# The Use of Wargaming for Early Stage Concept Analysis

*Underwater Defence & Security A*
*CNE Farnborough, May 2024*
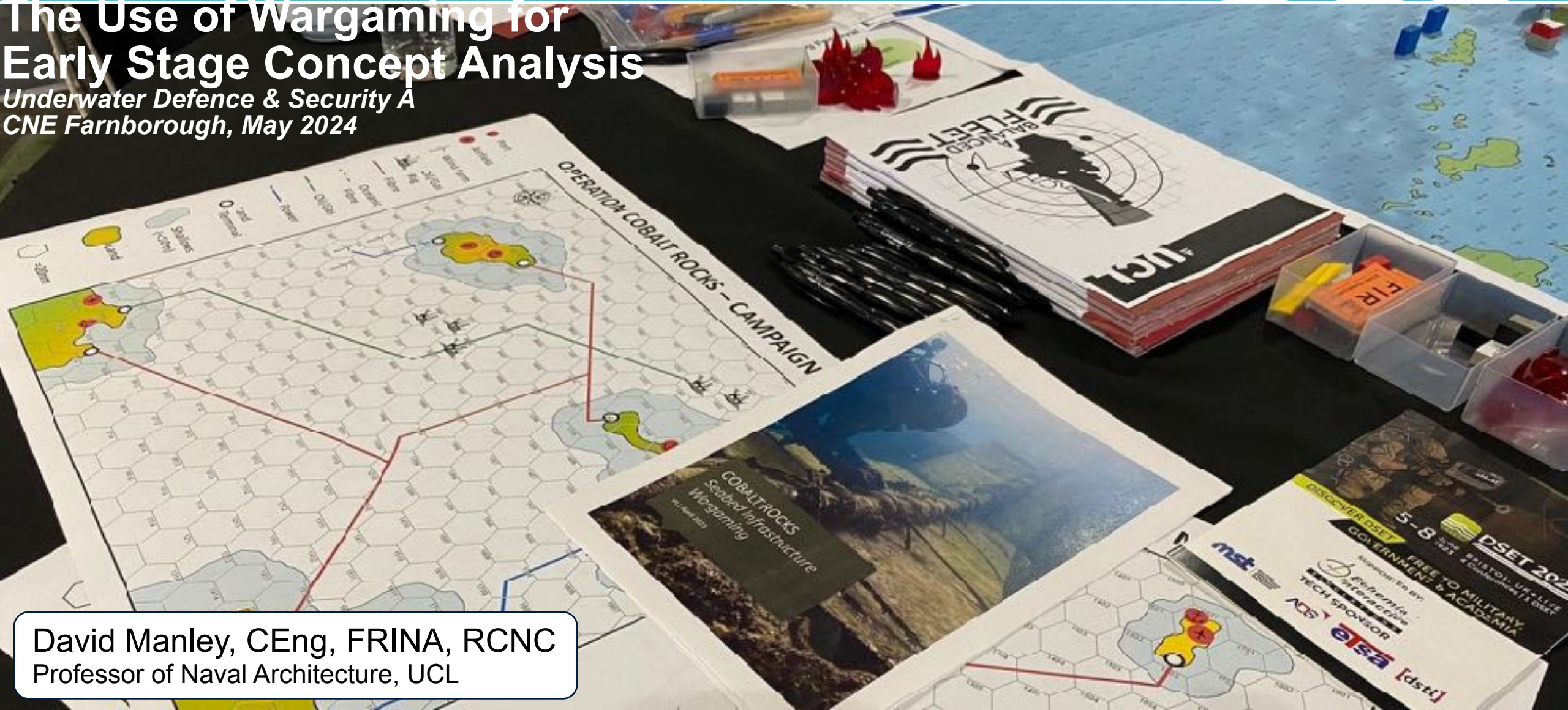
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Professor of Naval Architecture, UCL

# Agenda

- What is Wargaming?
- Wargaming at UCL
- Why do we use it?
  - Strategic, operational, tactical
  - Other users
- Early Stage Concept Analysis
  - NATO NSSE
  - Offboard Systems ASW Campaign
- Conclusion

# Who am I?

- Naval architect, Constructor Captain, RCNC

- Worked in the MOD for 30+ years

- Project naval architect for T22, T23 FFG and Astute SSN

- Currently the MOD Professor of Naval Architecture at UCL

- Specialist in warship survivability and weapon effects since 2000
- Secondment to Dstl, survivability R&D
- Lead the RN Survivability Strategy
- Technical adviser to all current RN and RFA ship and submarine projects, and to weapon projects on lethality
- Lead UK investigator in the ROKS Cheonan and HSV SWIFT inquiries
- Regular advisor to MOD agencies on emerging incidents, threats etc.

