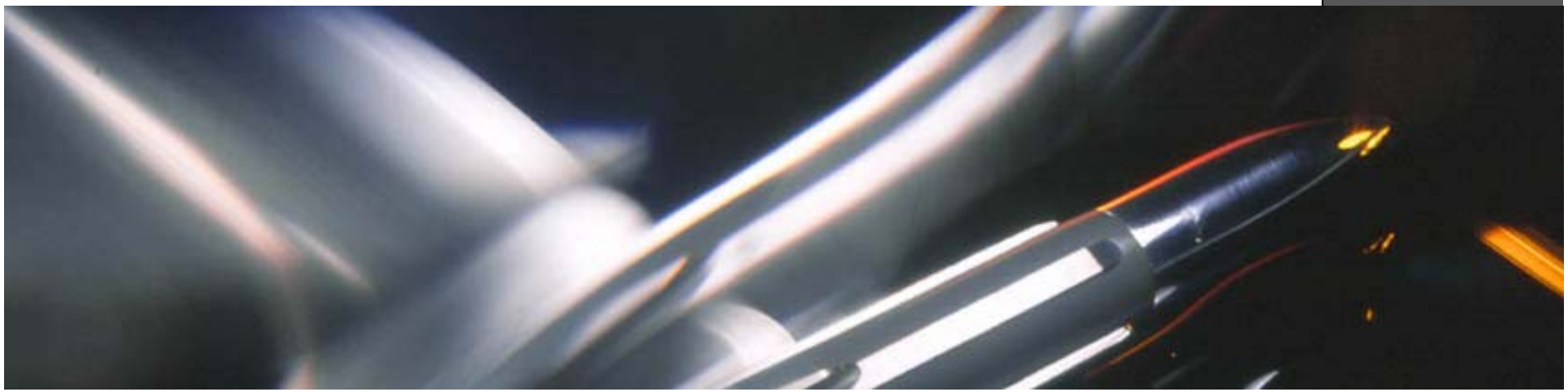

OR : Making an Impact in a Systems Engineering Environment

23ISMOR, 29th August – 1st September 2006

Jenny Young

Head of Operational Analysis, MBDA

MBDA MISSILE SYSTEMS

Setting the Scene

- MBDA is a leading global world-wide missiles and missile systems prime contractor
- 45 products in service
- 30 products in development
- Extensive experience of international programmes
  e.g. Storm Shadow/SCALP, PAAMS, Meteor

- Team of 14 – OA related activities
- Industrial Environment - Part of a systems engineering culture

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Typical Tasks

- Analysis and capture of User Requirements
  - *What does the User need the system to do ?*
- Defining System Architectures (MODAF Operational Views)
  - *Logically, how will the system work ?*
  - *How will the system interact with other entities ?*
  - *How will it be commanded ? Who makes the decisions ?*
- Concept of Employment (CONEMP)
  - *How will the system be used ?*
- Evaluation of Operational Effectiveness
  - *How good will the system be in operational use (quantitative and qualitative measures) ?…compared to other options and competitors ?*
  - *How could we refine the system design ?*
- Cost-Effectiveness studies and support to Business Cases
  - *Is it a cost-effective system ?*
  - *What is the balance of investment compared to other types of system ?*

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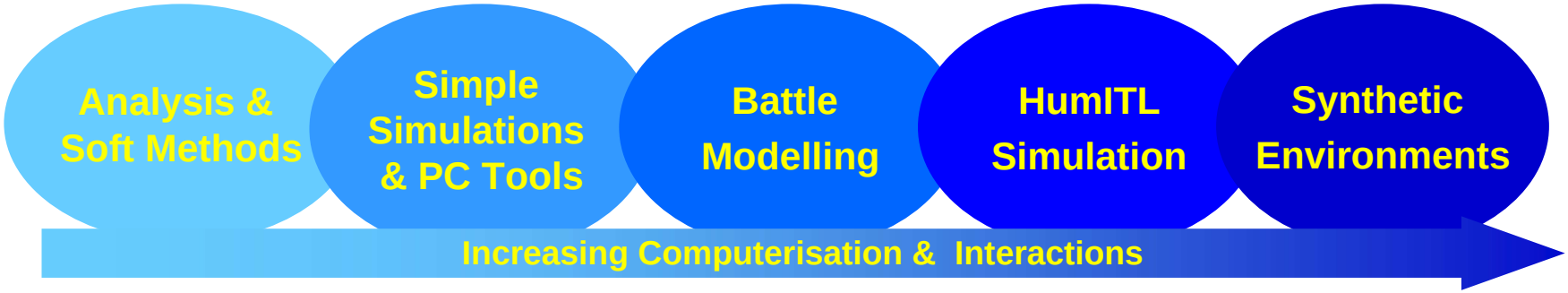
Scope of Tools and Techniques



