TU Delft
Maritime & Transport Technology

HOW WILL AUTONOMOUS VESSELS WORK?

BENEFITS & CHALLENGES

Autonomous ships are hot. Their development is capturing the enthusiasm of more and more companies. There is a long way to go, but autonomous ships have a great deal of potential. It is not a matter of IF, but only of WHEN they will become a reality. Take a look at the benefits and challenges in this graphical overview.

SHIP DESIGN

Present day ships cannot function without a crew, but the presence of the crew also strongly limits design freedom. Autonomous ships, therefore, require a complete re-evaluation of many design criteria and technical solutions to meet these criteria.

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SMART CONTROL SYSTEM

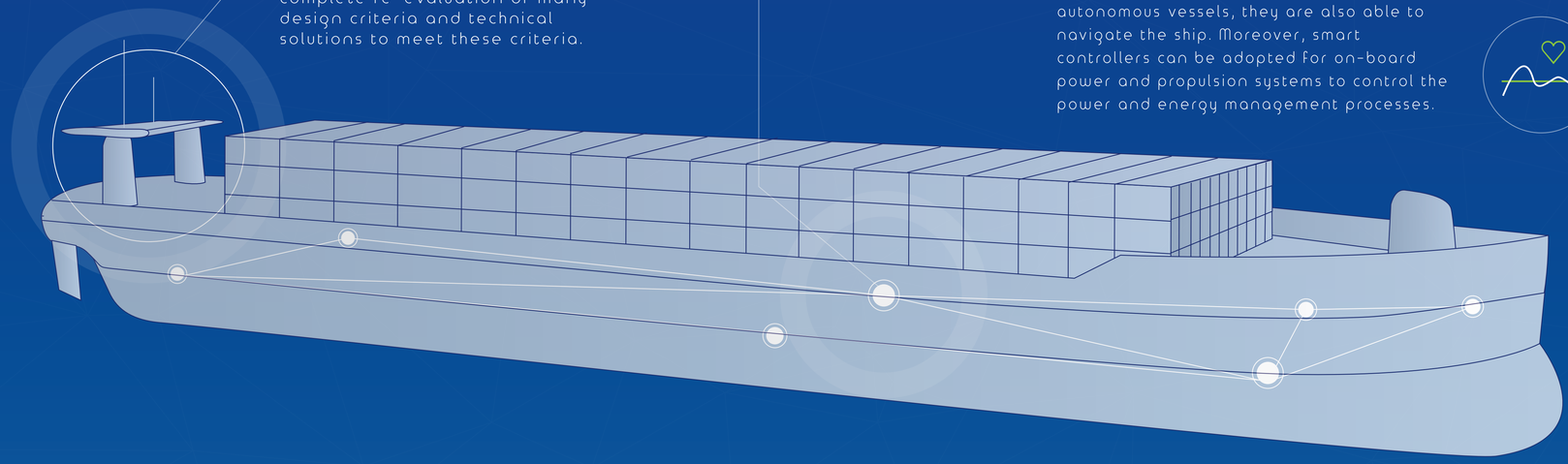
By gathering numerous types of data though different sensors, smart control systems can address several concerns with a perfect approach. On board smart controllers not only can plan suitable paths for the autonomous vessels, they are also able to navigate the ship. Moreover, smart controllers can be adopted for on-board power and propulsion systems to control the power and energy management processes.

CAPACITY

Ships without crew do not require life support systems and can carry more cargo.

HEALTH MONITORING

With the use of different fault-detection and isolation strategies and algorithms, autonomous vessels can detect faults related to different on-board components. In addition, by cooperating with the smart control system the effect of such faults on the overall system can be restricted.



HUMAN ERROR

At least 70% of all incidents at sea are (partly) caused by human error. Autonomous shipping should therefore lead to a drastic reduction of the number of incidents, casualties and maritime pollution.

LESS CREW COST

For a typical dutch short sea ship, the crew makes up about 40% of the total costs. Removing the crew therefore has a large potential for cost savings.

TERMINALS

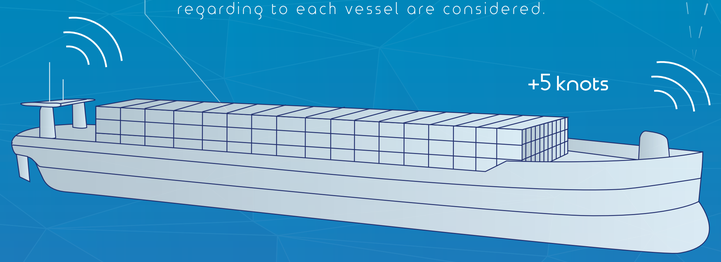
Autonomous ship operations could be aligned with the operations inside automated container terminals so that quay cranes and automated guided vehicles could be scheduled to load/unload and transport containers from the autonomous ships in the most efficient way.

