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How to handle the sea ice ?

Operational challenges and solutions for floating and fixed offshore windfarms in areas with sea ice or risk of sea ice.

- Can effectively ice management handle the sea ice and make floating windfarm structures possible in areas with risk of sea ice?

- And can bottom fixed windfarms be effectively serviced year around even in harsh ice conditions?

Experience from different projects, handling large moored structures in drifting sea ice and how an effective ice management can be used in marine operations.

Erik Almkvist,
Head of ice operations
Viking Supply Ships

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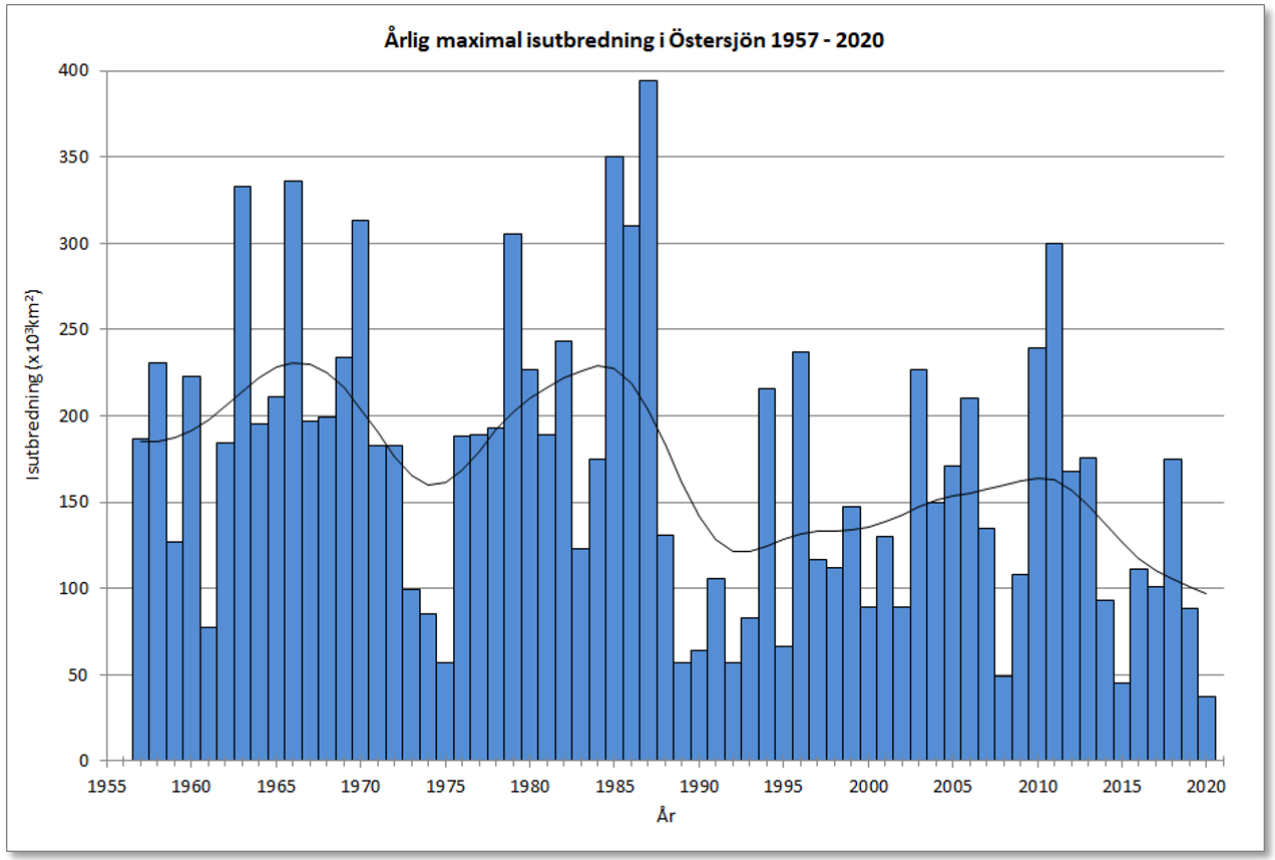
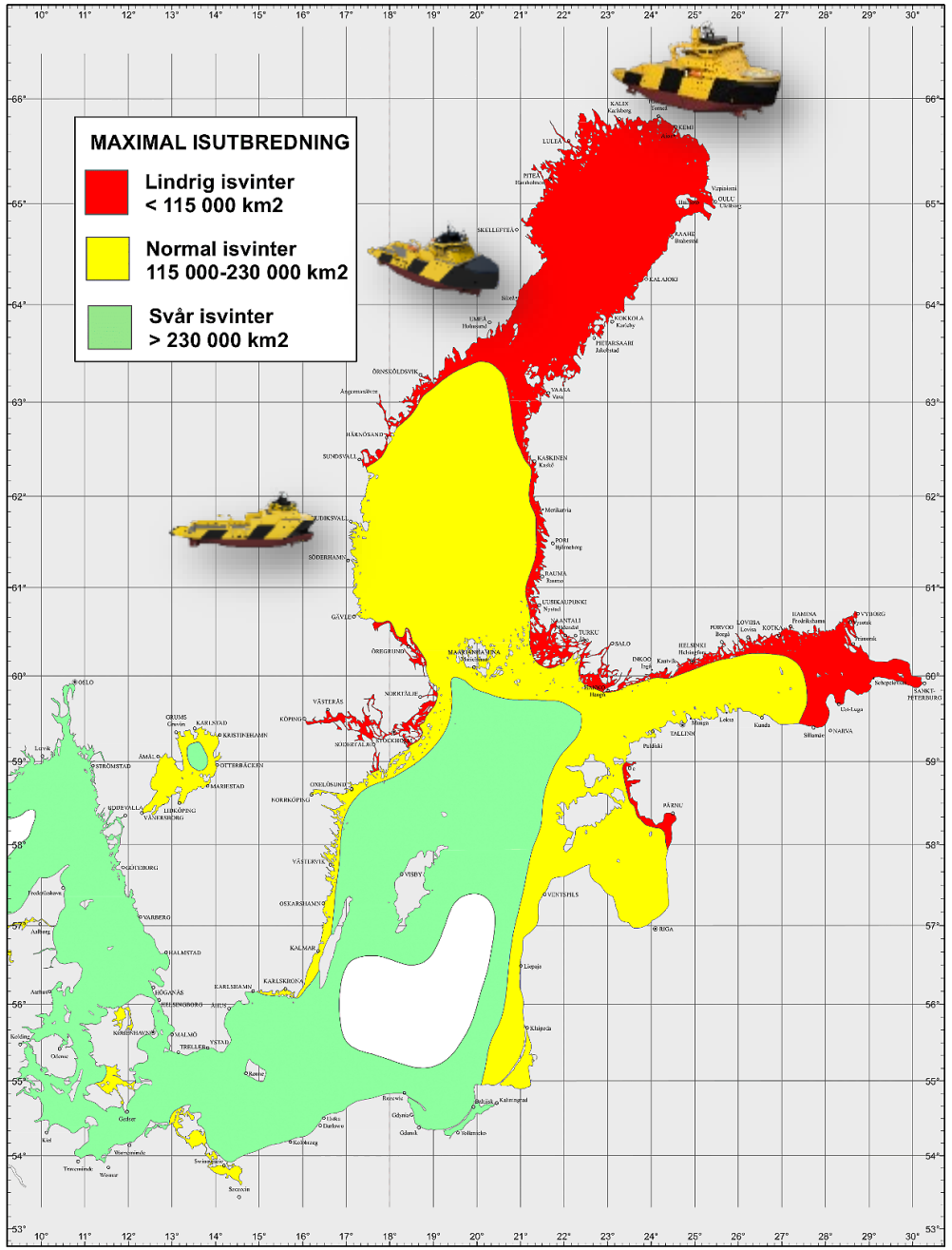
Challenging areas during winter



