



# Will Robots Save The Ship?

## *Options for Lean Crewed and Autonomous Ships* Naval Damage Control Conference 2024

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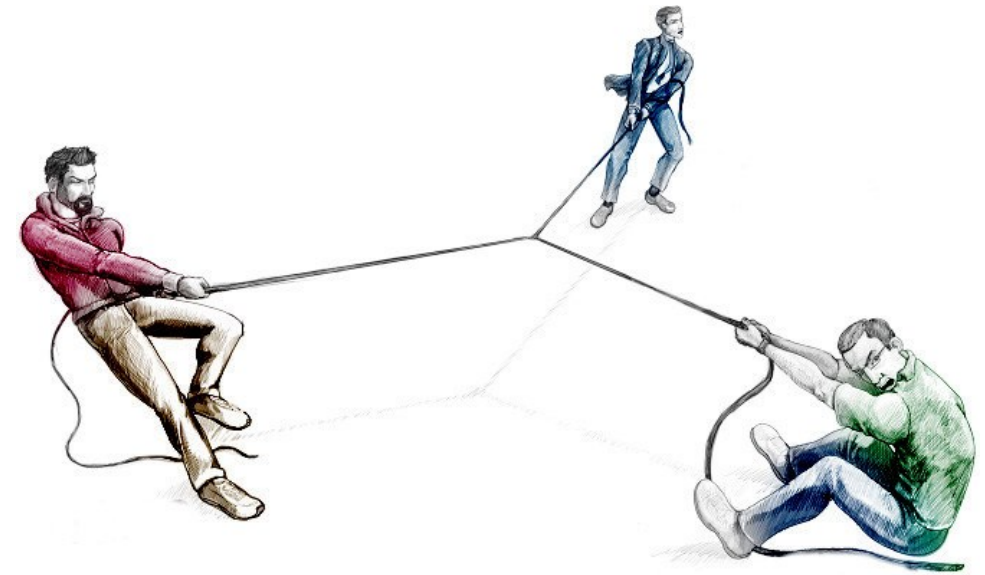


# Presentation Outline

- Introduction
- Developing Trends in Platform Design
- The Challenge of Lean Crewing and Autonomous Ships
- Potential Mitigations
- Autonomous and Robotic DCFF Systems
- Conclusions

# The Developing Naval Environment

- Lean crews
- Autonomous ships
- Increasing threat
- More diverse threat (maybe)
  
- Demands from our seniors for lean-crewed ships – but also cheaper – and more lethal.
- Maybe not a situation where “pick any two from three” is applicable



