

**Workshop on test strategies and guidelines
for tests of autonomous ships, 12.11.19**

INAS

International Network for Autonomous Ships

Welcome to SINTEF

- SINTEF Ocean
- The purpose of the workshop
- The discussions afterwards
- Next steps

Safety first



One of Europe's largest independent research organisations

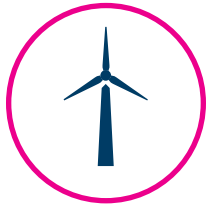


NOK 3.3 billion
Revenues

NOK 410 MILL
International sales

Applied research, technology and innovation

Expertise from ocean space to outer space:



Renewable energy



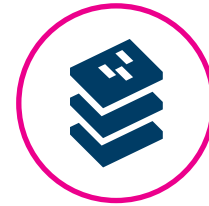
Ocean space



Industry



Buildings and infrastructure



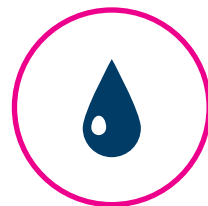
Materials



Micro-, nano- and biotechnology



Climate and environment



Oil and gas



Health and welfare



Society



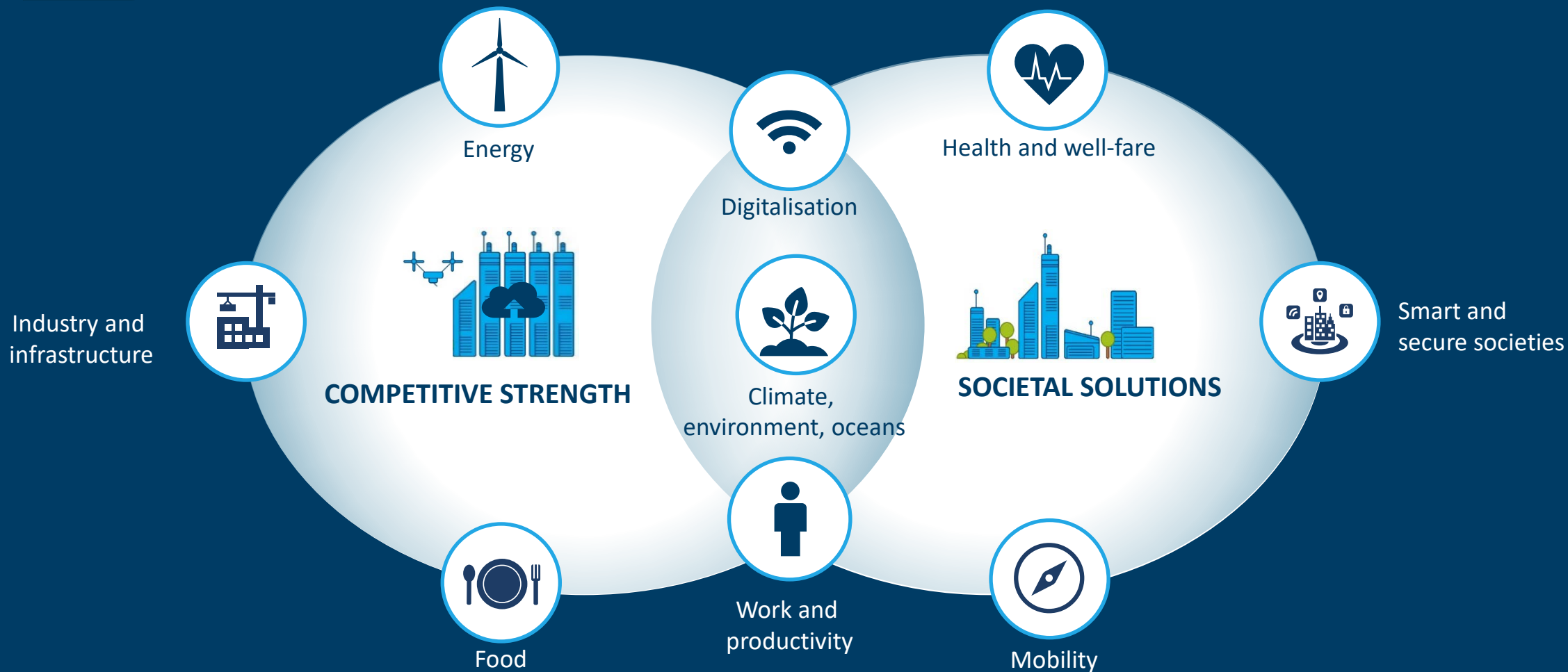
Digitalization

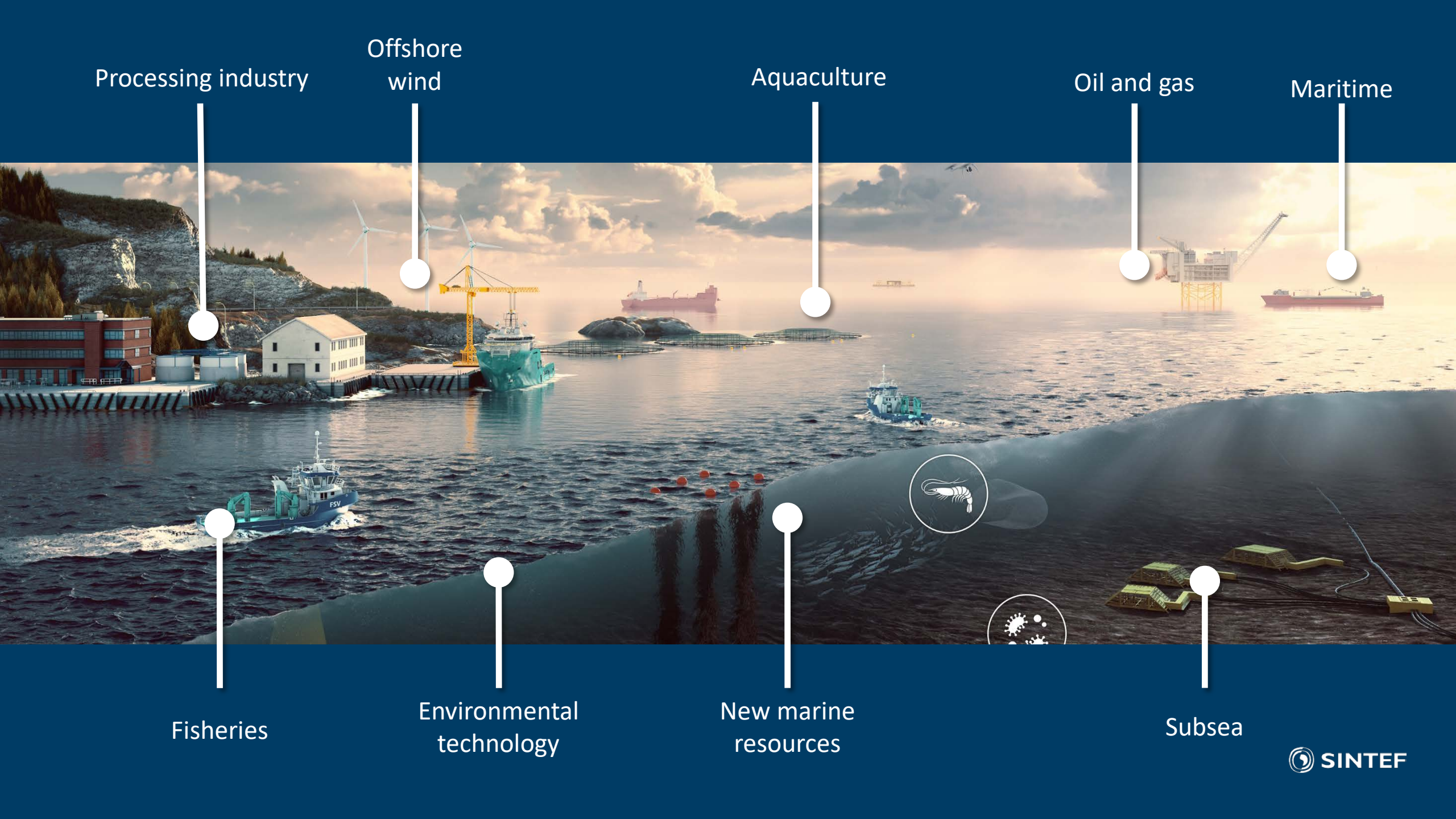


Transport

Vision: Technology for a better society

Expertise from ocean space to outer space





