

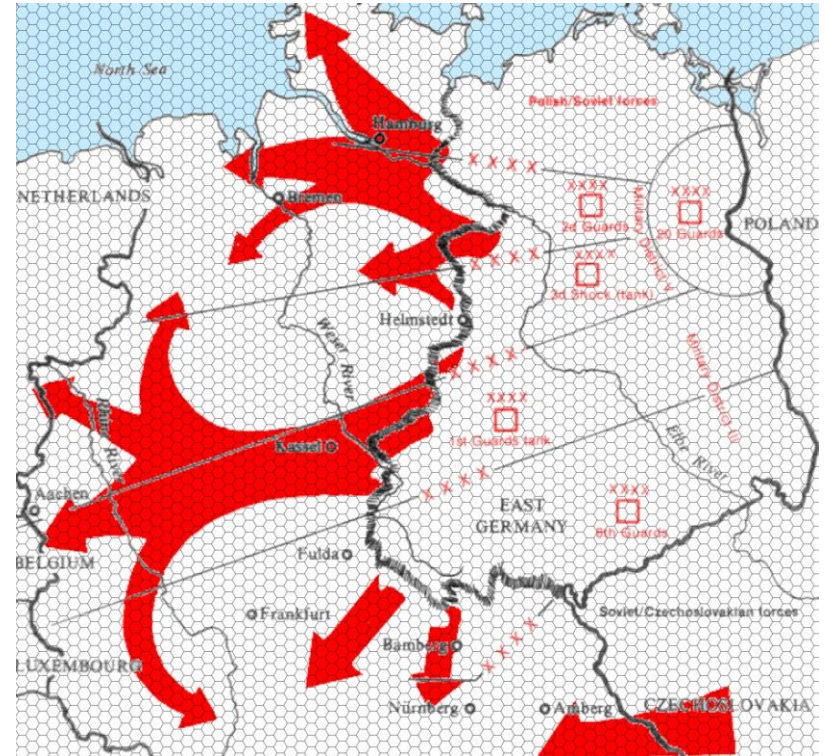


# The design of the Generic Low Operational Wargame system (GLOW)

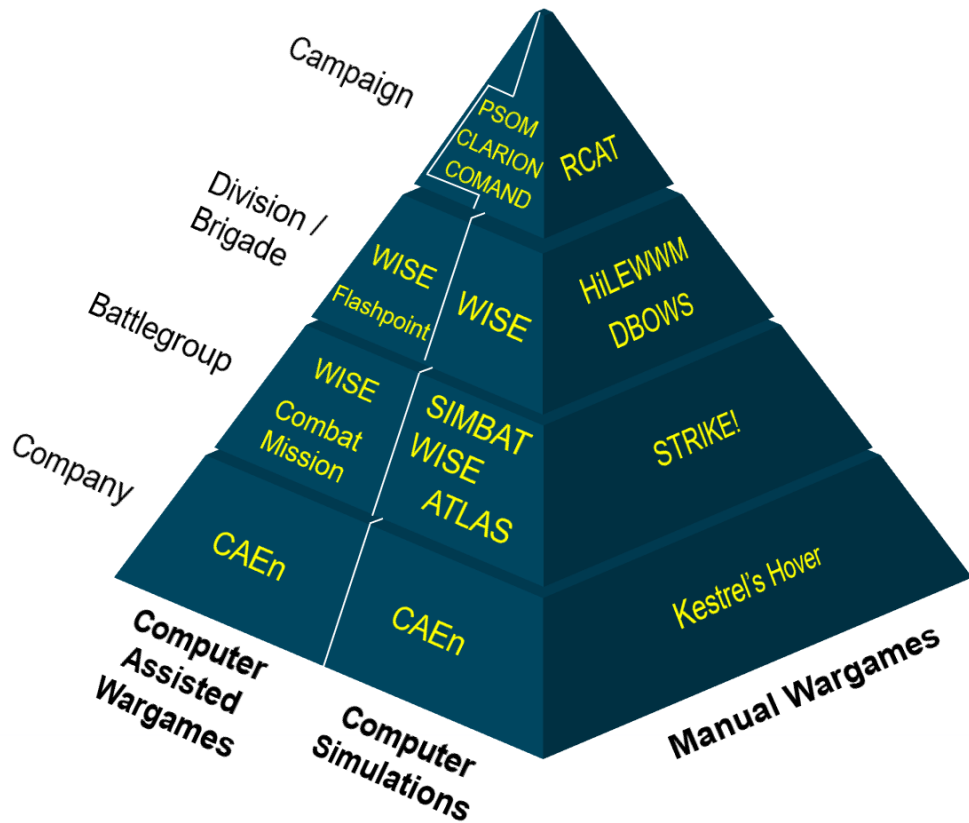
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DSTL/CP171661

