings with others, and recognize that all team members should reach their own conclusions about what the findings mean. Objective d ● Make use of and analyze models, such as tables and graphs to summarize and interpret data. Objective a ● Avoid choosing and reporting only the data that show what is expected by the person doing the choosing. Objective b ● Construct and share reasonable explanations for questions asked. Objective d
1st-2nd Grade - S1.0 Skills and Processes - Topic D. Technology Design and make things with simple tools and a variety of materials.	**In building their projects, students will:** ● Make something out of paper, cardboard, wood, plastic, metal, or existing objects

3rd-5th Grade - S1.0 Skills and Processes - Topic D. Technology DESIGN CONSTRAINTS: Develop designs and analyze the products: "Does it work?" "Could I make it work better?" "Could I have used better materials?" DESIGNED SYSTEMS: Investigate a variety of mechanical systems and analyze the relationship among the parts.	that can actually be used to perform a task. Objective a ● Recognize that some kinds of materials are better than others for making any particular thing. Objective d ● Realize that there is no perfect design and that usually some features have to be sacrificed to get others. Objective b ● Identify factors that must be considered in any technological design-cost, safety, environmental impact, and what will happen if the solution fails. Objective c ● Explain that something may not work as well (or at all) if a part of it is missing, broken, worn out, mismatched, or misconnected. Objective b

GOOD LUCK TO ALL TEAMS!

PAPER AIRPLANE CHALLENGE

STUDENT DESIGN REPORT

Team Name: _____

School/Organization Represented: _____

We are (please check one):

Grade One: ___ Grade Two: ___ Grade Three: ___ Grade Four: ___ Grade Five: ___

Team Members (names):

1.
2.
3.
4.

Adult Coach(es): _____

Coach's Email: _____

DESIGN REPORT DIRECTIONS

Make a copy of the "Student Design Report" pages for each TEAM. Team members should complete each part by clearly printing or typing the requested information. Additional pages may be inserted as needed.

Written reports must be submitted by EMAIL in PDF format to challenges@thebmi.org prior to 4:00 p.m. on April 4, 2025

Explain why you chose your first design for an airplane. *Include a picture of this design.*

What problems did you encounter with your first design?

Explain the improvements or changes made to your design after testing. *Include pictures of improved designs*, and explain how they were better.

Explain which design is the best.

How successful is your best plane?

What math skills were needed in this challenge?

What science skills were needed in this challenge?

What did you learn by taking part in this project?

What did you enjoy most about taking part in this project?

Team Members: List the team members, with a short description of how each person helped to make the project a success. What special skills were learned or demonstrated by each person?

Coaches: What assistance did the coach(es) provide during the project?

TO BE SIGNED BY ALL STUDENTS, ADULT HELPERS, AND TEAM COACH.

We hereby certify that the majority of the ideas, design, and work was originated and performed by the students, with limited assistance by adults, as described above.

Printed Name Signature Date