MASS NOW AND NEXT STEPS

ONE SEA ASSOCIATION – Industry Panel on MASS

IMO 110th Session of the Maritime Safety Committee
After session event 05:40 – 06:25 PM

23 June 2025

ONE SEA

Panelists

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KONGSBERG

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ROY FUNCK
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ABB

ONE SEA

Remote Operations Centre

ROC

Markus Laurinen

Growth & Solution Director -

Remote & Autonomous

Kongsberg Maritime

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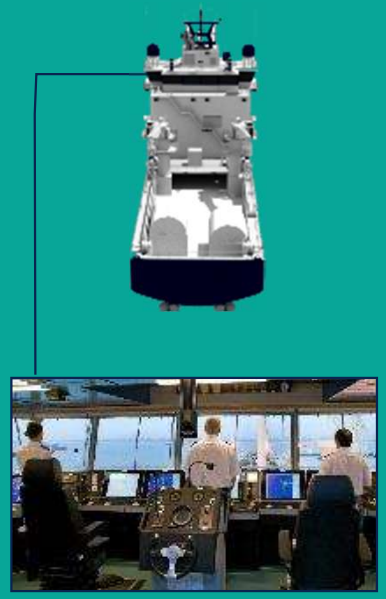
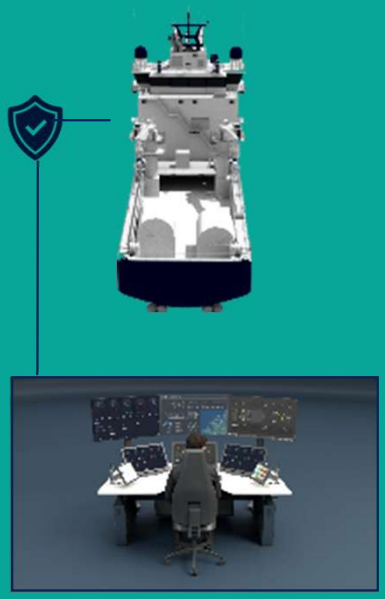
Remote & Autonomous business vision

Shaping the Maritime Industry

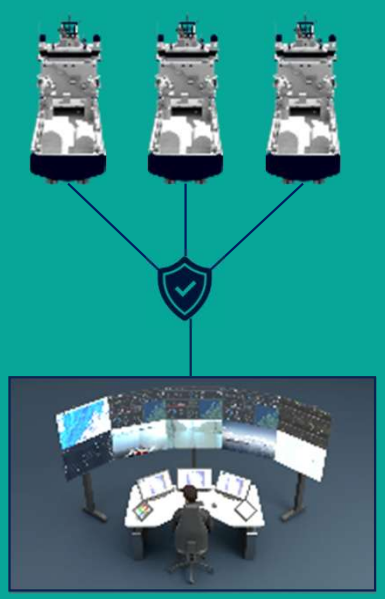
Conventional ship operation



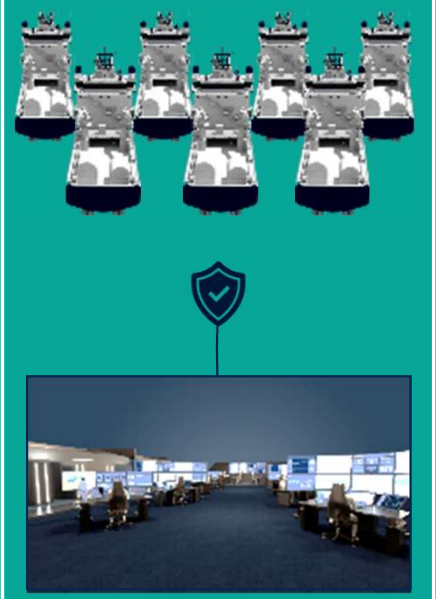
ROWS Single vessel operation



ROWS Multi-vessel operation



ROC Fleet operation



The Solution Context

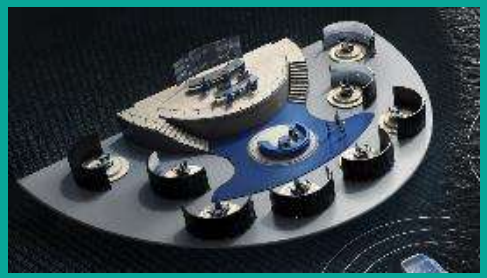
Remote & Autonomous operations

VESSEL SYSTEMS
(Incl. PORT SYSTEMS)

Enabling remote & autonomous operations with key digital orchestrators and well proven products.

CONNECTIVITY SYSTEM

Enabling secure and safe connection between the ROC and fleet of vessels.



