

ELMAR

2021-06-02



CHALLENGE:

OPPORTUNITY:



The Zeabuz solution: Zero-emission, autonomous, waterborne mobility

Creating shortcuts for pedestrians and bikers across
Rivers / Canals / Lakes / Harbor basins



Empowering communities

by enabling

- **Citizens** to travel across urban waterways 24/7
- **Urban developers** to provide flexible shortcuts between communities
- **Cities** to become cleaner and more attractive by improving mobility flow



Zeabuz aims to become a leading global provider of:

Autonomy for waterborne mobility

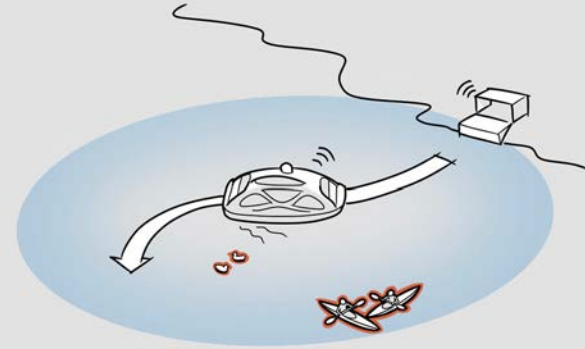
- **We develop Autonomy-as-a-Service**
for urban passenger ferries
- **We build trust in our technology**
through a transparent assurance framework
together with world leading partners
- **We're committed to inspire change of travel habits**
by actively disseminate the opportunities
- **We believe in open innovation with partners**
encouraging operators to design customized ferry systems
– expandable for cargo handling, trash collection, data gathering and more



