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Department of Defence
Defence Science and
Technology Organisation

Operationalising Adaptive Campaigning

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Defence Science and Technology Organisation

Australia

Outline

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- **What is Adaptive Campaigning?**
- Background
- Challenges of Adaptive Campaigning
- Our Approach:
  1. Conceptual Analysis
  2. Operationalisation
  3. Implementation
- SITREP

Adaptive Campaigning

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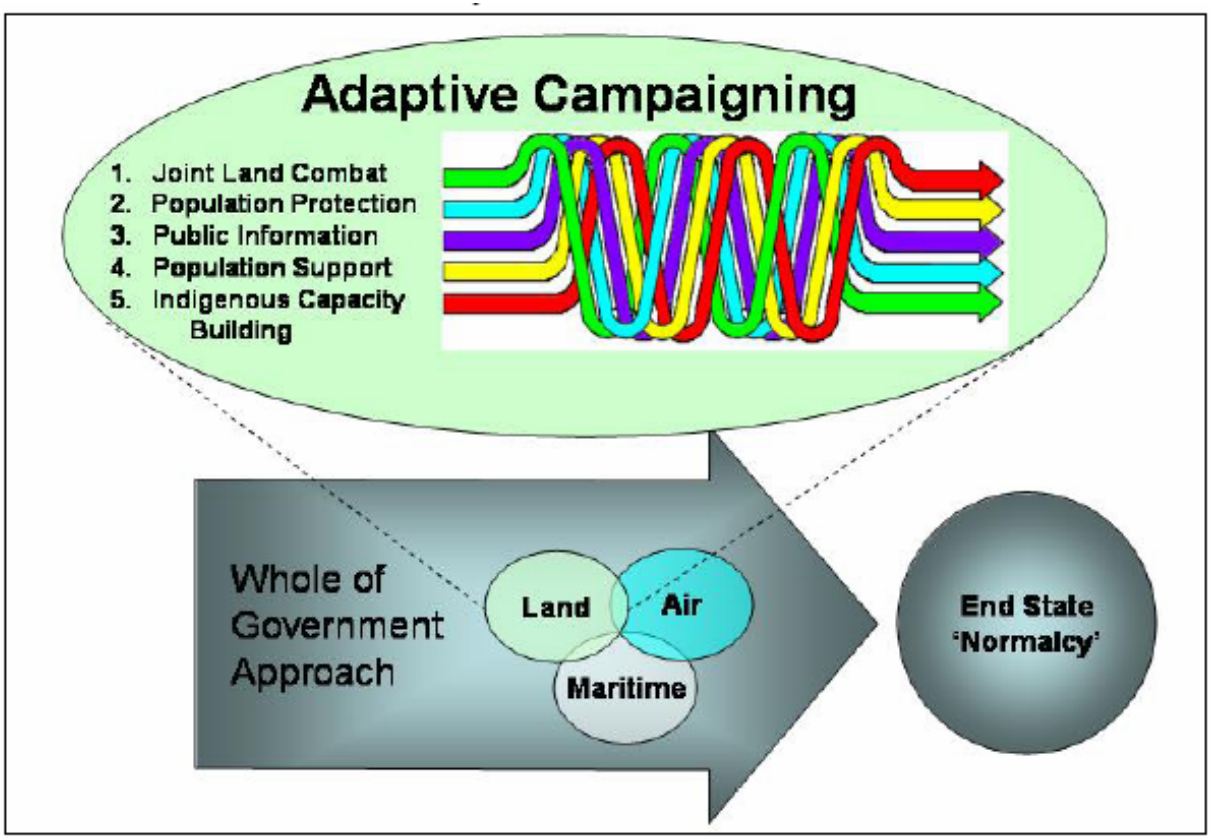
"Actions taken by the Land Force as part of the military contribution to a Whole of Government approach to resolving conflicts."



The endorsed Australian Army land operating concept

We know we're killing a lot, capturing a lot, collecting arms …
We just don't know yet whether that's the same as winning.