REMOTE OPERATIONS CENTRE

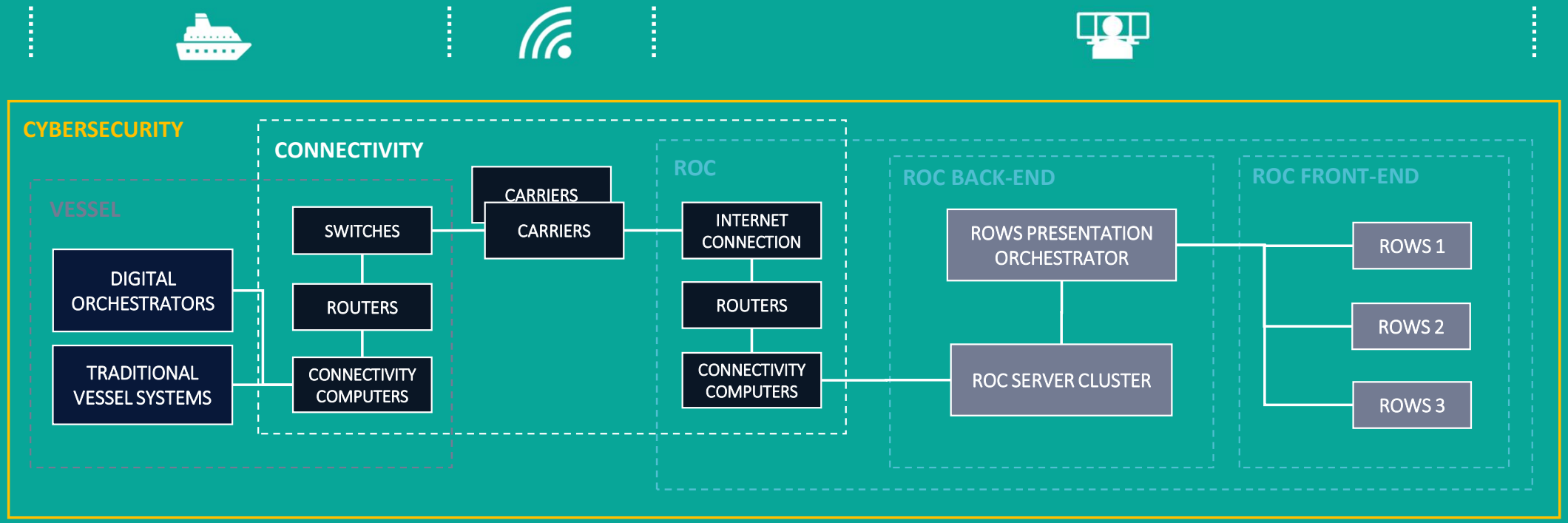
Enabling remote & autonomous operations of vessels and other floating assets in a safe, efficient and secure manner.

ROC OPERATOR

Providing required infrastructure and procedures for remote & autonomous operations.

Remote & Autonomous

High-level topology



Remote Operations Centre

Main building blocks

ROWS / FRONT – END (n pcs)

FIBRE

POWER

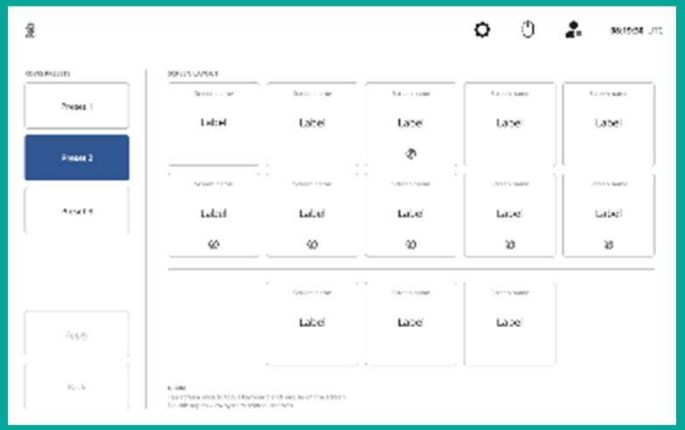
BACK – END (1-2 pcs)

INFRASTRUCTURE

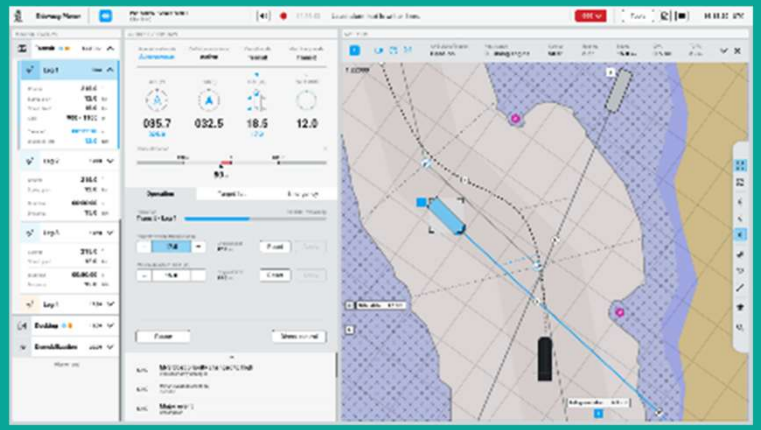
Built in customer premises according to ROC facility and infrastructure requirements & recommendation

