

DIEManalytics

**ASTRID** 

ANALYSIS FOR SCIENCE & TECHNOLOGY RESEARCH IN DEFENCE

# FUTURE-MATERIEL DISTRIBUTION LAND (FMDL) STRATEGY

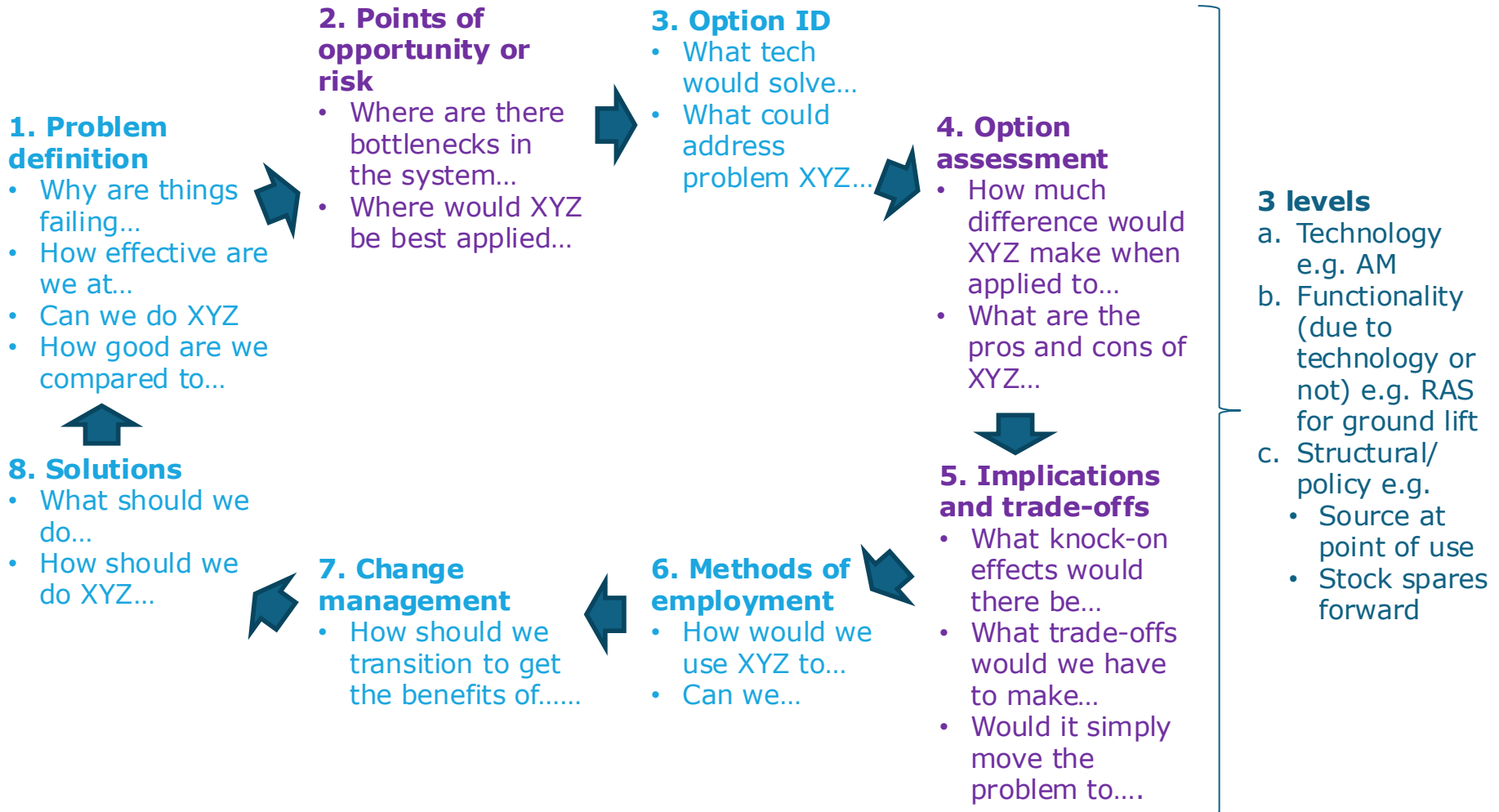
ISMOR 40  
Royal Holloway  
18th July 2023

