



Australian Government
Department of Defence
Defence Science and
Technology Organisation

Joint Strike Fighter: An Australian Perspective



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Defence Science &
Technology Organisation

Presentation to:
C4ISR Interoperability Asia Pacific
February 6-7 2006





Presentation Overview

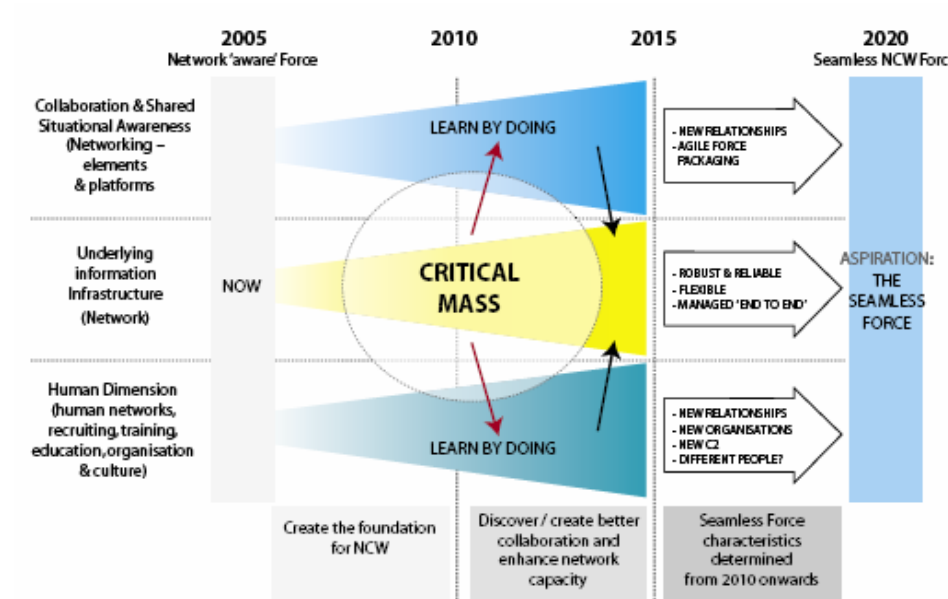
- NCW Environment
- Role of the AEW&C, NACC, and AWD
- Capability Design and Analysis
- DSTO Initiatives
 - Future Platforms
 - Legacy Environments
- Case Study
 - JSF C4ISR Integration into PACRIM Coalitions
- Summary
- Questions

Network Centric Warfare Vision ADF 2020



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- Force Application
- Information Superiority and Support
- Command & Control
- Force Deployment
- Force Protection
- Force Generation and Sustainment

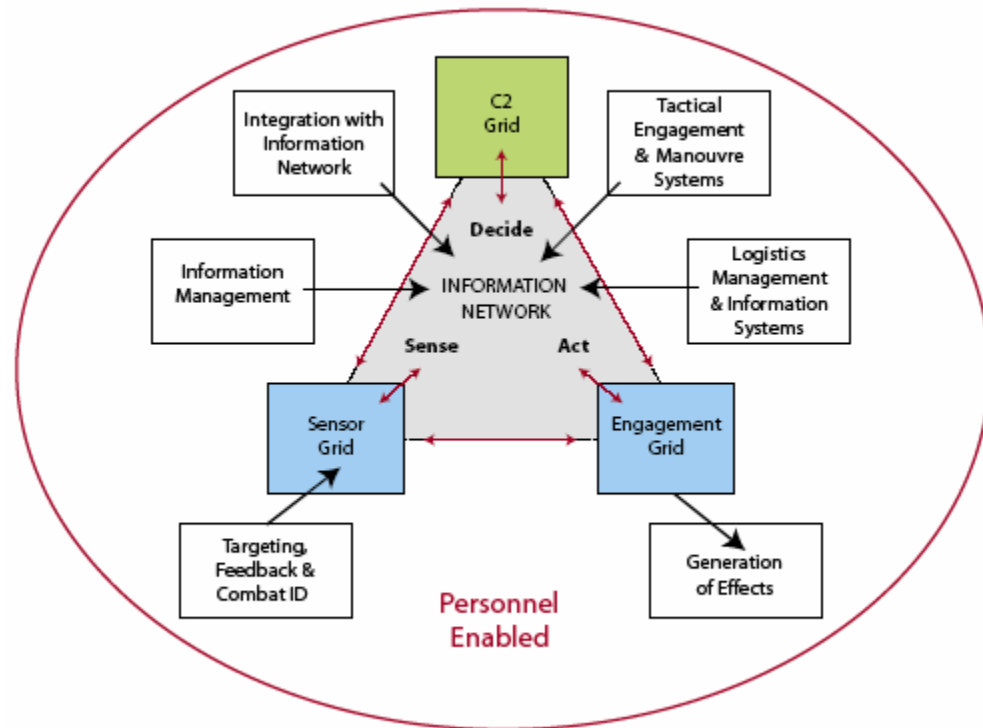


The creation of a Seamless Networked Force is the goal of the NCW vision of the ADF.



Network Centric Warfare Concepts

- The Australian View of NCW is that the Force will consist of 4 “Grids”:
 - Command & Control
 - Sensor Systems
 - Engagement Systems; and
 - The ‘Network’
- All underpinned by the skilled personnel utilising the provided systems.





