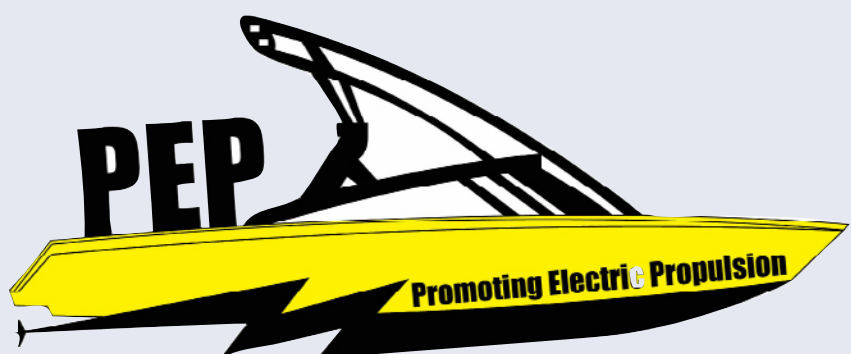
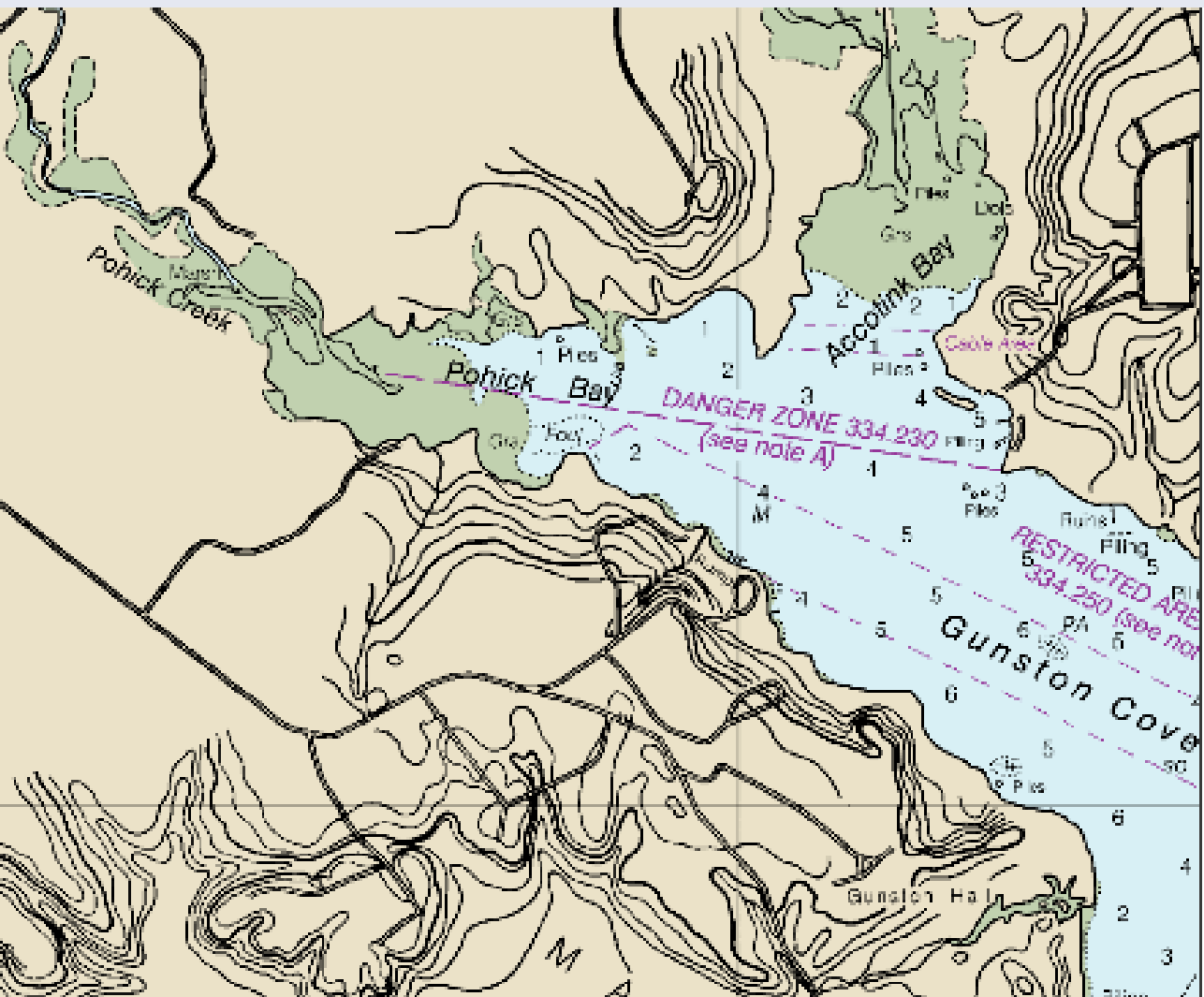


Promoting Electric Propulsion Competition



Mission: The Promoting Electric Propulsion Competition is organized by the American Society of Naval Engineers and held annually in order to foster the development of electric boats in the United States.