# Outline

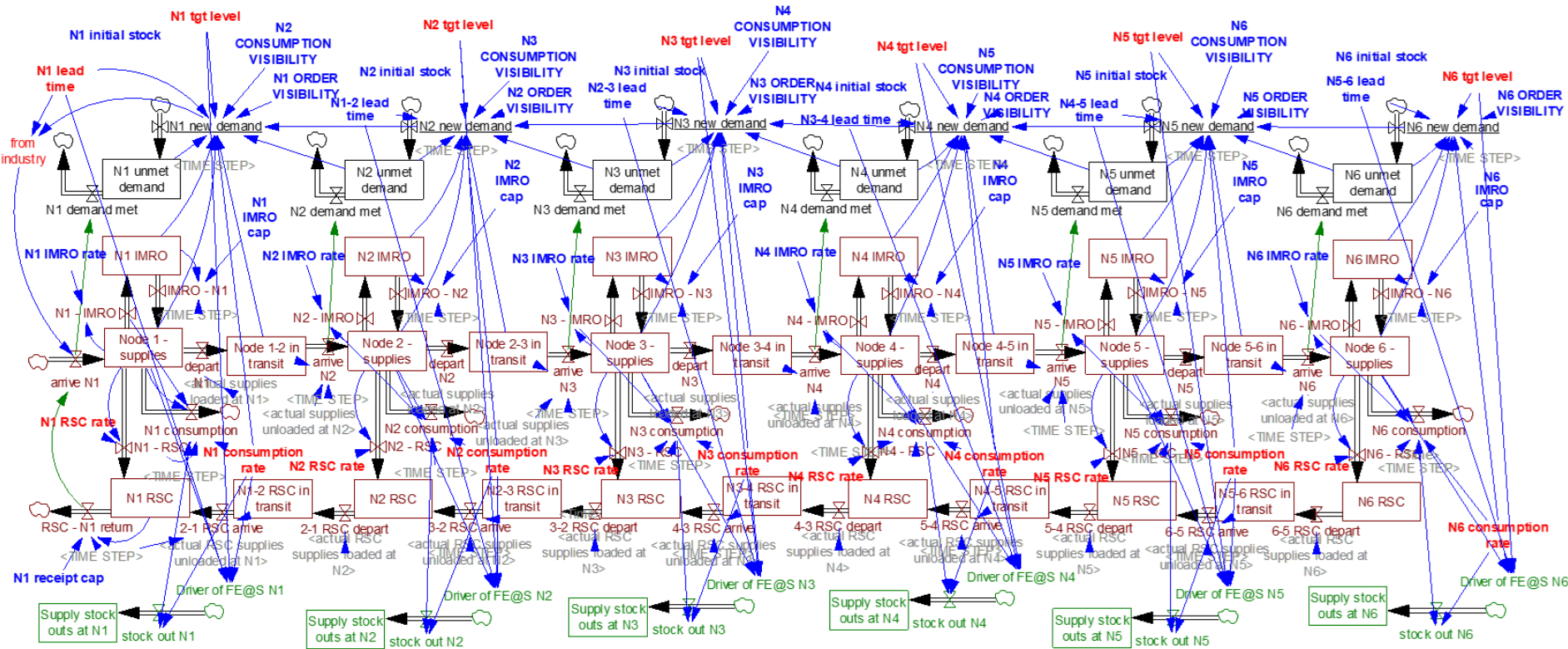
- SCALE
  - Introduction
  - Position and purpose
  - Structure
  - Outputs
- FMDL
  - Aims and objectives
  - Approach
  - Findings
  - Strategy
- Lessons
  - Technical
  - Military

- Dstl commissioned the SCALE model, as part of the Policy and Capability Enterprise Support (PCES) programme to
  - Initially, contribute to the Logistics Technology Investigations (LTI) project
  - Enable Dstl and MOD to
    - Identify points across the DSN where investment in research and innovation (in policy, structure, as well as technology) may drive step changes in capability or cost
    - Generate evidence of the potential impact on DSN capability and/or cost of specific 'interventions' e.g. strategies, concepts or technologies
- The driving principles of the model were to
  - Be highly aggregated in nature, order to model the 'end-to-end' DSN
  - Model the baseline to measure the benefit and impact of a change
  - Be able to consider radically different approaches (without having to build a new model)
  - Represent military operations of different scale, duration and physical location
  - Conduct rapid sensitivity analysis
    - To address emerging requirements from reviews or as new ideas come up
    - As more up to date data is sourced

