Galeforce

Where the future sets sail

Coach: Aravinthan K.

By:
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Saransh Singhania

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Team Presentation

- Coach Aravinthan K. :

I am the coach of team Galeforce. I am happy to represent SRM Public School. It is also a great honor to compete in this wonderful Competition. I have a specialty in robotics. As the robotics teacher of SRMPS I love to inspire as well encourage students to innovate and make their ideas come to reality.

- Jhanavarshan N. :

I am happy to be in team Galeforce. I have great creativity and make the most of everything I do.

Saransh Singhania:

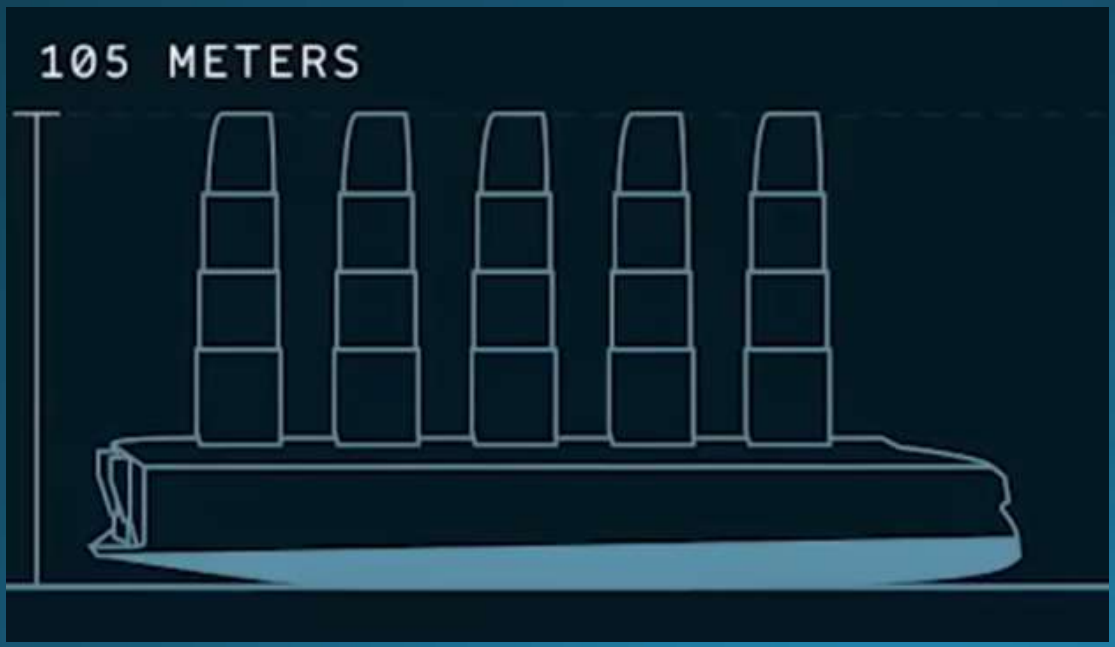
I am very passionate about this competition. I have diligently worked to make this a success and I would love to win.

