

**All models are wrong...  
...some models are useful**

**An overview of naval wargaming**

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# Introduction

- Who am I?
- What am I going to talk about?
- When can you ask questions?

# A note on definitions

- Wargame - *“A simulation of a military operation, by whatever means, using specific rules, data, methods and procedures.”*
- Simulation – *“The use of a data processing system to represent selected behavioral characteristics of a physical or abstract system.”*
- Distinguishing here between **modelling and simulation**, and **wargaming**
- One key difference – to me – is that a model or sim covers a **vignette** or lower in detail
- A wargame covers an **engagement** or a **campaign**

# Modelling vs Wargaming

- **Modelling**

- Single vignette or engagement
- Focus is usually on **technical** issues
- Driven by the model or simulation used
- *Informed by* policy and doctrine

- **Wargaming**

- A situation or campaign
- Focus is usually on **tactical or operational** (or higher) issues
- Can involve other “levers of power”
- Relatively tool-agnostic
- Draws on modelling to inform outcomes
- *Generates* policy and doctrine?

# Modelling vs Wargaming

- **Modelling**

- Opposed by technology or the environment

- **Wargaming**

- Opposed by other players!

**Now the great secret of its power lies in the existence of the enemy, a live, vigorous enemy in the next room waiting feverishly to take advantage of any of our mistakes, ever ready to puncture any visionary scheme, to haul us down to earth.**

LT McCarty Little, US Naval War College, 1887

## “Analysis”

Political judgements

Economic assessments

Intelligence information

## “Wargaming”

Campaign-level wargame

“Defend Friendlystan, deter Nastyland, and restore freedom of navigation”

Operational wargame

“Clear the mines in the Bhendi Straits against opposition”

## “Modelling”

Detection of mines by MCM’s Sonar 2093

Missile attack on Type 45 destroyer

Time to deploy CSG to Slendha Waist

“Descriptive / Narrative”

“Technical / Mathematical”

# A Brief History of Naval Wargaming

- James Clerk published “*An Essay on Naval Tactics, Systematic and Historical*” in 1782
  - Inspired the tactic of “breaking the line” used by Rodney at Saintes and by Nelson at St Vincent and Trafalgar
  - Perhaps more “model” than “wargame”?
  - But, used to develop tactics for battles, not just single ship-vs-ship engagements
- Captain Philip Colomb RN published “The Duel” in 1878
  - Detailed rules for a 1-v-1 warship battle

# A Brief History of Naval Wargaming

- Fred T. Jane released his “Naval War Game” in 1898, with the companion volume “All the World’s Fighting Ships”
  - Ship models manoeuvred on a board to determine position and range
  - Communication between commanding “admiral” and ship’s “captains” was strictly limited
  - Fire was assessed by hitting outlines with a “striker”
    - Target size depended on range
    - Number and ROF of guns determined how many strikes
    - Results based on shell size vs. armour of where you hit
  - Strategic element (pre-battle manoeuvres) available

# A Brief History of Naval Wargaming

- Extensive use of wargaming between First and Second World Wars
  - US Naval War College *very* active
  - Japan started major gaming effort in 1940
  - Limited British interest?
- Continued application post-war
  - Overlap between training and wargaming?
    - E.g. Command Team Trainers (Cook, MCTS)

# Naval Wargame Successes

“During the war, the war with Japan had been re-enacted in the game rooms here by so many people and in so many different ways that nothing that happened during the war was a surprise — absolutely nothing except the kamikaze tactics towards the end of the war; we had not visualized those.”

-- Admiral Chester Nimitz, 1960

*(...though he may have over-stated it!)*

# Naval Wargame Successes

Western Approaches  
Tactical Unit, under Cdr  
Gilbert Roberts RN,  
hugely influential in  
wargaming convoy actions

- Training for COs
- Tactical development

(hat-tip to Paul Strong)