Who: There will be 15 universities competing
Location: Pohick Bay Regional Park in Occoquan, Virginia
Date: May 26, 2022
Distance: 5 miles (5, 1-mile loops)



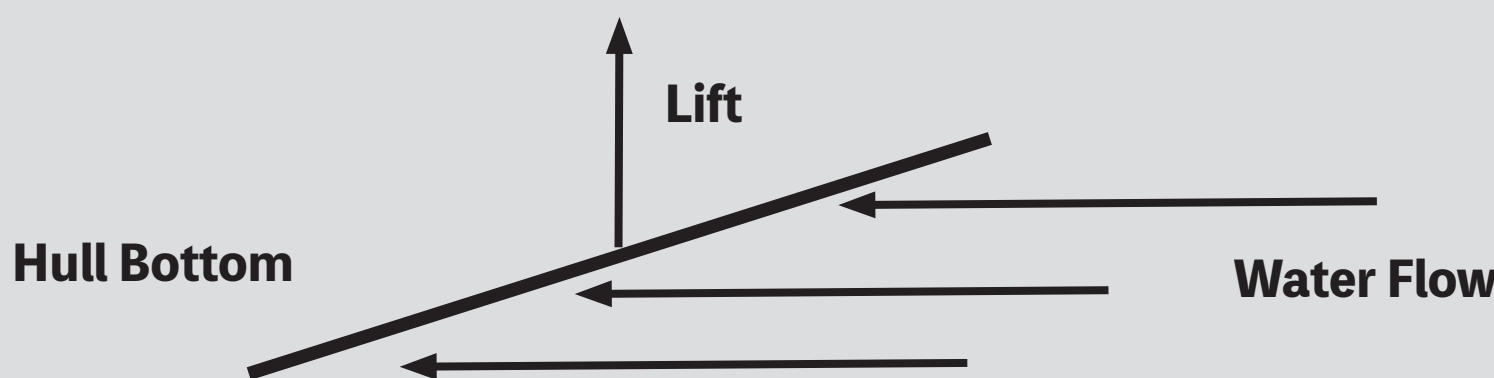
Rules:

- 1. There is no minimum or maximum engine size or power output.
- 2. Vessels shall have appropriate fit and finish to appear seaworthy.
- 3. All vessels must comply with USCG safety regulations.
- 4. Gasoline engines, recharging via an onboard generator, sails, and manual propulsion are prohibited during the competition.
- 5. Competitors will not have a charging station available to them on site.
- 6. All vessels must be equipped with sufficient battery storage to complete the race. Solar power and/or charging is permitted.

System Requirements

- 1. Achieve a speed of 25 miles per hour
- 2. Complete a 5-mile Race
- 3. Use an Electric Motor to Propel the Vessel
- 4. Use Electric Power to complete the entire race
- 5. Meets US Coast Guard Regulations
- 6. Meet Weight Capacity (1567 lbs)
- 7. Non-Frankenstein Appearance
- 8. Battery and Motor are Protected from Water
- 9. Stays within Budget (\$8500)

Planing - A planing hull utilizes hydrodynamic lift, the lift created helps the hull to rise out of the water and in turn reduces drag. Once the generated lift approaches the weight of the boat, the hull will rise out of the water and start to plane.



Not On Plane

On Plane



Calculations and Justification

1 Achieve Speed of 25 mph

Power Caluclation: helps us to determine the motor size required to move at a speed of 25 mph

Power = Force * Velocity
Force = 1/2 C rho A V^2
V = 25 mph = 11.176 m/s

V = Velocity
A = Wetted Surface Area (WSA)
WSA = (Total Surface Area) x (% boat in the water)
rho = density of water
C = drag coefficient

Not on Plane:

F = 2069 N
P = 27.736 Kw

On Plane:

F = 1133 N
P = 15.187 Kw

2 Complete 5 miles

Capacity = Power * time
distance = 5 miles
speed = 25 mph
time = distance/speed = 0.2 hrs

Not On Plane:
Capacity = 27.736 kW x (0.2 hr) = 5.55 kWh

On Plane:
Capacity= 15.187 kW x 0.2 hr = 3.03 kWh

5 Meet all US Coast Guard Regulations



6 & 7 Meet the Weight Capacity/ Non-Frankenstein Appearance

Takacat 420 XL

Weight Capacity: 1576 lbs
Weight 2 Persons: 360 lbs
Weight of System: 258 lbs

1576 lbs > 618 Lbs



8 Keep Battery Protected From Water

Battery Housing for Water-Proofing



9 Stay within Budget

Total Cost of System = \$8216 < \$8500

3 Use an Electric Motor

ME1616 Brushless Liquid Cooled IPM Motor

- 22 Kw - 62 Kw
- 96 V
- 89 % efficient
- RPM: 4500/ 6500 (max)
- Current: 250 A Cont. / 550 A Peak
- Torque: 130 ft-lb



4 Use Electric Power

INR Lithium ION Battery Modules

- Continuous Current: 132A
- Nominal Voltage: 46.8 VDC
- Nominal Capacity: 505Wh
- 12 modules
- Capacity of the system: 6.05 kWh

