OCEANBIRD

Powered by Alfa Laval and Wallenius

What we bring to AlfaWall Oceanbird

50/50
Joint Venture

- Product development
- Production experience
- Supply chain management
- Global service network
- Global sales network

- Shipping know-how
- Ship design
- Innovation
- Concept development
- Marketing & Communication

AlfaWall OCEANBIRD

A company owned by Alfa Laval and Wallenius

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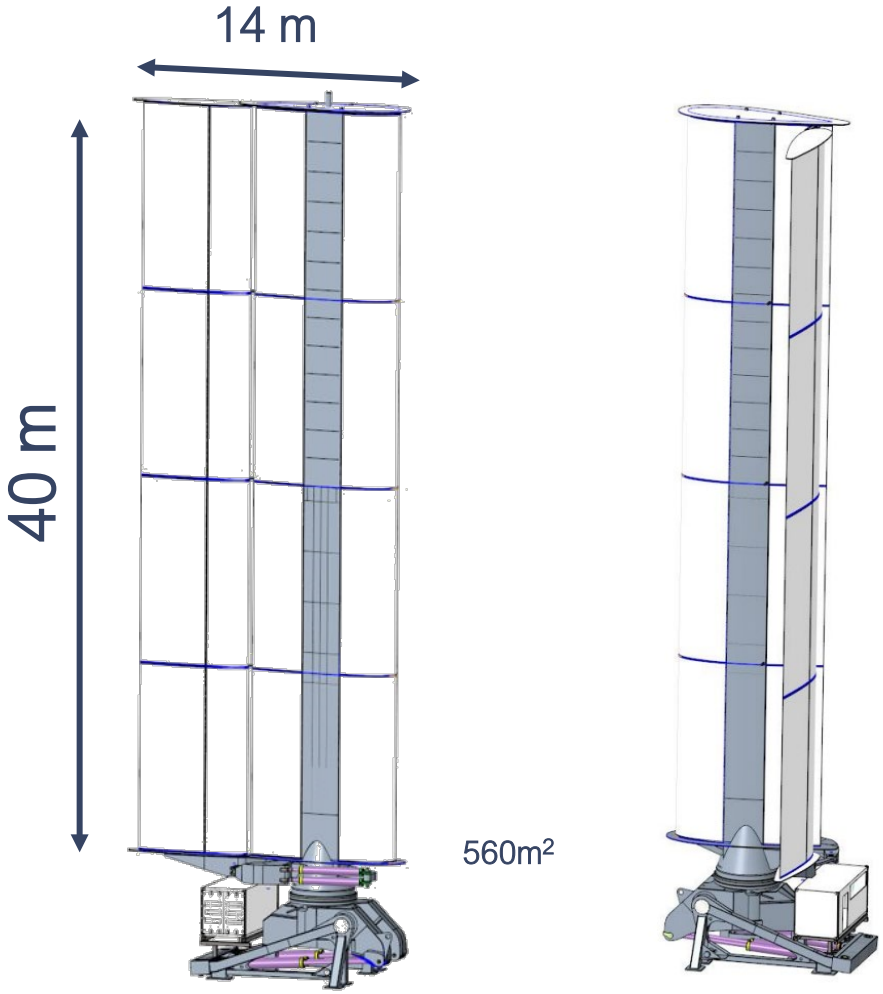
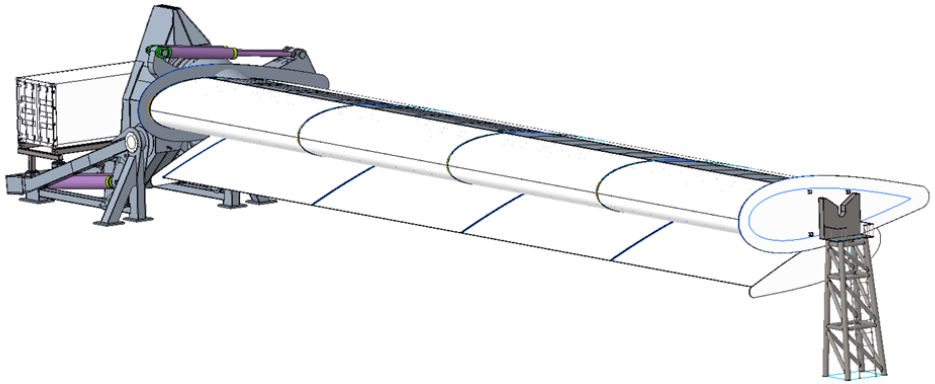
Reducing a lot on a few

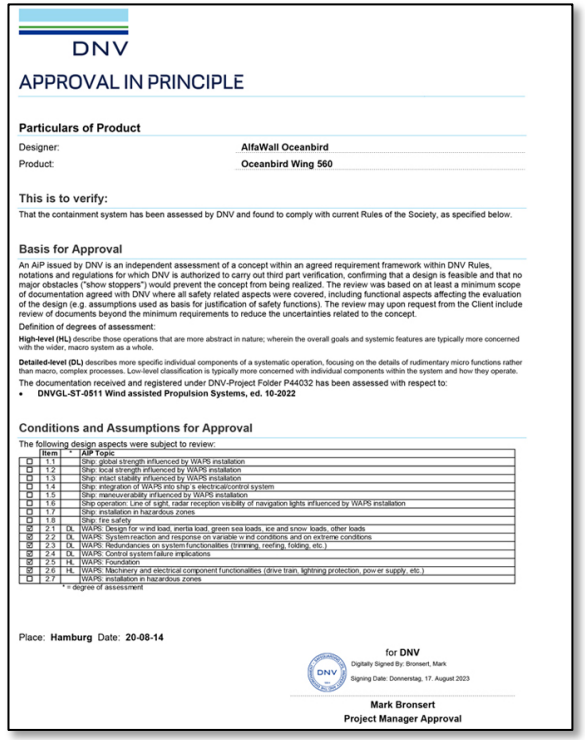
…and even more from a lot

Oceanbird Wing 560



- In-house development of,
  - Mechanical and structural design
  - Hydraulic control system
  - Automation system
- Tilted as ”out of operation” state
  - Lower design loads
  - Lower vessel reinforcements





DNV

APPROVAL IN PRINCIPLE

Particulars of Product

Designer: **AlfaWall Oceanbird**

Product: **Oceanbird Wing 560**

This is to verify:

That the containment system has been assessed by DNV and found to comply with current Rules of the Society, as specified below.

Basis for Approval

An AiP issued by DNV is an independent assessment of a concept within an agreed requirement framework within DNV Rules, notations and regulations for which DNV is authorized to carry out third part verification, confirming that a design is feasible and that no major obstacles ("show stoppers") would prevent the concept from being realized. The review was based on at least a minimum scope of documentation agreed with DNV where all safety related aspects were covered, including functional aspects affecting the evaluation of the design (e.g. assumptions used as basis for justification of safety functions). The review may upon request from the Client include review of documents beyond the minimum requirements to reduce the uncertainties related to the concept.

