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**Factors Affecting the Effectiveness of a Coalition C3
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Abstract

A coalition is made up of different countries working together to accomplish a common goal. In a coalition, each participating country may possess varying levels of command, control and communications (C3) capability including doctrine, procedures, technology and budgets. They may also utilise different command and control (C2) structures and models, and have diverse cultural backgrounds. For each specific coalition operation, there is a need to establish a coalition C3 system. This paper proposes the factors that affect the effectiveness of a coalition C3 system utilising a coalition lifecycle model. This lifecycle model is used to demonstrate the stages through which a coalition generally progresses including the trigger, building, implementing, operating and disestablishment of the coalition. Within the lifecycle each nation shapes the coalition with their cultural, legal and political influences. These influences impact upon the C2 model and the final form of the coalition C3 system. The lifecycle also includes a discussion of the processes, information management and information technology systems that will also need to be negotiated, built and implemented for the operation.

1. Introduction

“An operation conducted by forces of two or more nations, which may not be allies, acting together for the accomplishment of a single mission” (Commonwealth of Australia, 1997).

The term coalition operation is used to describe a broad spectrum of military operations involving more than one nation. Coalition operations for the Australian Defence Force (ADF) may range from peacekeeping and disaster relief to relatively high intensity conflict. The essential characteristic of a coalition operation is that the objective is pursued and realised by two or more nations working towards an agreed end-state, possibly without a formal alliance in place (Commonwealth of Australia, 2002).

Each coalition operation has particular requirements, and all coalitions are different. Each country has a particular objective and elements of capability to contribute and each nation may have its own constraints and rules of engagement. Countries within the coalition can be allies or non-allies. Countries that are allies will have a basis from which to start such

as shared processes and procedures, whereas non-allies working together may essentially need to build from scratch.

For each specific coalition operation, there is a need to establish a coalition C3 system. This paper discusses the nature of a coalition C3 system, including its development and lifecycle. The lifecycle discussion explores the stages through which a coalition generally progresses, including the trigger, building, implementing, operating and disestablishment of the coalition. Within the lifecycle each nation shapes the coalition with unique cultural, legal and political influences. These influences impact upon the command and control (C2) model and the final form of the coalition C3 system. The paper also includes a discussion of the processes, and the information management and information technology systems which form part of the coalition C3 system and will also need to be negotiated, built and implemented for the operation.

2. Command, Control and Communications

The term Command, Control and Communications has been defined by various sources, but Figure 1 shows a simplified version of the definition for the purposes of this paper and to examine Australia (AS) C3 in coalitions.

$\begin{aligned} C_1 &= \textit{Command is authority of forces} \\ C_2 &= \textit{Control is allocation of resources} \\ C_3 &= \textit{Communications facilitating C2} \\ C_1 + C_2 + C_3 &= C3 \end{aligned}$

Figure 1: A simplified C3 definition.

A C3 system supports command, which is the intention and authority, and control, which is the process by which command is exercised. Communications is the instrument bridging the gap between the two, and the act or process by which information or data is exchanged (Wheeler, 2006).

2.1 Coalition Command Structures

Within a coalition operation, ADF forces may operate under varying command structures. The four most common coalition command structures are known as integrated, parallel, lead nation and combination (Commonwealth of Australia, 2002):

Integrated: An integrated command structure consists of commanders and staff from multiple nations. This structure is generally characterised by a high levels of interoperability between the participants.

Parallel: Where several commands operate in parallel and achieve unity of effort through the use of coordination.

Lead Nation: A commander is appointed from the lead nation and national contingents are placed under this commander. This structure differs from the integrated structure in that it does not necessarily depend on high levels of

interoperability to succeed. The Lead Nation provides the key capabilities which enable participants to work together.

Combination: A combination of any of the above.

Allowing another nation to command one's own troops is a sensitive issue and, involves entrusting the care and use of a nation's military assets to another nation (Commonwealth of Australia, 2002). The most common way that nations deal with this issue is to place forces under the operational or tactical command of a coalition commander, but at the same time retaining national command under its own Rules of Engagement (ROE). In this way, national commanders can agree to a plan in principle and commit their forces to an operation under that plan but within their own ROE. This gives the coalition commander authority to issue orders to international forces whilst each nation retains veto rights over the actions which can be carried out by its own forces under that plan. In coalitions, the ADF will generally retain national command of its own forces.

2.2 Coalition Command and Control Structures

Placing resources under international control is a slightly less sensitive issue and control is more commonly shared as a responsibility among coalition members. Examples of C2 arrangements for AS include:

- AS command and control of AS resources,
- AS command and coalition control of AS resources,
- AS command and control of AS resources and AS control of coalition resources, and
- AS command and control of coalition resources (less common).

Figure 2 shows some examples of C2 arrangements for a coalition. Any particular coalition may be a combination of any of the previously mentioned structures or some special arrangement formed for a particular context. The first structure within Figure 2 shows a typical example of a *parallel* structure where each nation retains command and control of their own resources. In these circumstances, there is generally a need for a coordinator. This role might be undertaken by the United Nations (UN), the host nation or a participating nation.

The example of the *integrated* structure is shown within Figure 2. The commander of the coalition provides operational command and control of the allocated international resources. National command may be retained by each participant.

The example of *lead* nation is shown within Figure 2. The lead nation will provide the Headquarters and the principal command staff, and the commander may have command and control of coalition resources.