Examples:

- Problem structuring
- Application of Doctrine
- Decision making methodologies
- MODAF, DODAF
- N2
- QFD
- Strategy to Task

- Excel
- Popkin System Architect
- EXTEND™

- **FLAMES**
- BACMOT
- TEMPO

- **FOX-SE**
- Viewers / Analysis Tools
- MMI

- FOX-SE + SEAPI + L16
- FLAMES + F-SEAPI
- Viewers / Analysis Tools
- MMI
- Etc….

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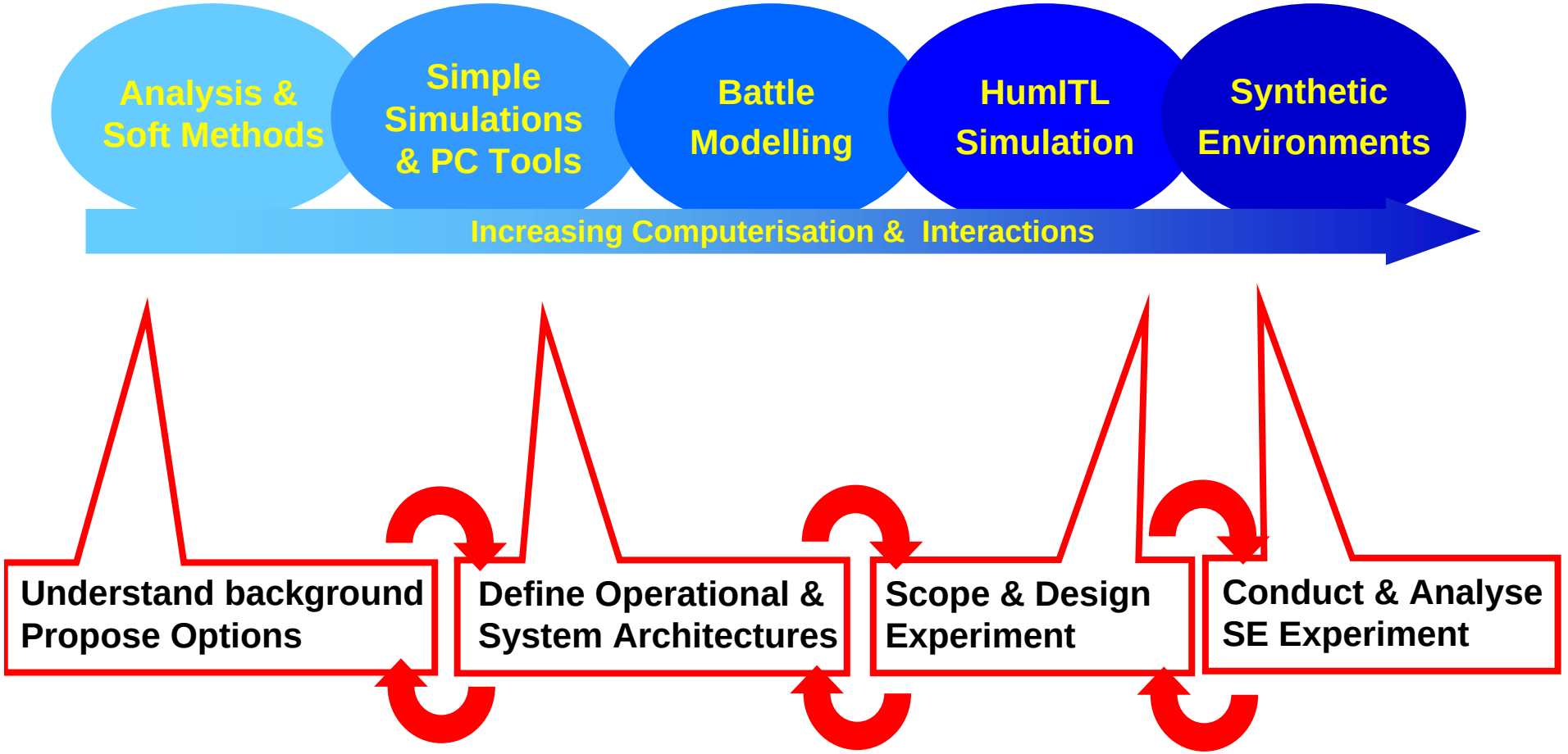
Example : Developing a Concept of Employment



