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AUTONOMY

# A Global Game Changer

2018-09-27



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# Key Points



1. What is  
Autonomy?



2. Enablers &  
Development

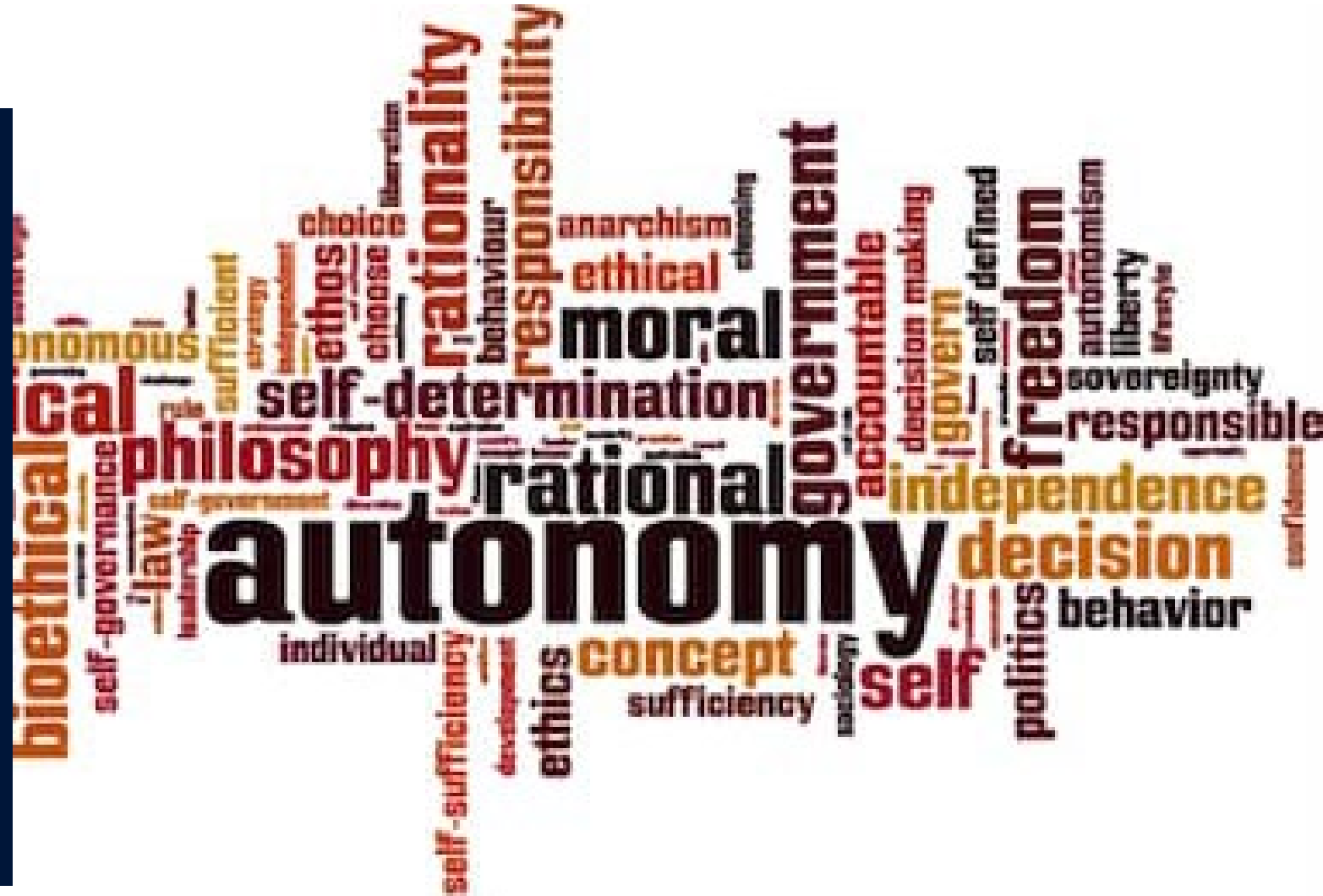
3. Who is  
tomorrow's  
Captain?





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# What is Autonomy?