Definition of degrees of assessment:

High-level (HL) describe those operations that are more abstract in nature; wherein the overall goals and systemic features are typically more concerned with the wider, macro system as a whole.

Detailed-level (DL) describes more specific individual components of a systematic operation, focusing on the details of rudimentary micro functions rather than macro, complex processes. Low-level classification is typically more concerned with individual components within the system and how they operate.

The documentation received and registered under DNV-Project Folder P44032 has been assessed with respect to:

- **DNVGL-ST-0511 Wind assisted Propulsion Systems, ed. 10-2022**

Conditions and Assumptions for Approval

The following design aspects were subject to review:

	Item	*	AiP Topic
☐	1.1		Ship: global strength influenced by WAPS installation
☐	1.2		Ship: local strength influenced by WAPS installation
☐	1.3		Ship: intact stability influenced by WAPS installation
☐	1.4		Ship: integration of WAPS into ship´s electrical/control system
☐	1.5		Ship: manoeuverability influenced by WAPS installation
☐	1.6		Ship:operation: Line of sight, radar reception visibility of navigation lights influenced by WAPS installation
☐	1.7		Ship: installation in hazardous zones
☐	1.8		Ship: fire safety
☒	2.1	DL	WAPS: Design for wind load, inertia load, green sea loads, ice and snow loads, other loads
☒	2.2	DL	WAPS: System reaction and response on variable wind conditions and on extreme conditions
☒	2.3	DL	WAPS: Redundancies on system functionalities (trimming, reefing, folding, etc.)
☒	2.4	DL	WAPS: Control system failure implications
☒	2.5	HL	WAPS: Foundation
☒	2.6	HL	WAPS: Machinery and electrical component functionalities (drive train, lightning protection, power supply, etc.)
☐	2.7		WAPS: installation in hazardous zones

* = degree of assessment

Place: **Hamburg** Date: **20-08-14**

for **DNV**

Digitally Signed By: Bronsert, Mark

Signing Date: Donnerstag, 17. August 2023

Mark Bronsert

Project Manager Approval

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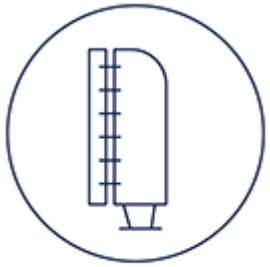
Sail systems

What type of technologies exists?

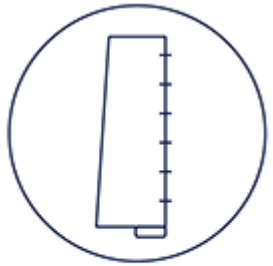


Rigid wing sails

Rotor sails

Soft wing sails

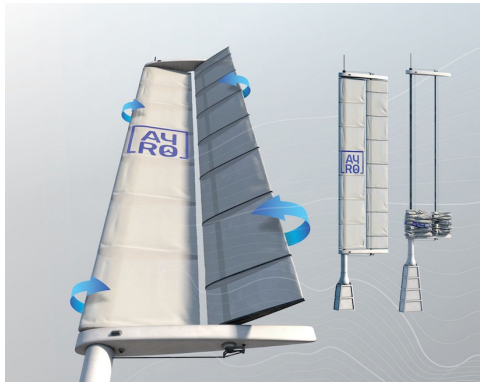
Soft sail system



Ventilated foil system

https://www.theoceanbird.com/media/

https://www.norsepower.com/on-going



https://ayro.fr/projects/

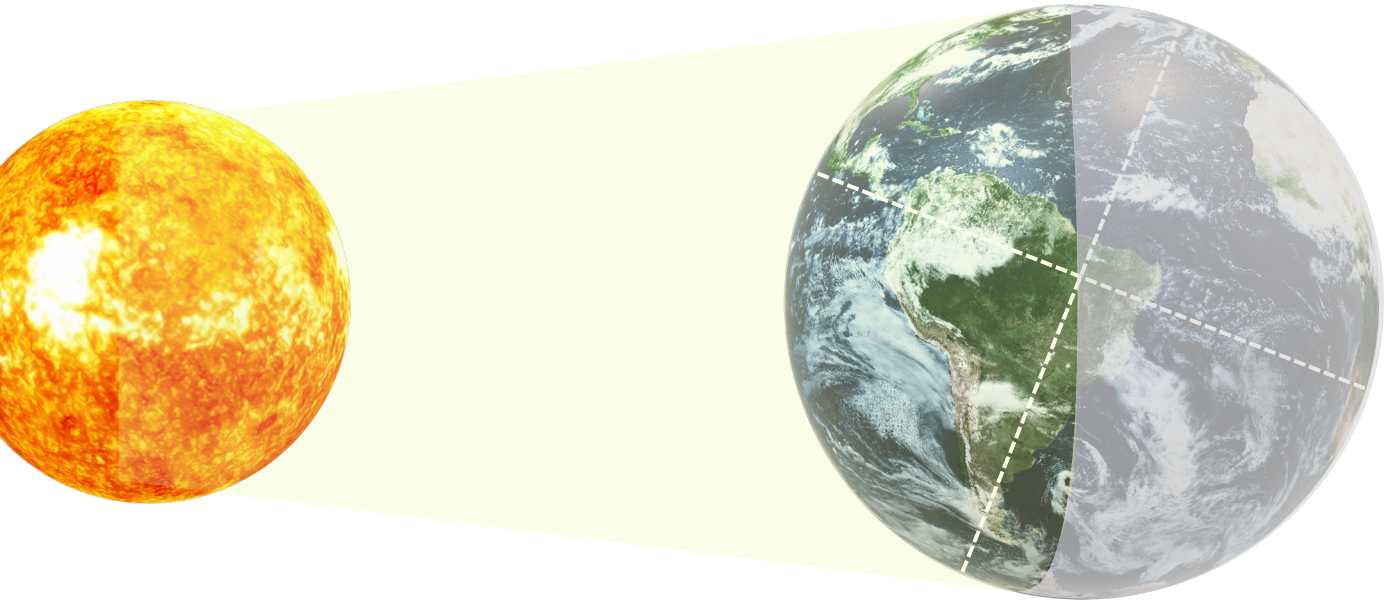
https://southernspars.com/portfolio/missy/

https://bound4blue.com/en/news/odfjell-first-to-install-suction-sails-on-deep-sea-chemical-tanker-104

