



Charles Wm. Lentz, Ed.D.  
Chairman Education Committee  
Navy and Marine Corps Homecoming 250  
8 Kirkbride Lane  
Doylestown, PA 18901

January 13, 2025

I am writing as the Chairman of the Education Committee for Homecoming 250 Navy and Marine Corps to invite your school district to be an integral part of the **Navy & Marine Corps 250th** Celebration in Philadelphia and Camden in October and November of 2025. This momentous occasion will commemorate 250 years of dedicated service by the U.S. Navy and Marine Corps, showcasing their rich history and highlighting their vital role in our nation's defense. This national event is to be the grand opening of the Nation's 250<sup>th</sup> anniversary - the Semiquincentennial. As part of the Homecoming 250 event, the Navy and Marine Corps are very interested in having schools and students in the Philadelphia Metropolitan area be a central part of this event.

This regional event presents a unique educational opportunity for students of all ages. We are offering a variety of engaging programs and activities designed to inspire learning and spark interest in STEAM fields, history, and civics and patriotism. We have devised four key ways in which schools can be a part of this celebration. Below are the four options for your district's students and teachers participation.

### **1. STEAM Competitions:**

We are hosting exciting STEAM competitions tailored to different grade levels, encouraging students to apply their creativity and problem-solving skills in a fun and competitive environment. These projects are being done in partnership with the U.S. Navy Maritime Industrial Base Program. A summary of the projects is below and the details for the grade span projects are attached.

- **Grades K-5: Sailboat Regatta:** Students will design and construct sailboats for a thrilling "raingutter regatta" race. Each school district will identify one team of students to send to the regional competition. The winners of the regional competition will be

selected to participate in a final competition at the national Homecoming event in October.

- **Grades 7-9: Submarine Challenge:** Teams will build submarines capable of completing a series of underwater tasks. Each school district will identify one team of students to send to the regional competition. The winners of the regional competition will be selected to participate in a final competition at the national Homecoming event in October.
- **Grades 10-12: "Shark Tank" Innovation Challenge:** Students will tackle real-world challenges faced by the Navy, presenting their solutions and prototypes to a panel of experts. Each school district will identify one team of students to send to the regional competition. The winners of the regional competition will be selected to participate in a final competition at the national Homecoming event in October. For this event naval officers will be the judges for the solution to the challenge.
- **Career and Technical Centers: Boat Building Challenge:** Students from at least two technical fields will collaborate to design and build a boat capable of carrying a specified weight. The more technical fields engaged the more points a team will score in this event. Each technical school will identify one team of students to send to the regional competition. The winners of the regional competition will be selected to participate in a final competition at the national Homecoming event in October.

## 2. Historical Events and Experiences:

The Philadelphia Metropolitan area will come alive with historical exhibits and activities. More information on the exhibits and opportunities will be provided at a later date. Some of the key events are noted below:

- **Ship Tours:** The U.S. Navy has committed to having at least a dozen historical and current naval vessels on display in the Philadelphia and Camden waterfronts which will be available for the students to explore. These vessels will represent numerous eras of naval history beginning with the American Revolution. The current ships will include, the Tall Ship Providence, the Battleship New Jersey, the Submarine Becuna and the Cruiser Olympia. Students will be able to tour these vessels as part of this celebration between October 10 through October 15, 2025.
- **Museum Programs:** Engage with special exhibits and programs at renowned regional museums. Museums which have committed to exhibits for this celebration are the African American Museum of Philadelphia, the American Swedish Historical Museum, the Battleship New Jersey Museum and Memorial, the Independence Seaport Museum, the Library Company of Philadelphia and the American Helicopter Museum.

## 3. School Visits:

Bring the Navy and Marine Corps experience directly to your classrooms! We can arrange for veterans and active-duty personnel to visit your schools, sharing their stories and career insights with students. Students will be able to hear from inspiring veterans and experts who will share their knowledge and experiences through their service in the armed forces. There will be veteran speakers available to speak about Navy and Marine Corps history. The Daughters of the American Revolution have also created educational programming which can be available to schools. Companies which serve the armed forces have also welcomed the opportunity to visit schools to share information about careers in their industries.

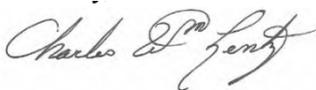
#### **4. JROTC Participation in Parade:**

Your district's student JROTC programs are invited to march in the grand parade honoring the Navy and Marine Corps, showcasing their dedication and discipline.

We believe that the Navy and Marine Corps Homecoming 250 offers an invaluable opportunity for your students to connect with our nation's maritime heritage and explore potential career paths in STEAM and service.

I have included a variety of attachments to assist in providing more information about the programs which will be available through this event. If you are interested, please complete either the attached form or [electronic form](#) indicating your area of interest so that we can be sure to include and inform you as the programs become available. I hope that you and your students will be involved in this once in a lifetime opportunity and stand ready to assist with any questions you may have. Please feel free to contact me at [clentz@nhsd.org](mailto:clentz@nhsd.org) or (267) 809-0082 with any questions. Thank you in advance for your consideration and I look forward to having you involved in this event.

Sincerely,



Charles Wm. Lentz, Ed.D.  
Chairman Education Committee  
Navy and Marine Corps Homecoming 250



**APPLICATION FOR INVOLEMENT IN HOMECOMING 250**  
**EDUCATIONAL PROGRAMMING OPPORTUNITIES**

Please submit no later than **February 28, 2025** to be considered for the programming to [kkane@nhsd.org](mailto:kkane@nhsd.org).

**School/School District**

**Name:** \_\_\_\_\_

**Contact Person and**

**Title:** \_\_\_\_\_

**Contact Information:**

**Address:** \_\_\_\_\_

**Phone:** \_\_\_\_\_

**Email:** \_\_\_\_\_

Please review the opportunities below and indicate interest by circling “yes” for each program of interest.

<b>STEAM Competition(s) interested in (if applicable).</b>	<b>Please circle one.</b>	
	<b>Yes</b>	<b>No</b>
<b>Elementary School Program (K-5)</b>		
<b>Number of Schools</b> _____		
<b>Middle School Program (6-8)</b>		
<b>Number of Schools</b> _____		
<b>High School Program (9-12)</b>		
<b>Number of Schools</b> _____		
<b>Career and Technical Center Program</b>		
<b>Number of Schools</b> _____		
<b>School Trips to Historical events/museum programs</b>		
<b>Educational Program Visits by Veterans (As available)</b>		
<b>School visits from Navy/Marine Corps representatives</b>		
<b>School visits from employers in the military service industry</b>		
<b>JROTC program participation in parade</b>		
<b>Number of Cadets in the Program</b> _____		



## LAUNCHING THE SEMIQUINCENTENNIAL

### Celebrating the 250<sup>th</sup> Birthdays of the Navy and Marine Corps at their Birthplace

As America prepares for the Semiquincentennial of the Declaration of Independence in 2026, Homecoming 250 Navy Marine Corps believes we should also celebrate the 250<sup>th</sup> birthdays of the military services that gained and defend our independence. The Navy and Marine Corps were founded on October 13 and November 10, 1775, in Philadelphia, and launched their first missions from the Delaware River. Homecoming 250™ is a 501(c)(3) charity created to bring the celebration of the Navy and Marines' 250<sup>th</sup> birthdays to their birthplace.

