

The Capability Gap in Military Theatre Distribution

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Abstract: KBR was tasked by the Defence Department to undertake a Project Definition Study (PDS) as part of Joint Project 126 Joint Theatre Distribution. This study was required to identify the outstanding theatre distribution capability gaps and to recommend courses of action to fill these gaps. The PDS followed a classic systems engineering approach but the level of complexity and the high-level outcomes expected meant that classic performance measures were found to be inappropriate for this system. The paper will describe the scope of the project and identify how the capability gaps were identified and solved – in both functional terms and performance terms.

Key Words: capability, requirements, distribution, military, gap, theatre, networks, modelling.

1. PROJECT DESCRIPTION

1.1 WHAT IS JOINT THEATRE DISTRIBUTION

1.1.1 The Joint Theatre Distribution System (JTDS) is the title given to the system of actions, resources, processes and management functions which control the in-theatre bi-directional flow of all classes of supply and personnel to satisfy needs generated by ADF activity. The scope of the systems is shown in Figure 1. It is inclusive of all systems, processes, equipment, transport assets, and personnel necessary to effect the desired outcomes. The JTDS must have visibility and influence over the flow of supplies, (including their priorities and configuration) and personnel across the strategic bridges. The JTDS will need to operate through all phases of military operations (pre-deployment, deployment, sustainment and redeployment). The scope does not include distribution in the National Support Base.

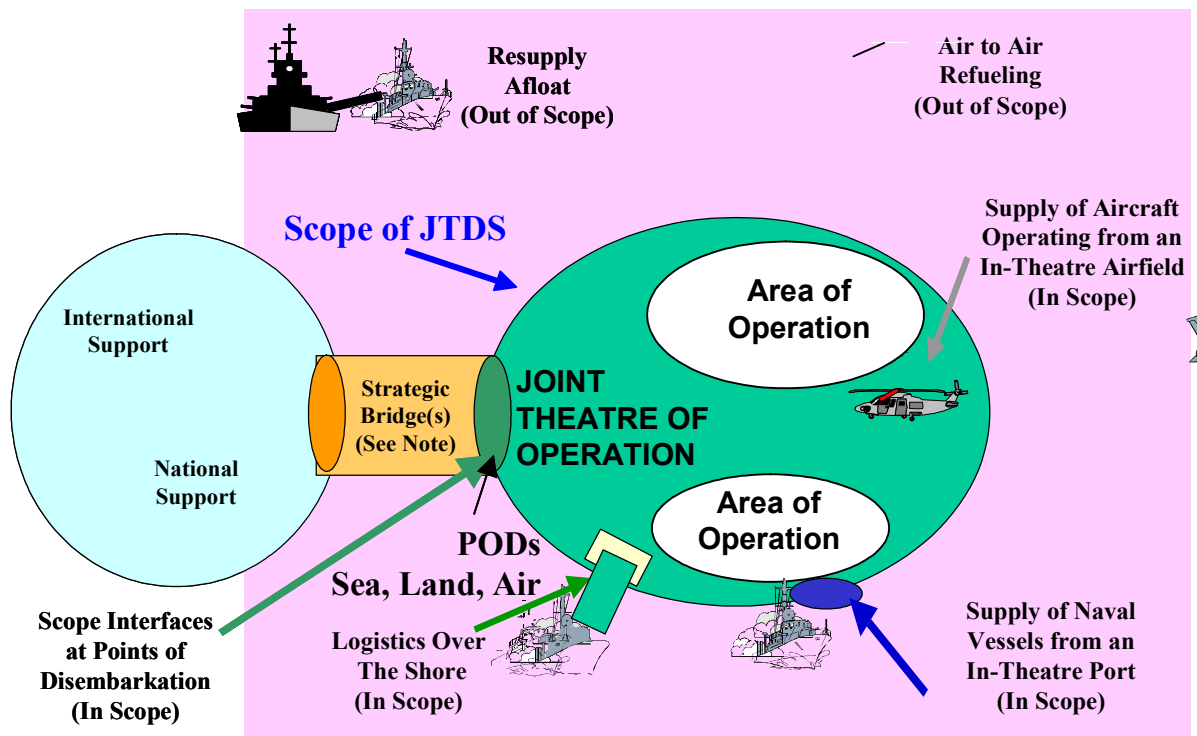


Figure 1. Scope of Joint Theatre Distribution System (OV-1)¹

1.2 SYSTEM FUNCTION AND PERFORMANCE

1.2.1 The vision of JP126 is to deliver an effective and agile JTDS that is responsive, robust, efficient and interoperable and meets the requirements of all users.

