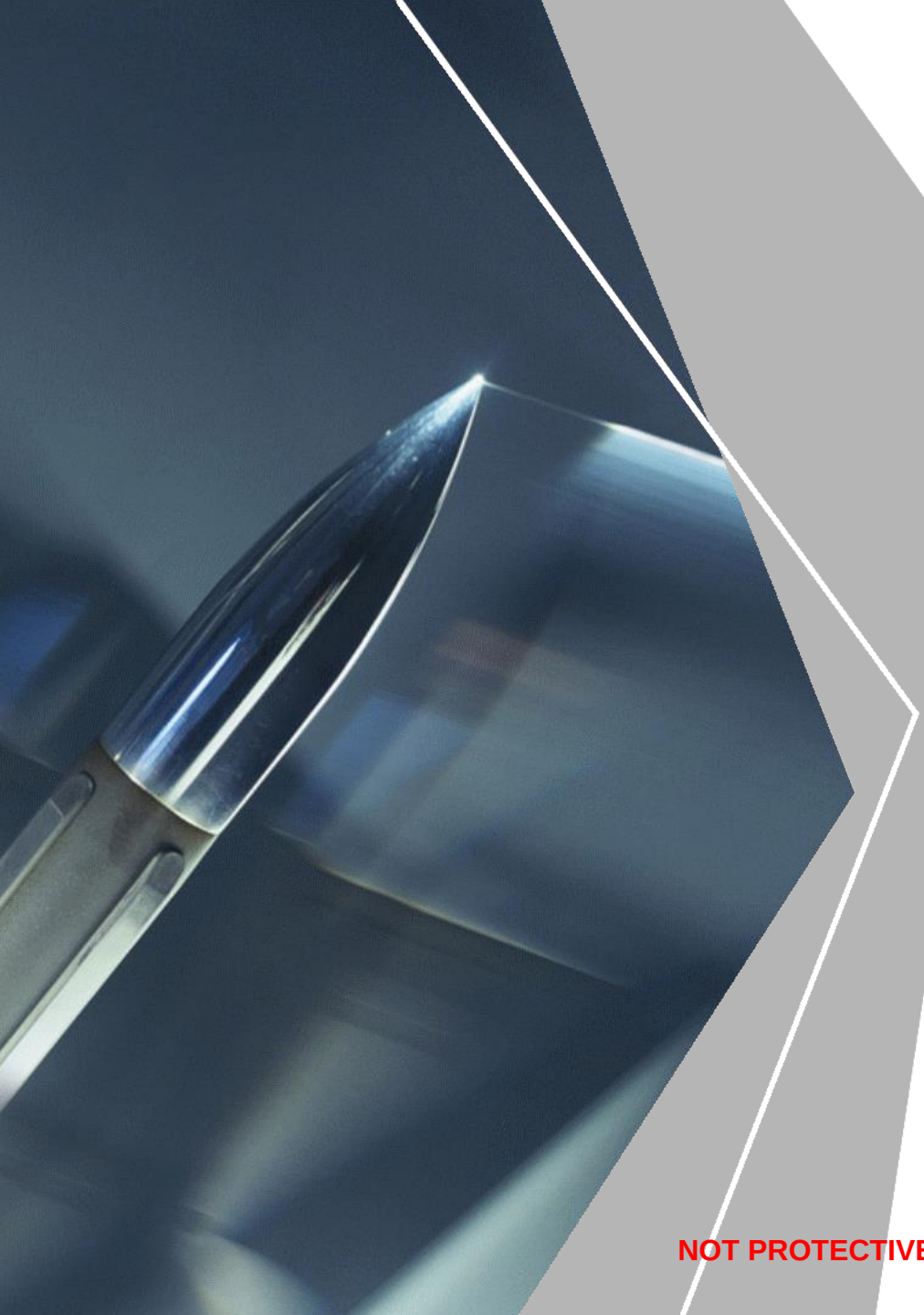


“The enemy also moves”

Or “What I learned about analysis from building (and playing) games”