Project Summary

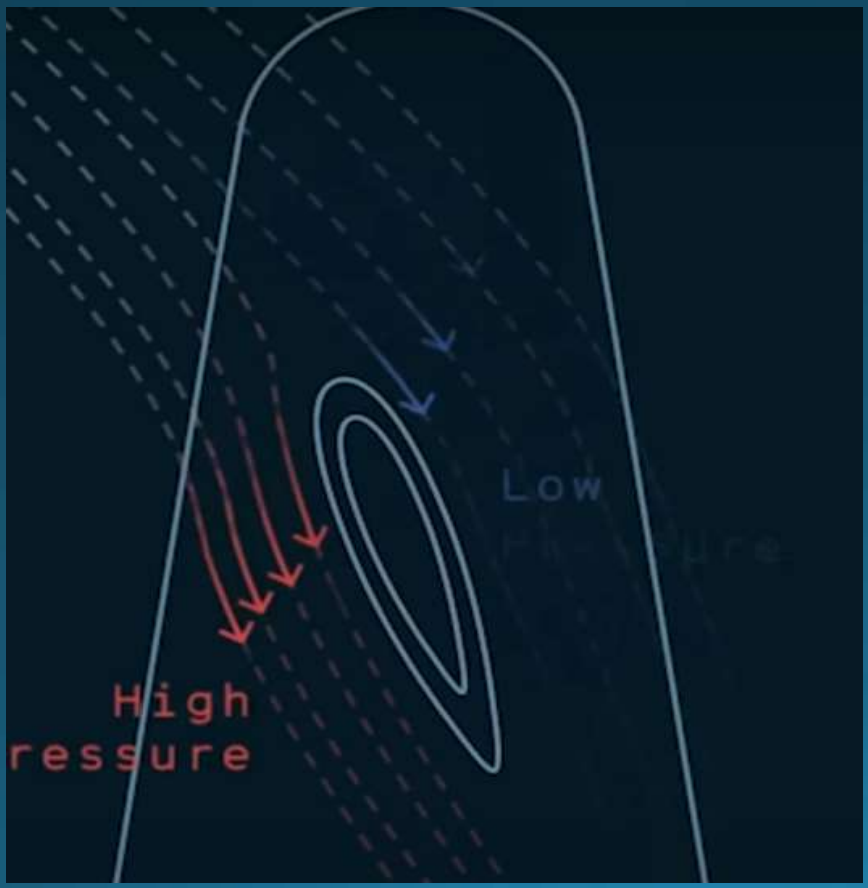
In a world grappling with the consequences of climate change and environmental degradation, the search for sustainable solutions has become imperative across all industries. One sector that has long relied on fossil fuels for its operations is maritime transportation. However, as concerns about greenhouse gas emissions and the depletion of finite resources intensify, an alternative path emerges that harks back to the age-old wind source to power ships into the future. That's where Galeforce comes in. It uses rigid, rotatable, and retractable fins to propel it's way through the sea

Our Solution

Galeforce has rigid sails, made of metal and composites, each standing 20m tall. They can extend telescopically to nearly 80 meters in order to take advantage of the stronger, steadier winds at that height in weather conditions. Added to the height of the deck above the water line the sails will reach a height of 105 meters virtually. For efficient sails computer control and automatically trimmed to take the best advantage of the wind.

