Maryland Engineering Challenges
2026 Cargo Ship Challenge
High School - Grades 9-12

Supported by:
Propeller Club of Baltimore
Naval Surface Ware Center - Carderock Division

Welcome Aboard

This challenge will allow high school students to design and build a 1:100 scale model cargo ship to move cargo within the Port of Baltimore. Within the confines of design limitations, student teams will work together to learn and develop solutions to a variety of challenges. No previous experience is required as teams are paired with mentors to help in the process. You will learn to work with a variety of building materials, adhesives, glues to assemble a hull and then install appropriate machinery to power your vessel.

Challenge

Each Team will establish a shipping company that will design and build a vessel to capable of carrying 3000g of sugar to the Port of Baltimore. The vessel must be designed within specific constraints. Each vessel will have use the same motor, battery, speed controller. Teams will submit a report explaining their design process, construction and testing prior to competition.

Dates

Registration: 11/1/2025

Please register your team prior to this date.

- Each team will need a list of Coach and members of the team at registration.
- The adult coach can assist many teams within a school
- Teams are limited to a size of 4 students.
- Register Link: https://bit.ly/2026MECRegistration

Workshop: 10/18/2025 10:00am-1:00pm

Please register for this hands-on workshop that helps teams and students understand the challenge during this workshop hosted by the US Naval Academy in Annapolis Maryland. This experience students will see actual Navy models designed and tested for real world solutions. Students will learn design and construction aspects of this project challenge. Teams with students under 18 years of age will be required to have an adult coach escort the students to the laboratory.

Registration is required: ***https://bit.ly/2026CargoShipWorkshopRegistration***

Report: 04/10/2026 prior to 4:00pm

Written report is due in a PDF format sent to email:
cargo.ship.challenges@gmail.com
challeges@thebmi.org

Competition: 04/26/2026 09:00 am

Location: Baltimore Museum of Industry, 1415 Key Highway, Baltimore, MD 2123

Vessel Design Constraint Requirements

Cargo Capacity: 3000 g (maximum)
Length: 100 cm
Depth: 10 cm
Draft: 5 cm
Beam: Determined by shipping company
GM: Minimum 0.95 cm or 2.0 second rolling period
Collision Bulkhead: 10% of length
Engine room: Bulkhead to separate cargo hold from Engine space.
Deckhouse: Must be at least 6.5 cm in height and be removable to inspect vessel.

Provide equipment Issued:
Motor: Kelvin LS5BFN-2645-R with Motor Mount.
Speed Controller: Provided.
Battery: HI-Performance 7.4V Li-Po 35C
Transmitter and Receiver: 4 Channel. Forward/reverse and steering.
Propeller: Provided
Shaft: Provided
Rudder Rod and shaft. Teams build rudder

Report Requirement

This report must contain the following:

1. Cover Page with Shipping Company Name and list of team members and coach.
2. Review the method of design and solutions your team conducted.
3. Final Dimensions: Length, Beam, Depth and Light weight without cargo.
4. Drawings. Teams must complete design drawings with scale and dimensions of the vessel. Including a profile, front/stern view and overhead view. This may be completed by CAD or graph paper drawing.
5. Testing and results. Teams must test vessel in “sea trials” prior to competition. Report observations and any changes made to vessel.
6. Maximum length of report is 5 pages. No addendum report on Competition Day.

Competition Requirement

1. ***ALL Vessels must be ready on competition day.*** There will be not time allocated for building or repairing of vessels. All teams will do oral presentations and competition together as a group.

2. Oral Presentation. Teams will present to the competition their solution on their vessel. Time 5 minutes limit.

3. Vessel is inspected, weighted empty and loaded with cargo. The vessel is tested in pool. Draft, and stability confirmed

4. Performance Demonstration. Teams will enter the course and navigate the vessel over a shallow water hazard and complete the full course. Times will be recorded to determine Required Freight Rate. If the vessel strikes the water hazard your vessel will incur a 30 second time penalty for each contact.

Glossary

Length: This is the extreme length overall from the bow to the stern of the vessel
Beam: This extreme width of the vessel measure on the main deck.
Depth: This is the distance from the keel to the main deck
Draft: This is the distance from the keel to the waterline.
Main Deck: The uppermost deck of the vessel.
Keel. The bottom of the vessel from which the vessel.
Light Weight: The weight of the vessel, equipment, battery, motor.
Loaded Weight: The Weight of the vessel with loaded cargo.
Displacement: Weight of water displaced by vessel floating in water.

Assistance

For some teams this challenge may require assistance. Local industry mentors are available to help teams with solving this challenge. Please reach out at anytime for assistance.

Report Grading Criteria (Weight 35%)

Item	Criteria	Points
1	Coverpage and Team members and Coach. Certification Statement that work was conducted by team.	5
2	Hull Shape and Design. Descibe Process.	10
3	Final Drawing of vessel and dimensions. Light Ship weight. Drawings must show; Profile, Top, End view of vessel with scale and dimensions.	50
4	Machinery Diagram with Components and Electrical wiring diagram	10
5	Testing. Proof of Testing and results.	25
TOTAL		100

Oral Report and Testing Grading Criteria (Weight 15%)

Item	Criteria	Points
1	Length	5
2	Draft Loaded (Marked)	25
3	Depth of Hull	5
4	GM Test (Loaded)	25
5	Bulkheads: Collision (10% of length) & Engine room.	10
6	Machinery Installation Fit and Finish	20
7	Deckhouse Height	10
TOTAL		100

Operational Grading Criteria (Weight 50%)

Item	Criteria	Points
1	Length	25
2	Cargo Weight (3000g)	25
3	Time on Course	50
TOTAL		100