bound4blue®

Harnessing the wind for propulsion

ShipZero28 – 12th September 2023

Company overview

2015

Founded in Barcelona by 3 aerospace engineers

OUR MISSION: to deliver automated wind-assisted propulsion systems as a turn-key solution to **decrease** fuel-related costs and pollutant emissions.

TODAY:

3 offices worldwide
+30 team members & +50 indirectly
eSAIL® installed on 3 vessels
eSAIL® ongoing installation on 4 vessels

It's an energy problem, not a fuel problem

WIND	+	ACTIVITY	+	VESSEL	+	Eco-FUELS
Wind-assist or primary wind power		Operational optimisation		Vessel optimisation		Renewable energy or waste derived fuels
-retrofit wind-assist (5-20% savings – possible up to 30%) -newbuild primary wind 30%++ -today's tech +optimise & cheaper -lease/OPEX approach		-voyage & fleet management -weather routing -speed reduction -virtual arrival -crew training -data/ blockchain -new business		-design -size & capacity -energy management system -energy efficiency measures -air lubrication -reduced engine power etc.		-2nd gen biofuels -batteries -synthetic fuels + CCS -bio-gas/liquids -H2 & H2 carriers *Electric propulsion systems enables modular approach
20-30%	**+**	**20%**	**+**	**20-30%**	**+**	**20-40%**

Source: International Windship Association

How our system works

WINGSAIL

AoA = 0°

Lift increases by increasing Angle of Attack

Maximum lift coefficient

At maximum AoA, maximum lift is reached

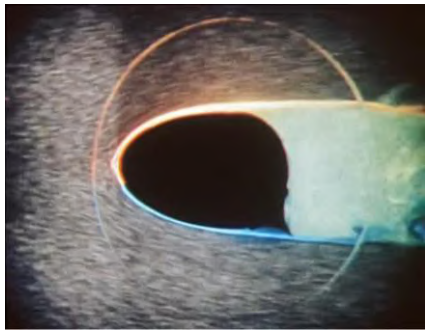
Low lift coefficient in the range of 1 or 1.2

Stall

Above maximum AoA, airflow detaches from the airfoil

All lift is lost

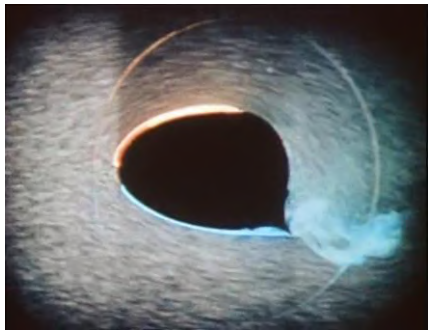
SUCTION SAIL - eSAIL®



Suction OFF

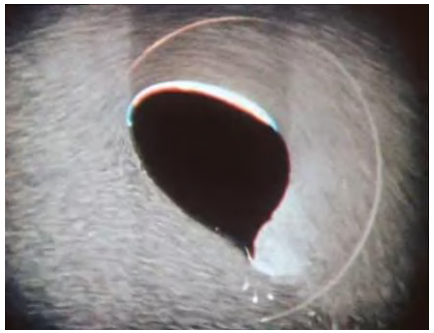
Airflow detached (stall) – no lift, only drag

Same effect as any structure (mast, crane, funnel)



