

# A Framework for Matching Capability Investments to Future Requirements

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## Report Documentation Page

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## Objective

Develop a framework for representing new capability (equipment) options in the context of related projects and extant capabilities.

Armed  
Reconnaissance  
Helicopter



- Identify capability gaps & synergies by matching to operational requirements
- Surveillance emphasis
- Decision support framework for making comparative assessments  
NOT an optimisation tool



HF Surface-Wave Radar

AP-3C AEW&C

Tactical Air Defence Radar

# Requirements Definition Process (Hierarchical vs. scenario-based approach)

National Military Objectives, Strategic Doctrine

Military Operations, Key Mission Components

Military functions

Tactical Objectives

Lower-level tasks & requirements

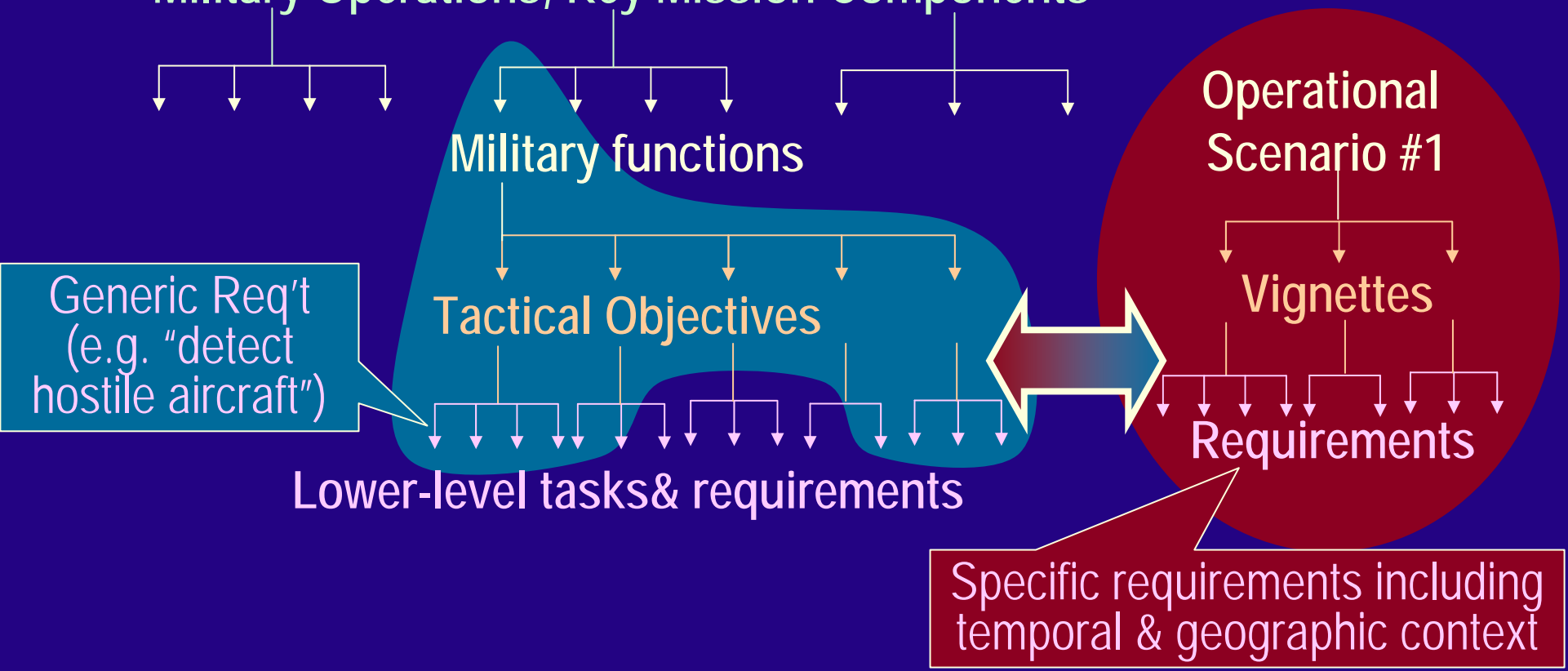
Operational Scenario #1

Vignettes

Requirements

Generic Req't  
(e.g. "detect  
hostile aircraft")

