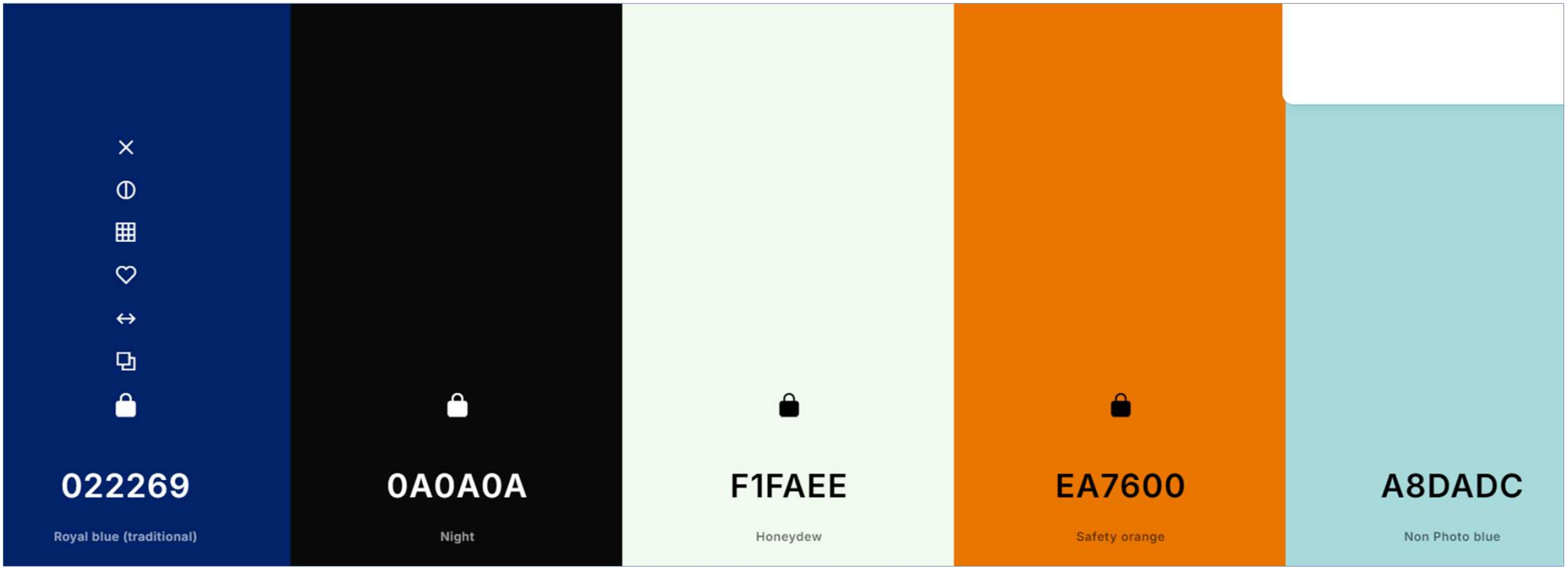
BETTER SHIPS, BLUE OCEANS

Zeilende vrachtschepen

Klankborgroep 26-11-2024

Graphical theme



De Gallant

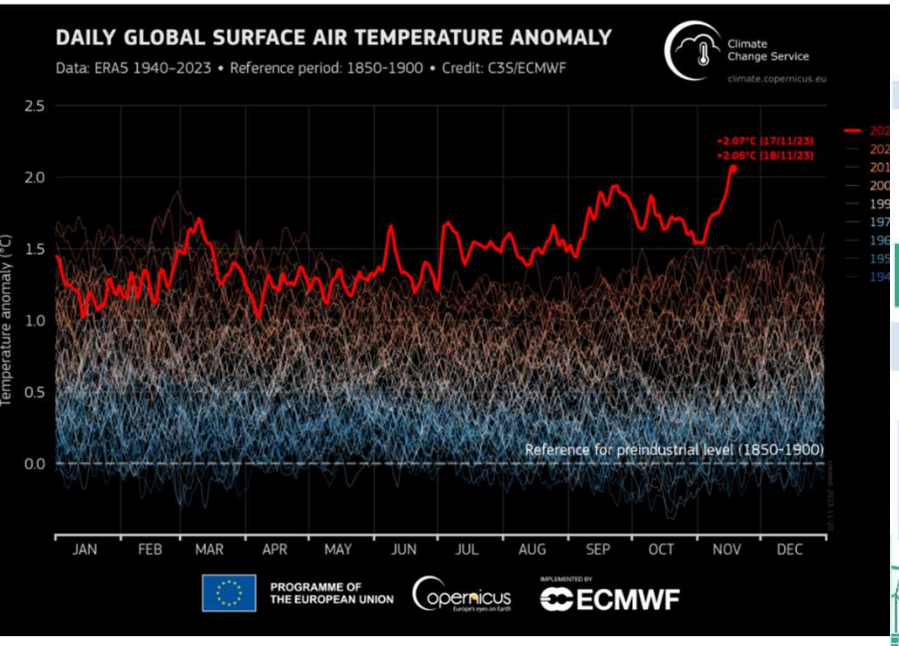
- 21-05-2024: Capsize and sunk off the coast of Bahamas
- 6 pers. rescued, 2 missing (Captain and chief mechanic)
  - “Glassy sea, particularly light winds”
  - “Temperature drop, sudden wind gusts”

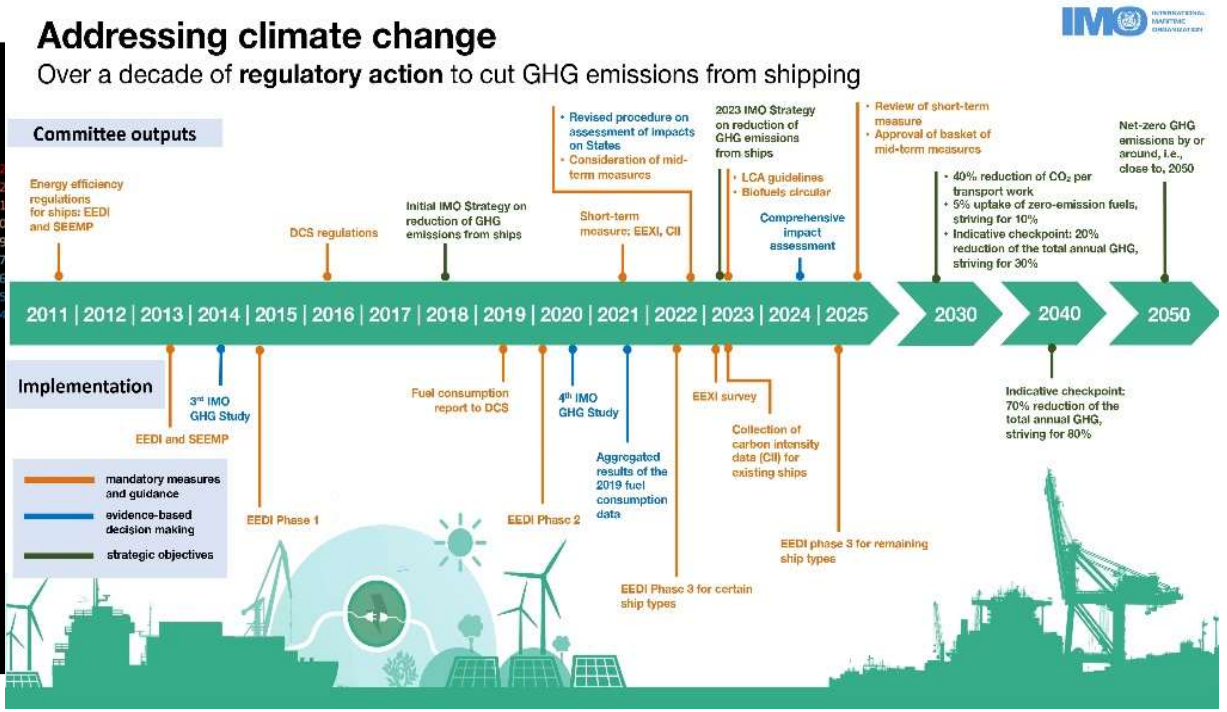
➢ Capsize and water ingress in few minutes

https://lemarin.ouest-france.fr/faits-divers/accidents-en-mer/les-circonstances-du-naufrage-du-de-gallant-et-lidentite-des-deux-marins-disparus-se-precisent-2f01ee98-2023-11ef-83d6-6d19ce3cf72c

Other accident linked to roll

Why use WASP?





https://www.imo.org/en/MediaCentre/HotTopics/Pages/Cutting-GHG-emissions.aspx

Why use WASP?