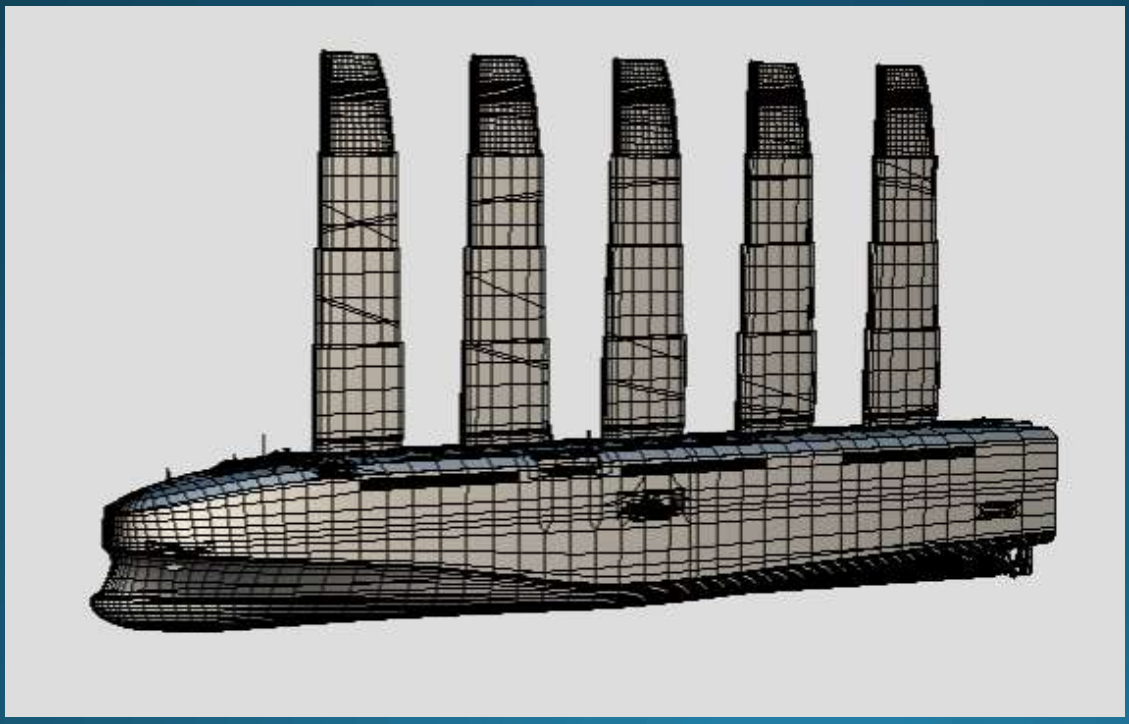


A big advantage of the design is the retractability of the sails, bringing them down makes the most barebones in the world easily accessible to them. Slipping easily under most bridges. Each of the four sails can rotate 360 degrees without clashing with each other. The ship depends on crosswind rather than wind from behind a 90% reduction in co2 emissions.

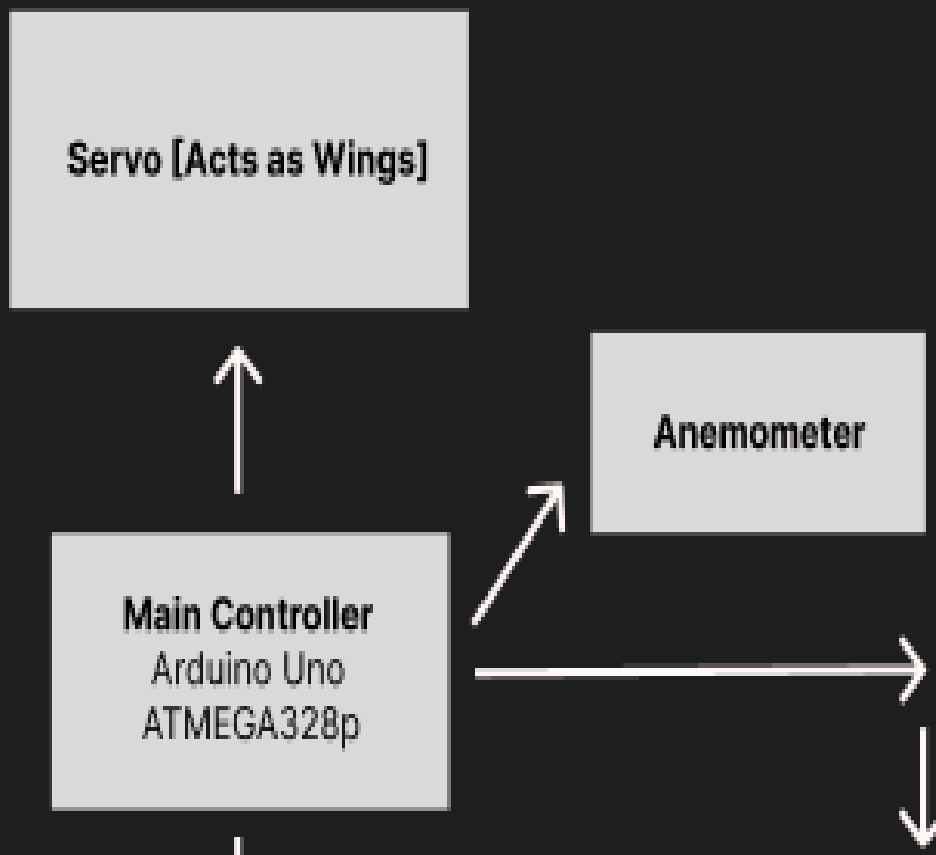


Galeforce's Design

- Type Wind-powered vessel, roll-on/roll-off
- Displacement 32 000 tons
- Length 200 m (660 ft)
- Beam 40 m (130 ft)
- Height 45 m (148 ft) – 105 m (344 ft)
- Propulsion Wind-assisted propulsion, five sails
- Speed 10 knots
- Capacity 7,000 cars



Galeforce



How Does It Work ?

