SEAMLESS

Regulatory Development & Risk Based Approval

REGULATORY & INTEGRITY – KONGSBERG MARITIME

SONDRE SOLVANG

REGULATORY SAFETY ADVISOR

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Kongsberg Maritime

At a glance

NOK 26bn
revenue

>30000
vessels with our solutions onboard

~8000
employees

Technology-driven integrator and systems provider to the maritime industry

Delivering the systems of tomorrow...

Present across the value chain, combining advanced engineering with deep domain knowledge of maritime operations

01 Vessel design
02 Components
03 System integration and automation
04 Delivery to yards and vessel owners
05 Aftermarket services

Uniquely positioned through a broad offering and system integration across the value chain

... tailored to the needs of today's fleet

Integrating the next-generation maritime technology and delivering future-proof solutions for all types of vessels

Designing and equipping the world's vessels, with ~1/3 of today's fleet using Kongsberg Maritime's solutions

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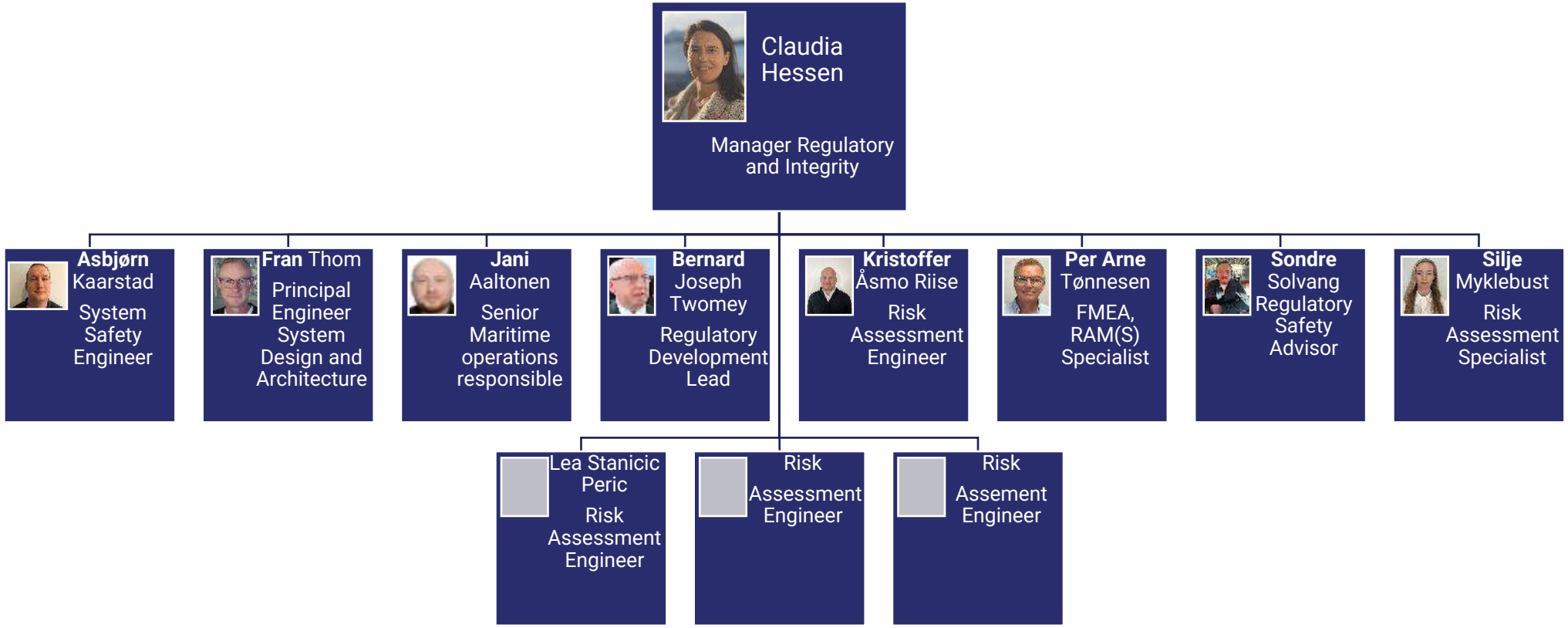
Who Are We?



