



Cyber-SHIP Lab
SECURING MARITIME



The Development of a Cyber Safety Culture

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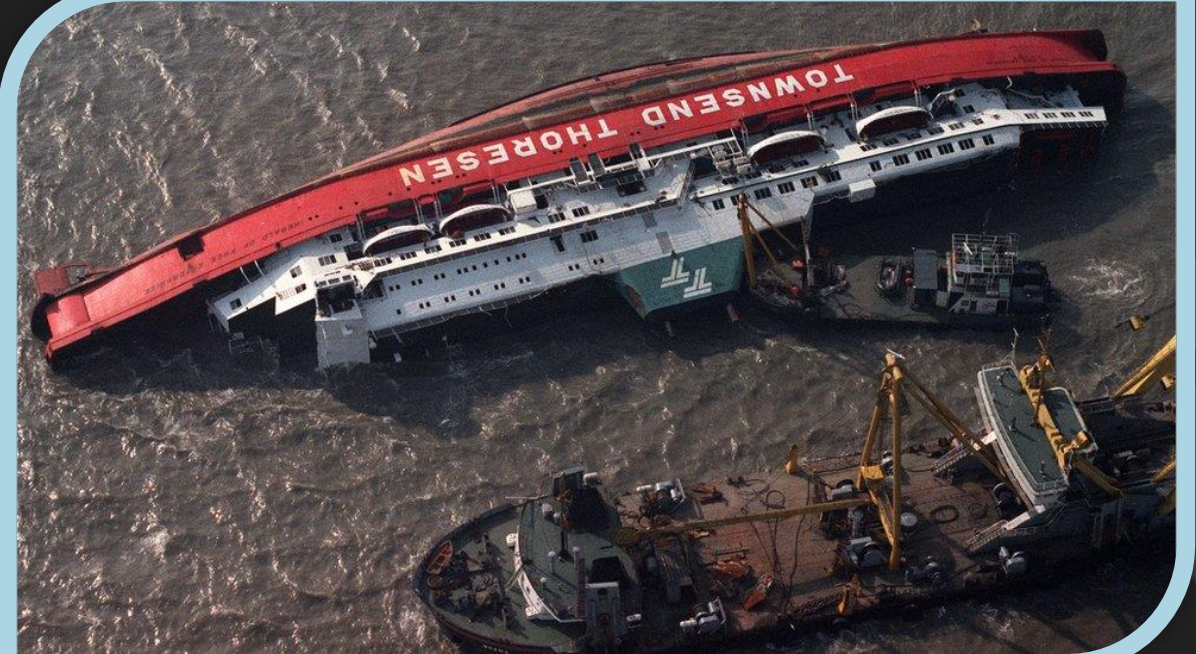
Safety and the Human Element



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“... infected with the disease of sloppiness”

(Department for Transport, 1987)

The Rise of Safety Management



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- Resolution A.596(15) – Safety of Passenger Ro-Ro Ferries
 - Published by the IMO in 1988
 - Stronger safety management practices were needed
- Resolution A.647(16) – IMO Guidelines on Management for the Safe Operation of Ships and Pollution Prevention
 - Published by the IMO in 1989
 - Precursor to the ISM Code
- ISM Code
 - Mandatory elements under SOLAS
 - Obligates States and companies to ensure safety risks are management appropriately



