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Maritime pilotage, cyber insurance and autonomous shipping conundrum

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The role of a pilot

- International regulation on issues concerning pilotage…… ?
- UK: S31(1) of the Pilotage Act 1987 – maritime pilot is "*any person not belonging to a ship who has the conduct thereof*"
- Maritime pilots: "servants of the vessel" – expert / specialist / advisory role (at least in theory!) …?
- Conduct vs command of a ship; action vs power

Maritime pilotage – liability

-> civil, not criminal

Relative immunity across jurisdictions: low limitations, high burden of proof, restrictions in ways claims can be brought etc.

Technological progress + global pandemic = more focus on REMOTE PILOTAGE

Quite opportune for MASS

Image source: Riviera Maritime Media

Maritime pilotage & MASS

- Departure from the physical onboard presence in the advent of MASS.
- Most likely **short to medium-term solution**: **remote pilotage**.
- Recently receiving more attention due to COVID-19.
- Advantages: pilot safety, financial;
- Challenges: limitations of technology.

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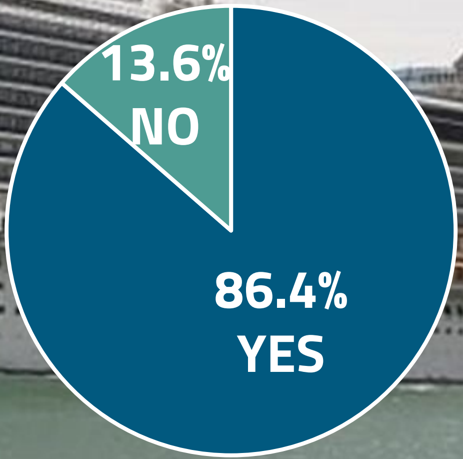
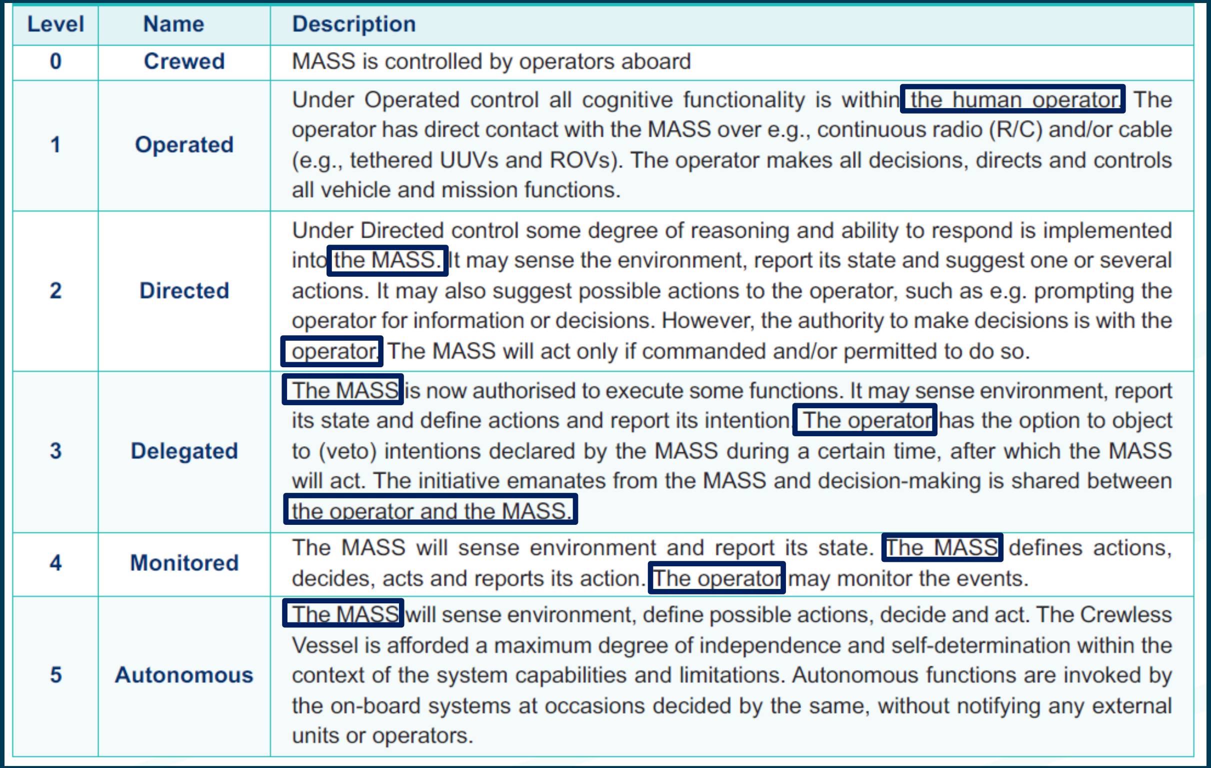
Would you have any concern if your vessel was being piloted remotely (or for pilots, if piloting a vessel remotely)?

