SFI · AUTOSHIP
Autonomous ships

SPRING NEWSLETTER 2026



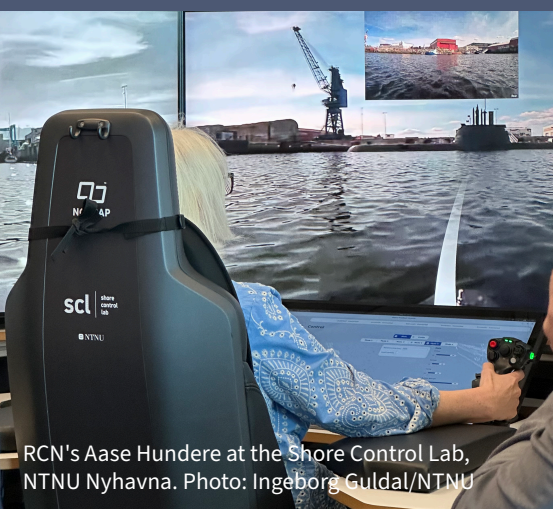
Anastasios M. Lekkas presenting at the spring researcher workshop.

Greetings from the Centre Director

SFI AutoShip has had a smooth and productive spring semester, including: Our regular researcher workshop on March 16, which was for the first time run as a single session; Webinars on perception, mission planning and multicrane automation; The RCN site visit on May 13, where the RCN representatives boarded milliAmpere1; The Board meeting hosted by SINTEF Ocean at Tyholt; Two excellent PhD defences with our most recent graduates, Spencer Dugan and Felix-Marcel Petermann.

We look forward to Susanna Dybwad Kristensen's PhD defence on September 17. Our upcoming events include regular webinars, the autumn researcher workshop on September 14 and the SFI AutoShip Days on October 13-14. We wish you all the best for the autumn and look forward to seeing you soon!

Anastasios M. Lekkas



RCN's Aase Hundere at the Shore Control Lab, NTNU Nyhavna. Photo: Ingeborg Guldal/NTNU

News and partner collaboration

- The **COLREG working group** has been meeting regularly, and arranged the webinar "Rights to data in a digitalised business world", with Prof. Harald Irgens-Jensen, in March.
- **RCN visited** SFI AutoShip at NTNU Nyhavna in May, and participated in a demonstration with milliAmpere.
- The **spring Board meeting** was hosted by SINTEF Ocean at Tyholt, Trondheim, and included a tour of the Ocean Technology Centre.

PhD and PD status

PhDs and PDs have participated in regular meetings to follow up innovation training and integration with Use Cases, culminating with the updated report on innovation leads presented to the Board in June.
2 PhDs have been completed and 1 thesis submitted so far in 2026:

- **Spencer Dugan** (WP4) defended his PhD "Methods and tools for the analysis and mitigation of drift grounding risk" in February.
- **Felix-Marcel Petermann** (WP3) defended his PhD "Designing the human-autonomy interface for autonomous ferries" in May.
- **Susanna Dybwad Kristensen** (WP4) submitted her thesis "Online risk modeling of autonomous surface vessels" in March and will defend her PhD on September 17.
- In addition, several more PhD theses are due to be submitted soon.


Spencer Dugan (WP4) with supervisers and committee after his PhD defence in February.


Felix-Marcel Petermann (WP3) with supervisors and committee after his PhD defence in May. Photo: Amanda Jørgine Haug/NTNU



The RCN site visit in May included a demonstration with milliAmpere at Nyhavna. Photo: Ingeborg Guldal/NTNU

Researcher workshop

The spring researcher workshop was arranged on March 16. Most of the PhD and PD researchers in the Centre presented their project status and plans, after overviews on Use Cases and partner collaborations presented by Maritime Robotics and SINTEF Ocean.
A central aim for this workshop was planning more regular webinars. Rather than parallel sessions according to WPs, we changed the format to a plenary session for the whole day, facilitating cross-WP collaboration.

RCN site visit

Aase Hundere, Kjell Røang and Olaug Råd from the Research Council of Norway joined the SFI AutoShip management and WP leaders as well as Board Chair Øystein Engelhardtsen from DNV for a site visit at NTNU Nyhavna on May 13. Updates on collaborations, activities, results and future plans were discussed before the meeting closed with presentations and demonstrations of our research infrastructure, including the Marine Cybernetics Lab, the Shore Control Lab and the milliAmpere.