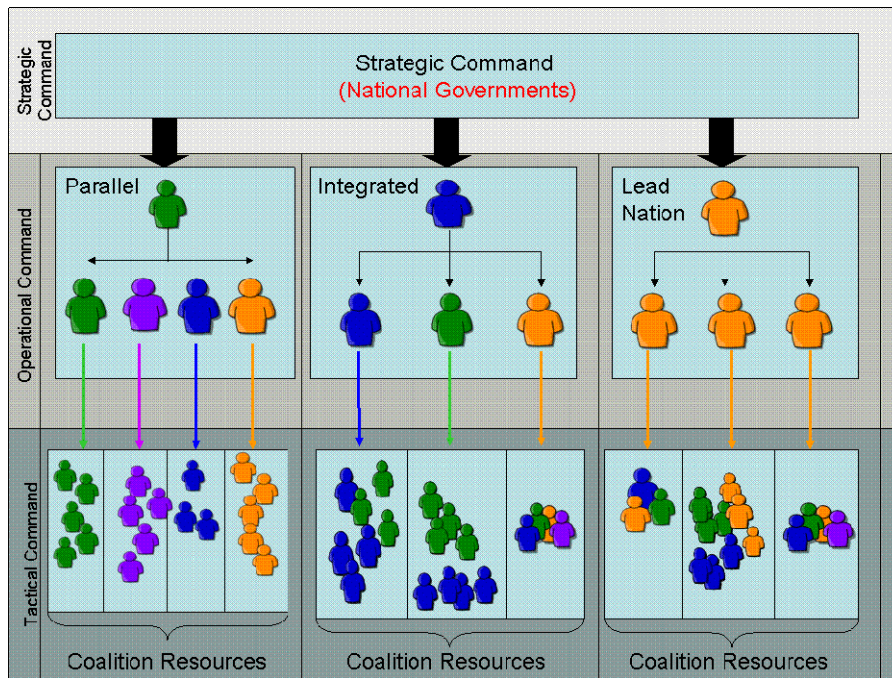


Figure 2: Examples of the command and control arrangements for a coalition.

2.3 Coalition Command and Control Models

Wheeler (2006) discusses the four main types of C2 models: centralised, decentralised, distributed and collective. Table 1 is a summary of C2 models that Wheeler (2006) developed to minimise ambiguity.

STRUCTURE		MODEL		DESCRIPTION
1.	Centralised	1.1	Fully centralised	Absolute consolidation of power in a single governing or authoritative body directly managing and directing all activities.
		1.2	Centralised veto	Partially decentralised control, subjected to continuous pervasive monitoring by a centralised authority holding veto privileges.
		1.3	Pooled joint assets	Centralisation of control over a pool of shared assets at the joint level, responsive to requests for resources from all levels.
2.	Decentralised	2.1	Decentralised execution	Power to utilise resources and exercise duly invested authority to accomplish objectives in line with higher guidance and intent.
		2.2	Parallel command	Federated system with authority and intent invested in multiple commands maintaining unity of purpose via a coordination centre.
3.	Distributed	3.1	Devolved C2	Devolution of C2 to the lowest levels,

STRUCTURE		MODEL		DESCRIPTION
				distribution of authority to tactical entities with reachback to operational support centres.
		3.2	Swarming networks	Fully autonomous system with emergent C2 structures arising from social networks and ad hock teaming.
4.	Collective	4.1	Egalitarian communitarianism	Governance of C2 by means of consensus decision, reached by process of communal discussion and debate.
		4.2	Contractual arbitration	C2 by means of negotiation in a self-regulating environment, utilising arbitration as a mechanism for socially binding contracts.

Table 1: C2 Structures and Corresponding Models and Definitions.

2.4 Command and Control models and their inherent communication paradigm

The nature of the C2 model will determine the nature of the communication paradigm used within a coalition. The communication paradigm is the way information is exchanged between the nodes of the C2 model to facilitate C2. A C3 model is the C2 model (i.e. centralised, decentralised, distributed, and collective) with the inherent communications paradigm (eg mono-directional, bi-directional, multi-directional, emergent etc.). The communication system is the realisation of the communication paradigm of the C3 model (for example, a real-time, two-way communication system).

The nature of the communication system within a coalition is influenced by the communication paradigm which is inherent in the C2 model that is chosen for each particular coalition. For example, in Figure 3 the C2 model is a *decentralised* one, and so the corresponding communication paradigm will be *hierarchical*, whereas in Figure 4 the C2 model is *centralised* and the corresponding communication paradigm is *hub and spoke* with all communication occurring via the central node. Each C2 model would have its own communications paradigm and corresponding communication system to facilitate it.

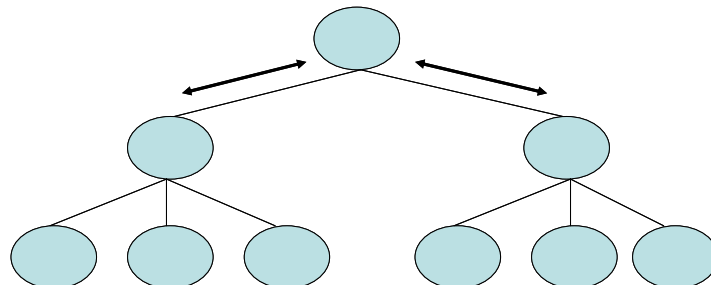


Figure 3: Hierarchical communication paradigm.

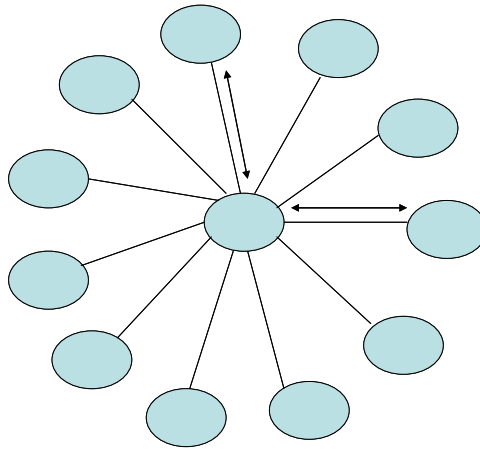


Figure 4: Hub and spoke communication paradigm.