- Rigid, data-driven, bottom up design, intended to represent the joint operational space, and to be capable of producing both qualitative and quantitative outputs.
- Primary purpose is for FORCEDEV and WARDEV
- Operational Level Analytical Wargame



# Pre-2022 Land Wargaming Pyramid



- Historical bias towards tactical wargaming
- Internal research highlighted the need for an analytical, low operational game
- Recent history has made this gap critical

# Existing Operational Wargames

- Many examples of commercial operational wargames
  - Tactics & Tactics II
  - Next War
  - OCS series
- Few professional, analytical examples in this low operational space
  - MCU's Operational Wargame System (OWS)
  - ...



- “Hence his true aim is not so much to seek battle as to seek a strategic situation so advantageous that if it does not of itself produce the decision, its continuation by a battle is sure to achieve this. In other words, dislocation is the aim of strategy; its sequel may be either the enemy’s dissolution or his easier disruption in battle”
  - Liddell Hart, Strategy (1954)





- Logistics movements are based on the number of possible truck round-trips, in a 24 hour period.
- This takes into account vehicle speed, carrying capacity, driver hours and load/unload times.
- Each logistics node has an amount of held stocks, and a number of assigned vehicles, each.
- Supplies are then transported node to node by movement points on the map, dynamically adapting to contested GLOCs, RDM, and other obstacles.

- Worked example (arbitrary truck numbers):

A node with four ten-ton trucks can deliver 120 tons (12 units) 40km away on road over 24 hours.

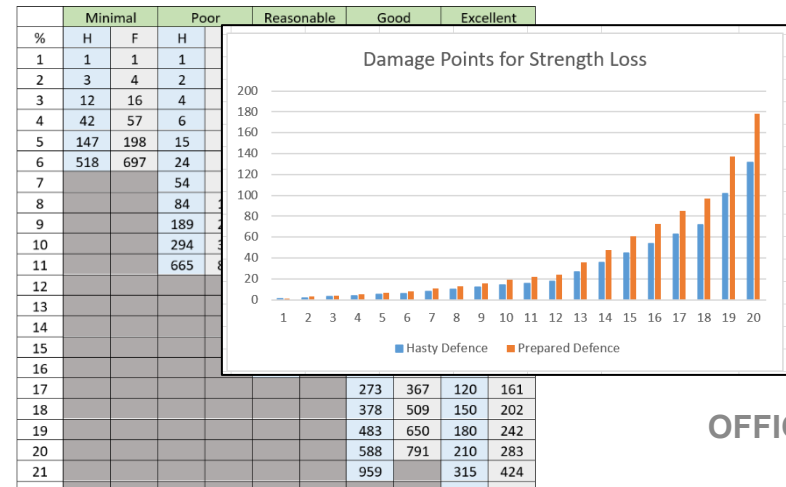
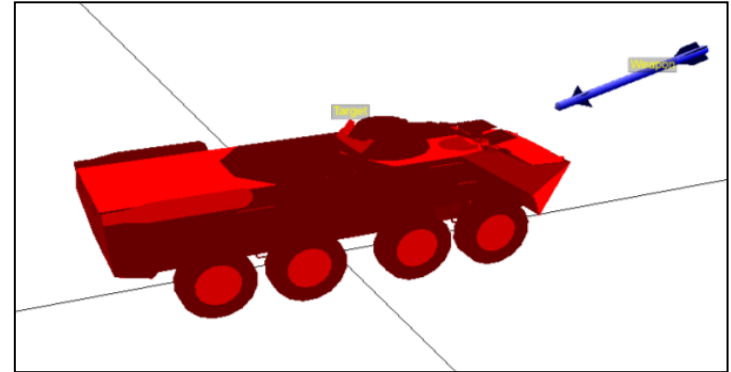
		Ammunition and Fuel			
		MP (units of 10 km)			
Trucks		2	4	8	20
1		4	3	2	1
2		8	6	4	2
3		12	9	6	3
4		16	12	8	4
	20	15	10	5	
	24	18	12	6	
	28	21	14	7	
	32	24	16	8	
	36	27	18	9	
	40	30	20	10	