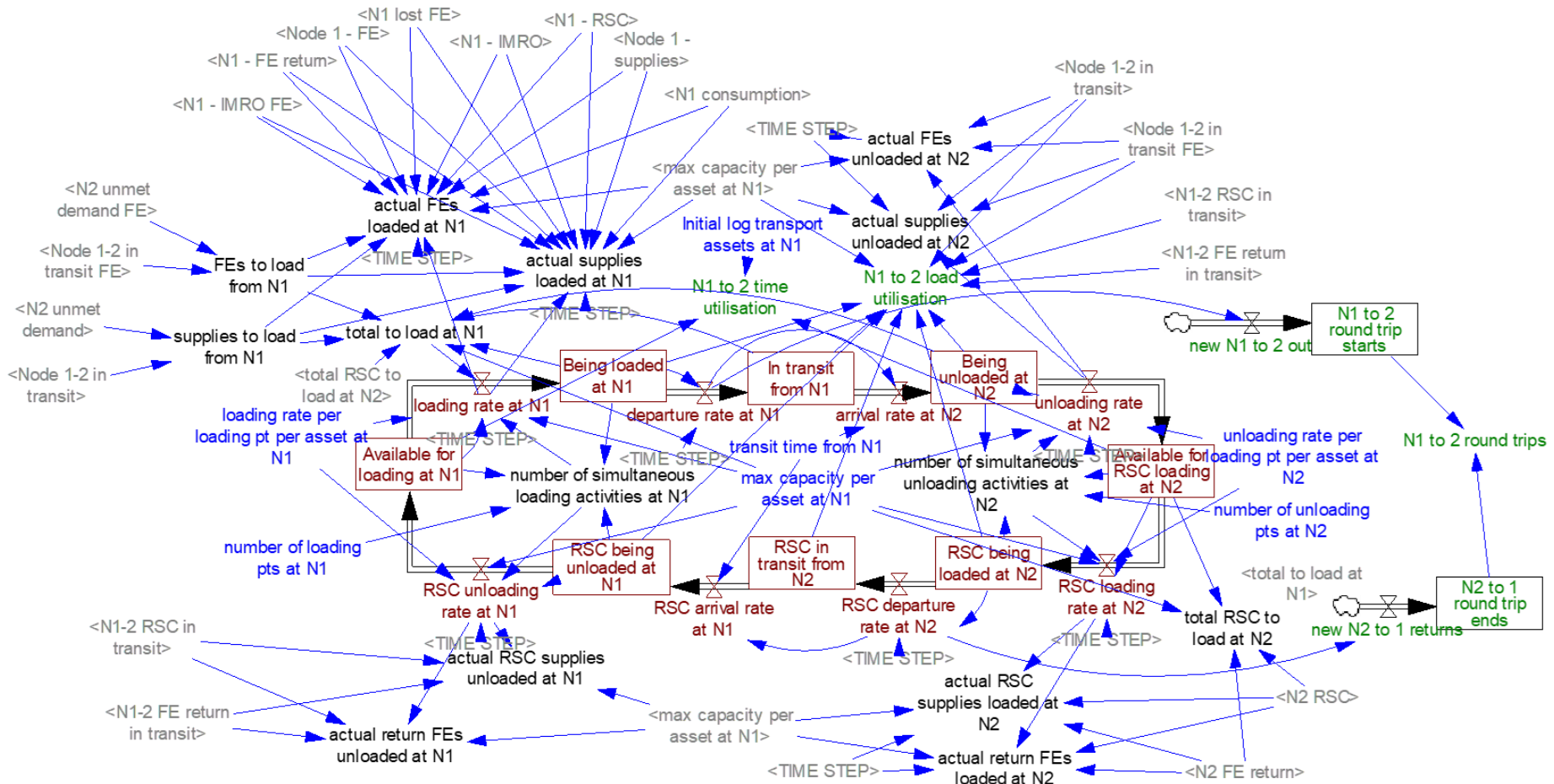
# SCALE | Position and purpose



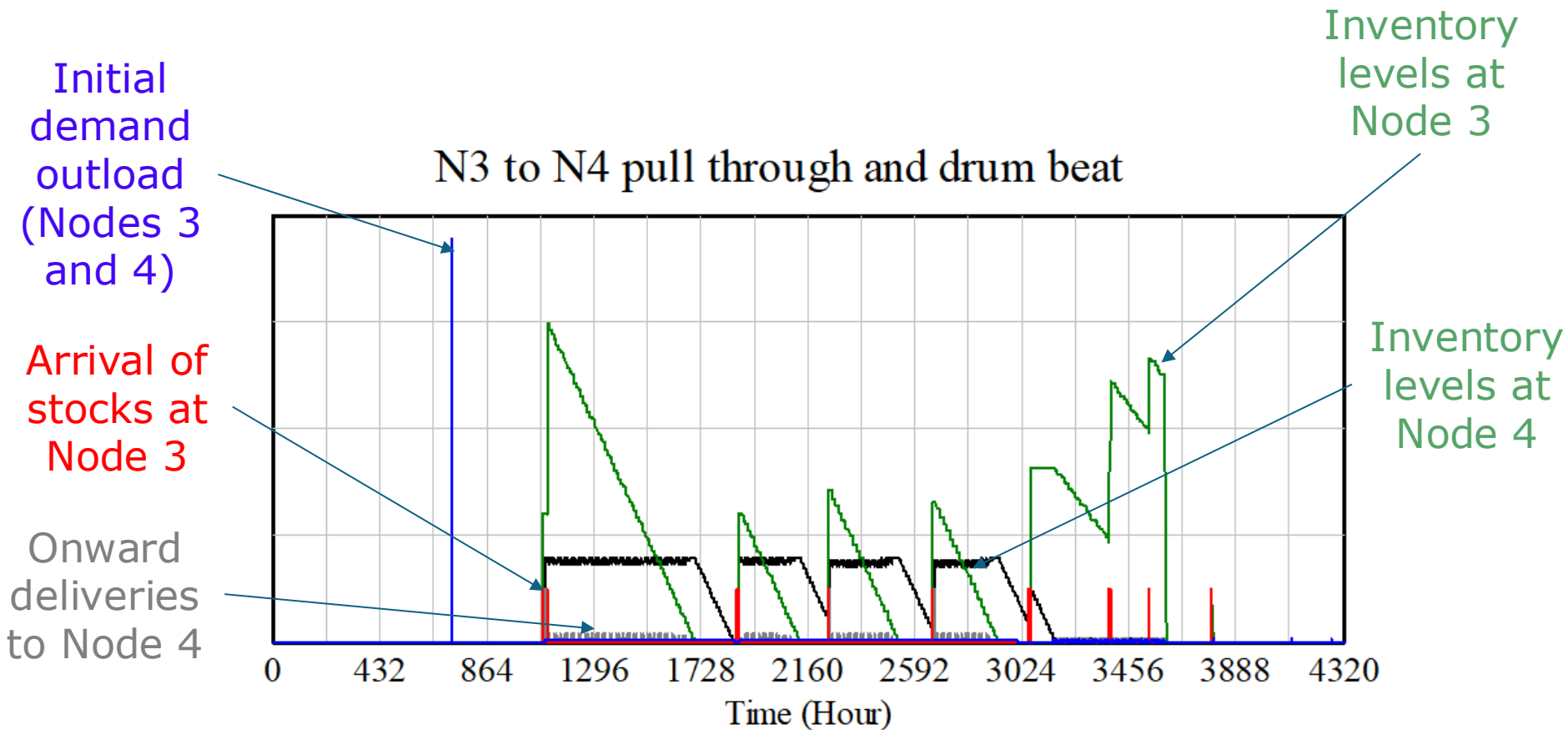
- Demand and fulfilment based on information flow
- Forward and reverse stocks and flows based of logistics assets
- User defines 'nodes'