International collaboration

- Liz Dietrich from UC Berkeley continued her stay as a Fulbright scholar at IMT, NTNU until April, collaborating with WP4 researchers.
- Nicola Sabatino from the University of Genoa has been a visiting PhD at ITK, NTNU during the spring of 2026, collaborating with WP1 and WP4. Nicola presented his work at the Spring researcher workshop.
- WP2 PhD Giacomo Melloni is currently a visiting researcher at the National Institute of Standards and Technology (NIST), USA.

Webinars so far in 2026

- "Extended Object Tracking for Maritime Autonomy”, (WP1, NTNU).
- "Mission planning for autonomous surface vehicles" (WP1, NTNU).
- "Partial automation of multiple ship cranes”, (WP5, SINTEF Ocean and SINTEF Digital).

Upcoming webinars:

- "Collision avoidance and safety experiments at the MC lab" (WP1 and WP4, NTNU and the University of Genoa).
- "An introduction to wave simulation in REEF3D and advanced rendering using ÆgirFrames" (WP4, NTNU).



The Spring researcher workshop in March. Photo: Ingeborg Guldal/NTNU



The June Board meeting hosted by SINTEF Ocean at Tyholt included a tour of the Ocean Technology Centre. Photo: Ingeborg Guldal/NTNU

Meet our graduates:

Spencer Dugan

Thesis title: "Methods and tools for the analysis and mitigation of drift grounding risk"



What was your project about?

Machinery failures onboard can quickly jeopardize ship safety. Two relevant high-profile examples are the near-miss of the Viking Sky and the allision of the Dali. These failures are highly relevant when we talk about reliability and repairability for autonomous ships.

One challenge is that these failures are rarely reported or contained within accident databases. This makes it difficult to accurately determine how often they occur or identify any underlying risk factors.

The overall goal was threefold. First, investigate how often failures occur, their outcomes, and recovery characteristics for conventional ships. Second, examine the gaps and biases in maritime accident databases. Lastly, assess how this knowledge informs traffic monitoring and autonomous navigation strategies.

Main take-aways from SFI AutoShip

The researcher seminars and SFI days have been fantastic opportunities to see how quickly autonomy is shaping the maritime industry, and proof that the SFI is leading the way research-wise. It's also been very helpful to get feedback directly from partners. I greatly enjoyed the discussions in Work Package 4, as well as my collaboration with the National Coastal Administration and discussions with Gard.

What have you achieved during your PhD?

I collaborated with the National Coastal Administration to analyze a dataset of observed drifting ships in Norwegian waters. We used the data to classify how often machinery failures occur. We then developed a statistical method based on epidemiology to identify "sick ships" and their underlying risk factors in the same way that medicine tries to identify risk factors for various diseases.

We applied the results to a supervisory risk controller. The controller used knowledge of the ship's machinery system reliability and recovery dynamics to mitigate drift grounding risk.

I was very fortunate to have shared my research at conferences in Poland, England, Japan and the US. Beyond the SFI, I collaborated with partners at two Polish universities on the ENDURE project to develop decision support systems for training ships. I also helped organize three successful editions of the International Workshop on Autonomous System Safety (IWASS) in 2023, 2024, and 2025.

What will you do next?

I have started at DNV as a researcher in ship autonomy. I'm very excited to work for a partner of the SFI and hope to stay involved in the project!

Spencer defended his PhD "Methods and tools for the analysis and mitigation of drift grounding risk" on February 18.

PhD and PD status

- We congratulate **Spencer Dugan and Felix-Marcel Petermann** on completing their PhDs this spring, and look forward to **Susanna Dybwad Kristensen**'s PhD defence on September 17.
- Several PhD candidates are expected to submit their thesis soon.

Meet our graduates:

Felix-Marcel Petermann

Thesis title: "Designing the human-autonomy interface for autonomous ferries"



What was your project about?

Autonomous passenger ferries change how people interact with maritime systems. Tasks traditionally handled by onboard crew may be transferred to automated systems and remote operators, while passengers need to understand and interact with a vessel with limited crew support.

My PhD focused on designing the human-autonomy interface so autonomous ferries remain safe, understandable, and usable for both passengers and operators. Using NTNU's autonomous passenger ferry milliAmpere II, I combined interaction design, Human Factors, and user-centred design methods to study passenger access, information and communication, and interfaces for remote supervision.

The work included designing and evaluating passenger-facing systems for access, information and communication, as well as interfaces supporting operators in remote supervision and control. Through field trials, simulator studies, interviews, observations and prototype evaluations, I investigated what information people need, how autonomous behaviour should be communicated, and how interfaces can support situational awareness without overwhelming their users.