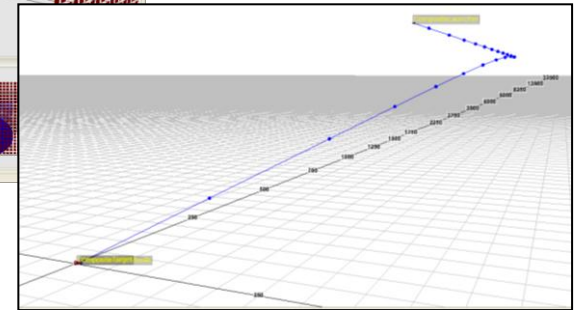
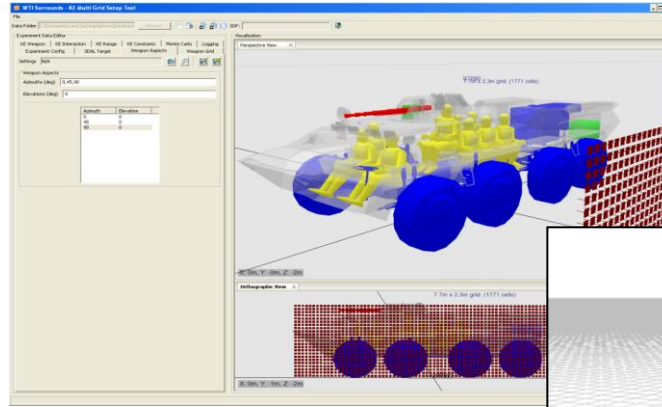
	Wheeled Light
Road	1
Open	2
Woods	8
Marsh	Impassable
Urban	17
Rubblisation	Impassable

# Three Pillars: Strike

- Since GLOW frames operational art as a conflict of enabler versus enabler, a system to model strikes is a critical component.
- In general, strikes can hit key targets of individual enablers (e.g., an MRAD system with four launchers can target the radar or the launchers), or they can target the body of a formation or node, assuming they have sufficient ISTAR for effect.
- Resultant damage against a formation uses a Soviet weight of fires curve, where damage points can be accrued from multiple sources, and resolved in aggregate.



- Strikes versus enablers based on data from computer modelling
- Strikes versus formation strength is derived from Soviet combat model (Calculating Combat Outcomes, CW Blandy)

