

Bridging the gaps between land, sea, and air operations using advanced human-machine teaming and large-scale simulated war games.

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Human decision-making



Humans rely on **shared mental models (SMMs)** to create a cohesive understanding of complex environments.

[Mathieu et al, 2021; Dong et al, 2022; Schelble et al 2022]

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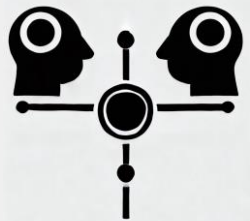
Cross-domain information integration is vital for **situational awareness (SA)**.

Decision dominance relies on building strong SMMs that inform SA to ensure rapid, well-informed decisions across teams and domains.

Key challenges



Paralysis by analysis: Too much data can overwhelm teams, leading to poor situational awareness, especially when trying to integrate data from multiple domains.



Shared cognition: Teams struggle to form SMMs in high-stakes environments, especially with complex or unfamiliar information.

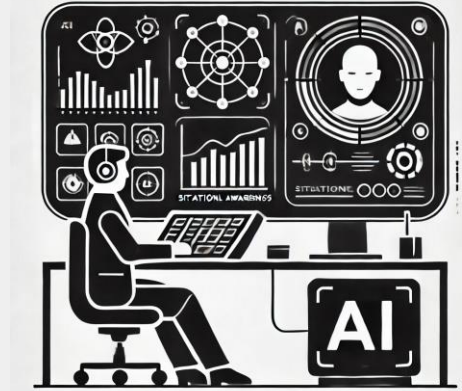


Coordination failures arise from communication breakdowns, lack of SMMs especially in situations where teams struggle to align actions and share critical information effectively

Introducing AI into the mix

AI can help filter and process data, reducing information overload.

Potentially enhances human interpretability by generating explainable insights, which can reduce information processing time and improve decision quality.



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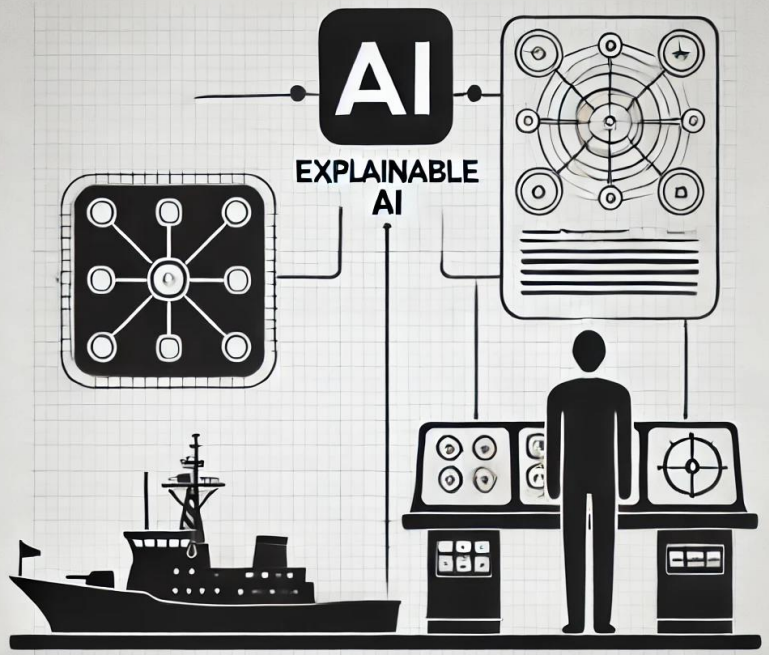
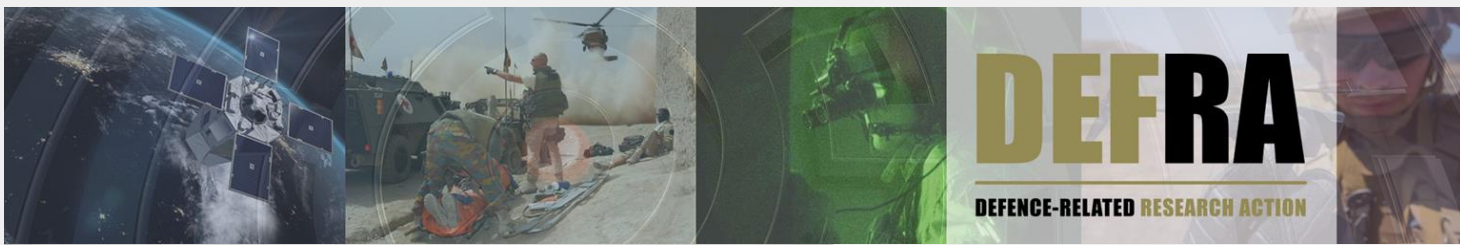
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Trust Calibration: Teams need to develop the right level of trust in AI outputs.