As a result of Homecoming 250's efforts, the Secretary of the Navy has announced that the Navy and Marine Corps will celebrate their 250<sup>th</sup> birthdays in Philadelphia and Camden in 2025, and we are planning with the Navy and Marines. [www.homecoming250.org/secretary-of-the-navys-announcement/](http://www.homecoming250.org/secretary-of-the-navys-announcement/). Numerous national and area leaders, organizations, corporations, countless veterans, and other Americans are supporting our efforts. [www.homecoming250.org/our-supporting-organizations/](http://www.homecoming250.org/our-supporting-organizations/).

Homecoming 250 is proud to host the national Navy & Marine Corps 250<sup>th</sup> Celebration in Fall 2025. It will be the grand opening of the Semiquincentennial, and its largest event honoring our military and veterans. Our plans to celebrate the Navy and Marine Corps 250<sup>th</sup> birthdays are highlighted by spectacular events:

On October 9-16, 2025, we will celebrate the Navy and Marine Corps 250<sup>th</sup> by assembling for touring historical, replica, and at least four active-duty Navy ships, an unprecedented display of Naval history from the American Revolution to the present. [www.homecoming250.org/the-navy-250th-celebration/](http://www.homecoming250.org/the-navy-250th-celebration/). The Blue Angels and other Naval and Marine aircraft will fly overhead, and there will be military demonstrations on the Delaware. We will host the Navy 250<sup>th</sup> Celebration, an All Veterans Reunion saluting all who served in every branch, a Salute to Youth Parade honoring those entering the services, a Victory at Sea concert by the Navy and Marine Bands at Independence Mall, and fireworks. There will be exhibits about the Navy and Marines at Philadelphia's superb museums, a Maritime Workforce Outreach, and an Academic Symposium hosted by UPenn and Rutgers. And we are planning special pro and amateur athletic events, school programs, and more.

On November 10, 2025, we will host the Marine Corps 250<sup>th</sup> Celebration, and the 100<sup>th</sup> Marine Corps Birthday Ball in the same Philadelphia ballroom where Commandant Lejeune held the 1<sup>st</sup> Marine Corps Birthday Ball in 1925. We will celebrate the recreation of The Tun, historic birthplace of the Marine Corps, as an operating tavern, owned by a charity, to serve as a destination for Marines, tourists, and others for decades to come. [www.homecoming250.org/the-marine-corps-250th-celebration/](http://www.homecoming250.org/the-marine-corps-250th-celebration/).

The Navy & Marine Corps 250<sup>th</sup> Celebration will remind us what unites us. It will salute those who serve, and honor veterans of all services. It will spotlight the Nation's birthplace and attract residents, tourists, and history lovers. It will inspire our youth and educate our citizens about our Nation's history, challenges, and future.

Learn more at [www.homecoming250.org](http://www.homecoming250.org). Help make it happen by volunteering, [www.homecoming250.org/get-involved/](http://www.homecoming250.org/get-involved/), donating at [www.homecoming250.org/donate/](http://www.homecoming250.org/donate/), or becoming a sponsor. Welcome aboard!



★ **2025** ★  
**National Milestone Event**

**SPECTACULAR DISPLAYS OF NAVY & MARINE CORPS HISTORY**

The celebration will include historical, replica, and active-duty ships representing the Navy from the Revolution to today, including ships important to the Marine Corps, in the greatest display of naval history ever. The celebration also will feature aviation displays by the Blue Angels, historic and current Navy and Marine aircraft, and Marine vertical takeoff and landing aircraft. The Marines will demonstrate their landing craft and equipment, and the Navy SEALs and Leap Frogs Parachute Team will participate. Philadelphia Museums will showcase the rich history of the Navy and Marine Corps from the inception of our nation to the present day.



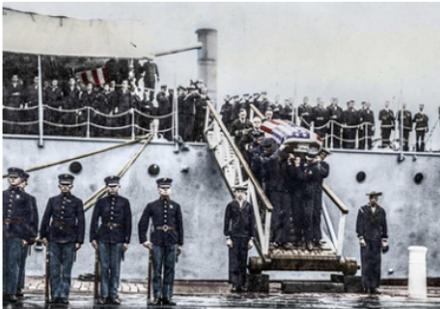
The Submarine Beccina served in WWII and the Cold War



Blue Angels



F4U Corsair of USMC



The Marines of the Olympia saved the casket of the Unknown Soldier



The USS Providence escorted the Marines' 1st amphibious mission

**ATTENDING ACTIVE & HISTORICAL SHIPS**

- Battleship *New Jersey*
- Cruiser *Olympia*
- Submarine *Beccina*
- Tall Ship *Providence Replica*
- USS *Monitor Replica*
- *Washington's Crossing Durham Boat*
- *Wasp-Class Amphibious Assault Ship*
- *Arleigh Burke-Class Destroyer*
- *Freedom/Independence Littoral Combat Ship*

**INVITED SHIPS**

- *Brig Niagara*
- *Ticonderoga-Class Cruiser*
- *San Antonio-Class Amphibious Transport Dock*
- *Virginia-Class Attack Submarine*
- *USCG Cutter*

**ATTENDING & INVITED NAVY & MARINE AVIATION**

- *Blue Angels (Attending)*
- *F/A-18 Hornets/Super Hornet*
- *F-35B/C Lightning II*
- *AV-8B Harrier II*
- *C-130/KC-130 Super Hercules*
- *V-22/MV-22 Osprey*
- *P-3 Orion*
- *P-8 Poseidon*
- *E-2 Hawkeye*
- *T-45 Goshawk*
- *T-34 Mentor*
- *F4F/FM Wildcat*
- *F4U/FG Corsair*
- *F6F Hellcat*
- *F8F Bearcat*
- *TBF/TBM Avenger*
- *SBD Dauntless*
- *SB2C Helldiver*
- *PBY Catalina*
- *OV-10 Bronco*
- *AH-1Z Viper*
- *CH-53 Super/King Stallion*
- *SH-60 Seahawk*
- *UH-1 Iroquois*
- *A-4 Skyhawk*

## 2025 CELEBRATION HIGHLIGHTS

### THE 100TH MARINE CORPS BIRTHDAY BALL

On November 10th, 2025, Homecoming 250 will host the 100th Marine Corps Birthday Ball in the same Philadelphia ballrooms where Lieutenant General John A. Lejeune held the 1st Marine Corps Birthday Ball on November 10th, 1925. At the historic Ben Franklin and Bellevue Ballrooms, this annual tradition was launched with distinguished guests, including the Secretary of the Navy, Commandant Lejeune, and Marine hero Smedley Butler. Having the 100th Ball at the very spot where it all started is a unique way to honor this special tradition and the Marine Corps 250th.

