

# MUNIN-Prosjektet: En konseptstudie for fullt ubemannede skip.

NFAS Oppstartskonferanse – 4. oktober 2016

Ørnulf Jan Rødseth – seniorforsker, MARINTEK  
OrnulfJan.Rodseth@marintek.sintef.no

**MARINTEK**

Norsk Marinteknisk Forskningsinstitutt

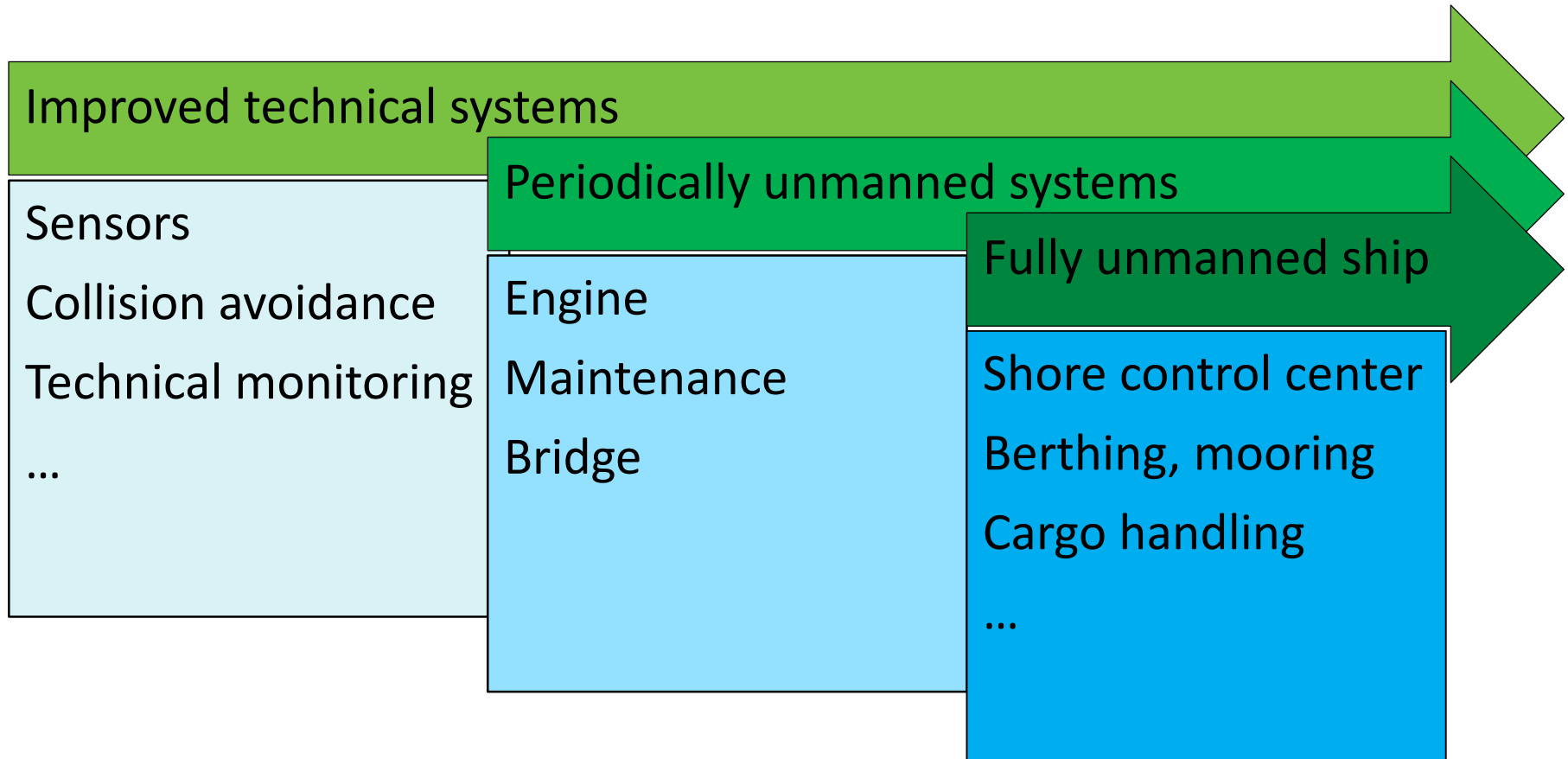
 **SINTEF**

# A concept study for a fully unmanned handymax dry bulk carrier on an intercontinental voyage.

- Duration: 01.09.2012 – 31.08.2015
- Funding: 2.9 million EUR of budget 3.8 million EUR
- Activity code: SST.2012.5.2-5: E-guided vessels - the 'autonomous' ship



# Different forms of autonomy



In this presentation we will mainly look at fully unmanned ships.

# Contents

- **Driving factors and risks**
- Critical design factors
- Some possible examples of unmanned ships
- Conclusions and summary

