



# Maryland Engineering Challenges

## 2025 Hovercraft Challenge

### Middle School Level – Grades 5 to 8

Sponsored By:

American Institute of Chemical Engineers, Maryland Section

Supported By: Kelvin Electronics ([www.Kelvin.com](http://www.Kelvin.com))

Engineer Contact:

Kathy Gunkel [wildwoodenvironmental@comcast.net](mailto:wildwoodenvironmental@comcast.net)



## Important Dates

### Registration Due

⇒ **March 21, 2025**

**Prior to 4:00 PM**

- In order to be a registered team, each team must have their adult Coach register online: <https://bit.ly/2025MECRegistration>

### Written Report Due

⇒ **Friday, March 28, 2025**

**Prior to 4:00 p.m.**

- Submit the team's **Written Report** in hard copy to the BMI at 1415 Key Highway, Baltimore, MD 21230. Please reach out to [challenges@thebmi.org](mailto:challenges@thebmi.org) if reports need to be submitted digitally.

### Hovercraft Competition

⇒ **Saturday, April 12, 2025**

**Program begins at 9:00 AM**

- Competition will be at the Baltimore Museum of Industry, 1415 Key Highway, Baltimore
- Teams should bring their completed hovercraft 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 Contact:**

Kathy Gunkel [wildwoodenvironmental@comcast.net](mailto:wildwoodenvironmental@comcast.net)

**Other questions?** Jessica Celmer [challenges@thebmi.org](mailto:challenges@thebmi.org)

## THE CHALLENGE

Design and construct a Hovercraft vehicle (a land-and-water transportation vehicle that Maryland could use for a ferry service across the Chesapeake Bay) from a kit to be the fastest vehicle in a race across a 20-foot stretch of floor. Imagine you are transporting vehicles and families from Fells Point to Kent Island in a “Reach the Beach” program for the State!

## ENGINEERING TEAM REQUIREMENT

For the benefit of the students, it is recommended that the team not exceed 4 students. There is no limit to the number of teams a school may have.

## DESIGN & CONSTRUCTION STANDARDS

- Teams will use a Kelvin “Advanced Competition Hovercraft Kit” **#841109** and other materials of their choice to construct a model Hovercraft.
  - The Kelvin Advanced Competition Hovercraft Kit is available at [www.kelvin.com](http://www.kelvin.com), search by **stock #841109** to make sure you order the correct kit as there are several sold by Kelvin.
  - The **Kelvin 841109** Hovercraft comes with an AAA battery pack, built-in on/off switch, and a 5-foot wire tether connecting the battery pack to the Hovercraft. It will be necessary for a team member to walk/jog alongside “the Bay” holding the battery pack and allowing the Hovercraft to move forward **WITHOUT** pulling it. Students should practice this before the competition.
  - Be careful which kit you order because Kelvin offers several kits. You want the “KELVIN Advanced Competition Hovercraft Kit”.
- *NOTE: Schools may request up to two free kits per school from the BMI. Kits will be available in the fall; you may request your kit(s) by contacting Jessica at [challenges@thebmi.org](mailto:challenges@thebmi.org) after October 1, 2024. This is a change from previous years because Kelvin is no longer providing the kits to the BMI at no cost. But, they have offered to subsidize the cost at 50%.*

## PERFORMANCE DEMONSTRATION GUIDELINES

- Each team can race their Hovercraft, starting from either side of the Bay, twice across the Bay and use the best time between the two runs.
- The Hovercraft cannot be “pushed” at the start of its Bay crossing.
- The Hovercraft cannot be “pulled” by the wire tether as a team mate carries it alongside “the Bay”.
- The Hovercraft cannot be touched or adjusted after the start of its crossing.
- Adjustments and/or repairs can be made between the two runs.

## **SCORING EVALUATION CRITERIA AND POINTS**

### *Written Report and Drawings*

*20 competition points*

- The quality of the written report has made a difference in the past between 1<sup>st</sup> and 2<sup>nd</sup> place!
- Timeliness of report submission is important– if it is not submitted when it is due, it will not be evaluated.
- No supplements will be accepted the day of the competition, instead incorporate any additional information into your Oral Report.

### *Oral Report*

*15 competition points*



Include answers to the following questions:

- Why is the Hovercraft a good choice as an auto transport vehicle?
- Why is it a good choice as a rescue vehicle?

### *Design and Fabrication*

*30 competition points*

- The design and fabrication of the model vehicle should look like a passenger vehicle. It will be a factor in the award of points for this category.
- Plan the Hovercraft as though the team is presenting the design to MDOT, the Maryland Department of Transportation.

