

# Tensions in naval ship design

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# Introduction

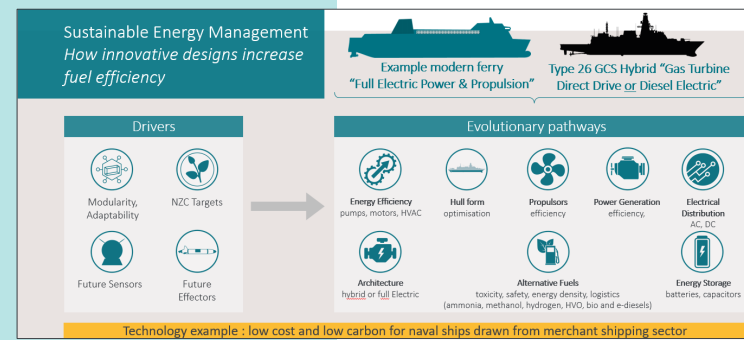
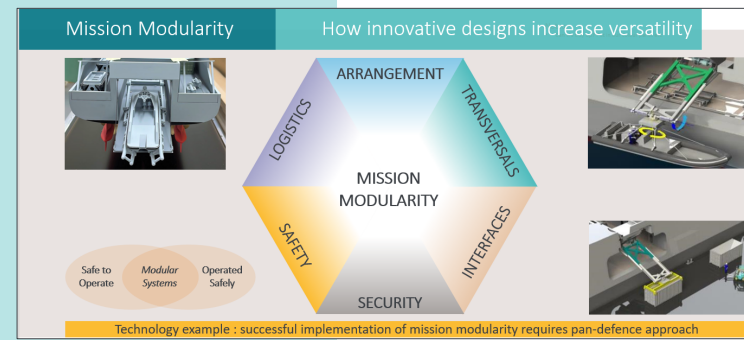
The presentation will cover:

- Re-cap “Future Trends in Naval Ship Design”, CNE ‘23
- What has changed?
- Technology impacts on naval ship design
  - Centralised vs distributed capability
  - Optimised vs traditional crewing
  - Design for X
- Future Technology



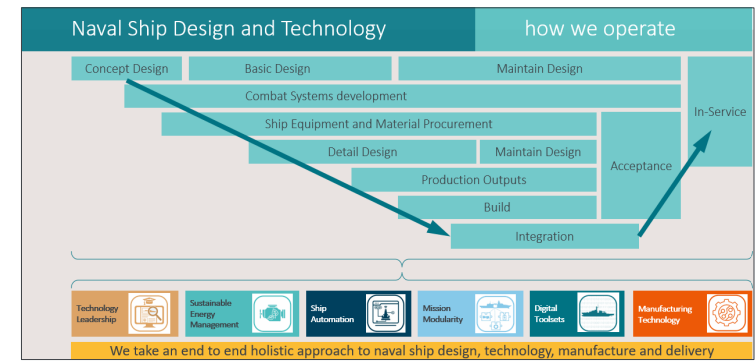
# “Future Trends in Warship Design”, CNE, 2023

1. an end to end holistic approach to naval ship design, technology, manufacture and delivery is needed
2. research and technology must be mapped to evolving Customer priorities
3. successful implementation of mission modularity requires pan-defence approach
4. low carbon naval ships must draw from the merchant shipping sector



