Adaptive modular sail system

NEW GENERATION OF SAILS

11 December, 2024



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We are Polar Fox Aerospace based in Kyiv, Ukraine. Our main occupation is development of drones for the civilian and military markets. The company's founder and chief engineer is Yuri Makusev, a graduate specialist in the aerospace industry with over 20 years of experience. We have extensive experience, especially in the creation of highly efficient aviation platforms using 3D printing.



Every year, the requirements for the environmental friendliness of transport are increasing. More and more companies are switching to cleaner fuel, but its price is high, and a number of problems remain unsolved. Big shipping vessel consume fuel for up to \$100,000 per DAY.



SOLUTION



Basic illustration. Does not reflect all technologies used.

Adaptive modular sail system.

From outside looks like regular 40ft shipping container. Inside it contains retractable sail, computing equipment, batteries. The dimensions of the container are absolutely identical to the standard one, so it can be placed on any boat that carries similar containers. Each module is completely power independent.



FEATURES



Basic illustration. Does not reflect all technologies used.

- Provides up to 100% needed force
- High performance with any direction of wind
- Real-time airfoil adaptation for max performance
- Modular, easy to configure needed power
- Retractable
- Compatible with any container ship
- Power independent
- Light-weight due to usage of composite materials



ACTION PLAN



01. EARLY STAGE DESIGN AND CALCULATION

Early stage design and calculations show us viability and relevance of the project. With estimated characteristics we can move to the advanced modeling and massive amount of simulations.



02. ADVANCED DESIGN AND ALL TYPES OF COMPLEX **SIMULATIONS**

After early stage passed, there is need for serious simulations, to provide data, that includes work with big data to provide informantion about potential efficiency on every route, on every day, in every weather condition. This will allow to create unique path for every vessel to get best efficiency.



If results from simulations will be satisfactory then real-life model will be built. Its will be scaled version. Numerous tests need for this stage. On the water, with different weather conditions. Wind tunnel test also required.



04.FULL-SCALE TESTS. FINAL PROVES OF CONCEPT

In case of success of the 3rd stage full scale version will be built. This stage requires lots of work for bug fixing, reliability tests, implementing latest technologies

needed.



METHODOLOGY OF TESTING

01 stage

This stage requires basic modeling, basic wind tunnel simulation and mathematical calculations. Shows us approximate numbers, but not exact. Already done by us.

02 stage

2nd stage the most complex and data saturated. Requires thousands of simulations, extremely powerful computational equipment and precise data collection. Minor design correction required.

03 stage

3rd stage first real-life stage. Providing us information about correctness of simulations and calculations. Also this stage will start work on actual sail. Here we will be able to see strong and weak points of construction and correct it. Early version of OS will be made.

04 stage

Pretty much duplicates 3rd stage, but providing us with full scale operational sail, fixed and modernized OS, construction related issues fixed. The most expensive stage.



As we mentioned before we already passed 1st stage of the research. Second part will require 2–6 months of simulations and work with big data. 3rd stage will require 6–12 months in the best conditions to make reliable contraction of scaled sail.

4th stage we see as a separate stage that is possible only with success of 3rd stage and rise of additional funding due to the high cost. With enough funding estimated time for completing this stage 6-12 months.



IMPLEMENTATION #1

Small container ship

This type of cargo ships will be the most effective platform for our solution, base on our early stage calculations. This type of ships often used on rivers, lakes, seas. Due to usage of HFO and other fuels lots of pollution goes to nearby coasts and cities. Our sail will make this ship noiseless, pollution free and extremely low cost to operate in long term.





IMPLEMENTATION #2

Large container ship

Large container ships, bulk carriers and tankers combined produce 78.6% of all CO₂ emissions from the global shipping industry. Amount of container ships will grow every year due to the growing demand. This become great problem for mankind with its pollution. Also, shipping companies are dependent to oils prices, politics of oil companies, etc. We offer solution, that will make the independent.



By our estimates, ships of E-class or Triple Eclass will be able to travel completely on wind power with average wind speed on the route around (8m/s) and lose only 3-4% of containers.



Bulk carriers and other vessels

In the future, this type of sails can be placed on almost every vessel, its just need a time to be adapted for them. With cooperation with ship makers it is possible to make ship that will be even more effective with this type of sails, reduced drag, lowered engine power, etc.

Retractable and complex shape of the sail allows to be compact and used in every current routes and canals.

N U M B E R S

26555 vessels

Can be modified or use modular sail system.

\$50 billion

Of fuel expenses can be saved just on container vessels per YEAR. And up to \$36 million for every single vessel.

144,5 million

Tonnes of CO2 emissions can be prevented every year.

Join us in changing the world.

Thank you!

NEW GENERATION OF SAILS

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