Suction ON

Flow reattaches – lift appear

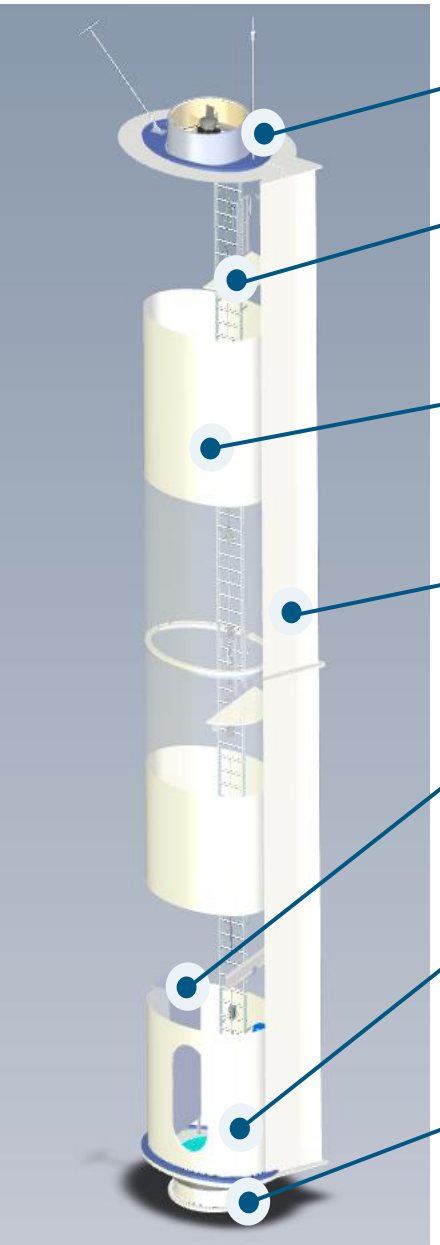


AoA increase

AoA can now be increased with no stall

*Large lift coefficient of up to 8.2 (**x6-7 times!**)*

eSAIL® - Main parts



SUCTION FAN

Electric axial fan to control suction

SUCTION AREA

Specifically designed area to avoid flow stall, ensuring high-performance aerodynamics

MAIN STRUCTURE & SKIN

Generates aerodynamic shape, contains/holds all parts/elements and provides mechanical strength

FLAP

Variable asymmetry of the eSAIL shape, maximizing aerodynamic performances

AUTONOMOUS CONTROL SYSTEM

Fully autonomous operation of the eSAIL with no workload and/or training for the crew

ORIENTATION SYSTEM

Slew-bearing + electric motor to adapt eSAIL orientation to any prevailing wind direction