2021 survey
122 respondents:
Pilot 27%
Master 24%
Chief Officer 16%
Junior Officer 22%
Other 11%



Source: Camille Blake ‘An analysis of the use of technology in remote pilotage operations’

MASS – levels of control



Level	Name	Description
0	Crewed	MASS is controlled by operators aboard
1	Operated	Under Operated control all cognitive functionality is within the human operator. The operator has direct contact with the MASS over e.g., continuous radio (R/C) and/or cable (e.g., tethered UUVs and ROVs). The operator makes all decisions, directs and controls all vehicle and mission functions.
2	Directed	Under Directed control some degree of reasoning and ability to respond is implemented into the MASS. It may sense the environment, report its state and suggest one or several actions. It may also suggest possible actions to the operator, such as e.g. prompting the operator for information or decisions. However, the authority to make decisions is with the operator. The MASS will act only if commanded and/or permitted to do so.
3	Delegated	The MASS is now authorised to execute some functions. It may sense environment, report its state and define actions and report its intention. The operator has the option to object to (veto) intentions declared by the MASS during a certain time, after which the MASS will act. The initiative emanates from the MASS and decision-making is shared between the operator and the MASS.
4	Monitored	The MASS will sense environment and report its state. The MASS defines actions, decides, acts and reports its action. The operator may monitor the events.
5	Autonomous	The MASS will sense environment, define possible actions, decide and act. The Crewless Vessel is afforded a maximum degree of independence and self-determination within the context of the system capabilities and limitations. Autonomous functions are invoked by the on-board systems at occasions decided by the same, without notifying any external units or operators.

Decreasing causal efficacy of the human agent as the level of autonomy increases.

Source: Maritime UK

Maritime pilotage & MASS cont.

- Varying levels of autonomy and multiple actors: MASS, shore control centre, pilot etc.
- Dynamics of shared control - any possible override? If not, who has **conduct** and who is **in command**? What is the legal status of each actor?
- Data gathered during each operation - possible demise of pilotage in the **long-term future**?
- Decreasing causal efficacy of human agents in the light of the increasing criminalisation – **a concern**.
- Increasing role of technology – new threats?

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> *Because of the current* ***limited level*** *of* ***technical sophistication*** *on board, the modern ship may not yet be a tempting target for the cybercriminal in a way that puts the hull, machinery or cargo at direct risk of loss or damage.*

Cyber Risk - Joint Hull Committee paper, 2015

MASS?

$10,500,000,000,000

Estimated **annual cost** of cybercrime by 2025.

$10,000,000,000

Estimated cost of **the 2017 NotPetya attack**.

Sources: Cybercrime Magazine; Wired

Cyber-attacks in the maritime domain

The 2017 NotPetya attack affected **Maersk**, amongst at least 300 other companies worldwide

In 2020 **CMA CGM** had to temporarily close its shipping container booking system due to the Ragnar Locker ransomware attack

Later that year, **MSC** was attacked by malware that brought down its data centre for several days

Cyber-attacks in the maritime domain

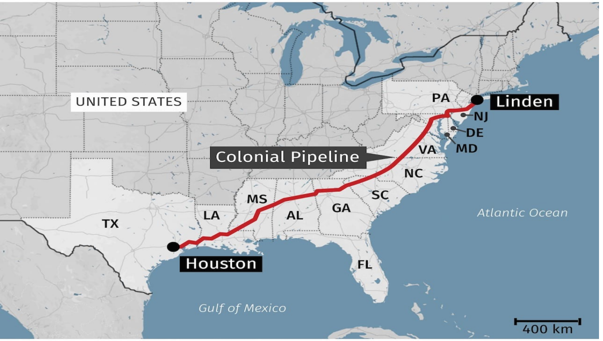
Approx. **25%-35%** of organisations admit to falling victim to **cyber-attacks** in the preceding 12 months

In 2020, Allianz reported a **400% increase** in attempted **malware attacks** against shipping companies

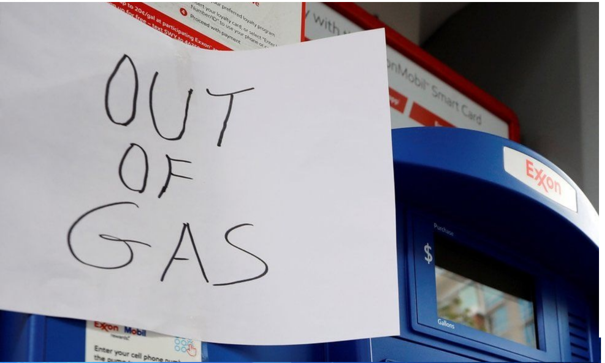
However, the true scale of the problem is difficult to gauge due to **underreporting / unawareness**

