

## **Topic: Coalition Interoperability**

### **Organisational Interoperability: Evaluation and Further Development of the OIM Model**

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# Report Documentation Page

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## **Abstract**

The military imperative to achieve increased interoperability both within forces and with other nations is well recognised. DSTO previously developed an Organisational Interoperability Maturity Model (OIM) to evaluate interoperability at the organisational level. The OIM considers the human-activity aspects of military operations, which are not covered in other models. This paper describes how the model has been used to identify problems and to conduct evaluations in coalition operations such as INTERFET and the Australia–US Interoperability Review. These assessments showed that the attributes of the OIM needed development and refinement. Further work on the model is presented. This model is then used to conduct a preliminary evaluation of interoperability between Australia and the US in the Multinational Limited Objective Experiment 2.

## **1. Introduction**

The following definition of interoperability is used by Australia and its allies:  
*“Interoperability is the ability of systems, units or forces to provide the services to, and accept services from other systems, units or forces and to use the services so exchanged to enable them to operate effectively together.”*

Interoperability is important because of the need of organisations to use resources efficiently and to operate in an effective way with other organisations to achieve common goals. Some means is needed for monitoring and evaluating the interoperability that can be achieved in any potential collaboration.

There is currently no universally accepted method of evaluating all aspects of interoperability between organisations in a collaboration. The Levels of Information System Interoperability Maturity Model (LISI) was developed in response to a US Department of Defense need to configure systems that can readily exchange information in joint and combined operations (C4ISR AWG, 1998). This model defines and evaluates interoperability between information systems. Kasunic (2001) recommended that the LISI model be used for technical compliance, and systems and operational interoperability. He also recognised the importance of organisational and cultural aspects but did not propose a means of evaluation. This void in the assessment of interoperability had been previously identified by DSTO and the Organisational Interoperability Maturity

(OIM) model was developed to address these issues (Clark & Jones, 1999; Clark & Moon, 2001). The term *organisational interoperability* was introduced to cover these higher-level issues characterised by human-activity. In the OIM, the focus is on how these factors affect the exchange of information and sharing of knowledge. The use of the LISI and OIM models together will thus cover the range of levels identified by both Kasunic and DSTO.

## 2. Overview of the OIM

Both the LISI and the OIM models are based on the concept of *maturity models*. These describe the stages through which systems, processes or organisations may progress or evolve as they are defined, implemented or improved. Although the models define levels of “maturity”, this does not mean that all organisations should aspire to the highest level; lower levels may be entirely appropriate in some circumstances. The use of the model to identify or characterise the level at which an organisation is operating is helpful in describing the situation and contributing to an understanding of the factors affecting interoperability.

In the original OIM model (Clark & Jones, 1999), five levels of organisational interoperability were described in terms of four attributes. These levels were called Unified, Combined, Collaborative, Ad hoc and Independent. Subsequently the “Ad hoc” level was renamed “Cooperative” to better reflect its definition. The four enabling attributes of the original model were evaluated by answering the following questions and using Table 1.

**Preparedness.** What doctrine, experience and training enable the organisations to work together?

**Understanding:** What level of information and knowledge sharing exists and how is the information used?

**Command Style:** How are roles and responsibilities delegated or shared?

**Ethos:** What level of trust, culture, values and goals are shared?

## 3. Application of the Original OIM Model

The original OIM model as described above was used to identify problems and evaluate interoperability in a coalition operation, (i.e. INTERFET in East Timor), and to assess interoperability between strategic-level headquarters for the Australian – US (AS-US) Interoperability Review. These two experiences, which are described below, highlighted the need to further develop the model and this development of the model is discussed in Section 5.