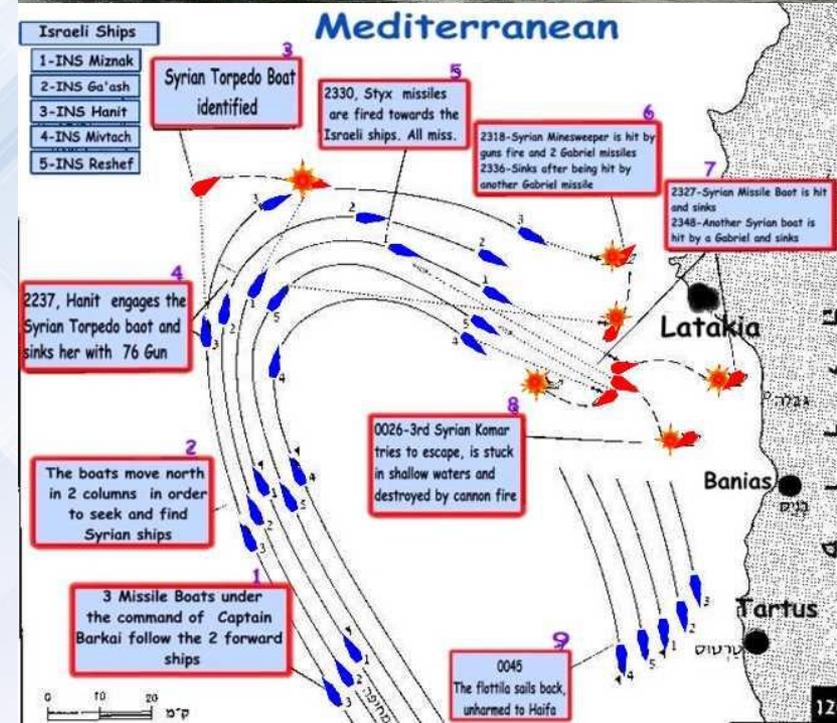
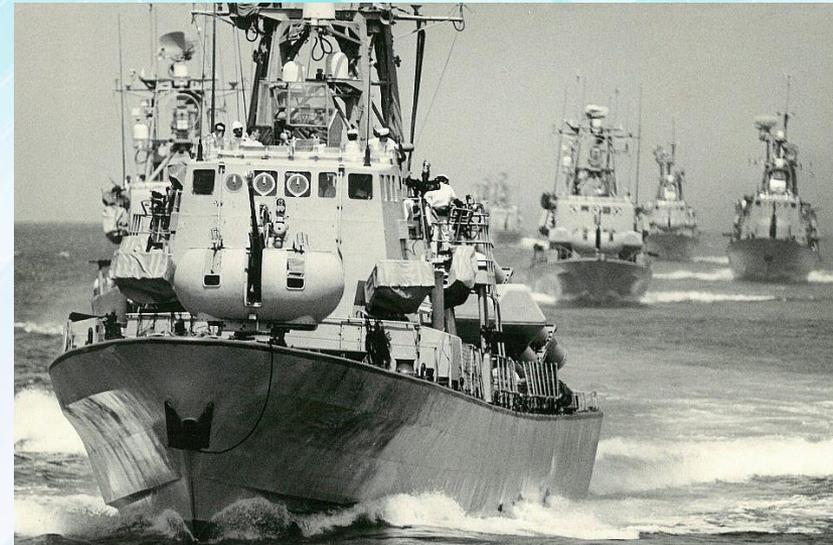


# Naval Wargame Successes

Israeli Navy expands and modernises after 1967

- New weapons, countermeasures, tactics
- Intelligence work to characterise threat

Major success in 1973 skirmishes



# Vulnerabilities of Wargaming

- Limits of input data – how much do we know about the systems we're modelling?
  - May not even fully understand our own kit, let alone the enemy's!
- Wargames can be constrained – for instance, how do you do “fog of war” and partial information?

# Limits of Modelling and Simulation

- Critical dependency on input information, whether for detailed modelling or for wargaming at higher levels
  - “The estimates... have been worked out from official statistics, and as they have received the approval of very high authorities on the subject, we may safely conclude that they are not far from correct.” (*Review of Jane’s Naval War Game*, The Engineer, 1898)
- How good is our understanding of the fundamentals?
  - Are there hidden flaws waiting for wartime to expose them?
  - Are new developments (technology, tactics, theatre) going to change the rules?