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Typical Tasks

- Analysis and capture of User Requirements
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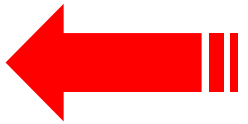

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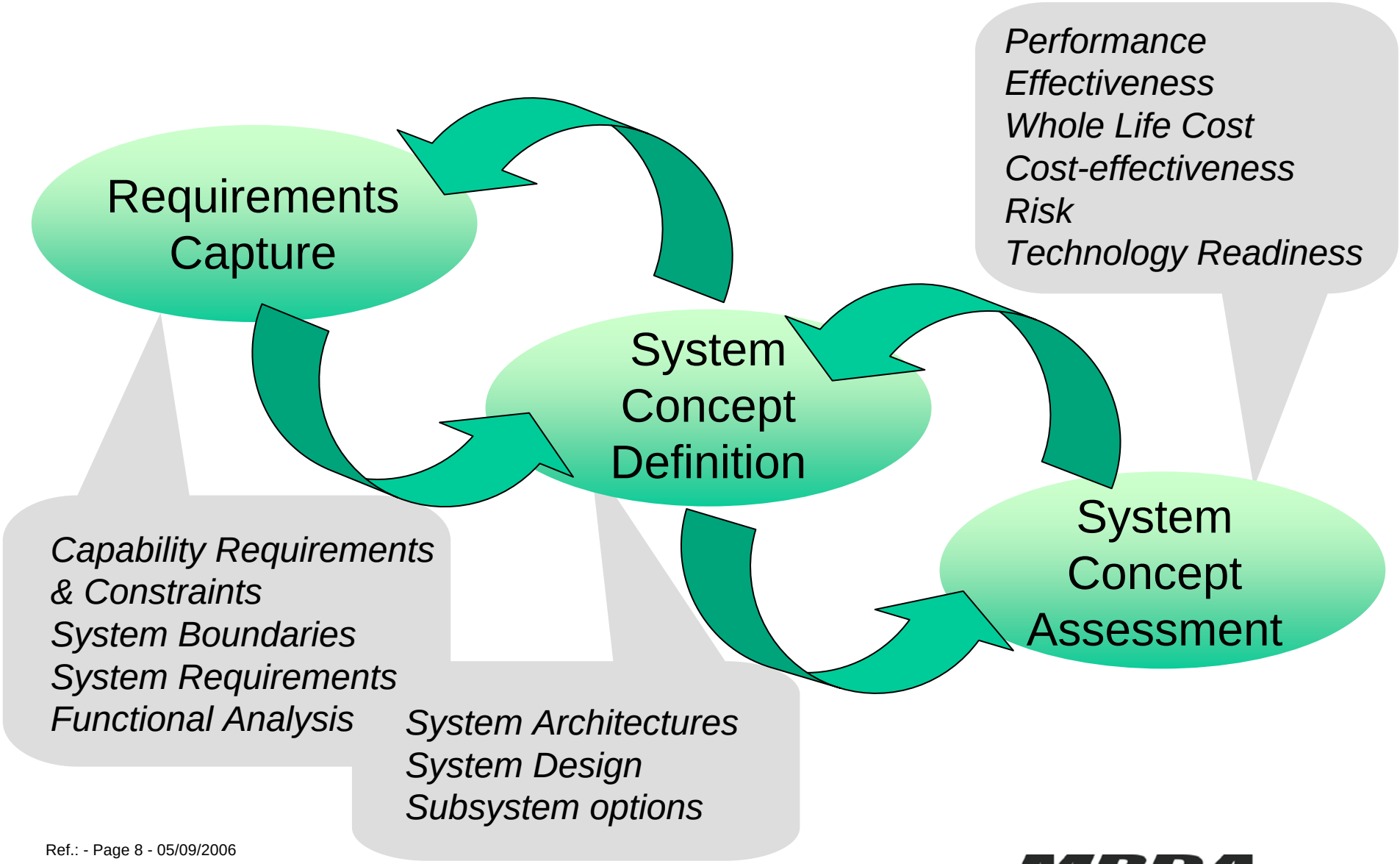
Typical Concept Study