Alistair Morley

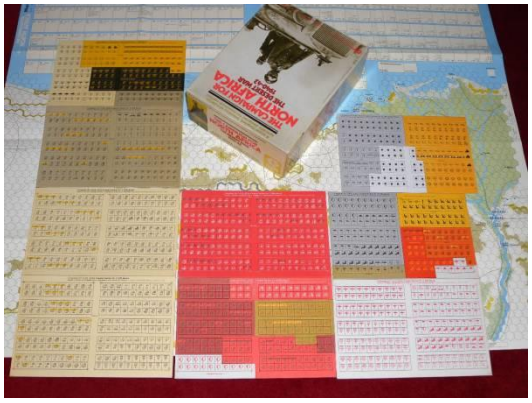
MBDA MISSILE SYSTEMS

What can this

Player 1 \ Player 2	C	S
C	(60,60)	(30,120)
S	(120,30)	(0,0)

….Or even this

…or this….



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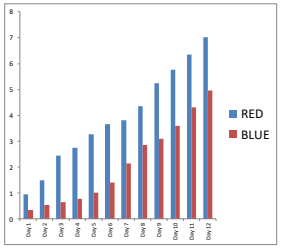
Tell us about this?

(and this)

	RED	BLUE
Day 1	0.959269	0.353930718
Day 2	1.490958	0.548826912
Day 3	2.442966	0.637128997
Day 4	2.739461	0.776757474
Day 5	3.273651	1.015701318
Day 6	3.656761	1.414387794
Day 7	3.811117	2.140520835
Day 8	4.360363	2.850721028
Day 9	5.248481	3.093372409
Day 10	5.769219	3.591495542
Day 11	6.353619	4.307441298
Day 12	7.020812	4.951511158



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MBDA MISSILE SYSTEMS

"Many Operational Analysis problems are set in adversarial systems which are inherently hard to bound and with variables which are hard to measure."

"Games are good at modelling of this class of system and good at teaching you to model this class of system."

OA problems as adversarial systems

"Gamefication"	"Traditional Approaches"
Loosely defined system (e.g.) Irregular warfare in Dombass region	Well-defined systems (e.g, high resolution simulation of fuses)
Adversarial systems	1-sided systems
Outcome depend on *choices* made by actors	Outcomes depend primarily on inherent *capabilities* of actors
Choices show strong interaction effects with each other	Choices occur (and can be assessed) in isolation
Dynamic equilibria / outcomes	Static equilibria / outcomes
Enemy poorly-defined / understood / modelled	Enemy well-defined / understood / modelled
Value judgement / Subjective metrics	Physical metrics
"Strategy and tactics"	"Logistics"
Understanding	Analysis

- **Technical Expert (Operational Analyst) with MBDA UK**
  - Delivering internal and external wargaming product
- **Previously with Dstl,**
  - working in Historical Analysis and other areas
- **30+ years experience building and playing across all classes of professional / hobby games.**
  - And an unrelated interest in game theory!

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- **“Know yourself and your enemy”**
  - Wargaming promotes clarity about players and objectives
- **“The road not taken”**
  - Wargaming promotes better understanding of strategy, risk, and uncertainty
- **“The Italian Pasta Rule”**
  - Wargaming promotes efficient models with good balance of resolution and accuracy
- **“*Veritas in Ludo*”**
  - Wargaming promotes honest discussion and creativity

“If you **know** the **enemy** and **know yourself**, you need not fear the result of a hundred battles”

~ Sun Tzu

The Lone Ranger and Tonto are on a hilltop completely surrounded by hostile Indians.

As they close in, the Lone Ranger turns to Tonto and says, "well, old friend, looks like we are in a bit of trouble here"

Tonto replies, *"Who's 'we', Paleface?"*

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Insight #1

Wargaming promotes clarity about players and objectives

Wargame design teaches you think carefully about the actors (players) in a system, and their objectives. You don’t make the mistake of thinking everyone wants the same thing, or as badly. You think about their span of control, and worry more about “big picture” politics and alliances and less time about optimisation of fires.

- **Your force and allies may not be a coherent player for analytical purposes**
  - Excusable in modelling simple conventional conflicts, but pathological in many real world situations
  - Even your close allies are not *perfectly* aligned with your own objectives / payoffs.