**Table 1.** *Original OIM Levels and Attributes*

	<b>Preparedness</b>	<b>Understanding</b>	<b>Command Style</b>	<b>Ethos</b>
Level 4 Unified	Complete - normal day-to-day working	Shared	Homogeneous	Uniform
Level 3 Combined	Detailed doctrine and experience in using it	Shared communications and shared knowledge	One chain of command and interaction with home organisation	Shared ethos but with influence from home organisation
Level 2 Collaborative	General doctrine in place and some experience	Shared communications and shared knowledge about specific topics	Separate reporting lines of responsibility overlaid with a single command chain	Shared purpose; goals, value system significantly influenced by home organisation
Level 1 Cooperative	General guidelines	Electronic communications and shared information	Separate reporting lines of responsibility	Shared purpose
Level 0 Independent	No preparedness	Voice communications via phone etc	No interaction	Limited shared purpose

### **3.1. INTERFET**

INTERFET (International Force East Timor) was an Australian-led coalition authorised by the United Nations to enforce peace in East Timor from September 1999 to February 2000. Australia's experience in East Timor provided some insights into the problem of forming a coalition quickly from a very disparate array of nations. At maximum strength, twenty-two nations participated with 11,000 troops. INTERFET was a temporary arrangement that lasted for five months and was to fill the void while a UN mandated multinational force was formed. Dr Alan Ryan of the ADF Land Warfare Studies Centre conducted detailed interviews with participants both in Dili and in Canberra. His writings, (Ryan 2000a, Ryan 200b) along with other sources, were used to derive the examples that are discussed in more detail by Clark & Moon (2001). Each attribute of organisational interoperability was examined with reference to examples from INTERFET. By looking at the attributes of organisational interoperability from the point of view of the interaction between members of the coalition, a table of assessment of interoperability was derived. The analysis is discussed below.

#### **3.1.1. Attribute Analysis**

##### **Command Style:**

The INTERFET HQ was based on the Australian Deployable Joint Force Headquarters (DJFHQ) with some staff from other nations e.g. NZ and UK. That the HQ did not contain representatives from all the nations caused some dissatisfaction (Ryan 2000a p.42) but made the HQ a more coherent organisation. INTERFET, as a whole, however

was not an integrated command. The provision of independent self-sufficient task forces under the operational control of the INTERFET HQ was found to be the most appropriate way of integrating forces with quite distinct military cultures and philosophies. The interaction between the INTERFET HQ and the different national task forces in their Areas of Operation was assessed as Level 2 interoperability for Command Style.

**Ethos:**

All of the participating countries could be said to have two underlying objectives: to assist the East Timorese and not to degrade their relationship with Indonesia. These would thus form the basis of the shared purpose of the coalition. Despite the shared purpose, one of the most difficult aspects of assembling and maintaining the coalition was the divergent nature of the operational philosophies of the participating countries and the differing caveats on different forces for their availability to perform certain tasks. The shared purpose however allows at least a Level 1 assessment for Ethos.

**Preparedness:**

The Australian DJFHQ (on which the INTERFET HQ was based) had exercised recently with the other ABCA (American, British, Canadian, Australian Armies Standardisation Program) members. Prior training activities with Thai, Fijian and Filipino forces also meant that these forces were more familiar with Australian military ways than other nations with no such exposure. Thus, the Preparedness attribute could be assessed as Level 2 with ABCA nations, Level 1 with Thai and Fijian forces and Level 0 with Republic of Korea (ROK) forces.

**Understanding:**

The INTERFET established simple but robust communications and standard operating procedures for interoperation, but more sophisticated messaging links and operational databases were not established. Owing to language differences, the shared understanding with ASEAN partners was less than that achieved with the ABCA countries.

**Table 2** *INTERFET Organisational Interoperability Assessments*

	AS	US	NZ	Thai	Phil
US	2				
NZ	2	2			
Thai	1	0	0		
Phil	1	0	0	0	
ROK	0	0	0	0	0

**3.1.2. Overall Assessment**

Table 2 shows the assessment of expected interoperability levels between some of the components of the INTERFET force. The table is constructed to show the minimum expected interoperability level between pairs of component systems as assessed across all

the attributes for the five levels of the model. The overall assessment of organisational interoperability is, by definition, based on the lowest score obtained for the attributes.

The Level 2 interoperability for the AS-US and the AS-NZ elements reflects the common language, ethos, doctrine, training and procedures of the ABCA allies. Familiarity from prior experience and training allowed both the Thais and the Filipinos to work at Level 1 interoperability with the Australians. In contrast, the lack of similar experience with Republic of Korea forces resulted in interoperability at Level 0.