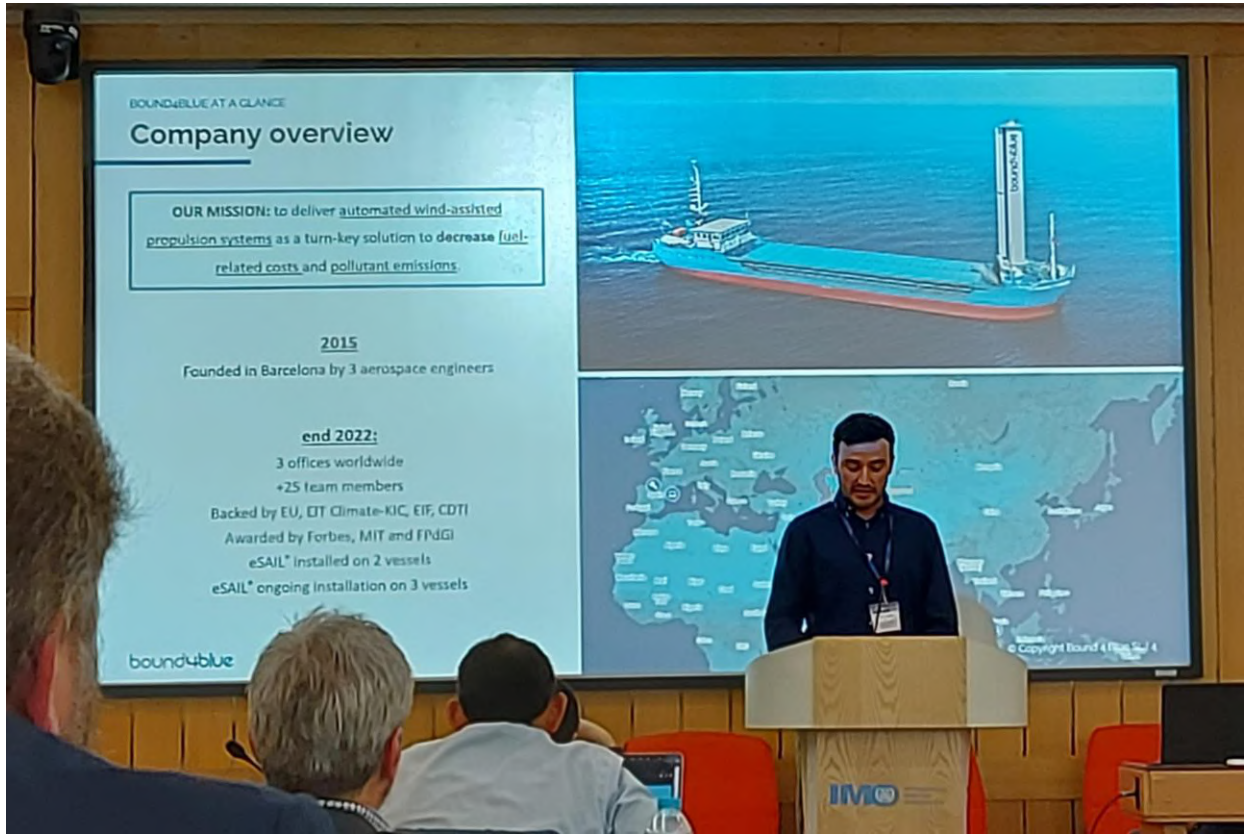
FLANGE CONNECTION TO THE DECK

Standard bolted flange connection to vessel deck

eSAIL® - Validated Performances

September 2022 – Wind Tunnel Test – IAT Saint Cyr

February 2023 – RINA Wind Propulsion Conference - London



eSAIL® - Product portfolio

MODEL 1

Width: *2,85 m*
Variable height: *12-17 m*
Automatic Control: *Yes*

Tilting system: *Optional*
EX Rating: *Optional*
Class Certificate: Optional

Example vessels: *Fishing vessel, GC/Multipurpose, Feeder, Research*

MODEL 2

Width: *4,5 m*
Variable height: *18-26 m*
Automatic Control: *Yes*

Tilting system: *Optional*
EX Rating: *Optional*
Class Certificate: Optional

Example vessels: *Handysize, MR, LR1 Handysize, Panamax, Ferry, Ro-Ro*

MODEL 3

Width: *6 m*
Variable Height: *24-36 m*
Automatic Control: *Yes*

Tilting system: *Optional*
EX Rating: *Optional*
Class Certificate: Optional

Example vessels: *LR, Aframax, Suezmax, Capesize, VLCC/OC*

Fishing Vessel

General Cargo

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

Testing phase: Full-scale installation #1 & 2

eSAIL®: Model 1 - 12x2.85m

INSTALLATION: May 2021

APPROVAL: Spanish Flag & Bureau Veritas

eSAIL®: Model 1 - 17x2.85m (tiltable)

INSTALLATION: December 2021

APPROVAL: DNV-GL

Fishing Vessel

General Cargo

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

Full-scale installation #3

SHIPOWNER: Amasus Shipping

VESSEL: EEMS Traveller
90m LOA

eSAIL®: (2x) Model 1 - 17x2.85m

INSTALLATION: July 2023
Spain

APPROVAL: Bureau Veritas

Fishing Vessel

General Cargo ✓

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

Full-scale installation #4

SHIPOWNER: Louis Dreyfus Armateurs

VESSEL: Ro-Ro

eSAIL®: (3x) Model 2 - 22x4,5m

INSTALLATION: N/A

APPROVAL: Bureau Veritas

Fishing Vessel

General Cargo

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

Full-scale installation #5

ODFJELL

SHIPOWNER: Odfjell

VESSEL: MR Tanker
183m LOA

eSAIL®: (4x) Model 2 - 22x4,5m

INSTALLATION: N/A

APPROVAL: TBD

Fishing Vessel

General Cargo

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

Full-scale installation #6

Marubeni

SHIPOWNER: Marubeni

VESSEL: Crimson Kingdom
229m LOA

eSAIL®: (4x) Model 2 - 26x4,5m
(Tilting)