- **Every player has a different payoff set**
  - Even perfectly aligned objectives don't make them the same side; they need a homologous span of control and co-ordination too.

- **Every player has different tolerance towards risk**
  - Risk aversion is almost nowhere to be found in the Operational Analysis literature
  - Deterrence studies are reduced to assuming *Common Knowledge* and *Perfect Predictions.*

- **Define your players correctly, but not exhaustively**
  - Where players have alike objectives *and* can co-ordinate, they can be reasonably combined for study purposes
  - Separate ROLES/CAPABILITIES from IDENTITIES
    - i.e. A government is not the same as a party
  - Too many players is as bad as too few

- **Even 2-player games are seldom zero-sum**
  - Zero-sum games are analytically simpler…but gross idealisations in many circumstances
  - E.g. Air to Air combat; both sides would prefer mutual retreat to mutual death….causes havoc with exchange ratio calculations.

- **Beyond 2-player systems *alliances* and *politics* <u>will</u> appear.**
  - The enemy of my enemy is my friend
  - E.g. Iraq 2006:
    - A dozen major internal factions and similar number of external states
    - Arguably roles for at least 3 players within the US-led coalition itself

“Two roads diverged in a wood, and I -
I took the one less travelled by…”

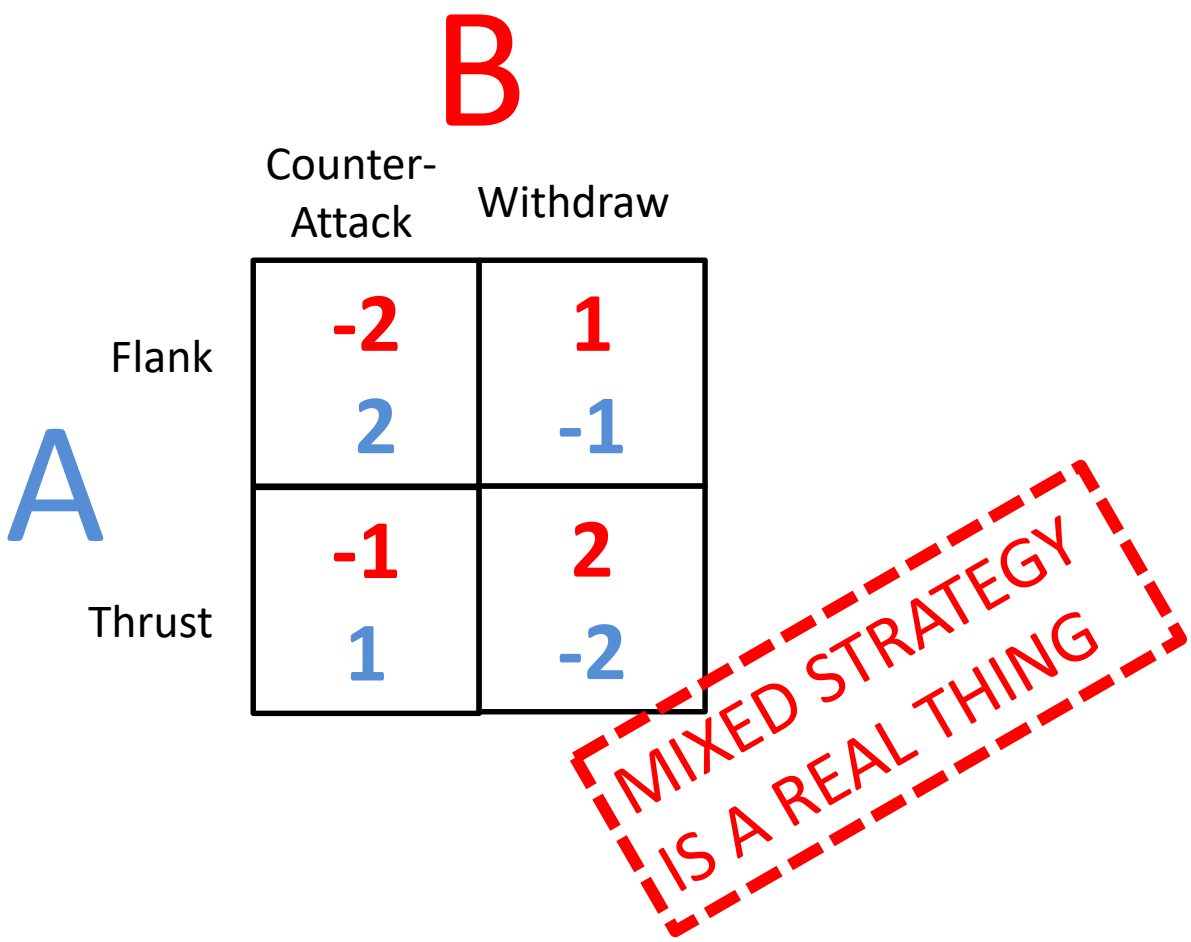
~Robert Frost

Insight #2

Wargaming promotes better understanding of strategy, risk, and uncertainty

There is no ideal plan. There is only strategy. There are endogenous and exogenous risk factors beyond your control. Average outcomes are not typical outcomes. Wargaming makes you much more tolerant of risk and uncertainty.

- **What's the best move for A?**



- **Most adversarial systems are mixed strategy systems**
  - True at most scales of operation
  - Dominant in the REAL WORLD: Pearl Harbour and the Fall of France

- **But mixed strategy is difficult to represent in traditional OA**
  - Too much analysis assumes a single, dominant strategy exists
  - …and can be decomposed into a series of vignettes

- **Wargaming familiarises players with strategy and risk; *endogenous system variance***

- **Lack of strategy and risk in analysis creates problems:**
  - Variation in strategy space is not captured
    - Conservative rather than radical plans inevitably adopted as templates
  - These in turn produce “average” analysis outcomes and neglects risk