Role of the AEW&C

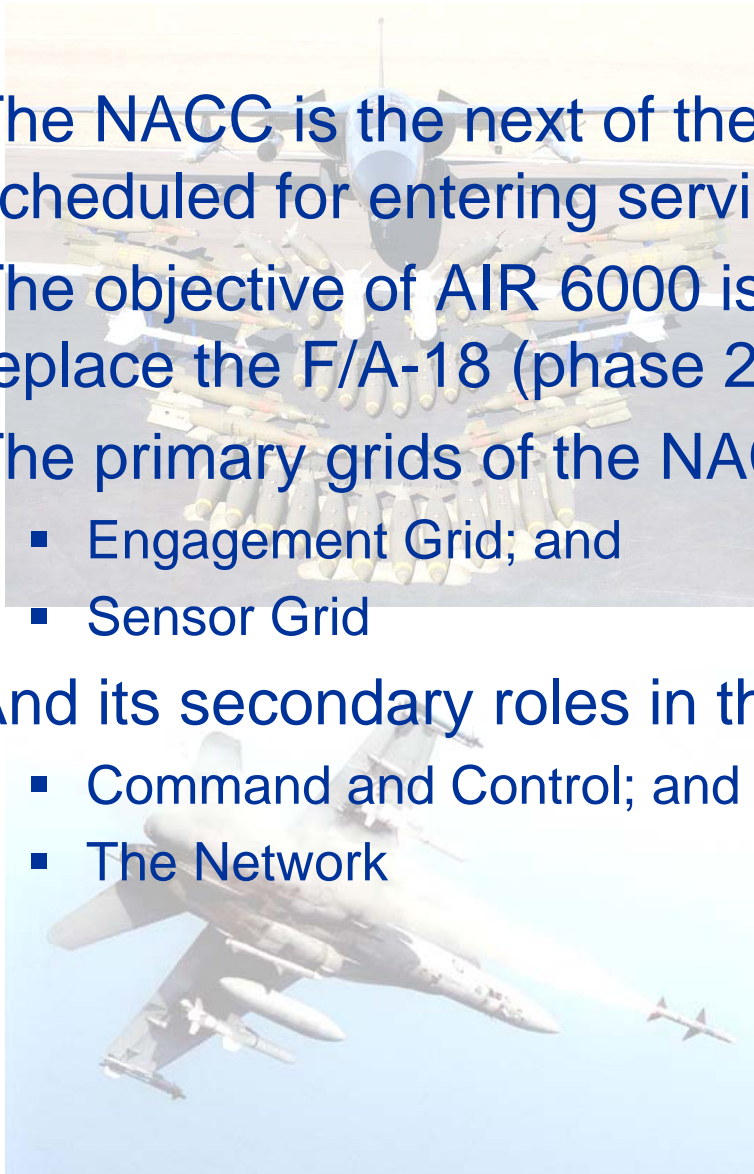
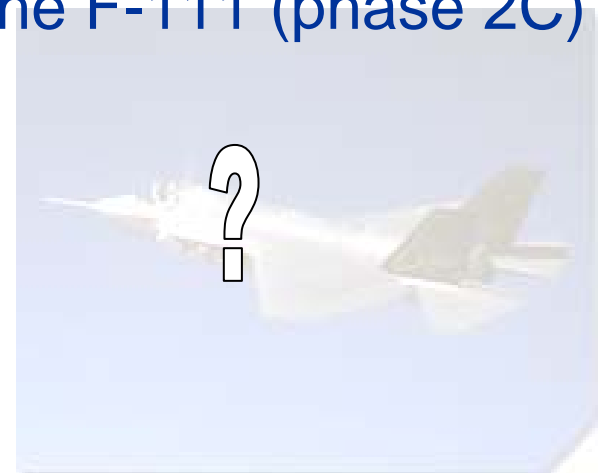
- Project Air 5077 is currently delivering the Airborne Early Warning and Control Aircraft into service with the RAAF
- Critical component of the Future ADO for operations in large Areas of Operation
- The AEW&C is identified as a critical component of the networked RAN and RAAF¹, with the roles of:
 - C2 for air defence;
 - Wide Area Surveillance;
 - Information Fusion;
 - NCW node
- The AEW&C will be Australia's first modern NCW platform that was designed and conceived for NCW operations

¹ NCW Roadmap 2005, Australian Government, Department of Defence



Role of the NACC

- The NACC is the next of the major NCW platforms scheduled for entering service in the ADO
- The objective of AIR 6000 is to identify the system(s) to replace the F/A-18 (phase 2A/B) and the F-111 (phase 2C)
- The primary grids of the NACC are:
 - Engagement Grid; and
 - Sensor Grid
- And its secondary roles in the:
 - Command and Control; and
 - The Network