- Logistics assets stock and flow between node pairs
- Allocates assets to different supplies, FEs or routes



- Pull-through and drum-beat dynamics



# FMDL | Aims and objectives

- What makes a difference
- For specific types of Op
  - In specific LSC legs
  - With different ways and means
  - In the face of threats and risks



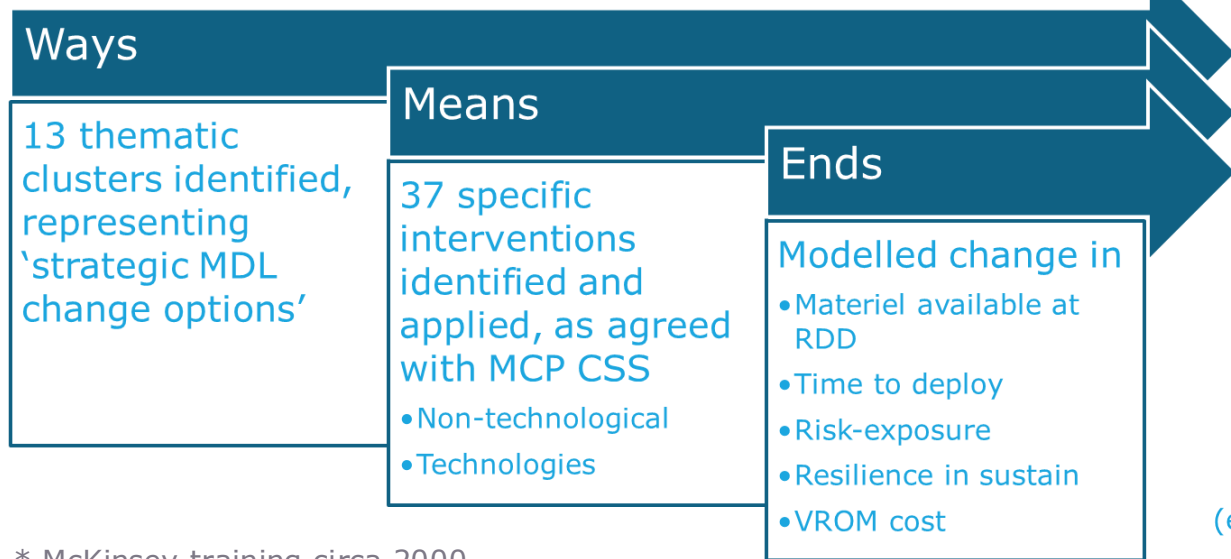
- 'Strategy is...
- ...When...
  - ...Where...
  - ...How...
  - ...to Compete'\*



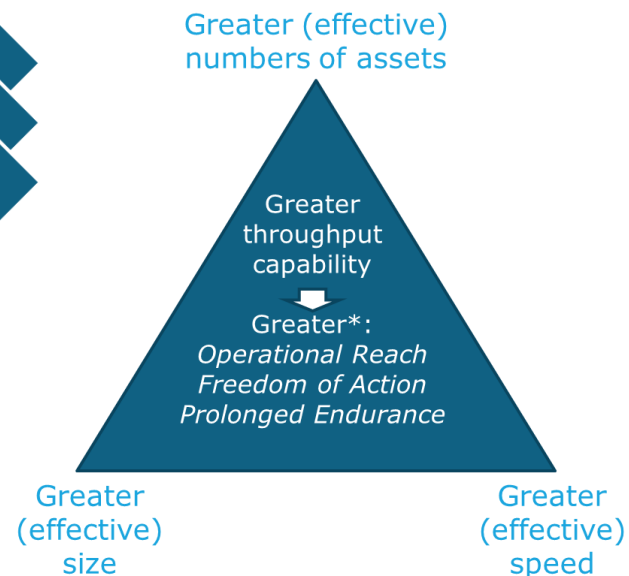
**AHQ need**

**FMDL  
'strategy'**

## DSTL's ASTRID Task 66 analysis

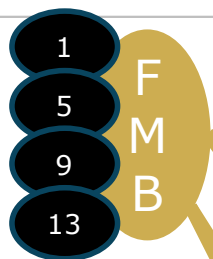


Benefits & costs (Tr2),  
 FOC (Tr3), Concurrency (Tr4)