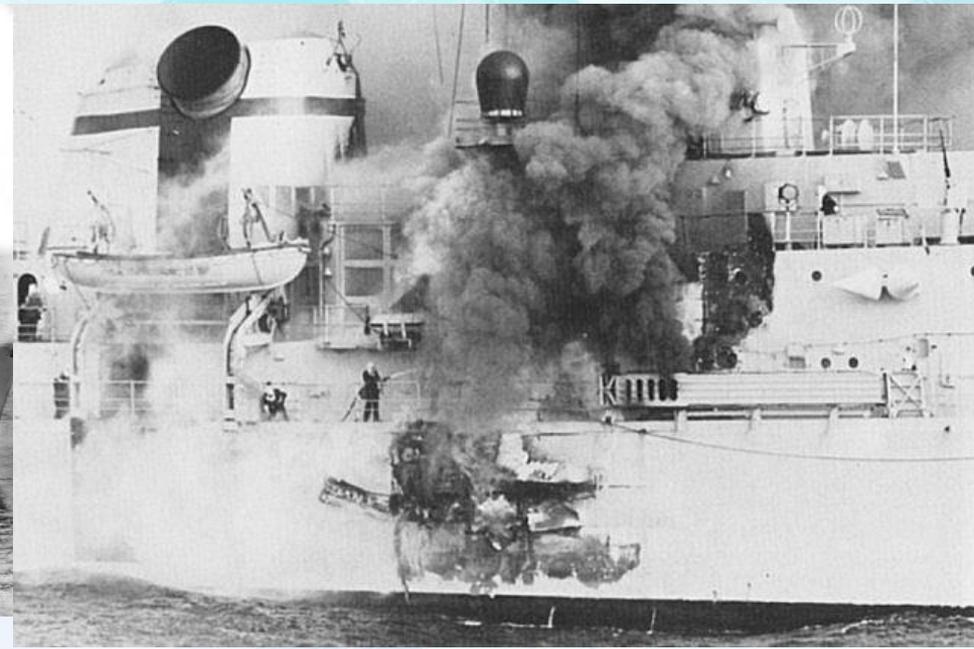
# Limits of Modelling and Simulation

- HMS *Sheffield* was hit by an AM39 *Exocet* on May 4, 1982
- The Board of Enquiry concluded the weapon didn't explode
  - All damage done by impact and unburned fuel
- Based on the then-available trials data and expert opinion

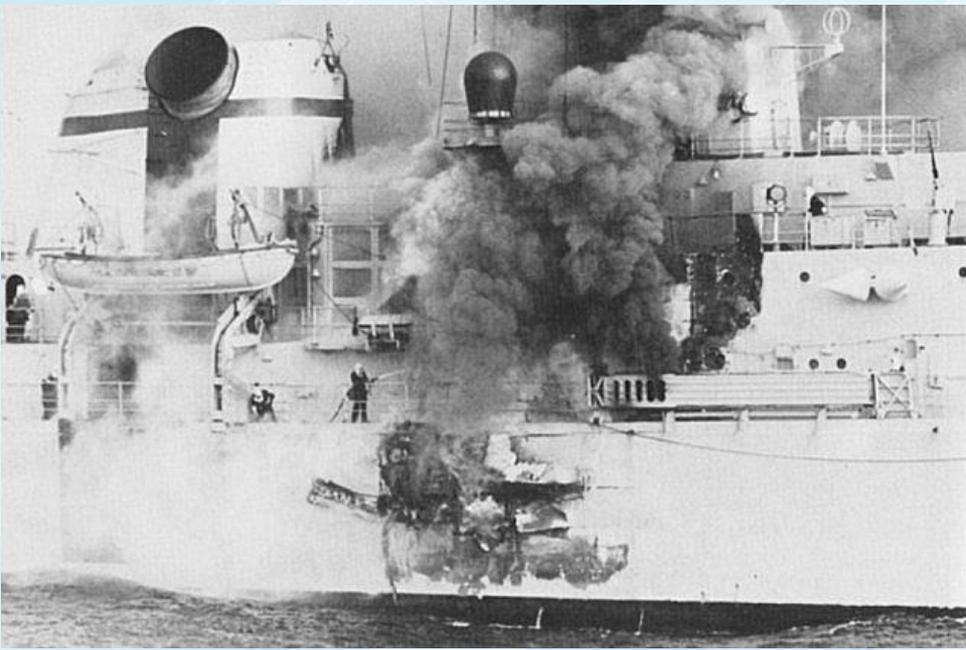




Former HMS *Undaunted*  
after MM38 Exocet hit  
(1978 trial)