### THE TUN REBORN

In 1775, the first Marines were recruited in The Tun, the historic Philadelphia tavern that became the birthplace of the Corps and helped give birth to the Navy and other organizations. Homecoming 250 is partnered with The Tun Legacy Foundation, the charity recreating The Tun, and is planning the celebration of The Tun's recreation as an operating tavern that will serve as a gathering place for Marines, tourists, area residents, and others for decades to come.

### LIVE PERFORMANCES

The celebration will include a "Victory at Sea" concert on Independence Mall, featuring the Marine Band, the Navy Band, and possibly the Philadelphia Orchestra and other performers. These performances will be followed by a dramatic fireworks and/or drone show.

### JOIN US

Homecoming 250's Navy & Marine Corps 250th Celebration will be the grand opening event of the Semiquincentennial and will be its largest event honoring the military and veterans, attracting visitors from across the nation. This event will remind us what unites us, reconnect Americans with those who serve, educate our youth, and commemorate those who bravely fought for us all.

To bring this monumental festival to life, we invite you to contribute through sponsoring and supporting this spectacular national event.

Your support will help...

- Shine an early spotlight on the birthplace of our Nation to launch the Semiquincentennial celebration.
- Ensure that this event becomes a memorable and meaningful tribute to the Navy, Marines, and veterans who have selflessly served our country.
- Provide a captivating journey through U.S. history with compelling visual displays, highlighting the pivotal role our military has played in defending our world.

To learn more, visit [www.Homecoming250.org](http://www.Homecoming250.org)



Silent Drill Team

### ADDITIONAL PLANNED EVENTS INCLUDE:

- Navy 250th Gala
- All Veterans Reunion Picnic
- Navy & Marine Corps Run
- NFL Salute
- Leadership Summit
- Veterans/Midshipmen's Parade
- Academic Symposium
- Historical Site Tours



USMC Ball



Tun Tavern (U.S. Naval History & Heritage Command)



U.S. Navy Band, 2019



## **TIMELINE OF EVENTS FOR EDUCATIONAL PROGRAMMING**

### **January – April 2025**

1. Schools distribute information about the competitions available through the Homecoming 250 STEAM challenges.
2. Teams complete their entries and presentations for the Homecoming 250 Challenges.
3. Schools and districts register to be a part of the programs available through the Homecoming 250 Celebration by **February 28, 2025**.

### **April 2025 – May 2025**

1. Regional competitions will be held to identify winning teams to compete in the national competition in the Fall of 2026 as part of the Homecoming 250 events. Date and Location TBA.

### **May 2025-October 2025**

1. Teams finalize their entries for the competition. Competition to be held between October 9-16, 2025
2. Exhibits available through museums, including:
  - a. African American Museum of Philadelphia
  - b. American Swedish Historical Museum
  - c. Battleship New Jersey Museum and Memorial
  - d. Independence Seaport Museum
  - e. Library Company of Philadelphia
  - f. American Helicopter Museum
3. Historical programming materials distributed to schools that expressed interest.
4. Programs in schools and visits by veterans take place in schools as requested.



## **TENTATIVE TIMELINE OF EVENTS FOR HOMECOMING 250**

### **Wednesday, October 8, 2025**

1. Opening of Navy History exhibit at Historical Society of Pennsylvania

### **Thursday, October 9, 2025**

1. Parade of Ships up the Delaware including:
  - a. Tall Ship Providence to Camden/Penn's Landing
  - b. Two Freedom/Independence – Class littoral combat ships to Camden/Penn's Landing
  - c. Arleigh Burke-class destroyer to Navy Yard
  - d. Wasp-class amphibious assault ship to Navy Yard
  - e. Naval Academy YPs and Sailboats
  - f. Among many others.
2. Parade of Ships Watch Parties at Fort Mifflin, Fort Mercer, Navy Yard, Penn's Landing and Camden Waterfront.
3. Opening Ceremonies/VIP events/Ship Arrivals/Blessing of the Fleet at the Navy Yard, Penn's Landing and Camden Waterfront.
4. Preview of Ken Burns' "The American Revolution" on Independence Mall
5. Opening reception for Academic Symposium at Library Company of Philadelphia
6. Philadelphia Orchestra Concert – opening acknowledgement of Navy and Marine Corps 250<sup>th</sup>.

### **October 9-16, 2025**

1. Touring of the Visiting and Resident Vessels, including the following vessels:
  - a. Battleship New Jersey
  - b. Cruiser Olympia
  - c. Submarine Becuna
  - d. Washington's Crossing Durham Boat
2. Water tours of the Delaware River by Tall Ship Providence and other ships
3. RiverLink Ferry connecting Penn's Landing and Camden Waterfront
4. Tours of Philadelphia and Area Sites Related to the Navy and Marine Corps
5. Aviation Flyovers over Philadelphia Area by:
  - a. Navy and Marine Corps Active-Duty Aircraft
  - b. Navy and Marine Corps and Heritage Aircraft

6. Demonstrations by:
  - a. Marine Corps Vertical and Short Take Off and Landing Aircraft
  - b. Navy SEAL's Helicopter and Water Teams
  - c. Leapfrogs Parachute Team
  - d. Marine Corps Hovercraft/Landing craft
7. Static Displays of:
  - a. Navy and Marine Corps Aircraft
  - b. Marine Corps and Navy Vehicles and Equipment
8. Performances by:
  - a. Navy Bands
  - b. Marine Bands
  - c. Marine Silent Drill Platoon
  - d. Marine Drum and Bugle Corps
9. Navy and Marine Corps Aviation at Philadelphia Northeast Airport
10. Marine Corps Physical Activity Centers
11. School Visits by Navy, Marine Corps, and Veterans
12. School Field Trips

#### **Friday, October 10, 2025**

1. Navy Chaplain Corps 250<sup>th</sup> Celebration/Professional Navy Chaplaincy Executive Board begins
2. Rain Date for Preview of Ken Burns "The American Revolution" on Independence Mall
3. Academic Symposium on 250 Years of Navy/Marine Corps History – Part I by Penn at McNeill Center
4. Army-Navy Cup at Subaru Park, Chester
5. Navy Band Concert

#### **Saturday, October 11, 2025**

1. Philadelphia Orchestra Concert – opening acknowledgement of Navy and Marine Corps 250<sup>th</sup>.
2. Academic Symposium on 250 Years of Navy/Marine Corps History – Part I by Penn at McNeill Center
3. Navy Seal Family Foundation Around the World Paddle Classic on Delaware/Schuylkill
4. 250<sup>th</sup> 5K/10K Run with the Marines and Sailors
5. Navy-Temple Football Game at Lincoln Financial Field
6. Navy 250<sup>th</sup> Gala with Secretary of Navy and Chief Naval Officers at Bellevue Hotel

#### **Sunday, October 12, 2025**

1. Leadership Summit
2. Homecoming 250<sup>th</sup> All Veterans Reunion Picnic on Independence Mall with VSOs
3. Televised "Victory at Sea" Concert on Independence Mall with the President's Own Marine Band, the U.S. Navy Band and Headliners.