INSTALLATION: N/A

APPROVAL: Class NK

Fishing Vessel

General Cargo

Ro-Ro & Ferry

Tanker

Bulker

Gas Carrier

General cargo

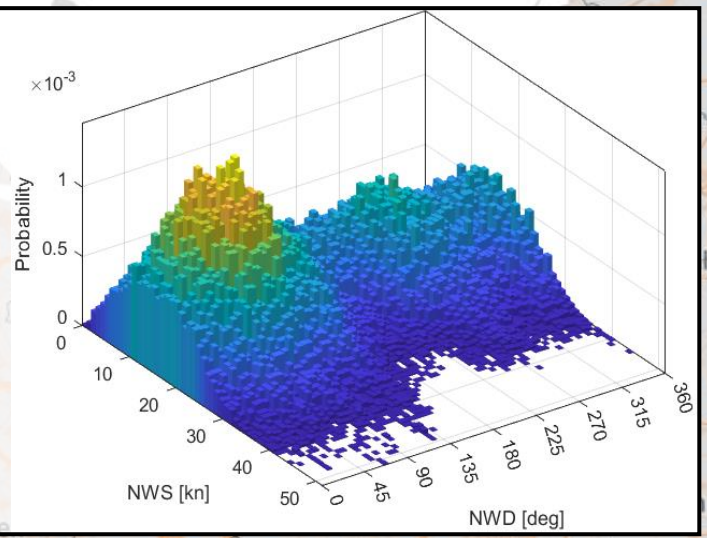
- General Cargo
- 90m LOA
- (2x) eSAIL – 17x2,85m
- Vessel speed 12 knot
- 2,850 DWT

Skagen

Rotterdam

- Historical wind data 2012-2021
- Fuel Savings
  - 0,85 Tn per day
  - 187 Tn per year (*)
- CO2 savings
  - 693Tn per year
- **18,2% fuel & emission savings** (**)
- 187k€ fuel saving (***)

(*) Assuming 220 sailing days
(**) Assuming a propulsive power of 1000 kW
(***) Assuming 1000€/ton



MR Tanker

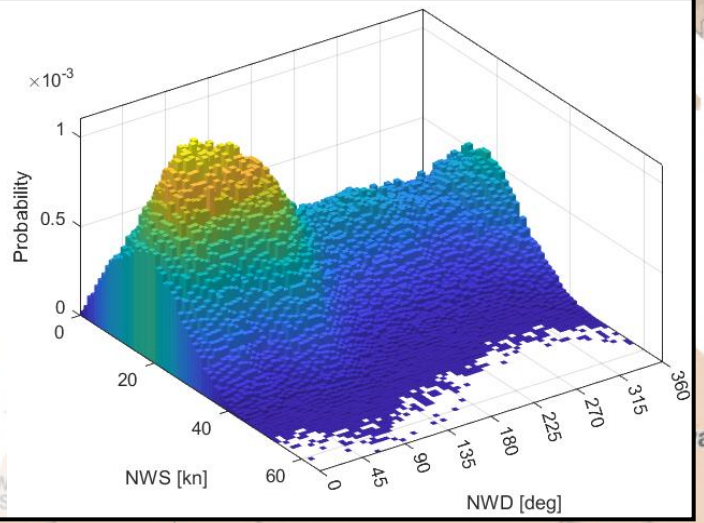
- MR Tanker
- 183m LOA
- (3x) eSAIL – 26x4,5m
- Vessel speed 14 knot
- 40,000 DWT