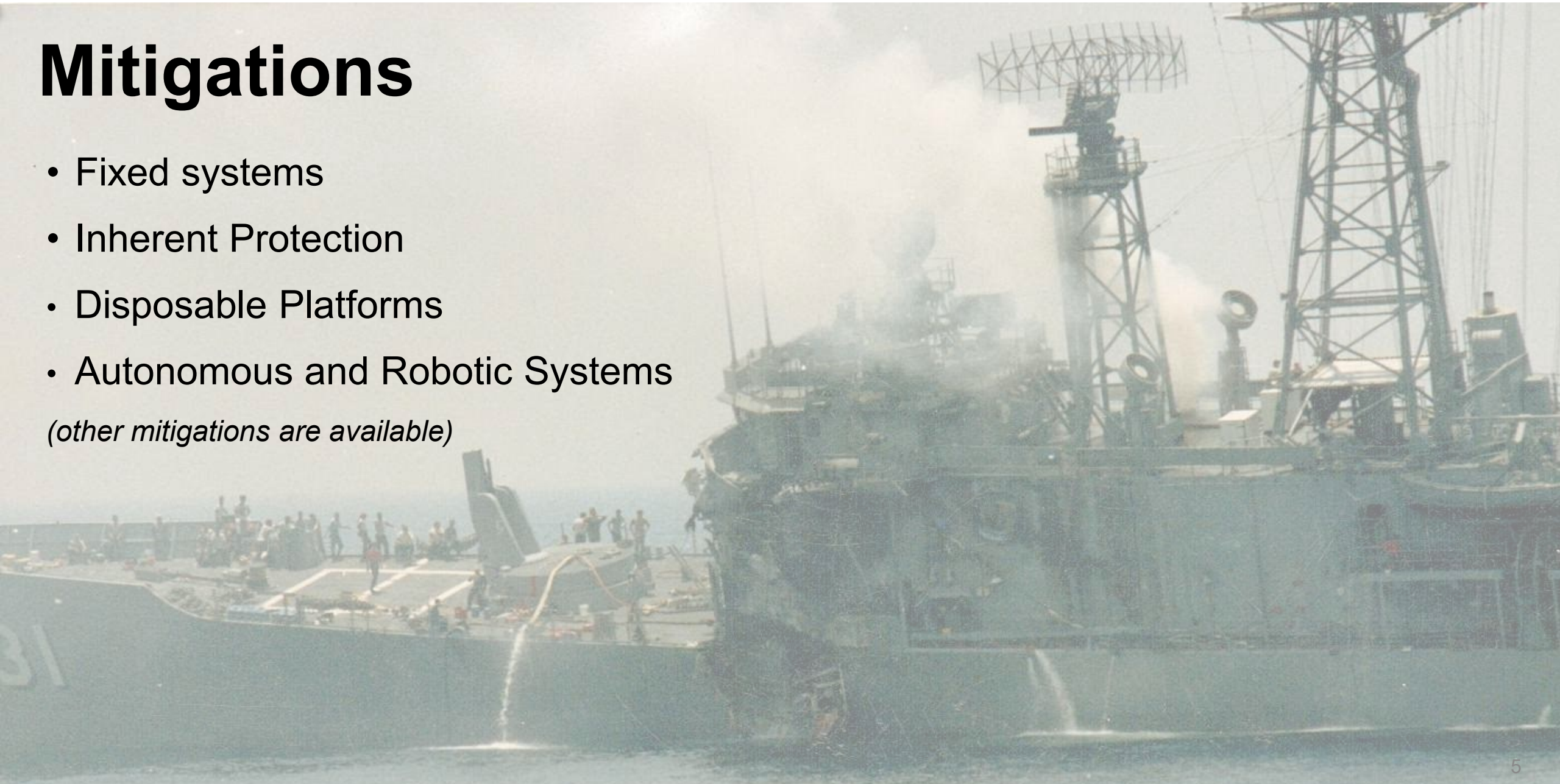
# Lean/Autonomous Shipping

- Reduced personnel available for DCFF
- None in autonomous shipping
- Potential for the loss of significant fleetwide capability if craft are lost
- In warships, potentially causing warfighting activity to be reduced or stopped whilst an incident is resolved
- What can we do?

# Mitigations

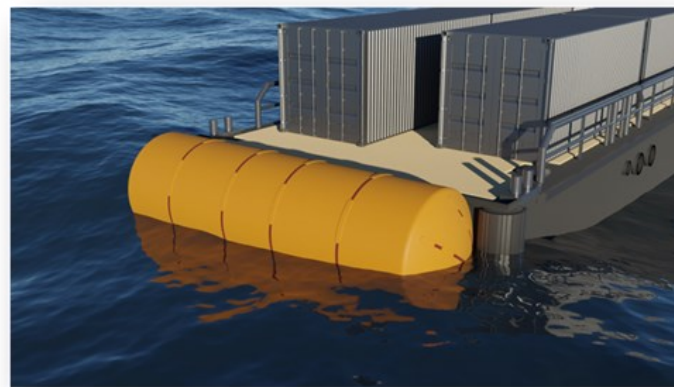
- Fixed systems
- Inherent Protection
- Disposable Platforms
- Autonomous and Robotic Systems

