A new rapid ISTAR assessment method

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Outline

- Introduction
  - background, need and development
- Model requirements
- Model description
- Example results
- Planned developments
- Summary
  - references and questions
Introduction
Introduction

• C2 is driven by the receipt of timely ISTAR information

• Previous OA support used explicit, detailed data
  – proved inflexible and costly to run

• Dstl LSD developed a new and abstract approach …
  – no need for detailed terrain data
  – no requirement for explicit platform-level deployments

• To assess quality and timeliness from an ISTAR mix
  supporting the main decisions in a scenario
  – used at unit (i.e. BG) level in this preliminary study
Background

• Gap identified in C4ISTAR assessment capabilities
  – between detailed platform-level explicit modelling …
  – and judgemental techniques, e.g. military assessment panels (MAPs) and BOGSAT

• Also request from NATO support to ARRC HQ OA

• Deep fires TA study in 2002 laid conceptual framework
  – but populated judgementally – subjective and time-consuming
  – and open to ‘criterion drift’ between evaluating cases

• Allowed a framework for capability gap analysis …
Principal of assessment

- Based on a contingency table of sensors against targets:

Sensor groups:

Target groups:

Apply logic rules...

Summary against target groups

Summary against sensor groups
Model description
Model requirements

• **Operational**: VB for Excel, spatial information, represent a ‘snapshot’ in time, run deterministically using probabilistic data, output easy metrics

• **Technical**: approximate spatial overlap, interaction of sensor capabilities with target types and postures, effects of terrain/met/night/day on sensor performance

• **Types of sensor**: ground-based imaging (optical and thermal), GSRs, unmanned acoustic and seismic, UAV-borne, WLRs, SRs, manned recce airborne, ESM
Model overview … 1

- Complex reality
  - many entities
Model overview ... 2

• Simplified view
Model description

- Blue sensors and Red targets are represented spatially as homogeneous ‘blobs’
- Sensor performance is measured over ‘snapshots’
  - assuming quasi-static deployments
  - target postures reflect unit movement and other activities
  - e.g. advancing, open, hide, ‘shoot and scoot’, etc.
- Terrain (including culture) assumed homogeneous
- Meteorological effects on some sensors
- Levels of CCIR represented
  - influencing timeliness, TLE and resolution
‘Logic engine’

- Runs six ‘coupling tests’ on each sensor/target pair:
  - spatial overlap
  - spectral compatibility
  - activity compatibility (for STI/MTI sensors)
  - resolution (DRI)
  - target location error (TLE)
  - timeliness
- All compared against target and CCIR parameters
- Sensor must pass all six to acquire target group
Influences on logic engine

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‘AND’ logic $\rightarrow$ MoP
Example results
Example results
# Base case summary

Overall summary. Parameters: TL 1; SG 1; Europe, hilly; Planning; Clear day

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## CCIR variation: Targeting

**Overall summary. Parameters:** TL 1; SG 1; Europe, hilly; Targeting; Clear day

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**Parameters:** TL 1; SG 1; Europe, hilly; Targeting; Clear day
Meteorological variation: Rain, night

Overall summary. Parameters: TL 1; SG 1; Europe, hilly; Planning; Rain night

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## Terrain variation: Desert, flat

Overall summary. Parameters: TL 1; SG 1; Desert, flat; Planning; Clear day

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| Parameters: TL 1; SG 1; Desert, flat; Planning; Clear day | 2| 4| 3| 2| 0| 0| 0| 0| 0| 0| 1| 0| 1| 3| 0| 2| 1| 4| 1| 2| 1| 1| 0| 4|
Strengths and weaknesses

• Comparative strengths of new model …
  – flexibility to model ISTAR from unit to theatre levels
  – represents a wide variety of collectors on an equal basis
  – rapid preparation and runs: pilot study ran 80 cases in one day

• Comparative weaknesses …
  – simple models shift burden of modelling onto data …GIGO!
  – uniform terrain assumption
  – poor representation of time
  – poor modelling of the intelligence process
Conclusions

• New technique developed to meet changing needs
  – speed, flexibility and responsiveness
  – for equipment procurement and operational support
• Used successfully on an ISTAR capability study
  – into equipments at the unit (battalion) level
• Strengths and weaknesses common to simple models ...
Planned developments

- C3I enhancements to include the intelligence process
  - improving representation of NEC
- Better terrain representation
  - simple terrain areas, similar to deployment method
- Enhanced resolution of sensor capabilities
  - search rates and range-related performance
- Allowance for sensor vulnerability
  - using mean time between loss (MTBL) curves
- Aim to encompass HUMINT on comparable basis
Summary

• A new rapid, high-level, automated ISTAR assessment tool
  – avoids drawbacks of detailed, engineering-type models
  – runs deterministically with probabilistic data
  – suited to quick capability gap analysis
• Modular design allows the six tests to be run independently
  – flexible, user-friendly, and easily verified
• Wide range of sensors and platform types
  – all assessed on an equitable basis
  – target posture included to reflect realistic battlefield scenarios
• CCIRs, terrain and meteorology reflect C2 environment and RoEs
• Potentially suitable for front-line OA use
References


Questions?