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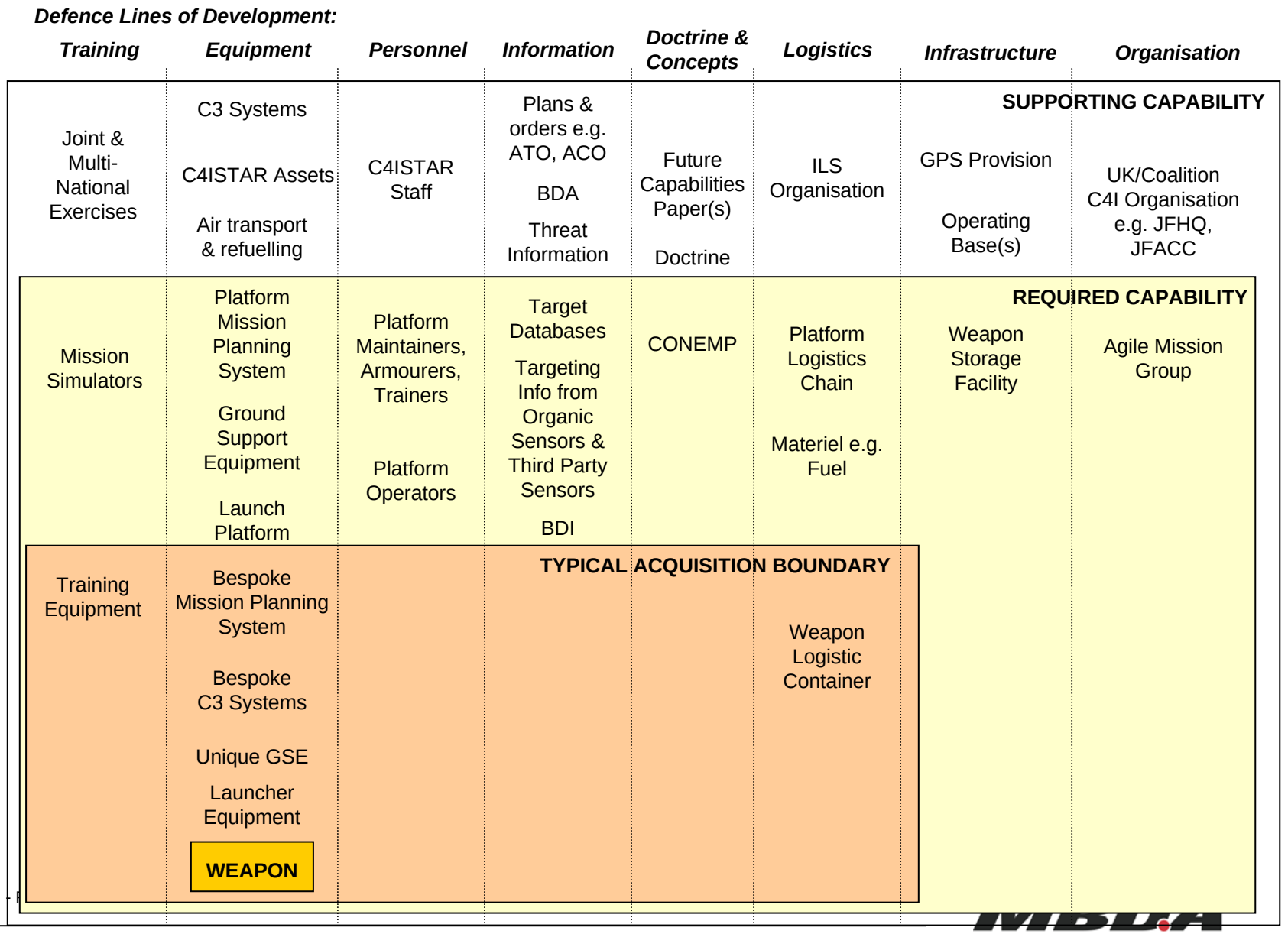
Generic Weapon System Boundary