*(other mitigations are available)*



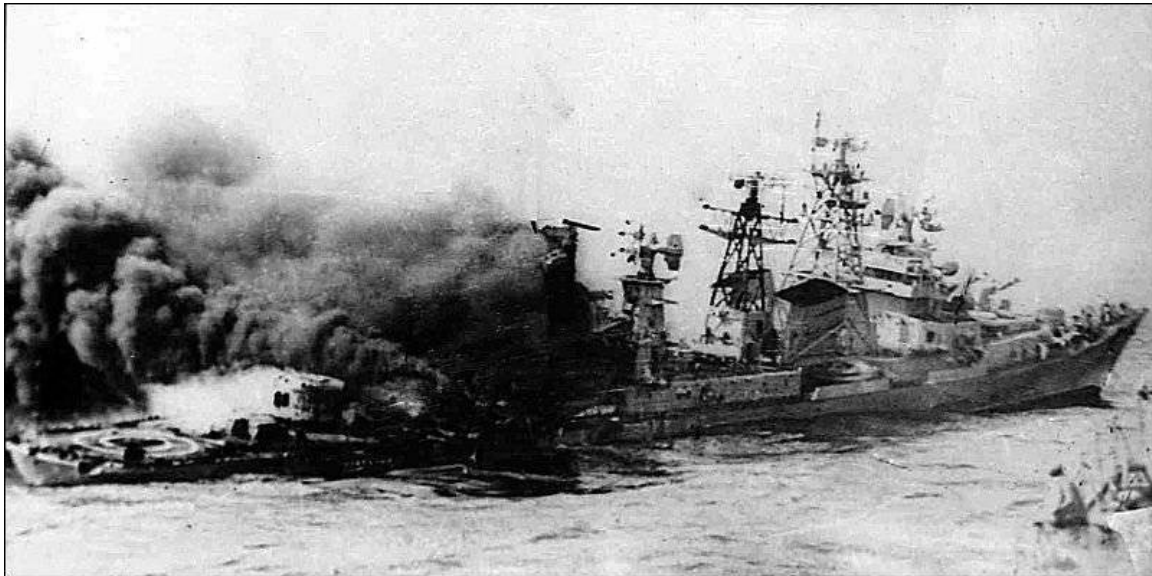
# Fixed Systems

- Watermist, dewatering systems
- Intelligent Fluid Systems
- Well understood
- Developing systems (e.g. IDACS)



# Fixed Systems

- Will they work when you need them?
- Will they work too well?



# Inherent / Augmented Protection

- Blast / fragment resistant structure
- Self healing structure
- Intumescent coatings, swelling fibres





# Disposable Platforms

- Have been considered several times
- Never really caught on
- How costly before “disposable” becomes unpalatable?
- What about the crew?



# Autonomous and Robotic Systems

- .....

# DC Robots? That's just Science Fiction!

- Maybe, maybe not
- Arguments against – expensive, not proven, fragile, will make mistakes
- The RN has invested over £200m in offboard MCM
- A key driver has been reducing the risk to personnel
- “Taking the man out of the minefield”
- If we can do that for MCM, why can't we do the same for fires, floods and other damage control activities?
- Is our current approach ALARP?