Processing industry

Offshore wind

Aquaculture

Oil and gas

Maritime

Fisheries

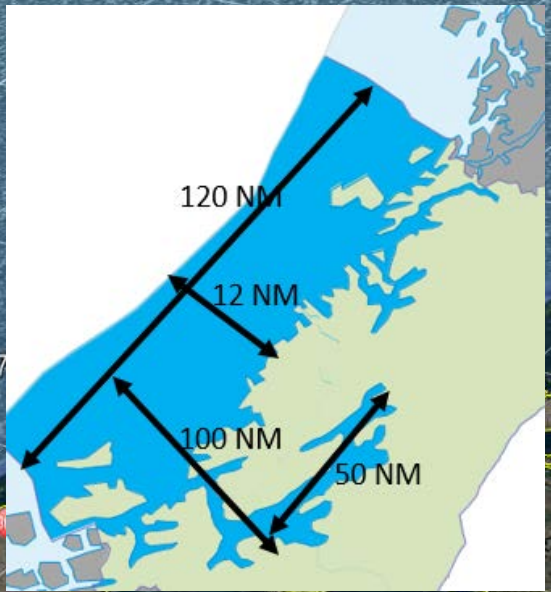
Environmental technology

New marine resources

Subsea

SINTEF Ocean : Integrated Autonomous Transport Systems





Test area - Trondheimsfjorden

- Established September 30th 2016
- Maritime Robotics, Kongsberg Seatech
- SINTEF Ocean, NTNU
- Port of Trondheim
- The Norwegian Maritime Administration
- The Norwegian Coastal Administration
- Area covers Trondheimsfjorden
- Permits
- Instrumentation and communication
- Navigation
- Safety
- Exchange of experience

	Kongsberg Seatech - Autonomous Drone 1 and 2 <ul style="list-style-type: none"> Advanced, multi payload MASS and USV autonomy test platform Broad sensor-suite for AI sensor fusion Situational Awareness Specialized, ultra-robust broad band communication World first VLOS pilot satellite link https://www.kongsberg.com/maritime/support/themes/autonomous-shiping/
	Maritime Robotics - OTTER Unmanned Surface Vehicle (USV) <ul style="list-style-type: none"> Hydrographic survey tool for mapping sheltered and enclosed waters The Otter is equipped with electric thrusters can be controlled via a graphical user interface WiFi, 4G and optional AIS receiver https://www.maritimeroobotics.com/otter
	NTNU - Research vessel Gunnarus <ul style="list-style-type: none"> The ship is fitted with a dynamic positioning system Optimal for ROV operations and the positioning of any deployed equipment The vessel is arranged with wet lab, dry lab and a computer lab in addition to a large aft deck The large mess hall functions as a lecture room for 25 people https://www.ntnu.edu/ocsp/gunnarus
	NTNU - Milliampere <ul style="list-style-type: none"> On-demand ferry - push the button for the ferry to come Electrical propulsion, Automatic charging of batteries Navigation: High-precision GNSS plus backup system Anti-collision system https://www.ntnu.edu/autoferry