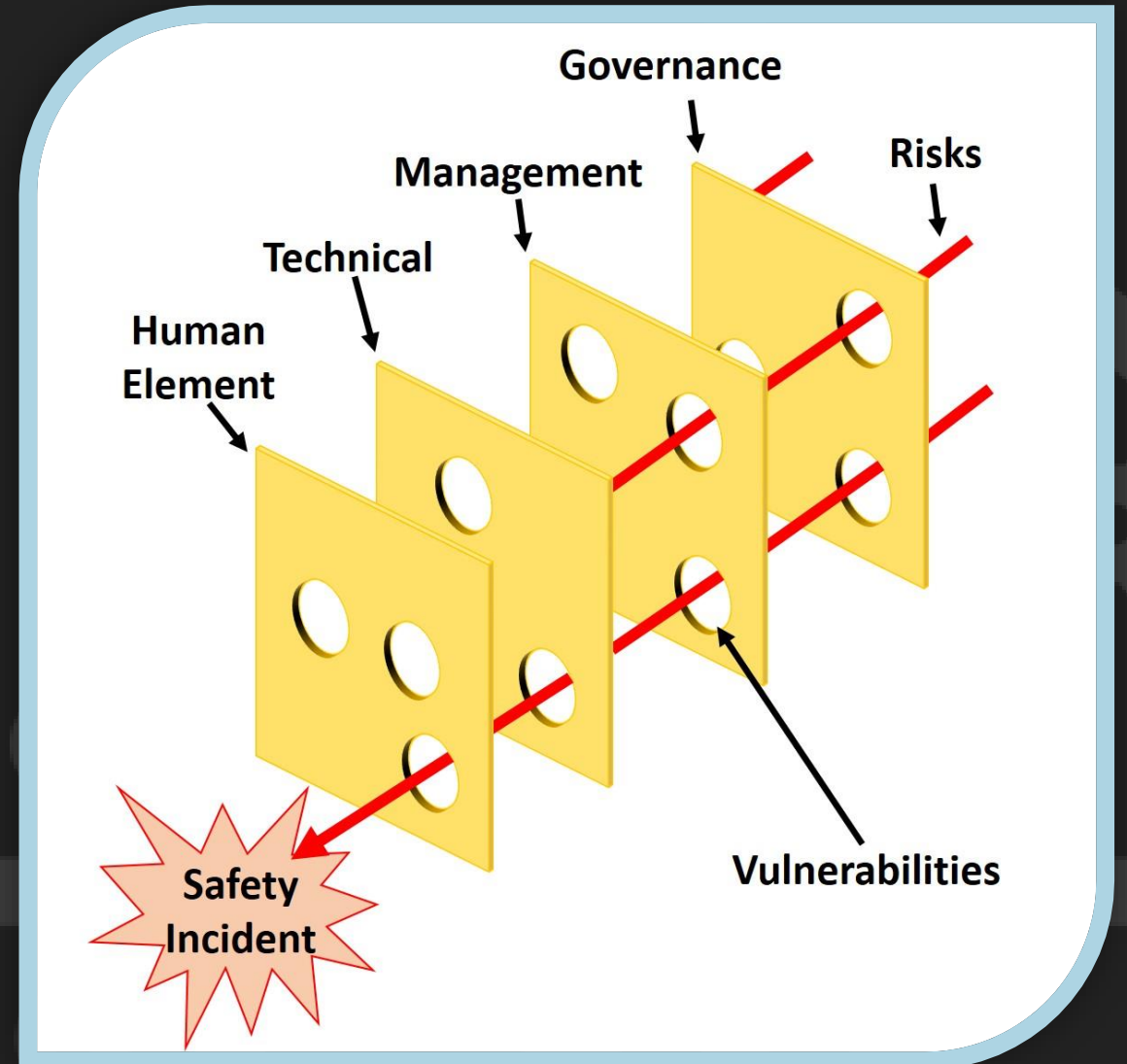
Maritime Safety Swiss Cheese Model



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- Adapted from Reason's (1997) *Swiss Cheese Model*
- Safety management has many layers of mitigations
- Each layer has weaknesses
- Good safety management ensures these "holes" do not line up