Future Ship Requirements	how ship designs are evolving
Aspect	Trends
Mission	<ul style="list-style-type: none"> <li>Sensors, effectors, combat management, networking with off board assets</li> <li>Physical interoperability with aviation, boats, UXVs</li> </ul>
Manoeuvre	<ul style="list-style-type: none"> <li>Speed, range, manoeuvrability for low carbon (energy demand, generation, management)</li> </ul>
Availability	<ul style="list-style-type: none"> <li>Improved availability, resilience on task, persistent presence</li> </ul>
Live	<ul style="list-style-type: none"> <li>Accommodation standards increasing, reduced husbandry, increased automation</li> </ul>
Ship Safety / Survivability	<ul style="list-style-type: none"> <li>Survivability extends ship safety into a threat environment</li> <li>Merchant shipping benchmark</li> <li>Damage stability and system redundancy – merchant shipping evolving to naval approach (e.g. "Safe Return to Port" for RoPAX ferries)</li> <li>Classification (Plan Appraisal, Material Certification, Production Oversight, "in" Class)</li> </ul>
Support	<ul style="list-style-type: none"> <li>Naval vs commercial (human factors, publications, spares, management systems, codification)</li> </ul>
Adaptability	<ul style="list-style-type: none"> <li>De-couple ship life from mission system life</li> <li>Mission modularity enables re-rolling, requires Pan-Lines of Development focus</li> <li>Defined in-service mission enhancements (e.g. maritime patrol, mine hunting)</li> <li>Infrastructure / margins for upgrade (space, weight, power, interfaces, systems capacities)</li> </ul>

Technology example : Evolving Customer expectations requires balanced approach to unit cost and whole-life cost



Key themes in “Future Trends in Warship Design” paper, 2023 remain valid

# What has changed?

## World Events

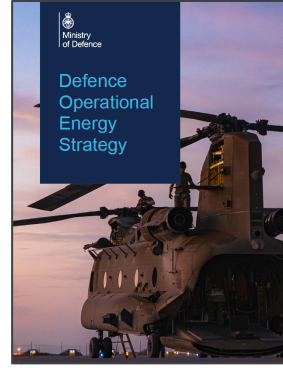
- Ukraine
- Gulf
- Israel / Gaza



- Resilience - need to maintain capability over long periods
- Evolving threats - asymmetric threats, innovative strategies
- Rapid agility - adapt and respond quickly, layered defence
- Co-operation - multi-national coalitions, interoperability