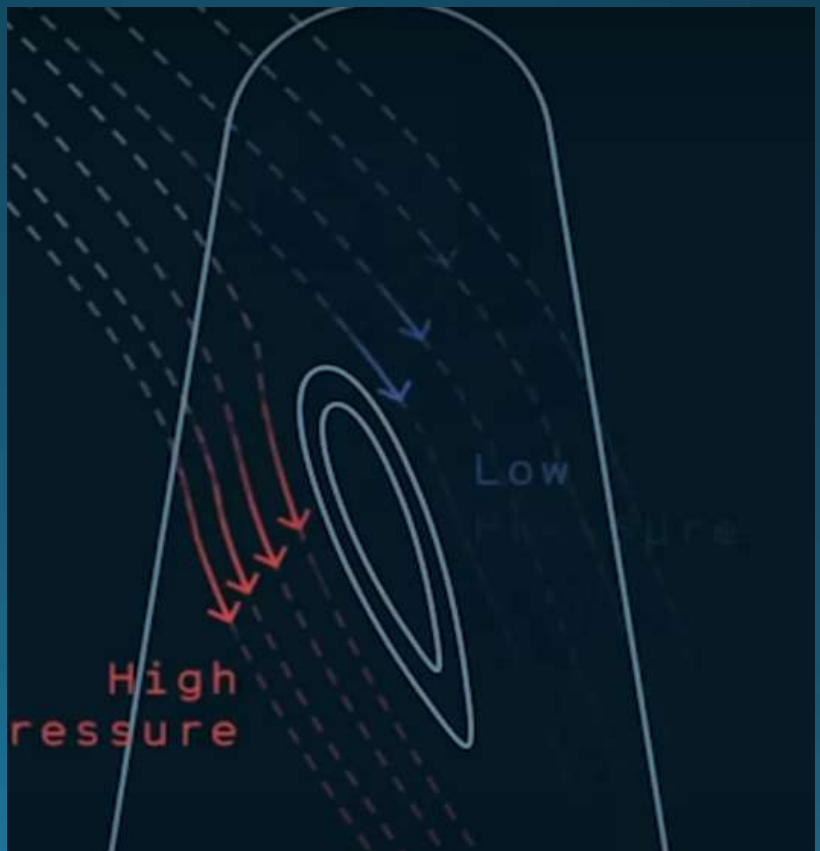
- First the anemometer sensor measures the air pressure .
- Raw data gets converted into digital values.
- The Calculations are done by the following formulas.
- Pressure = Force/Area .
- Force Out Of Wings = Air Pressure * Area B/W the wings.[Of which area B/W the wings are constant].
- With the output values, the servos will be adjusted according to the air pressure by adjusting their wings.

OUTPUT

- As a result the wings turns according to the "Air Pressure".

