Final conclusions of the MUNIN project

MUNIN Final Event
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http://www.unmanned-ship.org
1. Feasibility study

2. Outlook
Technical feasibility
Principal possible, but ...

Advanced Sensor Module

Shore Control Centre

Remote Maneouvring Support System

Maintenance Interaction System

Deep-Sea Navigation System

Engine Monitoring & Control System

Energy Efficiency System

Ship handling simulation
Technical feasibility
... prototypes need further development

Advanced Sensor Module

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Legal assessment
Safety gains can pave the way

**Risk Assessment**

**Legal and Liability assessment**

- **Collision**
  - $10^{-5}$ to $10^{-6}$
- **Foundering**
  - $10^{-1}$ to $10^{-2}$

The forth legal pillar
- Coastal State
- Flag State
- International Law
- Controller State?
Commercial use case
Depends on the concrete vessel and case

MUNIN compared to a conventional bulker
Expected present value over lifetime (Base)

- Higher newbuilding cost: -3.4 mUSD
- Crew cost: +10.4 mUSD
- Land based services: -2.5 mUSD
- Better fuel efficiency: +5.4 mUSD
- MUNIN: +9.9 mUSD

MUNIN compared to a conventional bulker
Expected present value over lifetime (MDO)

- Higher newbuilding cost: -3.4 mUSD
- Crew cost: +10.4 mUSD
- Land based services: -2.5 mUSD
- MDO as fuel: -19.4 mUSD
- MUNIN: -14.9 mUSD
Contents

1. Feasibility study

2. Outlook
From vision ...
... to reality?

It's not IF, it's only WHEN ...
... to reality?

But when is WHEN?
Further safety validation in large scale needed, e.g. by joint simulation ...
... but solutions must be applicable and tested in real live as well
Intermediate steps expected
e.g. **B0** - Soon on manned vessels?

**B0** - Periodical unattended vessel

- Less manning on-board
- Flex time for nautical officer
Shore-side shipping in the future
The dawn of the age of maritime autonomy is expected.

Is it totally unmanned? We will see ...
Thank you for your attention

MUNIN FINAL EVENT

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Is unmanned and autonomous shipping feasible? – And is it desirable?

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