	Kongsberg Seatech - Shore Control Room <ul style="list-style-type: none"> Research on remote operation of Autonomous vessels Control centre for Drone 1 and 2 Building situational awareness from test trials https://www.kongsberg.com/maritime
	SINTEF - ACE - Aquaculture Fish Farm <ul style="list-style-type: none"> A full-scale laboratory facility designed to develop and test new aquaculture technologies The research and experimental focus are mainly on technology for operation activities as well as constructions and environment surveillance Main sites are located on Østlandet https://www.sintef.no/en/aq-laboratories/ace/
	NTNU - Power station <ul style="list-style-type: none"> Power station installed at 365 meters depth for charging of underwater drones Collaboration between EquiQ and NTNU https://gemini.no/kortnytt/ntnu-dypstasjon-laboratorium-agnes-trondheimsfjorden/
	Communication and navigation infrastructure <ul style="list-style-type: none"> Installation of technology for maritime use Test site for technological development Support from ESA, The research council of Norway, and from the industry
	SINTEF and NTNU - Ocean Space Centre <ul style="list-style-type: none"> A knowledge centre for future ocean space technology, that educates future specialists in ocean space technology Ensure that industry and government enjoy access to leading expertise and infrastructure associated with the harvesting and management of our oceans Development of a future laboratory for ocean services http://oceanspacecentre.no/

Partners Trondheimsfjorden Testarev

Contact: Kay.Fortoft@sintef.no

Map of Trondheimsfjorden with various locations and facilities marked:

- SALMAR - Ocean Farm I
- Mausund
- Svellingø
- Sistf
- Kriarlaget
- Filjan
- Hitra
- Sandstad
- Stokkøund
- Arnes
- Råkvåg
- Uthaug
- Opphaug
- Brekstad
- Hasselvik
- Leiksvik
- Maritim
- Kongsberg Seatech Autonomous drones
- Kongsberg Seatech and Maritime Robotics control centres
- SINTEF Ocean laboratories
- Research vessel Gunnarus
- NTNU Milliampere - the autonomous bicycle ferry
- NTNU - Applied underwater Robotics lab

Test area - Trondheimsfjorden

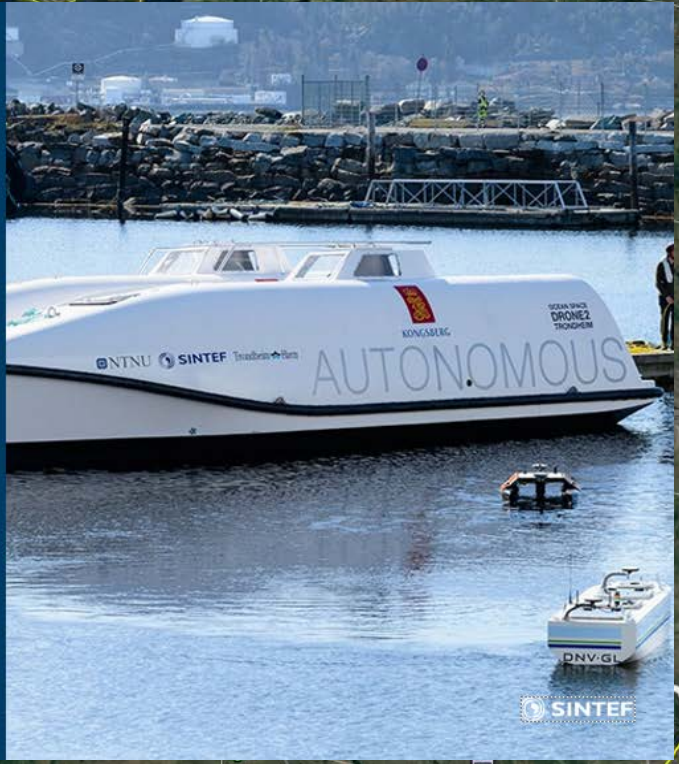
- Established September 30th 2016
- Industry, university, research
- Port of Trondheim
- Norwegian Maritime Administration
- Norwegian Coastal Administration
- Area covers Trondheimsfjorden
 - Permits
 - Instrumentation and communication
 - Navigation
 - Safety
 - Exchange of experience



The mission of Test Area Trondheimsfjorden

- Foster knowledge building
- Stimulate technology development
- Drive innovation
- Develop rules and regulations
- Test and verify concepts and solutions

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Workshop on test strategies and guidelines for tests of autonomous ships

Trondheim November 12th.