Donald Rumsfeld

Complex War

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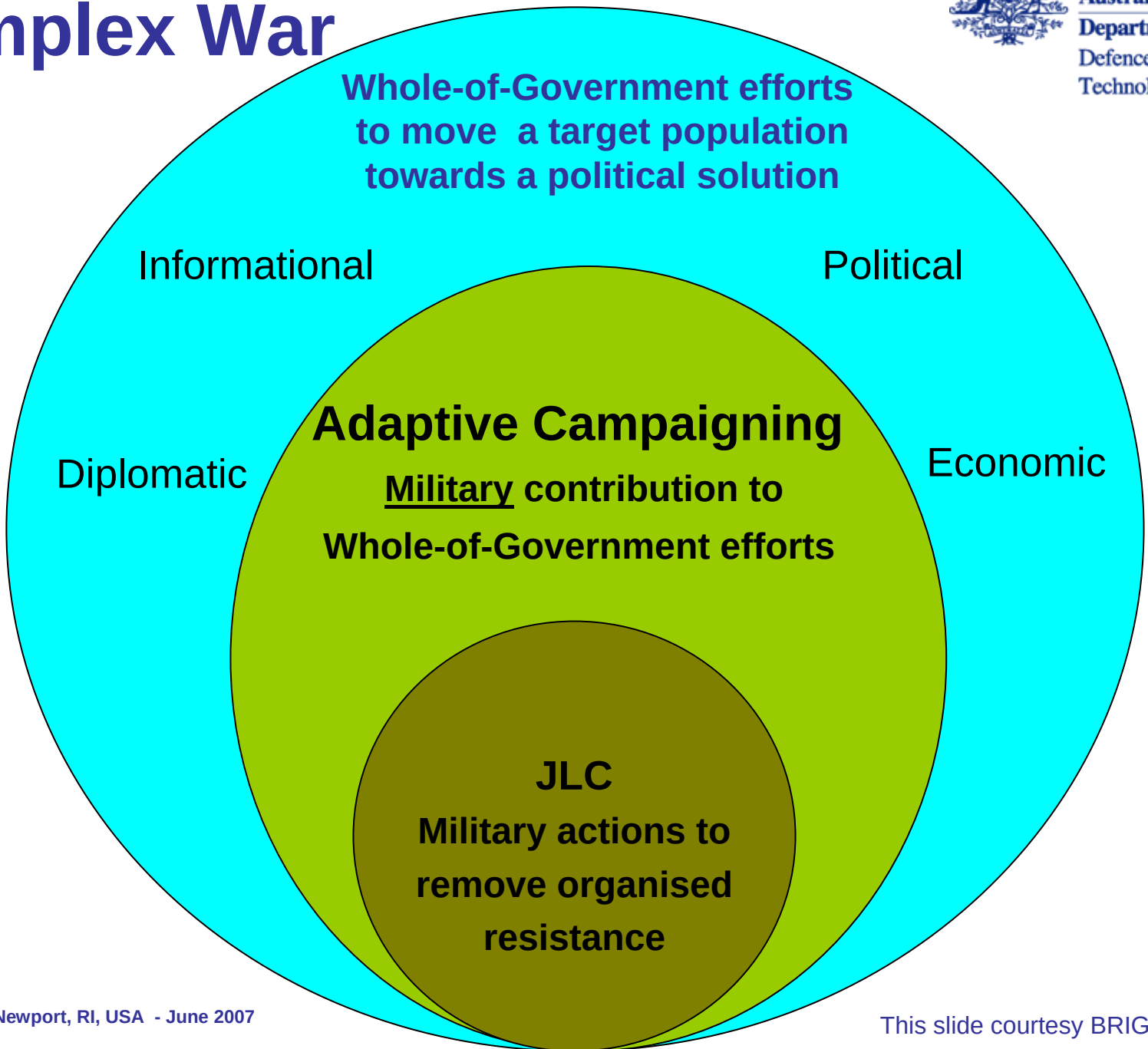

This slide courtesy BRIG Justin Kelly

Operational Uncertainty

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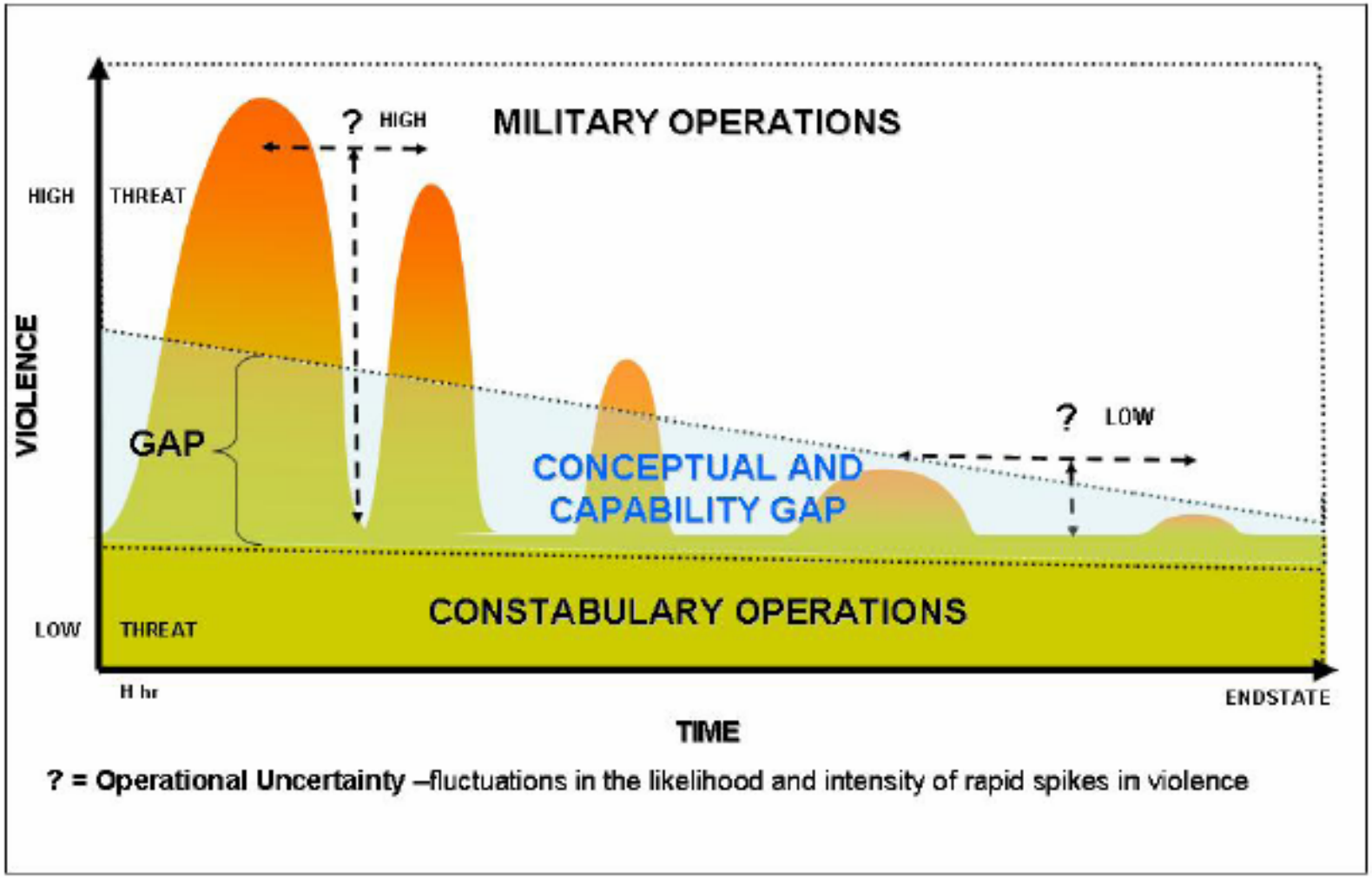
Operational Uncertainty, plus the adaptive nature of the threat, motivates Adaptive Campaigning