Defence Command Paper - update after 2 years

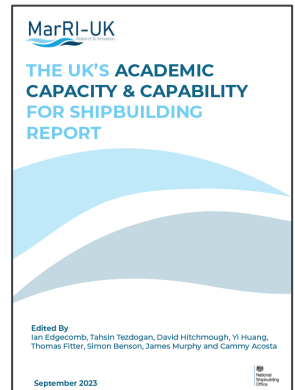
## Policy- energy as a weapon



### Defence Operational Energy Strategy, 2023:

- Operational advantage through energy

## Sector capability - co-operate for an enduring solution



### MarRI-UK report, Sept 23

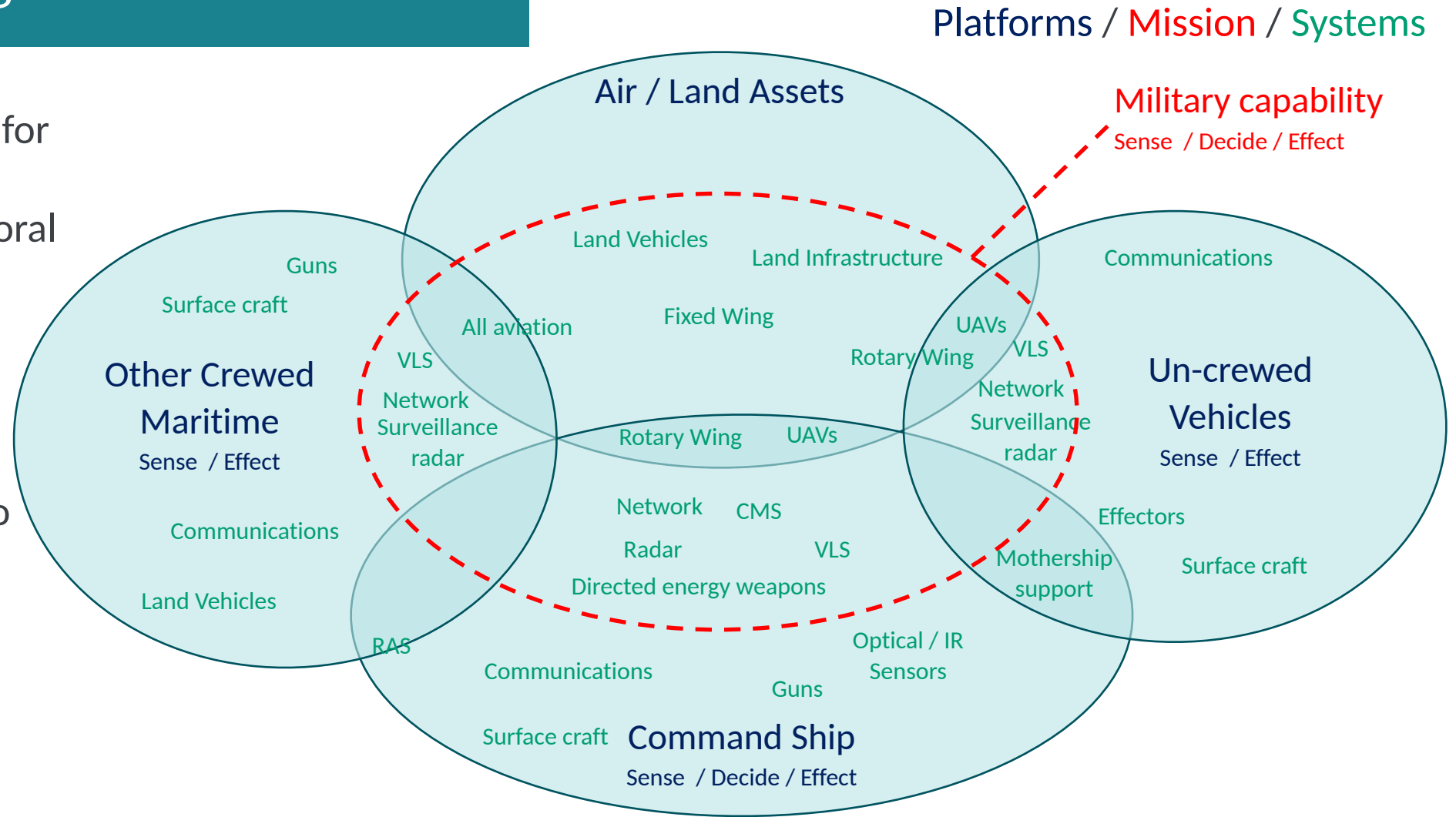
#### Focus areas:

- Autonomy
- Decarbonisation
- Digital
- Manufacturing
- Supply chain

World events has accelerated the need for change

# Centralised evolving to Distributed

- Distributed capability for anti-air warfare, mine countermeasures, littoral strike
- Layered defence, or “horses for courses”
- Networking
- Adaptability – quick to deploy
- Interoperability NATO physical (L&R, boats, aviation, UAVs)



Networking and interoperability for dispersed capability, using multi-function naval ships

# Optimised vs Traditional Crewing

## Optimised crewing

- Increased automation (& UPC)
- Culture for damage control

## Traditional crewing

- Crew-in-the-Loop
- Resilience at long term high tempo

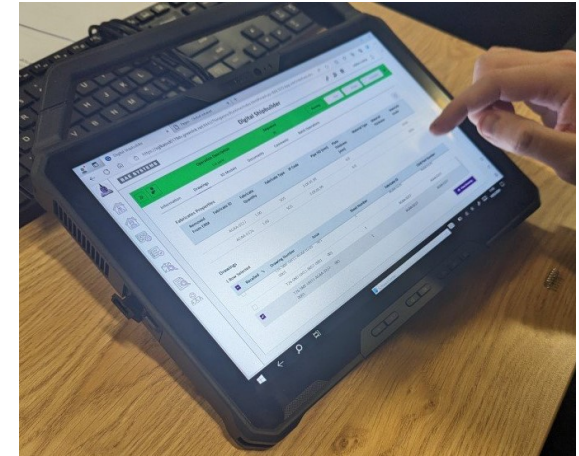


Automation and cultural change are all required to optimise crewing, while retaining the ability to surge