It is possible that there will be varying models of C3 used by participants within a coalition leading to the need for interaction between varying types of communication paradigms and systems. This will have an impact on the way the coalition operates and will influence the ease or difficulty with which interactions may occur. One example of this would be where the ADF is operating under a decentralised C2 model in a coalition with nation A, who is currently the lead nation for the coalition and who is operating under a distributed C2 model. The major issues which might initially arise from such an interaction would include:

1. How will the two C2 models work together and will a combination of models impact the effectiveness of the coalition C2?
2. How will the two communications systems interact and will the basic differences in paradigm impact the effectiveness of communications?
3. Will communication system differences impact on information exchange?

3. Coalition C3 System Components

This discussion looks at both the *coalition* and the *C3* aspects of coalition C3 individually and then describes how each aspect influences the other in the formation of the coalition C3 system, and how the system develops over time. Coalition C3 is composed of two important components: the coalition entity which consists of a number of international bodies working together to achieve an aim, and the C3 which gives the entity authority and resources.

3.1 The Coalition Entity

The coalition entity is the body which forms in response to an event and so, in essence, is always a unique object created in a particular context. The nature of this entity and the way it evolves are the formative aspects of a coalition and refer to the legal, political and

cultural aspects affecting the members of the coalition and how the emerging coalition dimensions are formulated, negotiated, and implemented.

Regardless of whether the coalition already exists at the point of a nation's involvement or whether it is involved in its creation, the involvement of a nation at any stage of a coalition will affect the nature of both the coalition entity itself and the nature of that nation's capability requirements in relation to that entity.

3.2 Coalition C3

Coalition C3 is associated with the actions of the coalition entity, the realisation of its authority & intent and the utilisation of its resources.

3.3 Coalition C3 Lifecycle

Coalition C3 is realised and utilised through a development cycle which this paper describes as the Coalition Lifecycle. This lifecycle describes the stages through which a coalition generally progresses from its formation to its disestablishment and is represented graphically in Figure 5. The lifecycle stages include the building, implementation, operating, and disestablishment of a coalition and are based on the Coalition Operations doctrine (Commonwealth of Australia, 2002), which provides broad principles and guidance for the planning, preparation and command of coalition operations in which the ADF participates. Each of these stages is described in more detail below.

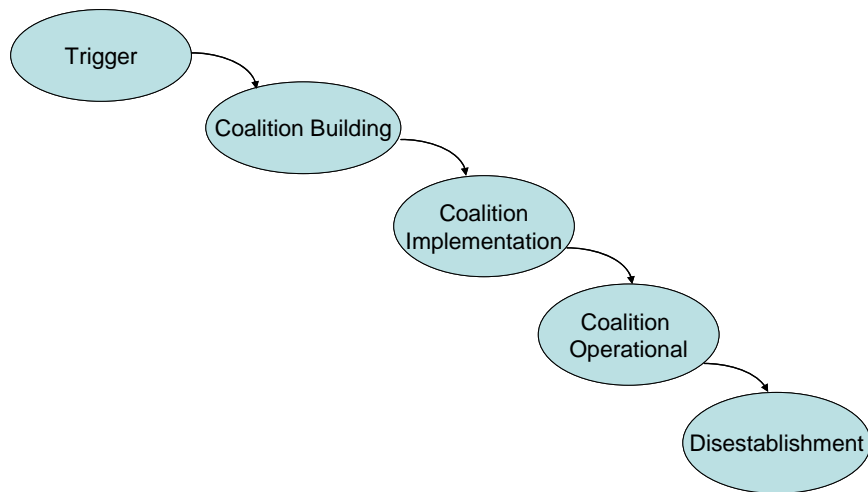


Figure 5: The coalition lifecycle model progresses from coalition building to disestablishment.

3.4 Trigger

The trigger phase occurs when some event or trigger precipitates the formation of a coalition. The request for Coalition members could come from a standing public international organisation (eg UN), or a request for assistance from a host nation. A coalition can also be formed by a group of nations under other arrangements such as the group formed in response to the War on Terrorism.

Participants decide whether they will participate within the Coalition and this decision making process includes both a political and military strategic element. Participating nations will evaluate how their strategic interests will be affected by their involvement in the operation and will include consideration of Alliance requirements, regional defence arrangements, the geographic location of the operation, public support, international obligations (such as the UN Charter), cost and effort.

3.5 Coalition Building

Trust and understanding is crucial for a successful coalition (Commonwealth of Australia, 2002). This includes having confidence in the professional competence of a lead nation (military operations and political management), and in its ability to act fairly, openly, and sensitively to members of a coalition. The coalition is built by negotiating arrangements such as the level of participation of each of the military forces, tasking and areas of responsibility, and funding. This paper refers to these formative aspects as the coalition framework. The coalition framework covers the political, legal and cultural aspects of a coalition and will be built by negotiation from the variety of base sets of each contributing nation.