Piercing the Veil of Uncertainty

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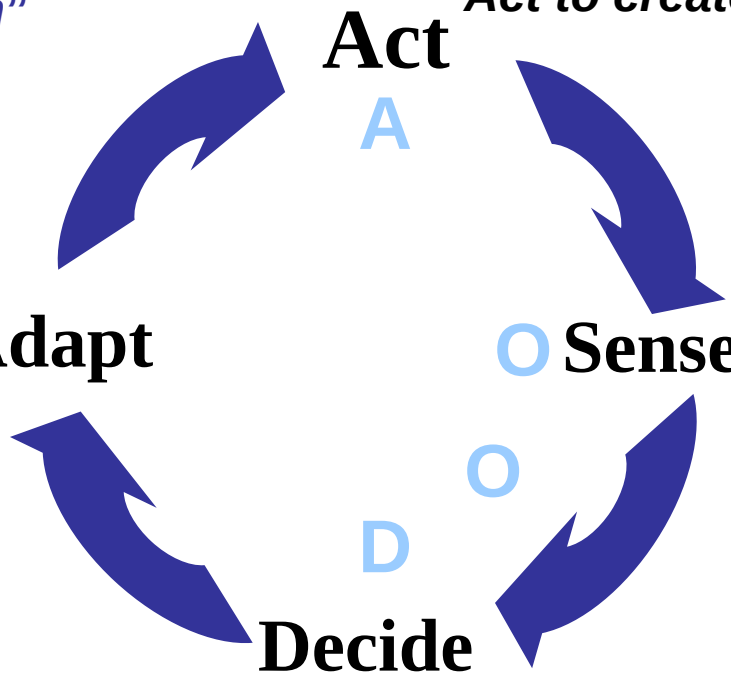
"fight for, rather than with, information"

Act first
Act in order to learn – probing actions
Act to create effect – decisive actions



Modifying actions

feedback for adaptation
learn what to sense
measure effectiveness

Be prepared to change if needed

Extends OODA

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Background

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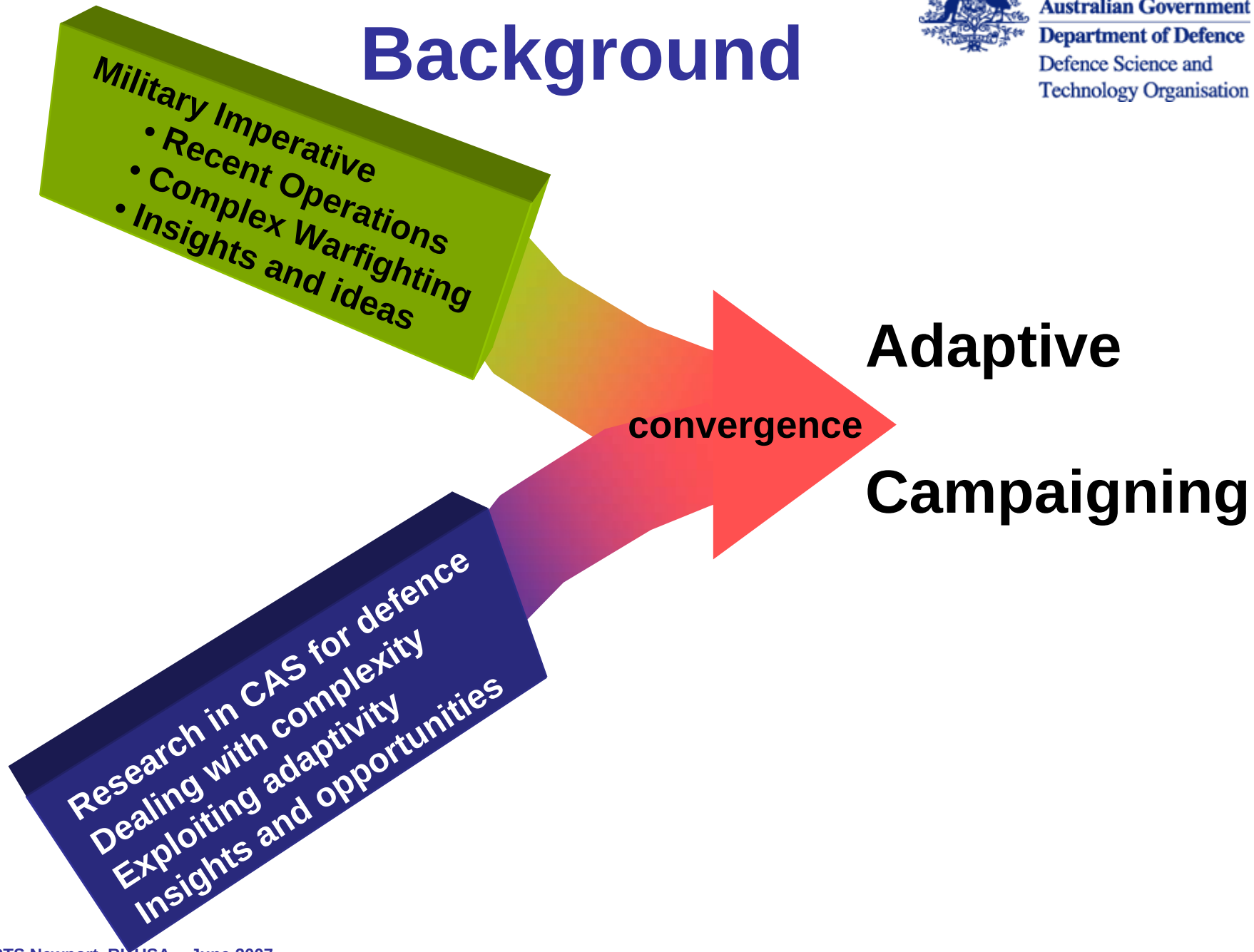