New Coordination Challenges: AI disrupts traditional team roles and dynamics.





AHOI: Advanced Human-machine Operational Integration

A full mission simulator exploring human-AI teaming in maritime environments.

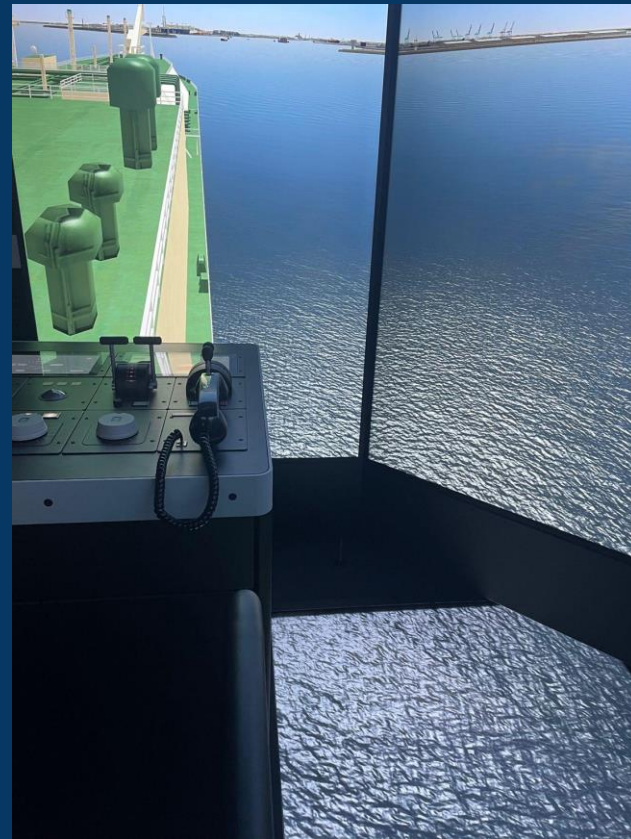
Testing rapid **trust calibration** mechanisms to help operators effectively adjust trust in AI.

Studying how **xAI** can assist teams in **building SMM's** and **cohesive SA**.









Towards multi-domain operations training

Enhanced connectivity: Integrates diverse teams and allied partners for cohesive training.

Scalable and flexible: Virtual environments allow easy modification and adaptation of training scenarios.

Safe practice: Enables safe rehearsal of dangerous or sensitive operations through VR/AR.

Integrated cross-domain learning: Facilitates joint training to operate effectively across land, sea, air, space, and cyber domains.

Federated simulators: Supports integration of different simulators for comprehensive, multi-service, and multi-partner training.



Challenges in MDO training

Integrating training across multiple domains (land, air, sea, cyber, space) and organizations (different services, commands, allies) is inherently challenging.

→ Requires balancing centralized coordination with decentralized training objectives.

Diverse training objectives may lead to siloed development and duplication of efforts if not effectively managed.

→ Leveraging emerging technologies like virtual, augmented, and live simulations can support joint training initiatives.

Effective MDO training requires embracing technologies that allow flexible, interconnected, and joint training capabilities across domains and organizations.

AI is part of the solution, but effective training and cross-domain integration are crucial.

Invest in large-scale simulations to prepare teams for integrated, multi-domain defense.

Thank you