Drones – as a facilitator for green profile port pilotage+

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YOUR TIME, YOUR SAFETY - OUR COMMITMENT

DanPilot

VesCo Systems – a joint venture

between Third Element Aviation & DanPilot

The vision

- VesCo
- Our vision
- The ambition

The project

- The approach to port
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- How far have we got?

The challenges

- Legislation
- Environmental limitations
- Trust aspect

The gain

- CO2 reduction
- Increased safety
- Cost-effective contingency

Supported by the Danish Maritime Fond

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The vision

Our vision for the use of drones

The vision is to take advantage of new technologies to enable shore-based port pilotage through increased real time situational awareness

The shore-based pilot operation must be performed with ***at least the same level of safety*** as if the pilot were on board the vessel.

The project

The approach to port

When approaching port, the vessel will be joined by a drone providing a live feed in bird's eye perspective to vessel captain as pilot. The bird's eye perspective offers easy and quick perception of multiple information.

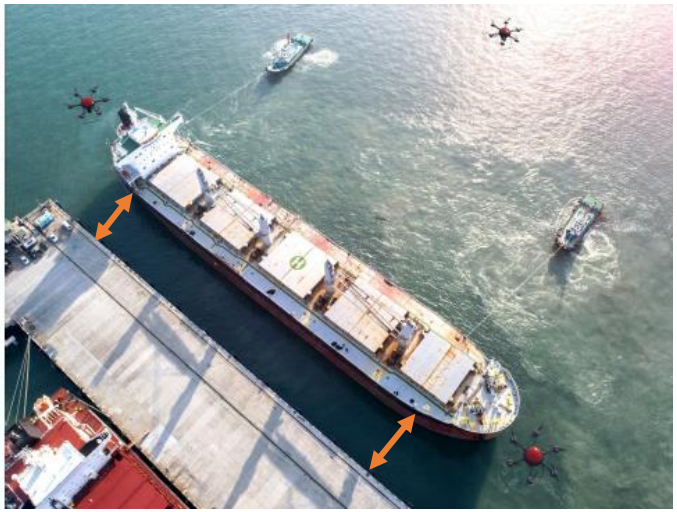
The project

The port maneuvering

Enhanced overview - increased situational awareness

A fleet of drones provide 360° aerial overview to vessel and pilot during port maneuver.

- Removing blind angles
- Clear view of the tugs, their actual position and performance
- Clear view of turn, drift, surroundings and obstructions



The project

How far have we got?

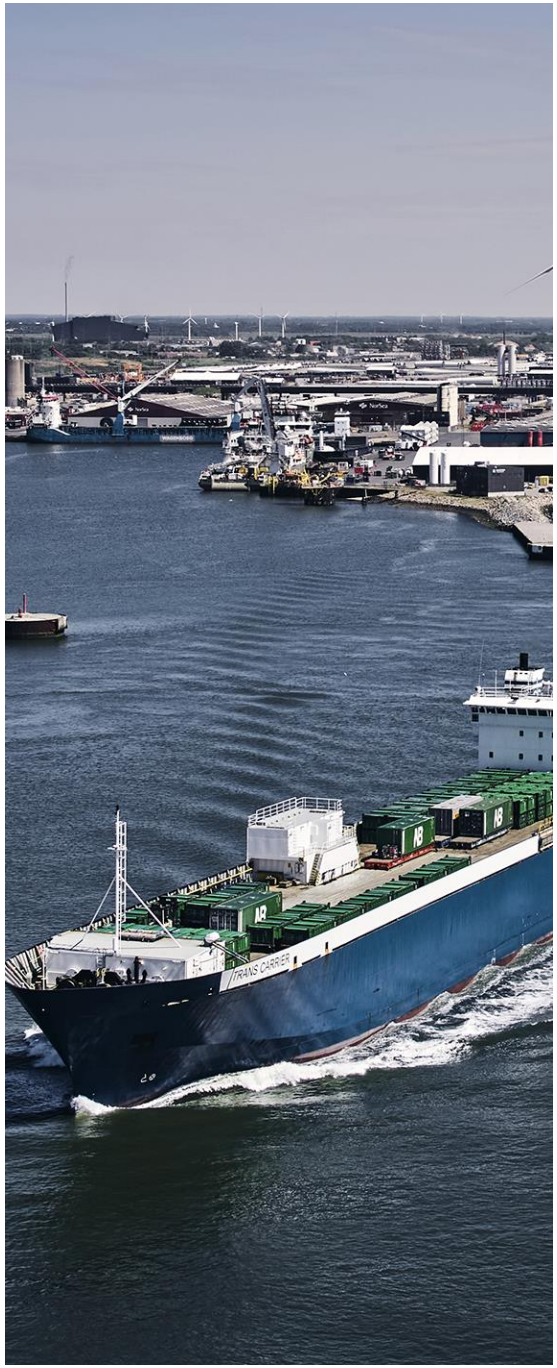
The MVP was developed by VesCo through 5 Integration (2019-2020). The development phase was supported by the Danish Maritime Fond.