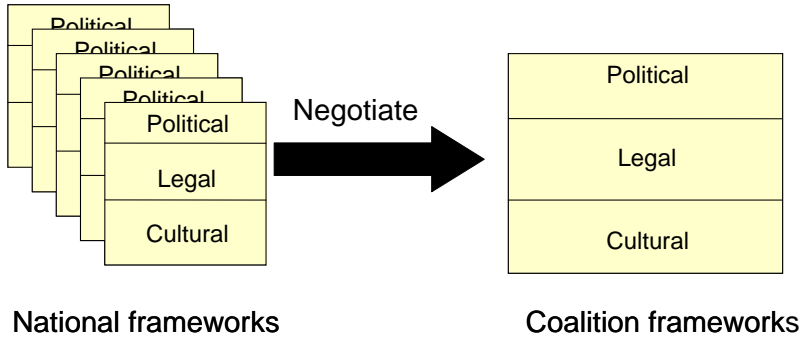


Figure 6: Negotiating between the national frameworks to create the coalition frameworks.

The political aspect considers national and cultural ethos, political aims, alignment of ethical backgrounds as well as the military goals and intent of the members within the coalition. It may also cover financial arrangements for the coalition participants.

The legal aspects include the Legal constraints and enablers such as alliances, agreements, and ROEs. Examples of legal agreements which enable the ADF’s involvement in a coalition include Status of Forces Agreements (SOFA), Status of Mission Agreements (SOMA) and UN contingent owned equipment Memorandum of Understanding (MOU) (Commonwealth of Australia, 2002).

The cultural aspect incorporates the issues associated with nations having different cultural influences, such as different languages, religious backgrounds, leadership styles, attitudes, opinions and perceptions.

Allied partners may have similar national frameworks, but it is unlikely that they will all be completely aligned. The final coalition framework will be a negotiated combination of the political, legal and cultural constraints and enablers that best fit both the situation and the aspirations of each of the participants as shown in Figure 6. Negotiation is conducted at the diplomatic and military strategic levels using networks such as the use of Defence attaches and diplomatic representatives (Commonwealth of Australia, 2002). This framework will influence and affect the way the coalition is built and undertaken, and the nature of the interaction between coalition partners.

3.6 Coalition Implementation

The coalition implementation stage is when the arrangements, plans, procedures and resources are agreed and put into effect. The coalition is not operating at this stage, but is preparing, training and deploying. The Coalition Framework developed in the previous stage will influence the C3 model and structures chosen at this point for the coalition operation. A commander would then be chosen to run the coalition and would establish the processes which are required to achieve the mission. This may take the form of a set of tasks or a list of requirements for services to be exchanged to achieve the operational goals.

3.6.1 The Coalition C3 System

During this stage, the coalition C3 system may be negotiated, developed and assembled. Nations contributing to the coalition will have their own C3 system which will vary in its nature, extent and degree of sophistication. The final form of the coalition C3 system will depend on the C3 models and structures in place as well as what can be realistically incorporated in that particular coalition instantiation given the nature of the participants. A coalition C3 system could be described as those architectural layers of support which enable and facilitate C3, and include processes, information management and infrastructure.

Once the processes and tasks are identified, information requirements would generally be determined. This would describe the range of information to be collected, exchanged and utilised. The information management requirements to manipulate and disseminate the information could also then be defined.

These information management requirements would in turn guide development of the supporting information systems. The information systems include the combination of the hardware, software and communications infrastructure needed to utilise and exchange information.

At this stage of the cycle, each nation will be deciding its level of involvement and the nature of its participation. This will necessarily impact on the degree to which a nation moves across the line which marks the transition from the participant's national C3 system to the coalition C3 system. Each nation will have "dual identities" in regard to C3 systems: their national C3 system and the C3 system established for the coalition. These two systems will have to interact at some level. The effectiveness of a coalition C3 system will depend on how well each participant can work within the coalition system, and how well

each nation can work across the boundary between the coalition C3 system and its own national C3 system.

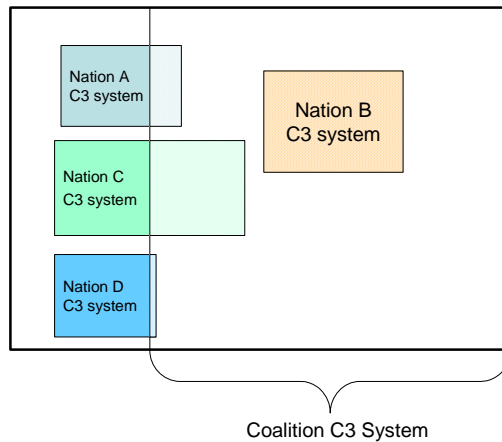


Figure 7: Example of the formation of a Coalition C3 system from contributing C3 systems.

For example, in Figure 7, nation B contributes its whole C3 system to the coalition C3 system. In this example it is likely that nation B would be the lead nation and have a stronger influence over the coalition C3 system. Nations A, C, and D only contribute some elements of their C3 systems.¹

3.6.2 Coalition Interfaces

The nature of a coalition C3 system means that each country will have two major interface points to manage which may or may not be distinct interfaces:

1. the national C3 system \leftrightarrow national elements within the coalition C3 system
2. the national elements within the coalition C3 system \leftrightarrow the international elements within the coalition C3 system.

Identifying these interfaces is the first step in understanding the nature of the ADF coalition C3 capability requirement for each coalition. Each interface will have a requirement for some level of interoperability between the national C3 system components and the rest of the coalition C3 system.

Each coalition operation will have particular requirements and all coalitions are different. Each country will have a particular agenda and elements of capability to contribute. Countries within the coalition may be allies or non-allies. Two countries that are allies have a basis from which to go forward, such as processes and procedures, whereas non-allies working together may not have that advantage.

¹ It is theoretically impossible for a nation contributing to a coalition, not to contribute any of their C3 system as all nations will need to contribute in order to participate, even if it is only at the political levels.