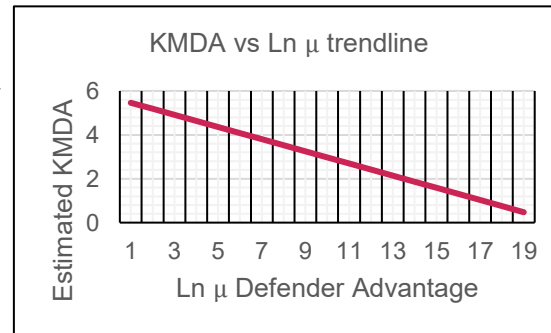
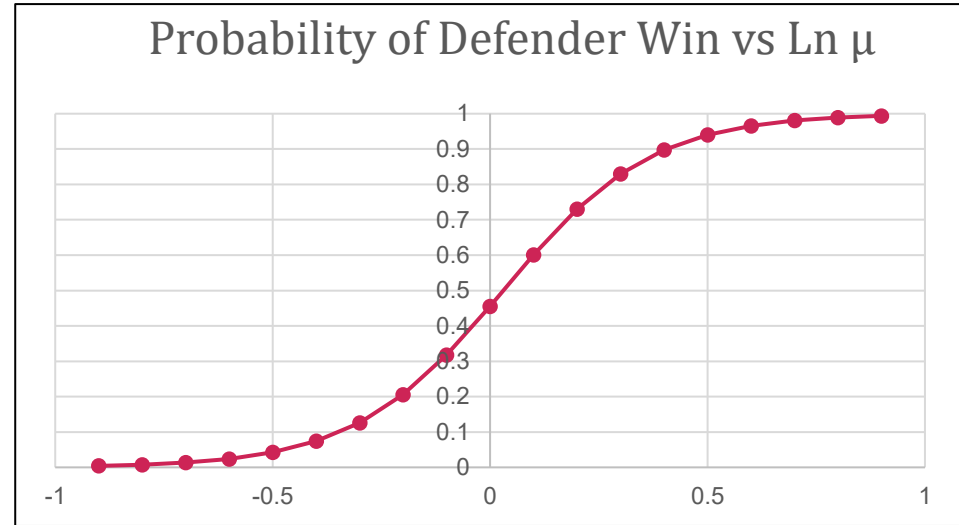


Form of Defence	Weapon Systems				
	Guns			Mortar	Rocket
	122mm	130mm	152mm	120mm	Medium
Hasty Defence	150	150	110	140	240
Well prepared Defence	200	200	150	200	320

Degree of Destruction in %	20	30	40	50	60	80
Coefficient relative to 30% (Neutralisation)	0.57	1	1.6	2.3	3.4	7.4

# Three Pillars: Battle

- Battle required a system which was quantitative, and could model attrition and rates of advance, at sub-hex scale.
- Because the combat here will be aggregated over a 24 hour period, combat modelling became a viable option.
- The approach taken was to lean on the historical analysis of Robert Helmbold, and his three battle parameters, Bitterness, Intensity and Defender Advantage, derived from his database of historical battles.
- This was combined with other Historical Analysis factors to account for the importance of terrain, obstacles, etc.