# Increasing automation in all areas



Google Car © Google.com

## Safety



NOAA Office of Response and Restoration

Own ship: No crew  
that can be harmed



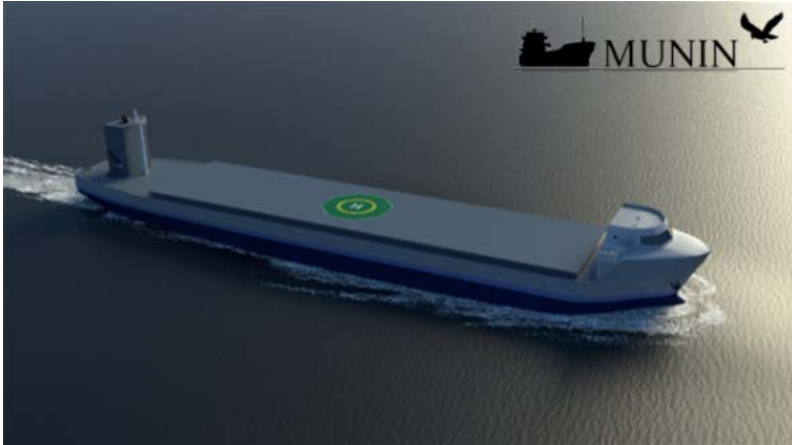
Exxon Valdez Oil Spill Trustee Council

## Other ships and environment:Less human errors

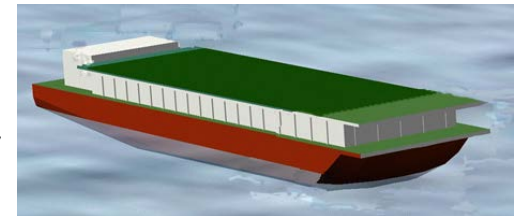


# Better maintenance reduces accidents

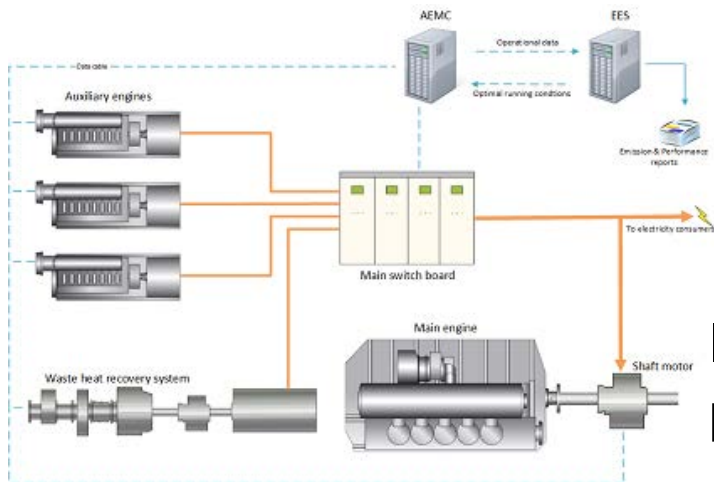
# Environment



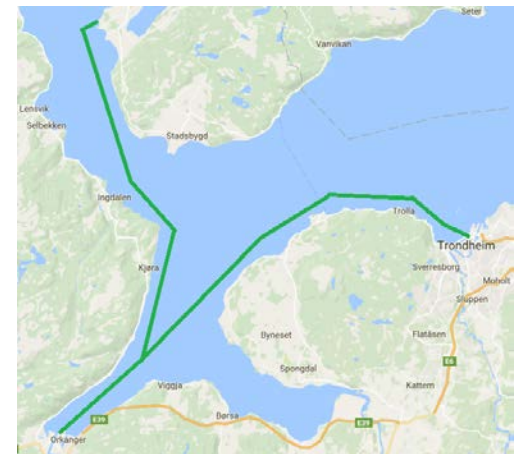
No hotel and no crew:  
Less energy, more  