The project

How far have we got?

Next phase:
Mature and Secure - with Esbjerg as test port!

- **Robustness:**
  - Reliability
  - Environmental resistance
  - Connectivity
- **HMI and interaction:**
  - Ease of use
  - Intuitiveness
  - Procedures and best practice
- **Build track record & gain experience:**
  - Experience
  - Documentation
  - Training and education



The challenges

Legislation:
According to the current Danish Pilotage Act, the Danish Maritime Authority (DMA) must establish more detailed rules for experiments with and possible establishment of land-based pilotage.

Environmental limitations:
Even though technology develops fast, the project is challenged by the rough maritime environment. If we can make it fly in Esbjerg, we can make it fly almost anywhere.

Trust aspect:
Trust and co-operation between crew and pilot is key.
How to build and maintain trust and co-operation remotely is the true challenge!

The gain

CO2 reduction:

The Climate Act sets up a goal of a 70% reduction of greenhouse gas emissions by 2030 compared to 1990, followed by total climate neutrality in 2050.

- A pilot boat emits 18 kg CO2 / NM sailed, and a significant CO2 reduction can be achieved through remote piloting.
- A remote pilot center will reduce the transport needs of pilot to different ports for pilotage operations.
- The acceleration / deacceleration of a vessel to embark or disembark pilot involves a significant increase in Co2 emissions.

The gain

Increased safety:

- Rigging pilot ladder is a physically hard and dangerous task for the crew.
- Climbing pilot ladder is risky, and a fall is often fatal.
- Pilot embarking operation can create traffic hot-spot and challenge the navigation for the surrounding traffic.

Cost-effective contingency:

- Maintaining a 24/7 contingency is very costly, especially for smaller units with limited traffic. A remote pilot setup where the same control center can serve several ports will reduce the standby time for the duty staff and thus the contingency cost.

Reduced cost ~ reduced prices ~ more vessels using pilot.

The port

Increased safety:

- We expect that more vessels will use the service, if it can be provided at lower cost.

- This would ideally ensure that more vessels are pilotaged, but less with pilots physically attending the vessels.

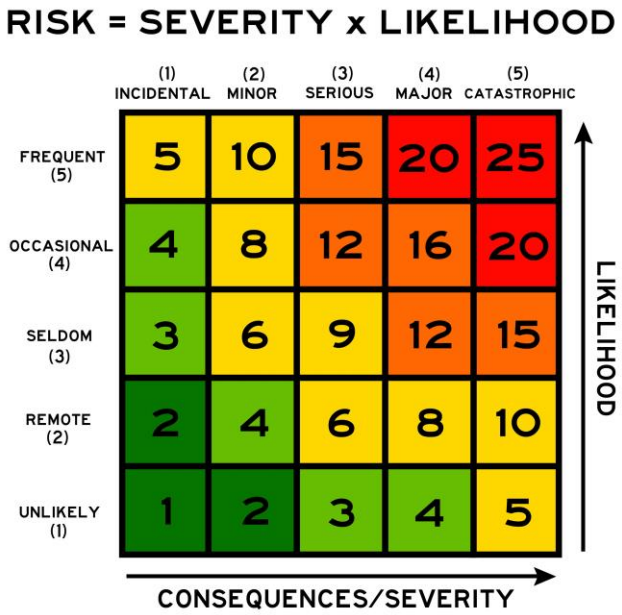
Maintain regulations:

- We would envisage maintaining regulations for compulsory pilotage.

The Port

Risk Awareness:

- An abundance of risks can be identified, if there is no pilot onboard for instance reaction time, equipment failure, adverse weather and unheard instructions, but there should also be advantages.



Opportunities:

- The ‘onshore pilotage’ will have more data available and will have an overview of the situation but must be fully dependent on the vessel crews.

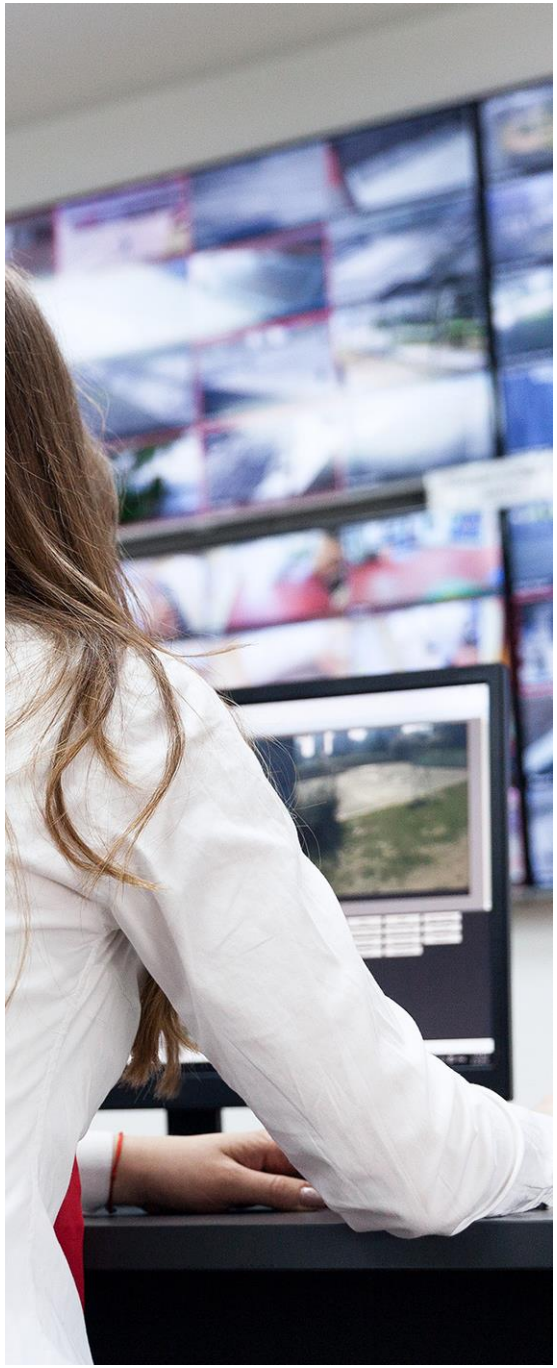
The Praxis

Control Center:

- A control center would allow for the pilot to have access to detailed information for the entrance and to combine the prevailing and the forecasted situation. This would improve decision making.

Research:

- More research is to be done in the cognitive model that allows for correct decision making, i.e. ship crew would also need training in coordination with the remote pilot.



The Praxis

The Dilemma:

- The decision between onshore and onboard pilotage may pave the way for a compromise of pilotage using both methodologies.

- The use of drones for the first part of the entrance allows for boarding of the pilot only during the most complex navigation and manuevering.

The future was here !