1.3 THE END POINT

1.3.1 JP126 will develop and implement a coherent set of capabilities to achieve the JTDS mission using existing capabilities, ongoing related project developments and JP126 acquisitions.

¹ While the ownership and operation of the strategic lift assets is out of scope, control of the flow, priorities and configuration of materiel on the strategic bridge is in scope.

2. THE CAPABILITY GAP EQUATION

2.1 The PDS was guided by the following equation at Figure 2:

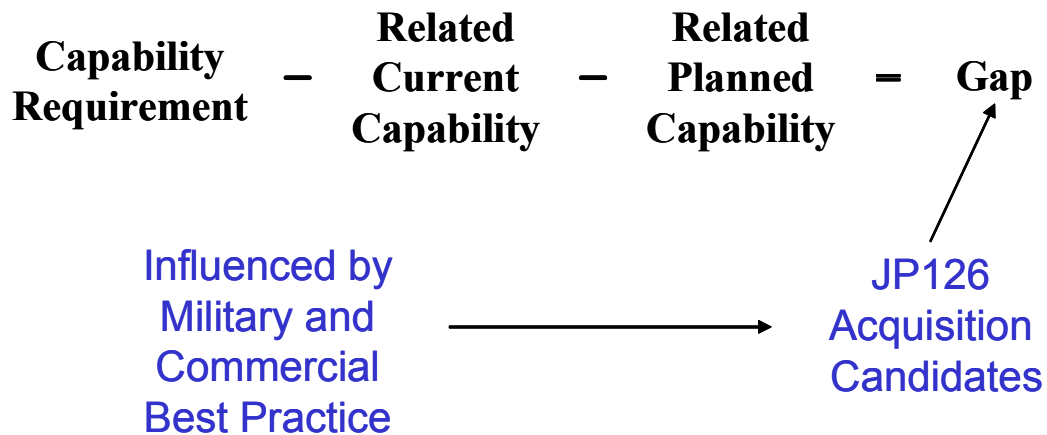


Figure 2 - JP126 Gap Equation

3. REQUIRED CAPABILITY

3.1 MISSION

3.1.1 The mission of the JTDS is:

The synchronized delivery of all classes of supply and personnel within joint theatre(s) of operations, at the required time, place, and in the required quantities and condition in order to support the Joint Commander's missions.