### **3.2. AS–US Interoperability Review**

As part of an AS–US Interoperability Review we were requested to apply the OIM model to the AS–US interaction that occurs between AS–USPACOM and AS–USCENTCOM.

The information required to make the assessment was collected by:

- reviewing the factors considered in the model,
- assessing doctrine and other reference material in terms of those factors and
- interviewing selected ADF personnel with experience in combined operations.

#### **3.2.1. Attribute Analysis**

##### **Preparedness:**

The Preparedness attribute for AS–USPACOM was assessed at Level 2 — general doctrine such as the ASUS Planning Manual is in place and familiar to both AS and USPACOM. Regular combined exercises occur and there is some combined operational experience. In contrast, the Preparedness attribute for AS-USCENTCOM was assessed at Level 1 — the same general guidelines are in place but there is no ongoing familiarity with them and there is no regular exercise program with USCENCOM. Although AS and USCENCOM have been involved in operations, each time aspects of the combined arrangement were started again from the beginning, owing to staff turnover and the lack of regular ongoing interaction.

##### **Understanding:**

The Understanding attribute for AS–USPACOM was assessed at Level 2. Knowledge about the situation and context is shared but this is a borderline Level 2 assessment because only some of the communication facilities are shared and well used, and the issue of releasability (by both sides) impacts on this attribute. Informal channels exist and are used. The Understanding attribute for AS-USCENTCOM was assessed at Level 0 — there were no direct communication channels in use and the informal channels have not been developed.

##### **Command Style:**

The Command Style attribute for AS–USPACOM was assessed at Level 2 — the US is more directive in style whereas the AS uses command by intent, i.e. end goals and guidance, and there is a difference in the roles of the organisations. Despite these differences, the command styles and arrangements are well enough understood to allow AS–USPACOM exercises and operations to take place with combined staff. The

Command Style attribute for AS–USCENTCOM was assessed at Level 1 — a lower level than for USPACOM because of the lack of familiarity between the organisations.

**Ethos:**

The Ethos attribute for AS-USPACOM was assessed at Level 2 — while some aspects of home-organisation ethos may be apparent there is sufficient trust for the shared goals, purpose and values to be used. Because of the familiarity with USPACOM staff and the higher level of joint exercising, exchanges and visits that take place, trust between AS and USPACOM is higher than with USCENTCOM.

The Ethos attribute for AS–USCENTCOM was assessed at Level 0 – while shared goals and purpose may be present, the level of trust is not high enough to overcome the predomination of the home-organisation ethos. Trust develops with exposure and therefore is not necessarily present at the start of an interaction or engagement.

**3.3. Overall Assessment of Organisational Interoperability**

The overall assessment is given in Table 3.

**Table 3 AS-US Interoperability Assessments**

AS-US Review	Preparedness	Understanding	Command Style	Ethos	Overall
AS-USPACOM	2	2	2	2	2
AS-USCENTCOM	1	0	1	1	0

- **AS–USPACOM:** The AS–USPACOM organisational interoperability is assessed at Level 2 – Collaborative Organisations
- **AS–USCENTCOM:** The AS–USCENTCOM organisational interoperability is assessed at Level 0 — Independent Organisations

This comparison showed that Australian interoperability with USPACOM and USCENTCOM differed mainly because of differences in the history of interaction and cooperation. The strong, shared commitment to building the relationship between ADF and USPACOM over the past fifty years has resulted in the achievement of Level 2 organisational interoperability and is mainly the result of a higher level of interaction which led to a better knowledge of each other, improved communication and accommodation of each other’s practices.

Several points should be emphasized about the assessment process. Firstly, the overall level of organisational interoperability is set by the lowest assessment of the four attributes and is therefore not necessarily indicative of an overall average qualitative assessment of a relationship. Secondly, the highest level describes an ideal state that would be extremely difficult to reach in a multinational context.

Since this evaluation was carried out, much has been done to strengthen and support the AS–USCENTCOM relationship. Further improvement can be expected as a result of the current implementation of the strategic review recommendations.