Ref.: -

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Typical Tasks

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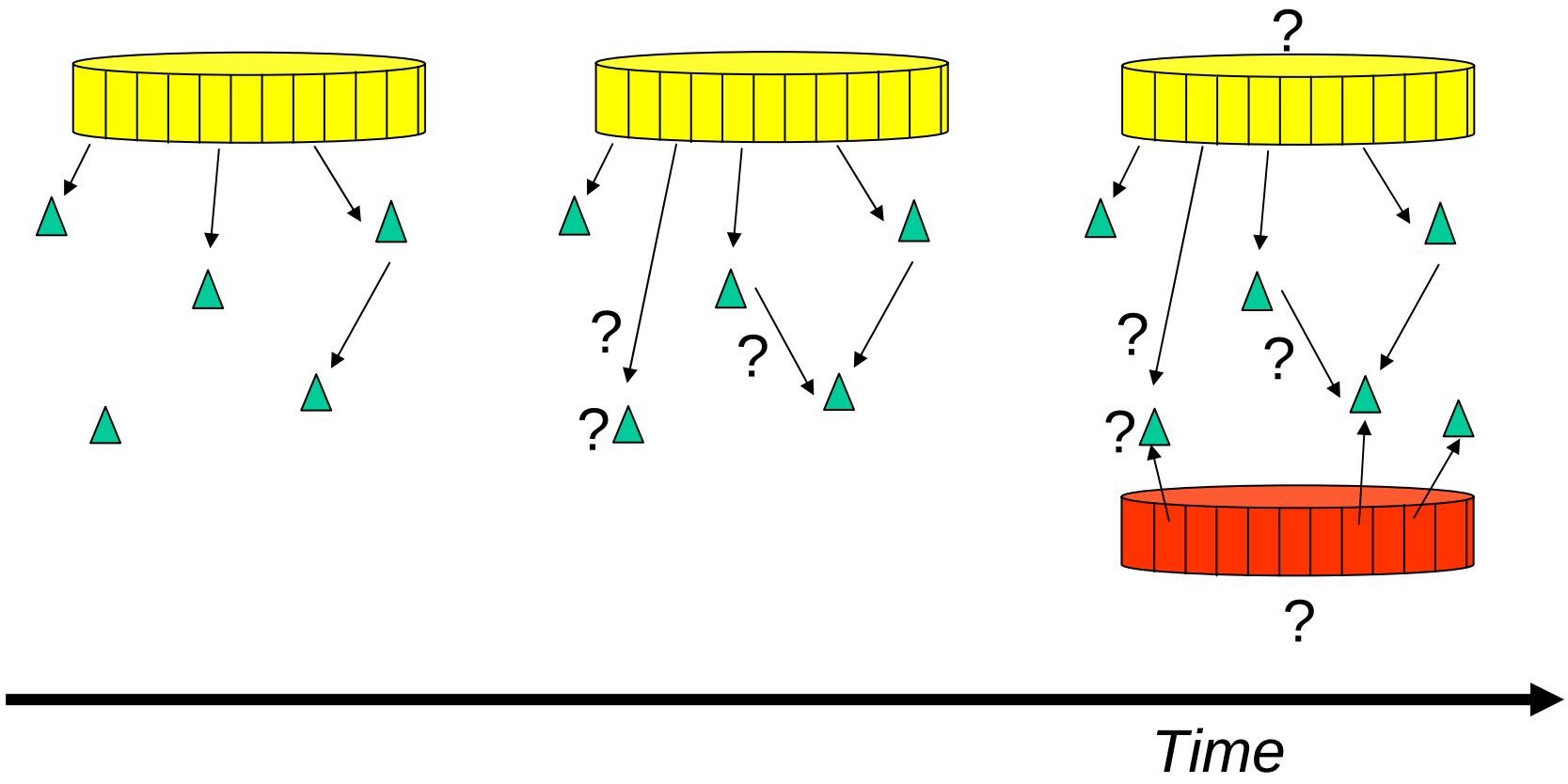
Increasing uncertainty with time….