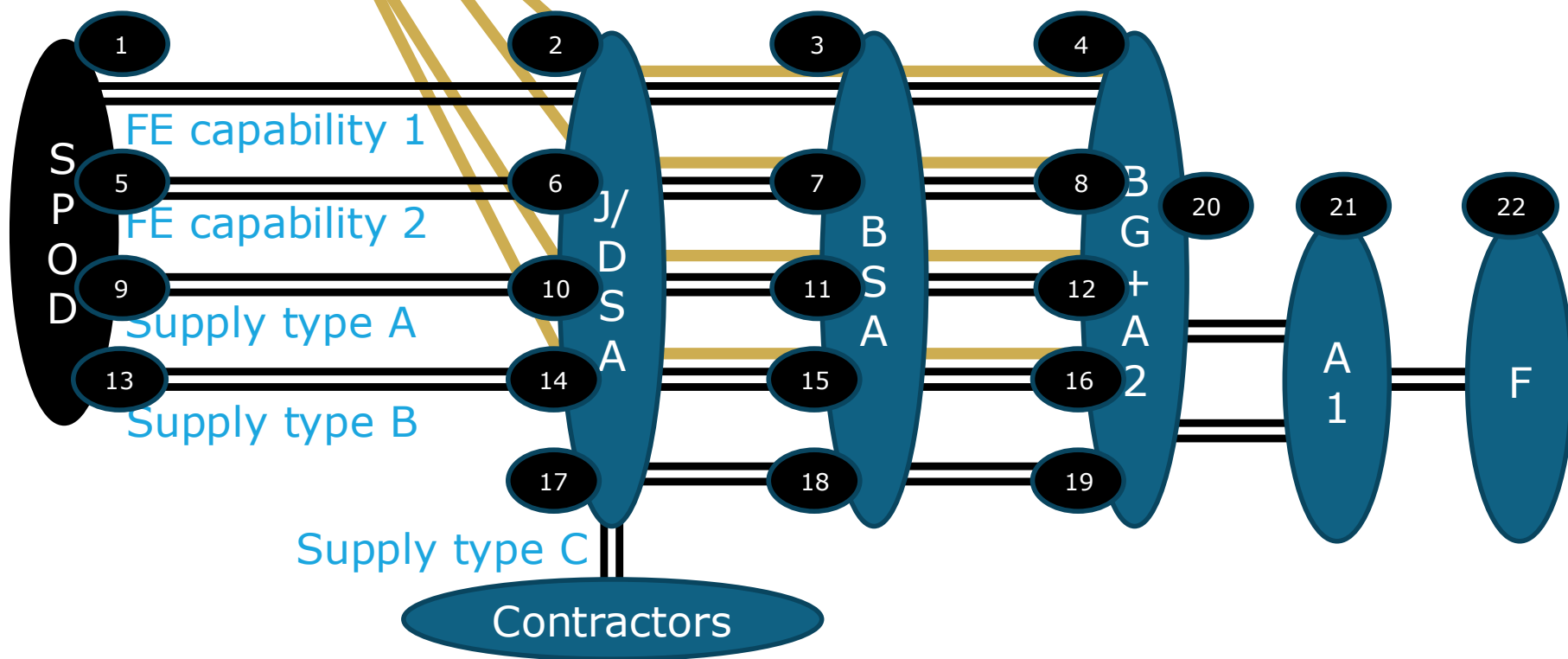


\* McKinsey training circa 2000

# FMDL | Approach

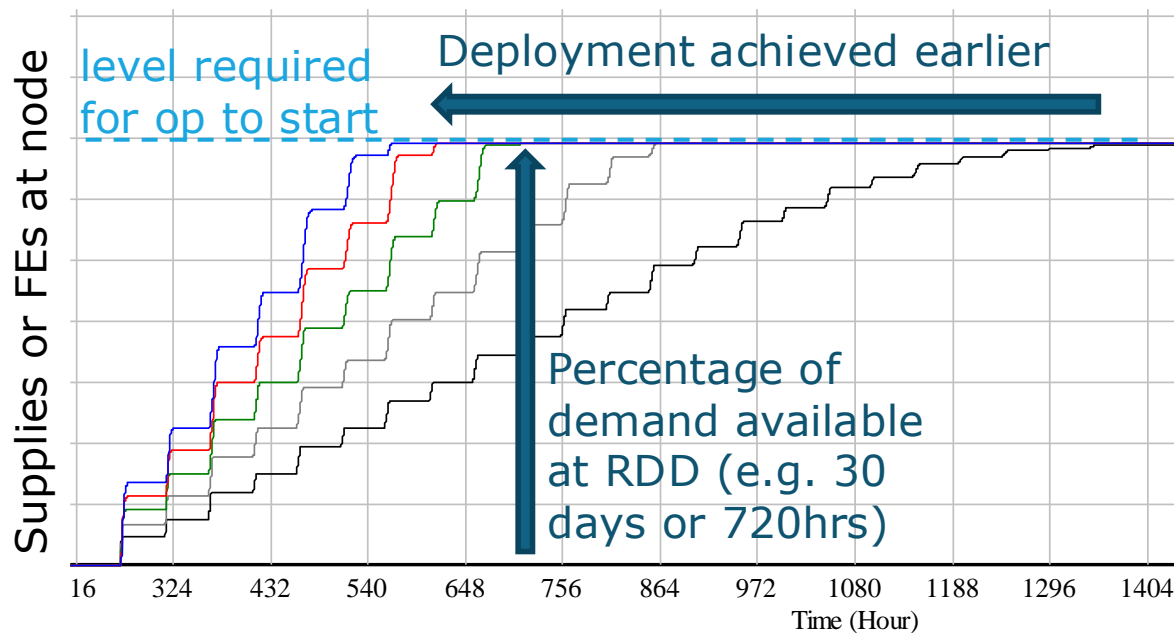


- Aggregated for rapid sensitivity analysis of 'end-to-end' logs system
- 'Chains Of Communication' (ChOCs) of platforms and supplies ('materiel) using common logs assets