3.6.3 Information Sharing

The multilateral nature of coalitions means that there will always be friction between the national interests of contributing nations and national sensitivities. Some nations may not wish to reveal information that may for instance reveal capability deficiencies. This, in turn, makes the task of intelligence gathering and sharing difficult indeed. One solution is that the lead nation operates with nations that it has existing intelligence-sharing arrangements with, and then offers information to other nations on a need-to-know basis. However, there will always be tension between the lead nation and other contributing states who may feel they are not being included equally. It is a feat of diplomacy for the lead nation to balance its own national security interests with the need to inform and involve other coalition member states.

3.7 Coalition Operational

The coalition operational stage is when the coalition participants are operating together to achieve the mission. The commander authorises the tasks to be undertaken and the services to be exchanged by the coalition forces, and positions the control mechanisms which will ensure that resources are allocated to the tasks.

3.8 Disestablishment

The disestablishment phase is when the exit strategies are put into place and the coalition is dismantled. An exit strategy could include a period to transition from military to civil authority. In addition, a coalition partner may exit if the operation is too risky, costly and/or the resources are needed elsewhere.

3.9 Changes in the coalition

Once a coalition has been established and is operating, changes within the coalition may occur, such as a nation leaving the coalition, or a new nation joining the coalition. Such alterations are likely to affect the way the coalition is operating and impact on the nature of the coalition entity, the processes, the relationships that have been built, and the C3 support system. Therefore the coalition would cycle back to the arrangements step within the lifecycle to allow for the coalition to reform. This process may be a major one or a relatively minimal one, depending on the size and strategic importance of the participants entering and leaving the coalition.

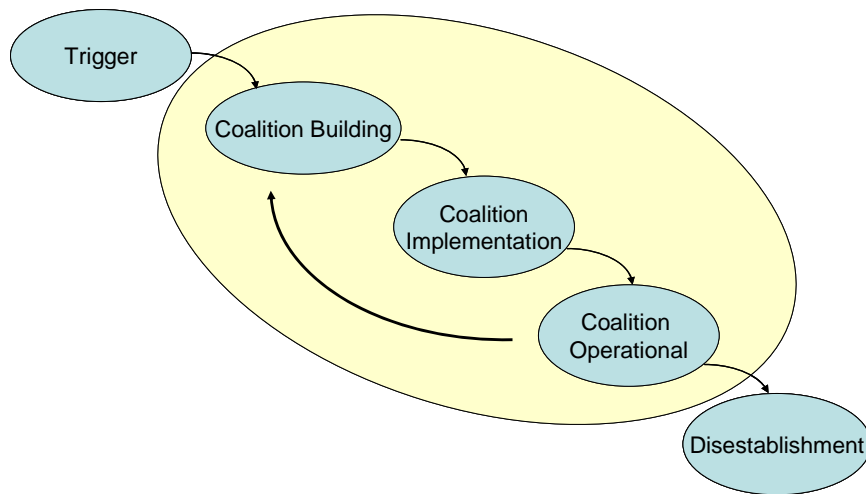


Figure 8: Recycling through the Building, Implementation and Operational stages.

3.10 Assessing Coalition C3 Capability

Coalition C3 capability can be defined as the capability required to support the formation of the coalition, its activities and control of resources in achieving its mission. Future coalition partners may possess varying levels of capability including technology, budgets, doctrine and procedures and under current strategic guidance, the ADF may be required to operate with coalition partners at various levels of capability.

There are many factors which may determine the effectiveness of Coalition C3, ranging from the very high level strategic factors down to the extent to which information management processes are supported by communications systems. However, each contributing nation will need to interact with the Coalition C3 system at some level, and so, at least to some extent, interoperability factors will play a role in the effectiveness of a coalition.

An assessment of ADF Coalition C3 capability needs to consider:

- The role of the ADF within a coalition
- The nature of the interface points under consideration: between the national C3 systems and the coalition C3 system where below 1) focuses on the information dimensions (within Table 3) and looking downwards, whereas 2) primary focuses on all the other dimensions.
 1. the national C3 system the national C3 system \Leftrightarrow national elements within the coalition C3 system. The primary focus of these interface points are on the information dimensions and below.
 2. the national elements within the coalition C3 system \Leftrightarrow the international elements within the coalition C3 system. These interfaces will encompass all the dimensions and the emphasis will change depending on whether the interfaces are between allies and non-allies.

- The nature of the C2 model interactions between the ADF and the other members of the coalition, as shown in Table 2.

C2 Models	Centralised	Decentralised	Distributed	Collective
Centralised	How responsive is the configuration when all communications & decisions between the two agencies made through the central nodes	Do the decentralised C2 nodes become the primary contact points for the Centralised one?	What issues arise due to the differing command levels for decision making?	How will group consensus decision making and centralised authority interact?
Decentralised		Do the decentralised C2 nodes contact each other directly. What is the role of the primary nodes?	What issues arise due to the differing command levels for decision making & how does the primary node in the decentralised system interact with the distributed system.	How will group consensus decision making and Decentralised authority interact?
Distributed			What mechanisms facilitate the interaction of these 2 systems?	Will each distributed node interact individually with the collective?
Collective				What are the legal implications for collective decision making across national boundaries?

Table 2: Future issues to be considered in the interaction of C2 Models.

Assessments of the ADF capability would identify critical success factors and potential risk factors for involvement in the coalition. The interoperability considerations developed for assessing the ADF capability, considered models discussed in the Organisational Interoperability Maturity model (Clark and Jones, 1999; Fewell and Clark, 2003), the Levels of Information Systems Interoperability model (C4ISR Architecture Working Group, 1998), NATO Consultation, Command and Control Technical Reference model (NATO C3 Technical Architecture, 2001), the Levels of Conceptual Interoperability Model (Tolk and Muguira, 2003), and the Layers of Coalition Interoperability (Tolk, 2003b). Table 3 summarises the factors affecting the ADF's ability to operate in a coalition environment.