A central outcome of my PhD is that autonomy should not only be considered as a technical capability. For autonomous maritime systems to work in practice, people need to understand what the system is doing, anticipate what will happen next, and know when and how to intervene or respond.

What have you achieved during your PhD?

My research investigated autonomous ferries as a complete human-autonomy system, covering both passengers and professional operators. Together with colleagues in SFI AutoShip and at NTNU, I developed and evaluated passenger information systems, automated access concepts and Human Factors solutions for remote operation and maritime situational awareness.

A particular highlight was conducting full-scale passenger trials with milliAmpere II in Trondheim, allowing prototypes to be studied under realistic operating conditions.

The PhD resulted in 23 peer-reviewed publications, including seven journal articles and 16 conference papers. I presented the work at around 15 international conferences and contributed to more than 60 presentations, demonstrations and dissemination activities. I also supervised or advised six students working on related Human Factors and interaction-design projects.

I successfully defended my PhD in May 2026. I was particularly fortunate to have John Zimmerman and Nicole Costa as opponents. Given their international expertise in interaction design, Human-Computer Interaction, and Human Factors, I knew this would be a demanding and intellectually challenging defence. At the same time, I was very grateful for the opportunity. The defence developed into an engaging discussion around the research, its design implications and the broader questions raised by the thesis, and I genuinely enjoyed the exchange. Having my work examined from these perspectives was both challenging and a particularly rewarding way to conclude the PhD.

Felix defended his PhD "Designing the human-autonomy interface for autonomous ferries" on May 28.

Main take-aways from SFI AutoShip

SFI AutoShip allowed me to connect interaction design directly with the development of real autonomous maritime systems. Instead of working only with hypothetical concepts, we had access to autonomous vessels, remote-operation environments, industry partners and researchers from multiple disciplines. This made it possible to repeatedly move between research, prototyping and real-world evaluation, while learning to understand the technical, operational and regulatory context surrounding the interfaces we designed.

My main take-away is that Human Factors and user-centred design need to be integrated into autonomous-system development from the beginning, rather than added after the technology has already been developed.

What will you do next?

I am continuing my work in maritime Human Factors and interaction design as a postdoctoral researcher at Western Norway University of Applied Sciences (HVL), while also continuing as a researcher at NTNU Department of Design and the Shore Control Lab (SCL).

My current research focuses on the user-centred development of future digital navigation tools. Together with professional navigators, we investigate how radar, AIS and ECDIS information is used in demanding situations, where important cues may be missed, and how new interface concepts could better support decision-making and situational awareness.

This continues the central theme of my PhD: designing maritime technology so that humans and increasingly autonomous systems can work effectively together.

Meet our graduates:

Susanna Dybwad Kristensen

Thesis title:
"Online risk modeling of autonomous ships"



What was your project about?

On conventional ships, the crew onboard can use their knowledge and experience to evaluate risk during operation, and make plans and decisions based on this. With the development of autonomous surface vessels with more autonomy and higher levels of autonomy, the tasks that are performed by humans today, will have to be transferred to the autonomous surface vessel (ASV) control systems.

In my PhD project I have investigated how we can develop risk models that can provide input to control systems during operation, and in this way give ASVs an understanding of risk. The goal has been to enable ASVs to make risk-aware plans and decisions, with a focus on navigation risk.

Main take-aways from SFI AutoShip

For me, a key take-away from the SFI AutoShip project has been the value of interdisciplinary discussions and collaboration.

I have learned a lot about different aspects of autonomous ship research through researcher workshops, webinars, and the SFI AutoShip days, and I am grateful to have been allowed to take part in the project.

What have you achieved during your PhD?

My PhD project has two main contributions. One is the development of methods and tools for identifying what can go wrong during ASV operations. A new hazard identification method based on systems-theoretic process analysis was proposed, and a software failure taxonomy was presented. Together, these methods can contribute to more holistic hazard identification for ASVs.

The second contribution is related to the development of online risk models and incorporation of these in ASV path planning and decision-making. Bayesian network online risk models were developed, with a focus on navigation risk. The models include factors related to the system, operation, and environment, and are developed so they can use different sources of data, including real-time data, to provide updated estimates of risk during operation.

The models were tested using different case studies, and an important achievement was performing tests on a real ASV in the Trondheimsfjord, where results showed that the ASV could use the online risk model to make plans where hazardous events like collisions and groundings were avoided.

What will you do next?

I am happy to share that I have started as a RAMS engineer in Kongsberg Maritime.

Susanna will defend her PhD "Online risk modeling of autonomous ships" on September 17.