New York

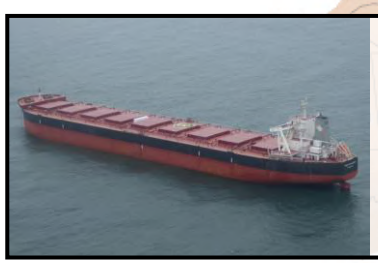
Rotterdam

- Historical wind data 2012-2021
- Fuel Savings
  - 3,83 Tn per day
  - 843 Tn per year (*)
- CO2 savings
  - 2671 Tn per year
- **15,3 % fuel & emission savings** (**)
- 843k€ fuel saving (***)

(*) Assuming 220 sailing days
(**) Assuming a propulsive power of 5350 kW
(***) Assuming 1000€/ton



Capesize Bulker



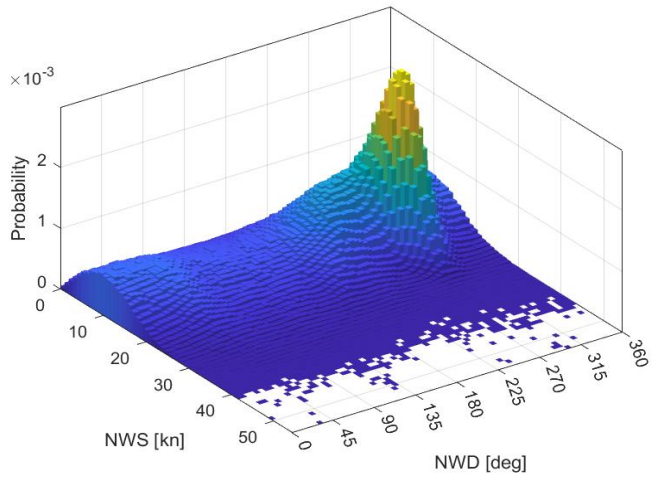
- Capesize bulker
- 300m LOA
- (8x) eSAIL – 36x6m
- Vessel speed 14 knot
- 210,000 DWT

Qingdao

Tubarao

- Historical wind data 2012-2021
- Fuel Savings
  - 12.98 Tn per day
  - 2856 Tn per year (*)
- CO2 savings
  - 9052 Tn per year
- **26.2% fuel & emission savings** (**)
- 2,856M€ fuel saving (***)

(*) Assuming 220 sailing days
(**) Assuming a propulsive power of 10600 kW
(***) Assuming 1000€/ton



Ro-Ro

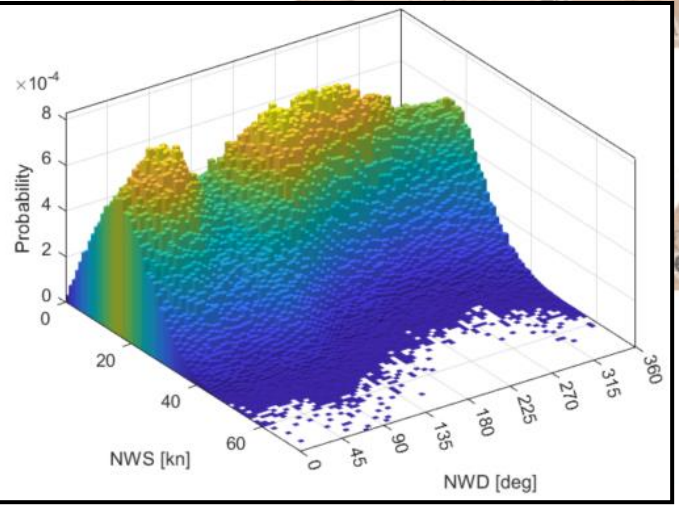
- Ro-Ro
- 200m LOA
- (3x) eSAIL – 26x4,5m
- Vessel speed 16 knot
- 18,000 DWT

Yokohama

Los Angeles

- Historical wind data 2012-2021
- Fuel Savings
  - 4,57 Tn per day
  - 1005 Tn per year (*)
- CO2 savings
  - 3187 Tn per year
- **14,45 % fuel & emission savings** (**)
- 1,005M€ fuel saving (***)

(*) Assuming 220 sailing days
(**) Assuming a propulsive power of 7000 kW
(***) Assuming 1000€/ton



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