# What is Wargaming?

- the action of playing a war game as a leisure activity or exercise in personal development.

- the action of engaging in a campaign or course of action using the strategies of a military exercise.

- Played using miniatures, counters, or in an abstract form (especially matrix games)

- Played using a defined set of rules which reflect the perceived or actual realities of technology, capability, command and control etc.

# Historical Use of Serious Games in Naval Applications



US Naval War College



Western Approaches Tactical Unit (WATU

# Wargaming at UCL

- To train and raise student awareness in maritime and joint operations, capability aspects of warship design

- To rapidly assess design options at platform and force level
  - "desk level" operational analysis
  - *Noting that "wargaming is NOT" operational analysis" (Stephen Downes-Martin, Connections US 2023)*

- Examples:
  - Understanding how maritime, land and air forces can work together in a littoral operation.
  - Assessing the benefit of enhanced aviation assets in OPV design
  - Demonstrate the benefits of platform and UXV survivability on Mission Success
  - Determining the effectiveness of an anti air warfare system in a particular environment
  - Understand the role and capability required in a Seabed Operations Vessel

# "Fleet Command"

- Introduce students and others to the wider conduct of naval operations at the task group level

- Demonstrate the role of different ship types, how they come together and work together in squadrons, Task Groups and fleets

- Demonstrate how naval forces interact with land and air forces.

- Highlight the impact of different capability choices, such as enhanced resilience to weapon damage, signature control, long range and high speed weapons, etc.

- Developing use by the UK Maritime Warfare Centre
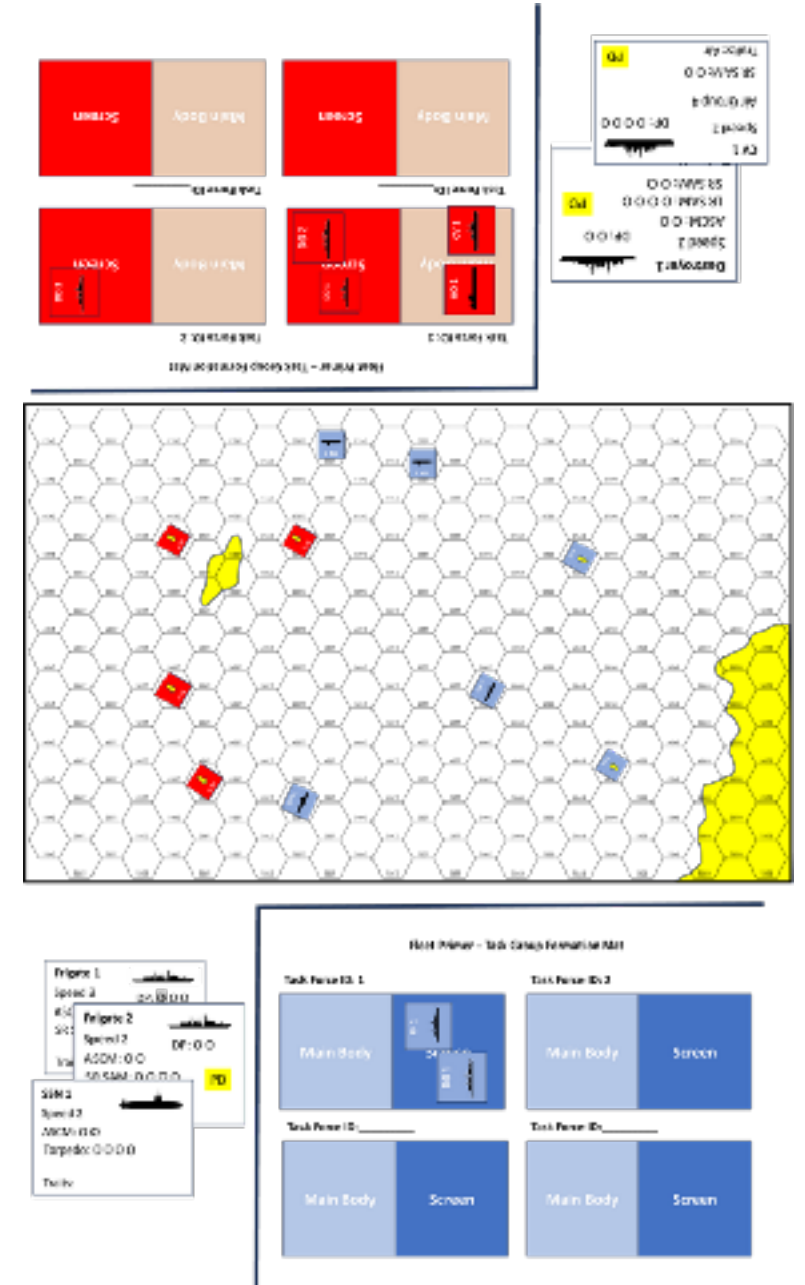
# "A Balanced Fleet"