	C3 Dimensions	C3 Aspects	Interoperability Considerations
Framework	Political Dimension	Intent	Ethos; Political aims; Alignment of ethical backgrounds; Military goals
	Legal Dimension	Authority	Legal constraints/enablers; alliances; agreements; ROE
	Human Dimension	Cultural & Social Issues	Culture; trust; experience; understanding; morale; personality
	Military Dimension	Command Philosophy	Centralised; decentralised; distributed; collective...
C3 System		Command Structure	Lead nation; Parallel command; Integrated forces; Mixed
		Control Arrangements	Processes; SOPs; Assignment of forces/resources; Doctrine; Training
	Information Dimension	Information Environment Issues	Information availability; Awareness levels;
		Information Exchange Issues	Systems; data; infrastructure
		Information Security	Shared; compartmented; national only...
		Communications	Personal; language; technical; equipment

Table 3: Factors Affecting the ADF's Ability to Operate in a Coalition Environment.

Some initial background work has been done to identify measurement parameters utilising the examining various existing models of interoperability and identifying some draft Coalition C3 capability measures, as shown in Appendix A. These measures would provide a checklist of issues to assist with the identification of the effectiveness of any particular Coalition C3 system.

4. Conclusions

Operations conducted in the future are likely to involve coalition members including both allies and non-allies. A coalition C3 system will be required to be built, negotiated and implemented for the conduct of the operation. The coalition C3 system as represented in this paper looks at the coalition and the C3 aspects individually, and describes how each aspect influences the other in the formation of the coalition C3 system, and how the system develops over-time.

This paper has put forward factors that affect the effectiveness of a coalition C3 to address perceived shortfalls in methodologies by which to assess ADF coalition C3. It has discussed the components of a coalition C3 system, the coalition lifecycle, and has made inroads to assessing coalition C3 capability. Future work should include development of assessing coalition C3 capability.

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Appendix A: Assessing Coalition Frameworks

Frameworks can be enablers or constraints and provide support to the C2 processes. Political, cultural and legal aspects are three areas that constrain and provide support to the coalition and these aspects are built from each contributing nation's framework and influence the way the coalition is built and operates.

This section identifies questions from the Organisational Interoperability Maturity (OIM) model (Fewell, 2003) which describes the ability of organisations to interoperate. Only the questions that are relevant to coalition C3 have been included.²

Political

The political aspect considers national and cultural ethos, political aims, alignment of ethical backgrounds and military goals. It also covers the intent of the members within the coalition and whether all participants can agree on coalition outcomes.

Reference Model	Coalition C3 political aspects to be examined or assessed
Coalition Operations (Commonwealth of Australia, 2002)	<ul style="list-style-type: none"> • Is the ADF desired end-state compatible with that of the coalition? <ul style="list-style-type: none"> ○ What is the government's intent with regards to the mission? ○ Are they aiming to make an influential or a token commitment?
	<ul style="list-style-type: none"> • Is the government supportive of the choice of lead nation for the coalition?
	<ul style="list-style-type: none"> • Are they willing to host an intermediate stage base (ISB) or a forward mounting base (FMB) if necessary?
	<ul style="list-style-type: none"> • Do they foresee any difficulties in working with other potential coalition participants?
OIM model (Fewell, 2003)	<ul style="list-style-type: none"> • How shared are the goals of the coalition? What are each nation's goals for the coalition? (congruence of national, economic, political and military strategic goals and the nature of the mandate)
	<ul style="list-style-type: none"> • What is the effect of external constraints on the collaboration? <ul style="list-style-type: none"> ○ Legislation and constitutional arrangements (includes issues of national security) ○ Political and economic environments and goals e.g. strategic interests, budgetary constraints, scope of mission, operational constraints ○ Public opinion including business and special interest groups ○ Information sources e.g. nature and freedom of the media ○ Nature of society e.g. languages spoken, historic, ethnic or

² Questions from Maurer (2004) have been created by analysing a definition of C2 (US Joint Pub 0-1) then matching it with the potential of a coalition operation which identifies the impact of coalition on command and control.

Reference Model	Coalition C3 political aspects to be examined or assessed
	religious connections and groups, standards of living and demographics, customs and rules of behaviour, commitment to human rights, democracy, free trade, globalisation and values e.g. those placed on human life (unwillingness to accept casualties).
Maurer (1994)	<ul style="list-style-type: none"> • Are there any hidden national agendas? • What is proof of completing the mission? Who decides? Who goes home first? • What accountability measures must be taken?

Table 4: Coalition C3 political aspects to be considered.

Legal

The legal aspects affecting each coalition including alliances, agreements, and ROEs. ROE "...specify the circumstances and limitations under which forces will initiate and/or continue combat engagement with other forces encountered." (Commonwealth of Australia, 1997).