Purpose build systems for ROC operations to reduce cognitive load

ROC applications



Control panel

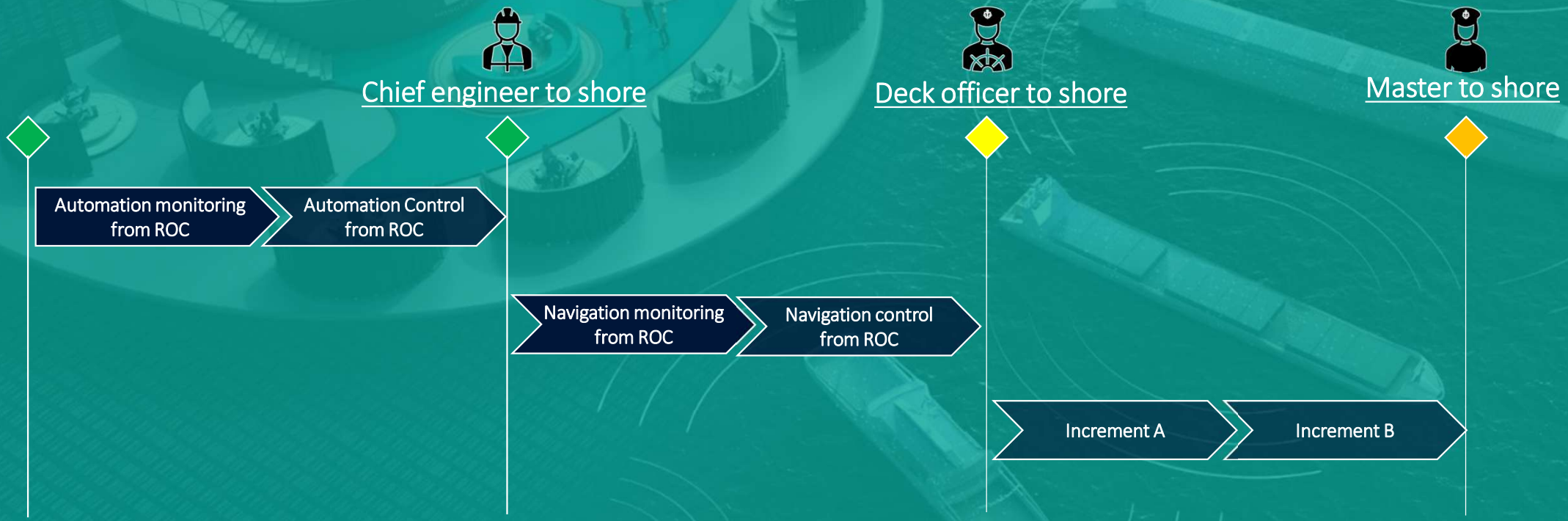


Autonomy UI - Navigation

Autonomy UI - Widgetboard

Stepwise approach with increments

ROADMAP to Remote & Autonomous operations



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Remote Operations Centre

Ongoing Public Customer Projects

YARA BIRKELAND

Autonomous zero emission shorth sea container vessel

ASKO AUTOBARGE

Autonomous fully electric barges for trailer transports

REACH SUBSEA

Unmanned Surface Vessels for ROV operations

TRAFIKVERKET

Fully electric, remotely operated roadferries

MASSTERLY

Remote Operation Center for Yara, Asko and Reach operations

Horten (NOR)

TRAFIKVERKET

Remote Operation Center for road ferries

Stockholm (SWE)

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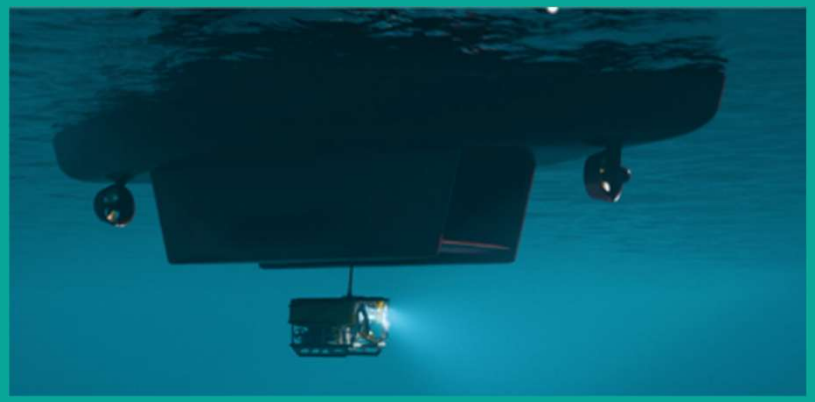
USV for ROV operation

- Built without a bridge, operating without crew onboard
- Fully controlled from Remote Operations Centre (ROV from different location)
- Stepwise introducing of autonomous control
- Compact, efficient and eco-friendly



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MASS enables breakthrough concepts to address maritime sustainability

Stepwise approach

- Initial operation - ROC onboard assisting vessel
- Next step – shore-based ROC operation

MASS is the way - not the target

Target is to make maritime:

- **More sustainable**
- **Safer**
- **More competitive**

Better fit for future!

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Remote & Autonomous Operations