Energy source description

Energy source description

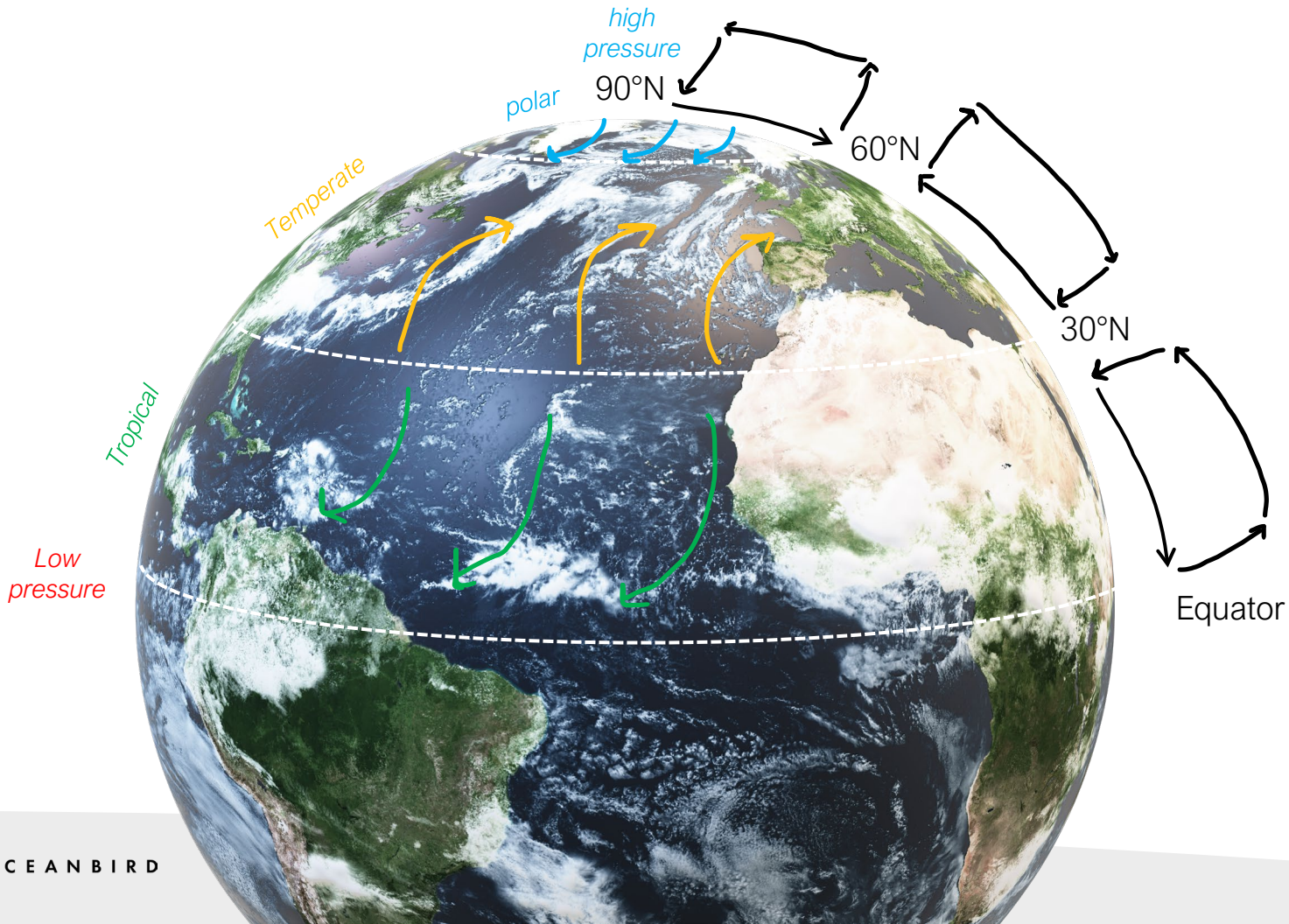
Where does wind come from?



- Sun rays strikes the earth at different angles – unequal heating of the earth surface

Energy source description

Where does wind come from?



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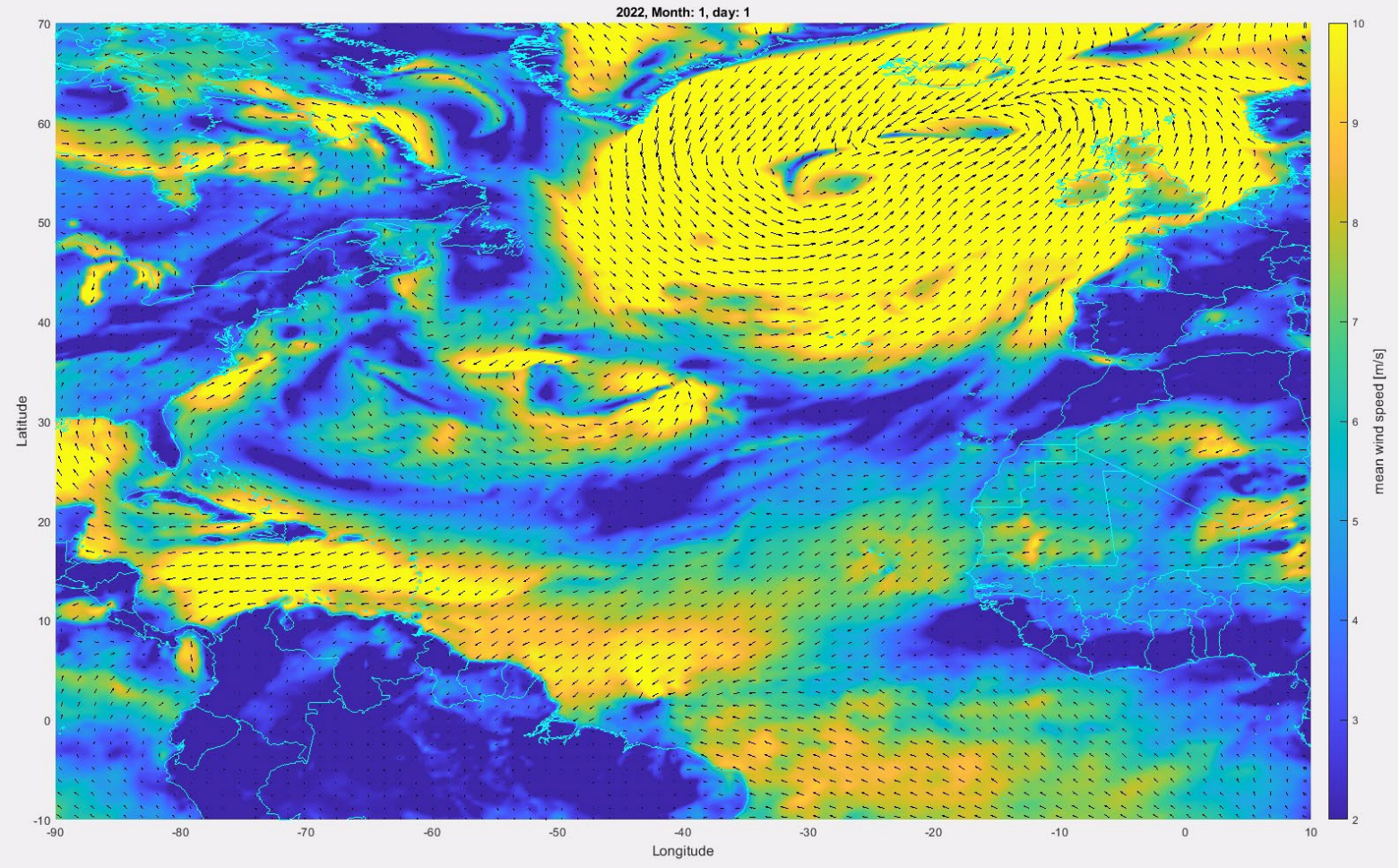