optimal voyage



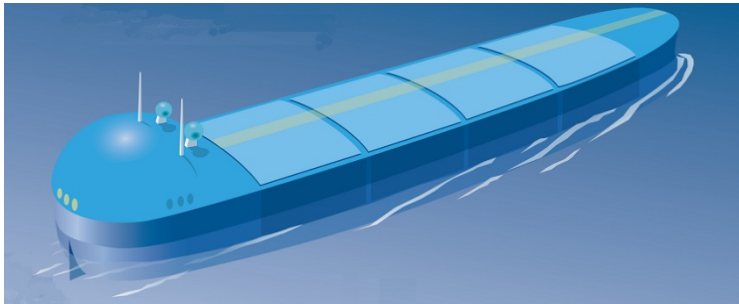
Completely new  
transport systems:  
Compete with road



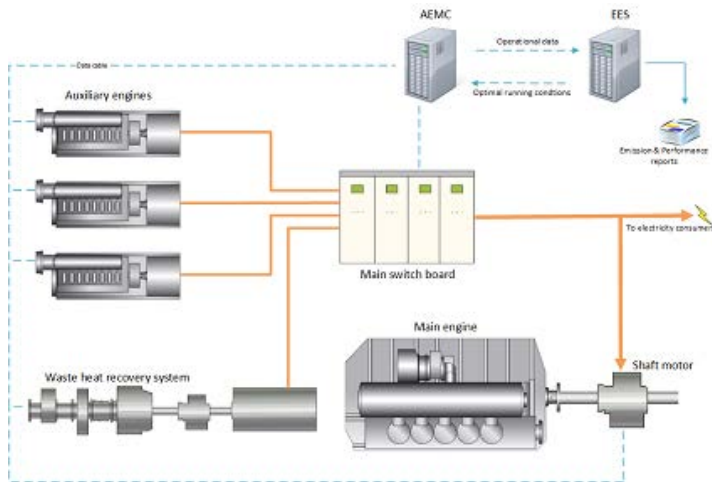
Improved automation:  
Better technical  
efficiency



## Reduced costs?



No accommodation  
Less power  
More cargo



No crew  
No crew related costs



Improved technical systems  
Less off-hire  
Better efficiency

# Societal

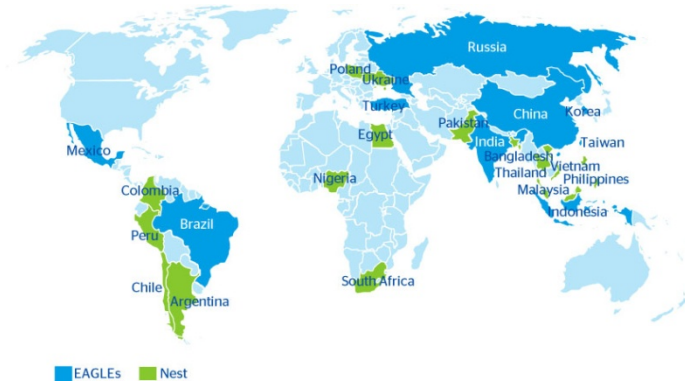


European maritime competitiveness  
European employer attractiveness  
Improved transport systems