https://vbk.lanssyrelsen.se/

SMHI

MAXIMAL ISUTBREDNING
OLIKA SVÅRIGHETSGRAD



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Ice chart

2023-03-22

Escort Icebreaking needed

But existing icebreaker fleets are not designed/or intended to operated to support offshore wind operations

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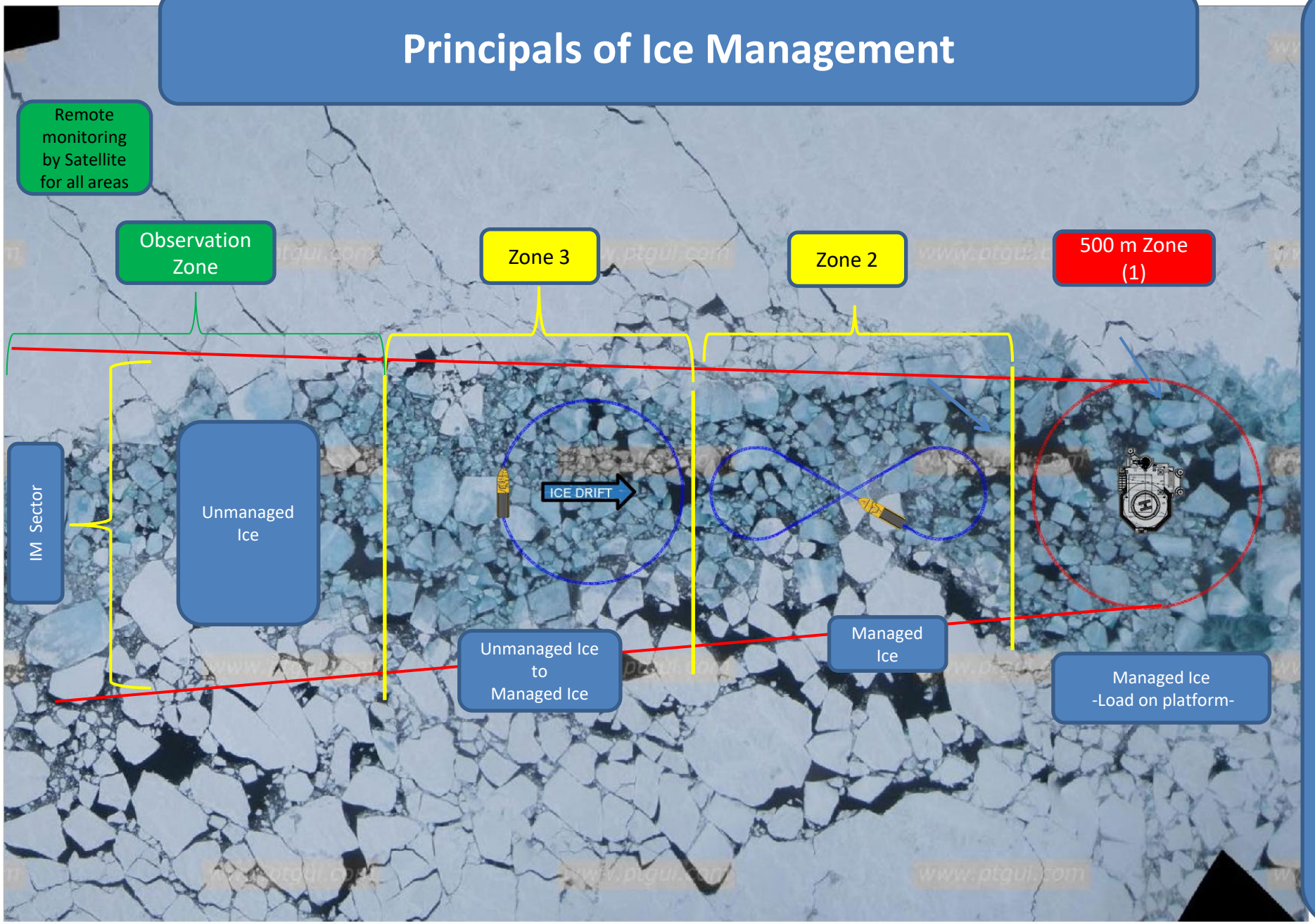
Principals of Ice Management