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Challenges

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- **Creating Adaptivity**
  - How to use our existing adaptive capabilities
  - How to develop new adaptive mechanisms
- **Complex Objectives**
  - Success = networked interdependent objectives
  - Associated measures of success span multiple scales
- **Complex Networked Causation**
  - Multiple agendas, multiple relationships between players
  - deception and hidden information, complex physical environments
  - All interconnected and with which the players interact
- **Limitations of Human Cognition**
  - Limits in dealing with large scale complexity, when the adaptive behaviour required extends over larger scale than what a small team can do alone
- **Complexity of our own Systems**
  - Integrating systems and forces assembled from countries with different cultures, capabilities and doctrine to create effective, resilient and agile networked force

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Multi-Level and Multi-Scale Analysis

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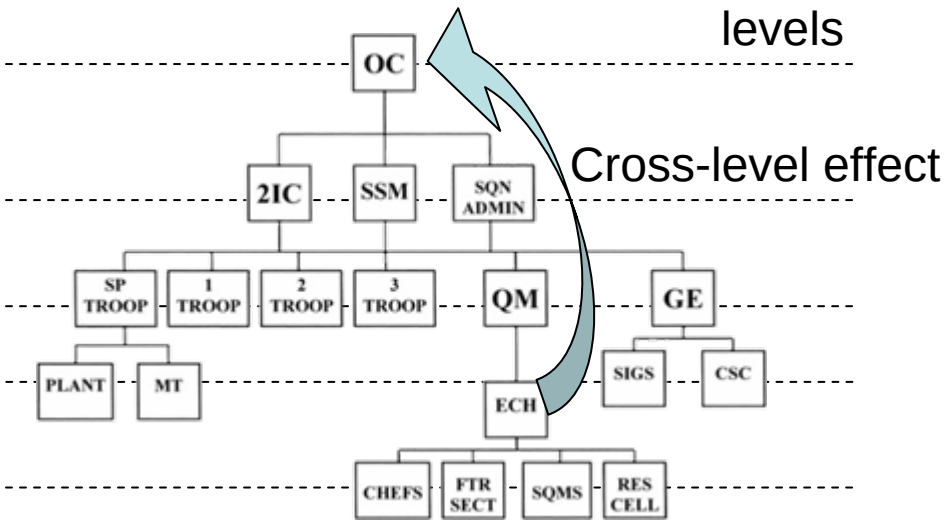

