



DESIGN DIVISION

The Challenge

Every vessel that sails the world's oceans begins with an idea. Long before a vessel transports cargo, supports offshore energy, conducts scientific research, or serves our nation's defense, teams of engineers, designers, and technical professionals work together to transform ideas into vessels capable of safely and efficiently performing their intended purpose.

Every decision matters. The shape of the hull, the placement of onboard equipment, the propulsion system, and the distribution of weight all influence how a vessel performs on the water. These decisions require creativity, technical knowledge, collaboration, and continuous testing to achieve the best possible solution.

Before a new vessel enters service, it must successfully complete a series of sea trials to evaluate its performance under standardized operating conditions. These trials verify that the vessel performs as intended and is ready for service.

Your challenge is to experience this process by creating a next-generation vessel capable of successfully completing its sea trials.

About This Brief

This Division Brief introduces this year's challenge and provides the information teams need to begin exploring, planning, and preparing for the challenge. It outlines the challenge purpose, overall objectives, and high-level expectations for the division.

A detailed Division Guide will be released separately and will serve, along with this brief, as the primary reference throughout the challenge season. The guide will include team expectations, checkpoints, documentation requirements, technical requirements, procedures, judging information, and other details needed to prepare for competition day.

Real World Connection

Designing a vessel is a collaborative effort involving professionals from many engineering and technical disciplines. Naval architects, marine engineers, CAD designers, and manufacturing specialists all contribute their expertise throughout the design process.

Home to one of the world's largest maritime communities, Hampton Roads professionals work together to design, build, modernize, and maintain vessels that support national defense, global commerce, offshore energy, and scientific research.

Every successful vessel represents thousands of engineering decisions made by teams working toward a common goal: creating safe, efficient, and reliable vessels that meet real-world operational needs.



Your Challenge

Using the provided propulsion system and challenge constraints, your team will design and construct a next-generation vessel capable of carrying a standardized operational equipment package while demonstrating its performance during a series of sea trials.

Throughout the project, your team will investigate how engineering decisions influence vessel performance. You'll explore how hull geometry, buoyancy, weight distribution, propulsion integration, and hydrodynamic performance work together to affect speed, stability, and overall efficiency.

During the official sea trials, your vessel will demonstrate its performance under standardized conditions. Success will depend on not only speed, but on your team's ability to balance competing design priorities while creating a reliable and well-engineered solution.

Things to Consider

Hull Design & Hydrodynamic Performance: The hull is the foundation of every vessel. Its shape, dimensions, and geometry influence how efficiently it moves through the water, how well it tracks through the course, and how much resistance it encounters. Consider how your hull design supports both speed and control.

Stability, Buoyancy & Weight Distribution: Every vessel must safely carry its operational equipment package while remaining upright and stable. Think about how buoyancy, center of gravity, hull geometry, and payload placement work together to influence overall vessel performance.

Propulsion System Integration: The propulsion system powers your vessel, but its effectiveness depends on how well it is integrated into your overall design. Consider motor placement, propeller alignment, shaft orientation, and how these components work together with the hull to maximize performance.

Engineering Tradeoffs: Every design decision has advantages and disadvantages. Throughout the design process, evaluate how your choices influence speed, stability, efficiency, and reliability. The most successful designs are those that balance competing priorities rather than optimizing a single characteristic.

Testing, Evaluation & Refinement: Professional design teams use testing to validate ideas and improve performance. Record observations, analyze results, identify opportunities for improvement, and use evidence to guide future design decisions. Continuous refinement is an essential part of every successful engineering project.

The vessels operating today were once innovative ideas on a designer's drawing board. As maritime technologies continue to evolve, new hull forms, advanced materials, autonomous systems, and emerging technologies are changing the future of vessel design. Your solution does not need to resemble an existing vessel. Think creatively, challenge conventional ideas, and develop a design that best meets the challenge requirements.

The Digital Ship Challenge organizers would like to stress that the majority of work on all phases of the project is to be designed and constructed by the students.



Judging Overview

Teams will be evaluated on multiple aspects of the design process and final vessel performance.

Evaluation will include:

- Digital Notebook
- Team Checkpoints
- Team Poster and Presentation
- Demonstrated Performance

Challenge Requirements

Teams will design and construct a next-generation vessel using the provided propulsion system while meeting all published design constraints.

Each vessel must:

- Meet specified size requirements
- Carry the standardized operational equipment package
- Successfully complete the sea trials
- Comply with all competition rules and safety requirements

Additional technical specifications, competition procedures, and detailed requirements are provided in the Design Division Challenge Guide.

Intent to Participate

Schools planning to participate in the 2027 Digital Ship Challenge should submit an intent to participate by September 11, 2026. This form is not your official team registration. Teachers will simply indicate the divisions they plan to enter and the anticipated number of teams. Team names and student information will be collected at a later date.

Complete the intent to participate form here: <https://forms.office.com/r/RHVKYCEREB>