# Design for X

## Design for Capability

- Ship safety
- Adaptability
- Survivability (cost-effective)



## Design for Build

- Build safety
- Infrastructure (new build hall, panel line, digital shipbuilder)
- Pre-launch outfit (modules, lock out,
- Procurement

## Design for Support

- Access
- Removal routes
- Working at height
- Spares
- Future support strategy

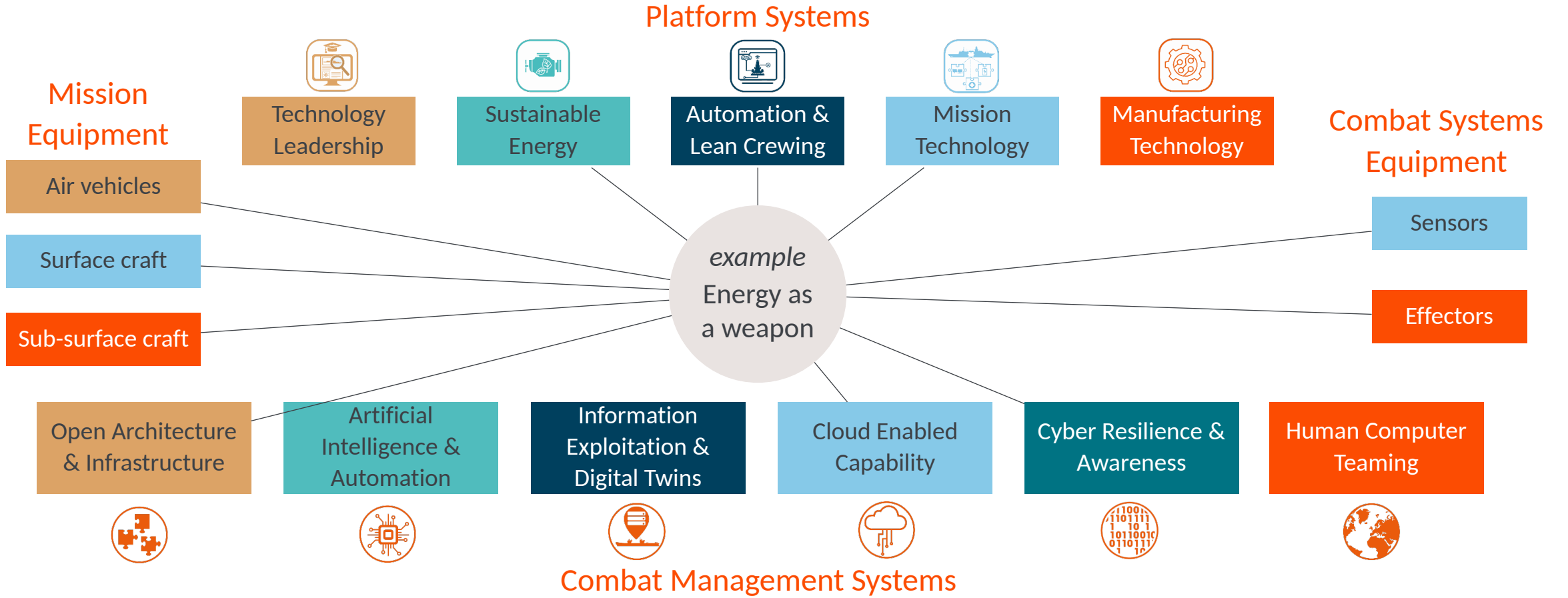
## Design for Cost

- Build strategy
- Design strategy (co-operation, toolsets, communication)
- Supplier involvement (design, data, services)



Maximising value for money for customers is a multi-faceted challenge that requires tempo in ship design

# Naval Ships Technology example



Achieving multi-discipline aspirations requires new forms of co-operation between suppliers



# Summary