Less dangerous work  
Periodically unmanned bridge  
Shorter stays away from home  
More interesting work

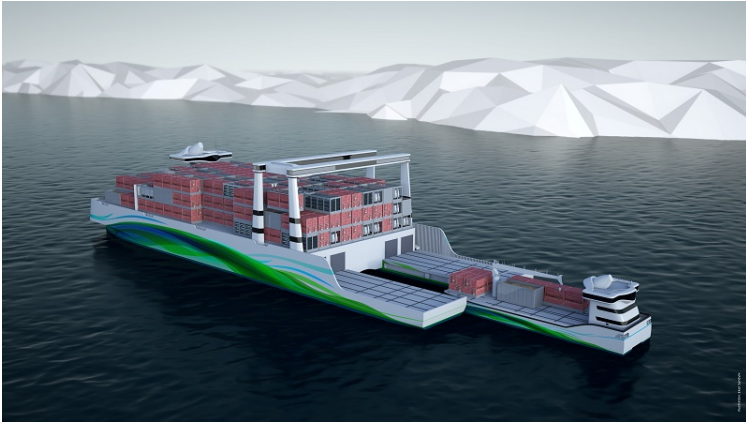


[strangecosmos.com](http://strangecosmos.com)



The world's need for  
low cost transport

# New business models



NCE Maritime Clean Tech & NCL

Mother ship and unmanned drones

Low operational cost short sea / last  
mile shipping



[godsfergen.no](http://godsfergen.no)

**Risks?**

# Cost-benefit

- No hotel
- No crew
- Improved efficiency
- Less off-hire
- New business model



- Dual propulsion, no HFO
- Shore Control Centre
- Longer dockings
- Costlier instruments
- Existing business model

# Legal and liability issues



- UNCLOS
- SOLAS

- Contracts
- Insurance



- Liability



[wikimedia.org/paolodefalco75](https://commons.wikimedia.org/wiki/File:Costa_Concordia_2012.jpg)

# Hostile (cyber) attacks

- Terrorist hijack e.g. by GPS spoofing



University of Texas at Austin

- Pirate attack



IMO



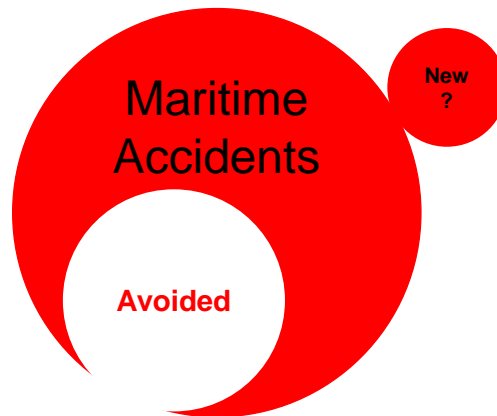
Wikimedia.org/Caricato da Makki98

- Governmental backdoor

# "Autonomy assisted accidents"



First radar assisted collision: Andrea Doria and Stockholm off Nantucket in 1956

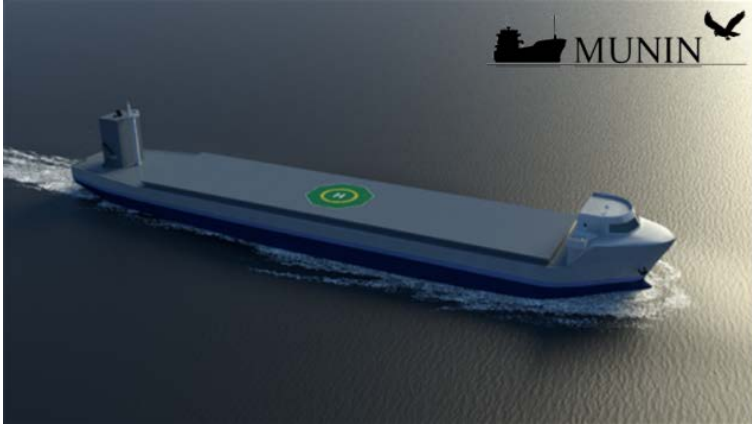


New accidents create problems for social acceptance!