3.2 JTDS NETWORKS

3.2.1.1 The overall concept for the JTDS comprises three networks (as illustrated in Figure 3):

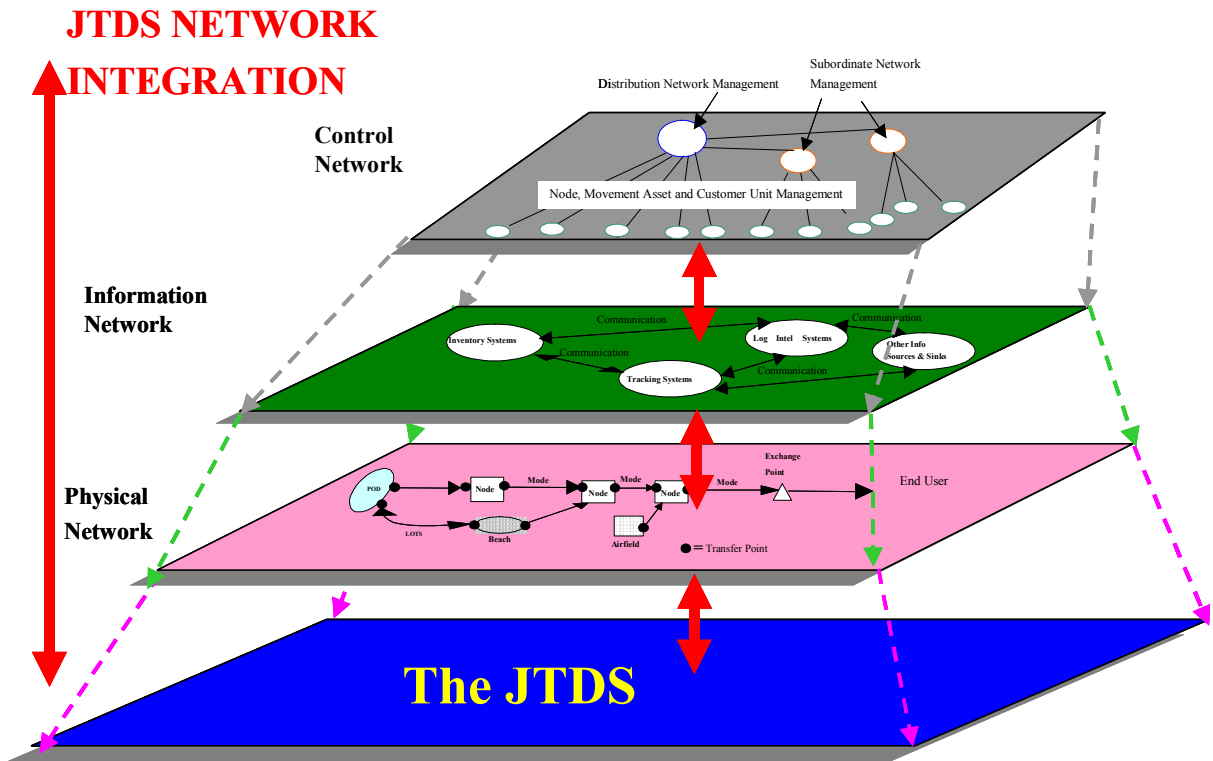


Figure 3 - The JTDS Networks

- a. A **control network** which gives the senior logistician and/or designated managers the capability to plan, monitor, measure, report and manage the operation of the entire JTDS.
- b. An **information network** which enables the JTDS managers and operators to:
 - (i) manage and monitor the status and location of supplies and personnel in theatre;
 - (ii) manage and monitor the status, location and capacity of the physical elements of the JTDS; and
 - (iii) view the status and location of demanded supplies and incoming personnel in the NSB.
- c. A **physical network** of nodes and movement assets which moves personnel and distributes the supplies to the customers.