Zone Definitions

Observation Zone: Area outside zone 1-3. The area is monitored by satellite imagery and possible scouting vessel. No active ice management.

Zone 3: Monitored by ice breaker 1, ice to be managed depending on ice conditions

Zone 2: Managed ice drifting towards platform, monitored by ice breaker 1 and 2, ice to be managed depending on ice conditions

500m Zone(1) : Ice that impact and introduce load on platform. Ice monitored from ice breaker 1 and platform monitoring system Ice Management

Sector: Depending on drift direction and drift forecast confidence

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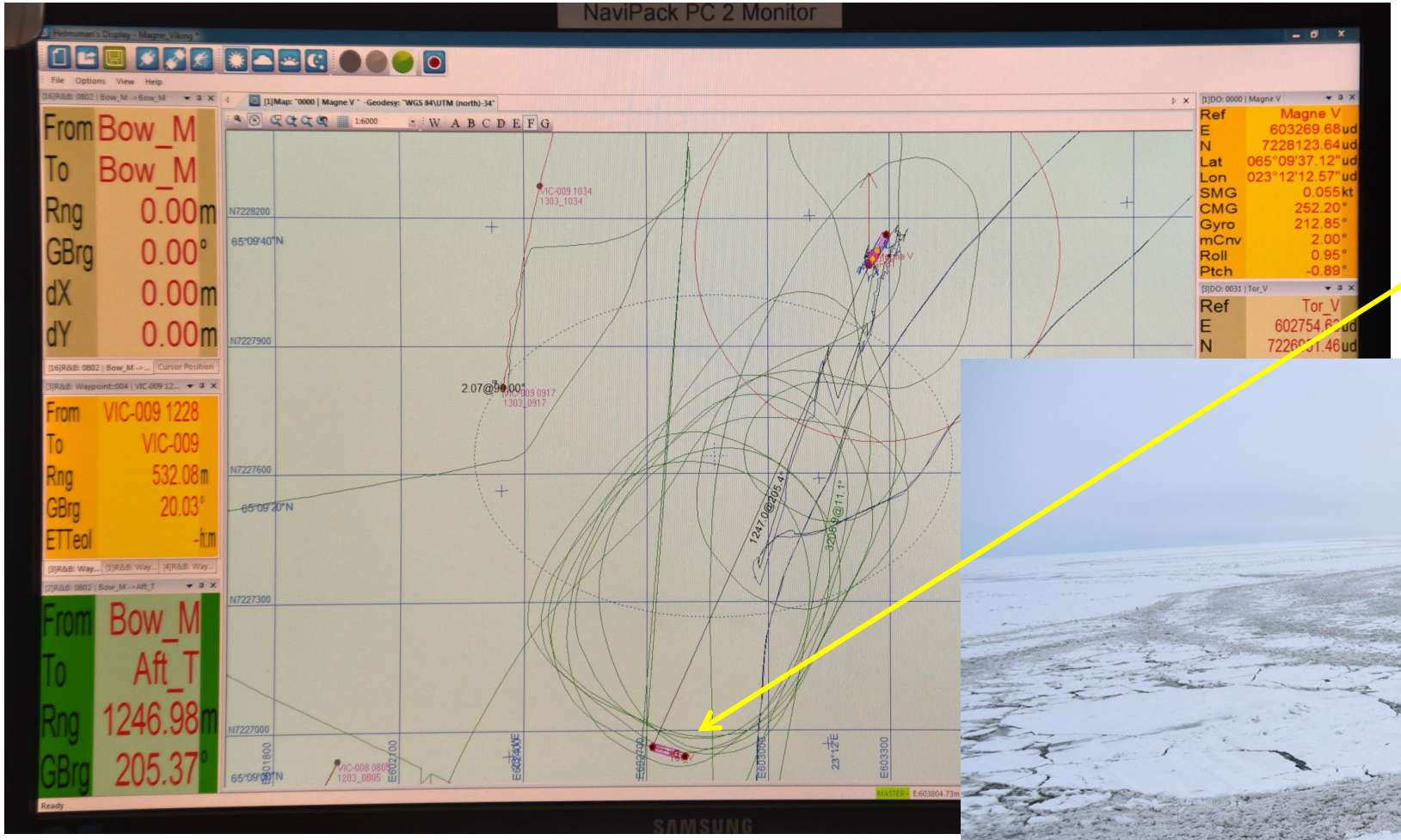