Role of the Air Warfare Destroyer

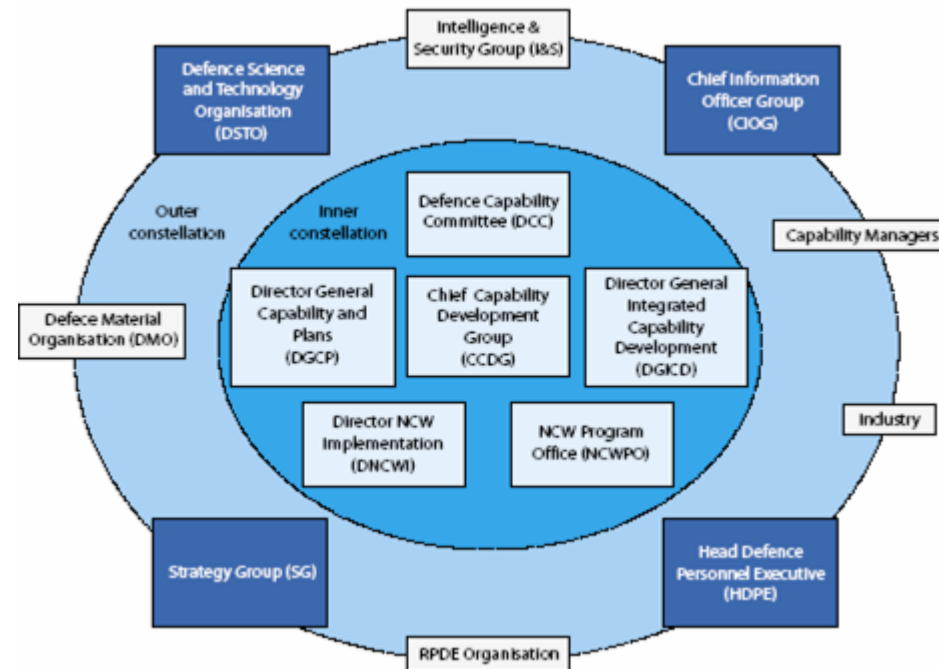
- Project Sea 4000 will deliver 3 Air Warfare Destroyers to the RAN with the first entering service in 2013
- The AWD will network the RAN task groups, and seamlessly integrate with Air and Land forces to form an ADF task group able to operate in Australian waters or on deployment.
- The AWD will have roles in all of the NCW grids, and form a core component of the future Networked Joint Task Force, building on the capabilities of AIR 5077.





Impact on Capability Design and Analysis

- Key Changes
 - Project Dependencies
 - Legacy Systems
 - Whole of Force Design
- The inner constellation focus on the integrating plan for the ADO
- The outer constellation focus on supporting and implementing the plan





DSTO Initiatives for Future Capability

- DSTO is structured to directly support the individual services within the ADF to achieve cross service and capability advice.
- DSTO has undertaken several corporate initiatives to support the development of future NCW capability.
- These initiatives focus on determining the processes by which a whole of force approach to capability design can be successfully implemented.
- Individual major capability projects have scientific teams assigned to ensure the integration of the capability into all other extant and planned systems.



DSTO Initiatives for Legacy Capability

- DSTO is providing S&T support to the ADO in developing project requirements for the upgrades of legacy platforms to enable them to meet the NCW roadmap targets.
- DSTO is providing support to the ADO to identify the extant systems that require upgrade support.
- The key objective of the work is to identify the critical systems that must be upgraded, and the most cost effective way to achieve the desired outcome.

Case Study: JSF PACRIM Integration



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Study Background

- October 2002 Australia signs SDD MOU with US DoD to join F-35 project as a TIER 3 partner
- Formal Decision on AS New Air Combat Capability expected in 2006
- A Series of Activities are underway to Support the Acquisition
- January 2003 a proposal for the JSF Interoperability Study Accepted

JSF PACRIM C4ISR Study Team



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Study Team Objectives

- Work with potential coalition partners to develop a **mutual understanding** of the C4ISR coalition environment
- Characterise a **coalition C4ISR environment** using generic scenarios in the Pacific Rim (PACRIM) region
- Identify risk to the **effective integration** of the JSF into a coalition C4ISR environment
- Describe the capabilities that are needed to ensure **effective interoperability** for JSF operations and support from C4ISR perspective
- Identify **capability shortfalls** in the coalition C4ISR environment and derive JSF interoperability requirements in the future time-frame (final stage of study)



Prime Study NCW Goal

- The key objective of the project can be summarised as:
- *“Integrating a capability yet to be built into a C4ISR environment that is envisioned, but not fully designed, whilst remaining compatible with equipment that was procured last century”*
- The project, ultimately focuses on the cross capability issues that examine the environment that the aircraft will operate in, with the objective of bringing the aircraft to full operational capacity as rapidly as possible.



Deliverables

- Operational Information Environment for the JSF in the PACRIM
- Assessment of adequacy of Operational Information (C4ISR) Environment
- The Information Exchange Requirements (IERs) for coalition JSF PACRIM operations
- Recommendations to address gaps in the Operational Information Environment



Capability Engineering JSF C4I Study Context

- Characterise a coalition C4ISR environment
- Identify risk to the **effective integration** of the NACC into the coalition C4ISR environment
- Describe the capabilities that are needed to ensure **effective interoperability** for NACC operations and support from C4ISR perspective
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Capture AS-IS Capability