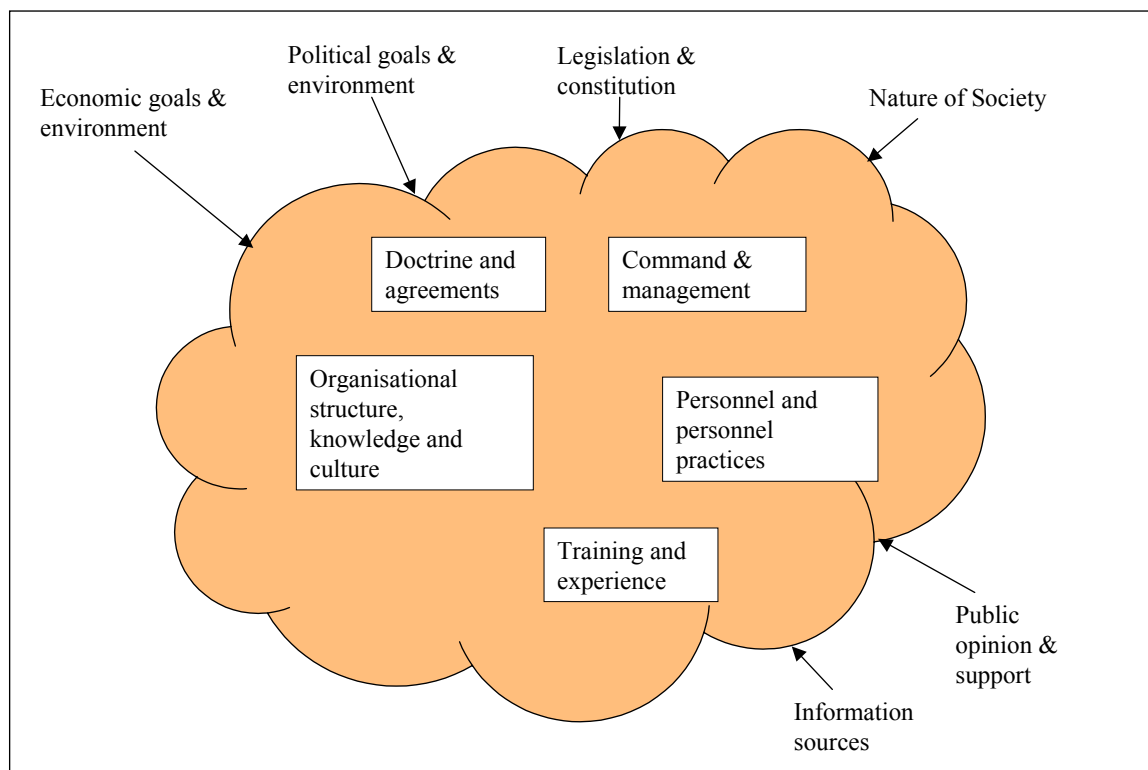
## 4. Further development of the model

### 4.1. Approach

The original development of the OIM was based on many discussions with subject matter experts and the original authors' experiences in analysing operational HQs. Its use in the evaluations described above, and the growing interest in the model by the Australian Defence Organisation, confirmed the need for the model to be more explicit in the criteria that are used to perform evaluations. Further development of the model was required.

As a first step, the literature was searched for perceptions gathered by interview, surveys and observations made during collaborations in order to check for completeness and to verify whether differences in identified attributes and sub-attributes could lead to interoperability problems in some situations.

As well, potential attributes and sub-attributes were identified using a systems approach (Figure 1). For this work, the boundary of each organisation, when viewed as a system, was restricted to those subsystems over which the command structure of the organisation has effective control. The basis for this approach is anecdotal evidence and opinion suggesting that interoperability problems can potentially occur anywhere in the collaboration where there is a difference between organisations.



**Figure 1.** Conceptual Model of a Military Organisation

The first group of factors identified that could potentially have an impact come from the environment of the organisation. In summary, these are:

- legislation and constitution,

- political and economic goals and environments,
- information sources such as the nature and freedom of the media,
- the nature of society including the languages spoken, historic, ethnic or religious connections and groups; customs and rules of behaviour; standards of living and demographics, commitment to democracy, free trade, globalisation, human rights and values (e.g. those placed on human life) and
- public opinion and support including the influence of business and special interest groups.