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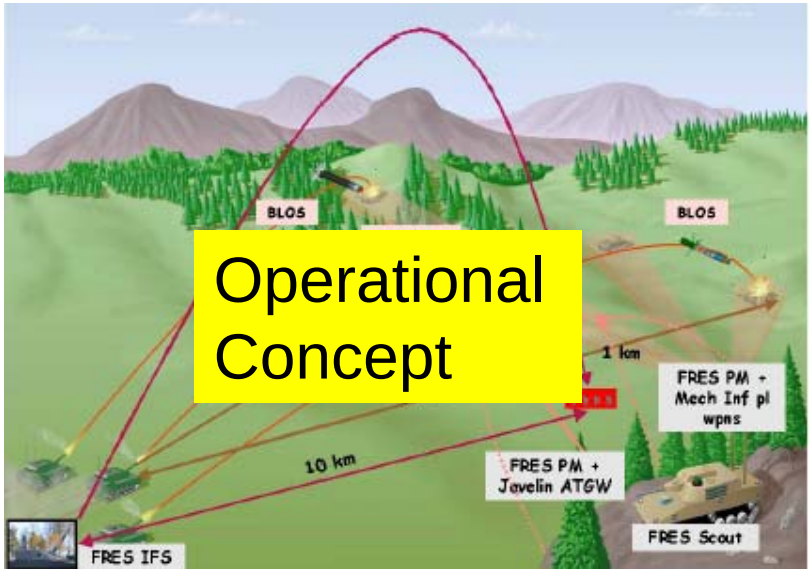
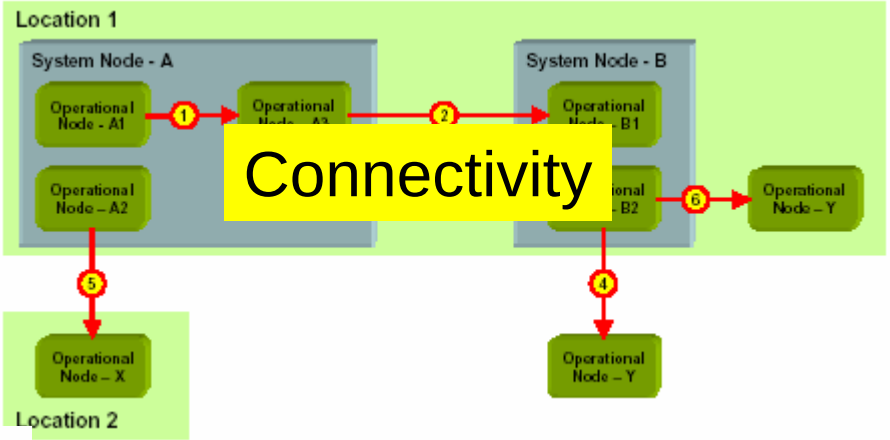
MODAF and DODAF

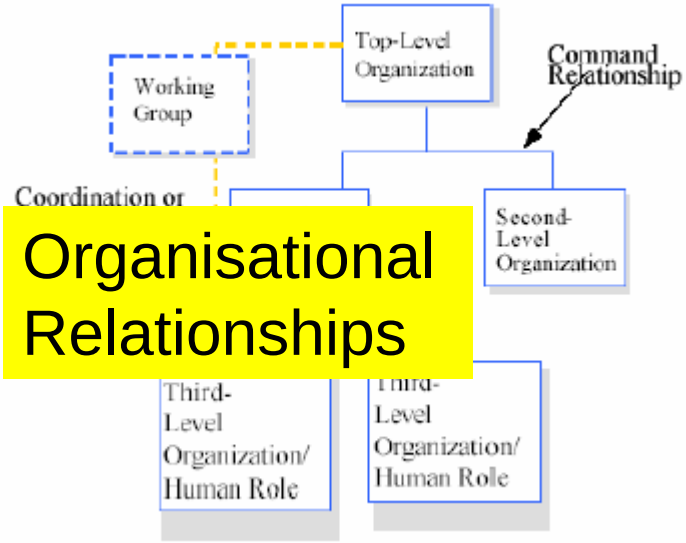
Figures extracted from MOD Architectural Framework Handbook Volume 2, www.modaf.com