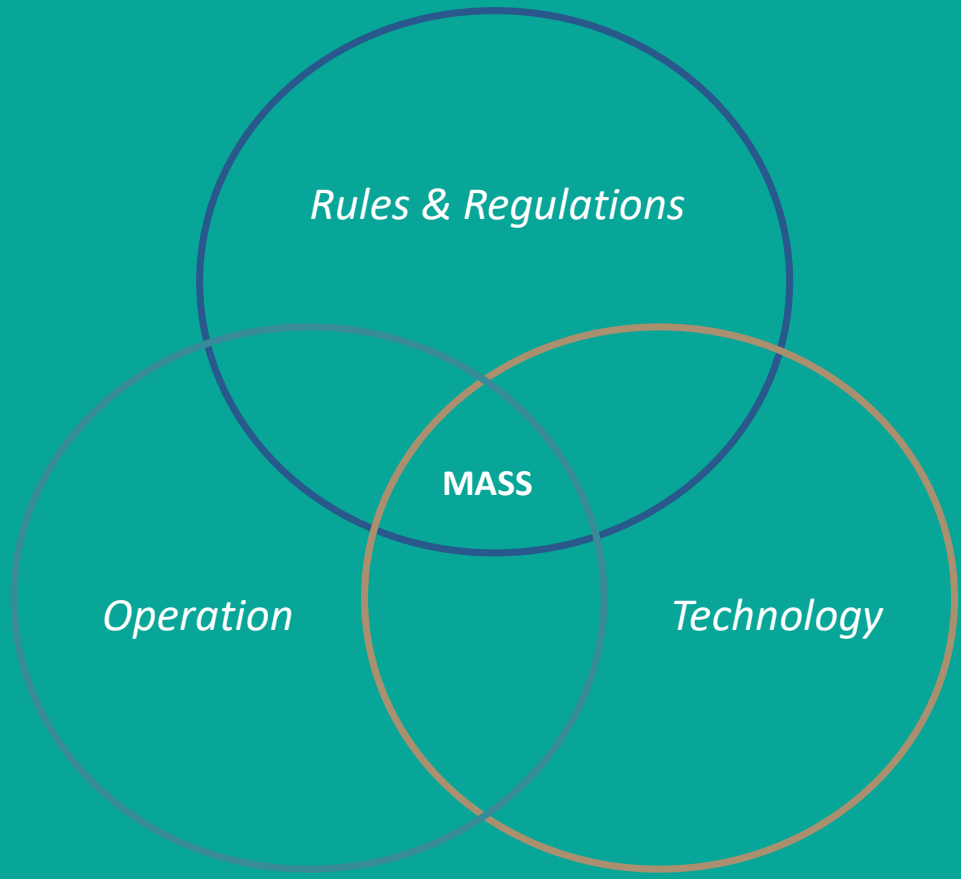
Collaboration is the key

MASS is the way to make the needed impact for maritime

...but we need strong collaboration !

1# MASS adaptation speed – To stay relevant

2# Optimum mandatory regulation – Role of Experience Building Phase



Cybersecurity in the context of autonomous ships

Pieter-Jan Note

Co-Founder & CEO

MAHI - Maritime Autonomous Systems

Image generated with AI

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Maritime IIoT security stands today where Industrial IIoT was in 2010

MAHI

Cybersecurity in context of autonomous ships

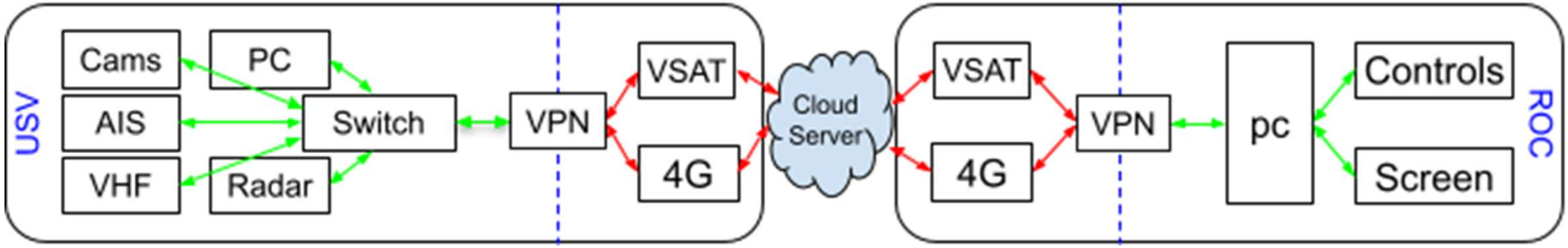
Ships' systems are increasingly connected to the internet:

- For remote operation and autonomous ships
- For remote monitoring and fuel optimization
- General trend towards 'connected everything'

Breaches of such networks can result in serious impact on operations and safety:

- Espionage, denial of service, spoof navigation sensor data, …
- In addition, for uncrewed vessels, potential to take over of the control & catastrophic consequences

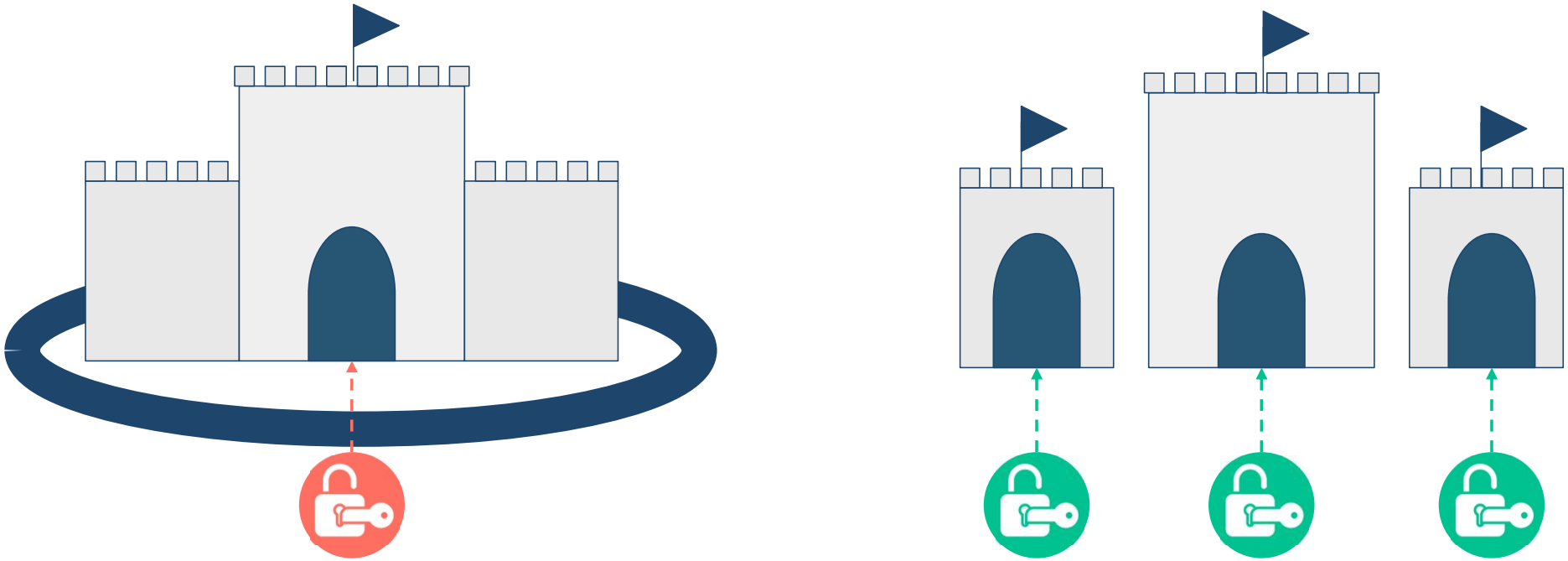
Expanding systems broaden the attack surface