4. Homecoming 250<sup>th</sup> Fireworks and Drones Show Visible from Independence Mall

**Monday, October 13, 2025**

1. Memorial Service to Navy and Marine Corps at Christ Church
2. Homecoming 250<sup>th</sup> “250<sup>th</sup> Salute to Youth” Parade of Midshipmen/ROTC/JROTC
3. Navy 250<sup>th</sup> Birthday Ceremony at Independence Mall with
  - a. Address by Secretary of Navy and Chief Naval Officers at Independence Hall
  - b. VIP Navy Reception at Congress Hall
4. Blue Angels Flyover
5. NFL/Eagles Monday Night Salute to the Navy and Marine Corps 250<sup>th</sup> at Lincoln Financial Field.

**Tuesday, October 14, 2025**

1. Navy Medicine Presentation at Pennsylvania Hospital

**Thursday, October 16, 2025**

1. Ship Departure and Closing Ceremonies

**November 10, 2025**

1. Marine Corps 250<sup>th</sup> Celebration at Independence Mall
  - a. Address by Secretary of Navy and Commander of Marine Corps at Independence Hall.
  - b. VIP Reception at Congress Hall.
2. Performance by Marine Drum and Bugle Corps
3. Celebration around Dedication of Recreation of Tun Tavern at 2<sup>nd</sup> near Market Streets.
4. Marine Corps 100<sup>th</sup> Birthday Ball at the Bellevue site of 1<sup>st</sup> Marine Corps Birthday Ball.

# **GRADE SPAN STEAM PROJECTS**



## ELEMENTARY LESSON PLAN FOR BUILDING SAILBOATS GRADES K-5

**Title:** "Full STEAM Ahead! Designing and Building Boats"

**Grade Level:** K-5 (adaptable for higher grades)

**Duration:** Flexible, depending on the depth of each activity. Can be spread across multiple days or weeks.

### **Learning Objectives:**

- **Science:**
  - Understand concepts of buoyancy, density, and water displacement.
  - Explore different forces (wind, water resistance) and their impact on movement.
  - Learn about different types of boats and their purposes.
  - For higher grades: delve into simple physics calculations related to speed, distance, and time.
- **Technology:**
  - Use digital tools (if available) for research, design, and documentation.
  - Explore 3D modeling (optional, for higher grades).
- **Engineering:**
  - Engage in the engineering design process (ask, imagine, plan, create, test, improve).
  - Apply problem-solving skills to design challenges.
  - Develop spatial reasoning and fine motor skills during construction.
- **Art:**
  - Express creativity through boat design and decoration.
  - Explore aesthetics and design principles.
- **Math:**
  - Measure and compare boat dimensions.
  - Calculate speed and distance.
  - Collect and analyze data from boat races.

### **Materials:**

- **Recycled Materials:** Potential Items include: plastic bottles, cardboard, Styrofoam, straws, fabric scraps, etc.
- **Basic Tools:** Scissors, tape, glue, markers, rulers

- **Optional:**
  - Rain gutter regatta inflatable course
  - Small pool or tub for testing
  - Weights for testing load capacity
  - Digital timers
  - Cameras for documentation
  - Computer/tablet for research and design

### Lesson Sequence:

1. **Introduction & Exploration (1-2 class periods):**
  - **Hook:** Engage students with videos of different boats (sailboats, submarines, cargo ships).
  - **Discussion:** What are boats? Why do they float? What are they used for?
  - **Research:** Explore different types of boats and their features. (K-2 can focus on basic types, 3-5 can research specific classes).
  - **Guest Speaker:** Invite a boat builder, sailor, or naval engineer (if possible) to share their expertise.
2. **Design & Planning (1-2 class periods):**
  - **Design Challenge:** Present the boat design challenge.
    - **K-2:** Focus on basic boat shapes and floating ability.
    - **3-5:** Introduce specific requirements (e.g., must carry a certain weight, must be propelled by wind/rubber band, etc.).
  - **Brainstorming:** Encourage students to sketch ideas and discuss design choices.
  - **Planning:** Guide students to create detailed plans with material lists and measurements.
3. **Construction & Testing (2-3 class periods):**
  - **Building:** Provide dedicated time for students to construct their boats.
  - **Testing:** Set up a testing area (pool, tub, or rain gutter regatta) for students to test their designs.
  - **Modifications:** Encourage students to observe, analyze, and modify their designs based on testing results.
4. **Race Day & Reflection (1-2 class periods):**
  - **Competition:** Organize a boat race with clear rules and safety guidelines.
  - **Data Collection:** Have students record race times and other data.
  - **Reflection:** Discuss the results, challenges faced, and lessons learned.
  - **Awards:** Recognize creativity, teamwork, and problem-solving skills (not just speed).

### Assessment:

- **Formative:** Observe student engagement, participation in discussions, and design choices.
- **Summative:** Evaluate boat designs, construction quality, race performance, and written reflections.

### Differentiation:

- **Support:** Provide pre-cut materials, templates, and step-by-step instructions for younger students or those needing extra support.
- **Challenge:** Offer advanced design challenges (e.g., incorporating renewable energy sources, designing for specific environments, etc.) for older or more advanced students.

#### **Sustainability Considerations:**

- Emphasize the use of recycled materials.
- Discuss the importance of reducing waste and protecting our waterways.
- Explore the impact of boat design on the environment.

#### **Extension Activities:**

- **Research:** Explore the history of boat building and famous naval architects.
- **Writing:** Write stories, poems, or technical reports about their boats.
- **Art:** Create artwork inspired by their boat designs.
- **Field Trip:** Visit a local marina, shipyard, or maritime museum.

This lesson plan provides a framework for a fun and engaging learning experience. Remember to adapt it to your specific classroom needs and resources. Have fun building those boats!