- Our primary game for surface ship design support
- Developed over 10+ years
- F2F or double blind
- Allows detailed representation of student designs (and real world ships)
- Missile engagement model allows assessment of self defence capabilities
- System layout and other design aspects allow assessment of ship survivability
- Used throughout the SDX
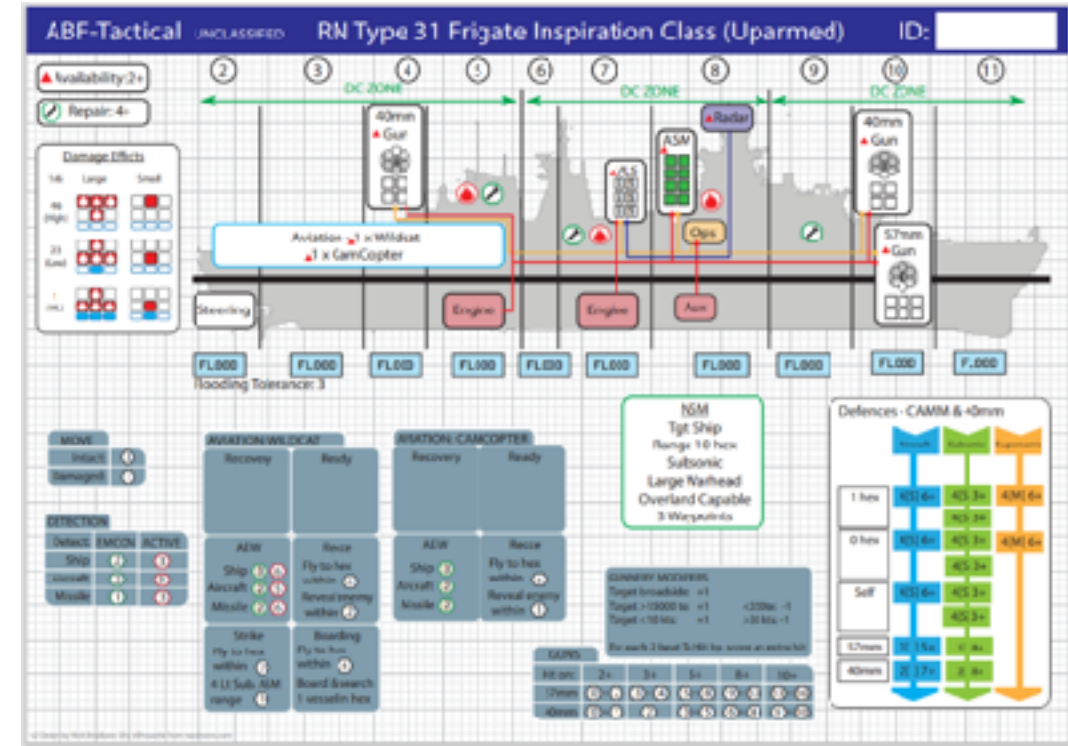
# Specialist Topics 1 - Low Level Tactical