Define Options for TO-
BE Capability



Engineer Closure of Gap

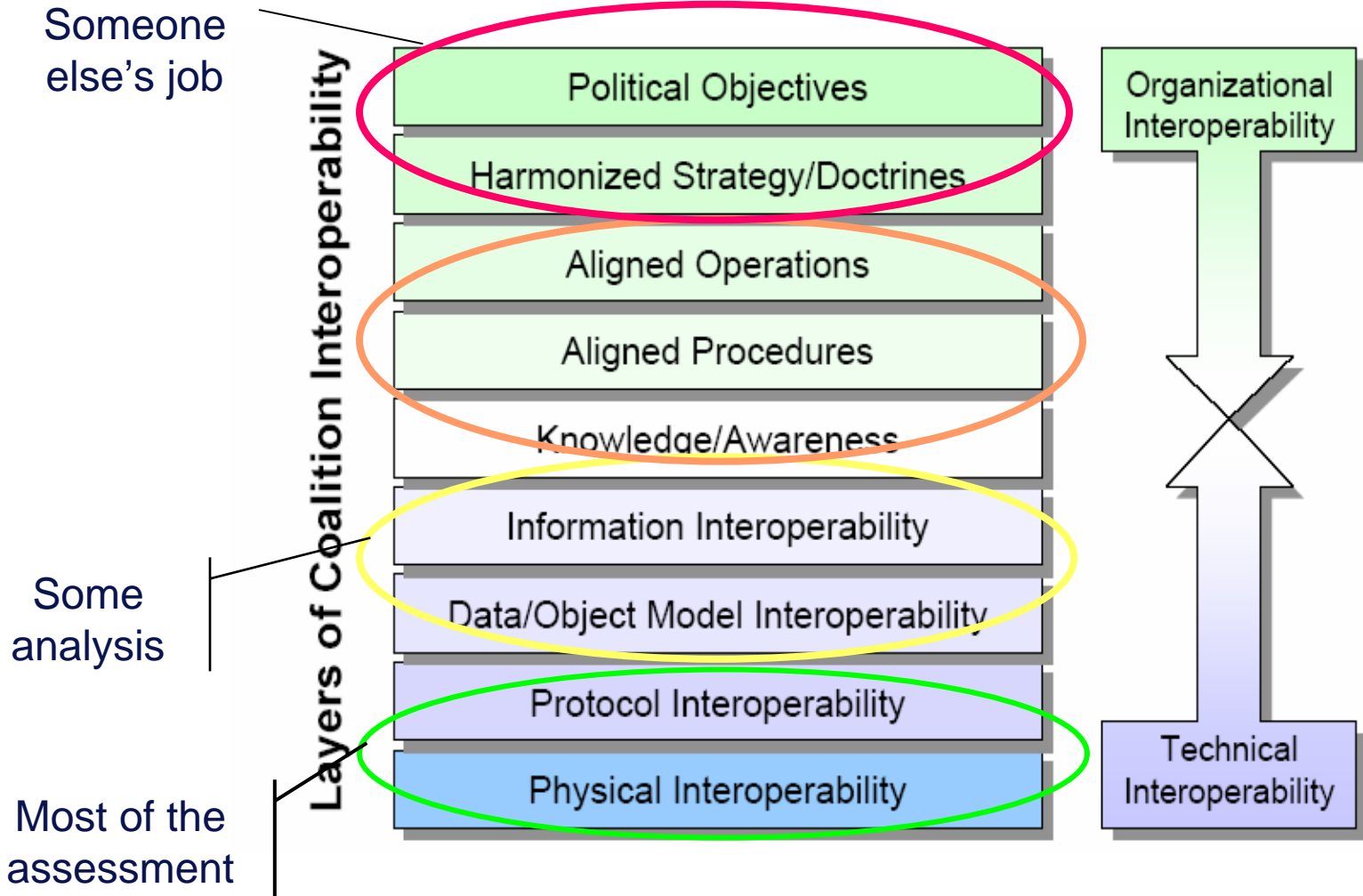


Capability Evolution



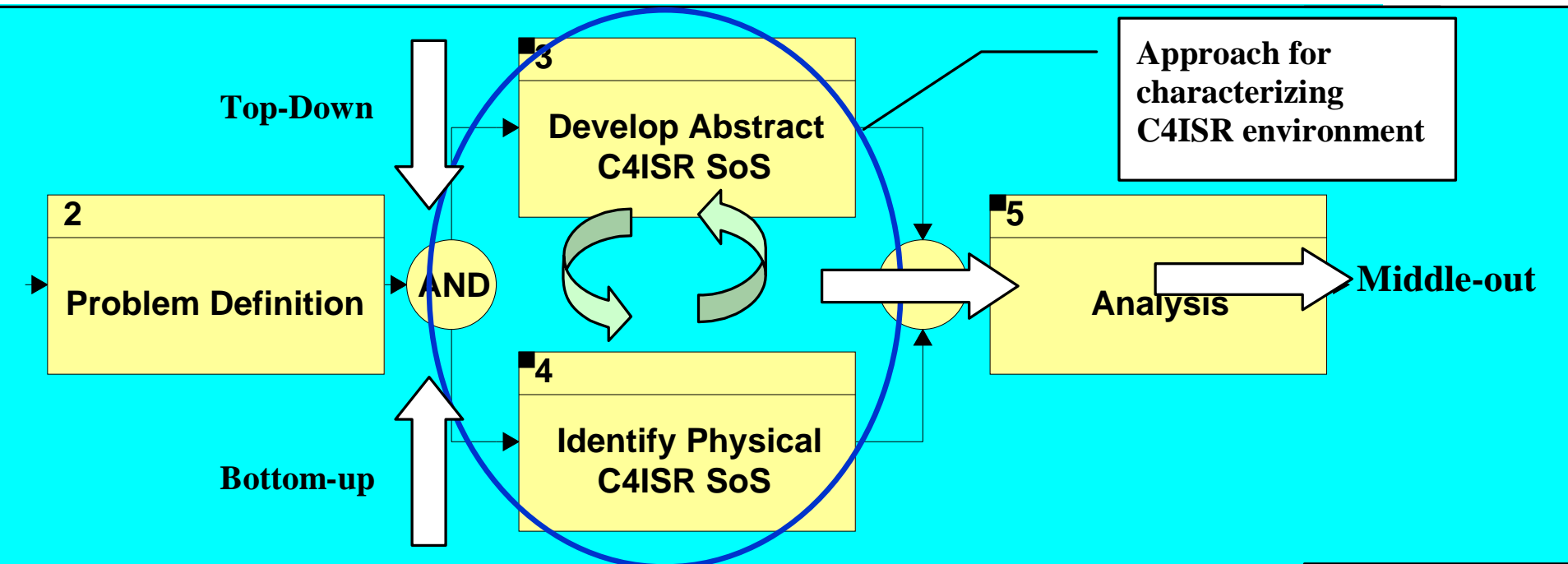
Technical Interoperability

Tolk's layer of Coalition Interoperability





Top-down Bottom-up Approach

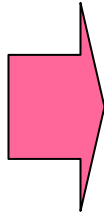


SoS = System of Systems



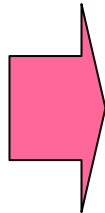
Output

Abstract Stable
C4ISR Systems
Model



- Slow-changing and traceable requirements view/model
- Preparation for future SoS changes

Physical C4ISR
Architectures



- Database Models – characterising C4ISR Support environment
- Technical Interoperability
- Interface Control



Models