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***"The extent to which a system can carry out its own processes and operations without external control."***

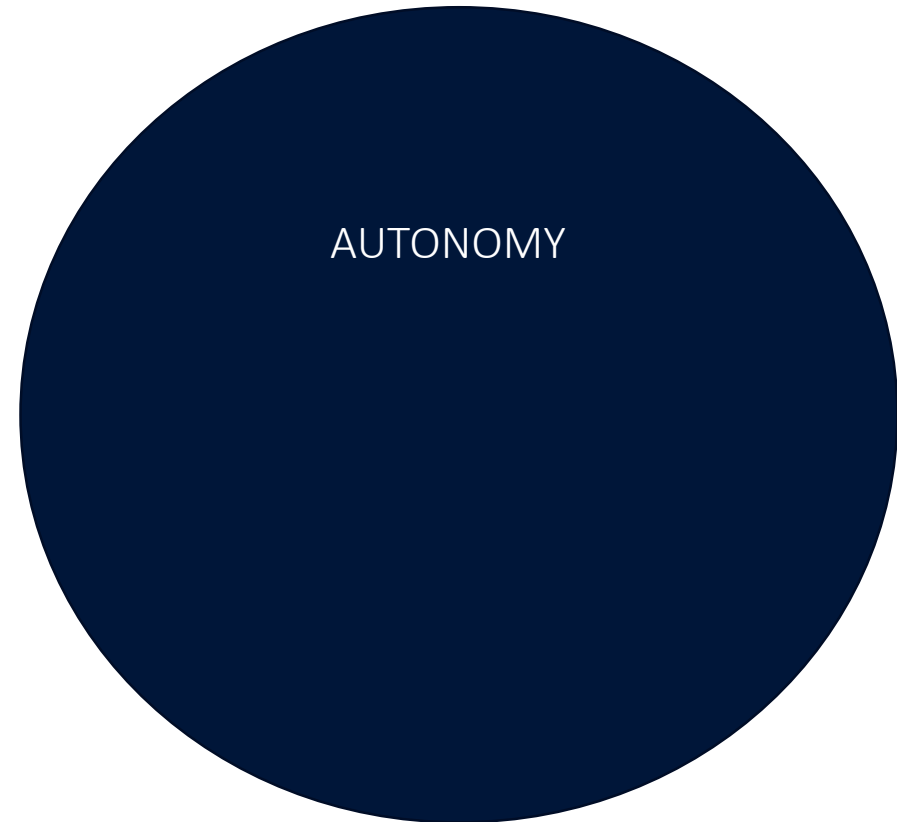
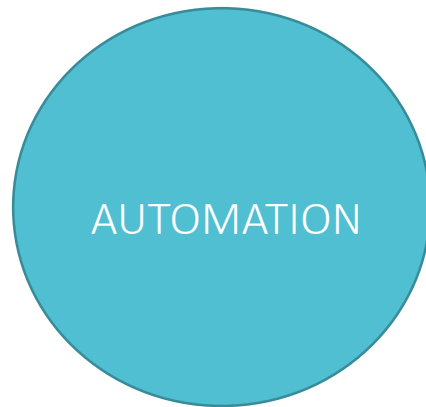
**Not a question of «all or nothing»**





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# Automation Vs. Autonomy





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# Levels of Autonomy

*Example of taxonomies*

1. *Automatic operation (Remote control)*
2. *Management by consent*
3. *Semi-autonomous operation or management by exception*
4. *Highly autonomous operation*

Source: NTNUs Centre for Autonomous Marine Operations and Systems

Operational autonomy levels	Manning levels		
	Manned bridge	Unmanned bridge – crew on board	Unmanned bridge – no crew on board
Decision support	Direct control No autonomy	Remote control	Remote control
Automatic	Automatic bridge	Automatic ship	Automatic ship
Constrained autonomous	-	Constrained autonomous	Constrained autonomous
Fully autonomous	-	-	Fully autonomous

Source: Norwegian Forum for Autonomous Ships



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# Automatic bridge – Operator assistance

System designed to support navigators and automate arrival and departure

Auto-docking and adaptive transit



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# Fully autonomous

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Sea-bed exploration (USV with AUV)