*"Swarming Boats"*

• OPV vs FIAC swarm

• Focus on small arms vs small craft, manoeuvring, firing arcs

• "Free movement" and a modified version for hex-based games ("CQB")
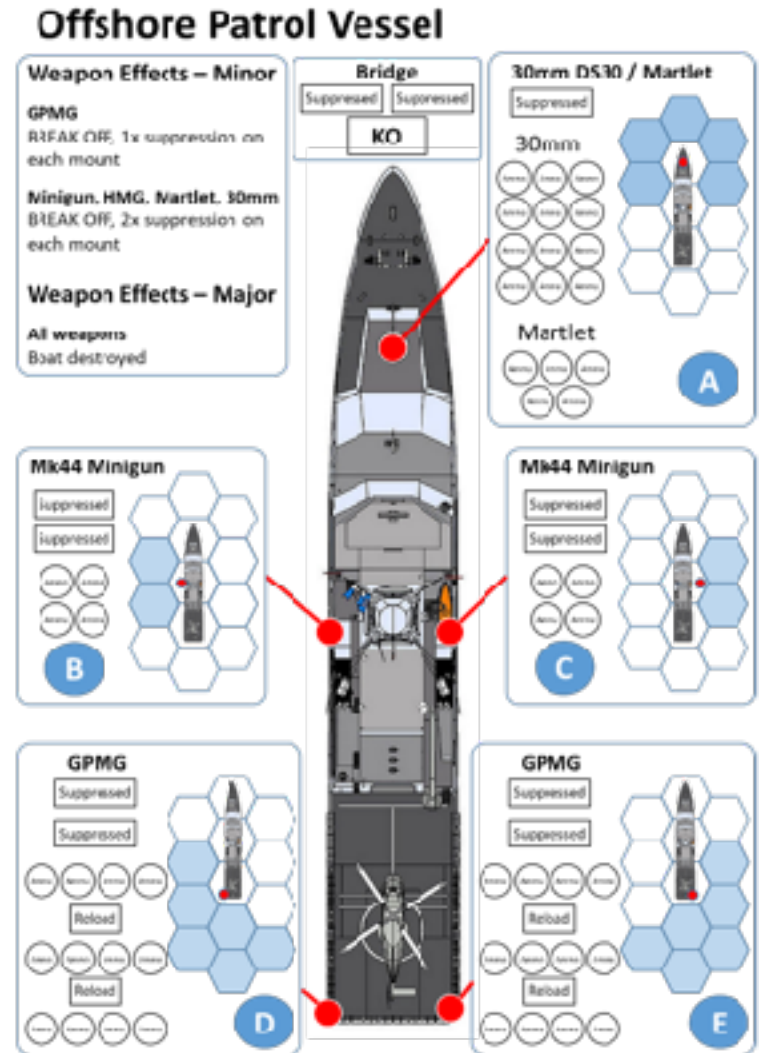
# Specialist Topics 2 – Seabed Operations

*"Cobalt Rocks"*

- Design and operation of seabed warfare vessels

- Development of national infrastructure protection systems

- Assessment of concepts for critical seabed infrastructure surveillance, protection and incident investigation