Technology components

Autonomy platform

Passenger handling



Remote support centre

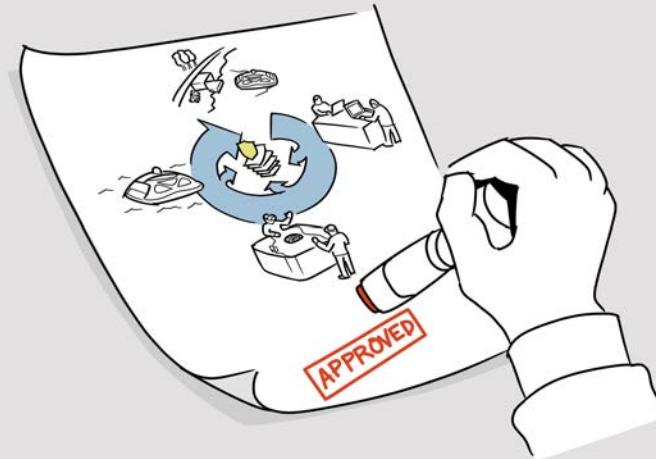


Provisioning of Autonomy-as-a-Service

Building trust through assurance & certification



Digital Twin for simulation & testing



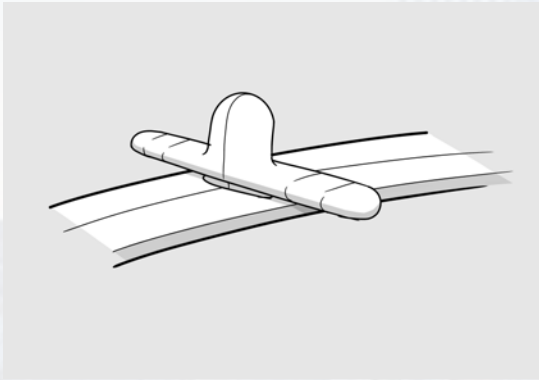
Assurance case



Stakeholder engagement

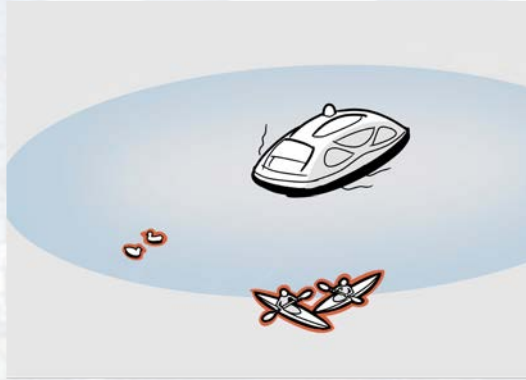
The Zeabuz autonomy platform

Sense



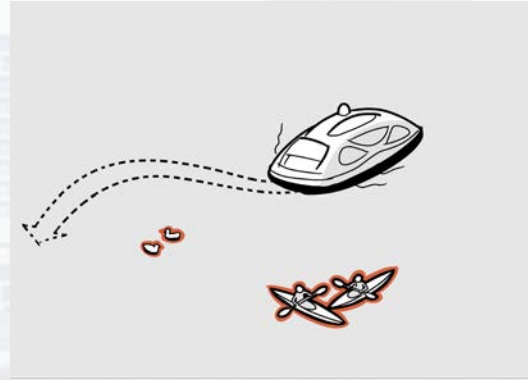
Perception
sensors

Comprehend



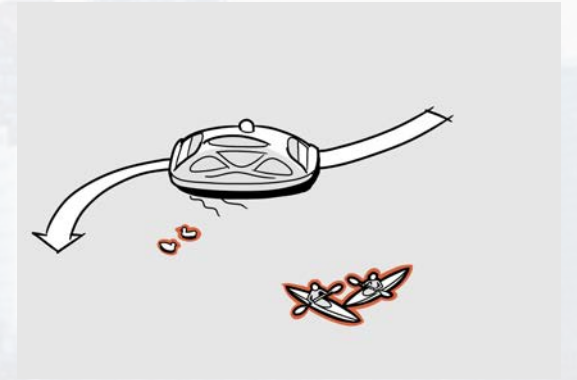
Situational
awareness

Plan



Motion planning &
collision avoidance

Act



Motion & actuator
control

Autonomy

Automation
(OTS system)

World's first autonomous urban ferry prototype "milliAmpere 2" – the Zeabuz starting point



- NTNU's research lab since 2018
- Scale model prototype
- Autonomy system tested and demonstrated at TRL 6
- Will continue as research lab for master and Phd students



- **Launched April 2021**
- Full scale living laboratory
- Focus on operational issues, passenger safety, and regulations
- Will be operated as autonomous passenger ferry

Video from tests: <https://youtu.be/Ry3-yxVaDuE>



TRONDHEIM
KOMMUNE

Trondheim  Havn
ET HAVNEKRAFTIG TRØNDELAG



NTNU

Kunnskap for en bedre verden



Zeabuz go-to-market strategy in 4 phases

2020-2021

Concept verification

2022-2023

Pilots

2024-25

Industrialization

2026 →

Scale-up &
Diversification

Strong strategic partners



- Investor
- Customer
- Business partner



- Co-founder
- R&D partner
- Technology provider (Licence agreement)



- R&D partner
- Assurance of complex digital systems
- Classification of autonomous systems



Marine Technologies

- Automation system provider
- R&D partner



Regulatory framework
developer / provider



General Autonomy cluster
organization



Network of technology
companies in Norway



TORGHATTEN

- Zeabuz's largest external shareholder
- One of Norway's largest transportation companies, on sea and land (previously also air).
- More than 140 years history
- A pioneer and world leading company within electric ferries also exploring hydrogen fuel
- Invested in Zeabuz to take an active role in development of autonomous mobility
- Strong focus on sustainable technology and operation as competitive advantage
- EQT bought all shares in Torghatten ASA, excluding Widerøe, January 2021.
 - A Swedish global investment organization with the mission to generate attractive returns and future-proof companies



- www.torghatten.no
- www.eqtgroup.com

Torghatten ASA subsidiaries



Employees



ERIK DYRKOREN
CEO & Co-founder
Ex Founder and CEO of
Blueye Robotics



HALVOR PLATOU
Sr. Systems Architect
Co-founder
Ex. DNV GL



HANNA MARIA VAN ZIJP
Director Public Affairs



BJØRN-OLAV ERIKSEN, PhD
NTNU Postdoc –
COLAV and system architecture,
To be employed August 2021



ØYVIND SMOGELI, PhD
CTO & Co-founder
Adjunct Professor, NTNU
Ex DNVGL,
Marine Cybernetics



CARL PETERSSON
Autonomy Engineer



JONAS SAGILD
Autonomy Engineer
Starting August 2021



ERIK WILTHIL, PhD
NTNU Postdoc –
SITAW and sensors
To be employed October 2021



HENRIK STRAY
COO & Co-founder
Ex ABB, Teekay



BRAGE SÆTHER
Autonomy Engineer



MAGNE SIRNES
Autonomy Engineer
Starting August 2021



TOBIAS TORBEN
NTNU PhD student -
Product Assurance
**To be employed
February 2022**



THOMAS SKARSHAUG
Autonomy Engineer
Co-founder



VINICIUS de OLIVEIRA
Sr. Autonomy Engineer

In process of hiring by end 2021:

- Director of Finance
- Business Developer x 2
- Sr. Systems Engineer



KJETIL VASSTEIN
NTNU PhD student –
Simulations of
autonomous systems
To be employed 2023

NTNU researchers & co-founders to be employed

Board of Directors



BJØRN K. HAUGLAND - Chairman
Co-founder
CEO Skift Norge, Board Member WWF-Norge
Ex: CSO DNV



STEIN ANDRE HERIGSTAD-OLSEN
VP Maritime Transport, Torghatten



TOR ARNE JOHANSEN
Co-founder
Professor NTNU AMOS
Ex: founder and CTO Marine Cybernetics,
co-founder Scout DI AS & UBIQ Aerospace AS



ASGEIR J. SØRENSEN
Co-founder
Professor and director NTNU AMOS,
Ex: founder and CEO Marine Cybernetics,
co-founder Ecotone AS and Eelume AS