Location: SINTEF Ocean, Otto Niensensvei 10, Meeting room Havrommet.

Time: 12:30 to 17:30.

In conjunction with ICMAS 2019 we are pleased to invite you to a workshop on tests of autonomous ships and the test strategies applied by the different test areas internationally. IMO MSC 101 approved MSC.1/Circ.1604 on "INTERIM GUIDELINES FOR MASS TRIALS" which is relatively high level, and an obvious question is if more detailed guidelines are needed!

The purpose of the workshop is to exchange information about local or national initiatives and see if there is a need or wish to develop more general "standards" for MASS tests and trials. We invite all receivers of this mail to respond with suggestions for brief presentations on their approaches and to provide some background for the discussions in the workshop. We cannot guarantee you will be invited to present because of time limitation. The main purpose with the event will be to have a workshop. The questions that should be addressed are:

1. Brief overview of scope of any test or trial guidelines.
2. Status and from where it can be downloaded, if it is available.
3. The need or wish for international "standards", for all or some parts of the guidelines.

The scope defined by the IMO Circular include different issues:

- Risk management
- Compliance with mandatory instruments
- Manning and qualification of personnel involved in trials
- Human element
- Infrastructure for safe conduct of trials
- Trial awareness (of third parties)
- Communication and data exchange for trial
- Reporting requirements and information sharing
- Scope and objective for trial
- Cyber risk management

Are there elements missing and where are the needs, if any, for more detailed specifications?

If we see a need for more detailed and common specifications, how should that be developed?

- *Published regulations and guidelines*
- *Perspective session*
- *Discussions*

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Time	Presentation	Presenter
12.30-13.00	Pre-registration to the ICMass/MTEC	
13.00-13.15	Coffee break	
13.15-13.25	Welcome to SINTEF Ocean	Kay Fjørtoft, SINTEF Ocean
13.25-13.35	INAS and the importance of a test area	Ørnulf Rødseth, NFAS/INAS
13.35-13.50	IMO MSC 101 approved MSC.1/Circ.1604 on "INTERIM GUIDELINES FOR MASS TRIALS"	Svein David Medhaug, The Norwegian Maritime Directorate
13.50-14.05	Guidelines for Autonomous Shipping – NI 641 Revision 01 – OCTOBER 2019	Jerome Faivre, Bureauveritas
14.05-14.20	Approval of situational awareness, decision support for autonomous navigation	Andreas Bradsæter, DNV GL
14.20-14.35	Voluntary Industry Code of Practice from UK	James Fanshawe, UK Marine Alliance
14.35-14.50	EU and the guidelines on safe MASS	Trond Langemyr, The Norwegian Coastal Administration
14.50-15.10	Discussion	
15.10-15.30	Coffee break	
15.30-15.40	Work from IALA	Geir Jegstad, Consultant
15.40-15.50	Perspectives from Flanders	TBD
15.50-16.00	Perspectives from Denmark	Erik I. Tvedt, Danish Maritime Authority
16.00-16.10	Perspectives from Finland	Jukka Merenluoto, Dimecc
16.10-16.20	Perspectives from Norway	Paal Aamaas, University of South Eastern Norway
16.20-16.30	Perspectives from USA	Glenn Wright, GMATEK
16.30-16.40	Perspectives from Hungary	Roberto Gonzalez
16.40-17.00	Discussion	
17.00-17.15	Summary	Svein David, Ørnulf
17.30	End	





Teknologi for et bedre samfunn