Specific requirements including  
temporal & geographic context



## Workshopping a scenario

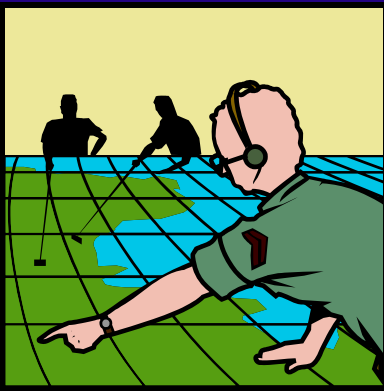
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- Scenario based on military guidance (e.g. reusing an existing war-game provided advantages w.r.t. endorsement, leverage & consistency)
- Break complex scenario into simpler vignettes that focus on specific operational issues
- LESSON: Remove extraneous considerations but don't oversimplify!
- LESSON: Importance of support from sponsor's office for organising military participation
- Workshop 1 Outcome: Military participants (not scientists) identify a critical list of operational requirements for each vignette, with reasons

Workshop 2 Outcome: List of preferred capability options for each requirement, with reasons

Capture individual opinions and group consensus for each requirement

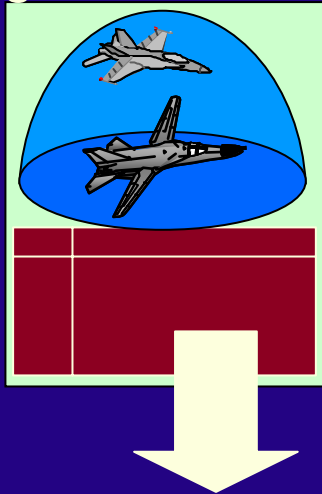
Write up workshop results and get participants to clarify and confirm conclusions (basic level of endorsement)



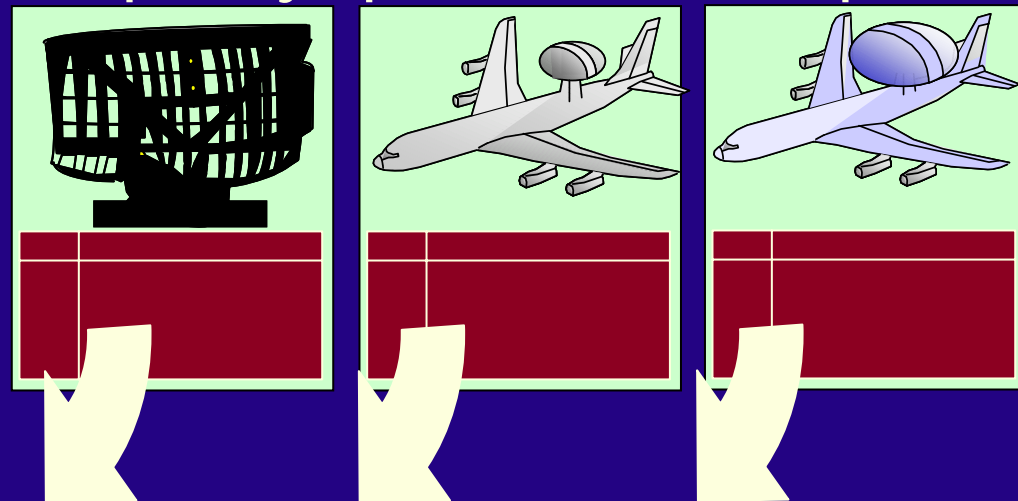


# Spreadsheet analysis: Matching capabilities to requirements

Vignette #1 Template



Capability Option A, B & C Templates\*



Metric	Req't	Option A	Option B	Option C
Metric 1		Red	Orange	Green
Metric 2		Red	Green	Green
Metric 3		Orange	Green	Green
Metric 4		Green	Orange	Orange