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Energy source description

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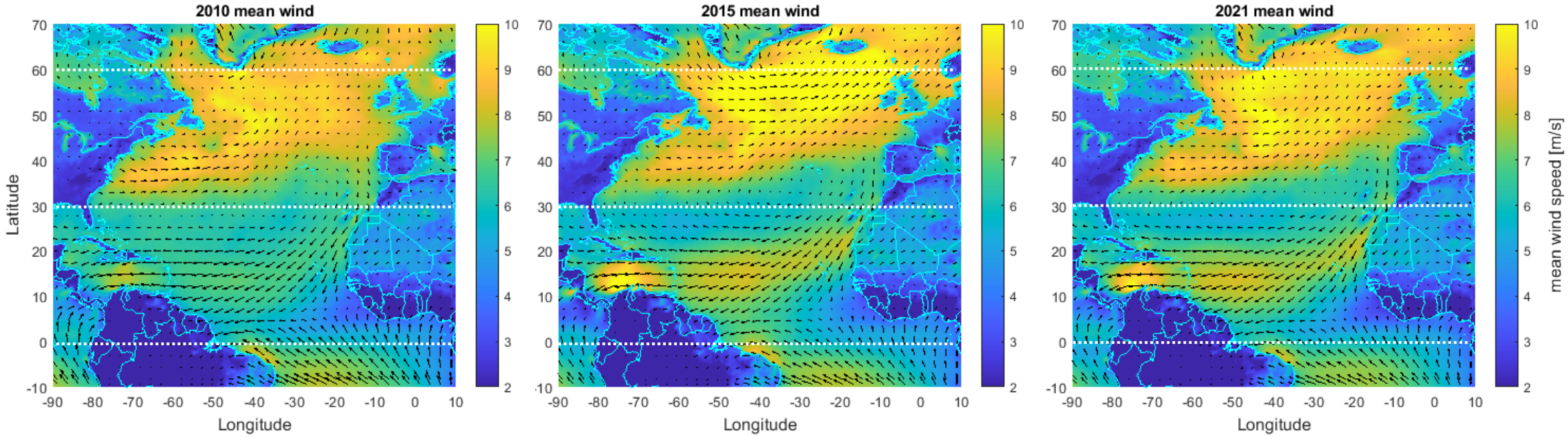

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Energy source description

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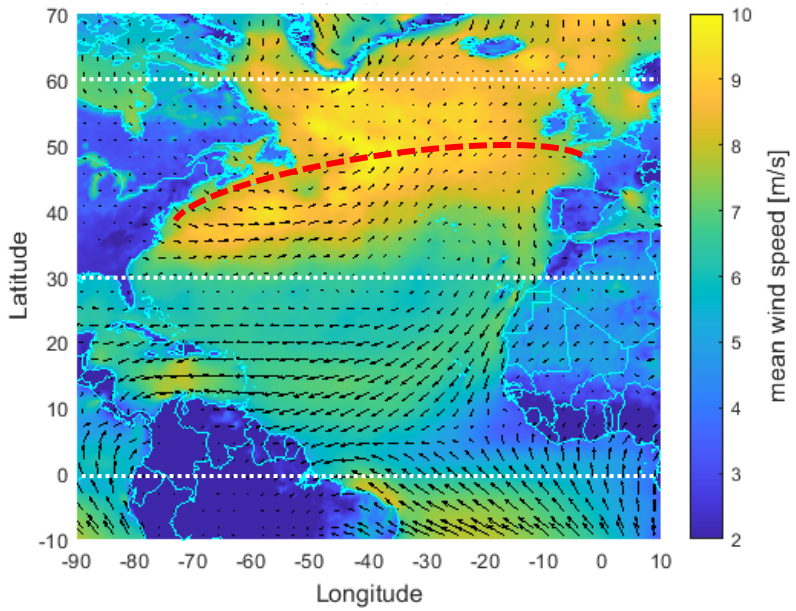