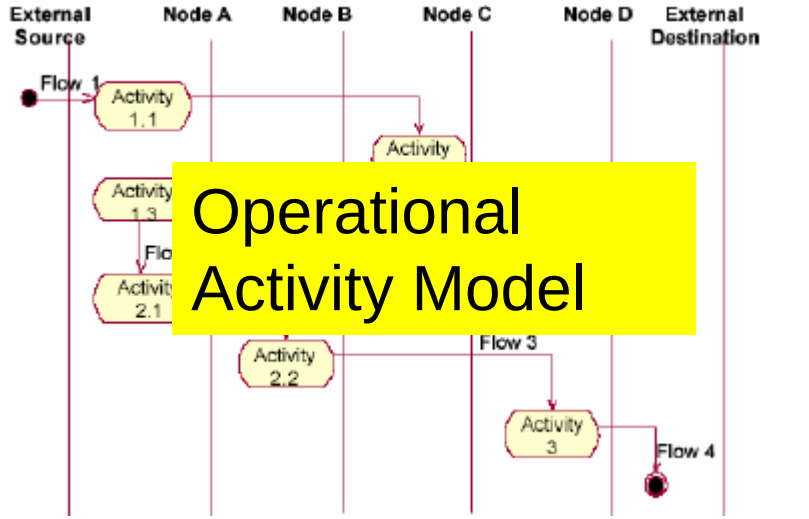
Operational Concept



Connectivity



Organisational Relationships



Operational Activity Model

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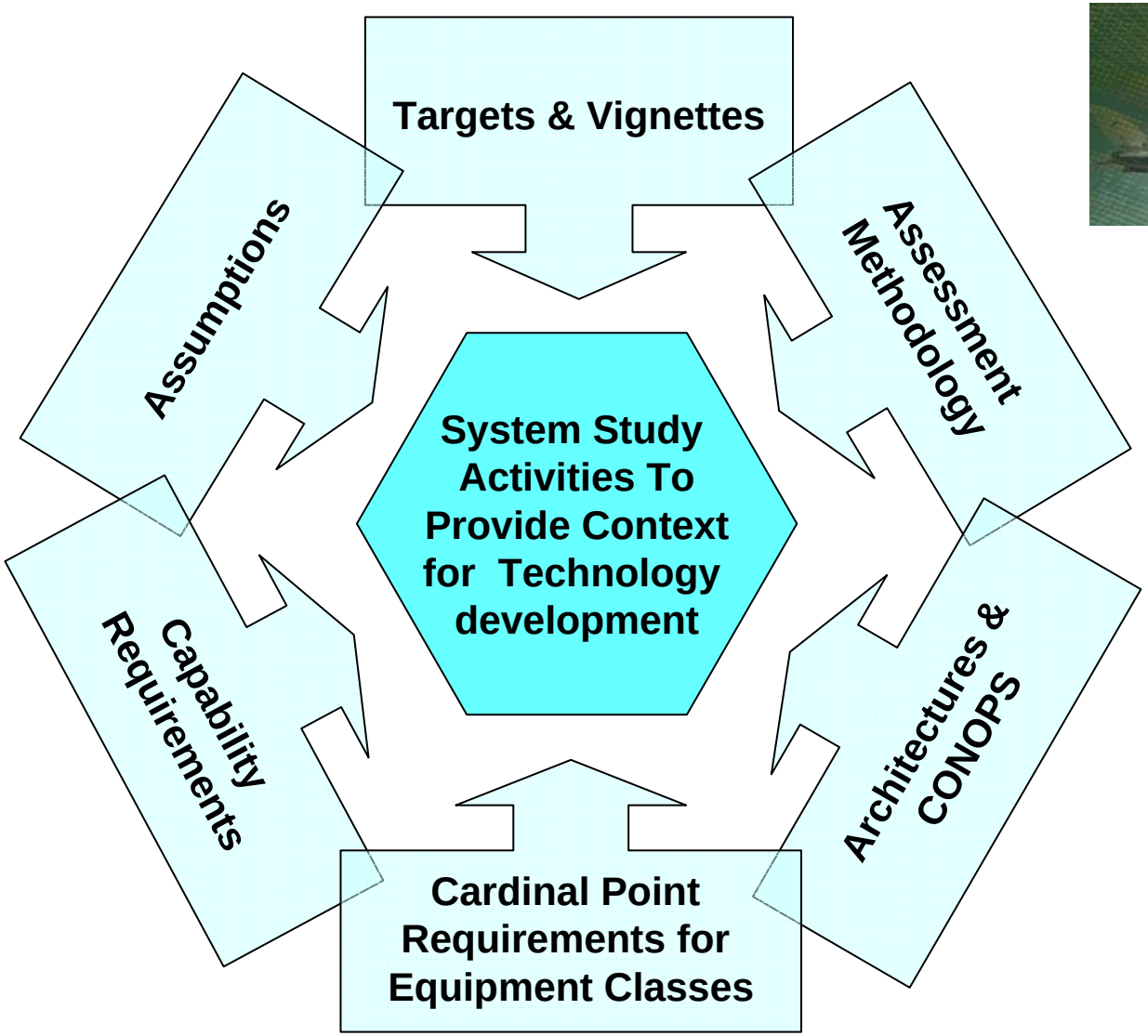
NEC Integrated Weapons Programme



BAE SYSTEMS

Cranfield UNIVERSITY

LOCKHEED MARTIN

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QinetiQ

SELEX Sensors and Airborne Systems

THALES Missile Electronics

- 2 Significant factors for NEC IW system architectures:

- The way in which engagement quality targeting data is provided to the Fast Jet (FJ) launch platform:
  - From FJ organic sensors
  - From 3rd Party / ISTAR asset(s)
  - A combination of organic sensors and 3rd Party / ISTAR assets