AM39 damage to  
HMS *Sheffield*  
(1982, Falklands Conflict)



AM39 damage to  
HMS *Sheffield*  
(1982, Falklands Conflict)



MM40 damage to former  
HS *Nearchos* D-219  
(2006 trial)

# Limits of Modelling and Simulation

- **Previous** experience of Exocet trials suggested massive hull rupture from the detonation
- **Later** experience, with larger, newer ships, showed much less damage to shell plating



# Limits of Wargaming

- Can be very difficult to model detection, identification, subterfuge and deception properly
- US Fleet Problem XV (1934) found SS-53 (surfaced, early morning) running into the Blue Fleet: it passed itself off as a party yacht, reached attack position, fired (simulated) torpedoes and escaped undetected...

**“The cumbersome nature of ensuring fog of war on the game board makes it difficult to practice low visibility and night tactics, tactical issues that would haunt the American navy all the way to Guadalcanal.”**

# When Wargaming Goes Wrong

- USN submarine doctrine pre-war emphasised avoiding detection
  - A sighted periscope was assumed to equal “killed”
  - Serious implications for reporting and promotion!
  - Tactics evolved to emphasis submerged attack using sound bearings
- Night operations considered “too dangerous”
  - Therefore, no data or experience for wargaming
  - Not explored even when U-boats proving value of surfaced attack at night
- Mk 14 torpedo never properly tested
  - Critical, layered problems seriously reduced effectiveness

# When Wargaming Goes Wrong?

- Japanese wargamed operations extensively – famous example at Midway
- Widely claimed that they “rigged the results” to ensure a win in the wargame, only to lose in reality
  - Larham (2012) explored this and found it wanting?
  - Carriers disabled by land-based level bombers in one wargame – basically a highly improbable dice roll
- Midway (reality) a good example of unpredictable results!
  - USN torpedo attacks far less effective than expected
  - USN dive bombers (unescorted!) unexpectedly lethal

# When Wargaming Goes Wrong?

- More recent wargame example – 2002’s “Millennium Challenge
- “Biggest war game in US military history”
- Widely reported as being rigged or flawed

***“War game was fixed to ensure American victory, claims general”*** – Guardian

***“War Games Rigged?”*** – Army Times

***“The Real Story of a Corrupted Military Exercise and its Legacy”*** – War on the Rocks

# When Wargaming Goes Wrong?

- Van Riper resolved to strike first and unconventionally using fast patrol boats and converted pleasure boats fitted with ship-to-ship missiles as well as first generation shore-launched anti-ship cruise missiles. He packed small boats and small propeller aircraft with explosives for one mass wave of suicide attacks against the Blue fleet. Last, the general shut down all radio traffic and sent commands by motorcycle messengers, beyond the reach of the code-breakers.
- At the appointed hour he sent hundreds of missiles screaming into the fleet, and dozens of kamikaze boats and planes plunging into the Navy ships in a simultaneous sneak attack that overwhelmed the Navy's much-vaunted defenses based on its Aegis cruisers and their radar controlled Gatling guns.
- When the figurative smoke cleared it was found that the Red Forces had sunk 16 Navy ships, including an aircraft carrier. Thousands of Marines and sailors were “dead”.

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# When Wargaming Goes Wrong?