**ELEMENTARY SAILBOAT RUBRIC**

<b>Team Name:</b>		<b>Team District:</b>		<b>Team School:</b>		<b>Total Score:</b>
<b>Category</b>	<b>Criteria</b>	<b>Points</b>	<b>Excellent</b>	<b>Good</b>	<b>Fair</b>	<b>Needs Improvement</b>
<b>Construction</b>	Durability: How well is the boat constructed? Does it hold up during testing and racing?	5	Boat is sturdy and shows no signs of damage after multiple tests and races.	Boat is mostly sturdy, with minor wear and tear after testing and races.	Boat shows some signs of weakness or damage.	Boat is fragile and falls apart easily.
	Water Resistance: How well does the boat resist water? Does it stay afloat and dry?	5	Boat remains completely dry and afloat throughout testing and racing.	Boat remains mostly dry with minimal water entering.	Boat takes on some water but remains afloat.	Boat takes on a significant amount of water and struggles to stay afloat.
<b>Speed</b>	Time Trial: How fast does the boat travel a set distance?	10	Boat completes the course in the fastest time.	Boat completes the course in a competitive time.	Boat completes the course, but at a slower pace.	Boat struggles to complete the course or does not finish.
<b>Creativity</b>	Originality: How unique and innovative is the boat's design?	10	Boat design is highly original and demonstrates innovative use of materials.	Boat design is creative and shows some unique elements.	Boat design is somewhat original but follows common patterns.	Boat design is basic and lacks originality.
	Problem Solving: How effectively does the design address the challenge criteria	5	Boat effectively addresses all challenge criteria with	Boat addresses most challenge criteria effectively.	Boat addresses some challenge criteria, but	Boat struggles to meet the challenge criteria.

	(e.g., carrying weight, wind propulsion)?		clever solutions.		with limitations.	
<b>Aesthetics</b>	Visual Appeal: How attractive and well-presented is the boat?	5	Boat is visually appealing with careful attention to detail and craftsmanship	Boat is well-presented and shows effort in its appearance.	Boat has a basic level of presentation.	Boat lacks visual appeal and shows little effort in presentation.
	Theme/Decoration: How well does the boat incorporate a theme or decorations?	5	Boat has a clear and well-executed theme or decorations that enhance its design.	Boat has a theme or decorations that are relevant to the project.	Boat has some basic decorations.	Boat has no theme or decorations.
<b>Sustainability</b>	Material Choice: How well does the boat utilize recycled and sustainable materials?	5	Boat exclusively uses recycled materials in a creative and effective way.	Boat mostly uses recycled materials with some new materials.	Boat uses a mix of recycled and new materials.	Boat primarily uses new materials.



### MIDDLE SCHOOL STEM DESIGN CHALLENGE

2024-2025 | Marines & Navy 250th Birthday Celebration | Philadelphia, PA

# **Middle School Engineering Contest**

## ***“Operation Dive & Deliver”***

**Testing Date: TBD**

**Location: TBD**

### Mission Brief:

The year is 2030, and you are part of an elite marine exploration team tasked with a high-stakes underwater mission. Your challenge is to build a submarine capable of hovering at specific depths, moving forward using propulsion, and accurately dropping a vital “supply payload” onto a designated underwater target zone. Teams must carefully balance their submarines, devise a reliable propulsion system, and engineer a release mechanism for their payload.

### Mission Goals:

- Achieve neutral buoyancy and hover at a set depth.
- Propel forward using a propulsion device such as rubber band powered props, water jet propulsion, etc.
- Execute a precise “supply drop” while in motion, dropping a small object onto a target zone at the bottom of a water tank.

- Have Fun, Be Creative, Think outside the Box.

## Challenge Stages:

### Stage 1: Buoyancy Test

- **Objective:** Adjust the ballast to make the submarine hover at a specific depth for at least 10 seconds without floating to the surface or sinking.
- **Materials:** Plastic bottles or containers for the hull, fishing weights or washers for ballast, small balloons or syringes with tubing for adjustable buoyancy.
- **Instructions:**
  - Students start by building their submarine using a plastic bottle or other waterproof container as the main body.
  - They will experiment by adding or removing weights until the submarine achieves neutral buoyancy, allowing it to “hover” at a designated depth in the tank.
  - Once balanced, students can test how small adjustments (like inflating or deflating a balloon) affect the submarine’s stability and hovering ability.

### Stage 2: Propulsion Test

- **Objective:** Move the submarine forward as far as possible using a rubber band-powered propeller, paddle system, or forced water propulsion. The submarine can be submerged or ride on top of the water for this test.
- **Materials:** Rubber bands, plastic paddles or propellers, skewers or small plastic rods for mounting.
- **Instructions:**
  - Students attach a rubber band to the back of their submarine and wind it around a small propeller or paddle.

- By winding and releasing the rubber band, the submarine should be propelled forward. Students can experiment with the number of rubber band twists to optimize the propulsion distance.
- Teams are encouraged to make minor adjustments and test various setups to find the most effective design for forward movement.

### **Stage 3: Timed Precision Drop**

- **Objective:** While moving forward, the submarine must drop a “supply payload” which will be a ping pong ball with a penny in it. The goal is to drop onto a target at the bottom of the tank using a pneumatic release mechanism.
- **Materials:** Small syringe, tubing, ping pong ball or small weighted object as the payload, tape or rubber bands for mounting.
- **Instructions:**
  - Attach a small syringe to the top or side of the submarine. When the syringe is pushed or pulled, it will activate a simple release mechanism for the payload.
  - Students place their “supply payload” (such as a ping-pong ball or a washer) into a small cup or compartment on the submarine.
  - As the submarine moves forward, the syringe is pressed (either by a teammate or with an extension) to release the payload at the right moment, aiming to drop it onto a target at the tank’s bottom.