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Agenda

Regulatory Development

- Regulations vs. Rules
- Shaping Maritime Regulations
- Regulatory Compliance
- Key Achievements

Risk Based Approval

- Methodology
- Analysis and Verification
- Key Achievements

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Regulations vs. Rules

Direct Regulations - *this tells people what they have to do and are enforceable by law and enforced by regulatory agencies with appropriate powers.*	Legal sanctions if not complied with • Acts of Parliament • associated statutory instruments • International Conventions • EU measures	IMO Finnish Maritime Administration Sjøfartsdirektoratet Norwegian Maritime Authority Danish Maritime Authority Maritime and Coastguard Agency
Rules, guidance, best practice – *do not have the force of law but can include certification processes attached to them*	• Government bodies, • NGO's • International Standards such as ISO, IEEE which sets out expectations – maybe specified in the contract for certification.	ISO International Organization for Standardization IEEE DNV LR Bureau Veritas ABS CCS

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Regulatory Development

- With the wide involvement we have the possibility to influence future regulations at national and international level. This places KM in a unique position within the maritime sector.
- With the competence collected in R&I we have the ability to **anticipate**, **interprete** and **influence** the **regulatory landscape** that will shape KM's future products and strategy.

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Shaping Maritime Regulations

Why influence IMO?

- Ensure regulations are achievable and evidence based
- Align new requirements with KM's technological capabilities
- Protect KM's commercial interest and credibility

How we influence

- Active participation with key flag states
- Engagement with recognised NGO's and industry bodies
- Providing direct advisory input to regulatory organisations

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Regulatory Compliance

- Regulatory Working Group ensures **regulatory compliance** with national and regional laws for **safe**, **secure**, **efficient** and **environmentally sound shipping**, covering everything from ship construction and pollution prevention to security.
- Ensure that we participate in rule hearing and that rule changes are implemented in KM

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Key Achievements

Prevented onerous requirements entering the MASS Code that would have had a significant financial impact on our business. (Minimum Risk Condition to Fall-Back States). A Minimum Risk Condition would result in the maritime sector having more stringent requirements to that of the aero, nuclear, medical, rail and automotive sectors.
Removed requirements that were unachievable. (Real Time changes to Timely), and ambiguous language open to interpretation by individual flag states.
Influencing amendments to the UK Primary Legislation making the UK MASS market more attractive to MASS Customers.
Informed the UK-NSO on future skills force through the SMI.
Established recognition as world leaders in the development of regulations applicable to MASS.
Provide expert advice and act as advisors to Norway, Denmark, Finland, Germany, Liberia, Marshall Islands along with CESA (EU), CIMAC, OneSea, IMarEST, IET, ISO, NI, IMPA.
Support academic collaboration in Norway (NTNU) and the UK (York, Strathclyde, Cranfield, UCL, Swansea and Cambridge)

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Going Forward

- Ensure we have a single point of contact for all regulatory engegagment
- Continue to actively engage with the regulatory authorities at national and international level in the development of maritime regulations
- Ensure that jurisdictional variations are captured and their implications on KM's services are fully understood

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Risk Based Approval

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Approval Without Prescriptive Rules?

Shift to Risk-Based Assessments

In the absence of clear rules, authorities use risk-based methods to evaluate autonomous maritime systems and ensure safety.

Performance-Based Standards

Instead of rigid checklists, performance-based criteria assess how well systems meet safety and operational goals.

Collaborative Approach

Industry, regulators, and technology experts work together to approve innovations and maintain safety in autonomous vessels.