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# Yara Birkeland

## Enablers & Development

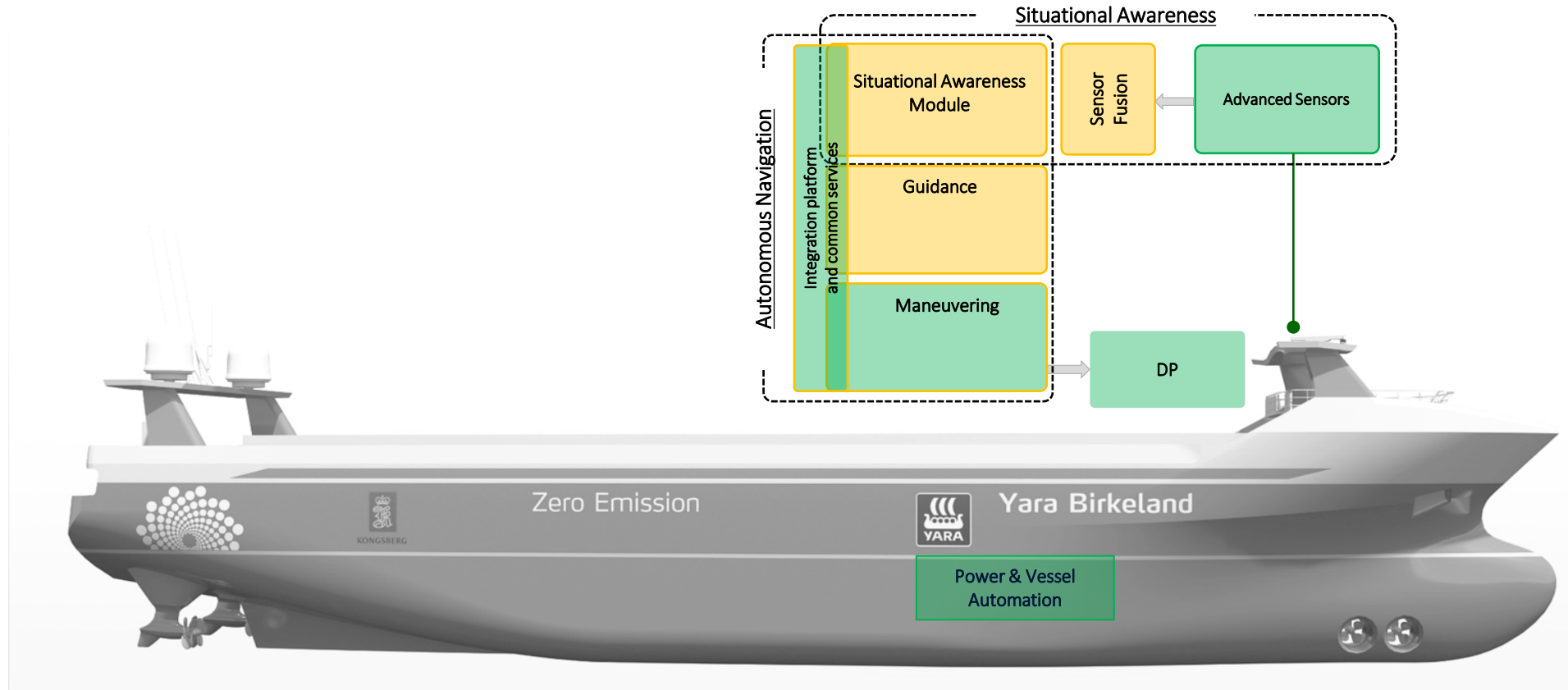


The autonomous ship YARA Birkeland as designed by Marin Teknikk.