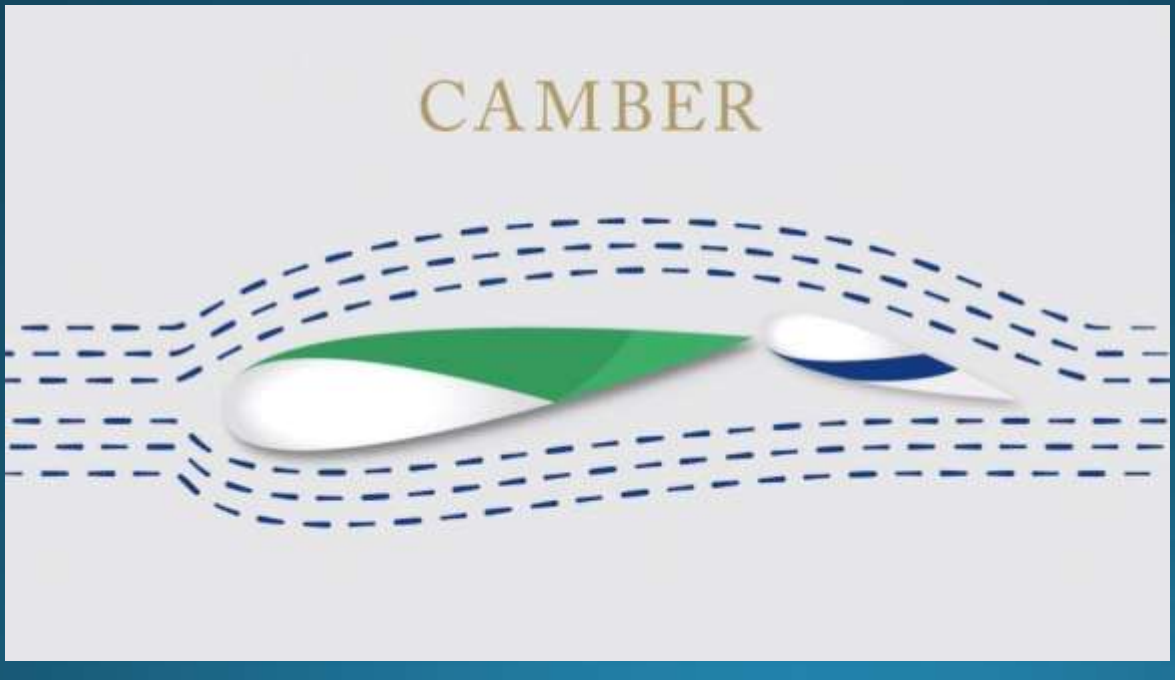
Anemometer

OUTPUT

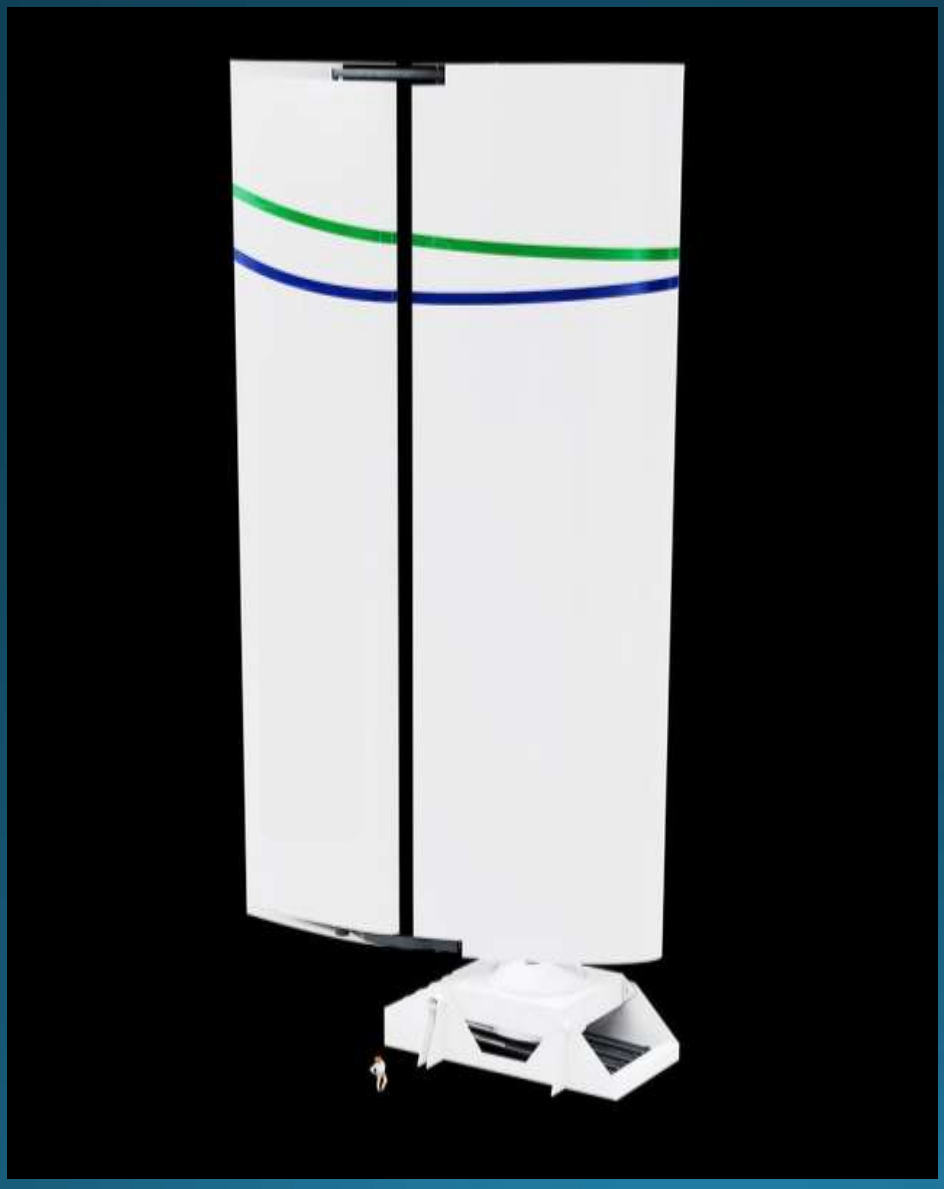


Galeforce's Alternative design

The symmetric design has no curved camber like a textile sail would get when the wind blows, which optimize the power that you can harvest from the wind. We have solved it but letting the main sail and flap, form a camber, where the wind is accelerating on the outer part of the wing and decreasing on the inner part. This increases the lift and therefore the overall performance.