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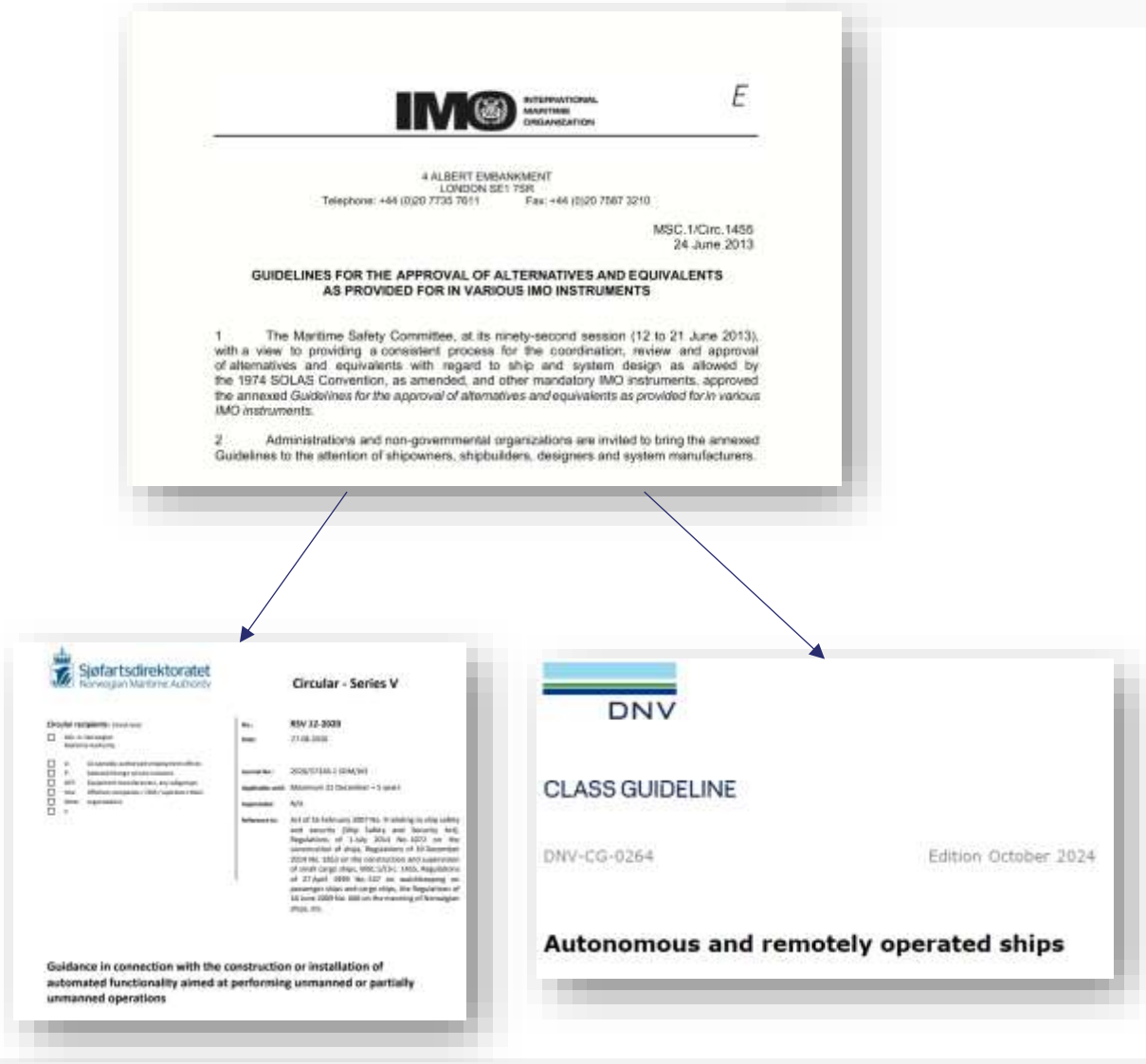
Risk based approval

Flag states and classification societies employ structured risk management methodologies, as described in IMO MSC.1/Circ.1455, to evaluate and approve autonomous vessels and systems.