    - Produces “just so” answers that are too “neat”.
  - It also tends to require unjustified simplifying assumptions
    - Perfect Information / “No surprises”
    - Perfect control / co-ordination
    - Perfect dependency / “chain of vignettes”

- **Leads to “Fetish-isation” of details and excessive emphasis on tactical execution of plan.**
  - Mapping out best FPs in the Fulda Gap.
  - 1961 US nuclear SIOP

- **Wargaming also familiarises players with out-of-scope events and uncertainty; *exogenous systems variation*.**
  - i.e. The map is not the territory

- **Excessive certainty about scoping and model boundary in analysis creates problems**
  - Over-confidence and cognitive biases
  - Curse of Expertise
    - Foxes vs Hedgehogs
  - Arguments from authority

- **Game Examples:**
  - Strategic Surprise mechanic: “Pearl Harbour” and breakthrough at Sedan. Labyrinth. Freeform play.

- **Example: Warship defences**
  - To justify expensive, high-end defensive systems, extensive analysis of warship defences are built about attacker assumptions and weapon, sensor and warning times, targeting and interception timescales, and defensive P(k) and loadouts.
  - BUT: In the real world many warships that have come under missile attack *didn't even have their radars/weapons turned on* and were struck without "entering" the modelled defensive system.

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- **From “The Campaign for North Africa”, SPI 1979**

[52.6] THE ITALIAN PASTA RULE

One of the biggest mistakes the Italians made during the entire Desert Campaign was to provide their troops with a diet which was composed, in large part, of spaghetti and macaroni. Aside from providing insufficient protein (this wasn’t Buitoni Brand), pasta has one serious drawback in the desert: you need water to cook it! Therefore, each Italian battalion, when it receive its Stores, must receive an additional 1 Point of Water when Stores are distributed. And battalion-sized unit that does not receive4 their Pasta Point (one Water point) may not voluntarily exceed their CPA that Turn. Furthermore Italian battalions not receiving their Pasta Point that have a Cohesion Level of -10 or worse immediately become Disorganized, as if they had reach -26. As soon as such units get their Pasta Point, they regain the original Cohesion level (i.e.. the level they had before they disintegrated).