knowledge consists of models that attempt to represent the environment in such a way as to maximally simplify problem-solving

Heylighen (Sep 1993), 'Epistemology, Introduction',
Principia Cybernetica Web
<http://pespmc1.vub.ac.be/fEPISTEMI.html>.

Why Models for SoS?

JSF C4ISR Study:

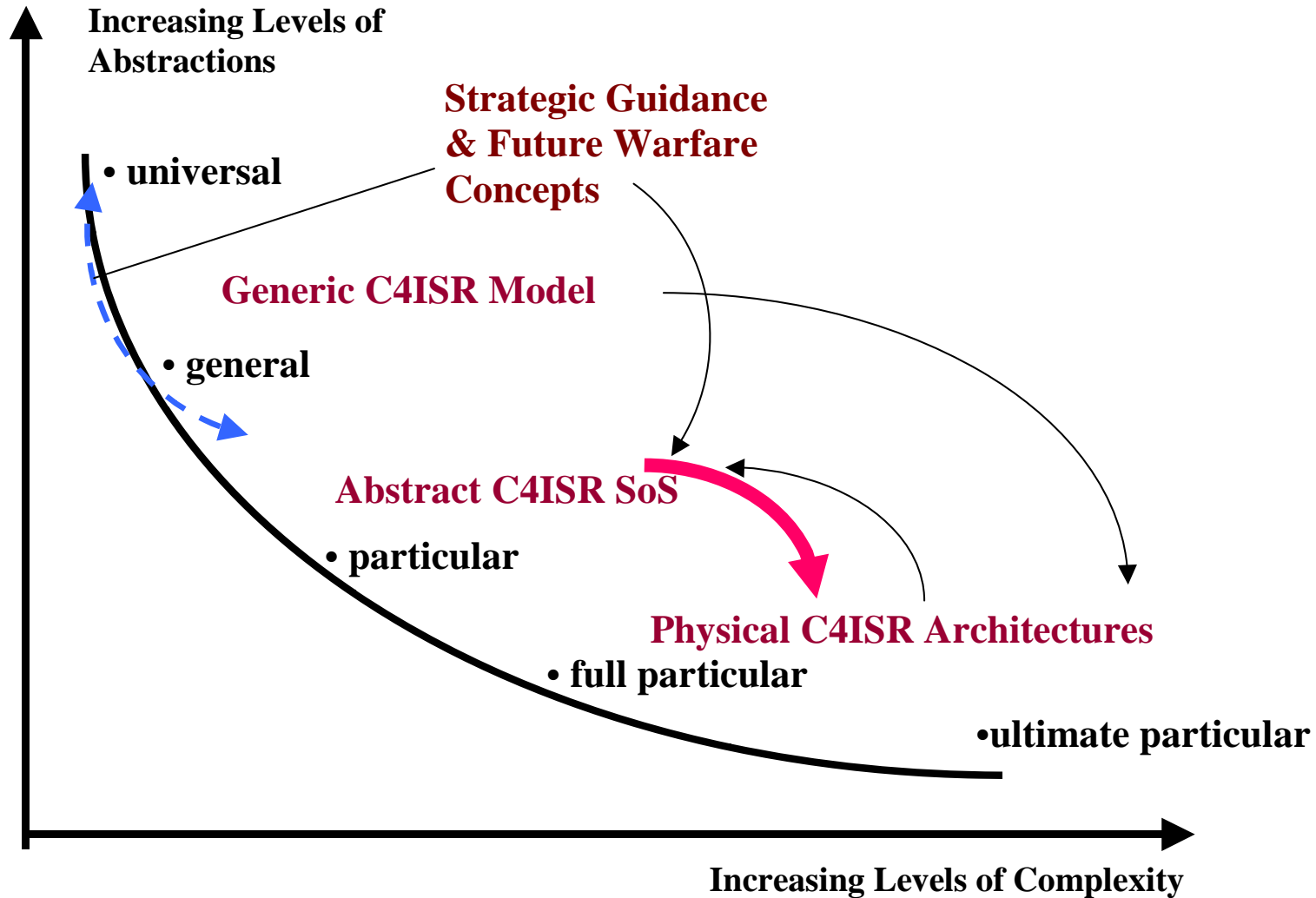


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1. To establish a means to define the system of interest - Physical C4ISR Environment - in a meaningful way.
2. To establish a rudimentary common language to conceptualise the future C4ISR environment in several areas of operation engaging and including potential coalition partners.
3. To capture information about the C4ISR environment in various Area of Operations (AOs).