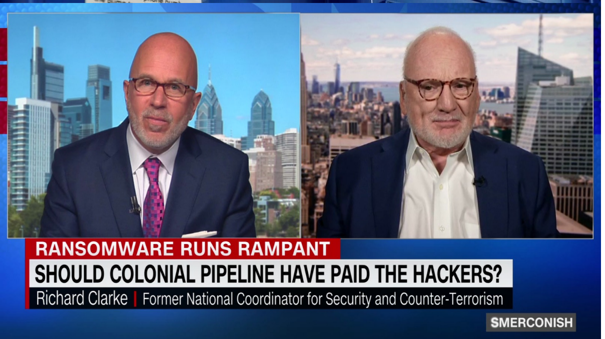
Sources: Cyber security white paper; Safety and Shipping Review 2021

Major U.S. gasoline pipeline hit by cyberattack



CBC NEWS




RANSOMWARE RUNS RAMPANT
SHOULD COLONIAL PIPELINE HAVE PAID THE HACKERS?
Richard Clarke | Former National Coordinator for Security and Counter-Terrorism
SMERCONISH

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Cyber-attacks are moving outside of the IT realm

The Colonial oil pipeline 2021 cyber-attack ended with **$4.4 million ransom** paid.

Critical infrastructure is particularly vulnerable – paying ransom is usually cheaper than dealing with the consequences of the attack.

Source: Bloomberg UK

Cyber-attacks are moving outside of the IT realm

900%

Increase in reported attacks on the maritime industry's OT in the last 3 years

$1,000,000,000 -> not cyber-related!

Estimated cost of Suez Canal blockage by Ever Given

$110,000,000,000

Losses caused by a hypothetical scenario - Shen attack

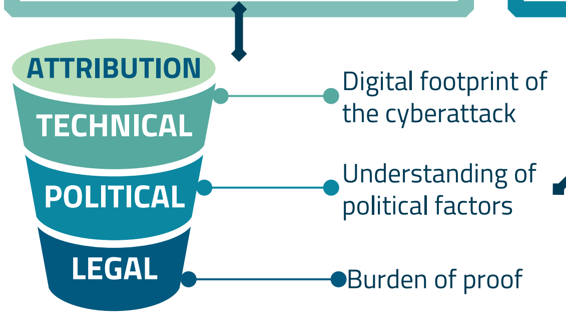
Sources: Shipping News; Reuters; Shen attack

Marine Cyber Insurance – 2022

Available cover is both **limited** and **restricted**, with the widespread use of **war risks** carve outs.

Ongoing challenges e.g. **ambiguous wording**, defining **maliciousness** and establishing **attribution**.

It is estimated that up to **92%** of the costs that may result from a cyber-attack may be **uninsured.**



ATTRIBUTION

TECHNICAL – Digital footprint of the cyberattack

POLITICAL – Understanding of political factors

LEGAL – Burden of proof

Source: [Maritime London Mapping a Path to Cyber Attribution]

Cyber-Risk Assessment for MASS

Potential MASS cyber vulnerabilities? TBC

Older vessels - outdated operating systems, software and inadequate cybersecurity measures?

Inside threats: human error, malicious insider, social engineering – still relevant?

Lack of onboard access.

Source: Safety4Sea

Cyber-Risk Assessment for MASS cont.

Higher cyber-physical interaction in comparison with traditional shipping operations.

Are navigational systems the most vulnerable? GNSS, ECDIS and the communication devices on shore control centres.

Greater integration and interconnectivity expand the potential attack surface. (?)

Sources: Cyber security risk assessment in autonomous shipping

MASS Insurance?

Image source: Automotive Logistics

MASS RISKS

A novel, navigaional risk type: “naked” software risk

Changes to the residual human risks

MASS SOFTWARE RISKS

Cyber loss randomness

- Loss experience data
- The law of large numbers
- The central limit theorem

Maximum cyber losses

- High impact low frequency events
- Loss cascades

Source: Autonomous Ships and the Law

MASS HUMAN RISKS

Change of status quo

Knowledge

Fortuity

Moral hazard

New actors

Remote operators

Management

Source: Autonomous Ships and the Law

Summary

Image source: Automotive Logistics

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Thank you.

Any questions?

Let’s keep the discussion going.