



Tactical Land War Games Approach and Issues

JD Smith,
Cranfield University
Cranfield Defence and Security
Centre for Simulation and Analytics

Aim



- Expose some issues with land wargame system at a semi-aggregated level
- Seek your expert
 - feedback
 - guidance
 - ideas



The Issue

- Operational Level Wargames
 - Aggregated Units
 - Combat factors/Power
 - Aggregated Effects
 - Degradation in Combat Power
 - 'Steps'
- Tactical Level
 - Entity level
 - Semi-aggregated



Tactical Level

- Entity level
 - Individual systems
 - Pkill/Phit
 - Eg Firefight
 - Probability tables, for example, for
 - Hit vs range
 - Kill given a hit
 - Detections

Tactical Semi-aggregated

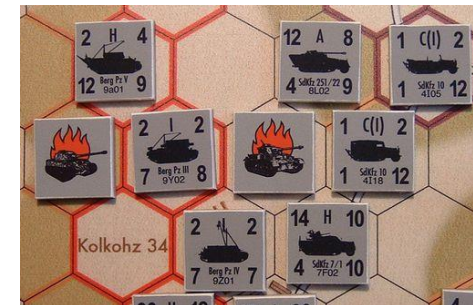
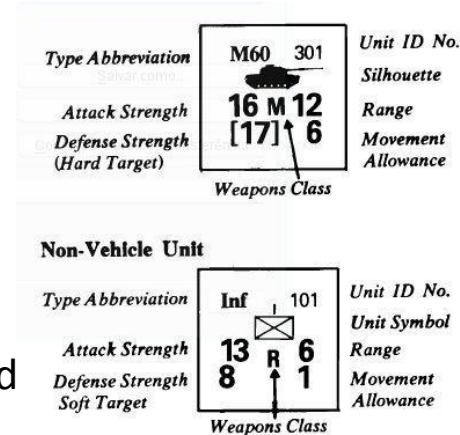


- Units representing Troop, Section size
 - eg
 - 3,4,5 vehicles
 - 4-30 personnel
- To allow
 - larger scope missions and
 - Practical/manageable unit numbers

Manual Game Approaches



- Mech War
 - Firepower factors
 - Differential (not ratio)
 - Pin, Disrupted (3 levels), Killed
 - Disrupted effect needs to be removed
- Panzer Blitz/Leader
 - Fire power factor
 - Ratio calculation
 - Disrupt effect or Kill
 - double disrupt is a kill under certain circumstances
- First Battles
 - Entity level generally
 - But ratio system
 - Pinned (temporary), Damaged (M kill), Killed





Issues

- Credibility and consistency
- Military credibility
- Analytical utility
- What do the results actually mean?
 - No burning hulks
 - No casualty counts

Manual vs Computer



- Entity Level simulations
 - JCATS
 - Janus
 - Milsim
- Semi-Aggregated
 - Abacus

Computer vs Manual



- Computer simulation and wargame reduce or avoid this issue
 - Entity level (especially vehicles)
 - Group and aggregate by orders and lower level unit behaviours and control
 - So is it really an old tech manual wargame issue?



An Approach

- Aggregated Units
 - 3 or 4 vehicles per unit – Troop level
 - But extendable
 - Start with PK per shot
 - Calculate probability of number of targets killed in a 'volley'
 - Assume target is 4 vehicles



Example Table

Vehicles

4 vs 4

Pk per shot

Expected Killed Targets

| | 0 | 1 | 2 | 3 | 4 |
|-----|-------|-------|-------|-------|-------|
| 0.1 | 0.656 | 0.292 | 0.049 | 0.004 | 0.000 |
| 0.2 | 0.410 | 0.410 | 0.154 | 0.026 | 0.002 |
| 0.3 | 0.240 | 0.412 | 0.265 | 0.076 | 0.008 |
| 0.4 | 0.130 | 0.346 | 0.346 | 0.154 | 0.026 |
| 0.5 | 0.063 | 0.250 | 0.375 | 0.250 | 0.063 |
| 0.6 | 0.026 | 0.154 | 0.346 | 0.346 | 0.130 |
| 0.7 | 0.008 | 0.076 | 0.265 | 0.412 | 0.240 |
| 0.8 | 0.002 | 0.026 | 0.154 | 0.410 | 0.410 |
| 0.9 | 0.000 | 0.004 | 0.049 | 0.292 | 0.656 |



Target Effects

- Variable
- Initial suggestion
 - 1 kill will affect target unit a little but recoverable in a short time
 - ‘suppressed’
 - 2 kills will disrupt target unit substantially but recoverable
 - ‘neutralised’
 - 3 kills will effectively defeat target unit

*Variable and tailorable – for example for trained/
motivated forces vs conscript*

Unit Representation



- How to represent unit capability
 - Convention is for a ‘Combat factor’
 - MW
 - PB/PL
- Combat factor to Represent aggregated effect capability of units
 - Attack and Defence



Example Units

- Assume the following
 - (would be revisable to real figures of course)

| Firer | Tank | BMP | BRDM |
|-----------------|------|-----|------|
| CR2 | 0.7 | 0.8 | 0.8 |
| Javelin ATGM | 0.5 | 0.7 | 0.8 |
| 40mm CTWS | 0.3 | 0.7 | 0.8 |

How to identify the columns



- By
 - Ratio?
 - Differential?

Examples



| | | | | Options | Def | | | | |
|--------|------|-----------|------------|---------|-----|----|----|--|--|
| | | | | 1 | 2 | 3 | 4 | | |
| 4 CR2 | Tk | Should be | 0.7 column | 7 | 14 | 21 | 28 | | |
| 4 Jav | Tk | Should be | 0.5 column | 5 | 10 | 15 | 20 | | |
| 4 40mm | Tk | Should be | 0.3 column | 3 | 6 | 9 | 12 | | |
| | | | | 1 | 2 | 3 | 4 | | |
| 4 CR2 | BMP | Should be | 0.8 column | 8 | 16 | 24 | 32 | | |
| 4 Jav | BMP | Should be | 0.7 column | 7 | 14 | 21 | 28 | | |
| 4 40mm | BMP | Should be | 0.7 column | 7 | 14 | 21 | 28 | | |
| | | | | 1 | 2 | 3 | 4 | | |
| 4 CR2 | BRDM | Should be | 0.8 column | 8 | 16 | 24 | 32 | | |
| 4 Jav | BRDM | Should be | 0.8 column | 8 | 16 | 24 | 32 | | |
| 4 40mm | BRDM | Should be | 0.8 column | 8 | 16 | 24 | 32 | | |



So

- A Unit of CR2 is
– Combat Power 28
- A Unit of Javelin is
– Combat Power 20
- A unit of Scout/40mm CTWS
– Combat Power 12



And the targets

- Tank – Defence factor 4
- BMP – Defence Factor 3
- BRDM - Defence factor 2

- And so on

Claims



- Links entity level performance data (Pk) to small unit aggregation
 - Firepower
 - Effects – casualties
 - Ammunition use
 - Open and transparent
 - Can be explained to military customer
 - Modifiable on the fly in an understandable and auditable way
 - Quick and simple

Questions and Advice



- Is it a non-question?
- Would/should you just use a computer sim?
- Is this approach sensible?
- What other exist?
- How should it be done
 - Firepower factors?
 - Ratio/differential/other?
 - Level of Aggregation?