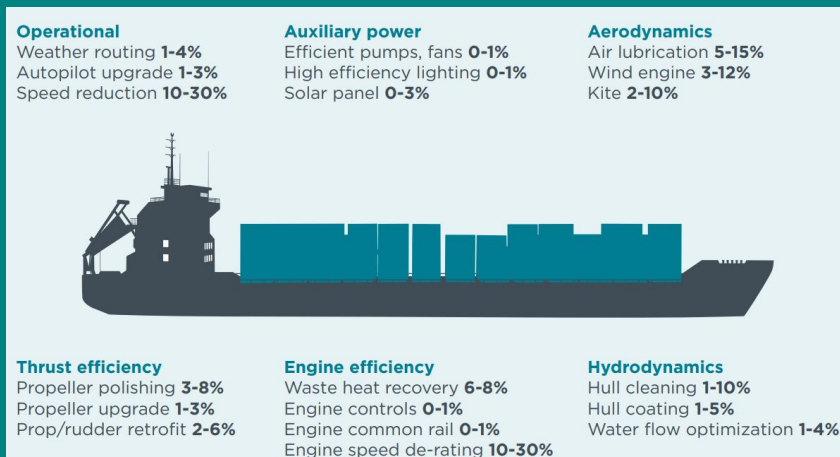




RETROFIT SOLUTIONS TO ACHIEVE 55% GHG REDUCTION BY 2030

Reduction of fuel consumption is not attainable by a single retrofitting solutions, instead a suitable combination of various systems is necessary. RETROFIT55 aims to develop a Decision Support System (DSS) that will leverage AI web-based tools and will provide a synthesis of the different technologies accounting for safety aspects, cost-effectiveness and life-cycle costs, including the decommissioning phase.

The White Paper on *Long-term potential for increased shipping efficiency* published by International Council on Clean Transportation describes the potential CO₂ reductions from various efficiency approaches for shipping vessels.



*Source ICCT, 2013 (Click [here](#))

RETROFIT55 aims at achieving the 35% reduction target by combining the following solutions:

- ✓ *Air Lubrication* through an innovative largely passive solution (PALS)
- ✓ *Wind Assisted Ship Propulsion (WASP)*
- ✓ *Holistic Hydrodynamic Optimization* including ALS and WASP
- ✓ *Operational optimization* including Weather Routing and hull/propeller fouling monitoring
- ✓ Increased *ship electrification* through combination of Fuel Cells, Battery capacity, Photovoltaic plants
- ✓ Integrated management of the main power plant and of the storage system through dedicated *Energy Management Systems*



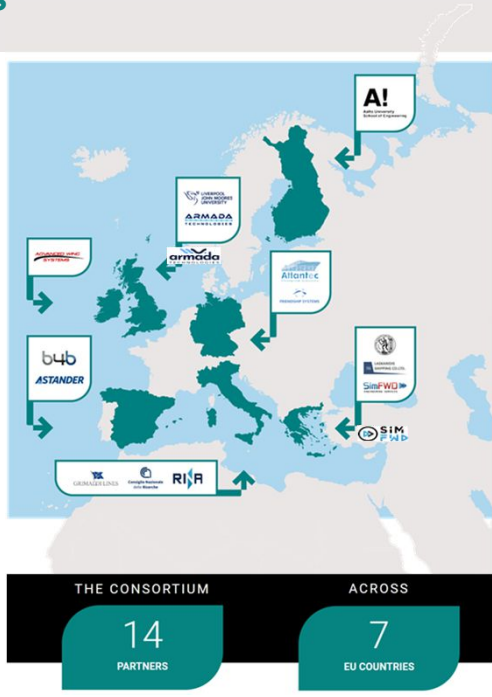
Rigid Solution

Wind Assisted Ship Propulsion (WASP) can provide an important and significant part of the energy mix for commercial shipping. Several solutions, either *rigid* or *flexible*, have already been adopted on ships of small size but the operational constraints remain a barrier to wider adoption by industry.



Flexible Solution

Partners



Inside this Issue:

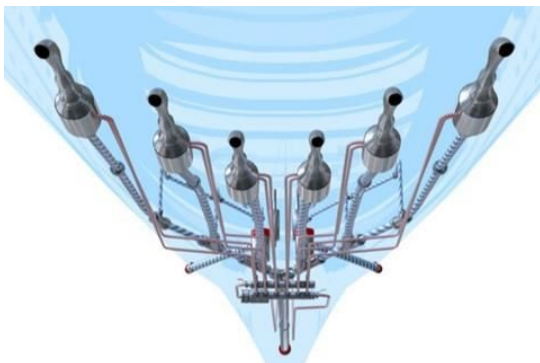
- ✓ Explore the proposed technologies
- ✓ Meet our technology providers
- ✓ Discover how each technology shall be investigated under RETROFIT55
- ✓ The benefits of each system

Website: <https://www.retrofit55.eu>

Read more about:

- ✓ The project [here](#)
- ✓ The partners [here](#)

Check EU CORDIS factsheet published in [here](#)



Air Lubrication Solution generates an air carpet underneath the vessel that thanks to the much lower dynamic viscosity of the air, leads to a significant reduction of the skin friction, which represents a large portion of the ship's resistance. Fuel savings are estimated to 8-12% depending on the specific vessel's size, hull shape and operational conditions, etc.

