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ZULU Associates is active as an initiator, developer and operator of innovations in the marine component of logistic chains. Its goal is to enable **zero emission** operation of commercial vessels on short sea, coastal and inland waterways routes through **autonomous operation** and **alternative propulsion**.

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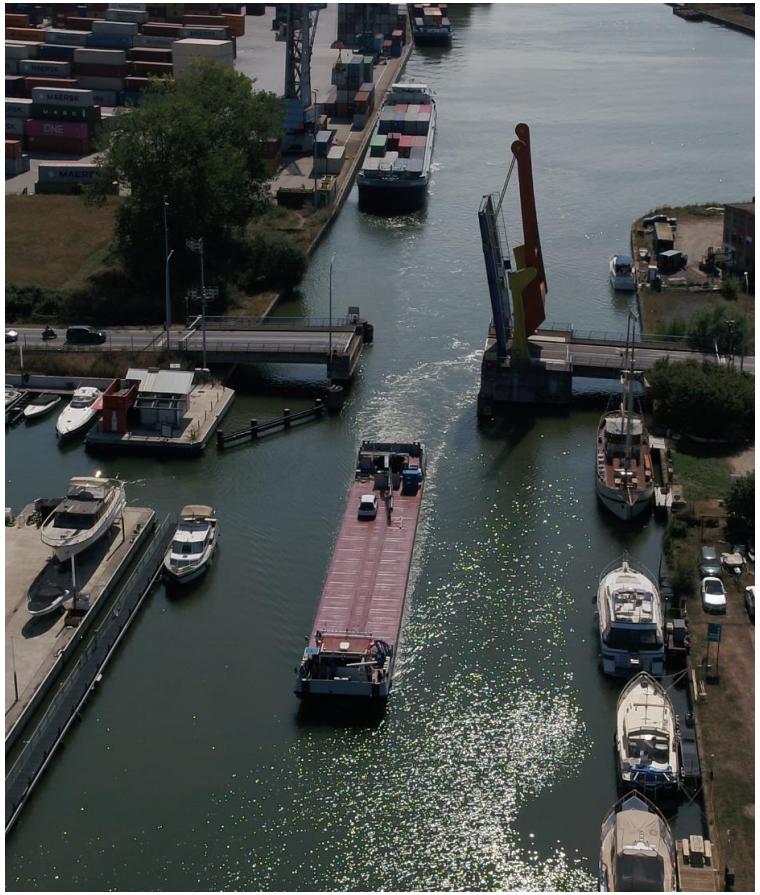
Autoship H2020

- ZA participates in the AUTOSHIP consortium (which has received €20 million subsidy from the EU). Officially announced on 21st January 2020. (https://www.autoship-project.eu/).
- Notwithstanding the COVID 19 crisis, work has carried on in the development of the AUTOSHIP consortium and the time-line is marginally extended.
- Pre tests initiated on IWT.



AUTOSHIP

Autonomous Shipping Initiative for European Waters

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 815012

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Definition of Autonomous operation

- NO crew on vessel during transit.
- Autonomous operation equipment and AI on vessel for present waterway infrastructure.
- Remote Control Centres (RCC) in continuous contact for monitoring and control.
- Fall back safety action.

- Autonomous equipment capable of situational awareness (outside & inside) and complexity analysis (levels).
- Situational awareness communicated from vessel to RCC.
- RCC situational complexity analysis & intervention in steps pending on operational situation & needs for intervention.
- Data gathering and exchange with RCC and other units.

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Focus of Autonomous operation

Present focus is on the navigational side of autonomous operation

- Remote Control (Seafar, SeaMachines, AUTOSHIP Project, MEGURI2040,..)
- Situational awareness (Orca, Groke, Buffalo Automation, SeaMachines, AUTOSHIP Project, MEGURI2040…)
- Data management (Shipping Technology, …)
- Artificial Intelligence (Kongsberg, Wärtsila, ABB, Seamachines, AUTOSHIP Project...)

All FANTASTIC developments with major and exciting industrial implications

But other parts of vessels have to be redesigned to be able to operate without crew and creates opportunities for change in traditional paradigms in maritime sector and change in logistic chains.

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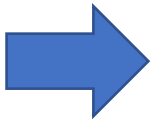
The Effects of Autonomous operation:

- Basic Economic advantages of autonomous ship operations when operating as crewed vessels

- Change of the traditional paradigm of economies of scale – change of development vectors



Bigger and Crewed vs Smaller and Digitally Connected

- Other Changes : transmodality, infrastructure, education, job functions, legal structures, …

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Economics

Lower Investment
- Accommodation
- Safety Systems

Higher Investment
- On board AI
- Sensors
- Redundancy
- Communication
- RCC

Margin for increased competitiveness vs crewed vessels & for zero emission propulsion

Lower Opex
- Crew Costs
  - Wages
  - Personal Equipment
  - Catering
  - Safety Equipment
- Lower energy needs
- Increase Safety
- More efficient voyage planning