- By-products for "red" considerations





COBALT ROCKS
*Seabed Infrastructure Wargaming*



**OPERATION COBALT ROCKS – CAMPAIGN MAP**

- Port
- Airfield
- Wind Farm
- Oil/Gas Rig
- Fibre
- Oceanic Fibre
- Oil/Gas
- Power
- Land Terminal
- Shallows (<50m)
- Land
- =20nm
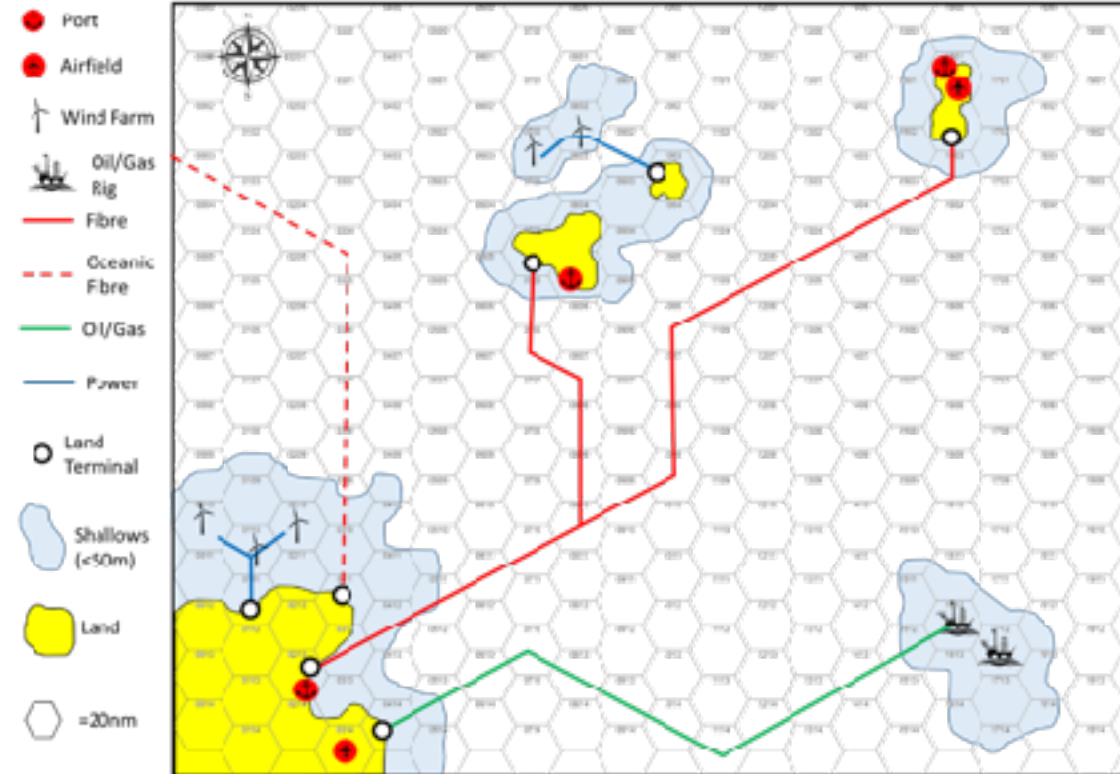
# Specialist Topics 3 – The "Internal Battle"