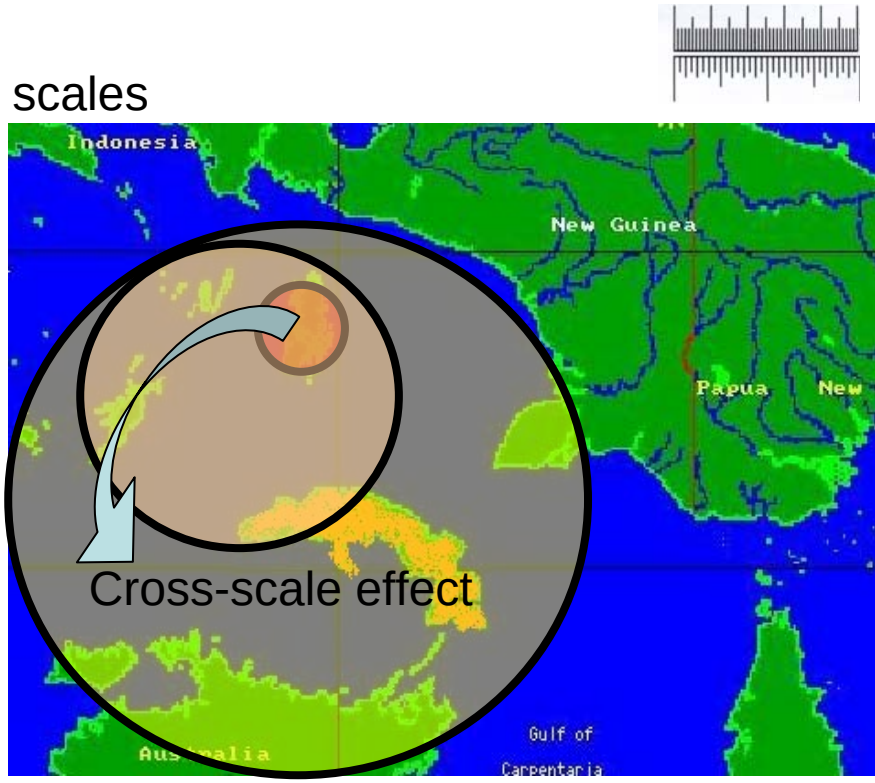

Adaptation occurs here

Effects of adaptation observed here

Adaptation – what it is…

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- CAS are complex systems which are adaptive – i.e. structure and behaviour of the system change over time in a way which tends to increase its 'success'.
- Being adaptive requires
  i. concept of 'success or failure', or 'fitness', for system in its context
  ii. a source of variation in some internal details of the system, and
  iii. a fitness-linked selection process, i.e. the system preferentially retains/discards variations which enhance/decrease its fitness, which requires…
  iv. way of evaluating impact of a variation on fitness – through feedback from external or internally modelled interaction.
  v. Thus over time, system generates and internalises variations which tend to increase its fitness or success – amounting to incorporation of information into the system.

Overview of Conceptual Framework for Adaptation

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- **A generic model of adaptation** – *what it is*
- **Types of adaptive mechanisms** – *implementation strategies*
- **Classes of adaptive mechanisms** – *what it deals with*
- **Levels of adaptation** – *what aspect of the system is adapting*
- **Scale of adaptive mechanisms** – *where it is applied*
- **Measures of success and failure** – *what steers it*
- **Health of adaptive mechanisms and factors that influence its effectiveness** – *what it takes to make them work*
- **+ *Framework for Addressing Complex Problems***

CAS Diagnostic tools,
analysis of temporal dynamics and
adaptivity implementation guidelines

The promise of applying adaptation...

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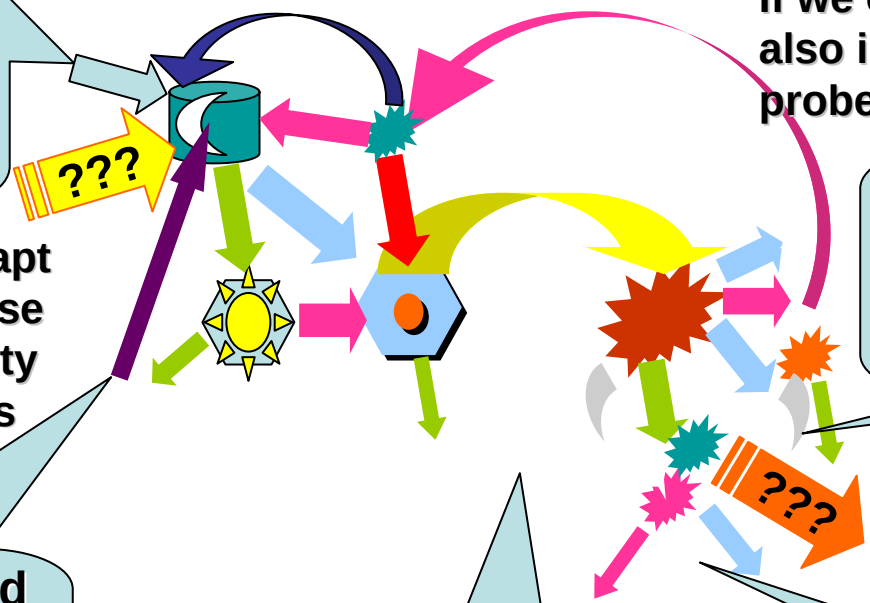
- **increase the probability of obtaining desired outcomes by:**
  - finding and identifying existing adaptive mechanisms in the systems that contribute to the outcomes we care about,
  - selecting those adaptive mechanisms that are the best targets of our interventions, and
  - shaping perceptions of what constitutes success and failure in those mechanisms, or by modifying aspects of their three other elements so that the system will as a result, but of its own 'volition', take a different course.
- **a more effective strategy than trying to force the system to undertake (or not) particular actions, because:-**
  - if the system and its context truly are complex, then trying to work out the right actions in advance becomes a futile exercise, and
  - the principle of economy of effort – a subtle but effective intervention to align system's own adaptive mechanisms with our intents → desired outcomes with less apparent interference and exertion and more precision in effects.

Predictability requires knowing how system behaves
Influencability requires knowing how system adapts

- probing actions
- use model to predict, test, refine
- Iterate

But a CAS may co-adapt and change in response
→ limited predictability
… unless you know its adaptive mechanisms



If we can not only observe, but also intervene… then we can probe, seek to influence, …

- Observe/measure actual consequences
- Revise model
- Iterate

Influence = targetted intervention that increases prob of preferred outcome

eg through harnessing and tweaking existing adaptive mechanisms, not nec. via prediction.
Don't need to model the detail and predict !!!