- The way in which weapon Command & Control is conducted:
  - The weapon is autonomous
  - Via a datalink from the launch aircraft
  - Via a datalink from a 3rd Party / ISTAR asset

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Summary of NEC IW Architecture Options

Architecture Designation	Source of Targeting Data	Source of Weapon C2
1a	Fast Jet Organic sensors	Autonomous Weapon
1b	Fast Jet Organic sensors	Fast Jet
2a	FJ + 3rd Party	Autonomous Weapon
2b	FJ + 3rd Party	Fast Jet
2c	FJ + 3rd Party	3rd Party
3a	ISTAR	Weapon
3b	ISTAR	ISTAR

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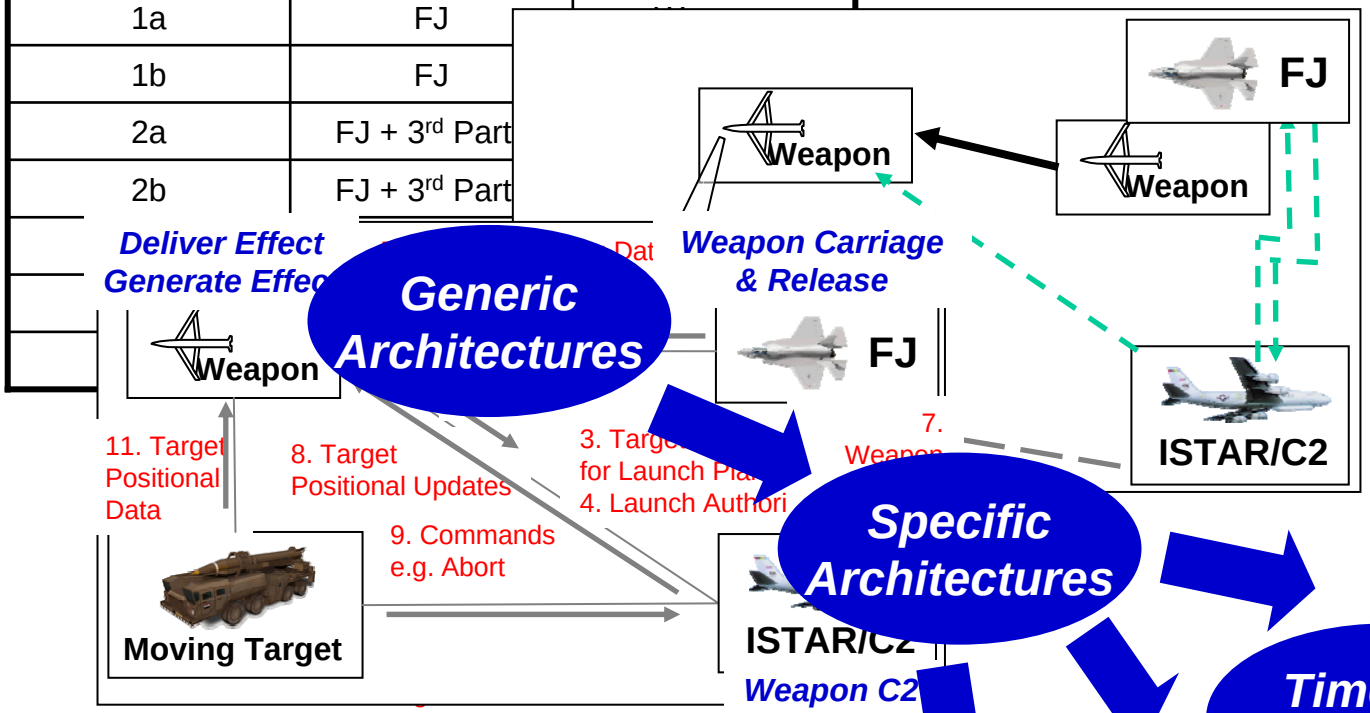
Development of Generic, then Specific Architectures

Architecture Designation	Source of Targeting Data	Source of Weapon C2
1a	FJ	
1b	FJ	
2a	FJ + 3rd Part	
2b	FJ + 3rd Part	



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Conclusions

- There is a seamless relationship between OA activities and high level systems engineering
- OA has a role to play in all aspects of system concept engineering
  - Requirement Capture, Architecture Definition, Concept assessment
- Most impact is obtained by working as part of a multi-disciplinary team, where OA people are able to provide:
  - Broad operational thinking – provides context for technology development
  - Problem Structuring

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Questions ?

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