These factors potentially constrain organisations, e.g. legal constraints such as the international law of armed conflict and defence budgetary constraints. The environment also largely defines the organisation's goals and provides constraints in the form of government guidance and policies, formal guidelines and administrative procedures developed outside of the organisation. Differences in the environments of each collaborating organisation may indirectly place additional external constraints on the entire collaboration by, for example, imposing additional goals on some participating organisations or legislative, casualty or intelligence-gathering limitations.

The main subsystems within the organisations can be viewed as:

- organisational structure, knowledge and culture,
- command and management, including management practices e.g. guidance on ways of operating and distributing authority,
- doctrine and agreements covering all aspects of the collaboration and operational concepts e.g. tactics, techniques and procedures (TTPs) and Rules of Engagement (ROEs),
- personnel and personnel practices including the accompanying set of skills, competencies; guidelines and policies on recruitment, work practices and conditions of work and
- training and experience including the experience personnel bring to an organisation — individual and collective training and experience and staff development.

As a result of these approaches:

- The emphasis in some attributes is changed e.g. command and co-ordination becomes how well the participating organisations fit into the command structure and adapt to the command style of the combined organisation.
- Some new dimensions are included. For example, personnel arrangements and organisational factors are added to the Ethos attribute. This covers factors such as workload and work ethic, conditions of work and the use of personnel e.g. women, conscripts, reserves and mercenaries.
- More detail was added to the model.
- Attribute names are modified to reflect the changes.

- The reference table is modified accordingly.

The attributes and sub-attributes of the model are described in more detail in Appendix A.

The revised model was used to develop a questionnaire, which could be given to the participants in a coalition activity.

## **5. Preliminary Evaluation of MNLOE2**

### **5.1. Background**

The Multinational Limited Objective Experiment 2 (MNLOE2) was held in February 2003. It was the second in a series of four experiments involving Australia, Canada, Germany, UK, US and for the first time included a multinational NATO element. The United States Joint Forces Command (USJFC) lead the combined effort under the auspices of the J9 (Concept Development & Experimentation) cell. MNLOE2 examined issues associated with how a Combined Joint Task Force Headquarters might plan and conduct Rapid Decisive Operations (RDO) within a distributed collaborative information environment. One goal was to examine the viability of building a Multinational Operational Net Assessment (ONA) in a coalition setting using a distributed collaborative information environment. The ONA is a process that collects and integrates information from a wide variety of sources, with the aim of rapidly turning this into actionable knowledge for commanders. The process identifies strengths and vulnerabilities (political, military, economic, social, information, infrastructure) in each system potentially involved within an area of interest specified by the theatre commander. The process then cross links potential effects, vulnerable nodes and links, potential actions (diplomatic, information, military or economic) and resources. MNLOE2 also examined information release issues between multinational partners.

MNLOE2 was a timely opportunity for investigating organisational interoperability in a multinational environment using the revised model. The preliminary evaluation presented here focuses on the interaction between the United States Joint Forces Command and Australia.

The information required to make this assessment was collected by:

- Observing participants locally within Australia and monitoring communications and information exchanges between nations,
- Surveys which were completed by participants of all nationalities at all sites, and
- Daily and weekly workshops with other participants, analysts and senior personnel.

### **5.2. Attribute Analysis**

The four attributes of the revised model — Preparation, Understanding, Command and Co-ordination and Ethos (Socio-Cultural factors) — were assessed for MNLOE2 based on the sub-attributes and questions listed in Appendix A.

#### **5.2.1. Preparation**

The broad underlying question for this attribute is:

*How well prepared are the participating organisations to perform the goals of this collaboration?*

### **Doctrine**

The Operational Net Assessment (ONA) and the Multinational Information Sharing for Allies and Coalition Partners (MNISACP) Concepts of Operations formed the basis of the doctrine used in this experiment. These were developed by the US alone, initially for US use. The ONA process was developed and refined for a coalition environment during the experiment along with its associated business rules. Australia has no process presently, which is directly comparable to the ONA.