SUSANNE JÄSCHKE
Innovation Manager
NTNU TTO

Advisors



EGIL EIDE
Associate Professor,
Electronics, NTNU
Ex: founder/CTO, 3D Radar
Co-founder / Inventor



MORTEN BREIVIK
PhD, Head of Dept. of
Cybernetics NTNU
Ex: Manager Kongsberg
Maritime
Co-founder / Inventor



EDMUND F. BREKKE
Associate Professor,
Cybernetics, NTNU
Co-founder / Inventor



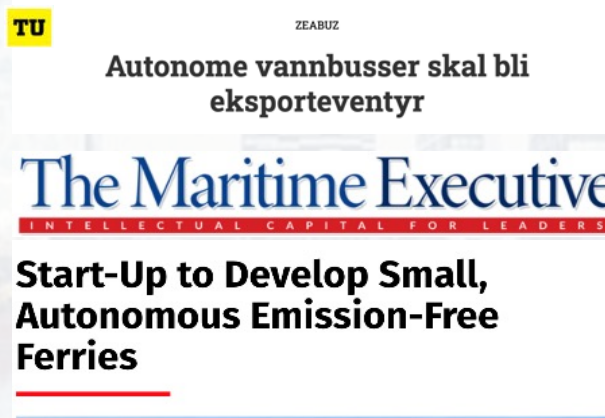
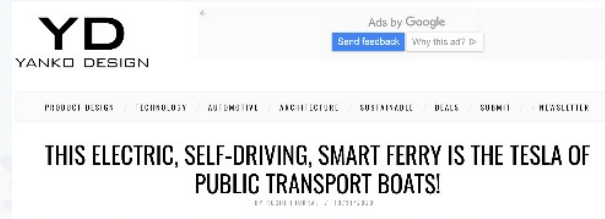
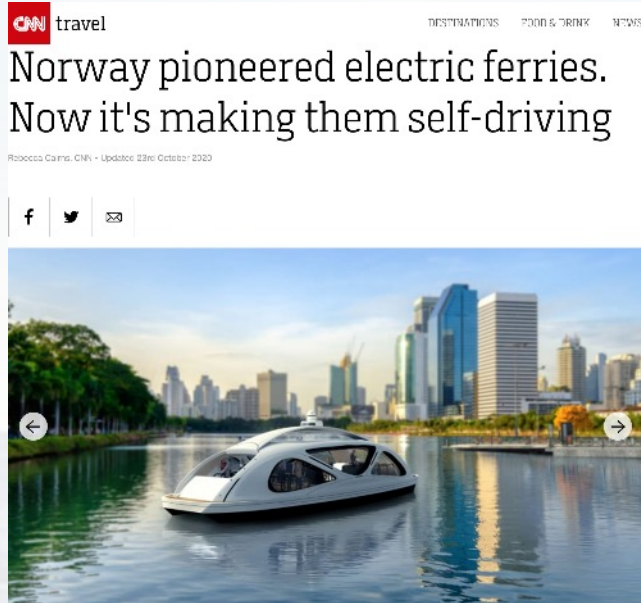
TOR SVENSEN
Vice President, Marine
Technology at RCCL
Ex: CEO of DNV Maritime,
chairman of IACS, Professor at
University of Strathclyde



TORE ULSTEIN
Chair and owner Ulstein
Chair NORCE
Ex: President NHO

High market interest globally

Zeabuz press coverage



Zeabuzが目指す自律型のエレベーター



“Zeabuz” Is the Newest Norwegian Autonomous Ferry Startup, Will It Make It?

DET GRØNNE SKIFTET
Norske byer som testarena for ny teknologi – nå har Bergen en stor mulighet



Torghatten satser millioner på førerløse miniferger

TRANSPORT: Trafikkselskapet Torghatten går inn på eiersiden i Zeabuz, som skal hente 200 millioner kroner og trafikere norske og internasjonale byer med førerløse el-ferger.



BLA HØRMEI, FALPØK: I år har Zeabuz fått seg en testarena i Bergen, og det er et stort skritt mot å få ferger til å kjøre uten fører. (Bilde: Zeabuz)



INNOVATION PROJECT



zawas

ZAWAS: Zero-emission Automated Water Shuttles.

The cost-efficient, environmentally friendly future of public transportation in urban areas.

ZAWAS is a ground-breaking new initiative by three innovation clusters and 9 industry partners in Norway. The project aims to take Norway's maritime industry to the next generation – through transforming our waterways into rapid, zero-emission, autonomous public transportation transits.

The collaborating partners in ZAWAS have the technology, know-how and testbeds to build and pilot zero-emission autonomous water shuttles. Over the coming years the project partners will work together to establish a framework for the widespread use of autonomous water shuttles in urban areas around the world. This involves transitioning from pilot ferries to full-scale operational shuttles, developing the infrastructure for energy supply and working alongside maritime authorities to adapt legislation.



simonsen
vogtweig



BLUEDAY
TECHNOLOGY

WESTCON



The project is supported
by Innovation Norway.

Oslo by night 2022?