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# Critical Design Factor 1 - 4



**No crew or  
accommodation**



**Trade-off between technical  
and operational complexity**



**Shore support infrastructure**

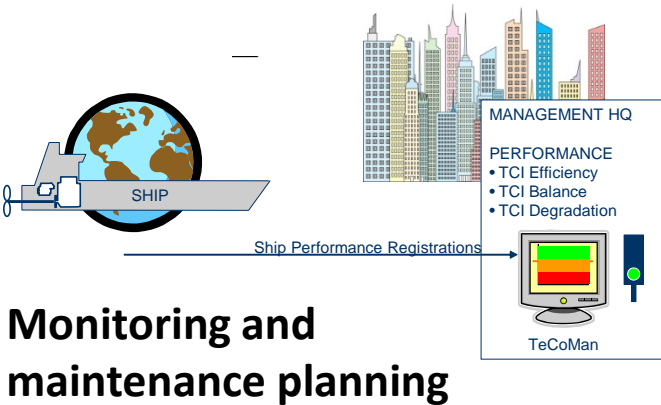


**No onboard cargo intervention**



# Critical Design Factor 5-8

Highly reliable technical systems



Sufficient redundancy



Rapid repair

# Contents

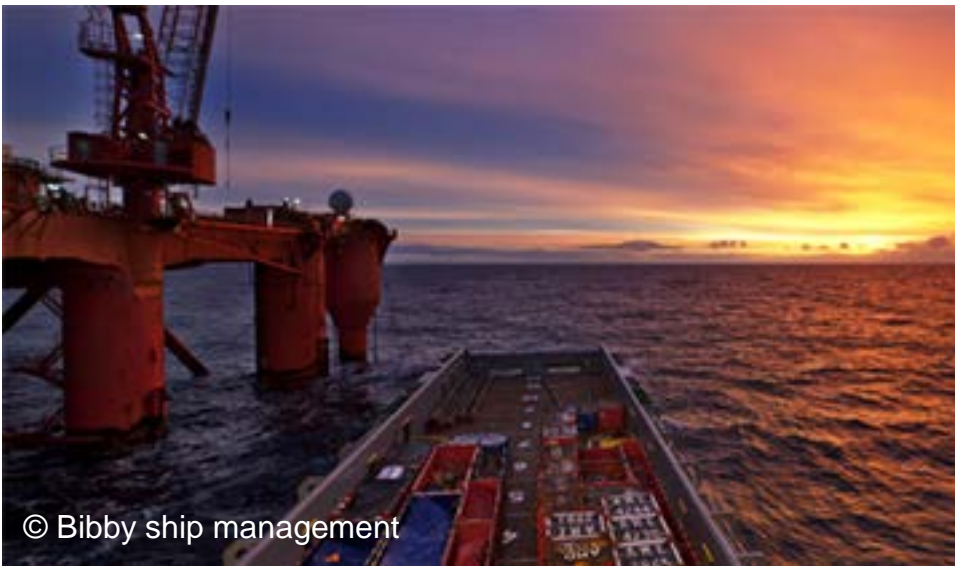
- Driving factors and risks
- Critical design factors
- **Some possible examples of unmanned ships**
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# Deep sea

- 10 000 TEU container vessel
- Shanghai – Los Angeles
  - Two states involved
  - 6000 nm, open sea
  - No channels
  - Short port approach
  - Remote control to port
- Dual propulsion systems
- Two stroke diesels
- Biofuel, methanol ...