Icebreaker

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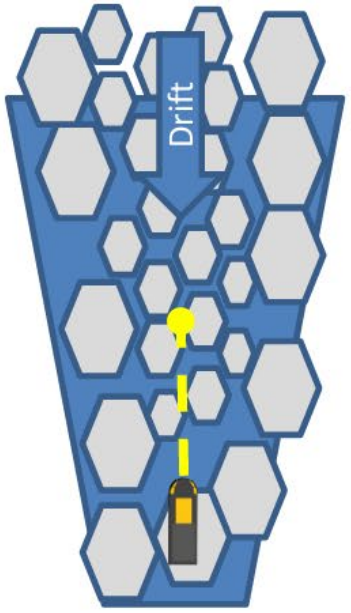
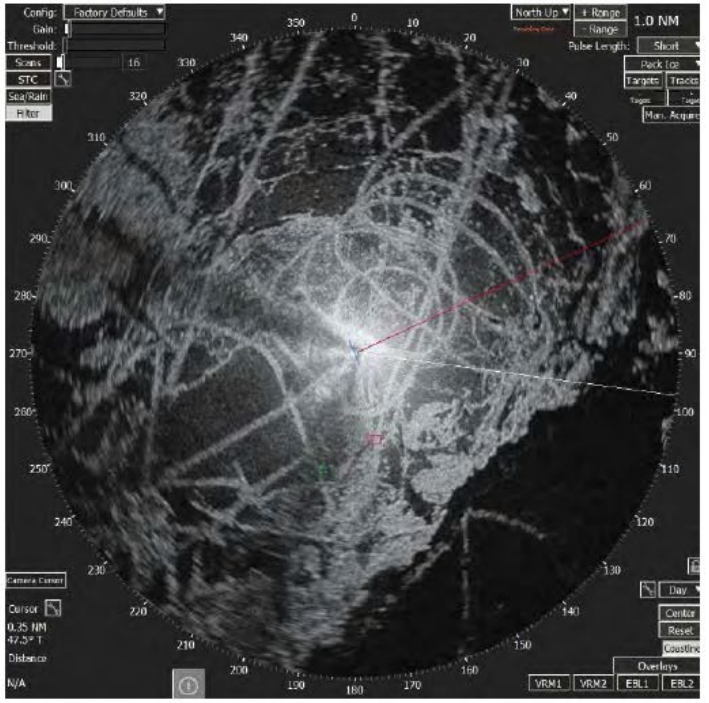
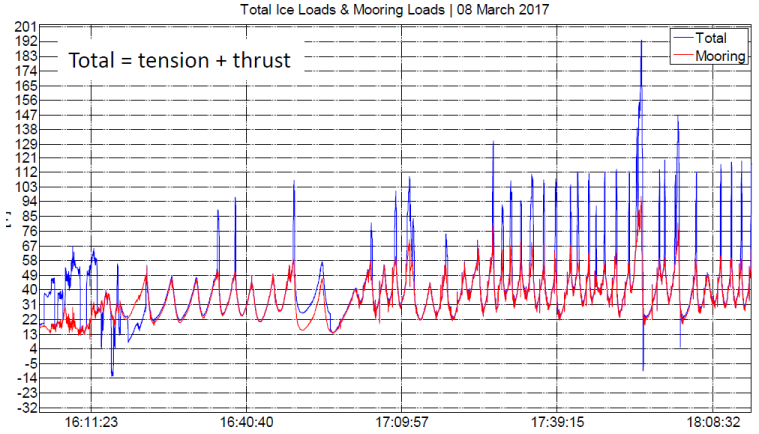
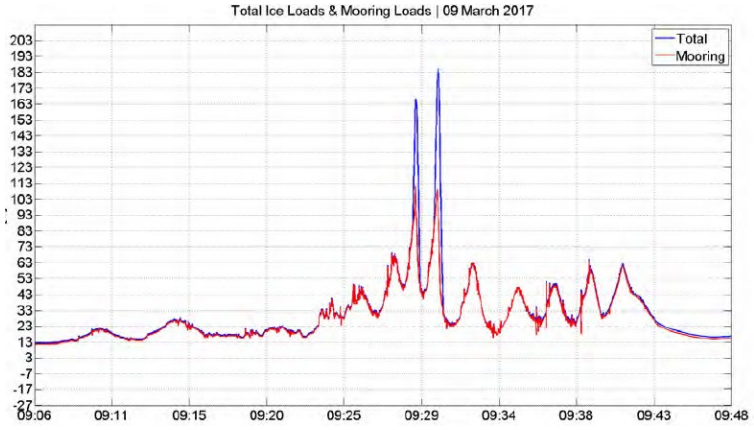
Anchored vessel in drifting ice





Station Keeping Trial (SKT)
Full scale test; Objective to gather full-scale data on a stationary floating structure in ice.