- **Average saving of 8%** (5%-21%)
- **50 tons HFO/year**
- **1800 tons CO_2/year**

- French ship owner Socatra (chartered by Total)
- Two Norsepower Flettner rotors (2x35m)
- Syroco provided routing + optimisation ship energy usage

Surge of WASP vessels

	In project				Total Project	Build					Total Build	Grand Total
Ship type	Flettner	Rigid wing	Suction wing	Thick batten sails		Flettner	Rigid wing	Soft sails	Suction wing	Thick batten sails		
Bulk carrier	**2**		**1**		**3**	**7**	**4**		**1**		**12**	**15**
Cement carrier	1				1	1			1		2	3
Chemical tanker			2		2	1			8		9	11
CO2 Tanker	1				1	2					2	3
Container vessel		**1**		**6**	**7**				**1**		**1**	**8**
Crude oil tanker					0	1	2				3	3
General cargo		**1**	**1**		**2**	**4**		**2**	**7**		**13**	**15**
Heavy lift vessel					0	1			1		2	2
LPGC					0				1		1	1
RoRo	3	1		1	5	2			2	1	5	10
RoRo/PAX					0	2	1				3	3
Yacht					0			1		1	2	2
Grand Total	7	3	4	7	21	21	7	3	22	2	55	76

Surge of WASP vessels

VESSELS

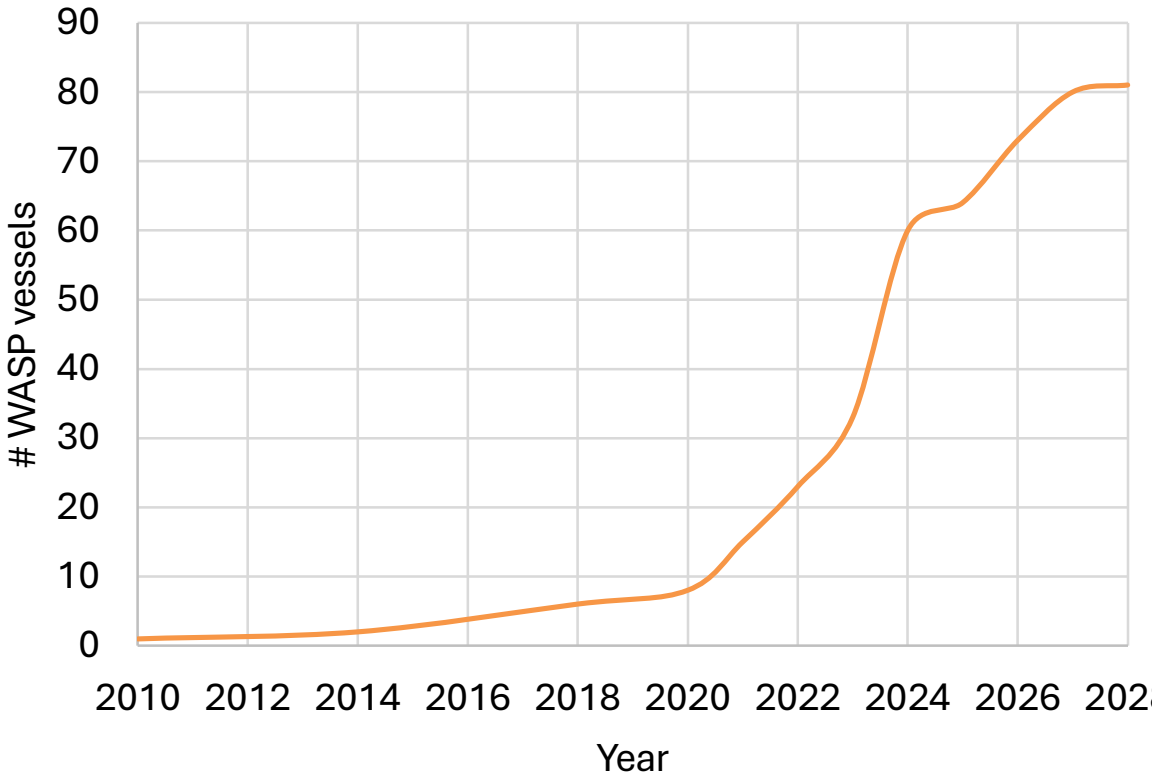
20 bound4blue eSAIL to be fitted on 5 Maersk Tankers ships

BUSINESS DEVELOPMENTS & PROJECTS

Amasus signs fresh deal with bound4blue to fit

BUSINESS DEVELOPMENTS & PROJECTS

Smart Green Shipping secures $1.3 million funding injection to



Wind-Assisted Propulsion Trial Off to Promising Start

Commodities trading giant Cargill is revealing promising results from a six-month trial of wind-assisted propulsion technology on board one of its chartered

March 13, 2024 Total Views: 2501

A *new* class of vessel?