**MIDDLE SCHOOL DESIGN CHALLENGE RUBRIC**

<b>Team Name:</b>		<b>Team District:</b>		<b>Team School:</b>		<b>Total Score:</b>
<b>Category</b>	<b>Criteria</b>	<b>Points</b>	<b>Excellent</b>	<b>Good</b>	<b>Fair</b>	<b>Needs Improvement</b>
Stage 1: Buoyancy	Neutral Buoyancy: Does the submarine achieve neutral buoyancy at the designated depth?	20	Submarine hovers at the designated depth for the entire duration (10 seconds) without sinking or floating.	Submarine hovers at the designated depth for most of the duration with minimal sinking or floating.	Submarine briefly hovers at the designated depth but struggles to maintain neutral buoyancy.	Submarine is unable to achieve neutral buoyancy and either sinks or floats immediately.
Stage 2: Propulsion	Distance: How far does the submarine travel?	20	Submarine travels the entire length of the testing area (maximum distance).	Submarine travels a significant distance with good speed.	Submarine travels a moderate distance.	Submarine travels a minimal distance or not at all.
Stage 2: Propulsion	Efficiency: How efficient is the propulsion system?	20	Propulsion system is highly efficient, providing consistent and controlled movement.	Propulsion system is mostly efficient, with some minor inconsistencies in movement.	Propulsion system is somewhat efficient but may exhibit significant inconsistencies.	Propulsion system is inefficient and struggles to propel the submarine effectively.
Step 3: Precision Drop	Accuracy: How accurately does the submarine drop the payload onto the target?	30	Payload lands directly on the target.	Payload lands within the designated target area.	Payload lands near the target area.	Payload misses the target area completely.
Creativity & Teamwork	<b>Design:</b> How creative and innovative is the submarine's design?	5	Submarine design is highly original and demonstrates out-of-the-box thinking.	Submarine design is creative and incorporates unique elements.	Submarine design is functional but lacks significant originality.	Submarine design is basic and uninspired.
Creativity & Teamwork	<b>Teamwork:</b> How effectively does the team work together?	5	Teamwork is exceptional, with clear communication,	Teamwork is good, with effective collaboration	Teamwork is evident, but there is room for	Teamwork is lacking, with minimal

			collaboration, and problem- solving.	and communication .	improvement in communicatio n and collaboration	collaboration or communication.
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## HIGH SCHOOL STEM DESIGN CHALLENGE

High School Lesson Plan:  
STEM Technology Challenge - Naval Innovation

Subject: STEM (Science, Technology, Engineering, Mathematics)  
Grade Level: 9-12

### **Executive Summary:**

The U.S. Navy faces an array of complex challenges requiring innovative approaches to ensure safety, efficiency, and environmental sustainability. From improving ship performance to addressing marine environmental concerns and enhancing sailors' safety in extreme conditions, the demand for creative problem-solving is paramount. To inspire the next generation of innovators, this program challenges high school students to research a current naval issue and develop a prototype solution, culminating in a "Shark Tank"-style presentation to showcase their creativity, feasibility, and potential impact.

Students will explore one or more focus areas: ship design and efficiency; navigation, safety, and security; sustainability and environmental impact; maintenance and repair; and human factors. By combining STEM skills, the engineering design process, and the principles of universal design, participants will tackle real-world problems while honing their ability to communicate solutions effectively through video presentations and digital posters.

Materials to support classroom implementation include a structured, multi-day lesson plan to support students as they progress from brainstorming and research to prototyping and presentation. Possible activities include learning universal design principles, collaborating on innovative solutions, constructing prototypes with hands-on materials, and creating polished presentations. This Challenge emphasizes teamwork, critical thinking, and creativity while providing differentiated support for diverse learning needs. Assessment includes evaluations of research quality, prototype functionality, and presentation clarity using a comprehensive rubric. Participating schools may consider including extension opportunities, such as guest speakers and field trips, to further connect students to the naval industry, sparking interest in STEM careers and equipping them to shape the future of naval innovation.

### **Problem Statement: Innovate to Navigate: The Future of Naval Solutions**

The U.S. Navy faces diverse and evolving challenges that require innovative solutions to maintain safety, efficiency, and environmental responsibility. From improving maritime security to enhancing vessel performance, addressing marine environmental concerns, or developing

technologies to aid sailors in extreme conditions, the demand for creative problem-solving has never been greater.

As a team of innovative thinkers, your mission is to research a current naval problem and design a prototype that addresses this challenge. You will present your solution in a "Shark Tank"-style pitch to a panel of judges, showcasing your understanding of the issue, the feasibility of your design, and its potential impact on naval operations.

Your prototype could address one or more of the following focus areas:

- Ship design and efficiency: Examples include strategies to decrease fuel consumption or improve hull design
- Navigation, Safety and Security: Examples include strategies or devices to improve surveillance and defense capabilities, avoid collisions, and/or predict weather.
- Sustainability and Environmental Impact: Examples include solutions to reduce emissions, prevent pollution, and/or reduce the naval operations' environmental footprint
- Maintenance and Repair: Examples include solutions to prevent corrosion or to perform underwater inspection.
- Human Factors: Examples include solutions to improve sailors' health, safety, or quality of life. Solutions that increase accessibility for sailors with disabilities.

Are you ready to dive deep and rise to the challenge? It's time to combine your creativity, STEM skills, and teamwork to create the future of naval innovation!

Learning Objectives:

- Students will be able to identify and research a real-world problem within the naval industry.
- Students will be able to apply the engineering design process to develop an innovative solution.
- Students will be able to demonstrate the principles of universal design in their prototype.
- Students will be able to effectively communicate their solution through a video presentation and digital poster.

Materials Needed:

- Computers with internet access
- Presentation software (e.g., Google Slides, PowerPoint)
- Video editing software (e.g., iMovie, Adobe Premiere Rush)
- Poster design software (e.g., Canva, Adobe Spark)
- Prototyping materials (e.g., cardboard, foam board, 3D printer, LEGOs, basic electronics)

Possible Multi-Day Lesson Plan to Support In-Class Implementation:

Day 1: Introduction & Research

1. Introduction (10 minutes):
  - Begin by introducing the challenge and its connection to real-world problem-solving in the naval industry.
  - Discuss the importance of STEM fields in naval innovation.

- Show examples of naval technologies and their evolution.
2. Brainstorming Naval Problems (15 minutes):
    - Divide students into groups of 3-4.
    - Brainstorm potential problems faced by the naval industry. Encourage them to think broadly about areas like:
      - Ship design and efficiency: Examples include strategies to decrease fuel consumption or improve hull design
      - Navigation, Safety and Security: Examples include strategies or devices to improve surveillance and defense capabilities, avoid collisions, and/or predict weather.
      - Sustainability and Environmental Impact: Examples include solutions to reduce emissions, prevent pollution, and/or reduce the naval operations' environmental footprint
      - Maintenance and Repair: Examples include solutions to prevent corrosion or to perform underwater inspection.
      - Human Factors: Examples include solutions to improve sailors' health, safety, or quality of life. Solutions that increase accessibility for sailors with disabilities.
  2. Research and Problem Selection (20 minutes):
    - Have each group select one problem to focus on.
    - Guide students to conduct research using reliable online sources (naval journals, industry websites, scientific articles) to gather information about their chosen problem.

## Day 2: Universal Design & Ideation

1. Universal Design Principles (15 minutes):
  - Introduce the concept of universal design. Explain its seven principles:
    - Equitable Use
    - Flexibility in Use
    - Simple and Intuitive Use
    - Perceptible Information
    - Tolerance for Error
    - Low Physical Effort
    - Size and Space for Approach and Use
  - Discuss how universal design can be applied to naval technology to improve accessibility and usability for a diverse crew.
2. Ideation and Brainstorming (20 minutes):
  - Guide groups to brainstorm potential solutions to their chosen problem, keeping universal design principles in mind. Encourage creative thinking and out-of-the-box ideas.
  - Have each group sketch and annotate multiple solution ideas.
2. Solution Selection and Refinement (10 minutes):
  - Facilitate a discussion within each group to select the most promising solution.
  - Encourage groups to refine their chosen solution based on feasibility, effectiveness, and adherence to universal design principles.