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Several papers of the project and its results are available:
https://www.researchgate.net/publication/327873063_Station-Keeping_Trials_in_Ice_Project_Overview

Marine operations
in ice infested waters is possible with the correct assets, design and operational experience

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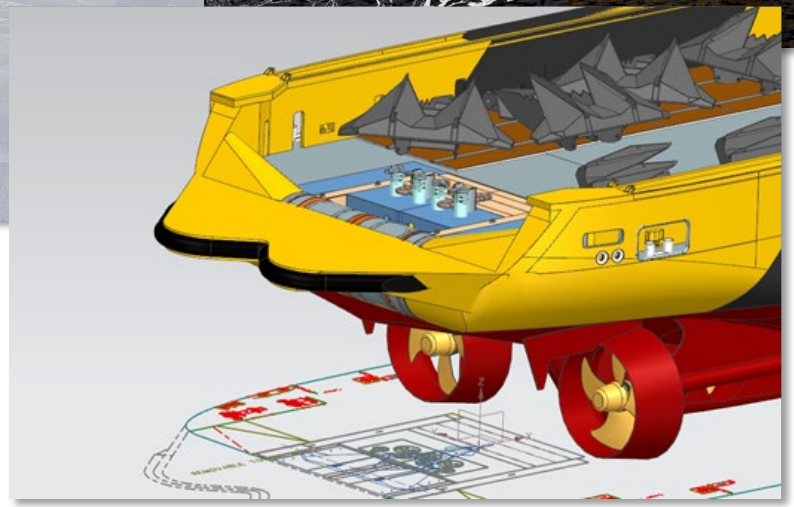
New challenges – New solutions

Floating Wind
Installation Vessel & Icebreaker



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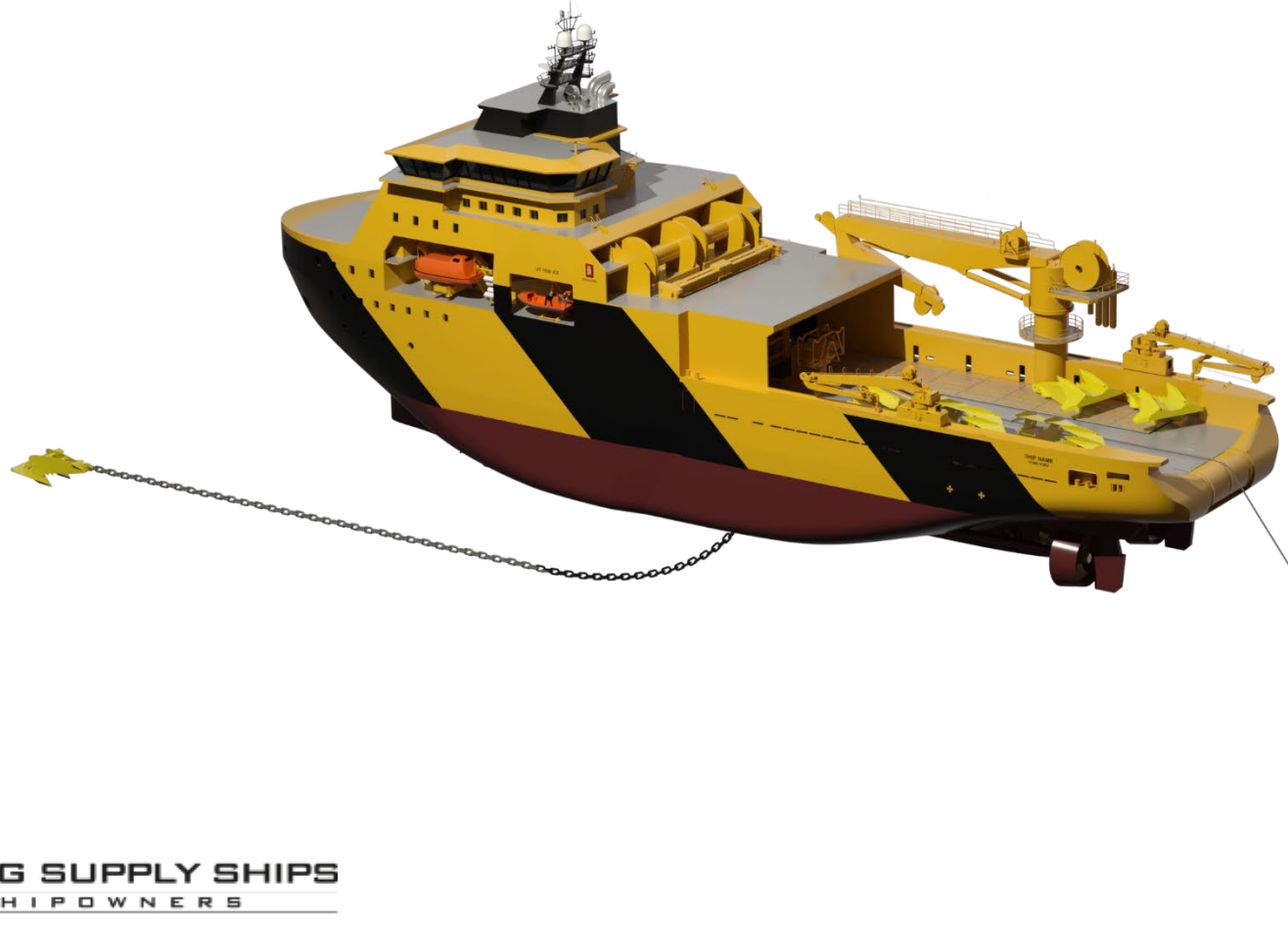
UT 7826 CD Floating Wind Installation Vessel