3.3 FUNCTIONAL REQUIREMENTS

3.3.1 Figure 4 shows the top level function requirements for the JTDS functions. These were developed in CORE.

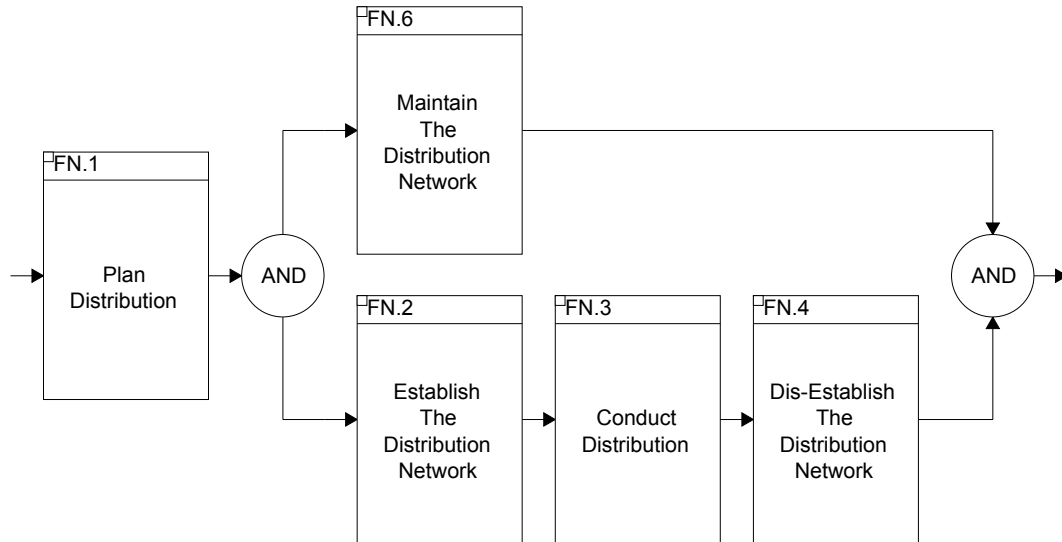


Figure 4 - Functions Of Joint Theatre Distribution

3.3.2 The ‘Conduct Distribution’ function is further devolved into lower level functions shown in **Figure 5**.

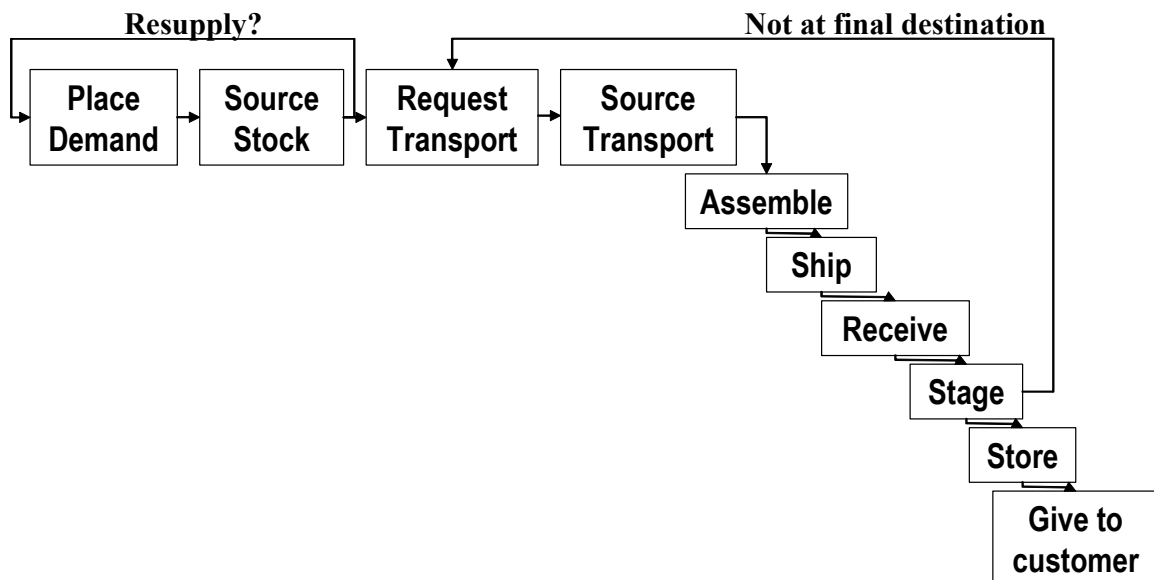


Figure 5 - Conduct Distribution Functions

3.3.3 **These function were further decomposed to six levels and involved 200 or so functions. For analysis they were placed onto the one worksheet (6 meters in length – which will be available at the conference)**

3.4 PERFORMANCE REQUIREMENTS

- 3.4.1 The JTDS must be capable of supporting ADF operations across the range of credible contingencies. The system must be responsive, robust, efficient and interoperable, allowing the Joint Theatre Commander to plan and conduct operations confident that any limitations imposed by the logistic system will be minimized - with respect to his freedom to manoeuvre and ability to maintain operational tempo.
- 3.4.2 To better define these performance requirements the following were developed:
- a. Critical Operational Issues,
 - b. Measure of Effectiveness, and
 - c. Measures of Performance.
- 3.4.3 **Unfortunately, the stakeholder community were unable to determine the classic performance requirements for such a complex system. For example, the measurement units for the required availability and reliability of the system could not be determined.**

3.5 MODELLING

3.5.1 Basis of Analysis

- 3.5.1.1 To provide some definition to this capability, three scenarios were analysed:
- a. a small joint deployed battalion sized force of 1200 personnel conducting peace keeping operations, concurrently with
 - b. a deployed joint brigade group of 5500 personnel, and separately
 - c. a brigade group of 9000 personnel involved in war-fighting operations.

3.5.2 Static Modeling

- 3.5.2.1 These scenarios were analysed in Microsoft Excel. The outcomes provided an idealistic solution.

3.5.3 Discreet Event Simulation

- 3.5.3.1 Discreet event simulation was provided by DSTO using a tool called Planimate. The plan was for this to take the idealized excel solution and introduce delays based on limited resources and operational variables to provide a more realistic picture of the physical requirements.