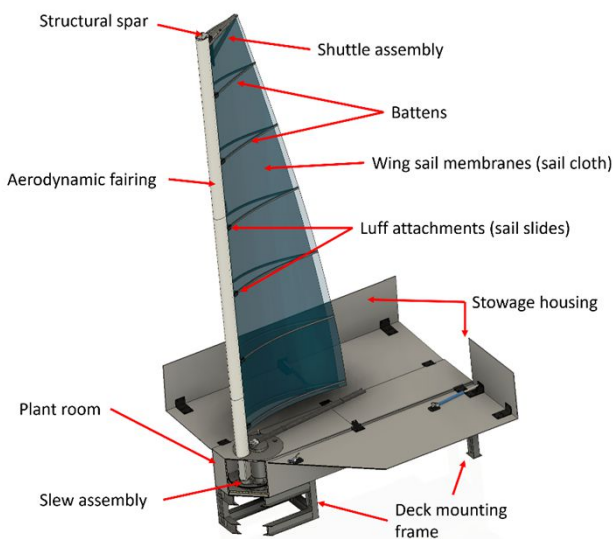
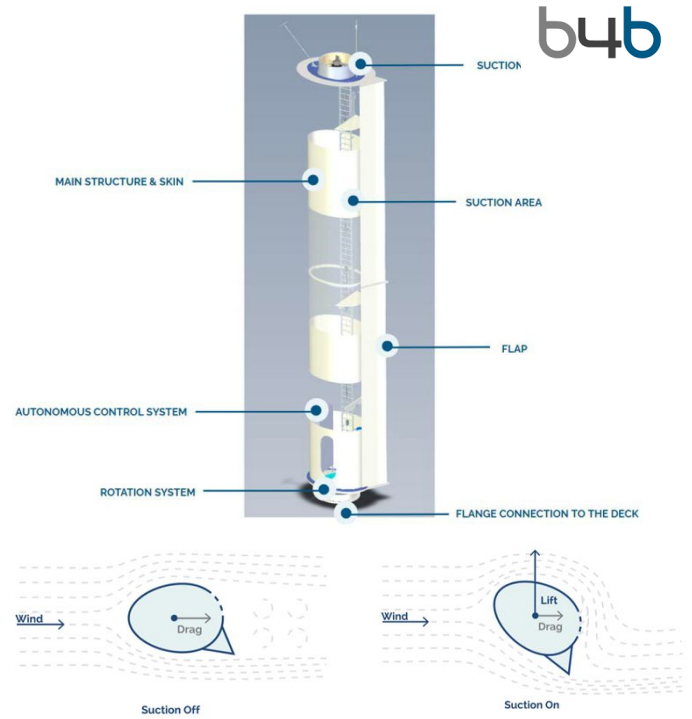


Rigid wind sail - eSAIL- developed by bound4blue

- Fully automated rigid sail
- Active boundary layer control using suction

Within RETROFIT55:

- ✓ Design a standardized family of steel reinforcements
- ✓ Right force distribution over hull and bow
- ✓ Lowest weight
- ✓ Minimum footprint on the vessel working area
- ✓ Weather Routing Optimization



Semi-rigid wing developed by Advanced Wing Systems

- Fully automated, collapsible and foldable wing
- The shape of the wind section is controlled through rigid battens
- Fits into an ISO container

Within RETROFIT55:

- ✓ System Design and Layout
- ✓ Numerical Modelling
- ✓ Prototype construction and land-based trials

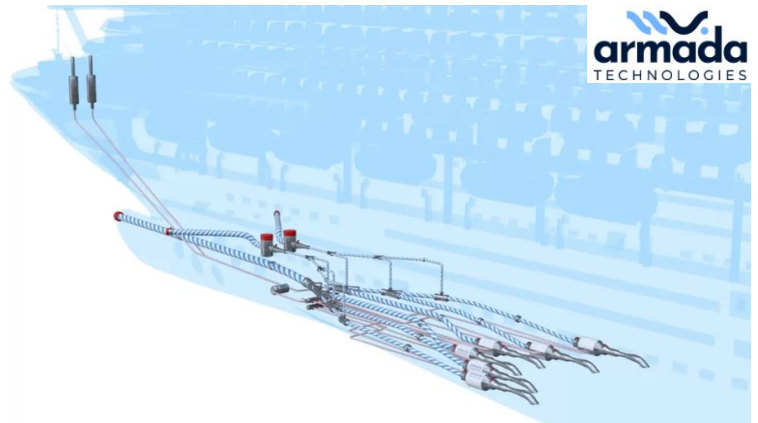


Passive Air Lubrication System (PALS) developed by **Armada Technologies**

- ❑ Significant power reduction through the application of *Venturi* to passively create bubbles

Within RETROFIT55:

- ✓ Determine the complete system design and layout
- ✓ Injection Conditions
- ✓ Outlet Design
- ✓ Hull and Sea Condition effect
- ✓ Optimizing the system to deliver fuel savings of 6-8 percent
- ✓ Towing tank experiments



Electrification and Energy Management System

- ❑ Analyze on-board energy systems of the Case Study Vessel
- ❑ Propose New Solutions:
 - ✓ Active and reactive load analysis
 - ✓ Shaft Generator systems (PTO/PTI)
 - ✓ Cold ironing
 - ✓ Power Converters for supplying large motors
 - ✓ Photovoltaic solar panels
 - ✓ Optimum operation of electric energy system
 - ✓ Fuel Cells
 - ✓ Batteries