Under Circ. 1455, the approval pathway requires a systematic identification, assessment, and mitigation of hazards—typically through methods such as HAZID (Hazard Identification), FMEA (Failure Modes and Effects Analysis), and other qualitative or quantitative risk analyses.

- NMA RSV 12-2020 and DNV CG-0264 are guidelines for approving and safely operating autonomous and remotely controlled vessels, based on the risk management framework in IMO Circ. 1455.



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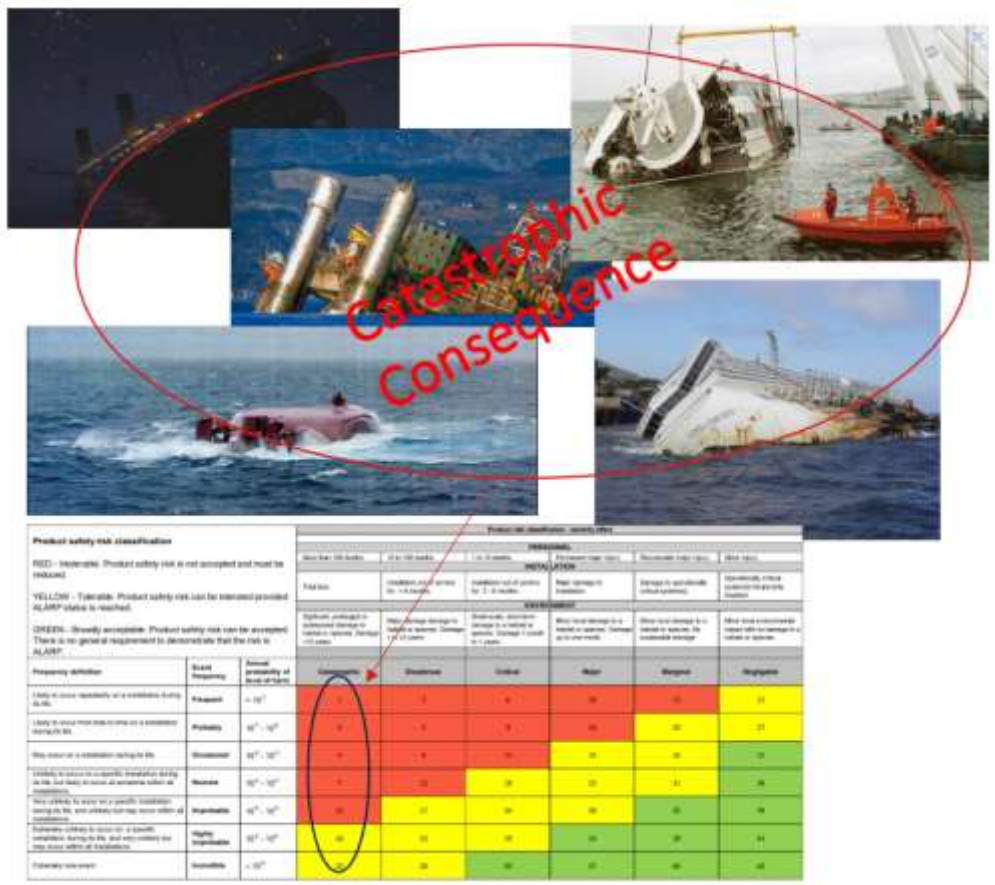
Risk Methodology – Hazard Identification (HAZID)



Systematic Hazard Recognition

HAZID provides a structured approach for identifying potential hazards in various industrial activities and operations.

Multidisciplinary Team Approach

HAZID engages experts from different fields to brainstorm and analyze potential risk scenarios together.

Improving Safety and Compliance

Outcomes from HAZID guide organizations to implement controls, elevate safety standards, and achieve regulatory compliance.