### *Performance Demonstration*

*35 competition points*

- Each Hovercraft will be required to race across the “Chesapeake Bay”, from Fells Point to Kent Island, a 20-foot distance over a flat, dry surface, under battery power.
- Performance scoring points will be awarded as follows:
  - 35 points-fastest time across the Bay
  - 30 points-2<sup>nd</sup> fastest time
  - 25 points-3<sup>rd</sup> fastest time
  - 20 points-4<sup>th</sup> fastest time
  - 10 points-each successful “Bay” crossing
  - 5 points-each successful launch that reaches the midpoint of the “Bay”

## **Written Report for the Hovercraft Challenge**

The Written Report plays an important role for the Engineer. It is how engineers communicate their ideas to parties in a permanent format. These parties might be investors, a boss, a client, employees, or maybe the Patent Office if one is trying to get a patent for their work. An oral presentation enhances the written report, but the written report serves as the “take-away”, the means by which an individual may refresh their memory with regard to what you covered in your presentation. How much easier is it for you to remember what your teacher told you when you have something in writing from them, along with your notes? A patent application

requires that everything be submitted in writing to create a permanent record of your patented “gizmo”.

In the case of the written report you are preparing, the Sponsor is looking for your ability to put together a standard report, one which includes a Title Page, Table of Contents (in a normal format), an Abstract, a Summary, an Introduction to the report, “THE REPORT”, your Conclusions and Recommendations, your Acknowledgements to the people who supported you in this endeavor, a Bibliography listing sources of your information and research, Appendices as needed, original Drawings (hand or computer), and Photos to supplement your discussion. And, most important is a Certification that you and your teammates did the work yourselves, that it was not done by your teacher(s) or parent(s). This is YOUR project, not theirs!!

Here are some notes to help you develop and prepare a quality written report. In addition to “THE REPORT”, you should consider including the following features:

Title Page —include name of challenge, team name and logo, name of school or organization, names of students, name of teacher or advisor. An original logo design and its details will earn an extra 3 points. *Copying a graphic from a website and using it for your logo will result in loss of points...better no logo than stealing somebody else's work.* These Title Page requirements have been established by the Maryland Engineering Challenges program.

Abstract, Summary, Introduction, Conclusion—Conduct an internet search to find out how the Abstract differs from the Summary, how the Summary differs from the Introduction and Conclusion, etc.

Conclusions and Recommendations —How successful was the project? What did the team members learn by participating in an engineering challenge? What did each team member learn about their aptitude for engineering related careers?

Acknowledgments —List the names of the adults who assisted in the project with a brief description of what they did. Required...lose 5 points if not included.

Certification —Include a certification, signed by all student team members and adult coaches/assistants, stating: “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 in the Acknowledgements.” Required...lose 5 points if not included.

Bibliography —list all references used, including internet website/webpage, books and magazines. *(An internet website URL address is not enough...provide a few words about the information you obtained from it.)*

Appendices —conduct an internet search about Appendix (Appendices) and use them appropriately to include information about the Safety precautions you considered and incorporated, the Team Members with short biographies about each, scheduling and accomplishments achieved, special tools and/or machines used to design and build the Hovercraft.

Photos – Not required, but you can earn up to 5 bonus points with the inclusion of relevant photos.

Remember, a good report can make or break a team as far as placing First, Second, or Third. Only 5 points separates the fastest Hovercraft from the 2nd fastest. And, it has happened in the past that First place was won by a team with the second fastest Hovercraft because they achieved more points with the quality of the report they submitted.

Please note: At least 1 competition point will be deducted for poor grammar, poor spelling, or clear evidence that only “spell check” was used and no proofing was performed. The report is evaluated on a scoring scale of 100 points and the scoring points are scaled to the equivalent of 20 competition points...a score of 100 points on the scoring scale is equivalent to 20 competition points and a score of 50 points is equivalent to 10 competition points. *How do we know there was only “spell check”? When we see correctly spelled words used out of context, for example, “four” instead of “for”, “form” instead of “from”, “touché” instead of “touched”, we know spell check was used and didn’t stop at the word because it was spelled correctly, even though it was the wrong spelling for the context of the discussion.*

**GOOD LUCK TO YOUR TEAM...WE LOOK FORWARD TO REVIEWING YOUR  
REPORTS AND MEETING YOU TO DISCUSS YOUR HOVERCRAFT AND  
ACHIEVEMENTS WITH THIS ENGINEERING CHALLENGE.**