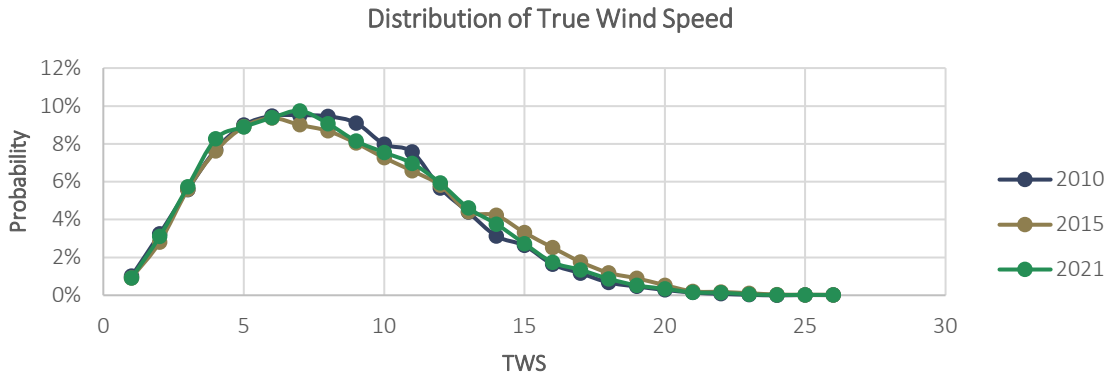

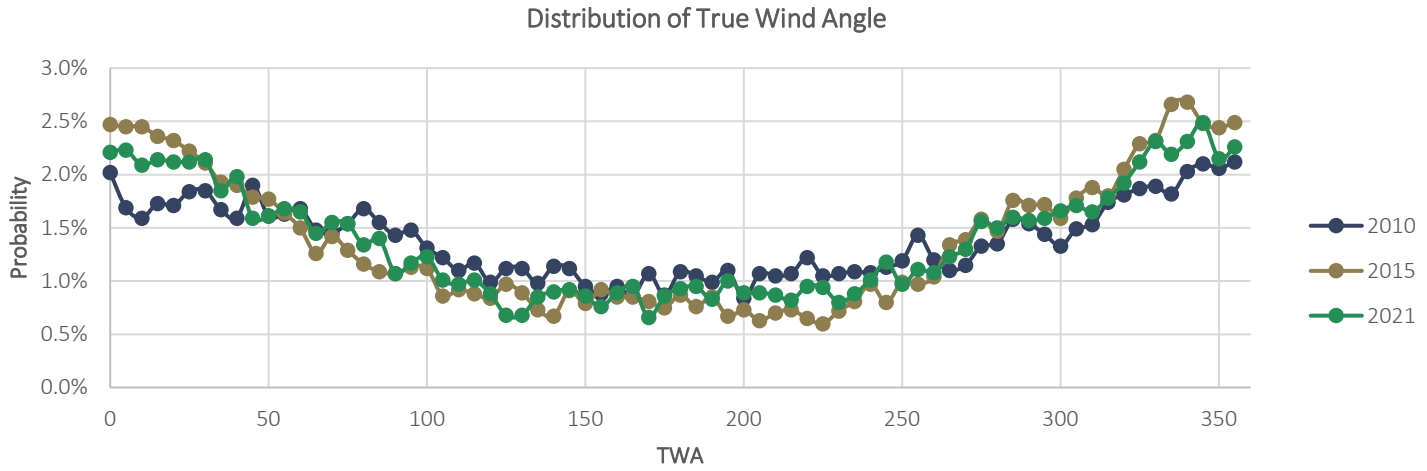

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Wind is the right way forward

Reduce OPEX

- Less dependent on oil
- Uncertainties of future fuel prices, wind is free

Zero emissions

- No emissions like CO_2, NOx, SOx and particles
- Reduce underwater noise

Reliability

- Wind is a constant energy source
- Opens for hybrid solution

Future proof

- Compliance with future legislation like CII
- No additional infrastructure needed

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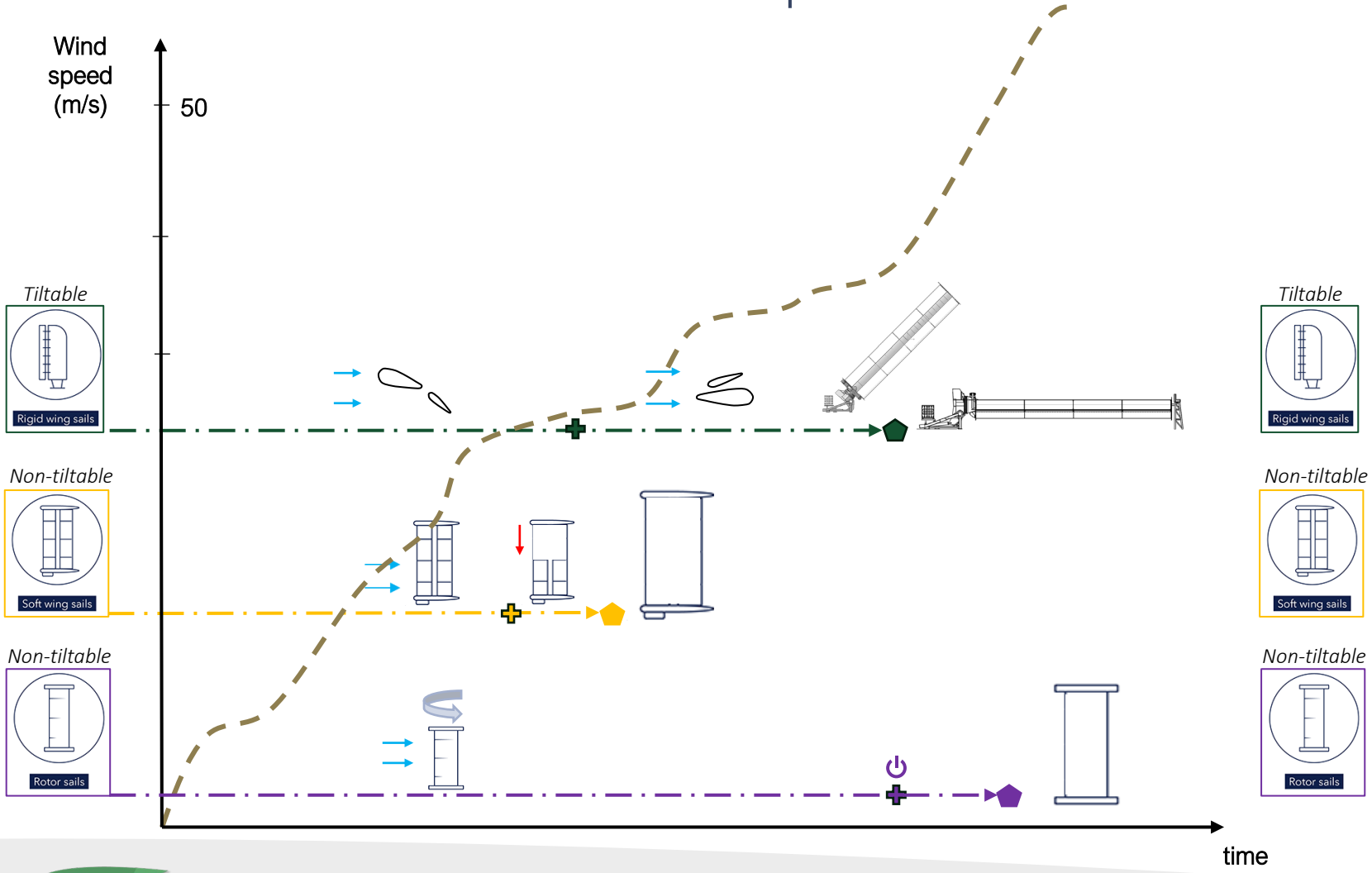
Safety challenges and mitigations

Safety challenges

How to ensure that ”out of operation” state is reached?