### **Training**

The lower level of prior exposure of the Australians to the ONA concept in comparison to the US team placed additional importance on training for AS. Training was conducted by the US in three workshops prior to the experiment and during the first week of the experiment over a distributed network. Training for AS, however, was considered inadequate as some personnel were unable to attend training due to other commitments and some training was missed due to network problems. Other problems encountered related to the content, mode and style of presentation of the training briefings.

### **Experience**

The US developed, and have considerable experience in using, the ONA concept. Consequently about half of the US team rated themselves as having a significant level of prior exposure, whereas the AS team rated themselves as having at most limited exposure.

There were some differences in the level of experience and background of the two teams e.g. in years of military experience and years in military speciality. Both teams had at best limited prior combined exercise experience with the other. Very little training on cultural differences had been undertaken by the members of either team. This is important as sharing a common language and having similar histories may mask some real cultural differences.

### **Assessment**

The preparation attribute for US–AS in this experiment was assessed at Level 2, mainly due to inadequate training, lack of prior experience and the stage of doctrine development.

#### **5.2.2. Understanding**

The broad underlying question for this attribute is:

*How well developed is the level of mutual understanding and knowledge between the participating organisations?*

### **Knowledge, experience and familiarity with each other**

Both countries use English as their first language with some differences in accent, colloquial expressions, phraseology and word meaning. Other barriers to understanding included the use of unexplained acronyms. There was some anecdotal evidence of minor

differences in interpretation of doctrine. This could be due to initial unfamiliarity with the ONA process and the lack of detail in the process description, in the definitions of terms and details of how the process fitted into the wider framework.

Considerable cooperation exists between AS–US in a range of areas including personnel exchange, combined exercising, intelligence sharing and research. Due to the small sample size, this was not necessarily reflected at the team level. Both teams had at best limited prior exchange visits with the other. There was some prior social interaction.

### **Information and knowledge sharing capabilities**

The experiment was conducted in a distributed collaborative environment. Given the choice of tools and the large number of participants, controllers and observers, the network was unable to handle the data transfer requirements of the experiment. In many other respects, the set-up appears to conform to LISI (C4ISR Levels of Information System Interoperability) Level 4.

The experimental set-up was constraining because players were limited in what tools could be used and in how they could be used. Voice communication was not always possible. These constraints impacted on the nature of information exchange and forced modifications to work practices. Some tools were general-purpose communication tools and others were developed specifically for use in the ONA process. Players identified the need for some improvements in functionality in the tools and suggested minor modifications. The database, whilst a valuable tool, was perceived to be slow, inflexible and hard to use. As this was an experiment, there was limited redundancy and little contingency planning.

### **Value of information and knowledge exchanged and built**

One recognised shortcoming of the experimental design was that the final product was not passed onto a higher level of command, nor was there any other form of immediate and independent product assessment. Players therefore had no feedback on the quality of the knowledge they produced.

### **Assessment**

The Understanding attribute for US–AS in this experiment was assessed at Level 2.

#### **5.2.3. Command and Co-ordination**

The broad underlying question for this attribute is:

*How well do the participating organisations fit into the command structure and adapt to the command style?*

### **Command arrangements and leadership style**

The experiment was run under the lead-nation model by the US in widely dispersed geographical locations over a distributed network. There were differences in perspective of the role of a lead nation. AS players were initially uncomfortable with the command style and expected the US to take on a more obvious leadership role within the ONA task whereas the US preferred to act as a moderator. Outside of the ONA task, there was no simulated command structure either national or multinational. This flat structure is

considerably different from normal arrangements. Some AS players were uncomfortable with this, especially the lack of local AS command and co-ordination.

This lack of an outside command structure also meant that it was not clear how the ONA process fits into the overall command decision-making process.

### **Level of unity of command**

The nature of the experiment, the network and the tools and equipment that were permitted meant that there was no means of communicating with others not directly involved in the experiment including national superiors. This was an artefact of the experiment and gives no clue as to what would happen in real operations. It also meant that the ONA process was not fully implemented as other agencies and subject specialists were not part of the experiment.