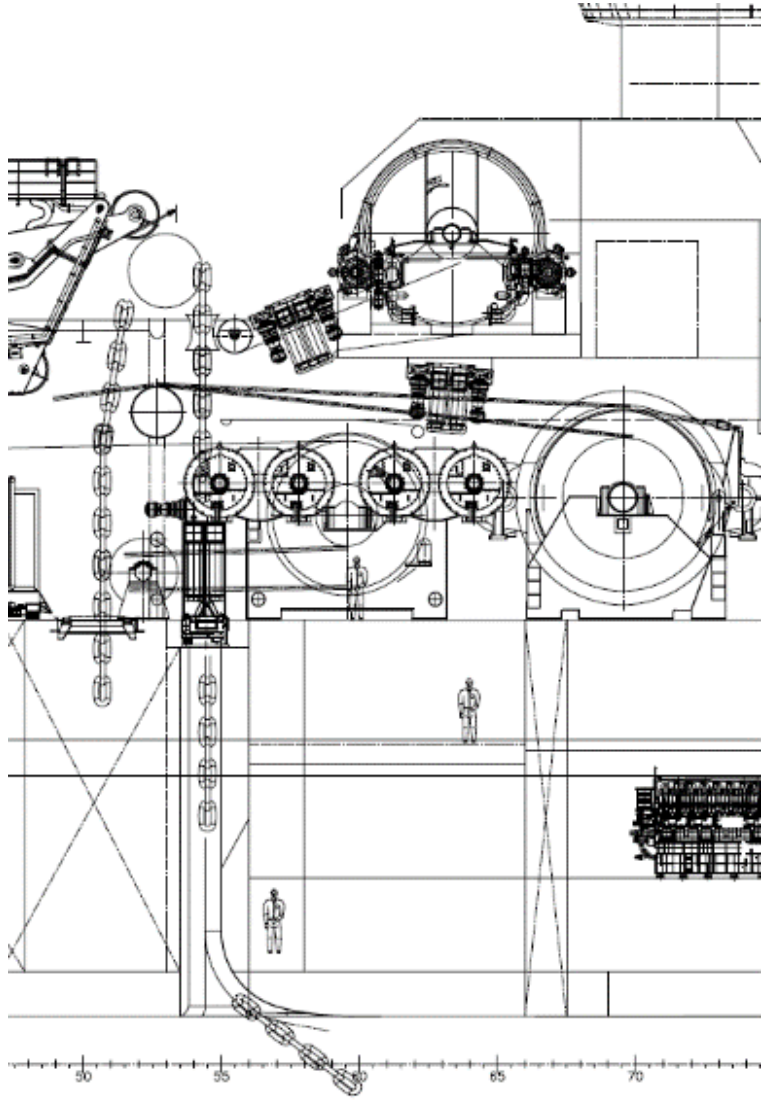
Equipment / Capasity	Description
Design	Kongsberg UT 7826 ICE
Client single cabins	60. Total accommodation 100
Healing/Anti Healing	Active roll-dampening. Hoppe U tank system
Particulars	L: 106 m B: 26/25 m Draught: 7,5 m
Deck	1000m2 + 200m2 (Hangar Roof)

Equipment	Description
Propulsion	2 x 10 MW (PTI 2 x 5 MW)
Fuel/Hybrid	eMethanol / Battery 3,2 MW
Bollard Pull	Min 300 Te
Winch System	Brattvåg 500 Te 3 Drum, 2 Secondary, Rope storage
Chain Capacity	1770 m3
Helideck (Can be Mobilized)	18 m 8,6 T (AW 189)
AHC Crane	250 Te
WROV	LARS in Hangar Overside

UT 7826 CD
Floating Wind Installation Vessel & Icebreaker

- Up to 1000 T Cross tensioning system in 2 fall
- Centre chain chute system with chain stopper
- WROV used for Connection to Chain forerunner.