- **Pleasure boats fitted with anti-ship missiles**
  - Not quite as simple as it sounds!
  - Physical problems – weight & bulk
  - Integration issues – power & services
  - Control and targeting issues



# When Wargaming Goes Wrong?

- Small propeller aircraft 'filled with explosives'

**Cessna 150**

**MGTOW of 720 kg**

**$V_{\max}$  ("top speed") 120 knots**

**F/A-18E Hornet**

**MGTOW of 30,000 kg**

**Landing speed is 135 knots**



# When Wargaming Goes Wrong?

- **Shut down radio traffic, sent commands by motorcycle**
- 1,000 km as the crow flies from Bandar Abbas to Tehran (1,300 km by road)
- **0.003 seconds** by radio wave, **14 hours** by motorcycle



# When Wargaming Goes Wrong?

- Much of Red's spectacular first success in MC02 came from wargame exploits
  - A great deal of "...but that wouldn't work in reality"
- Well reported as "US Navy ignores wargame lessons"
  - Or more hostile stories:
    - "...the Pentagon top brass simply pretended the whole thing had not happened"
    - "American troops will be sent into battle with a set of half-baked tactics that have not been put to the test"
- Parallels with the Midway story?
  - 16 US ships destroyed in Red's first attack – refloated and exercise continued
- Claims that Red were forced to follow scripts to allow Blue victory
  - "Not allowed to use air defences"
  - "Exercise scripted to allow a Blue win"

# When Wargaming Goes Wrong?

- MC02 had 13 distinct areas for assessment – “assured access” was only one of them
- Mix of live and CPX gaming, and the need to game the entire campaign, constrained some issues
  - Live airdrop by Blue required limits on Red air defences due to timing
    - “Had this live event not occurred so early in the scenario these actions may not have been required.”
  - “As the exercise progressed, the OPFOR free-play was eventually constrained to the point where the end state was scripted. This scripting ensured a Blue operational victory and established conditions in the exercise for transition operations.”
- Flaws in the wargame, or necessary constraints to allow each phase to be played with appropriate assets?

# When Wargaming Goes Wrong?

- **Official Findings**

- While operating in the collaborative environment the JTF was able to minimize, but not prevent, surprise attacks by opposing forces
- Blue reduced joint force vulnerability to disruption; however, it was not able to prevent OPFOR observation of its forces, due to sympathizers, terrorist cells, and during the initial days of the operation, commercial satellite imagery
- Blue forces could not isolate or suppress enemy anti-access capabilities consistently during the experiment
- Blue did not successfully create operational sanctuaries in time and space necessary for conducting RDO
- Despite persistent targeting and rapid engagement, Blue could not deny the enemy sanctuary
- At the operational level, Blue was able to provide protection for operational forces, means, and noncombatants in the JOA
- Blue was moderately successful in providing operational air, space, and missile defense

# Conclusions (1 of 4)

- **Wargaming has proved it can be very successful for tactical and operational development, and as a training and teaching tool**
  - Not a panacea or automatic success, but effective wargaming has been extremely valuable
- **Wargaming works best when built on a clear understanding of the technologies and tactics being employed**
  - Will not reveal technical problems with equipment
  - Limited by the rules, scenarios and assumptions
- **Wargaming needs a defined aim and purpose**
  - “Lessons” out of context of game may be invalid
  - Campaign script may march on despite events

# Conclusions (2 of 4)

- **Wargaming in peacetime can carry messages**
  - Can indicate intentions, plans and capabilities (actual or desired)
  - Leaks and dissent can have long-term repercussions
- **Wargaming can explore new concepts and technologies**
  - But – also requires new tactics to use them properly
    - French *Mitrailleuse* of 1870
  - Failure is always an option!
    - “Torpedo Battleship”

# Conclusions (3 of 4)

- **Modelling, trials and exercises essential to provide data**
  - Wargaming builds on information
  - Flawed information means flawed lessons
  - “Representation of reality” in wargames risks becoming the accepted ground truth
- **Reality may have hidden flaws and surprises**
  - Cordite volatility at Jutland
  - Unexpected enemy capabilities
    - Type 93 “Long Lance” torpedo
  - Systems used out of context
    - Rapier in San Carlos

# Conclusions (4 of 4)

- **Understand the purpose of the wargame**
  - Is it to develop and teach tactics?
  - Is it to explore new concepts?
  - Is it to assess the stockpiles required to conduct a campaign?
- **Wargames may not even focus on fighting**
  - A political/military game (e.g. HCSC's TWG) *may end without conflict*
    - Logistics, politics and economics more important than warfighting?
  - Just because it says "wargame" on the label...
- **Predicting *outcomes*, or exploring *possibilities*?**
  - Both are valid uses of wargaming
  - Not necessarily interchangeable!

**Any Questions?**

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