### **Assessment**

The lack of a well-defined command structure means that the command arrangements in this experiment did not fit easily into any of the levels in the reference table. For the purposes of this evaluation, the command and co-ordination attribute was assessed as being closest to Level 2.

#### **5.2.4. *Ethos (Socio-cultural factors)***

The broad underlying question for this attribute is:

*What impact do socio-cultural factors have on the level of collaboration needed to achieve the goals?*

### **Commitment to Goals**

The US devised and explicitly stated the overall goals of the experiment. A general rationale for AS involvement was given during pre-MNLOE2 briefings. Specific AS national objectives existed but players, due to an oversight, were not informed of these. This and the lack of local leadership meant that AS players could only speculate as to what the specific AS goals were.

### **External Constraints**

Owing to the fact that MNLOE2 was an experiment, many external constraints did not have an obvious impact. Exceptions were legislative, e.g. information-sharing and disclosure policies, and budgetary constraints.

US–AS cultures are similar in many ways but there are sufficient differences to cause some misunderstandings. One trivial observed difference which impacted on the social interaction in this experiment was US lack of knowledge of cricket. Some Commonwealth players expressed the opinion that Commonwealth countries generally work well together.

### **Personnel arrangements and organisational factors**

The US had approximately six times as many players as Australia. Due to smaller numbers, not all areas of expertise were covered in the AS team. In particular, AS had only one planner. Given the absence of a formal command structure, their small numbers

and close physical proximity, AS players developed face to face, flexible and informal methods of working.

Some players perceived minor differences in AS–US military philosophy such as the relative importance placed on diplomacy versus military action.

**Perceived levels of trust and respect**

A certain level of perceived risk is needed before there is a need to trust. At the organisational level, there was some risk in that collaborators wished to be seen as competent and reliable in order to promote future cooperation. At the player level, there was probably little risk since the actual level of information exchanged was unclassified and there was no assessment of product quality.

**Assessment**

The Ethos attribute for US–AS in this experiment was assessed as being Level 3.

**5.3. Overall Assessment**

Table 4 shows the assessments of the attributes of organisational interoperability between Australia and the US as demonstrated in MNLOE2. The overall assessment is Level 2 (Collaborative). One of the main impediments to achieving a higher level of interoperability was the lack of adequate training and experience in working in a multinational collaborative environment using well developed common doctrine, tools and agreed operational processes. Also of importance were problems with voice communications using the software tools chosen, access to the database and the fact that there was little redundancy in the network.

**Table 4** MNLOE2 AS-US Interoperability Assessments

MNLOE 2	Preparation	Understanding	Command and Co-ordination	Ethos	Overall
AS-US	2	2	2	3	2

**6. Conclusion**

The growing interest in the OIM model and the evaluations presented in this paper demonstrate that the OIM model provides a useful framework for the evaluation of organisational interoperability in military operations. The use of the OIM in conjunction with the LISI model allows all of the levels of interoperability identified by Kasunic (2001) to be evaluated. The revisions made to the model and presented in this paper, make the model easier to understand and use but these changes need to be tested further in a wide range of real life collaborations.

**7. References**

C4ISR Architecture Working Group (1998) “Levels of Information System Interoperability” (LISI) C4ISR Architecture Working Group Interoperability Panel, United States, 30 March 1998

Clark, T. (2002) Report on Organisational Interoperability Study by DSTO for AS-US Interoperability Review, 19 August

Clark, T. & Jones, R. (1999) "*Organisational Interoperability Maturity Model for C2*" Proceedings of the 1999 Command and Control Research and Technology Symposium. United States Naval War College, Newport, RI, June 29-July 1

Clark, T. & Moon, T. (2001) "*Interoperability for Joint and Coalition Operations*" Australian Defence Force Journal No. 151, November/December 2001

Fewell, M.P. & Hazen, M.G. (2003) "*Network Centric Warfare — Its Nature and Modelling*" DSTO Research Report (in preparation)