For simple causality:
- Observe cause
- and predict effect
  or
- Press the button
- and control the effect

- Model causal & influence network.
- Observe/measure contingent factors.
- Predict some consequences

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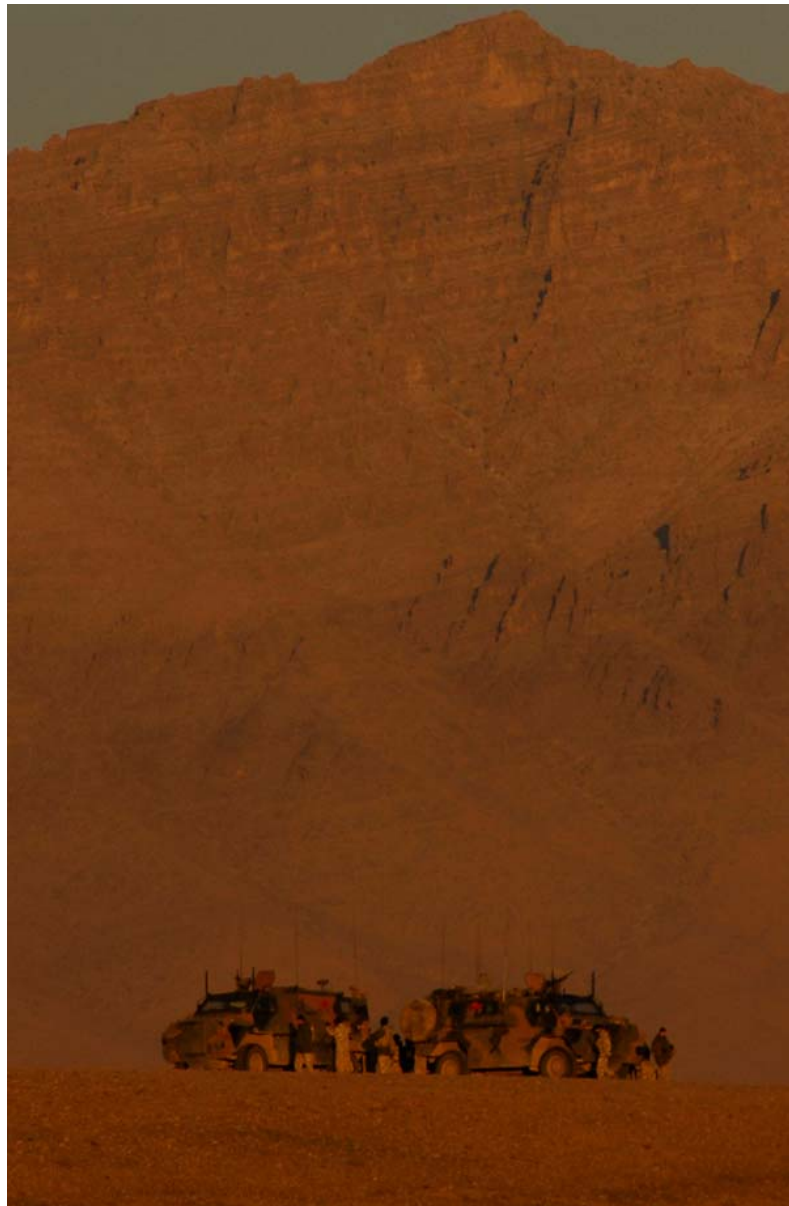

Operationalisation

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- Operationalisation is about generating feasible options from conceptual designs for changes to operations
- Must address implications for doctrine, training, materiel, personnel, organisation, systems, etc
- Includes military input on context and operational art
- Addresses **how** change can be implemented
- and **What** could be changed (quickly):
  - Processes
  - Decision support tools
  - Training
  - TTPs
  - Boundaries between FEs, tasks, responsibilities
  - Capability requirements for tech insertion and for future

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Implementation

- Operational unit manages risk, decides what to change
- Operational feedback drives further development

Paths to Implementation

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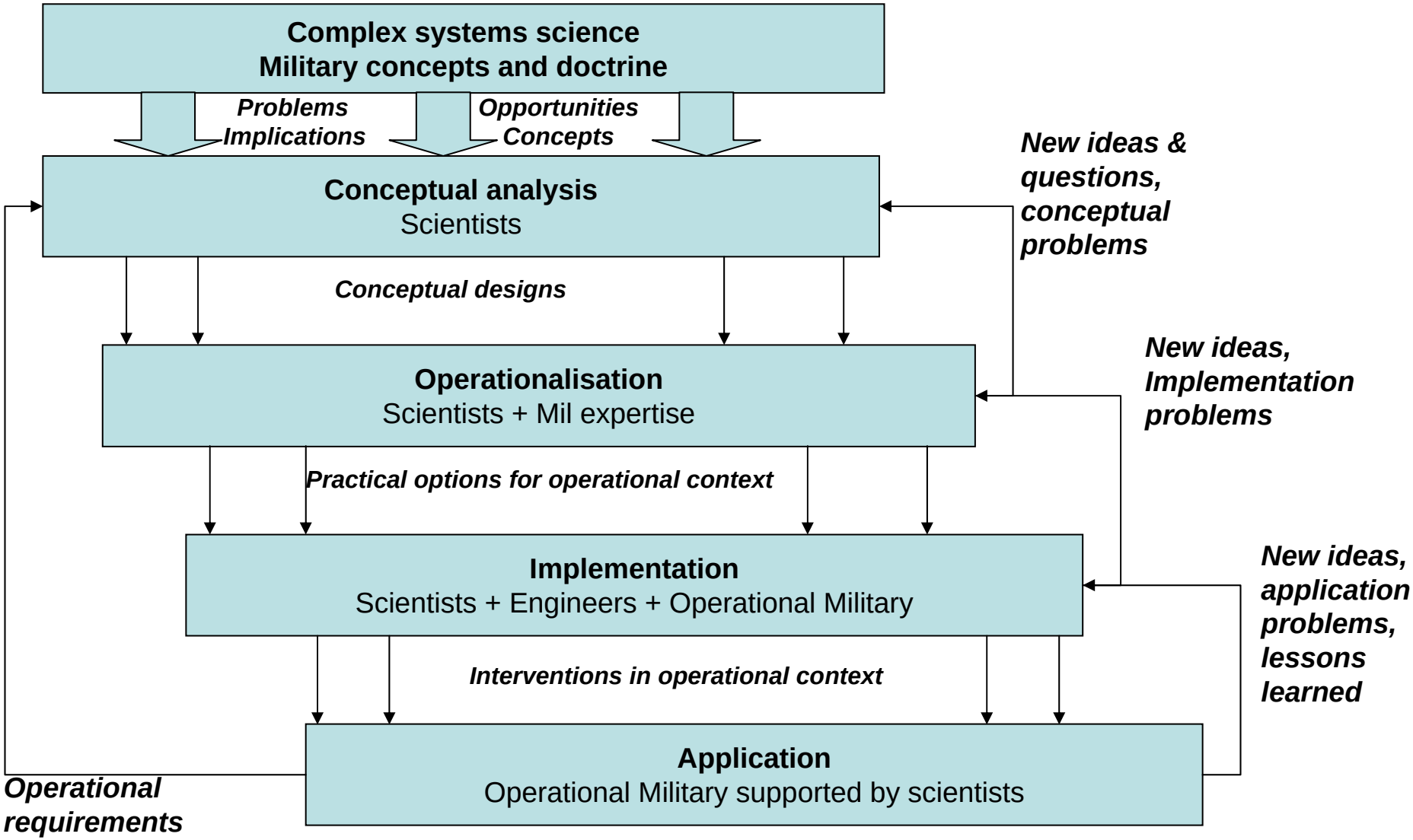