Architecture / SoS Models: Abstract to Particular



Architectural Systems View of NCW



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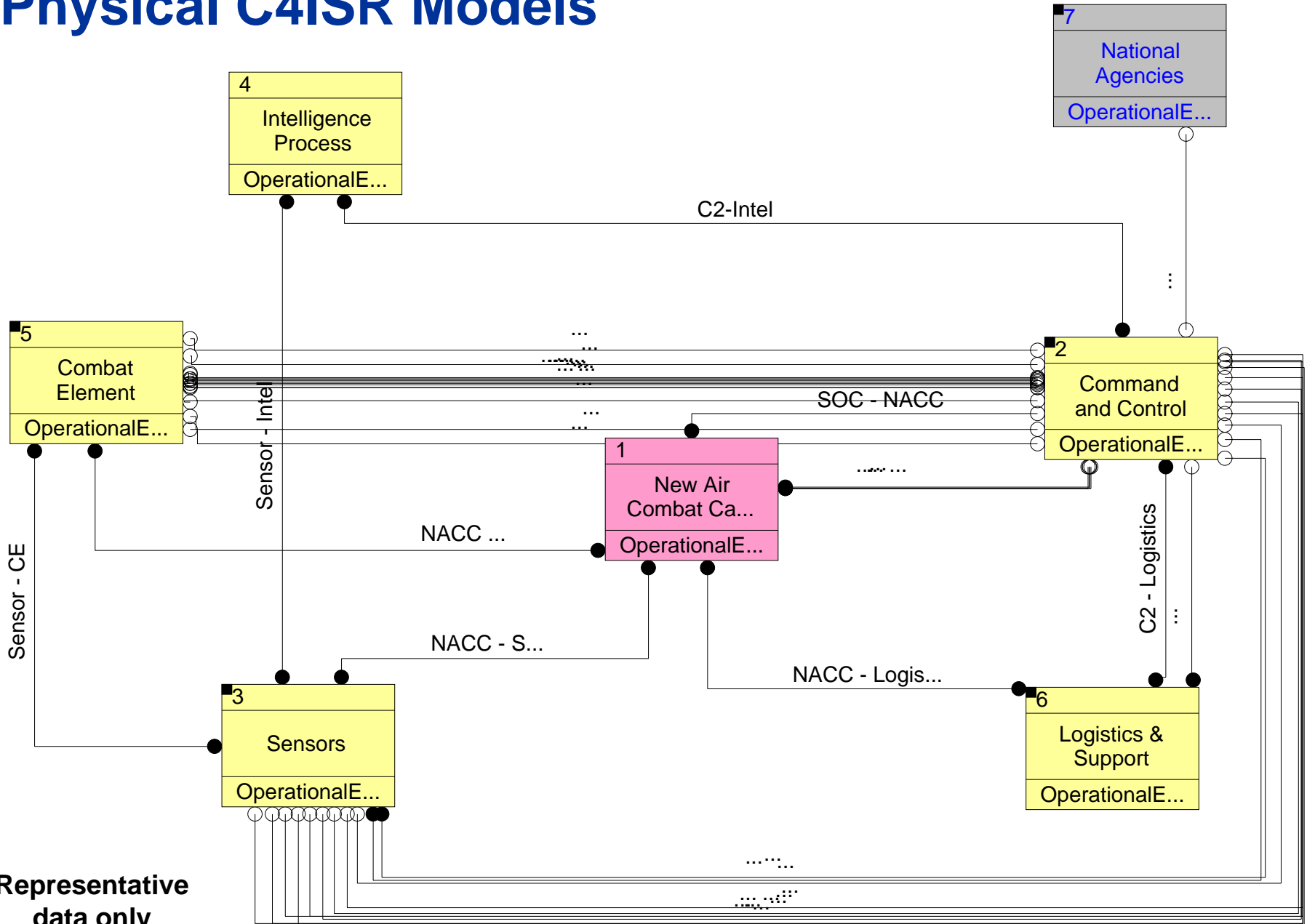


The operational architecture view is a description of the tasks and activities, operational elements, and information flows required to accomplish or support a military operation.