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Risk Methodology – Failure Modes & Effect (Criticality) Analysis (FME(C)A)

Systematic Risk Assessment

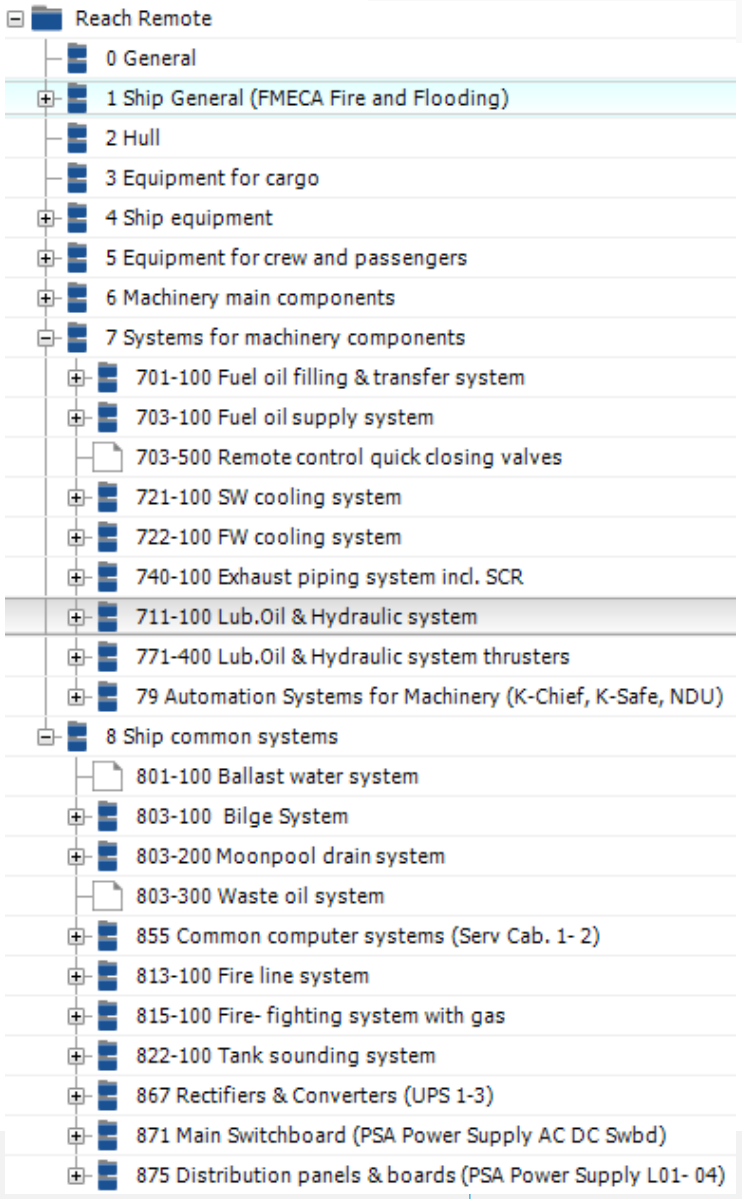
FMEA provides a structured approach to identifying and evaluating potential failure modes in products or processes.

Causes and Effects Evaluation

The methodology focuses on assessing the causes and effects of failures to understand their impact and likelihood.

Prioritizing Mitigation Actions

FMEA helps organizations prioritize corrective actions to address the most critical risks, enhancing reliability and safety.