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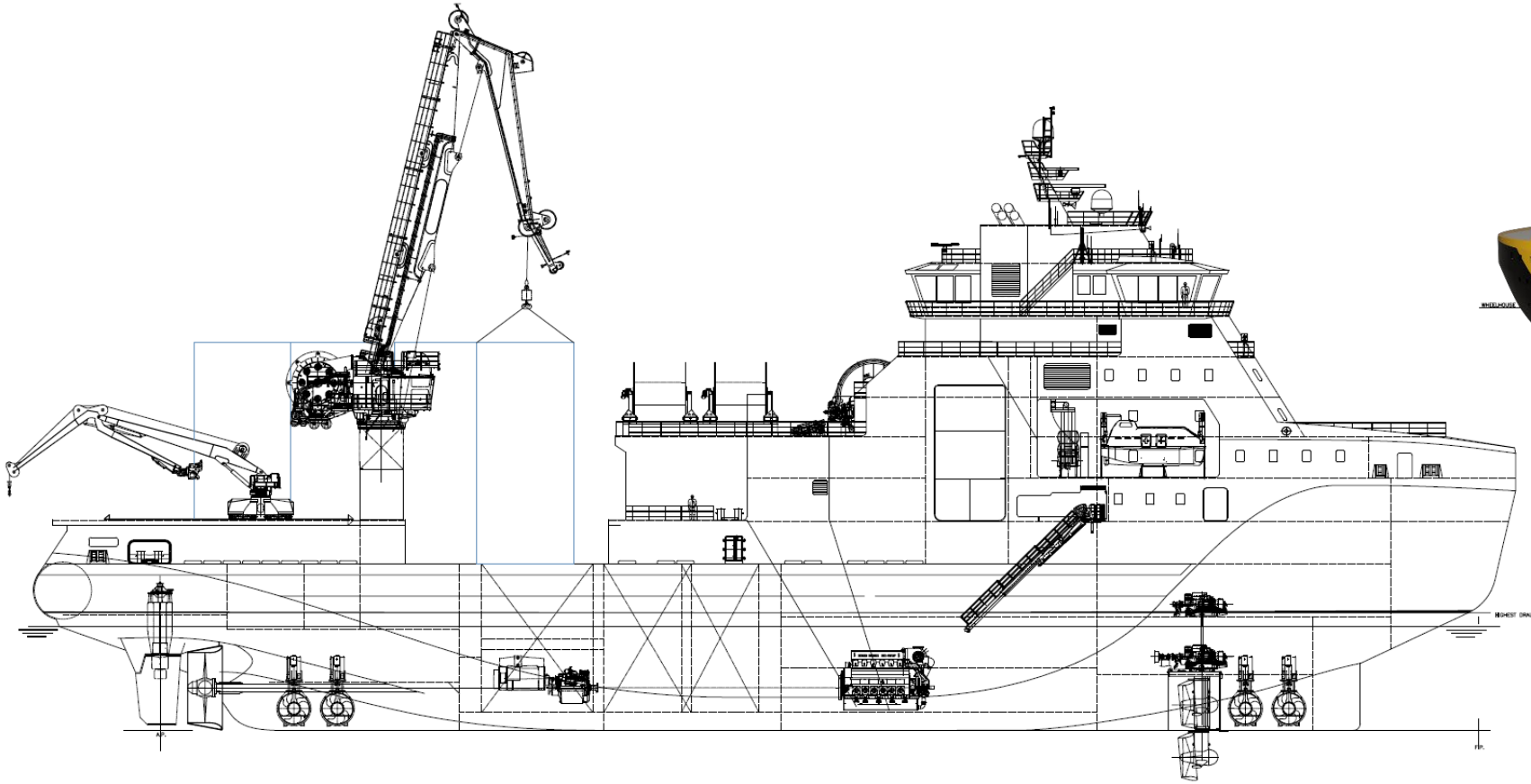