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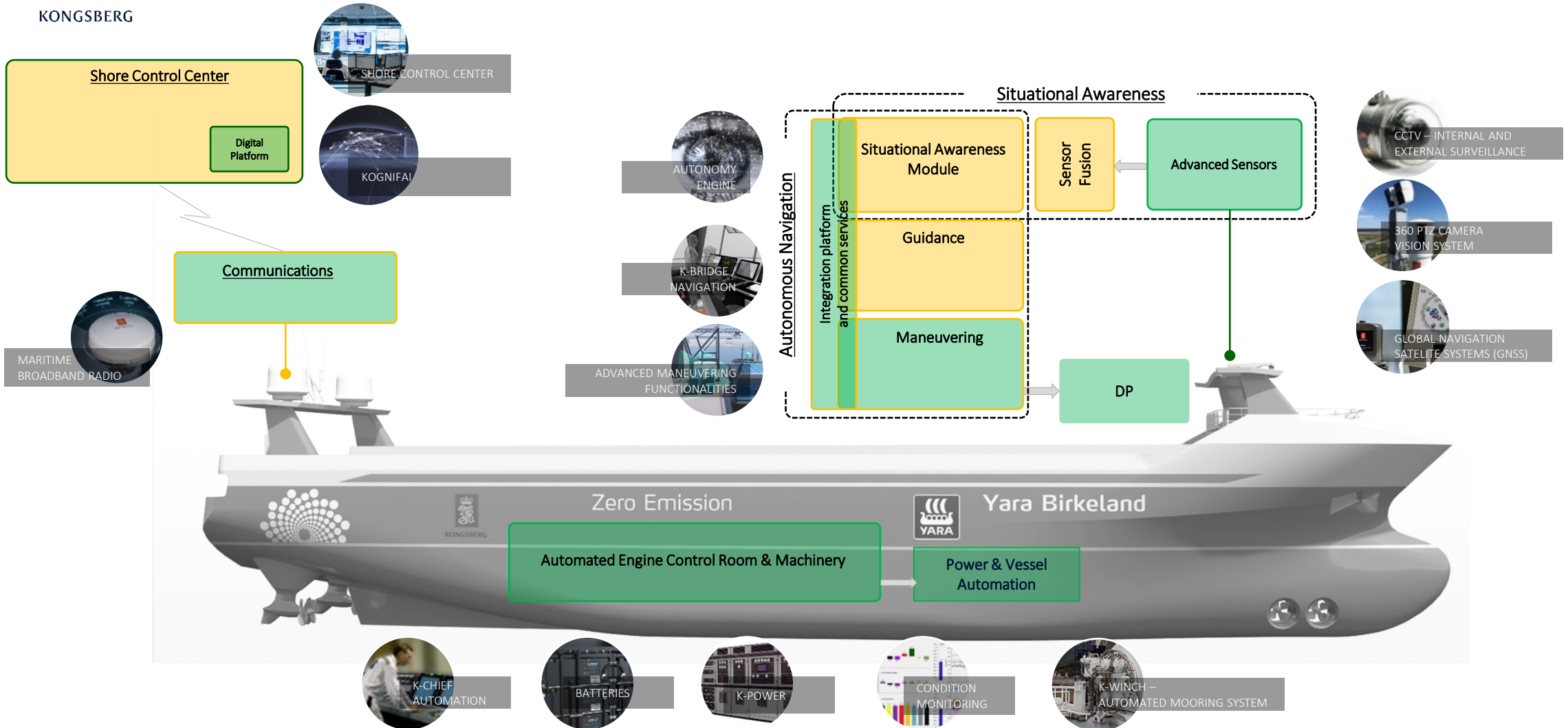
# Development areas & products





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# Development areas & products





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*Today the **Remote Support**  
supports the human operator  
onboard the ship in some  
**exceptions** from normal operations*

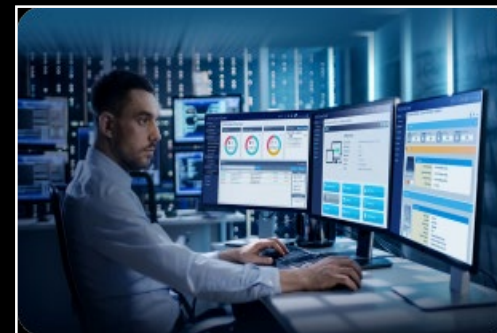
*The **Shore Control Center**  
extend this scope by providing  
**Applications for:***





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# Who is tomorrow's Captain?



Vessel A

Vessel B