- Simulates levels of material at, and rate of flow between 'nodes'
- 'Nodes' represent conceptual 'sources, stocks and sinks' of materiel



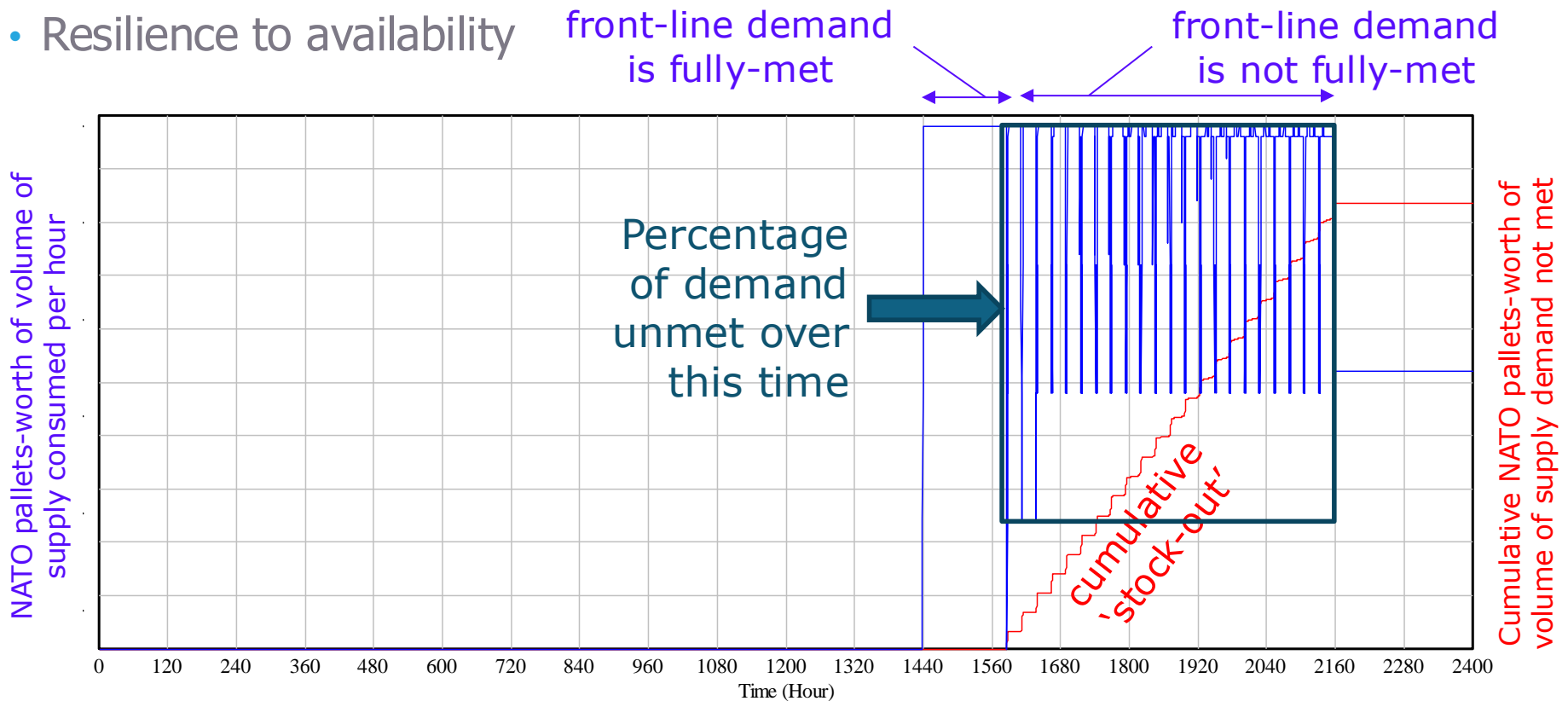
## Deployment

- % of demand level available at RDD
- Time deployment achieved
- Logistics activity level (LAL), as drives cost and operational risk