% wind power

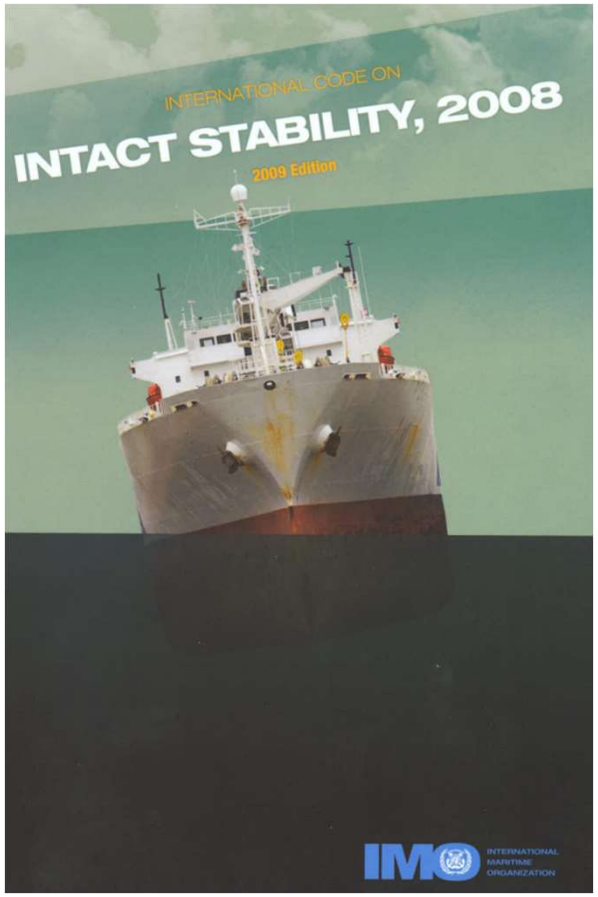
Novelty

- WASP ships form a *new* class of vessel

Mission Environment Design

- New class = new challenges

Current regulations – I.S. code



https://www.imorules.com/

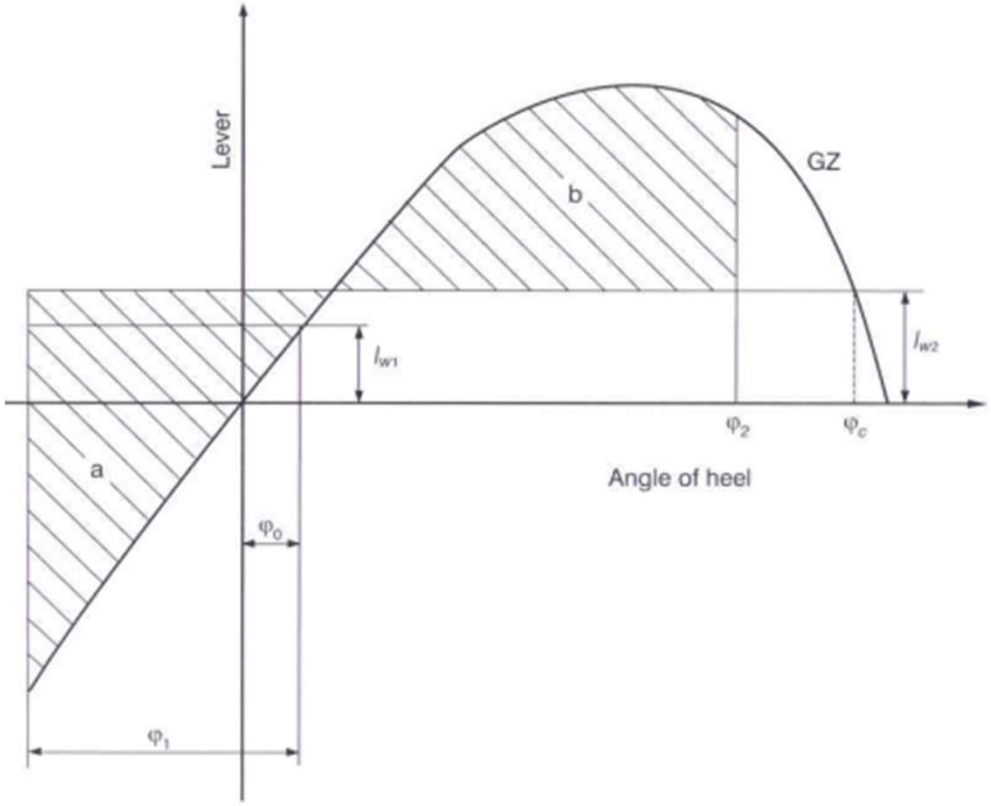


Figure 2.3.1 – *Severe wind and rolling*

Current regulations

https://www.imorules.com/

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LONDON SE1 7SR

Telephone: 020 7587 3152
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IMO

E

Ref. T1/2.04

MSC.1/Circ.1200
24 May 2006

INTERIM GUIDELINES FOR ALTERNATIVE ASSESSMENT OF THE WEATHER CRITERION

1 The Maritime Safety Committee, at its eighty-first session (10 to 19 May 2006), approved Interim Guidelines for alternative assessment of the weather criterion, aiming at providing the industry with alternative means (in particular, model experiments) for the assessment of severe wind and rolling criterion (weather criterion), as contained in the Code on Intact Stability for All Types of Ships covered by IMO Instruments (resolution A.749(18)). The Interim Guidelines should be applied when the wind heeling lever and/or the angle of roll (as defined in paragraphs 3.2.2.1.1 and 3.2.2.1.2 of the Code) need to be determined by means of model experiments.

2 Member Governments are invited to bring the Interim Guidelines to the attention of interested parties as they deem appropriate.

***

IMO INTERNATIONAL MARITIME ORGANIZATION

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SUB-COMMITTEE ON STABILITY AND LOAD LINES AND ON FISHING VESSELS SAFETY
53rd session
Agenda item 3

SLF 53/INF.3
12 October 2010
ENGLISH ONLY

DEVELOPMENT OF NEW GENERATION INTACT STABILITY CRITERIA

A procedure for determining a GM limit curve based on an alternative model test and numerical simulations

Submitted by Finland and Norway

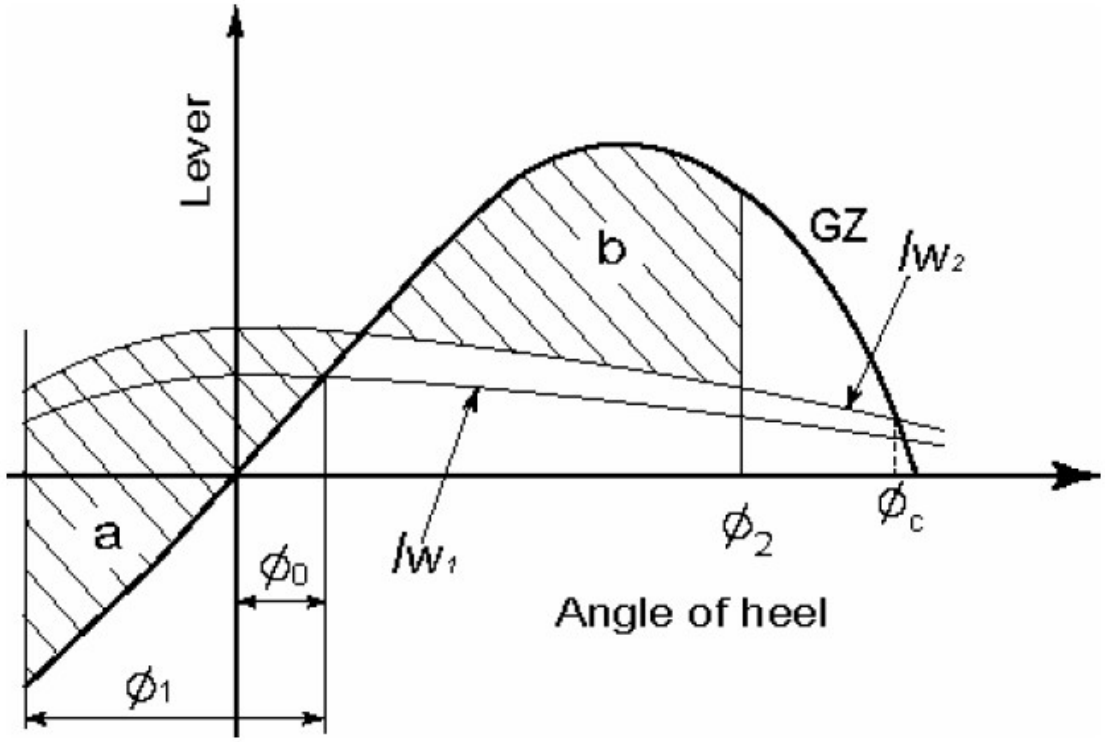
SUMMARY

Executive summary:	This document presents an alternative approach to the application of the weather criterion
Strategic direction:	5.2
High-level action:	5.2.1
Planned output:	5.2.1.16
Action to be taken:	Paragraph 4
Related documents:	SLF 51/4 and SLF 52/3

- Compare I.S. / Circ.1200 / FLF.53 in the light of WASP vessels
- Are current regulations still suited?
- Is static approach valid for dynamic winds loads (gusts)?
- Is it possible to find a vessel+WASP that complies with I.S. code *while showing unsafe behaviour?*