Advantage	Downside
Low cog and small lateral area	High capacity hydraulic equip.
Low weight	OPEX
Simple	Aerodynamic resistance

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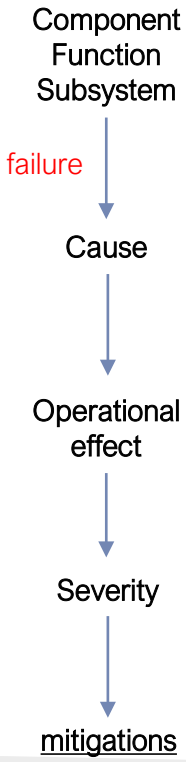
Safety challenges

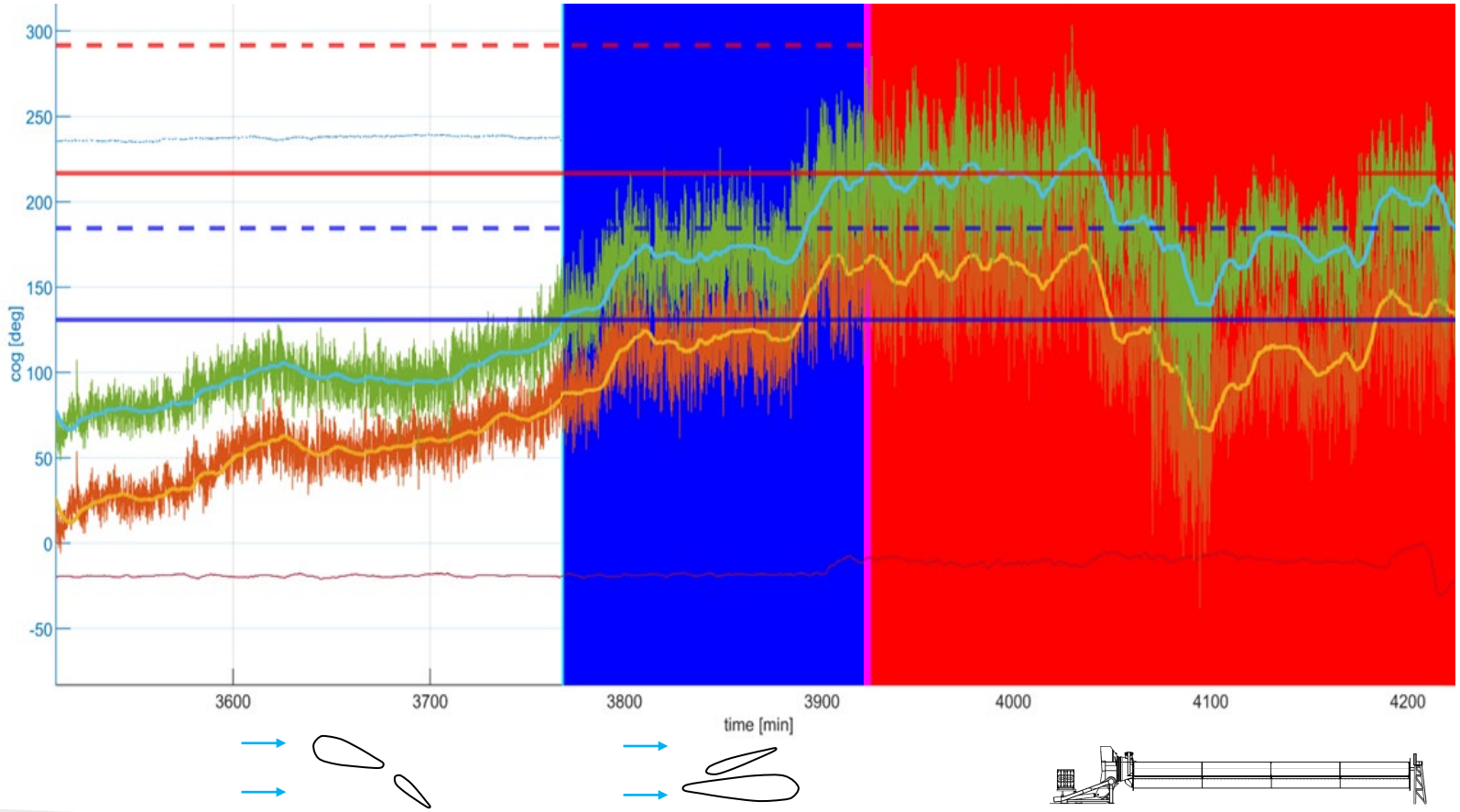
How to ensure that ”out of operation” state is reached?

Mitigations

- Failure Mode Effect Analysis



- Real wind measurements for simulations



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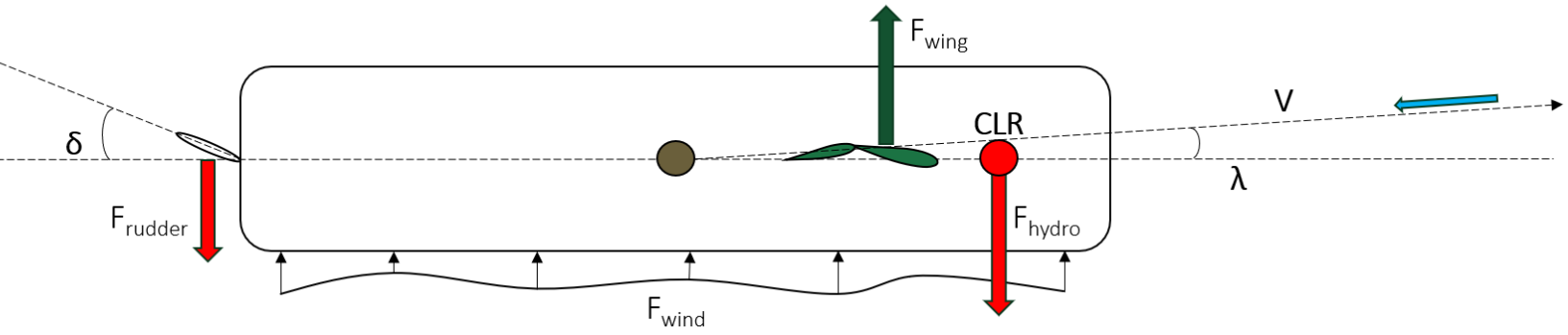
Safety challenges