$$P(DWins) = (1 + \exp(-z))^{-1}$$

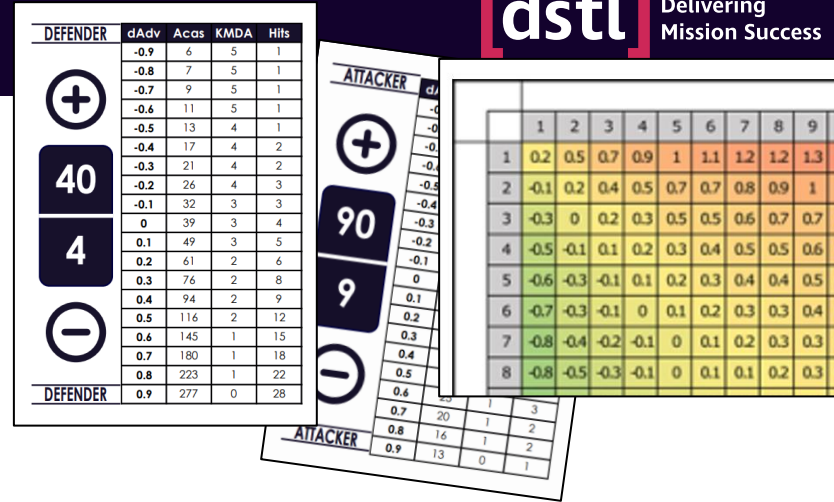
$$z = a + b \ln \mu$$

$$a = -0.1794$$

$$b = 5.8694$$

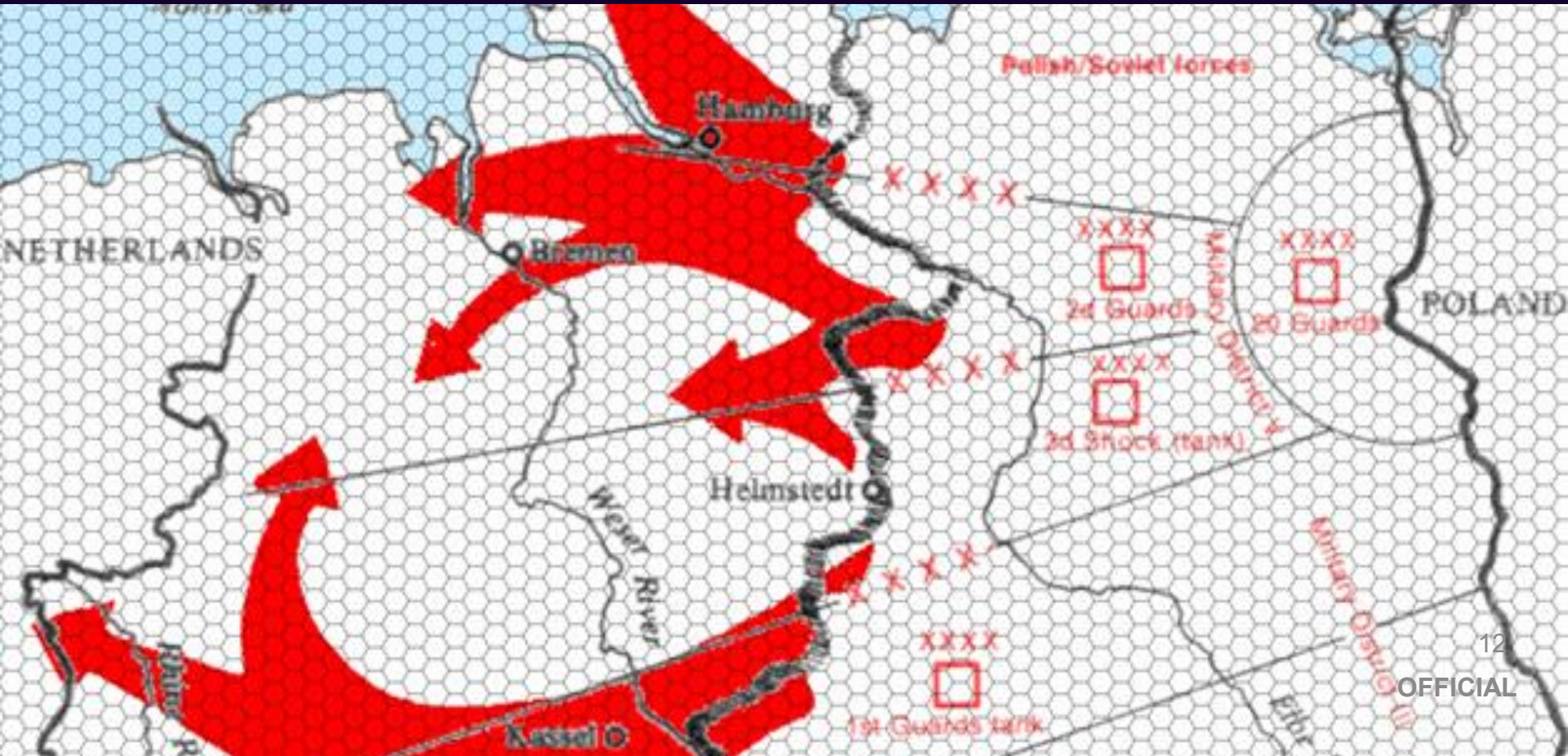
# Three Pillars: Battle

- One of the core problems with all combat modelling is that the historical record for how long battles last, or when they culminate, looks essentially random.
- There has been work looking at both extreme cases: the cases where culmination was random, and where it's deterministic, and neither makes sense of the data.
- GLOW's solution for this is then to have an initial Defender Advantage derived from the ratio of combat values, modified by terrain and other factors.
- Then, both sides select a playing card to choose their culmination point, and the side that reaches this point first (after some friction to account for the standard deviation of the data) will lose the battle.
- Successful attacks track sub-hex movement, so a static and attritional line will end up with points of "tension" or "strain" that can develop or release over days of attempts.



- Combat has a dAdv of -0.3
- Attacker selects 90 and Defender selects 40.
- End result is that the Defender loses, and takes 40 losses, with the attacker taking 21, and advancing 4km into the hex.

# Questions





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