Threats & impact

Threat type	Impact
1. GNSS spoofing/jamming	Misrouting, grounding, collision
2. Data breaches	Theft of sensitive routing/cargo data
3. AI/ML exploitation	Manipulation of decision algorithms
4. Supply chain attacks	Compromised components introduced during manufacturing/maintenance
5. System takeovers	Unauthorized control over navigation

From a **‘Castle-and-moat’** cybersecurity model to a **‘zero-trust’** model as a mitigation strategy



Castle-and-moat

Zero-trust

Regulatory and Industry Initiatives

- **IMO** Guidelines: Mandating cyber-risk integration into safety management systems
- **IACS** Guidelines: IACS UR E26 (for ship designers, shipyards & integrators?) & E27 (for equipment OEMs)
- **UK MCA** Workboat Code: Outlining baseline requirements like threat modeling and recovery protocols

Collaborative Threat Intelligence: Industry partnerships for sharing attack data and solutions such as the Common Vulnerabilities and Exposures (CVE) program by NIST.

Conclusion

Widely used ‘Castle-and-moat’ model is insufficient!

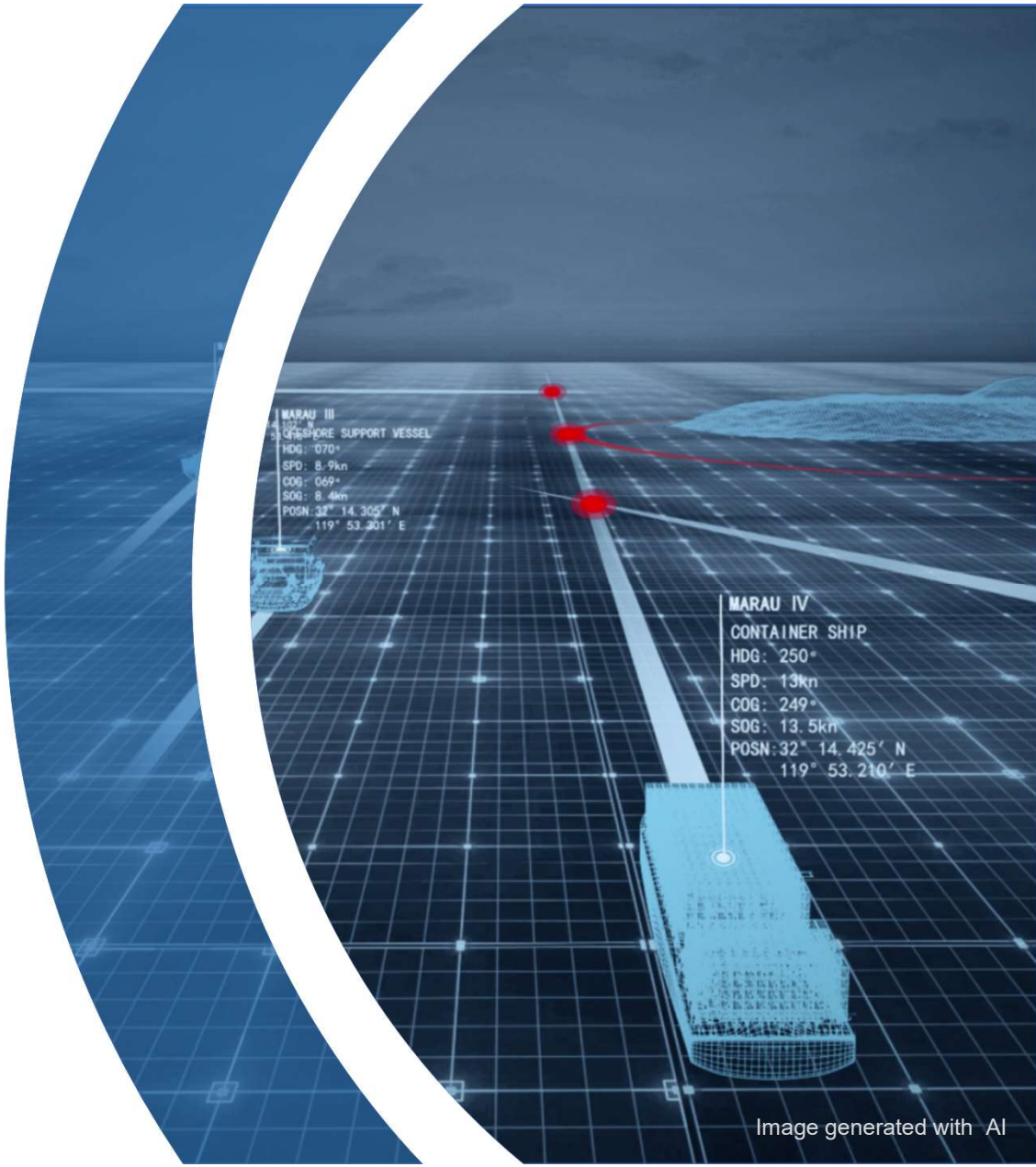
Proactive frameworks such as **security-by-design** and **adaptive architectures** offer the only viable **pathway to resilience** in the ever-evolving industry.