Current regulations – IMO MSC.1/Circ.1200

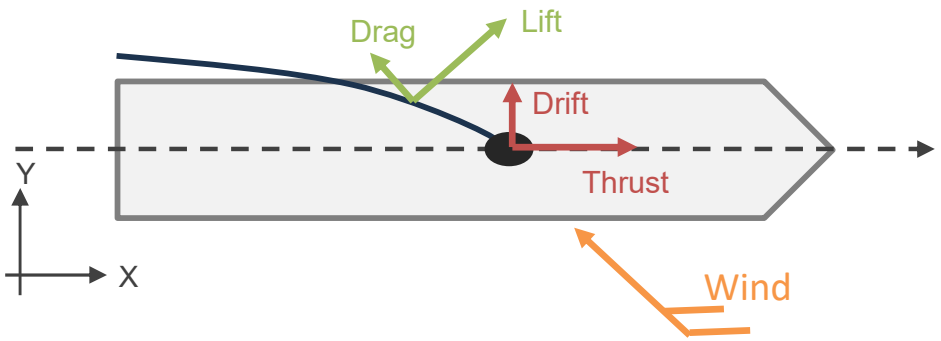
INTERIM GUIDELINES FOR ALTERNATIVE ASSESSMENT OF THE WEATHER CRITERION

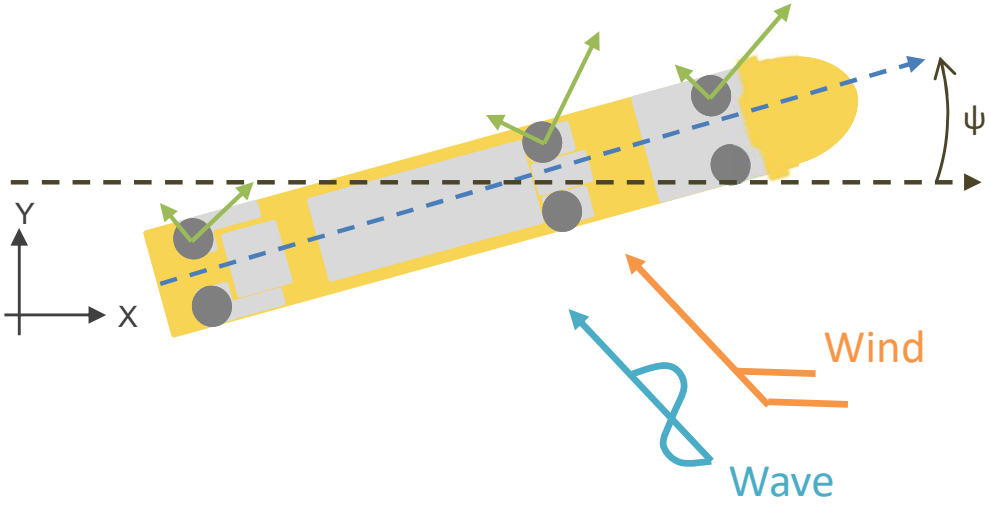


Weather criterion when the wind heeling lever is dependent on the heeling angle

➔ Less conservative

Main issues with WASP





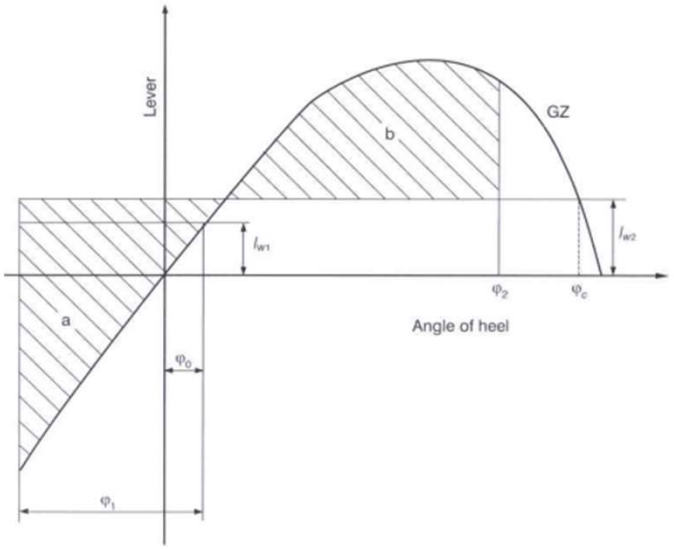
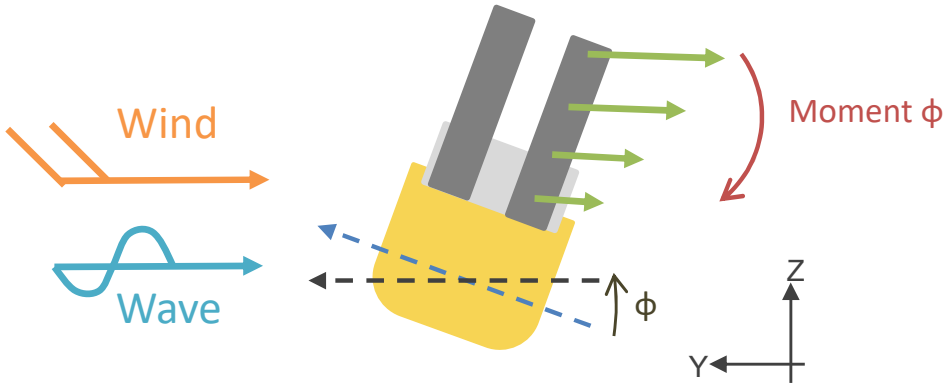
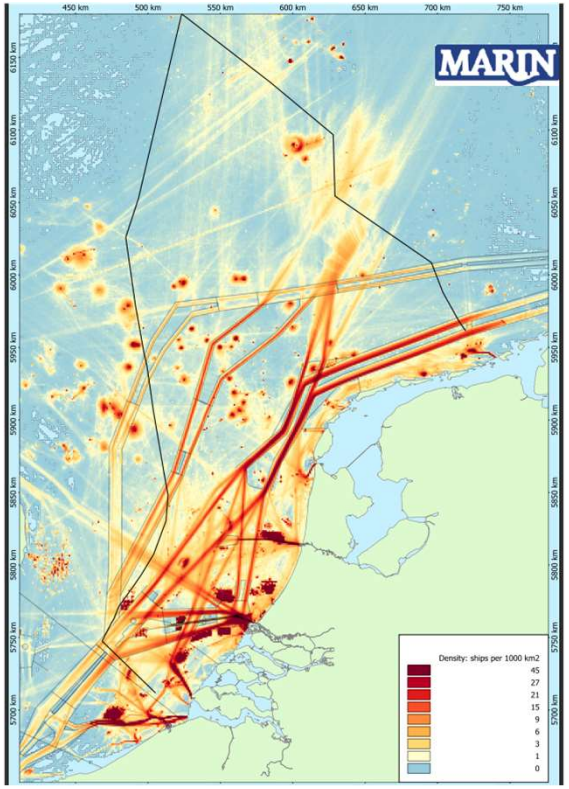


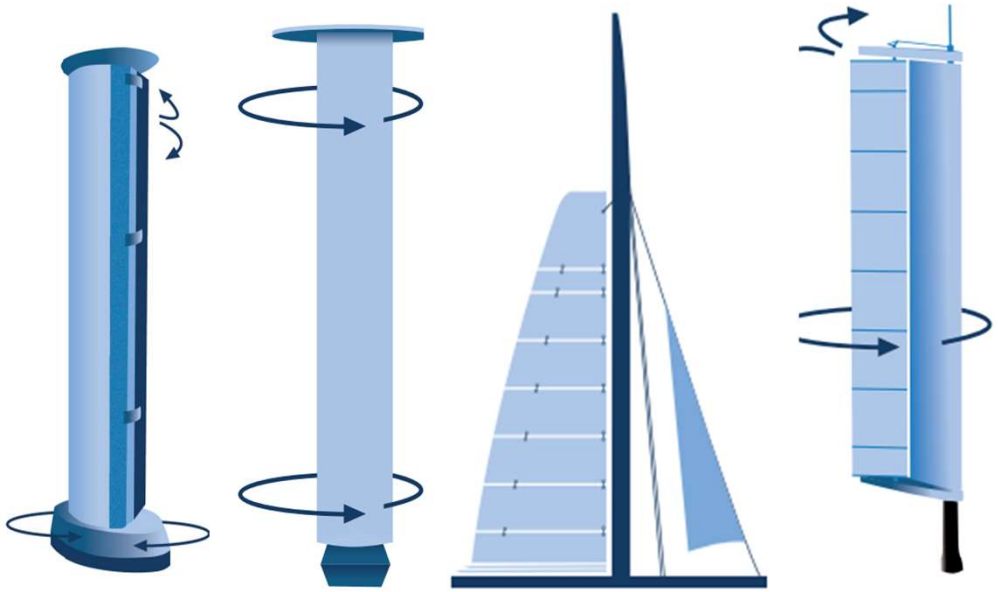
Figure 2.3.1 – *Severe wind and rolling*



Main issues with WASP



Main classes of WASP

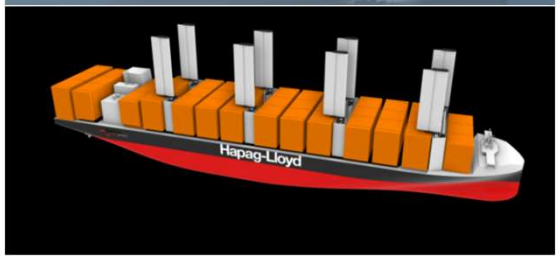


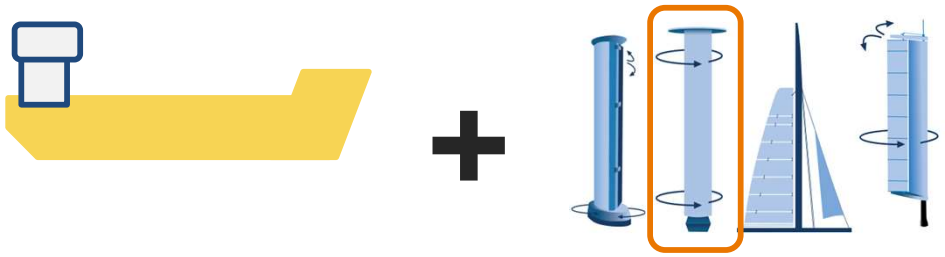
- Main goal: maximise lift/drag
- Minimal deck footprint
- Some systems have integrated failsafe (depowering, flag mode, pivoting mast,…)