Reference Model	Coalition C3 legal aspects to be examined or assessed
Coalition Operations (Commonwealth of Australia, 2002)	<ul style="list-style-type: none"> • Is there a good understanding of the legal mandate for the operation, and all relevant laws? • Are they signatories to the treaties governing the conduct of the operation? If not are they willing to abide by relevant clauses of these treaties? • Do they agree to contribute on a consensual basis to the development of an appropriate Status of Forces Agreement? • Are they comfortable with the coalition Rules of Engagement, and willing to abide by it? • What is their level of legal compatibility with the coalition?
Appropriateness and effectiveness of legal arrangements.	<ul style="list-style-type: none"> • Have ADF ROE been constructed in line with national policy, and have they considered domestic and legal obligations, political and military end-states, operational factors and diplomatic issues (Commonwealth of Australia, 2004). • Have national ROE been made compatible with those of the multinational force commander (Young, 2003).
OIM model (Fewell, 2003)	<ul style="list-style-type: none"> • What relevant prior formal arrangements exist between participating organisations? What is the level of coverage (how well does this common doctrine and legal framework cover all expected operations of the collaboration?) <ul style="list-style-type: none"> ○ Legal framework and doctrine (organisational processes including government guidance and policies, scope of organisational mission, guidelines and administrative procedures, war-fighting philosophy, standard operating

Reference Model	Coalition C3 legal aspects to be examined or assessed
	<p>procedures e.g. processes, liaison, interpreters, official language and terminology, command and co-ordination structure.)</p> <ul style="list-style-type: none"> ○ Information, knowledge and intelligence sharing agreements ○ Agreements relating logistics agreements and financial agreements.

Table 5: Coalition C3 legal aspects to be considered.

Cultural

Cultural influences can include aspects such as an understanding of each other's motivations, constraints such as national and religious holidays and requirements, the acceptable means to achieve a goal, language, religious background, leadership style, attitudes, perceptions, opinions and philosophy (Commonwealth of Australia, 2002; Maurer, 1994).

Reference Model	Coalition C3 cultural aspects to be examined or assessed
Coalition Operations (Commonwealth of Australia, 2002)	<ul style="list-style-type: none"> • What cultural barriers will need to be overcome? • Is there a language barrier? If so, are they able to provide linguists or Liaison Officer's with relevant language skills? • Are there any other religious or cultural issues which need to be addressed?
OIM model (Fewell, 2003)	<ul style="list-style-type: none"> • What differences in personnel arrangements and organisational factors may impact the coalition? • Ways of operating and operational culture within each organisation e.g. ways of structuring tasks and working together, methods of reaching decisions, workload and work ethic, traditions, customs and values, level of professionalism, use of personnel e.g. women, conscripts, reserves, mercenaries and conditions of work. • Organisational structure e.g. size, rigidity/flexibility of internal structuring. • What are the impacts of perception of risk and trust on the coalition? • Perceived level of risk for each participating organisation • Perceived level of reliability of each participating organisation e.g. dependable, fulfils commitments • Perceived level of openness and honesty of each participating organisation e.g. behaviour seen as genuine, negotiates honestly • Perceived competence of each participating organisation • Perceived level of concern of each participating organisation for the interests of each of the other organisations • How compatible are the command leadership styles? • Differences in command issues (degree of control, degree of formalism,

Reference Model	Coalition C3 cultural aspects to be examined or assessed
	<p>and leadership style)</p> <ul style="list-style-type: none"> • What level of relevant education, training and experience do participating organisations and individuals have? • Education for work in a coalition environment (cultural preparation, training about other coalition organisations, and formal processes to pass on prior experiences of working with other collaborating organisations)?
Maurer (1994)	<ul style="list-style-type: none"> • Cultural differences can affect the way decisions are made, how much a nation are willing to participate and the basic mode of operation for a nation's forces. • Address cultural barriers and sensitivities and be aware of the impacts of regional variation. • Differences will raise many questions when the operation is being planned. <ul style="list-style-type: none"> ○ Approach to command within the operation (Several approaches may cause tension, disagreement, and misunderstanding). ○ Understanding of different philosophies between different organisations (such as time management, being too brusque). ○ Understanding of Basic knowledge, common sense and religion can all impact upon the coalition operation. ○ Understanding of the limitations that are inhibited by the beliefs and planning for mortuary affairs, food supply, and medical care

Table 6: Coalition C3 cultural aspects to be considered.

Assessment of Coalition Processes

The commander(s) will develop a set of tasks or may list the services to be exchanged between the participating members. The services exchanged can be characterised according to the SCMILE services framework (Lowe, 2006) which involves coalition members providing to and from each other between the services as briefly described in Table 7. The processes for how the organisational structures will operate within the specific operation will need to be developed by the commander(s).

Service	Short Description
Sensing	The provision of information on the battlespace.
Command & Control	The provision of instructions for agents and analysis of the battlespace, past, present and future
Engagement	The provision of effects in and on the battlespace.
Physical Mobility	The provision of locomotive ability.
Information Mobility	The provision of information storage, manipulation and dissemination infrastructure and processes.
Logistics and Support	The provision of physical materials and activities that enable the normal functioning of an agent.

Table 7: Description of the services.

Reference Model	Coalition C3 processes to be examined or assessed
OIM model (Fewell, 2003)	<ul style="list-style-type: none"> • Scope and degree of cooperation and collaboration in developing the processes at a individual and organisational level • Common interpretation • Establishment of long-term personal friendships, social interaction and perceptions of friendship • Degree of cooperation in knowledge building
Tolk (2003b)	<ul style="list-style-type: none"> • Are the military leaders and decision makers aware of the processes of the coalition partners, e.g., through exchange programs of the military academies, cultural and political exchange programs, etc? • Are the military leaders and decision makers aware of the processes of the coalition partners, e.g., through exchange programs of the military academies, cultural and political exchange programs, etc?

Table 8: Coalition C3 processes to be considered.

Information Management

The effectiveness of the information management layer is dependent on the creation and implementation of procedures to capture, store and retrieve information. The types of procedures that should be implemented include:

- Procedures for what information to gather,
- Procedures for what to do with the information once gathered (which information is stored, deleted etc),
- Procedures to know which information to pass on (including to whom),
- Procedures for data/information exchange across systems (e.g. use of thumb drives etc),
- Procedures for use of systems by coalition members (military and non-military),
- Procedures for IP names, bandwidth allocations, agreed frequency etc, and
- The data, meta-data, databases, information formats being exchanged is in a standardised format and agreed upon by the coalition.