## Sustainment

- % of demand unmet over time
- Logistics activity level (LAL)
- Resilience to availability

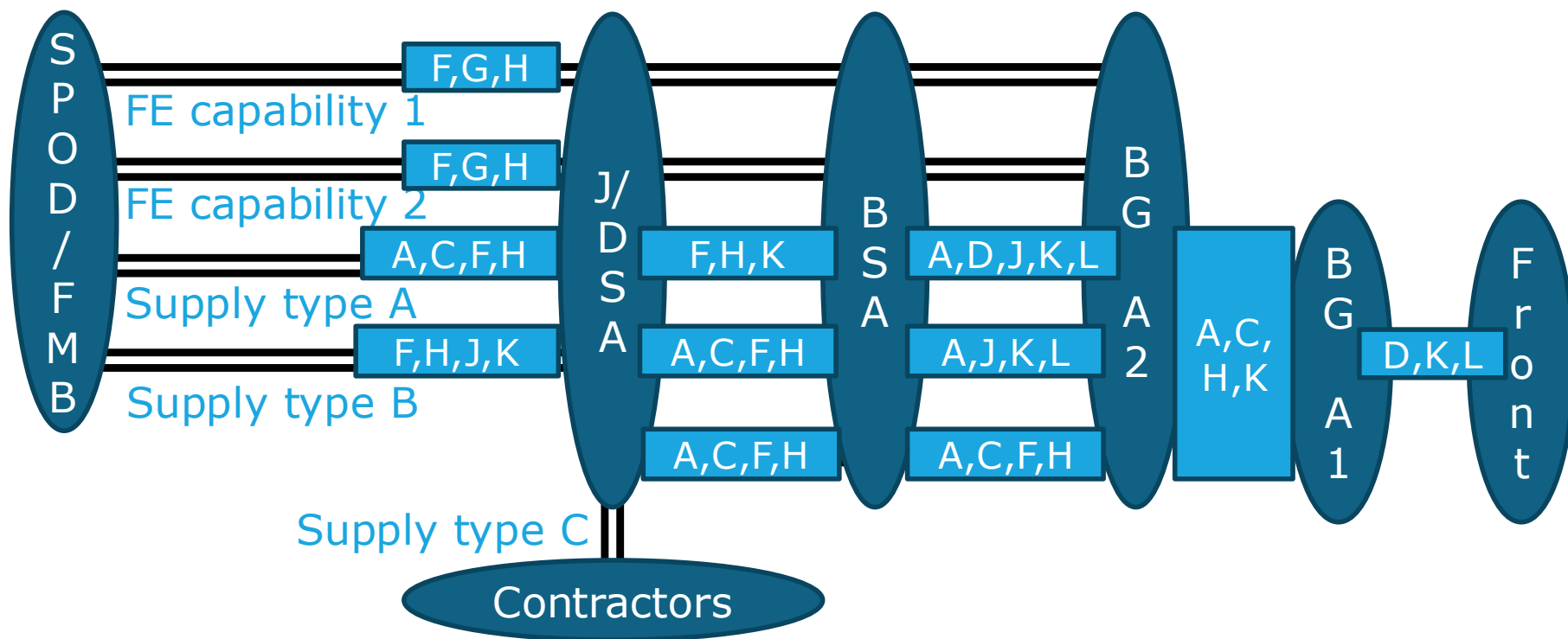


# FMDL | Approach

- A. Supply sourcing
- B. Supply manufacturing
- C. Availability
- D. Error management

- E. Demand level
- F. Delivery distance
- G. System structure
- H. Financing of assets

- I. Demand volumetrics
- J. Process speed
- K. Delivery throughput
- L. Resilience



- *Shortfalls* are estimated in the ability of the LSC to meet Supported Force demand, in the following contexts

*Assumes 100% availability of the CSS Supporting Force capabilities (platforms)*

	Scenario 1		Scenario 2	
ChoC	Deployment	Sustainment	Deployment	Sustainment
FE capability 1	Yellow	Grey	Green	Grey
FE capability 2	Red	Grey	Red	Grey
Supply type A	Yellow	Green	Green	Green
Supply type B	Green	Green	Green	Green
Supply type C	Green	Green	Green	Green

- Metrics reported:
  - Deployment Phase: % shortfall in required materiel available at RDD
  - Sustainment Phase: % shortfall in planned demand met on time

- *Pinchpoints* - are estimated in the *reduction in the* ability of the LSC to meet Supported Force demand *with 20% reduction in CSS capability*

*Assumes an (arbitrary) 80% availability of the CSS Supporting Force capabilities (platforms)*