### Days 3-4: Prototyping

1. Prototype Planning (15 minutes):
  - Guide students to develop a plan for their prototype, including:
    - Materials needed
    - Construction steps
    - Features to be included
2. Prototype Construction (Remaining Time):
  - Provide students with access to prototyping materials and tools.
  - Supervise and assist students as they build their prototypes.
  - Encourage collaboration and problem-solving within groups.

### Day 5: Presentation Preparation

1. Video Presentation (20 minutes):
  - Introduce the guidelines for the video presentation:
    - Clearly explain the naval problem and its significance.
    - Describe their solution and how it addresses the problem.
    - Highlight the universal design features of their prototype.
    - Demonstrate the functionality of their prototype (if possible).
    - Keep the presentation concise and engaging (3-5 minutes).
2. Digital Poster (20 minutes):
  - Provide guidelines for the digital poster:
    - Include visuals (photos, diagrams, sketches) to illustrate their solution.
    - Use clear and concise language to explain the problem, solution, and universal design features.
    - Organize information logically and use an appealing layout.
2. Presentation Practice (5 minutes):
  - Allow time for groups to practice their presentations and rehearse their explanations.

### Day 6-7: Presentations and Evaluation

1. Presentations (Majority of Time):
  - Have each group present their video and digital poster to the class.
  - Encourage classmates to ask questions and provide constructive feedback.
  - Presentations should be a maximum of 5 minutes.
2. Evaluation (Remaining Time):
  - Use the included [rubric](#) to evaluate student presentations and prototypes based on:
    - Clarity of problem definition and research
    - Innovation and effectiveness of the solution and the application of universal design principles
    - Quality and functionality of the prototype
    - Teamwork and collaboration
    - Quality of the video presentation
    - Creativity and visual appeal, including the digital poster

Differentiation:

- For students who need support:
  - Provide pre-selected research articles or websites.
  - Offer more structured guidance during the brainstorming and prototyping phases.
  - Allow for alternative presentation formats (e.g., written report, oral presentation).
- For advanced students:
  - Encourage them to explore more complex naval problems.
  - Challenge them to incorporate advanced technologies or design features into their prototypes.
  - Have them research and present on the ethical considerations of their solution.

Assessment:

- Observe student participation in discussions and group activities.
- Evaluate the quality of research and problem-solving.
- Use the included rubric to evaluate the video presentations and digital posters.

Extension Activities:

- Invite a naval engineer or other industry professional to speak to the class.
- Arrange a field trip to a naval museum or shipyard.
- Have students submit their projects to a STEM competition in addition to the Homecoming 250 High School Competition.



**HIGH SCHOOL STEM DESIGN RUBRIC**

**Naval Innovation Design Challenge Rubric**

**TEAM #:** \_\_\_\_\_

**SCHOOL:** \_\_\_\_\_

**REGION:** \_\_\_\_\_

**JUDGE #:** \_\_\_\_\_

**TOTAL SCORE:** \_\_\_\_\_

CRITERIA	4 - EXCEPTIONAL	3- PROFICIENT	2- DEVELOPING	1 - NEEDS IMPROVEMENT	S C O R E	WEIGHT	WEIGHTED VALUE
<b>Problem Definition &amp; Research (20%)</b>	Problem is clearly identified and well-researched. Reliable sources are cited. Students demonstrate a deep understanding of the issue.	Problem is identified and adequately researched. Sources are used but lack diversity or depth.	Problem is identified but lacks thorough research. Minimal sources are used or cited	Problem is unclear or poorly defined. Little to no research is evident.		X5	
<b>Innovation &amp; Solution Design (25%)</b>	Solution is highly innovative, feasible, and directly addresses the problem. Strong adherence to universal design principles.	Solution is innovative and feasible, addressing most aspects of the problem. Universal design is evident	Solution demonstrates some innovation but has feasibility concerns or limited universal design application	Solution lacks innovation or feasibility and show minimal connection to universal design principals.		X6	
<b>Prototyping &amp; Functionality (20%)</b>	Prototype is well-constructed,	Prototype is adequately constructed and	Prototype is partially constructed,	Prototype is poorly constructed,		X4	

	functional, and effectively demonstrates the solution.	functional, demonstrating the solution to some extent.	with limited functionality or unclear connection to the solution	non-functional, or does not align with the proposed solution.			
<b>Collaboration &amp; Teamwork (15%)</b>	Team works seamlessly, with all members actively contributing and respecting one another's ideas.	Team works well together, with most members contributing actively and respectfully.	Team demonstrates some collaboration but lacks consistent contribution from all members.	Team collaboration is minimal, with limited participation or response among members.		X4	
<b>Presentation &amp; Communication (15%)</b>	Presentation is well-organized, engaging, and clearly explains the problem, solution, and prototype. All team members participate. Adheres to time guidelines.	Presentation is organized and adequately explains the problem, solution, and prototype. Most members participate. Adheres to time guidelines.	Presentation lacks clarity or organization, with minimal participation or unclear explanations. Does not adhere to the time guidelines.	Presentation is unorganized, unclear, and lacks participation from team members. Does not adhere to the time guidelines.		X4	
<b>Creativity &amp; Visual Appeal (5%)</b>	Project demonstrates exceptional creativity, with visually appealing and engaging materials (video, poster, etc)	Project demonstrates creativity and visual appeal, but some aspects lack engagement.	Project shows minimal creativity or visual appeal, with limited effort in presentation materials.	Project lacks creativity and visual appeal, appearing rushed or incomplete.		X1	

**Additional Notes for Judges**

- Ensure consistency in scoring by reviewing all criteria before evaluations
- Encourage constructive feedback in the comments sections to inspire student growth.

**COMMENTS:**



## CAREER AND TECHNICAL CENTER STEM LESSON PLAN

Lesson Plan: Naval Engineering Challenge

Subject: Integrated CTE Project (Drafting, Welding, Mechatronics, Machining, Engineering)

Grade Level: 11-12

Project Overview:

Students will collaborate in interdisciplinary teams to design and construct a floating vessel made of at least three metal sections, assembled without welding. The vessel must accommodate a maximum payload of bricks before submerging. This project simulates the complexities of large-scale naval engineering, emphasizing precision, buoyancy, and teamwork.