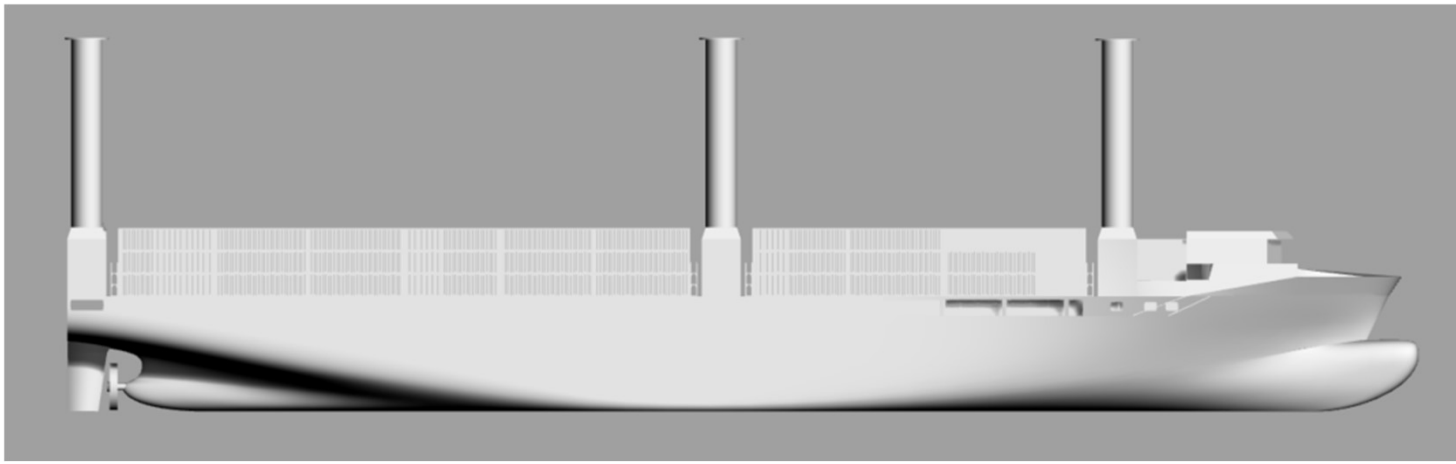
- *How fast can it be depowered?*
- *In which condition?*
- *Drag Impact on initial stability (GM)?*
- *Susceptibility to gusts ?*
- *Operation under increased heel?*

https://www.wind-ship.fr/livre-blanc

Fictive vessel

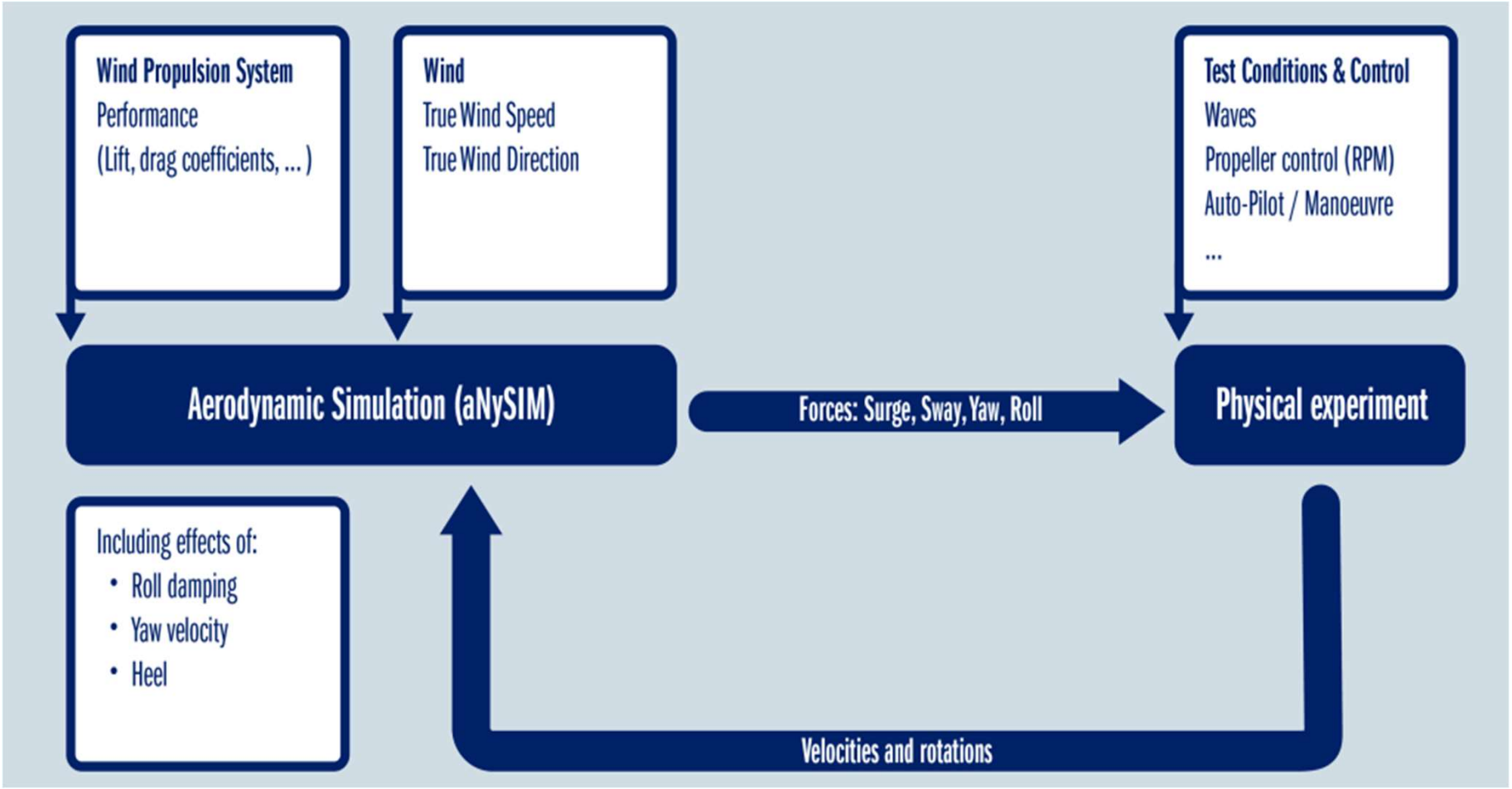




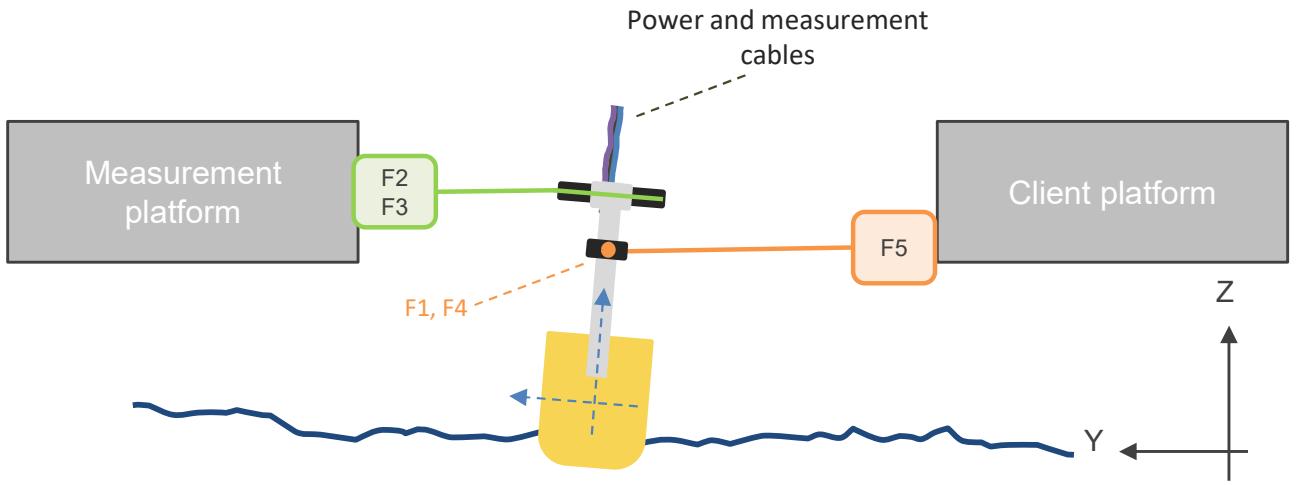


- Container vessel (163 m) + Flettner rotor (6x25x5 m)
- Most issues could arise (low initial GM, high point of application for wind)
- Available hull