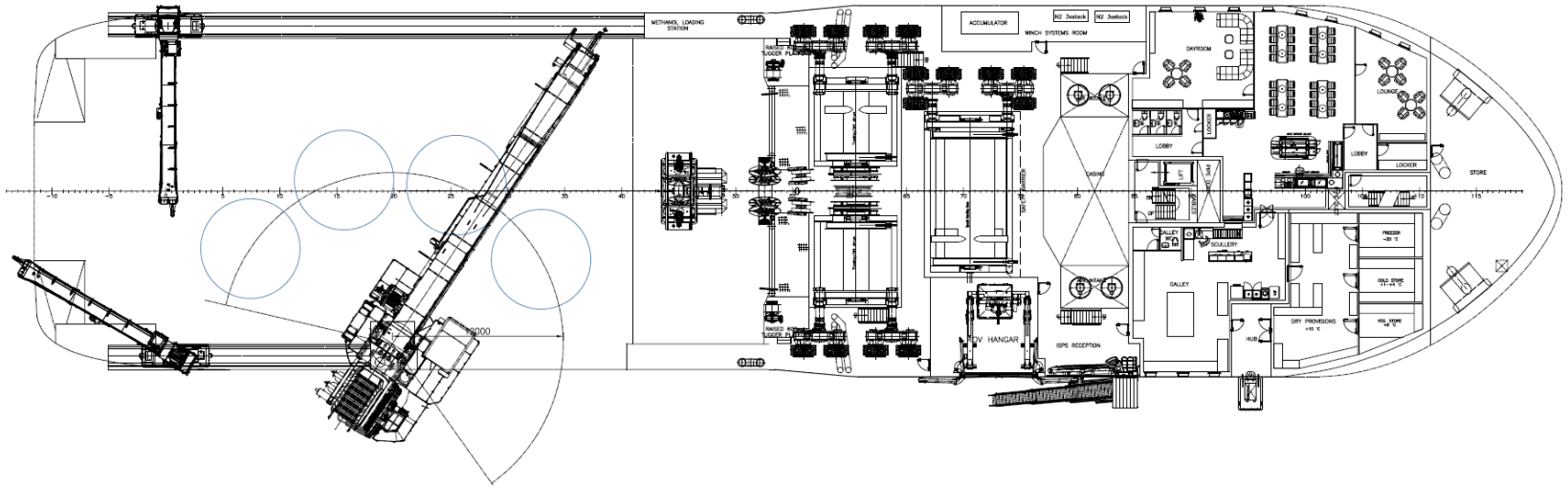

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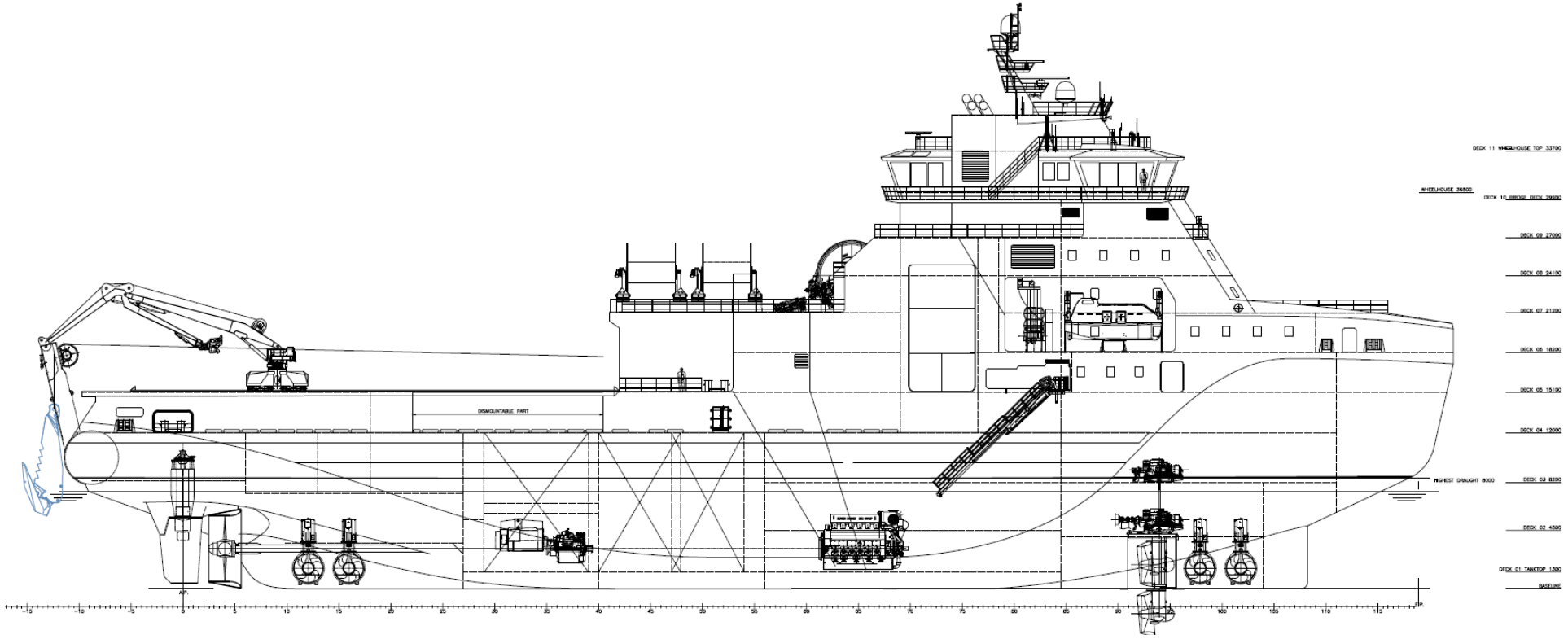

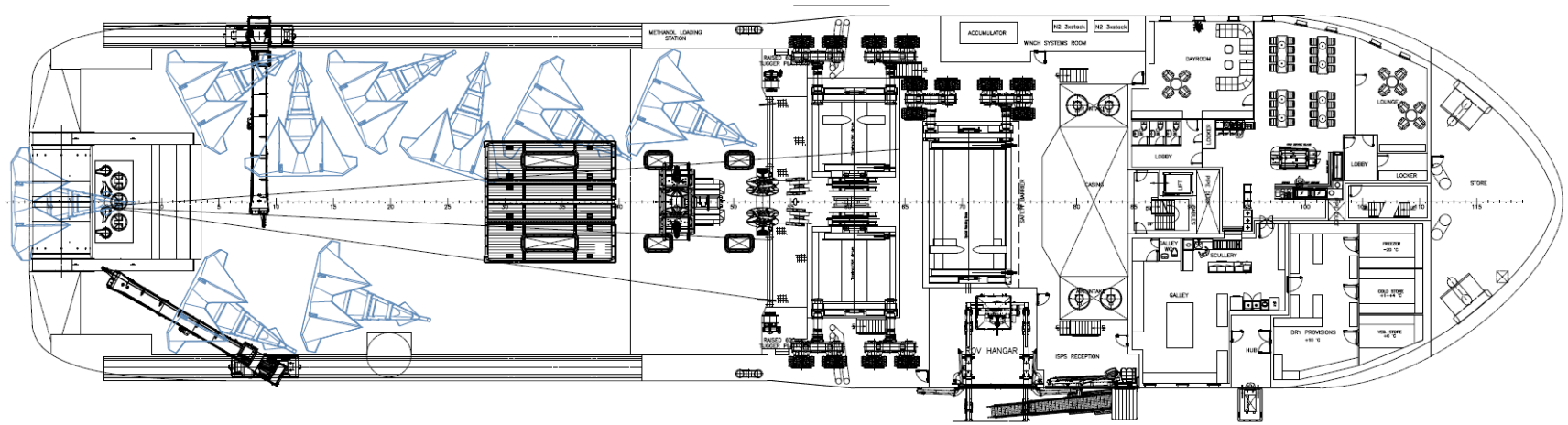

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CSOV for year-round operation in Bay of Bothnia

Equipment/Capasity	Description
Design	Kongsberg UT 5525 ICE
Client single cabins	68. Total accommodation 120
Comfort Support Systems	Active rolldampening. Hoppe U tank system, Fin Stabilizing
Particulars	L: 101 m B: 25 m Draught: 6,5 m
Propulsion	4 x 4,5 Mw
Fuel/Hybrid	eMethanol/Battery 3,2 MW
Gangway system	MCG 30 m at 16-26m Operability Hs 3,0 m @25 m
Logistic system	Large warehouses and elevator for trolleys
Daughter Craft	12-16 m
Helideck	18 m 8,6 T (AW 189)
3 D Crane	5T@25 m. 20 T Harbour mode

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