Minimum Safe Lookout Area & AI Technologies for MASS

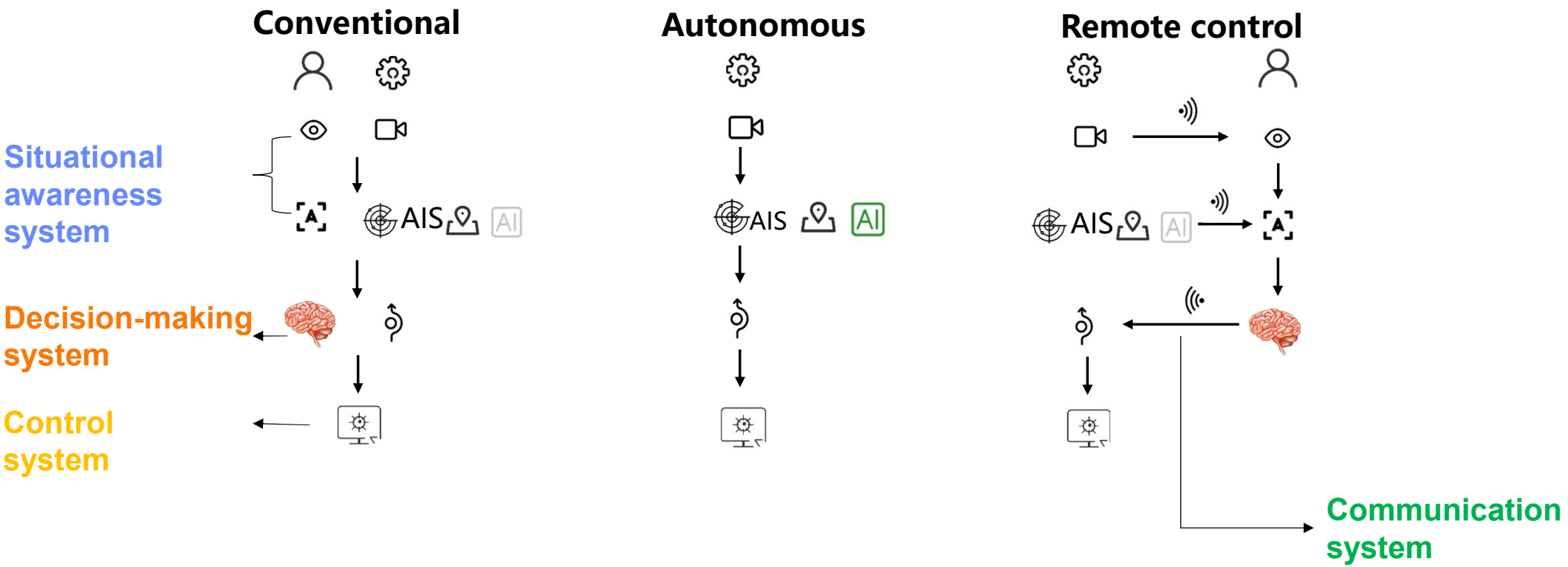
Ben Zhang

Founder, Chairman

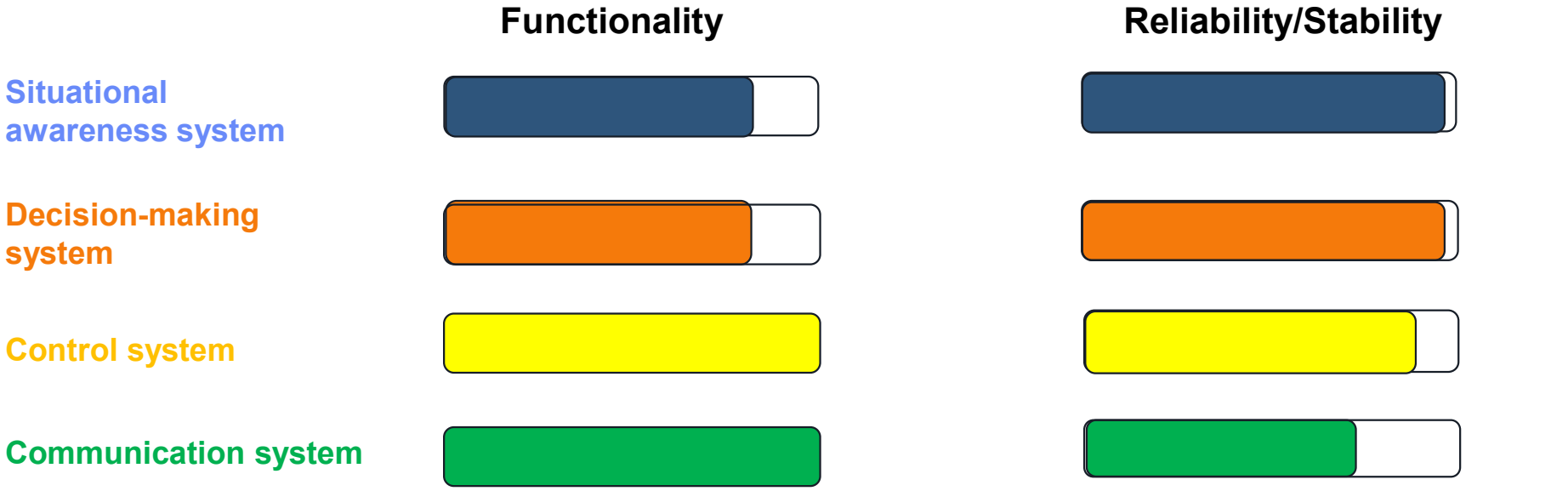
Marautec Co., Ltd.