Test set-up – Wind & waves



Test set-up – Wind & waves



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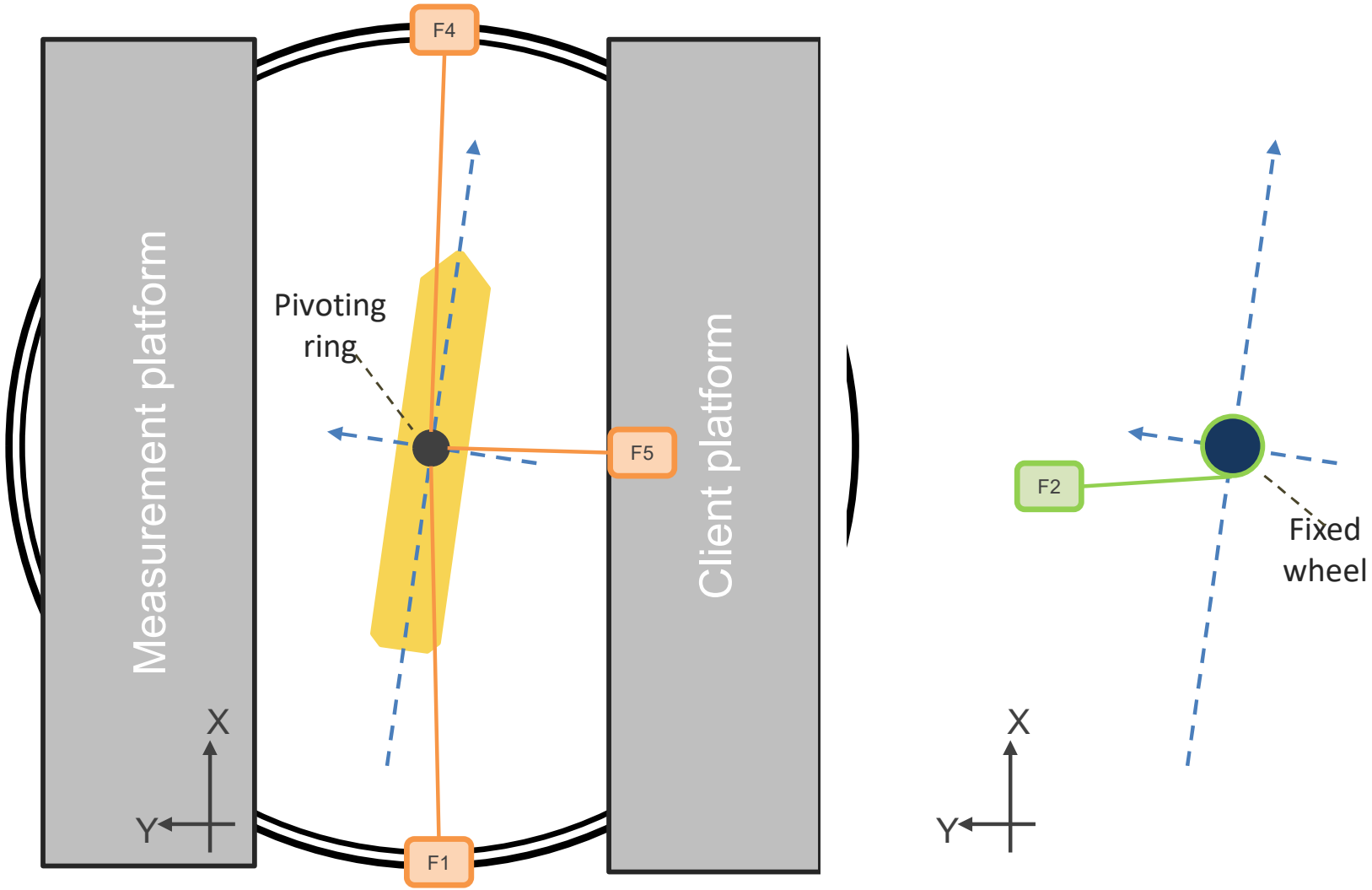