# Is Development Practicable?

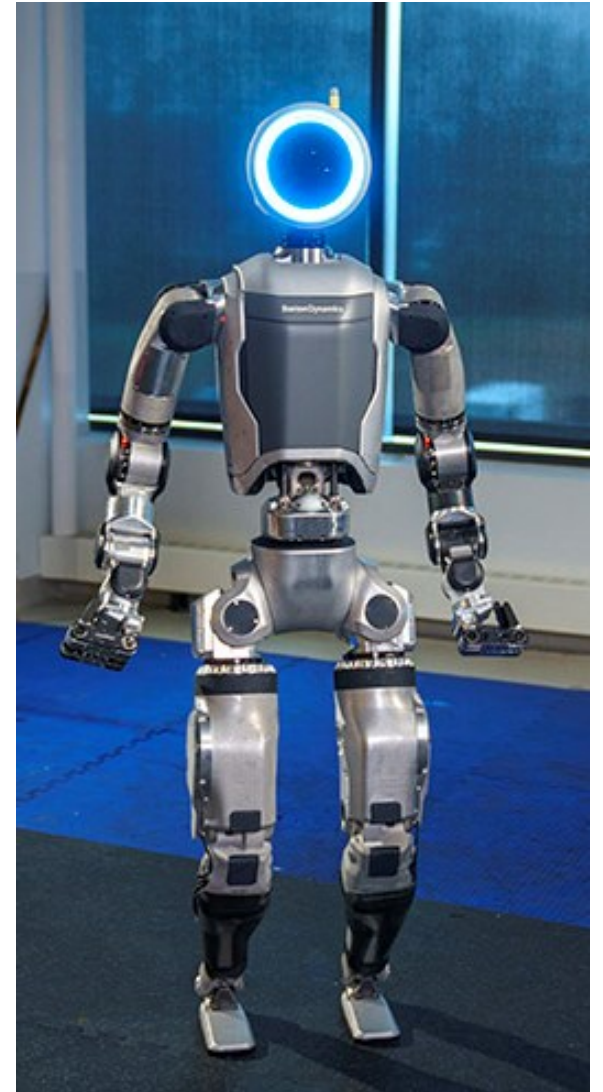
- Yes, its “just” a question of money
- Mobility / Stability
- Current bipedal robots have good resistance to perturbations, impacts, uneven surfaces
- Robots don't need to be bipedal, lower CofG. Additional arms for bracing
- Identifying damage and applying DC techniques
- An ideal case for AI/ML and a graduated implementation
  - Remote control
  - Command approval
  - Autonomous



*\*\*Yusuf, Amani, Use of autonomous systems to reduce personnel risk in shipboard damage control, UCL, 2023*

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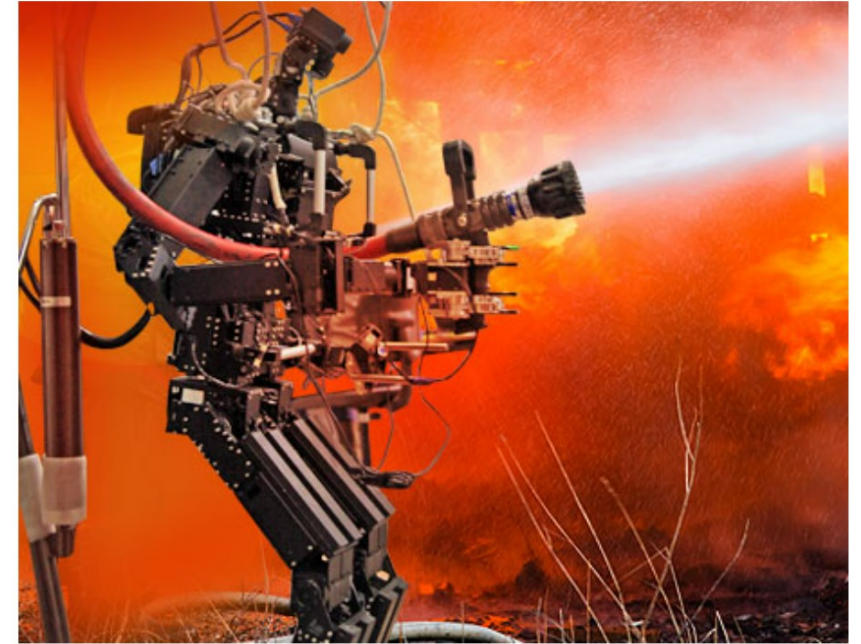
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# Are They Appearing Elsewhere?

- Yes, its “just” a question of money
- Mobility / Stability
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*THOR-OP autonomous firefighting robot. Robot image: Virginia Tech*

# Conclusions

- There are a range of options to enhance the ability of lean crewed and autonomous ships to recover
- These may, in weapon-induced cases, themselves become ineffective due to damage
- Development in robotics present an opportunity to develop increasing DC capability to assist, augment and, in time, replace humans in dangerous damage control scenarios
- We just need to believe.....



# *Any questions?*

Why didn't anyone  
tell me about this?

It was on  
the syllabus.