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Conceptual design for Operational Responsiveness and Agility

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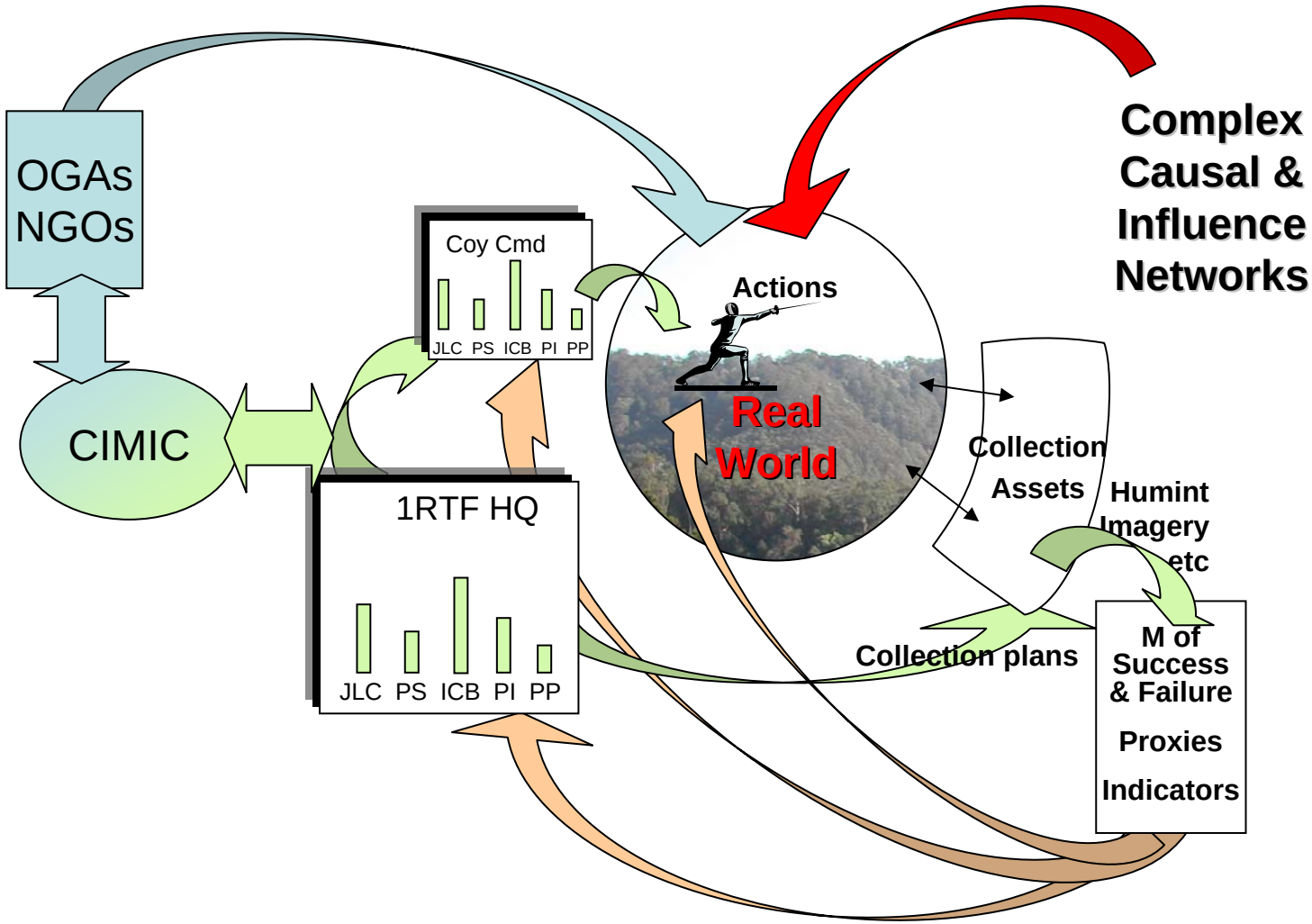