Learning Objectives:

- Technical Skills:
  - Apply drafting principles to create detailed vessel blueprints.
  - Utilize machining techniques to fabricate precise vessel components.
  - Employ mechanical fastening methods for secure assembly.
  - (Optional) Integrate mechatronics for propulsion and control systems.
  - (Optional) Incorporate welding for non-structural elements (e.g., mounting brackets).
- Collaboration:
  - Effectively communicate and coordinate tasks within interdisciplinary teams.
  - Problem-solve and compromise to achieve shared project goals.
- Critical Thinking and Problem Solving:
  - Apply engineering principles to optimize vessel design for buoyancy and stability.
  - Analyze and troubleshoot design flaws and construction challenges.

## Project Phases:

### 1. Design and Planning:

- Research: Investigate naval architecture principles, buoyancy, stability, and modular construction methods.
- Conceptualization: Brainstorm vessel designs, considering size, shape, and sectioning strategies.
- Drafting: Produce detailed 2D and 3D models using CAD software (Drafting program).
- Material Selection: Determine appropriate metal types and thicknesses (Engineering/Welding program input).
- Collaboration: Regular meetings between Drafting, Engineering, and relevant fabrication programs (Welding, Machining) to ensure design feasibility and manufacturability.

### 0. Fabrication:

- Machining: Produce precise vessel components based on CAD models (Machining program).
- Welding (Optional): Fabricate non-structural components like mounting brackets or decorative elements (Welding program).
- Mechanical Assembly: Utilize appropriate fastening techniques (bolts, screws, rivets) to join vessel sections (collaborative effort).
- Quality Control: Continuous inspection and adjustment throughout the fabrication process.

### 0. Integration and Testing:

- Mechatronics Integration (Optional): Install propulsion systems, lighting, and control mechanisms (Mechatronics program).
- Buoyancy Testing: Conduct initial floatation tests in a controlled environment (e.g., school pool).
- Payload Testing: Incrementally load the vessel with bricks to determine maximum capacity.
- Refinement: Analyze test results and make necessary design or construction modifications.

### 0. Competition and Evaluation:

- Final Payload Test: Conduct a formal competition to determine the vessel with the highest payload capacity.
- Evaluation: Assess vessels based on payload capacity, design creativity, craftsmanship, and teamwork.
- Presentation: Each team presents their design process, challenges, and solutions.

#### Assessment:

- Individual: Evaluate student contributions to their specific program area (e.g., drafting accuracy, machining precision, welding quality).
- Team: Assess overall project success (payload capacity, vessel design, teamwork effectiveness).
- Presentation: Evaluate clarity, completeness, and professionalism of team presentations.

#### Materials and Resources:

- Software: CAD software (e.g., AutoCAD, SolidWorks), optional programming software for mechatronics.
- Materials: Sheet metal (aluminum, steel), fasteners (bolts, screws, rivets), optional electronic components for mechatronics.
- Equipment: Machine tools (lathes, mills, etc.), welding equipment (optional), hand tools, measuring instruments, pool or water tank for testing.

#### Differentiation:

- Advanced Learners: Encourage exploration of advanced design features (hydrodynamics, stability control systems) and fabrication techniques.
- Struggling Learners: Provide additional support with drafting, machining, or assembly tasks, and pair them with more experienced students.

#### Extension Activities:

- Research: Investigate historical and modern naval vessel designs.
- Industry Connection: Invite guest speakers from shipbuilding or engineering fields.
- Community Outreach: Showcase student projects at school events or local competitions.

#### Safety Considerations:

- Enforce proper safety protocols for all equipment and tools.
- Provide appropriate personal protective equipment (PPE).
- Supervise students closely during fabrication and testing phases.



**CAREER AND TECHNICAL CENTER STEM CHALLENGE RUBRIC**

Team Name:		Team District:		Team School:		Total Score:
Category	Criteria	Points	Excellent	Good	Fair	Needs Improvement
Design & Planning	Research & Concept: Thoroughness of research and clarity of design rationale.	10	Demonstrates in-depth research with clear connections to design choices and a well-defined rationale.	Shows evidence of research with some connections to design choices and a rationale.	Research is evident, but connections to design choices and rationale are limited.	Research and rationale are minimal or unclear.
	Blueprints: Accuracy, detail, and completeness of vessel blueprints.	10	Blueprints are highly accurate, detailed, and comprehensive, with proper dimensions and annotations.	Blueprints are mostly accurate and detailed, with minor omissions or inconsistencies.	Blueprints are somewhat accurate and detailed, but with significant omissions or inconsistencies.	Blueprints are inaccurate, incomplete, or lack sufficient detail.
Construction	Precision & Craftsmanship: Accuracy of component fabrication and quality of assembly.	15	Vessel components are fabricated with high precision, and assembly demonstrates excellent craftsmanship.	Vessel components are mostly accurate, with good overall quality of assembly.	Vessel components show some inaccuracies, and assembly has noticeable flaws.	Vessel components are inaccurate, and assembly is poorly executed.
	Structural Integrity: Strength and	15	Vessel exhibits exceptional structural	Vessel is structurally sound and stable, with	Vessel shows some structural weaknesses	Vessel is structurally weak and unstable.

	stability of the vessel structure.		integrity, withstanding significant weight and maintaining stability.	minor weaknesses.	and may have stability issues.	
Functionality	Buoyancy & Payload: Maximum payload capacity before submerging.	20	Vessel achieves the highest payload capacity, demonstrating excellent buoyancy and stability.	Vessel achieves a high payload capacity, with good buoyancy and stability.	Vessel achieves a moderate payload capacity.	Vessel has a low payload capacity and struggles to stay afloat.
Collaboration	Teamwork & Communication: Effectiveness of team communication, coordination, and problem-solving.	10	Teamwork is exceptional, with clear communication, roles, and collaborative problem-solving.	Teamwork is effective, with good communication and coordination.	Teamwork is evident, but with some challenges in communication or coordination.	Teamwork is lacking, with minimal collaboration or communication.
Presentation	Clarity & Professionalism: Quality and clarity of project presentation (if applicable).	10	Presentation is clear, well-organized, and professional, effectively communicating the design process and results.	Presentation is mostly clear and organized, with some room for improvement.	Presentation is somewhat clear, but lacks organization or professionalism.	Presentation is unclear, disorganized, and lacks professionalism.
Optional Elements Construction	Mechatronics/Welding: (If applicable) Functionality and integration of mechatronics or welding.	10	Mechatronics/welding are seamlessly integrated and function flawlessly, enhancing vessel performance.	Mechatronics/welding are mostly functional and integrated well.	Mechatronics/welding have some functionality but with limitations in integration.	Mechatronics/welding are non-functional or poorly integrated.
Departmental Collaboration	Inclusion of multiple divisions of career and technical center.	1 point for each added division	4 additional divisions	3 additional divisions	2 additional divisions	1 additional division