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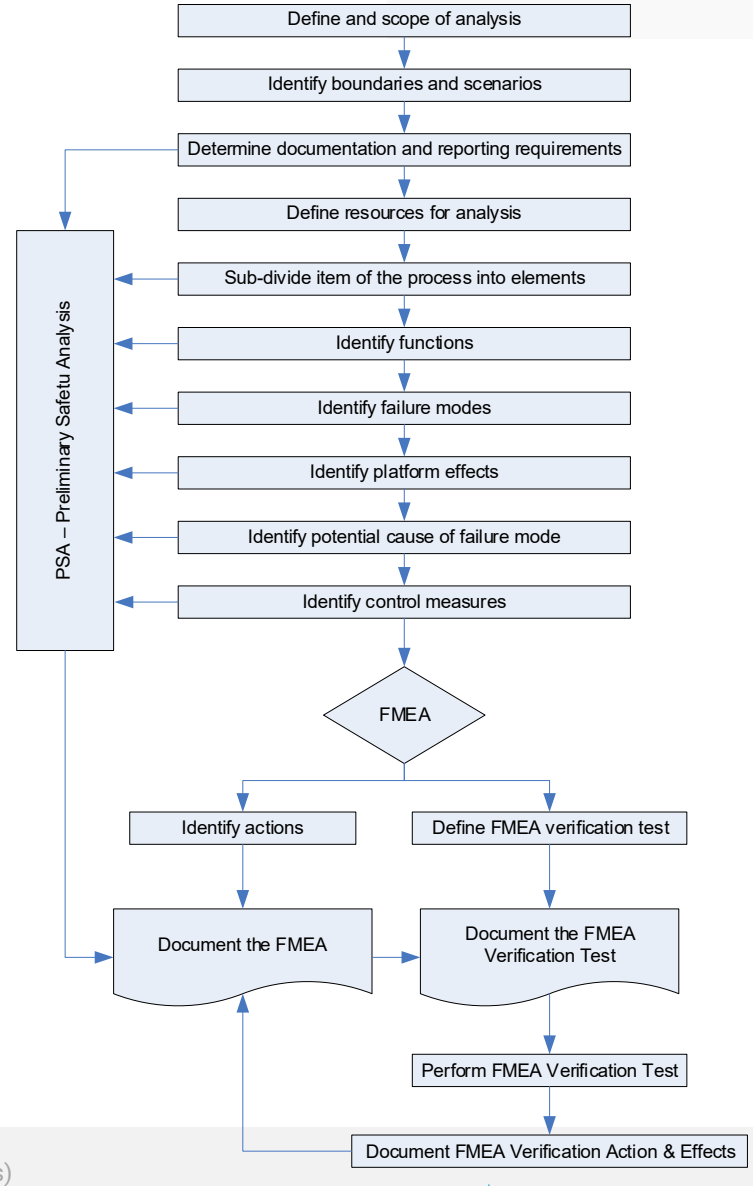
Risk Methodology – FME(C)A

- **Turning Insights Into Actions**
- **Supporting Regulatory Approval**
- **Building Confidence Across Stakeholders**
- **Enabling Continuous Improvement**



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FME(C)A Verification

FMEA Verification Testing

1. Confirms FMEA predictions in real-world conditions
2. Bridges theory and actual system performance
3. Ensures failure modes behave as predicted
4. Verifies control measures function properly
5. Identifies further mitigations for discrepancies
6. Used in KM verification programs and proving trials
7. Proves FMEA validity and system operability

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Success 2025 –ASKO/ YARA

Breakthroughs in Remote & Autonomous Operations

ASKO/ YARA BIRKELAND

•Achieved successful IAT and DNV testing for MARIT, THERESE and YARA Birkeland with no show-stoppers, enabling progression to operational readiness.

•Secured DNV/NMA approval for 1:3 remote engineering monitoring & control, marking a world-first capability at this vessel scale.

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Success 2025 – Reach Remote

Breakthroughs in Remote & Autonomous Operations

Reach Remote

- Delivery of Reach Remote 1 & 2
- Completed IAT and DNV testing for Reach Remote vessels and supported successful “removal of assisting vessel” concept validation through hazard identification and testing.
- *As of today, Reach Remote 1 is operating in the North Sea, with vessel control located in Horten, and ROV control in Haugesund*
- *Reach Remote 2 is operating in Offshore Australia with Vessel and ROV ROC in Perth.*

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