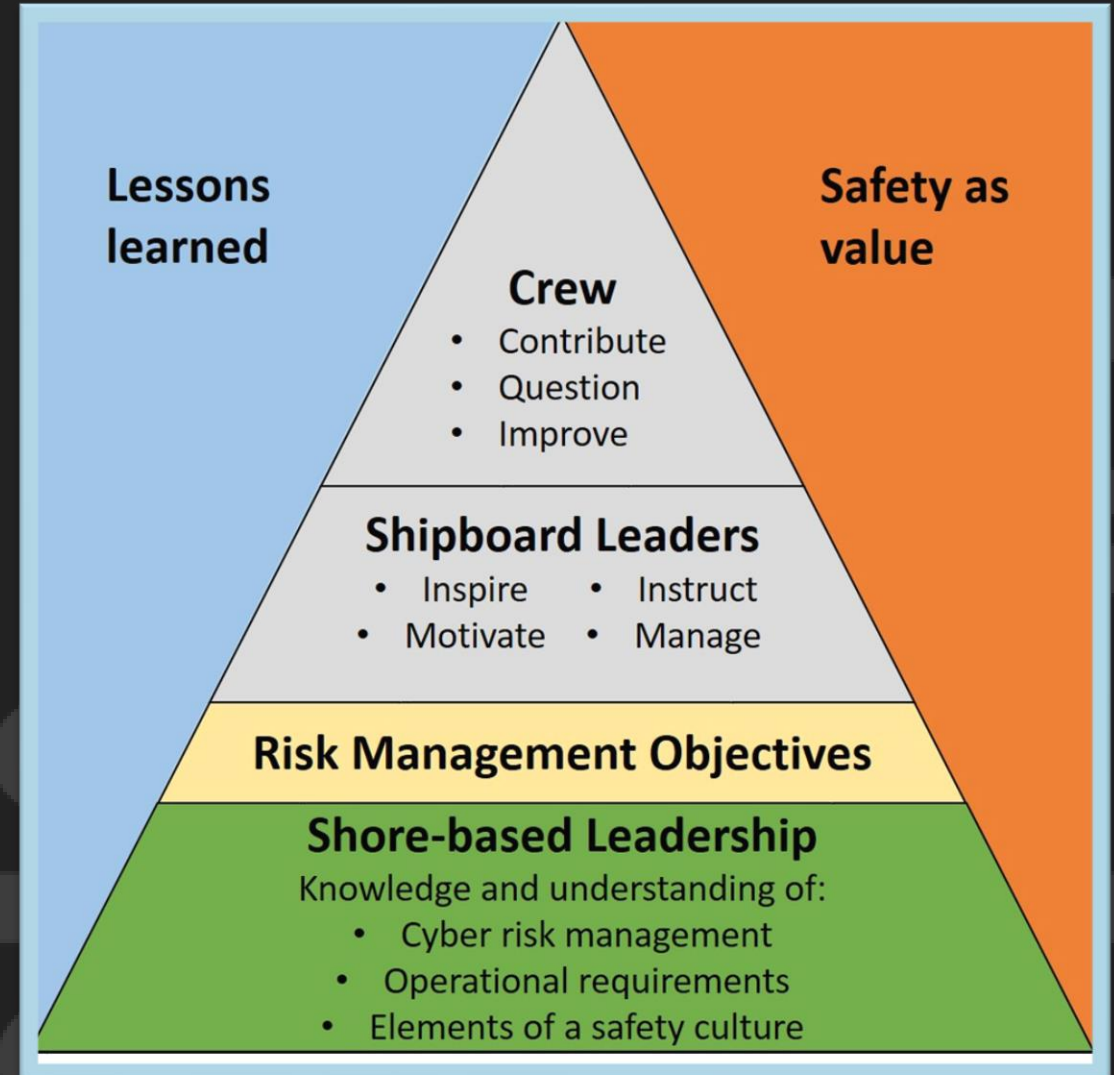
Safety Management in Action

Table 1. Factors Leading to the Capsize of the Herald of Free Enterprise

Failure in...			
Governance	Management	Technical	Human Element
Bow and stern loading doors were only required to be <u>weathertight</u> (a lesser <u>watertightness</u> level).	Memorandum sent to operators pressuring them to load and leave <u>Zeeburgge</u> 15mins ahead of schedule.	Lack of <u>fool proof</u> system to indicate to bridge that the doors have been closed.	The Captain accelerated rapidly, causing water to flood the car deck.

Developing a Safety Culture

- ISM Code and the SMS requires the development of a safety culture
- Challenges facing development
 - Information Difficulties
 - Organizational Behaviours
- Adapted from Drouin's (2010) Safety Culture Pyramid
 - Engagement at all levels of an organisation
 - All have different responsibilities



Benefits of a Cyber Safety Culture



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- Resolution MSC.428(98)
 - Mandates inclusion of cyber risk management in Ship's SMS
 - A safety culture is the transition from a "paper exercise" to practical benefits
 - If people think "cyber safety" in all parts of daily operations less incidents are likely to occur – should become subconscious like fire safety etc

Compliance with Resolution MSC.428(98)

Being able to demonstrate that cyber risk is considered holistically and managed appropriately.

Reduction in Risk Human Element Pose to Safety

Allow personnel to "become robust human firewalls" against cyber incidents.
(European Union Agency for Network and Information Security, 2017)

Reduction in Insurance Premiums

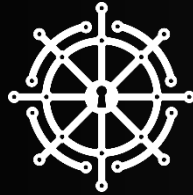
A cyber notation from the Class Societies can help reduce insurance as it demonstrate compliance etc.

Avoidance of Costly Financial Ramifications

The negative publicity and regulatory fines associated with cyber incidents can have a significant impact.



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Thank you



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References

- Department for Transport. (1987). *Herald of Free Enterprise Formal Investigation*. Retrieved May 10th, 2021, from https://assets.publishing.service.gov.uk/media/54c1704ce5274a15b6000025/FormalInvestigation_HeraldofFreeEnterprise-MSA1894.pdf
- Drouin, P. (2010). The building blocks of a safety culture. *Seaways, October*, 4-7. Retrieved from http://www.safeship.ca/uploads/3/4/4/9/34499158/safety_culture_pauldrouin.pdf
- European Union Agency for Network and Information Security. (2017). *Cyber Security Culture in Organisations*. Retrieved 19th May, 2021, from <https://www.enisa.europa.eu/publications/cyber-security-culture-in-organisations>
- International Maritime Organization. (1989). *Resolution A.647(16) - IMO Guidelines on Management for the Safe Operation of Ships and Pollution Prevention*. London: International Maritime Organization
- International Maritime Organization. (1988). *Resolution A.596(15) - Safety of Passenger Ro-Ro Ferries*. London: International Maritime Organization
- Reason, J. (1997). *Managing the Risks of Organisational Accidents*. Aldershot: Ashgate Publishing.

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