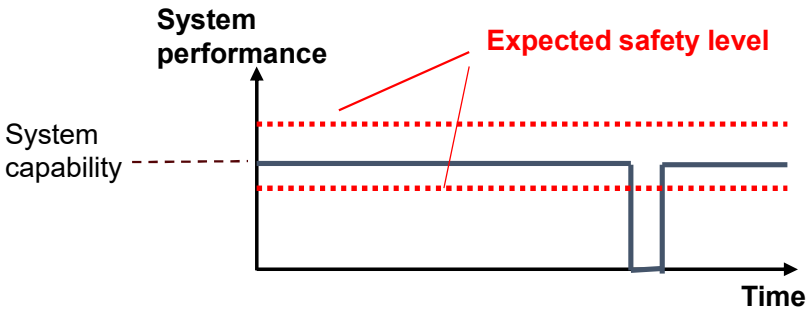


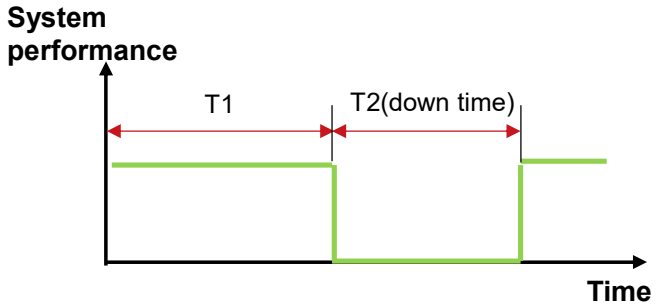
Key Functions for Autonomous Navigation Systems for MASS



Functionality Requirement Vs. Reliability Requirement

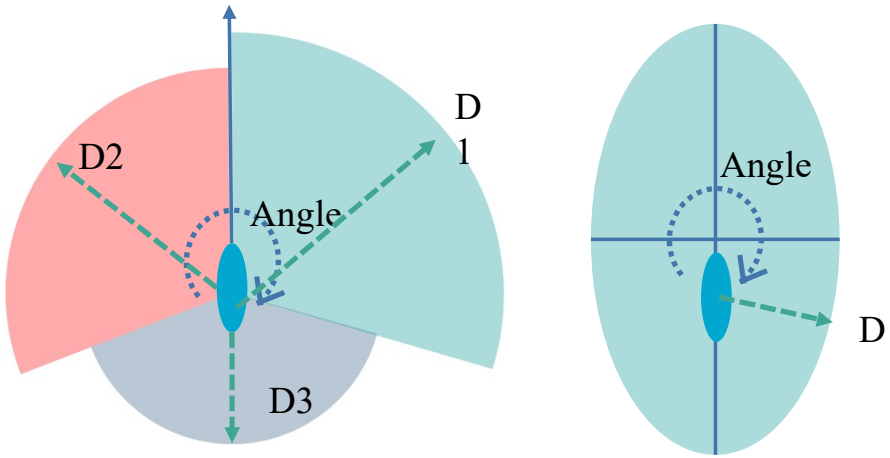






Essential to Define Minimum Safe Lookout Area

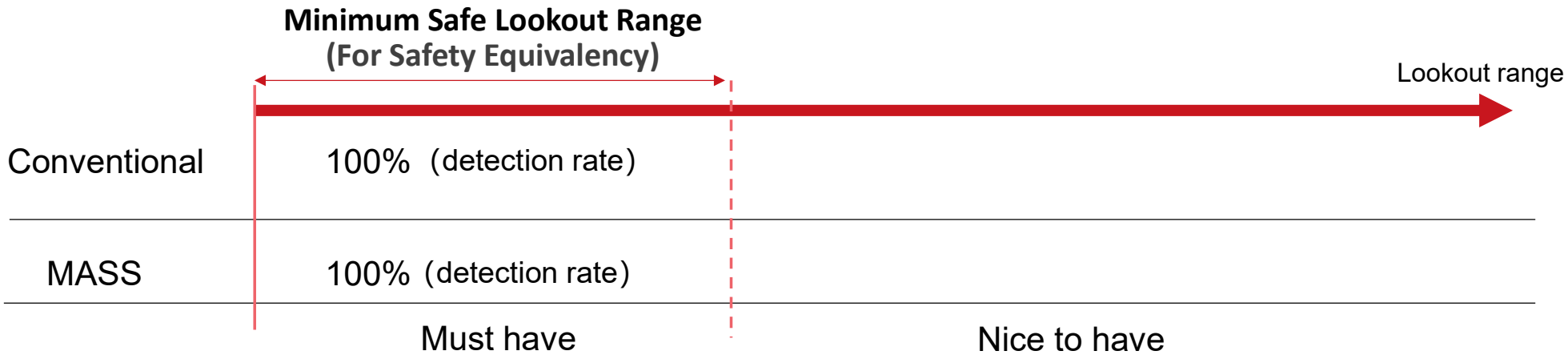
Safe Lookout Area



(GOODWIN E M.A statistical study of ship domains[J].Journal of Navigation,1975)

- **Minimum Safe Lookout Area** must be **quantitatively defined** so that the **expected safe level** can be determined based on safety equivalency principle, both for autonomous mode and for remote controlled mode.
- As such, other important parameters such as **requirements on communication bandwidths, situational awareness systems, and control systems, can be determined accordingly.**
- Relevant tests and verification can be done quantitatively to ensure a certain expected level of safety.