- A possible extension into damage control and firefighting

- Tabletop assessment of alternative methodologies and equipment

- Aiming to conduct a joint project with MOD and Industry DCFF specialists







A SOLITAIRE GAME DESIGN
by Steve Dixon

PICKET DUTY

Kamikaze Attacks against
U.S. Destroyers · Okinawa, 1945

LEGION
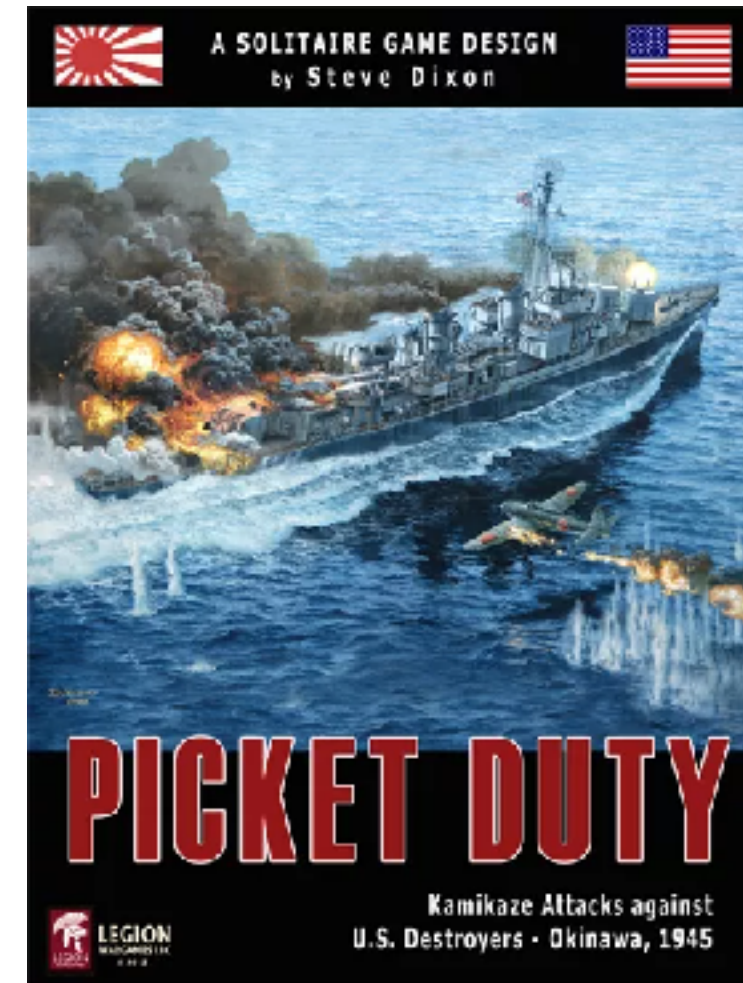
# Going Beyond UCL

- Development of tools such as ABF into project support tools, e.g. rapid option evaluation.
  - NATO NSSE project ongoing – "ASW Barrier" wargame campaign commencing next week
  - DE&S Ships IFC engagement, Dstl, NCHQ NAVY DEV

- Interest in "Cobalt Rocks" from several agencies in the UK and overseas

- "Swarming Boats" has been adapted by the Maritime Warfare Centre into a new training tool, in particular on the Command Warfare Course. "Fleet Command" likely to be used for higher level games

- Swarming Boats and ABF used for training events with DE&S , SDA and Dstl graduate and young engineers

# NATO Specialist Team on Naval Ship Systems Engineering

NATO working group

- Its mission is to support NATO nations in developing cost-effective warships
- By developing methods of assessment and processes for the concept stage of naval ship design
- Sub group of NATO Ship Design Capability Group (SDCG)
- Tasked by SDCG to develop a NATO standard

Important in Naval Ship Systems Engineering

- Capturing stakeholder needs and expectations
- Controlling the naval ship requirements and budget modification process

Outcome is of critical importance to combat effectiveness

- Can wargaming help finding out what it is that drives the design of a warship?

# NATO Specialist Team on Naval Ship Systems Engineering



- Recent work concentrated on Mission Modularity, working closely with other STs to develop interface standards and proving the case for mission modularity in naval ships.

- *STANAG 4830 / ANEP-91 / ANEP-99*

- Work included a 2 day wargame applying Mission Modularity to a series of low end naval missions (disaster relief, counter piracy and non-combatant evacuation operations).

- This wargaming activity showed promise in its ability to explore concepts and hence ST/NSSE's current programme of work is going further, considering more high-end warfighting roles

- Aiming to creating formal guidance within SDCG's suite of standards and guidance on the conduct of wargaming for concept analysis and assessment.
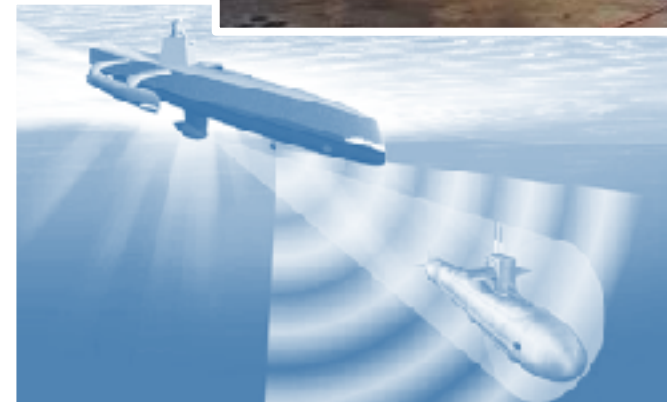
# ST/NSSE Project Wargames

- Demonstration of wargaming applied as a concept assessment tool

- Using a realistic "high end warfighting" relevant to current NATO members and allies

- ASW barrier using offboard systems selected as the concept for study

- Wargaming to find out if it is possible to protect an amphibious task group against enemy submarines using only offboard maritime unmanned systems instead of traditional anti-submarine warfare frigates

- Concepts explored through a 3 day wargaming "campaign" centred on a Non-combatant Evacuation Operation (NEO) in the face of a hostile threat

- Games run at the NDP offices in Filton, involving NSSE members, SMEs, "interested parties" and others
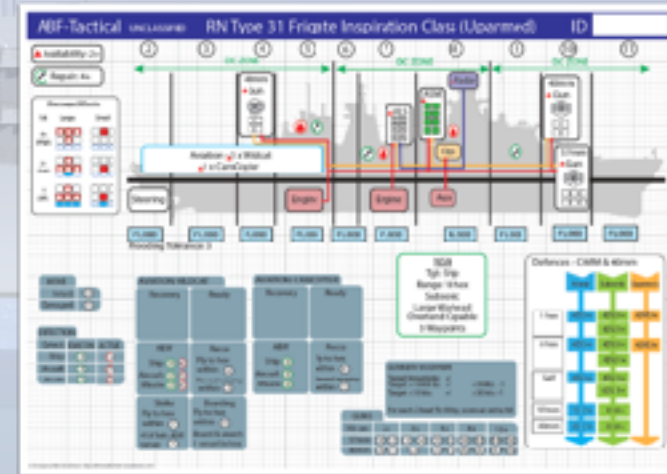
# Schedule of Games