Conceptual design for Operational Responsiveness and Agility

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- **Level 1**: real-time adaptive action-in-the-world
- **Level 2**: Learning → better abilities to act, sense, decide
- **Level 3**: Learning-to-learn → better ability to adapt
- **Level 4**: Defining success → better proxies
- **Level 5**: Co-adaptation → better use of SoS

- **Level1/5: current effectiveness and Operational Agility, Responsiveness, Resilience, Flexibility, employing existing capabilities – we build on this**
- **Level 2: AARs, training, changes to orbat, tech insertions, individual learning , Evolving shared C&IN models**
- **Level 3: extending and improving Operational Agility, Responsiveness, Resilience, Flexibility through improved AARs, training in Adaptive Stance, improving tools to support adaptation, analysis of current adaptive practices and solving identified problems**
- **Level 4: Evolving Measures of Success & Failure, Proxies & Indicators**

Address at several scales of application

Conceptual design for Operational Responsiveness and Agility

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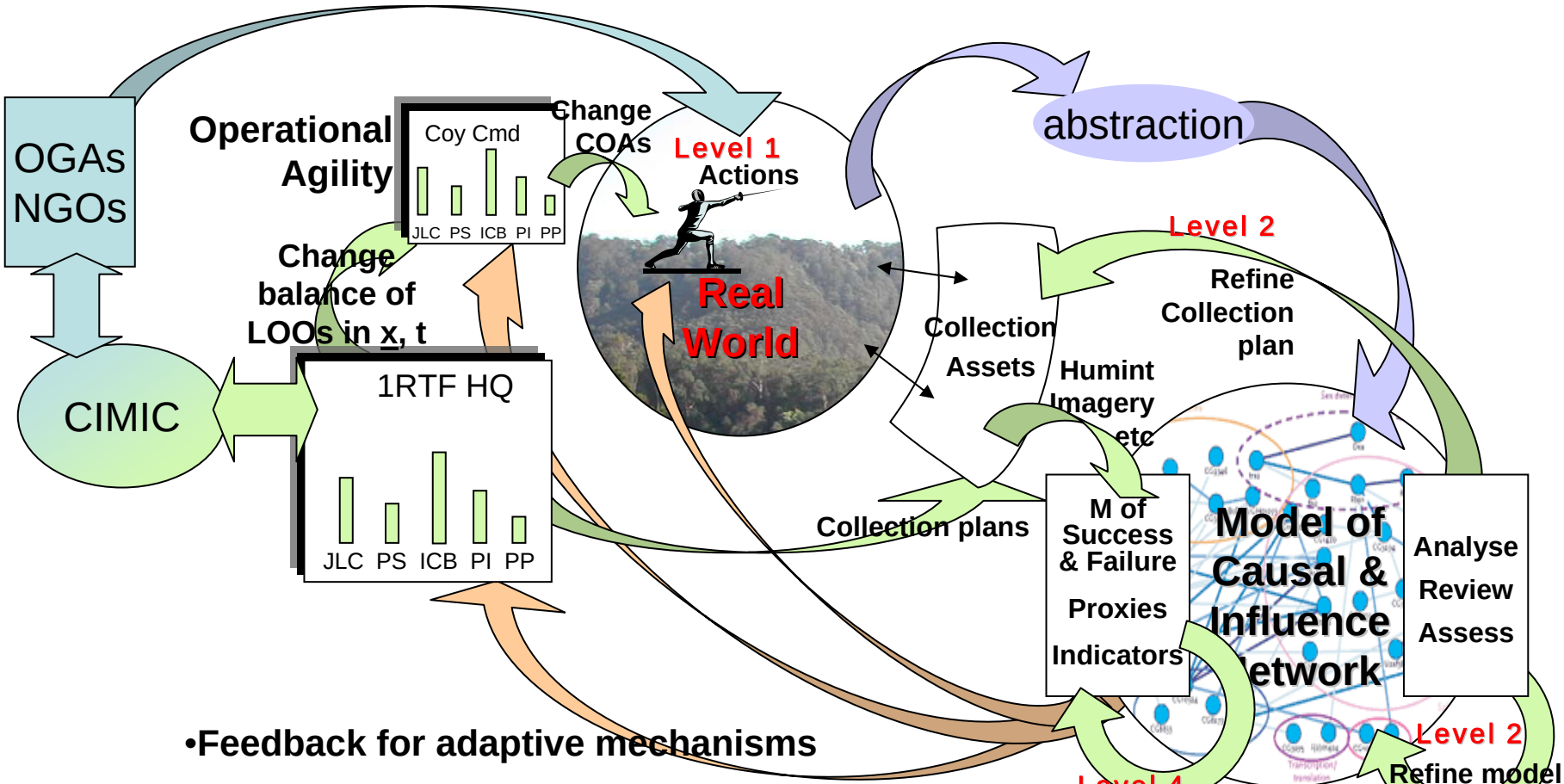

- Feedback for adaptive mechanisms
- Current understanding for Adaptive Stance
- Critical uncertainties in model of Causal and Influence Network


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SITREP: Other Aspects

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See paper for details…

- **Support Systems** – esp for C&IN modelling
- **Analytical Framework** – understand what to observe and why, and how to prioritise
- **Overall campaign process** – examine build-up, execution and wind-down / transition phases
- **C2 concepts** – shift to increased supported auonomy and planning for adaptivity
- **Human Sciences aspects** – the Adaptive Stance

Thank You