Reference Model	Coalition C3 information management aspects to be examined or assessed
Coalition Operations (Commonwealth of Australia, 2002)	<ul style="list-style-type: none"> • What processes will they agree to for the distribution of intelligence product? • Are they willing to coordinate intelligence operations? • Does an existing intelligence-sharing arrangement occur across coalition members? • The level of legal compatibility with the coalition?
OIM model (Fewell, 2003)	<ul style="list-style-type: none"> • What are the information and knowledge sharing capabilities in procedures, applications, infrastructure and data?

Reference Model	Coalition C3 information management aspects to be examined or assessed
	<ul style="list-style-type: none"> • Communication and information system capability (conforms with LISI enterprise levels) • How useful are the communications and information exchanged? <ul style="list-style-type: none"> ○ Timeliness, age (currency), relevant and clear, accurate, consistent, complete, comprehensible, of value, judged to be credible and authentic i.e. not interfered with during transmission (from Fewell & Hazen, 2003) ○ Quality and amount of information exchanged and knowledge built
	<ul style="list-style-type: none"> • Is the information getting to the right person at the right place at the right time? (question formed from the IM definition) • Are there security limitations on giving the information to the right person (due to security caveats on the information)? How is this overcome? • Is the coalition member able to use the coalition information system? Or is the coalition member able to gain the information via other means (e.g. copying it from a thumb drive etc)? • Is the correct information being collected? Is the information relevant?

Table 9: Coalition C3 information management aspects to be considered.

Information and Communications

The information and communications layer is the computer technology (hardware and software) and the communications technology that enables information to be transported electronically. Within this layer questions when implementing the IT systems is who contributes what systems? Is the host nation going to provide the system? Which nations can use the particular system (will depend on agreements between the nations). The nations contributing to the coalition will need access to an IT system within the coalition in some way, and also a system that enables reach-back and forward to the nation's home base/HQ.

Reference Model	Coalition C3 Information and Communications aspects to be examined or assessed
	<ul style="list-style-type: none"> • Within this layer questions when implementing the IT systems should be considered: <ul style="list-style-type: none"> ○ Who contributes what systems? ○ Is the host nation going to provide the system? ○ Which nations can use the particular system (will depend on agreements between the nations). ○ The nations contributing to the coalition will need access to an IT system within the coalition in some way, and also a system that enables reach-back and forward to the nation's home base/HQ.
LISI (C4ISR)	<ul style="list-style-type: none"> • The following is a simplified version of aspects which should be considered from the LISI model to determine how interoperable systems

Reference Model	Coalition C3 Information and Communications aspects to be examined or assessed
Architecture Working Group, 1998)	<p>are:</p> <ul style="list-style-type: none"> ○ Set of applications are used on the system (different applications on all systems, same applications on systems) ○ Type of network connection, level of networking required? Are they inter-connected with other systems i.e. members national system? ○ Is the data in a format it can be loaded into different applications ○ Set of infrastructure (including hardware, communications, servers, system services etc) to be used for the operation?
Maurer (1994)	<ul style="list-style-type: none"> ● What languages are involved? ● What support infrastructure exists or will be provided? ● Is host support extended equally to all participants? ● What is the variety of protocols and standards? ● What variation of capability exists? ● Is the total capability either interoperable or compatible? ● Is security an issue – how much of it is needed?

Table 10: Coalition C3 Information and communications aspects to be considered.

When a coalition is implementing the IT systems, the systems need to be interoperable in some way to allow the coalition to work together. The level of interoperability between the systems for the coalition will depend on the operation requirements, and available infrastructure etc. Different levels of connections for a coalition can vary from no system connection between IT systems to a coalition system with all members accessing the systems. The following describes four levels of connections between IT systems:

- No System: All information is exchanged verbally or paper-based.
- National systems: electronic information is exchanged manually.
- Privileged access: elements of the coalition are provided with systems from another country for use during the operation.
- Coalition system: where all members have access to information/data.

Within these layers information security should be considered which covers more than information, including all infrastructures that facilitate its use. This can include processes, systems, services, and technology including computers, voice and data networks. The goal is to get the right information to the right people at the right time.

Possible sharing of information across systems would vary from only one nation using the system (1-eye), allies only, compartmented used (for example 4 eyes e.g. AS/UK/US/CA), and all coalition members. Within the information security considerations into the following should be considered when assessing IT systems:

- Confidentiality: ensuring the information is accessible only to those authorised to have access
- Integrity: the validation of the data where altering of information can be malicious (attacker) or accidental (transmission errors or hardware crashes)
- Availability: the proportion of time a system is in a functional condition

- Authentication
- Non-repudiation
- Information pedigree
- Privacy

Human Interactions

Coalition C3 includes two aspects of interaction including human to human interaction, and human to capability. Human to human interactions includes the interactions between the different nations of the coalition and will occur at all stages of the Coalition lifecycle as humans are involved across the whole spectrum of the coalition life. Issues associated with this include cultural influences, perceptions, understanding, and people on an individual and team basis.

Human and capability interactions include a human using/interacting with information and communication systems that are used within the coalition focussing on humans using different coalition members' systems (for example, an AS member uses an US IT system). Issues associated with this includes usability aspects such as learn-ability, efficiency of use, accessibility and also considers if the human is correctly trained, whether the task can be undertaken, and familiarity of the equipment compared to the nations' equipment.