Day 1:
- Briefing
- Game 0: Training Vignettes
- Game 1: Baseline ASW Task Force, Insertion

Day 2:
- Game 2a, 2b: Baseline ASW Task Force, Barrier
- Game 3a, 3b: UXV Force Mix 1, Barrier

Day 3:
- Game 4a, 4b: UXV Force Mix 2, Barrier
- Game 5a, 5b: UXV Force Mix 2, Extraction

Day 4:
- Washup, discussion

- "Hot wash" debriefs after each game

# Game Data Architecture

# Ship Sheets, Capability Cards

# Agility – Rapid Tech Insertion

After Day 2, inserted:

- ASROC

- "Palisade" SSTD UXV

- Seabed Sensor Network

With SME data input, created capability cards overnight and introduced on Day 3

# Key Outcomes (Summary)

- Effectiveness of USV towed arrays, especially where they bring the ability to add mass of sensors

- The absolute dependence of all uncrewed systems on a fully integrated, stable and robust mesh network solution for MUS C2 – A CRITICAL aspect for UUVs

- The very high positive impact of ASROC as a Blue asset

- Unexpected heavy use of Ship Launched Torpedo systems.

- Efficacy of a USV based Torpedo Decoy

- Heavy expenditure of sonobuoys

- Weather and environmental impacts

- Continued utility of crewed ASW helicopters in a UXV environment

*"Whilst all the above points are heavily caveated by the artificialities of game mechanics and nature of using unclassified data, vice real world, there is no doubt that these issues would warrant further exploration in a more developed gaming environment."* - NATO ASW Barrier Project Director
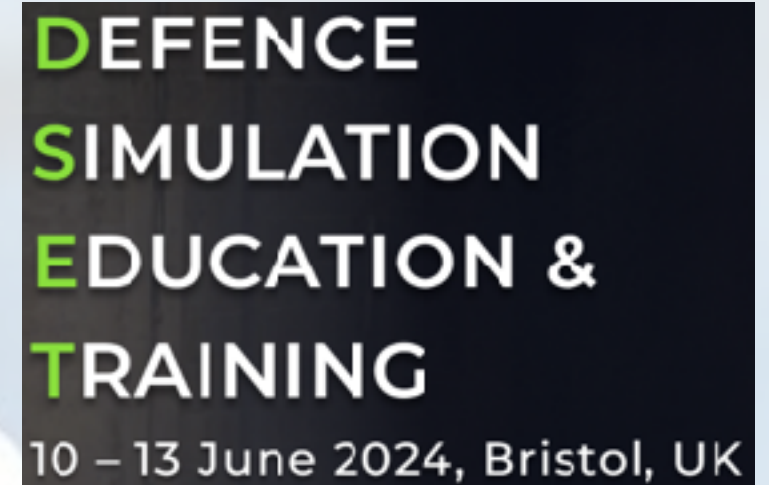
# Conclusions