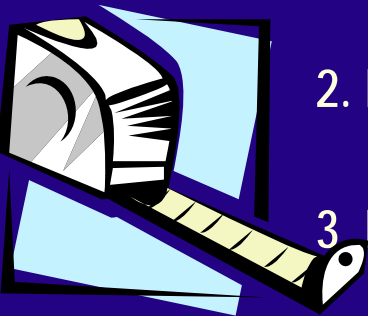
Cross-check results against workshop capability preferences

\* Note: ground-based and airborne radar icons are shown for illustrative purposes only

## Metrics

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- Derived from operational requirements not technical capabilities
- Aim for independent, objective requirements (yes/no or a natural numeric score, such as a track update rate)
  - Eg “all weather” requirement might include humidity, smoke, cloud, rain, sea state & ionospheric effects
- Each capability can be assessed and endorsed separately, providing re-usable operational capability summaries
- Also need a way of aggregating the results:
  1. Numerically  
 (“All-weather” becomes the expected % time sensor is operational, given expected weather conditions in operating environment)
  2. By level of difficulty using pair-wise comparisons  
 (small fishing boat; patrol boat; aircraft carrier)
  3. Panel of technical experts compares rankings across all capabilities

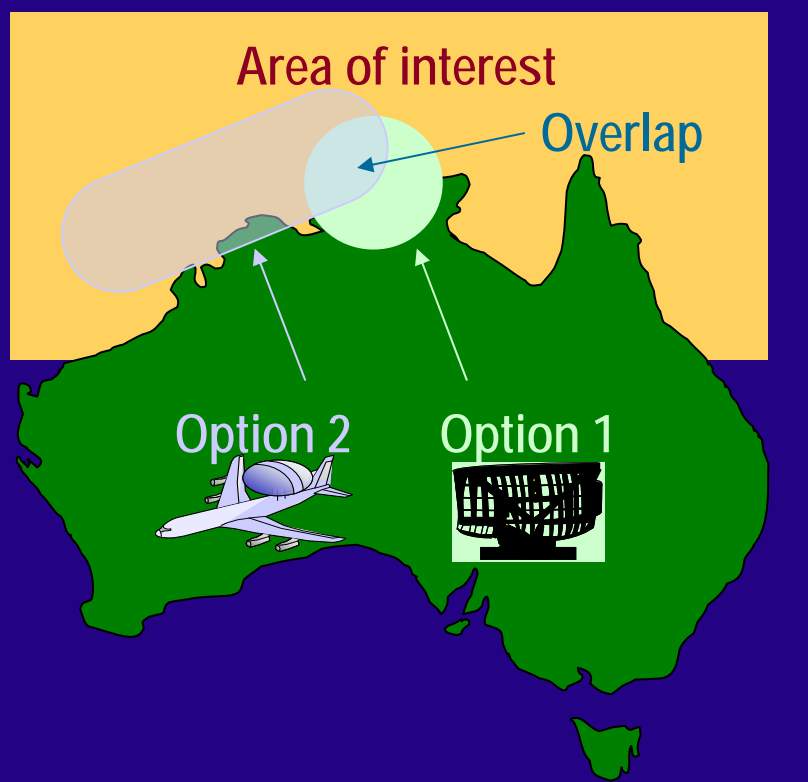




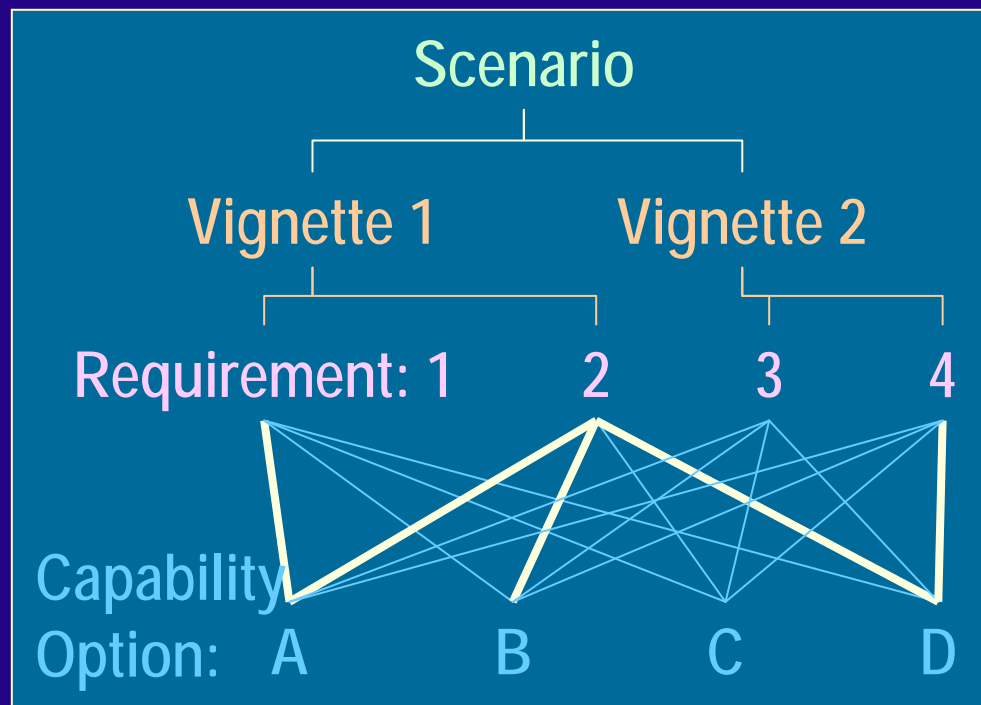
## Displaying results

- Traffic light matrices for top-level overviews
- Geographic measures on coverage maps

Metric	Option A	Option B	Option C
Location	Red	Orange	Green
Environm't	Red	Green	Green
Target 1	Orange	Green	Green
Target 2	Green	Red	Red



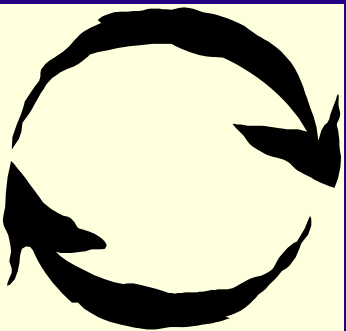
- Tree diagrams for scope & asset assignment