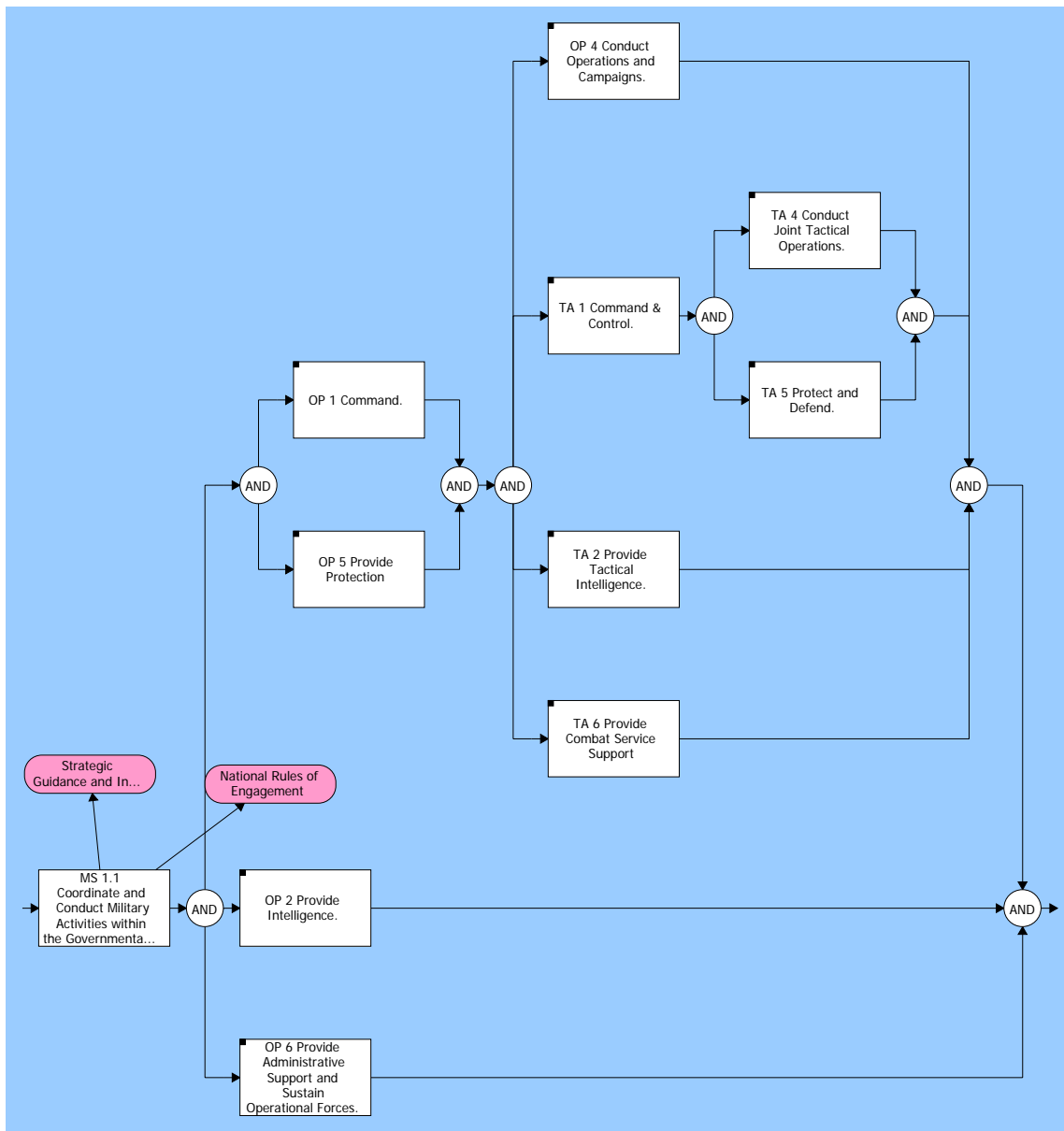
Use Of Models: Physical C4ISR Models



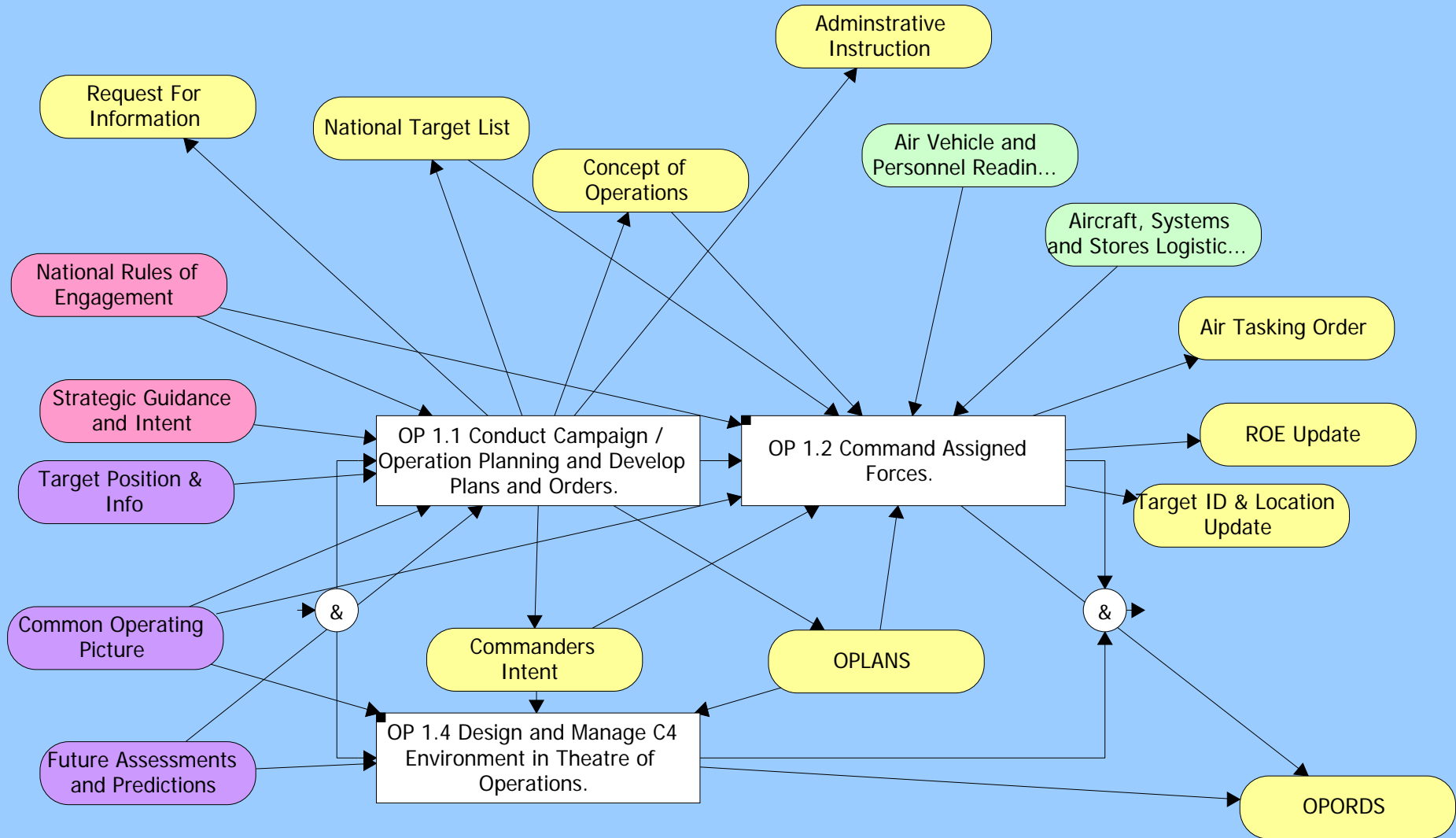
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Operational Activity Diagram (OV-5)



Operational Activity Diagram Expansion



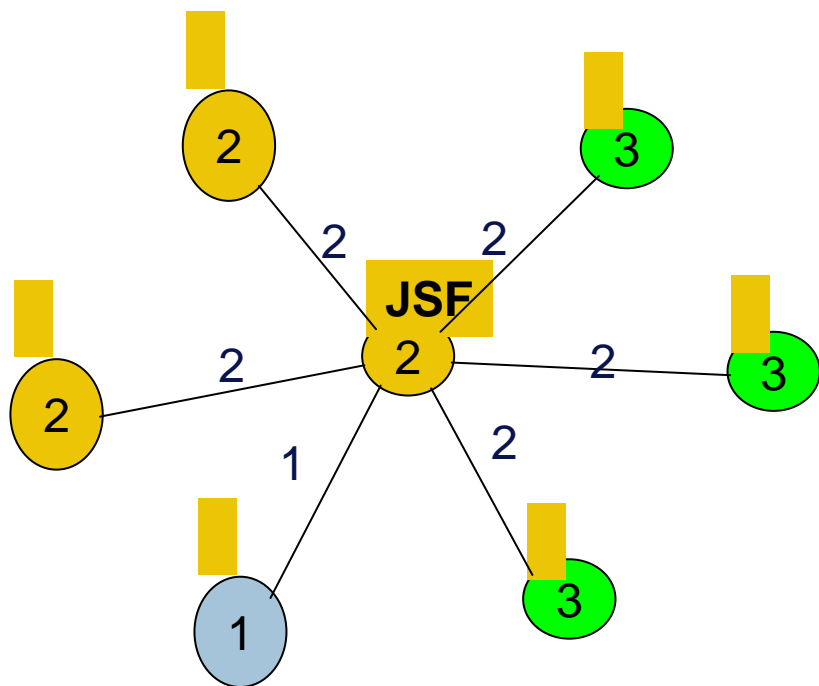
Operational Connectivity Diagram (OV-3+)



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4			4											
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Representative data not actual

System Interoperability Analysis



		Systems							
		J S F							
S Y S T E M S	J S F								

Representative data not actual



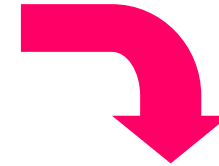
Requirements Analysis

- Requirements Specification not sufficient for identifying and defining the future C4ISR Environment
- A “Requirements Specification” for a complex future SoS would as a minimum consist of:
 - Model / framework of activities and information
 - Required characteristics of the complex SoS
- The Requirements Analysis must bridge the gap between high-level concepts and equipment acquisition



Requirements Analysis

What are the requirements on the future C4ISR Environment with respect to support of weapons delivery?



Which ones will impact on JSF + C4ISR operational concepts?

How will they impact on JSF + C4ISR operational concepts?

Example NCW questions (Dstl UK):

Where does NCW deliver most benefit to Defence?

What can be traded off to pay for it?

What changes are required to processes, structures, equipment etc to deliver the desired transformation?



Conclusion

- Prepare future capabilities for coalition operations
- Risk reduction for integration of new capability
- Facilitate effective use of new technology
- Bridge the gap between concepts and acquisition
- Requirements analysis for NACC in context of joint / coalition capability



Summary

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- Capability Design and Analysis
- DSTO Initiatives
 - Future Platforms
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Questions



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Thank you