- Did it work? – YES
- Benefits to exploring concepts – even with Open Source data
- Generated a great many insights of benefit to the NATO ASW Barrier Team
- Provided a bird's-eye view before diving into detail
- Determine what questions to ask
- Agility of manual wargaming (with SME input)
- Identify disruptive technologies
- Identify technologies which do – or don't - work well
- Identify gaps that could usefully be filled
- Instant arms race – counter, counter-counter
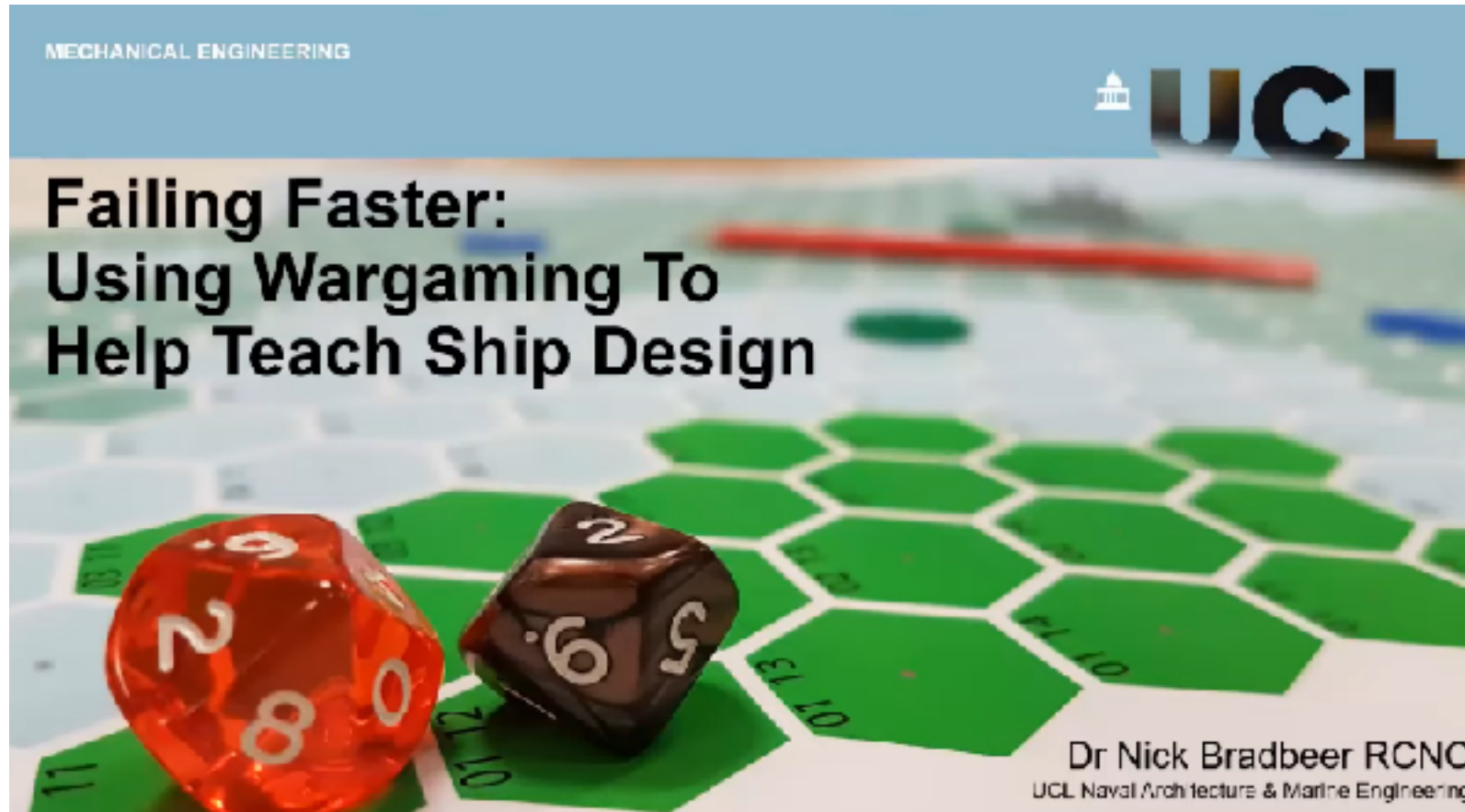- 2nd/3rd order effects, "system" aspects, synergies

# Conclusion

- Wargaming shown to have significant potential benefit in naval concept analysis

- To be carried forward in a NATO context (ASW Barrier), also generated work in DE&S (MRSS)

- UCL has developed a range of wargames that ably support its educational and design support requirements, supplementing its own games with commercial products where it is effective to do so

- Those games have obvious utility beyond the academic environment

- The benefits of learning and development activities using these games is already being felt in the UK naval environment

- There is always more to do…….



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MECHANICAL ENGINEERING
Falling Faster:
Using Wargaming To
Help Teach Ship Design

Dr Nick Bradbeer RCNC
UCL Naval Architecture & Marine Engineering

https://www.youtube.com/watch?v=cP6HzLB0DZI

# For more info:



https://www.youtube.com/watch?v=cP6HzLB0DZI