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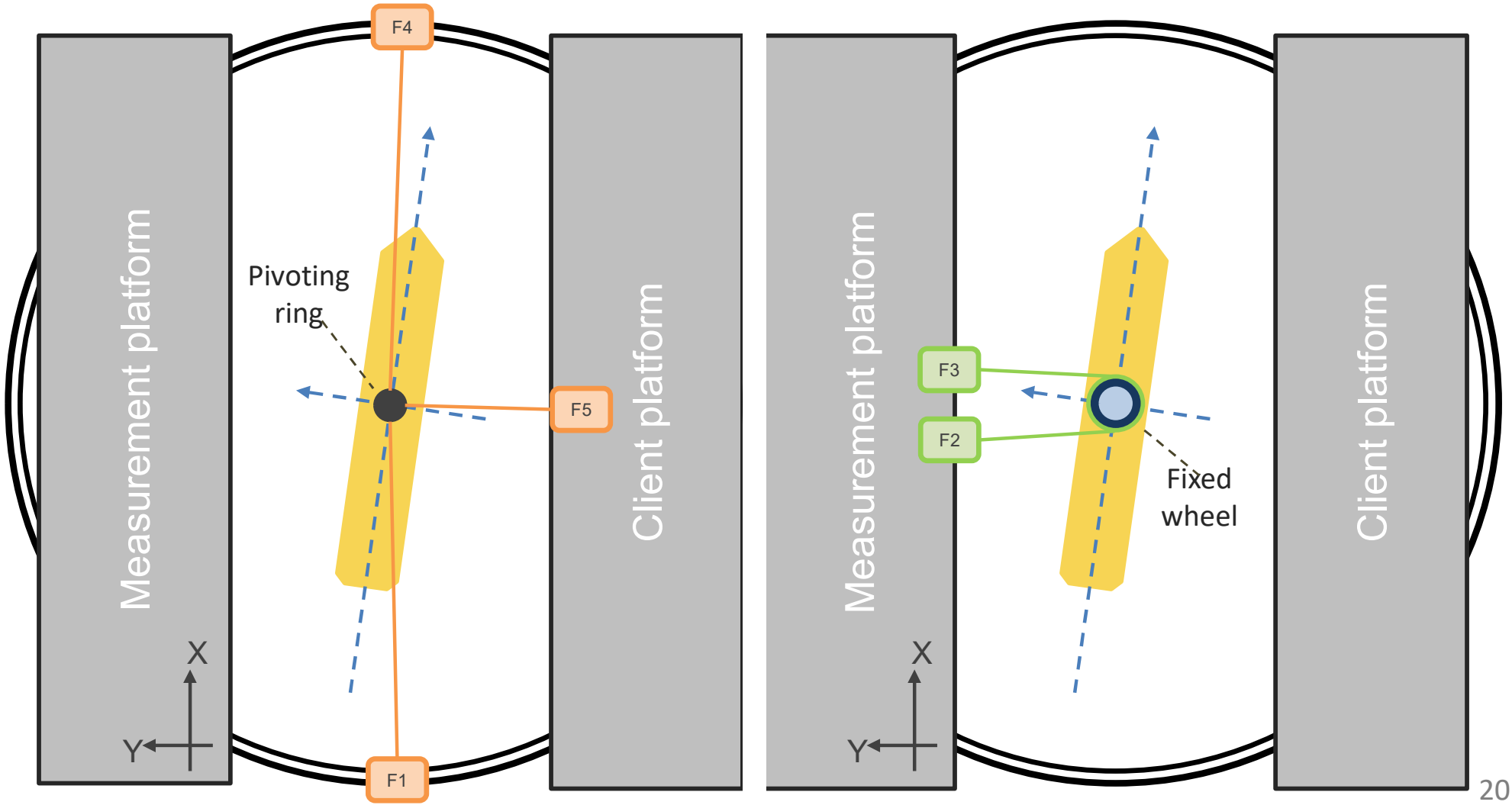
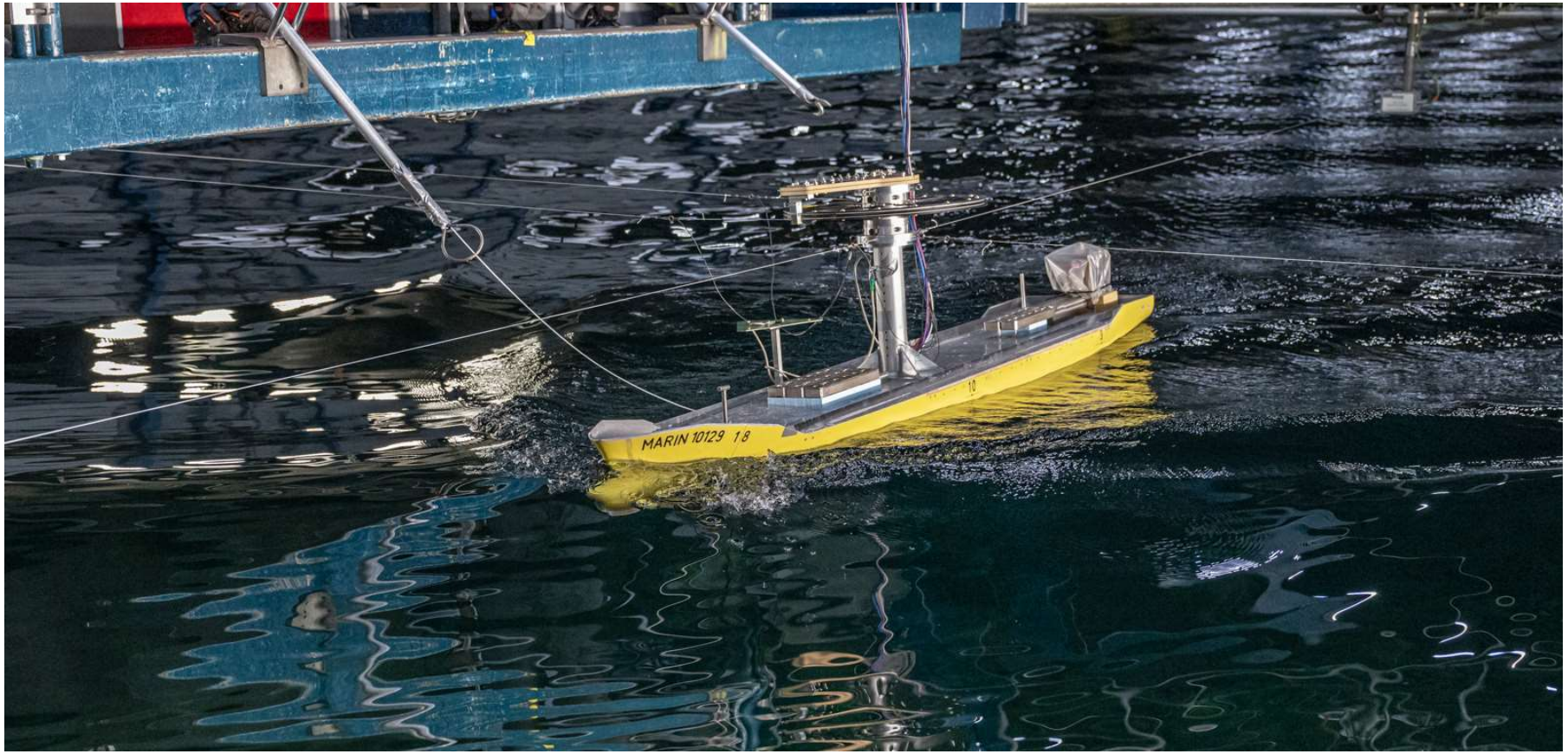
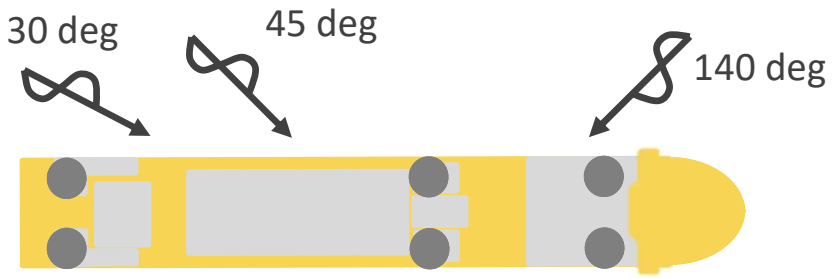


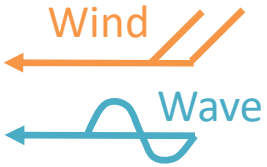
Test results



Test results

General seakeeping behaviour



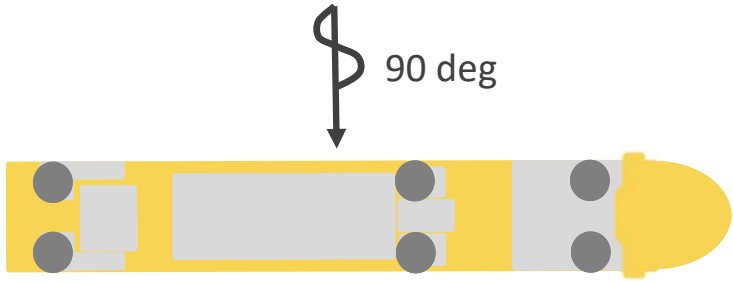


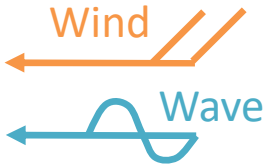
- No wind
- Steady wind
- Unsteady wind

- Regular waves H=5 m; T=10 s
- Vs=12 kn

- TWS=24.5 kn; Top operating condition
- TWS=35 kn; Gust factor 1.42

Weather criterion tests





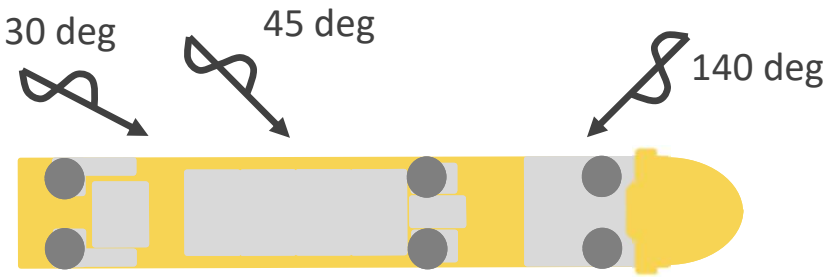
- No wind
- Constant force
- Steady wind
- Unsteady wind

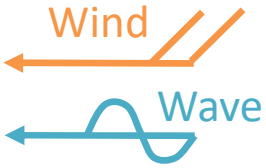
- Hs=11.9 / 12.6 / 13.2 m
- Tp=19.6 / 18.7 / 17.8 s
- Vs=0 kn