- 3.5.3.2 **Unfortunately, the complexity of the distribution system was unable to be modeled satisfactorily – despite 12 months of development.**

4. PLANNED CAPABILITIES

- 4.1 The JP126 project will proceed in parallel with a range of projects and activities related to distribution across Defence. A fundamental objective of JP126 is to pull these initiatives together, develop an understanding of their products and timelines, and provide a conceptual framework for future operational logistics and Combat Service Support (CSS) that will be provided within the joint theatre(s) of operations. JP126 is:
- a. influencing directly related projects,
 - b. advising related projects, and
 - c. informing projects of interest.

5. THE ACQUISITION OF SOLUTIONS TO FILL THE GAPS

5.1 FUNCTIONAL GAPS

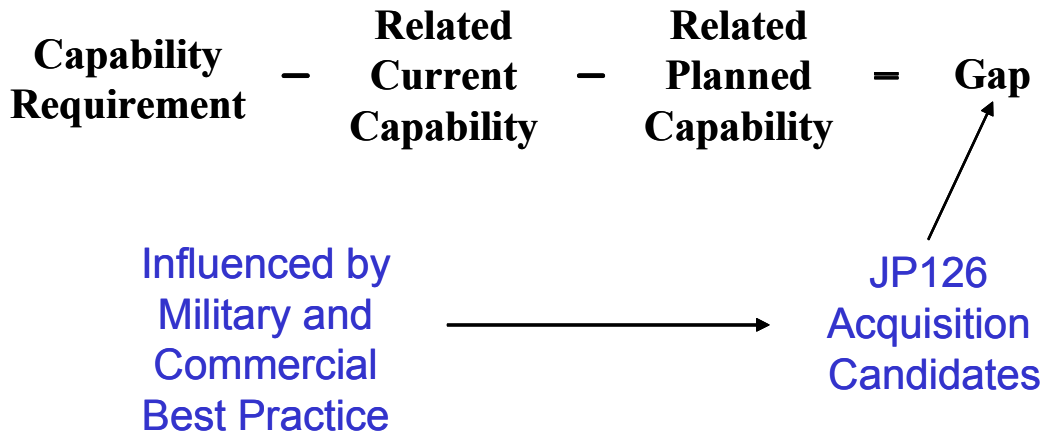
- 5.1.1 Where one of the functions was not currently being performed (nor was there a planned project to perform that function in accordance with the required capability) then there was a clear case for acquiring that capability. Functions that fell into this category were mainly in the information and control networks, eg the ability to place a demand electronically for ammunition in the theatre, or the maintenance/synchronisation of the distribution network.
- 5.1.2 **The acquisition of solutions to fill functional gaps in the information and control networks was not simple.** The deployed information systems need to be interoperable with the Defence corporate systems which need to be understood and their further development influenced by the theatre distribution requirements. This iterative improvement approach needed to be considered in conjunction with a number of other information projects (such as JP2077 – Improved Logistics Systems).

5.2 PERFORMANCE GAPS

- 5.2.1 All of the physical functions are currently being performed but often in an inefficient manner. Quantification of current performance and required performance was very difficult at the systems level. However, the level of performance turned out to be a minor influence on the physical solution space. The main influences on the physical equipment solution were:
- a. The dependency on related projects.
 - b. Fundamental inputs to capability (ensuring that there was a full capability and not just some pieces of equipment). Specifically this involved equipping duplicate units in the ADF to allow some flexibility during initial selection and the rotation of forces.

6. SUMMARY

6.1 The overarching framework for the PDS is:



6.2 CAPABILITY REQUIREMENT

- 6.2.1 Deriving required functional requirements was quite involved - but straightforward (CORE was used to produce Functional Flow Block Diagrams).
- 6.2.2 The required performance requirements could not be quantitatively determined at the system level. The closest performance requirements were in terms of generic high level aspirations.
- 6.2.3 A number of scenarios were used to define the requirements and to understand how sensitive the requirements were to a range of situations. The physical network was modeled statically – but not dynamically, ie the PDS was unable to simulate the in-theatre distribution chain.

6.3 CURRENT CAPABILITY

- 6.3.1 The current capability had shortcomings across the full spectrum of the supply chain.

6.4 PLANNED CAPABILITY

- 6.5 The planned projects and introduction into service considerations had a very significant impact on the solution space – much more than the generically-defined system-level performance requirements.

ATTACHMENT

PowerPoint Presentation