# Offshore supply



- Offshore supply vessel
- North Sea, Mexican Gulf
  - One state involved
  - 3-6 day roundtrip
  - Base near open sea
  - Infrastructure at base/rig
  - Remote controlled at base/rig
- Dual propulsion systems
- Diesel-electric
- LNG, biofuel, methanol ...

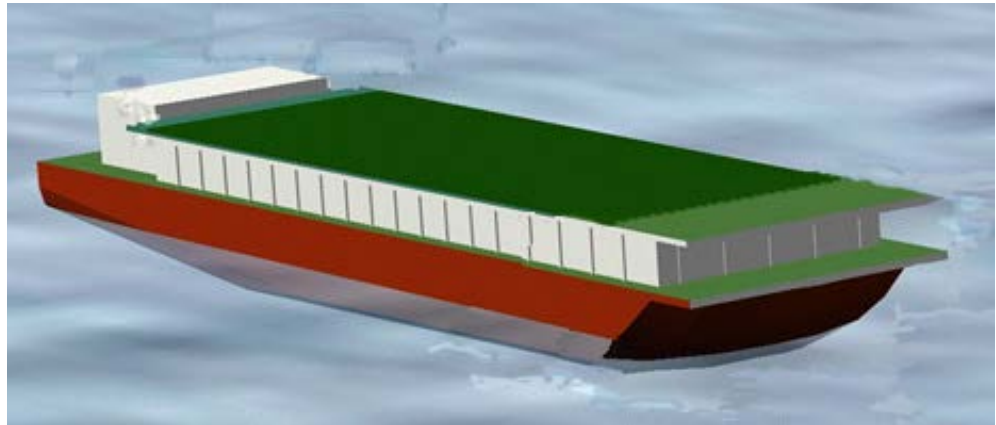
# Short sea automated transport

- Transport between small ports
- National/Regional
- 24/7 port calls
- Legs 4-12 hours
- Fully automated cargo handling
- Automated berthing
- Hybrid, LNG, biofuel, methanol ...



# Inland waterways

- Short voyages
- 12-50 TEU
- Inland, fjords/sheltered
- Low cost: Wait in port
- Legs 4-12 hours
- Port cranes
- Automated berthing
- Batteries



# Contents

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# Conclusions and summary

- Largest unmanned ship study in Europe is completed.
- Overall conclusion is that the unmanned ship will come – no long term show stoppers.
- There are design factors that needs to be considered for successful implementation.
- In addition, the business case must be sound!

# High public interest

The collage features several prominent media outlets and websites:

- Naval Architects**: A LinkedIn group page for naval architects, with a post about unmanned ships.
- Electronics Weekly.com**: A website with a green banner for "Breakthrough Technology".
- The Economist**: A red banner with the text "The Economist".
- DIE WELT**: A website with a globe logo and the text "DIE WELT".
- Bloomberg**: A black banner with the text "Bloomberg".
- Newsweek**: A red banner with the text "Newsweek".
- Hamburger Abendblatt**: A website with a logo and the text "Hamburger Abendblatt".
- eNav INTERNATIONAL**: A website with a logo and the text "eNav INTERNATIONAL".
- MARINTEK**: A blue banner with the text "MARINTEK".
- SINTEF**: A blue banner with the text "SINTEF".

Other visible content includes:

- A post from **Rolls-Royce** about building unmanned ships.
- A post from **IHS MARITIME** about unmanned ships.
- A post from **NDR** about the best of the north.
- A post from **Motorship** about the future of shipping.
- A post from **Can Futuristic Unmanned Cargo Ships Sail Without Seafarers?** with social media links (Facebook, Twitter, Google+, LinkedIn, Pinterest).
- A post from **Are Unmanned Vessels the Future for the Ocean?** by Michael Carroll.

# Thank you for your attention!



<http://www.unmanned-ship.org>



SST.2012.5.2-5: Grant no. 314286  
E-guided vessels: The 'autonomous'  
ship

# SEA TONOMY