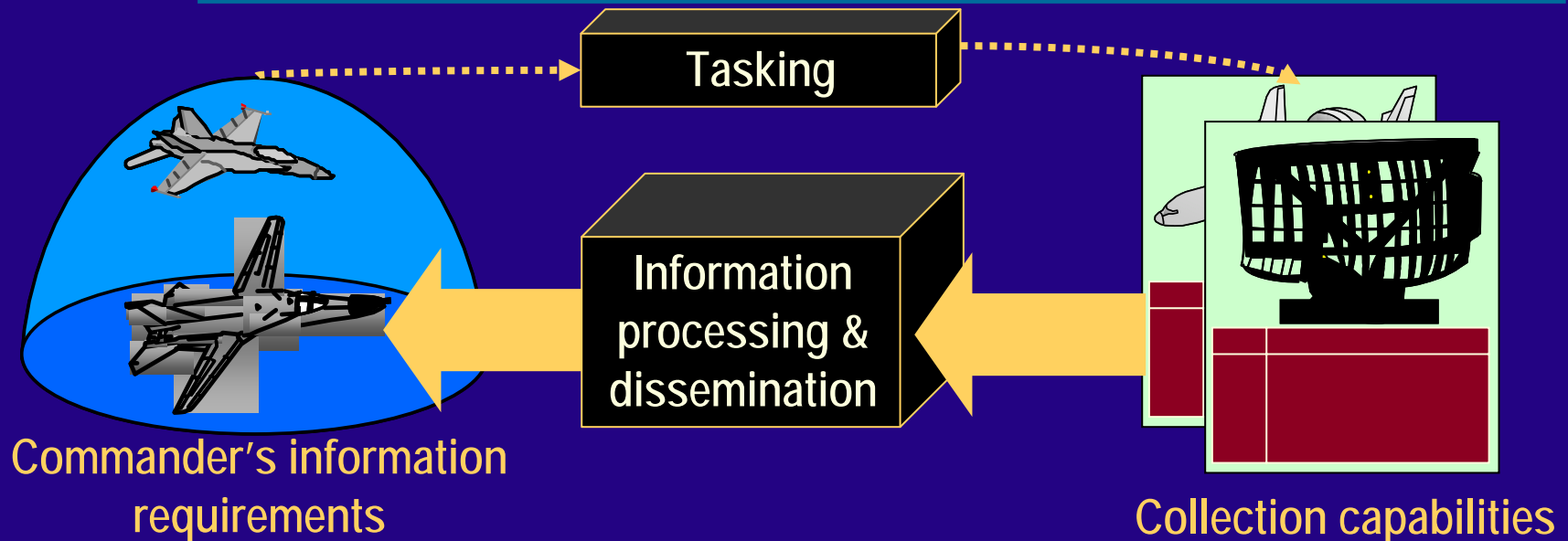
## Next steps: Iterate

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- Repeat for new capabilities and extra scenarios/vignettes. (Use guidance & hierarchical breakdowns to check if we've missed any significant requirements.)
- Sensitivity testing
  - Did scenarios identify enduring or outlying requirements & capabilities?
  - Spread of requirements from multiple scenarios
  - Effect on capability options of varying each requirement in turn
- Automate the analysis process and diagram generation? (eg adapt an existing spreadsheet-based analysis tool)



## Next steps: Information Management (TCPED)

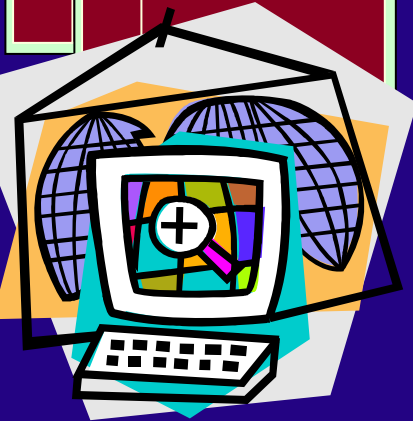
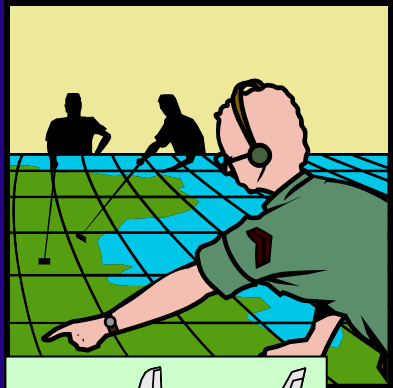


- So far looked at “collection” aspects; need to close the loop and consider the rest of the Tasking, Collection, Processing, Exploitation & Dissemination (TCPED) spectrum
- Retain a scenario focus & use the identified requirements
- Identify key tasking/processing sites and conduct C4ISR Information Architecture analysis interviews (to produce information flow diagrams & logical data models)

## Summary

Objective: Develop a framework for representing new capability (equipment) options in the context of related projects and extant capabilities.

- Scenario-based operational requirements
- Set of re-useable, endorsed capability summaries
- Summarise requirements and capabilities against a common set of metrics
- Contributes to decision-making process but does not replace the need for senior military judgement
- Add requirements and capabilities iteratively
- Next step: Investigate information management processes



## Questions and Feedback

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