	Scenario 1		Scenario 2	
ChoC	Deployment	Sustainment	Deployment	Sustainment
FE capability 1	Yellow	Grey	Red	Grey
FE capability 2	Red	Grey	Red	Grey
Supply type A	Yellow	Yellow	Yellow	Red
Supply type B	Yellow		Yellow	
Supply type C	Green		Green	

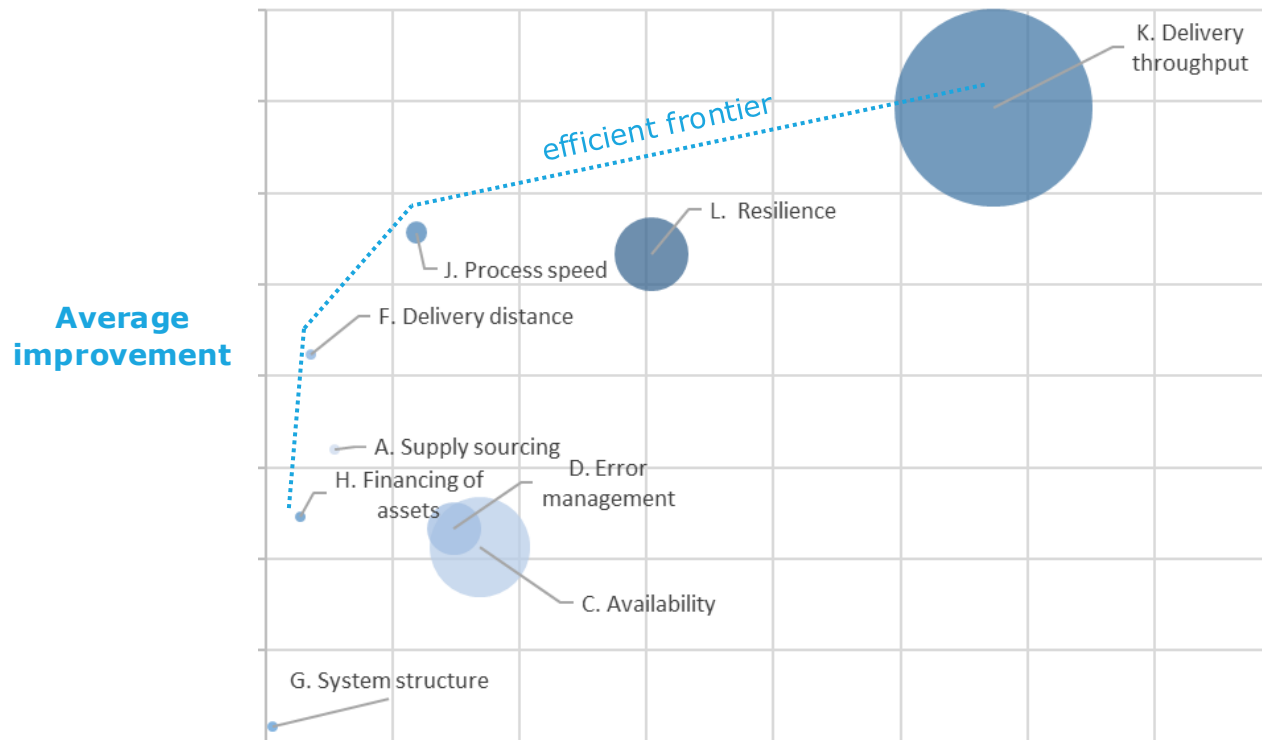
- Metrics reported:
  - Deployment Phase: change in % shortfall in required materiel available at RDD
  - Sustainment Phase: change in % of planned demand not met on time

# FMDL | Findings

	Deploy time/ level	Deploy LAL	Sustain LAL	Attrition resilience	Avg
A. Supply sourcing					
C. Availability					
D. Error management					
F. Delivery distance					
G. System structure					
H. Financing of assets					
J. Process speed					
K. Delivery throughput					
L. Resilience					
M. Asset management					

LAL = Logs Activity Level

- Centre of bubble: Average cost and logs benefit across of all interventions in cluster
- Bubble size: Proportional to standard deviation of costs of interventions in cluster
- The axes are not linear but scaled to show a clear distinction between approval categories



- Technical
  - Pipe-cleaning the analysis was useful, but be careful which case you use
  - Model speed allowed us to compensate for input data uncertainty
  - A close working relationship, and hands-on approach (three ways i.e. DIEM/TPG/TechModal, Dstl, ASTRID) was built-in, and a life-saver
    - Data gathering and verification separated-out and fully-funded
    - The best verification is repetition
    - Testing and translation from 'OA nerd' to 'military'
    - Software versions, GUI options and file-naming conventions are risks
    - Diversions and deep-dives were supported, but a menu/MoSCoW approach might have helped
  - Previous research did not have us in mind!
  - Need more 'elapsed time' (person-hours enough though)
- Military
  - Grouping technologies into 'intervention clusters' allowed greater option coverage and made the strategy more robust to the future
  - A wargaming approach might have helped focus early on
  - Use more input-data workshopping/ MJP

THANK YOU