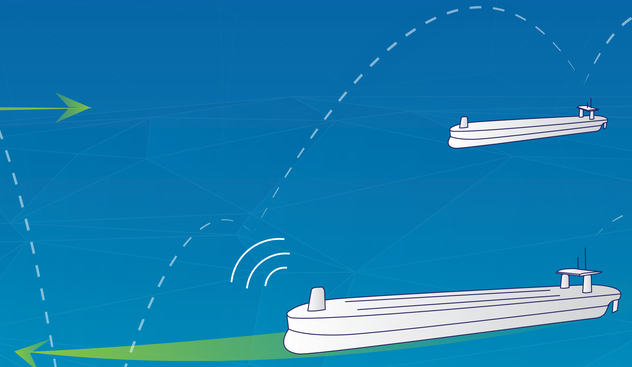
CREW SHORTAGE

By 2025, a shortage of approximately 150.000 maritime officers is expected. Autonomous shipping can help to solve this problem.

AUTONOMOUS COORDINATION

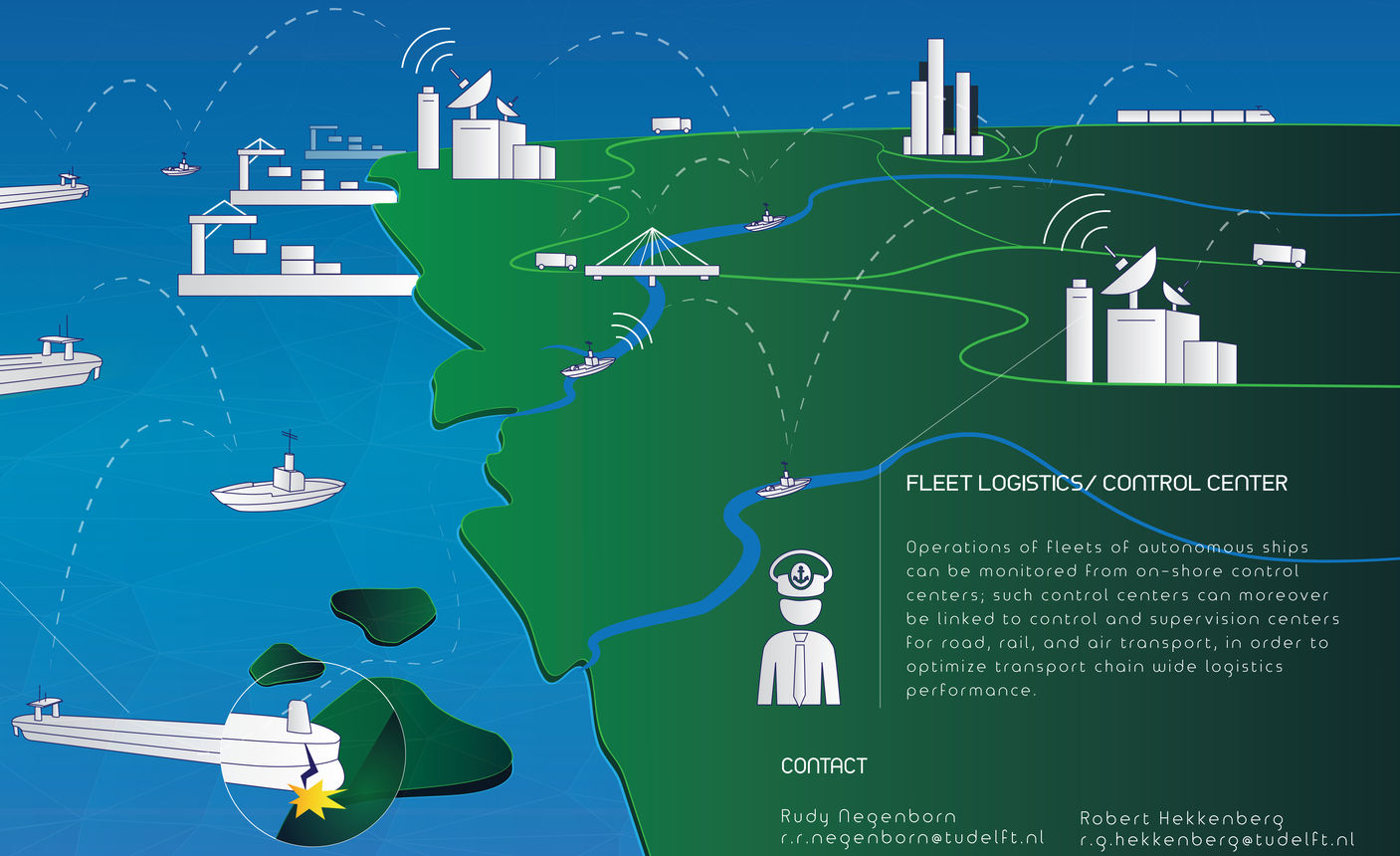
Thanks to distributed control algorithms autonomous vessels are able to collaborate appropriately to carry out different tasks and operations. These vessels are able to communicate and cooperate to optimally operate while several issues such as safety, environmental situations and concerns, fuel consumption and dynamical restrictions regarding to each vessel are considered.





LEGAL

All international ship-related law implicitly or explicitly assumes that ships have a crew and a captain. Changes to the legal framework are, therefore, required to make autonomous shipping possible. Given the way e.g. IMO works, this is a challenging and long-term process.



FLEET LOGISTICS/ CONTROL CENTER

Operations of fleets of autonomous ships can be monitored from on-shore control centers; such control centers can moreover be linked to control and supervision centers for road, rail, and air transport, in order to optimize transport chain wide logistics performance.

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