Higher Opex
- RCC costs
- Additional equipment maintenance
- Additional in-port supports
- Communication

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Additional Advantages with Economic Effects

- Better adherence to routing and keeping ETA especially on short transits (short sea and IWT), lower energy needs

- 24/24 operation in Inland Waterway Transport – 30% more productivity

- Less human error
- No human crew to save

} lower insurance costs

- Better communications : voice vs digital

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Change of the Traditional Paradigm of Size

The main present paradigm of shipping is: bigger is better:

- Investment per ton-TEU/NM
- Energy need per ton-TEU/NM
- Crew need per ton-TEU/NM

Need for shift in the paradigm because:

- Large ports with congestion and emissions
- Requirement for less energy needs in absolute terms
- Evaluation of energy needs for complete logistic chain
- Black Swan events (Evergreen – Suez ,..)
- Smaller vessels – smaller problems

“Bigger” becomes no longer the paradigm

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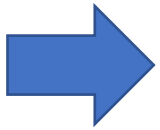
Propulsion

- Shipping is major source of GHG/Nox emissions



Need for use of alternative propulsion

- Smaller vessels allow for more alternative systems, need less energy in absolute terms

  - Batteries
  - Hydrogen based
  - Wind propulsion

} Become possible

- Need for new energy infrastructure: battery swapping, hydrogen bunkering,..

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Smaller Vessels

- Use of smaller ports , higher flow capillarity, less drayage, modal shift
- More productive quaysides/terminals
- Smaller equipment (lifting cranes, drayage, terminal size, ..)
- More redundancy
- Less susceptible to waterway sizes, especially in IWT
  - Draft – Rhine, Meuse, Donau, …
  - Canal & Lock sizes

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Redesigned Logistic Chains

- Size vessel as function of the flows, not by capacity
- Zero Emission also becomes KPI – strategic vector
- Cargo handling of smaller vessels – increased quay productivity
- RORO is too energy intensive
- Legal framework (e.g. time charter contracts, in-port handling, energy, ...)
- Data communication integrated in operations/synchro-modality
- Examples
  - Continent – UK : reducing trucking in the UK
  - Greek Islands : potential for full zero emission island logistics

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Industry Structure

Change from owner skipper model to corporate model

- Dearth of skippers (average age inland waterway in Netherlands is 60/65 in 2022)
- On board living becomes incompatible with required operational capabilities
- On board living becomes less socially acceptable
- Replacement of vessels requires large investment capacity
- Standardisation leads to fleet formation
- Client push for zero emission operations by 2030 not 2050
- A large part of the short sea and inland waterway fleets are obsolete and need replacement
- Issue of legacy assets

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New Programs supported by EC

- ReNEW Project
  - Transition of IWT to smart, green, sustainable and climate-resilient sector.
  - 24 participants of 11 countries.
- Seamless Project
  - develop and adapt missing building blocks and enablers into a fully automated, economically viable and cost-effective, waterborne freight feeder loop service for SSS (Short Sea Shipping) and IWT (Inland Waterways Transport).
  - 25 participants of 12 countries.

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New Designs applied

At ZULU Associates we are incorporating these perceived changes into a fleet of new standardized vessels to be available on time charter basis:

- ZULU MASS: a 3,500t/200 TEU short sea vessel
- X Barge: a 1,500t/80 TEU inland barge
- Redesigning logistic chains
- FEED process finalized on ZULU MASS
- AIP on ZULU MASS from Lloyds Register

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Specifications ZULU MASS

- Length Overall 90.0 metres
- Draft mid. 5.5 metres
- Beam mid. 15.0 metres

- Air draft limit (Assumed) 9.10 metres (ab. WL)
- Service Speed 10.5 knots (85% MCR)
- TEU Capacity 180 (varies with air draft)
- GWT 3.500 t

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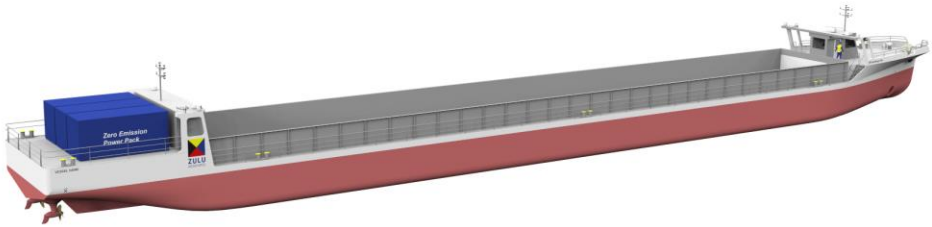
Specifications X-Barge

- Length Overall 85.0 metres
- Draft mid. 2.5 metres
- Beam mid. 8.0 metres

- Air draft limit (Assumed) 9 metres (ab. WL)
- Service Speed 8 knots
- TEU Capacity 80
- Bulk Capacity 1.500t



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Email: antoon.vancoillie@zulu-associates.com