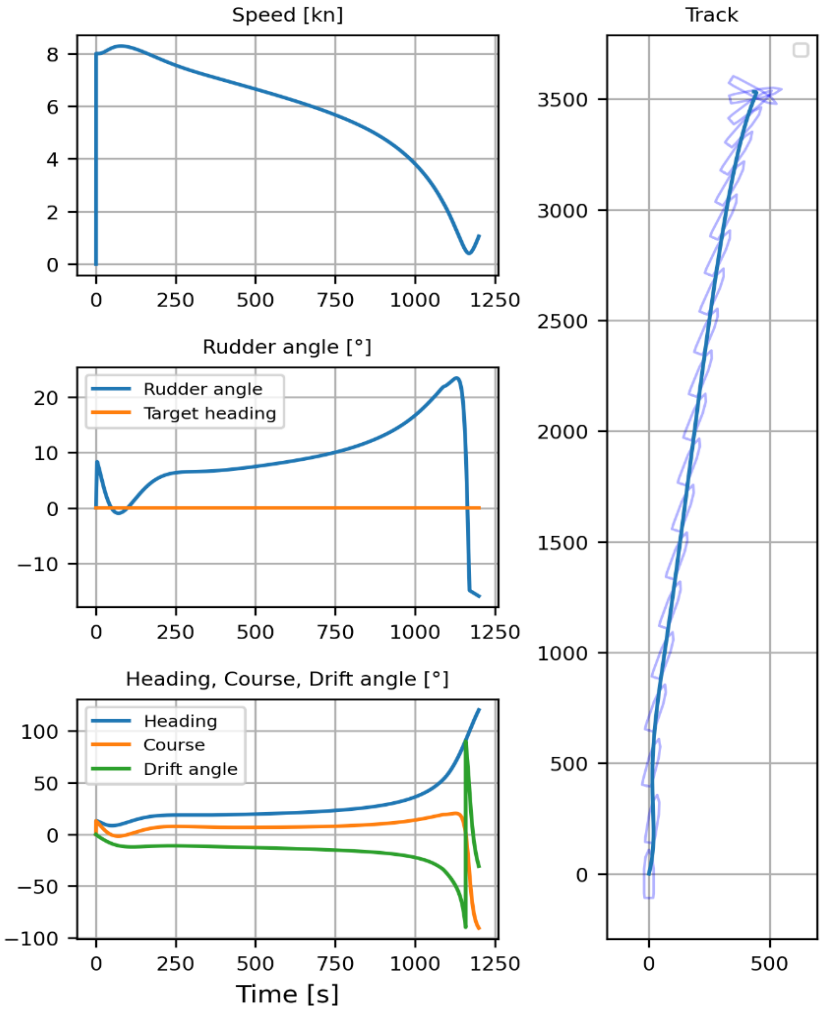
Influence on maneuvering & course keeping

Wind propulsion units creates forward thrust and side force

- Rudder compensating for additional side force
- Resulting leeway and rudder angle are very much dependent on size and position of installed wind power



Poor balance



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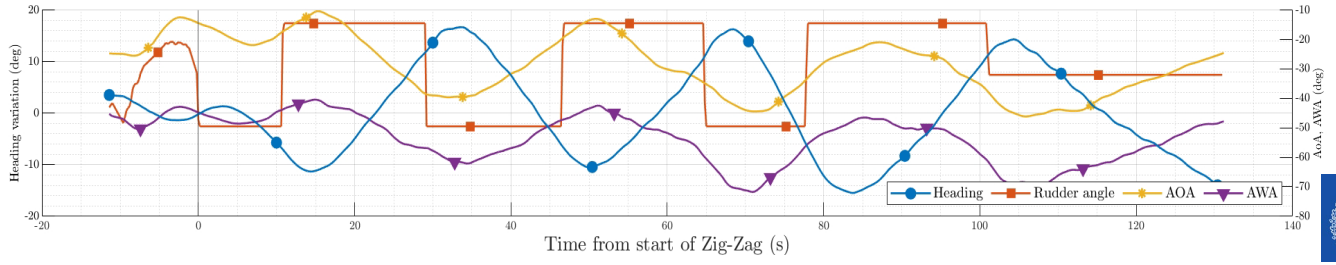
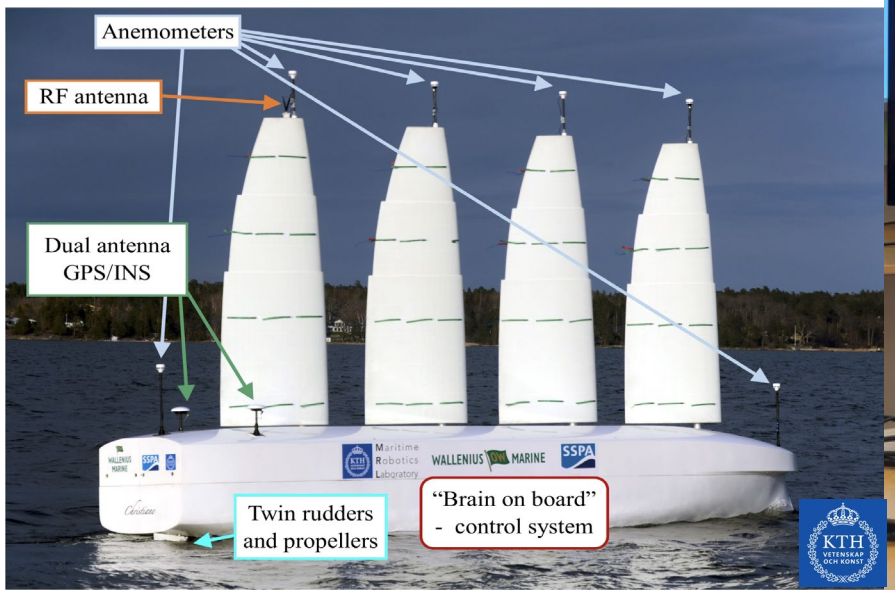
Safety challenges

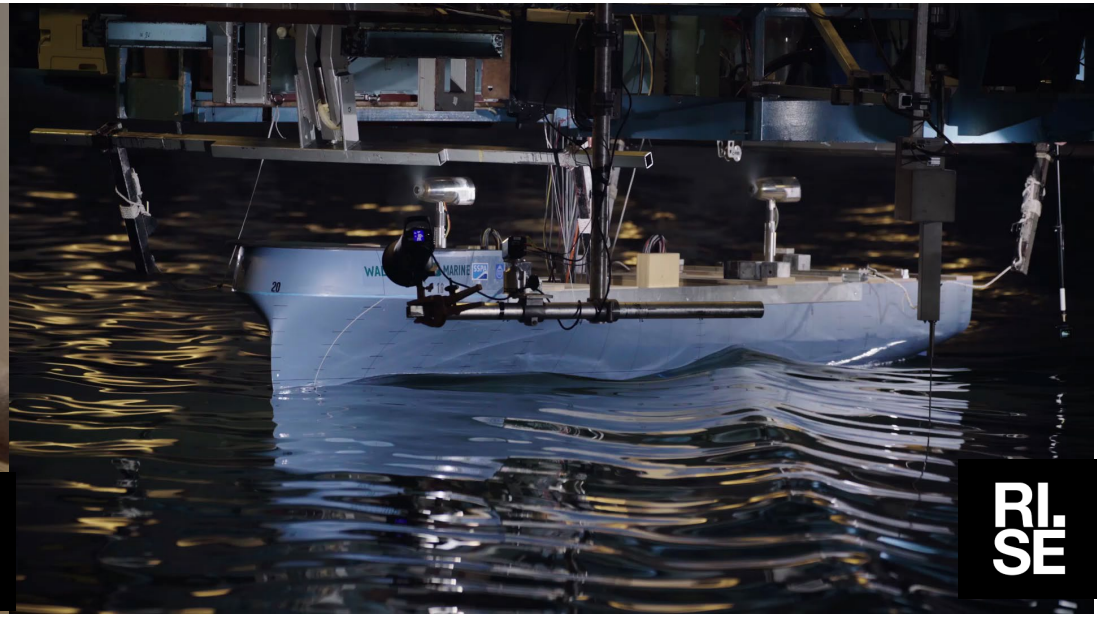
Influence on maneuvering & course keeping