- TWS=24.5 kn; Top operating condition
- TWS=35 kn; Gust factor 1.42

Test results

General seakeeping behaviour





- No wind
- Steady wind
- Unsteady wind

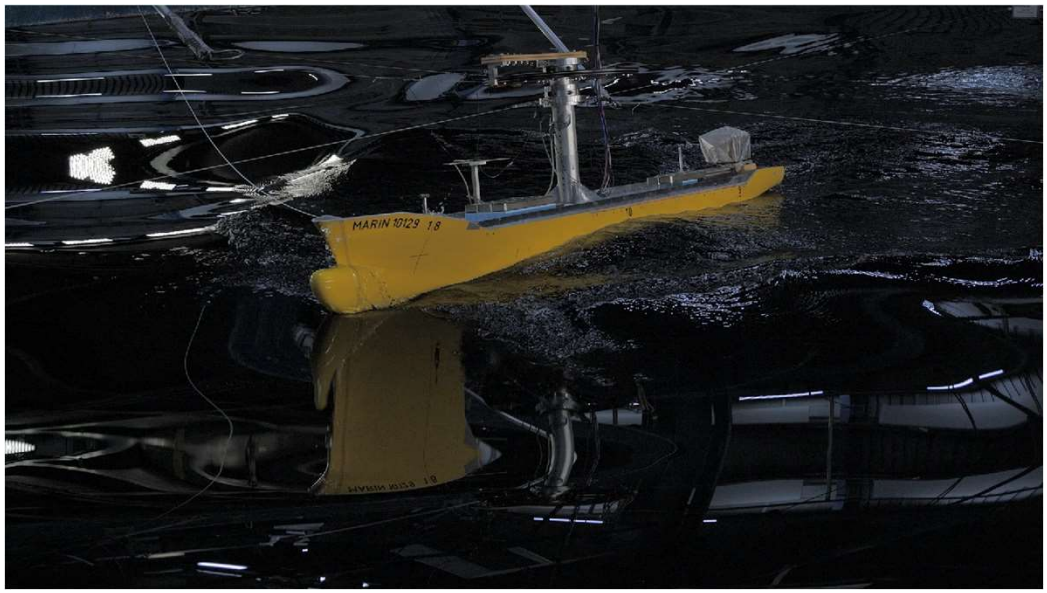
- Regular waves H=5 m; T=10 s
- Vs=12 kn

- TWS=24.5 kn; Top operating condition
- TWS=35 kn; Gust factor 1.42

Most demanding condition

Heading = 140 deg

TWS=24.5 kn – Steady wind

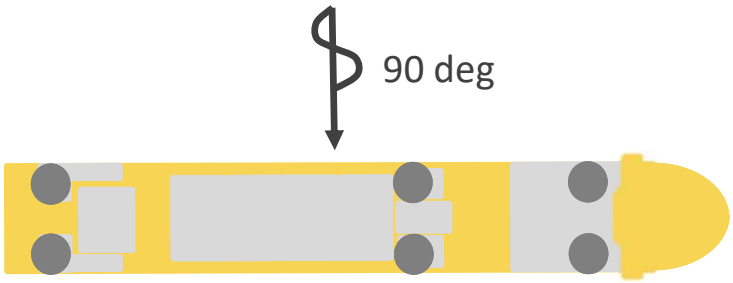


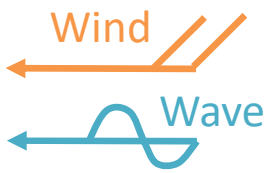
Test results

		Roll [deg]	**Mean**		**StdDev**		**Max**	
		TWS [kn]	24.5	35	24.5	35	24.5	35
Heading [deg]	Wind type	TWA [deg]						
140	no	140	6.4	6.4	0.8	0.8	8.6	8.6
	spectrum		7.1	6.3	1.1	0.8	11.8	8.9
	steady		**10.1**	**7.7**	**0.8**	**0.7**	**12.6**	**10.0**
45	no	45	0.5	0.5	1.4	1.4	3.1	3.1
	spectrum		2.2	2.7	1.7	1.5	5.6	6.0
	steady		2.2	3.3	1.5	1.7	5.3	6.6
30	no	30	0.4	0.4	2.6	2.6	4.8	4.8
	spectrum		0.2	0.4	2.6	2.3	4.7	4.3
	steady		0.4	0.7	2.6	2.3	5.0	4.6

Test results

Weather criterion tests





- No wind
- Constant force
- Steady wind
- Unsteady wind

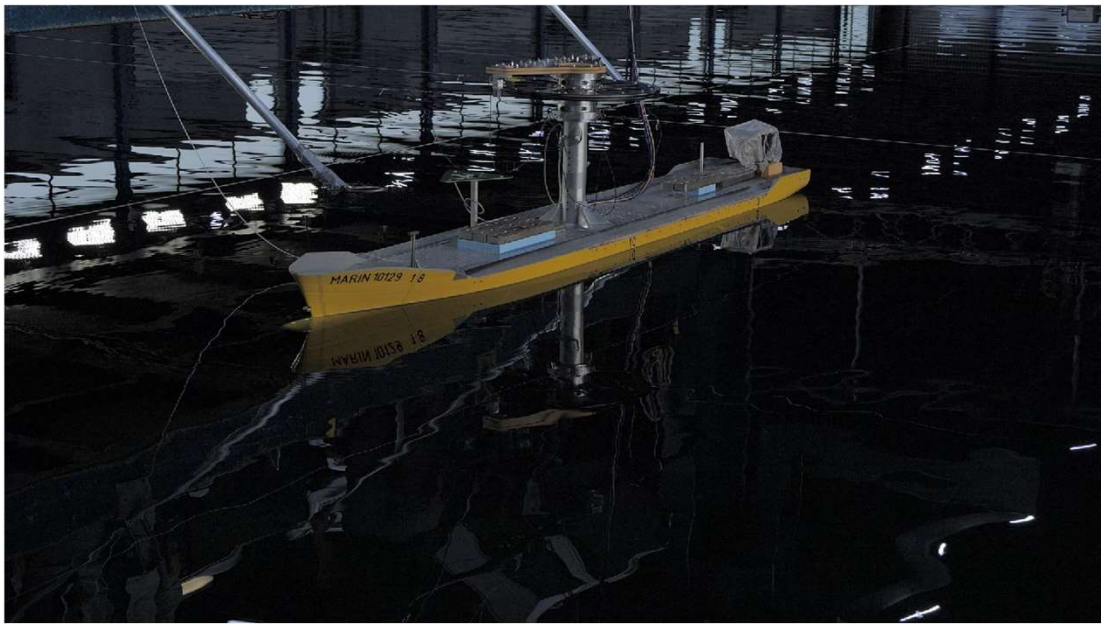
- Hs=11.9 / 12.6 / 13.2 m
- Tp=19.6 / 18.7 / 17.8 s
- Vs=0 kn

- TWS=50.5 kn

Most demanding condition

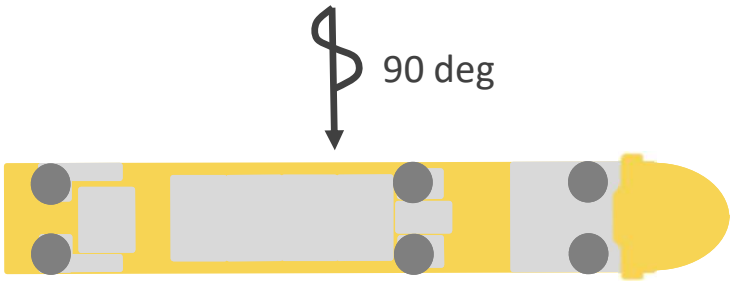
Hs=13.2 m; Tp=17.8 s

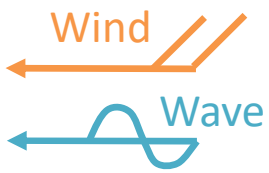
Constant force



Test results

Weather criterion tests





- No wind
- Constant force
- Steady wind
- Unsteady wind

- Hs=11.9 / 12.6 / 13.2 m
- Tp=19.6 / 18.7 / 17.8 s
- Vs=0 kn

- TWS=50.5 kn

Hs / Tp	Wind type	Roll [deg]	Mean	StdDev	Max
[m] / [s]		TWA [deg]			
11.9 / 19.8	spectrum	270	4.7	3.5	20.6
12.9 / 18.7	no		-2.3	4.3	11.9
	constant force		5.1	4.4	20.8
	steady		4.8	2.9	16.0
	spectrum		4.6	3.3	18.7
13.2 / 17.8	no		-2.7	4.2	10.8
	constant force		**5.2**	**4.7**	**22.2**
	steady		5.1	3.0	15.8
	spectrum		5.0	3.3	18.4

Main conclusions

Test results (preliminary conclusions)

- Wind causes higher heel angles and induces roll damping from sails

➔ lower roll standard deviation

- Spectrum wind led to lower maxima than traditional steady force approach

➔ Current regulation conservative

- Dynamic effects of unfavorable wave encounter and wind gust cause unsafe roll angles.
- Extreme cases (off design) need to be considered in safety assessment

➔ Simulations necessary to realize such rare, but dangerous events

➔ Potentially needs to be addressed in future regulation on dynamic stability

Better Ships, Blue Oceans