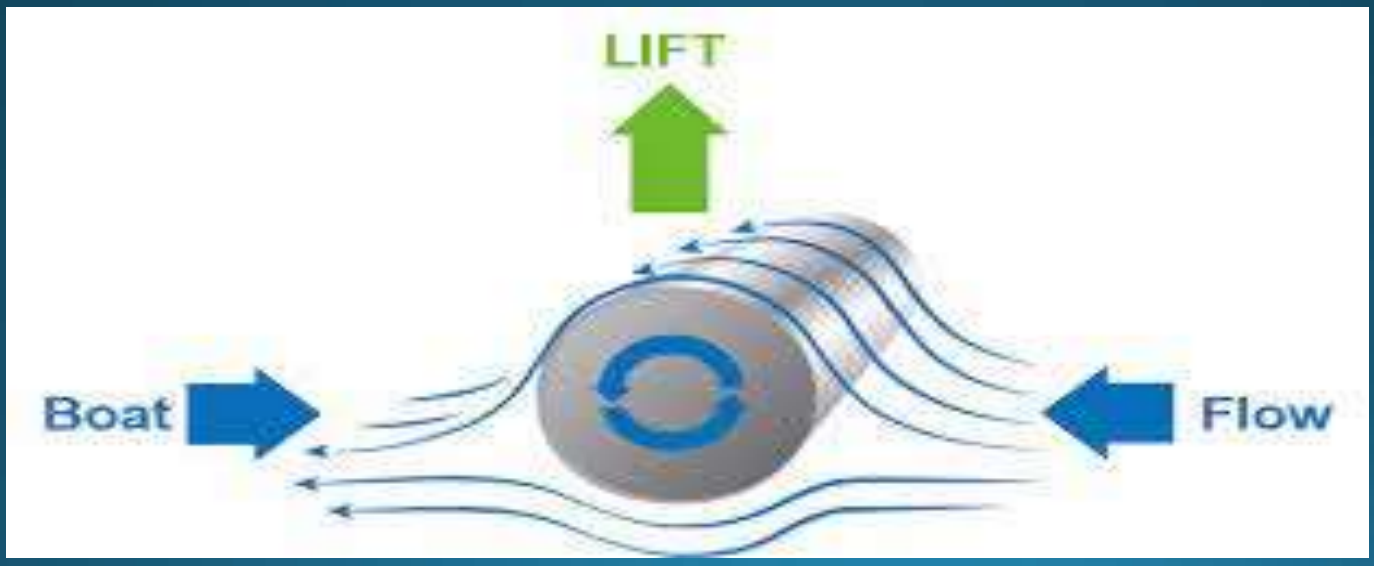


The two-part wing sail design enables to generate substantially more power relative to the wing size. This gives the ship many added benefits, such as less material usage, low weight and smaller deck footprint to mention a few.



OTHER SOLUTION

Some ships use rotating vertical cylinders for generating the Magnus effect to achieve additional propulsion. This is similar to the Bernoulli principle for aircraft wings. when the wind encounters the fast spinning cylinders air passing on one side is accelerated while wind on the opposite side is slowed. The net effect is increased thrust due to lifting expressed sideways rather than upwards fuel savings can be from 5% to 20% by exploiting this energy-gathering technique.



NITINOL

Nitinol is a shape memory alloy made primarily from nickel and titanium. It was discovered in 1960 by the U.S. Naval Ordnance Laboratory and the name "Nitinol" comes from its components: Nickel (Ni), Titanium (Ti), and Naval Ordnance Laboratory (NOL). Key properties of Nitinol include: Shape Memory Effect: Nitinol exhibits a remarkable shape memory effect. When the material is deformed at a lower temperature (martensite phase), it can recover its original shape upon heating above the transition temperature (austenite phase). This behavior is due to the reversible change in crystal structure.

Superelasticity: Nitinol also demonstrates superelastic behavior, sometimes referred to as "pseudoelasticity." In this state, the material can undergo significant deformation while remaining elastic and recover its original shape once the stress is removed, even at temperatures below the transition temperature.

https://drive.google.com/file/d/1U_IeN5SeU9hs4CWDmvRzGo-NQFqzKEBG/view?usp=drive_link

This video shows the shape memory properties of Nitinol

NITINOL SHIP ANCHOR

Ship anchors are hazardous to marine ecosystems because of their large size. So if the anchor could somehow shrink and be automated the risk of damaging coral reefs will decrease. That where Nitinol comes into play. With its corrosion resistance and shape ability it can be trained to take the form of an anchor when heated.

Superelasticity: Nitinol also demonstrates superelastic behavior, sometimes referred to as "pseudoelasticity." In this state, the material can undergo significant deformation while remaining elastic and recover its original shape once the stress is removed, even at temperatures below the transition temperature.

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SOCIAL IMPACT AND INNOVATION

- Our ships can provide the world with almost zero emissions. Even though our ships are small they can have a big impact in the maritime transportation sector.

We also believe that if we provide this sector with a eco-friendly solution others will follow along.

So as Galeforce is just a simple ship that uses wind power we assure you that it will be one of the most important key to provide a zero pollution world

Entrepreneurship and Business

- Galeforce is small but can carry half the amount of cargo of the larger freight ships.
- Galeforce cuts the cost of fossil fuels, which is skyrocketing. The business dealers can buy multiple ships which can save the cost of the fossil fuels as well as compensate for the cost of the ships.

Galeforce

Key Features: The key features of our ship is that it is wind powered and not wind assisted

Key Resources:

Nitinol, metal alloys , Toroidal Propellers

Cost:

It is very cost effective as it uses free wind energy

Customer:

Our customers will be mostly Shipping Industries

Goal:

To make a pollution free world with our project.

References

- The Verge Science
- Motech
- Wikipedia
- Veritasium
- International Maritime organization

Thank You