Mitigations

- Model tests
- Simulations
- Control system development
- Crew training
- Operational restrictions







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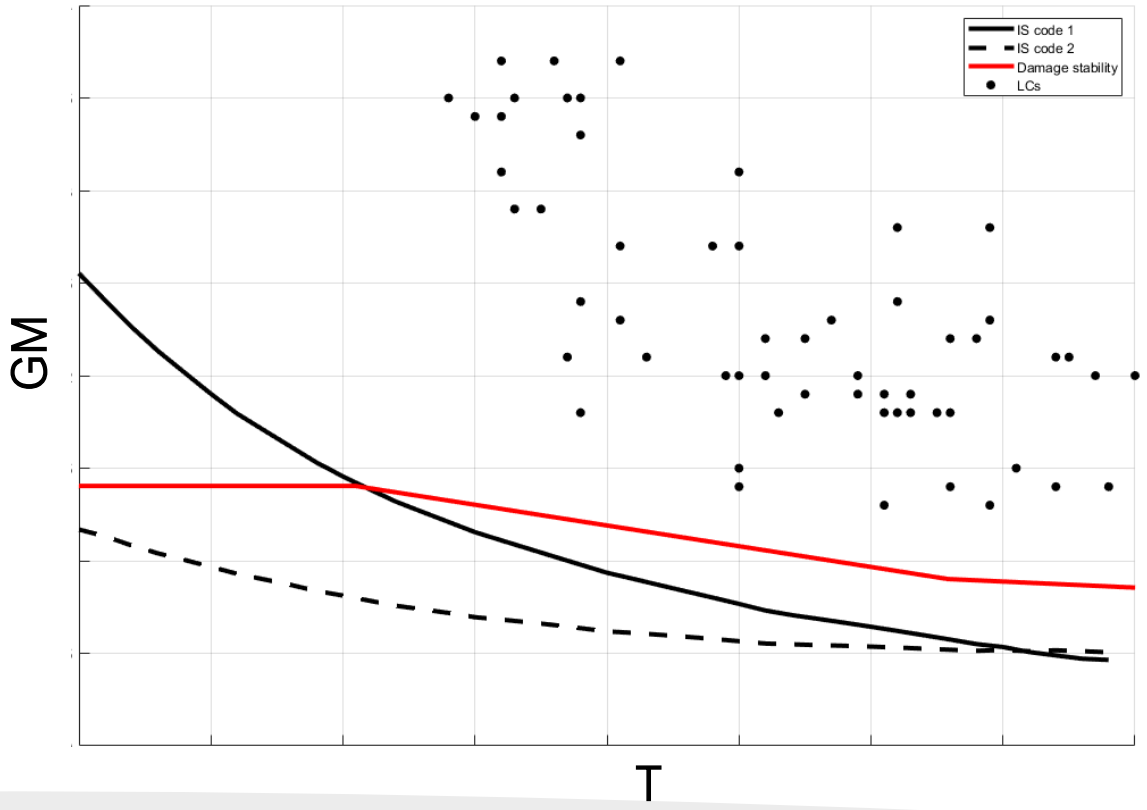
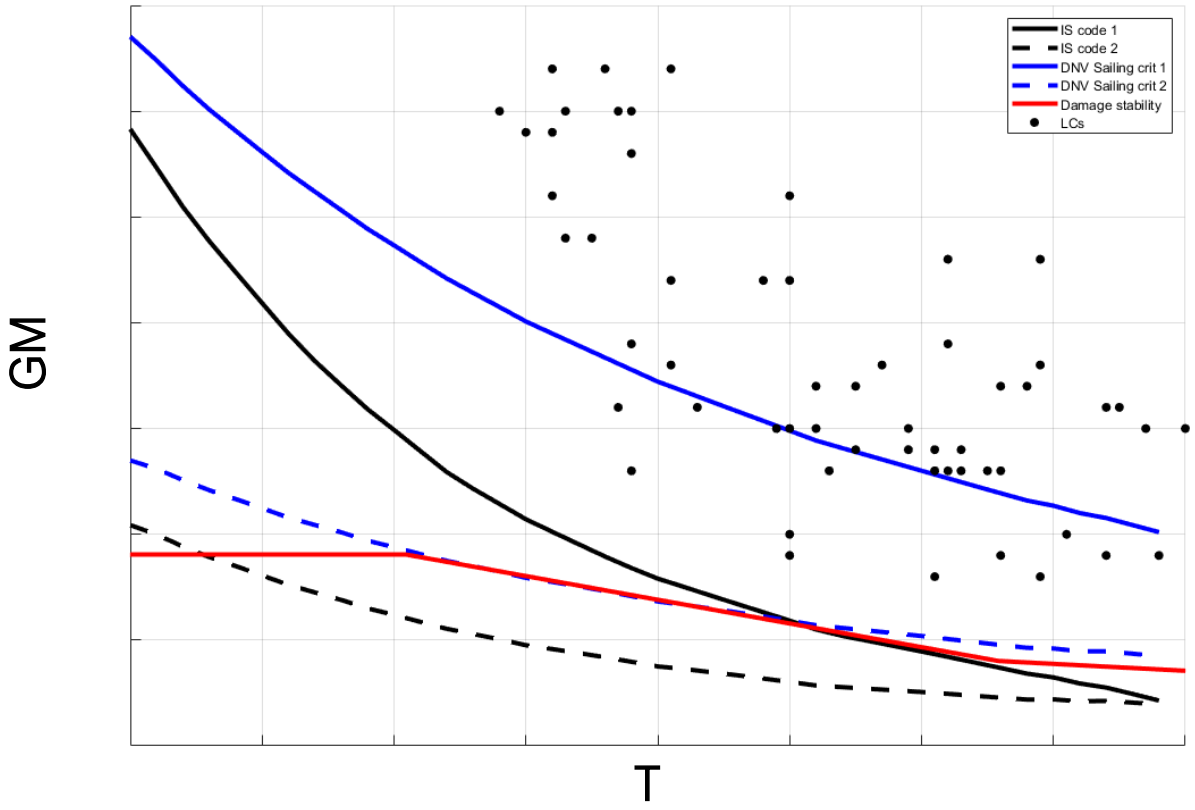
Safety challenges

Influence on stability and comfort

Minimum allowable GM
0 x WPUs



Minimum allowable GM
4 x WPUs



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Safety challenges

Influence on stability and comfort

Safety challenges

Mitigations

- Continuous FMEA & Hazard analysis
- Develop simulation models and train with measured environmental data
- Involve stakeholders
- Allow for vessel design iterations

THANK YOU

Emil Kotz
emil.kotz@theoceanbird.com
Customer Project Manager

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