Pasta la vista, baby

Insight #3

Wargaming promotes efficient models with good balance of resolution and accuracy

Wargaming is (alas) limited mostly by player time. Designers and players soon learn to exclude any mechanism that isn't adding to the experience. What survives has to be quick, (sufficiently) accurate, and understandable/transparent. It focuses attention on what is important and produces a heterodox mind-set.

- **Limited time and conservation of “fun”**
  - Force systems to discard cumbersome mechanics and simplify others rather than pay lip-service to the idea
  - Games that are user-unfriendly go extinct
    - Operational Analysis which is user-unfriendly gets more documentation

- **Novel mechanics**
  - Emphasis on “unification”; common mechanisms to handle several different physical effects and actions (e.g, Morale and cohesion rules), training accuracy and resolution for speed of play.

- **Wargaming as game, not simulation**
  - Apotheosis of Wargaming-as-Simulation circa 1978 (“Italian Pasta Rules”).
  - Coincided with decline of market
  - Explosive re-growth of hobby post 1990 driven by “game” side.
  - Which is better? What can you learn from a “bad” game?

- **Wargaming tends to emphasise a wider set of DLODS than traditional modelling**
  - Organisation, Training, Doctrine and Personnel
    - Systems where equipment is not a (relatively) big differentiator of the various sides. Pre-industrial warfare doesn't have quite the same variety in gear.
    - Quality more a function of personnel
    - EXCEPTION: Modern miniatures
  - Information
    - Closed games and the value of information
  - Logistics (and economics)
    - A wargame played out of over many months / years of game time allows (demands) an emphasis on supply and force generation in a way that many simulations can't.

"He who knows only his own side of the case knows little of that.... Nor is it enough that *he should hear the opinions of adversaries* from his own teachers, presented as they state them, and accompanied by what they offer as refutations. He must be able to hear them from persons who actually believe them...he must know them *in their most plausible and persuasive form*"

~ John Stuart Mill

Insight #4

Wargaming promotes honest discussion and creativity

Wargaming is the archetypical Red Team activity; without a Red Team, its always tempting to argue one side's case to the exclusion of the other. Wargamers tend to be more creative than a single authority trying to be "fair".

- **White is a poor Red**
  - Control teams modelling Red, compared to a dedicated Red Team are;
    - Less creative (“Use Blankets + Children to defeat the Kill-droids”)
    - More passive (Red shoots back but doesn’t try to seize the initiative)
    - Less tenacious (“I’ll make you roll for it”)
    - More conservative (“Hah! They would never dare to…..wait…what’s that sound?”)

- **Talk is cheap**
  - “….Someone will bell the cat”
    - It’s (too) easy in analysis to defer to a implausible course of action “in principle”; wargaming forces *someone* to own the risk or admit the plan is actually unfeasible.

- **Analysts need spaces to (safely) fail.**
  - For an analyst, being *wrong* is a professional nightmare, but losing all of Western Europe to a Russian invasion can be shrugged off as *bad dice*.
  - “Let’s try this and see if it works…”

- **Manoeuvreist approach**
  - Wargamers encourage players to think about other metrics for victory than the annihilation of the opposing force
  - Wargamers are comfortable with soft systems methods for representation of conflict. Morale, “resources”, and popular support / legitimacy

- **Mission Command**
  - The point of wargaming is to find a better way to do-it-yourself, not to follow precise instructions
  - Search for “Exploits” and “Cheese” (that may, or may not, be realistic, but train people to explore systems / rules in order to optimise them).

- **Integrated Action**
  - Wargaming teaches sequencing and synchronisation to exploit maximum number of concurrent bonuses at the point of decision

- **"Know yourself and your enemy"**

  Wargaming promotes clarity about players and objectives

- **"The road not taken"**

  Wargaming promotes better understanding of strategy, risk, and uncertainty

- **"The Italian Pasta Rule"**

  Wargaming promotes efficient models with good balance of resolution and accuracy

- **"Veritas in Ludo"**

  Wargaming promotes honest discussion and creativity
  (The enemy is the best teacher)

Questions? Comments? Own experience?

MBDA MISSILE SYSTEMS