What is Minimum Safe Lookout Area



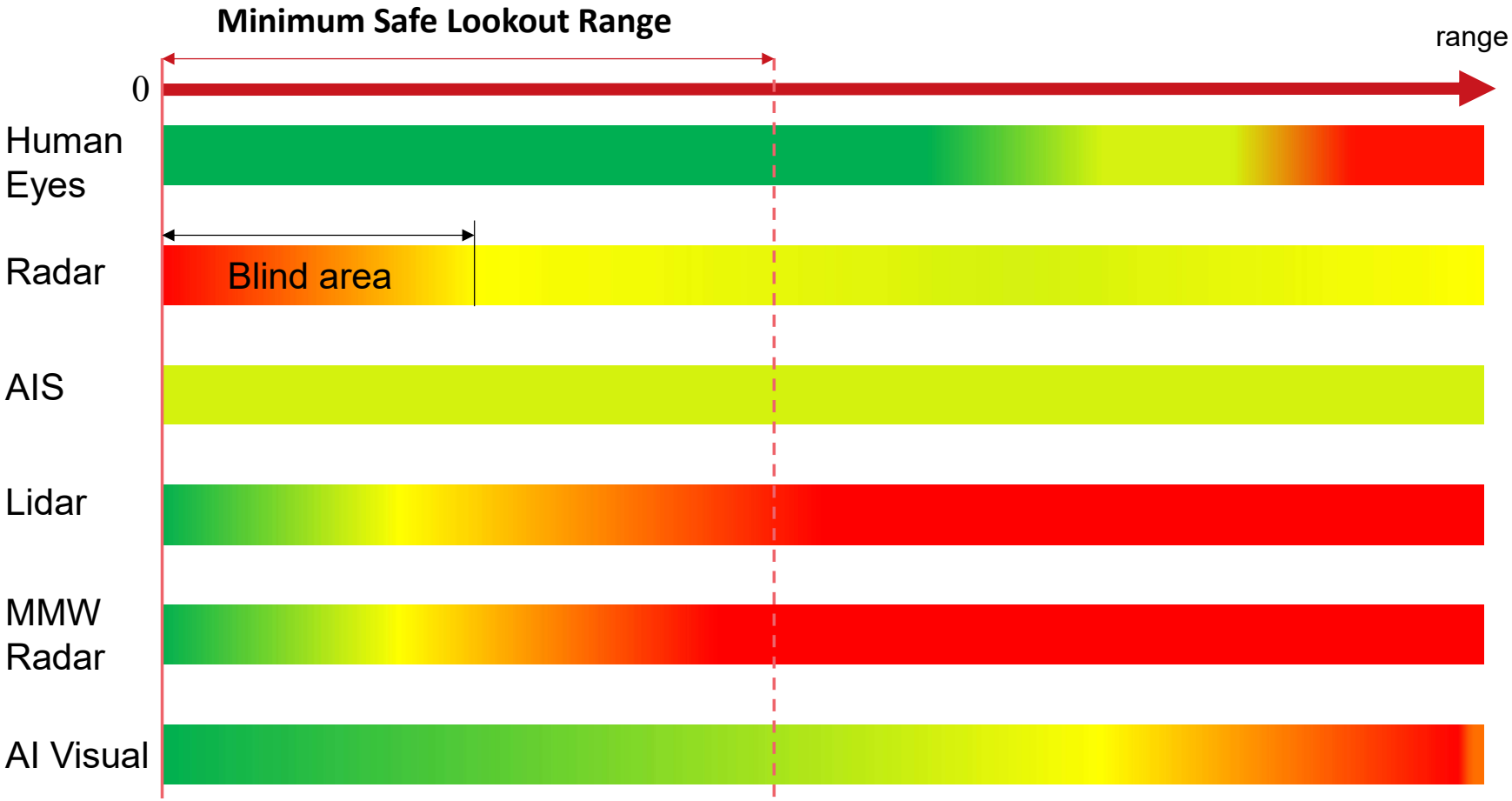
Within Minimum Safe Lookout Area, safety equivalency must be assured:

- All objects that may cause collision risk must be detected;
- All risks must be identified;
- Enough time and space must be available to allow for collision avoidance decision making and maneuvering.

Minimum safe lookout area may vary due to:

- Ship type and ship size
- Speed and operational scenarios
- Ship propeller systems (bow thrusters and Azimuth thrusters)
- Environment conditions (wind/wave/current)

Comparison of Various Detection Technologies



ISO Project: Determine Minimum Safe Lookout Area for MASS

The project is set to:

- Thoroughly interview as many Masters as possible, to gain sufficient insight to determine reasonable safety lookout area at various operational environments and conditions.
- Test and verifying real-ship situational awareness systems, to reach a quantifiable and verifiable conclusion with a statistically convincing minimum requirements for Safe Lookout Area essential for a MASS.
- Produce standards and criteria on minimum requirements on Safe Lookout Area, hence enabling all sub-functions and sub-systems of ANS for MASS to be developed with clear guidance

Progress So Far…

Project: “Determine minimum requirements for safe lookout area” and “Determine minimum requirements for berthing”

- Over 100 ships confirmed to participate in this study and test;
- Call on more entities worldwide to participate in this project, to enrich the study， participate in discussions, and share the findings;
- And work out a set of requirements on Minimum Safe Lookout Area which is fundamental for MASS’ development.

AI Technologies for Situation Awareness for MASS

All Around Coverage

- ✓ 360° Situation awareness, no blind area
- ✓ Apply all detection technologies to identify all potential risks in lookout area

All Weather Conditions

- ✓ With enhanced visibility in night and foggy conditions for navigation day and night

All Processes

- ✓ From berthing to navigation
- ✓ Extended capability on detection, risk identification,route planning, to automatie controlling

Sea-shore Sharing for All Stakeholders

- ✓ Enabling shipping companies to view vessel ‘ssurrounding environment in real time from anywhere.

To join project

“Determine Minimum Requirements for Safe Lookout Area”

“Determine Minimum Requirements for Berthing

Contact Project Leader

ben.zhang@marautec.com

Thank you for attending.

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