Kasunic, M. (2001) "*Measuring Systems Interoperability: Challenges and Opportunities*", Version 1.0, Software Engineering Institute, Carnegie Mellon University

Mishra, A. K. (1995) "*Organizational Responses to Crisis: The Centrality of Trust*" in Trust in Organizations. Frontiers of Theory and Research. Kramer, R. M. T., Tyler, Tom R. Sage Publications NK 261-272

Ryan, A. (2000a) "*Primary Responsibility and Primary Risks*": Australian Defence Force Participation in the International Force East Timor, Land Warfare Studies Paper No. 304 November 2000

Ryan, A. (2000b) "*From Desert Storm to East Timor: Australia, the Asia-Pacific and 'New Age' Coalition Operations*", Land Warfare Studies Paper No. 302 January 2000

## **Appendix A**

### **1. Preparation**

The broad underlying question for this attribute is:

*How well prepared are the participating organisations to perform the goals of this collaboration?*

#### **1.1. Legal and doctrinal framework for the collaboration**

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?)

1. Legal framework and doctrine (organisational processes including government guidance and policies, scope of organisational mission, guidelines and administrative procedures, war-fighting philosophy, standard operating procedures e.g. processes, liaison, interpreters, official language and terminology, command and co-ordination structure.)
2. Information, knowledge and intelligence sharing agreements
3. Agreements relating to education, training and experience e.g. exercising
4. Logistics agreements
5. Financial agreements.



### ***1.2. Education, training and experience***

What level of relevant education, training and experience do participating organisations and individuals have?

Staffing e.g. set of skills, competencies and experience and staff development practices.

1. General education
2. Specialised training for collaboration role e.g. military speciality
3. Experience in this speciality
4. Training in the use of doctrine, operating procedures, processes or tools to be used in this collaboration
5. Experience in the use of the doctrine, operating procedures, processes or tools to be used in this collaboration
6. Education for work in a multinational environment (i) cultural preparation (cultural awareness training, language training, language accommodation skills, nation specific education on, for example, culture, religion, law, politics, economy, media, nature of society, public opinion) (ii) training about the other collaborating organisations (specific education on, for example, mission, capabilities, culture (rules of behaviour, prestige,) personalities) (iii) formal processes to pass on prior experiences of working with other collaborating organisations

## **2. Understanding**

The broad underlying question for this attribute is:

*How well developed is the level of mutual understanding and knowledge between the participating organisations?*

### ***2.1. Knowledge, experience and familiarity***

To what degree have participating organisations developed shared knowledge, common experience and familiarity with each other?

1. Common interpretation e.g. of doctrine and agreements, knowledge and information shared including terms, definitions and jargon.
2. Scope and degree of cooperation and collaboration at the individual and organisational level now and in the past (development of doctrine, processes, and tools, experimentation, personnel exchange, long term working relationships, regular meetings, combined exercising and training)
3. Establishment of long-term personal friendships, social interaction and perceptions of friendship
4. Degree of cooperation in knowledge building

### ***2.2. Information and knowledge sharing capabilities***

What are the information and knowledge sharing capabilities in procedures, applications, infrastructure and data?

1. Communication and information system capability (conforms with LISI enterprise levels)

### **2.3. Value of the communications and information exchanged**

How useful are the communications and information exchanged?

1. 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)
2. Quality and amount of information exchanged and knowledge built

### **3. Command and Co-ordination**

The broad underlying question for this attribute is:

*How well do the participating organisations fit into the command structure and adapt to the command style?*

#### **3.1. Command arrangements**

How were responsibilities and authority delegated and shared between the collaborating organisations?

1. Homogeneous integration
2. Separate areas of responsibility

How unified is the command?

1. Scope for dual lines of reporting e.g. for home nations and organisations to influence and interfere in the command chain

#### **3.2. Command and leadership style**

How compatible are the command leadership styles?

1. Difference in command issues e.g. (i) degree of control - discipline, rules of behaviour, adherence to rules, latitude given (ii) degree of formalism e.g. detail in orders, use of command intent or directive control (iii) leadership style

### **4. Ethos (Socio-cultural factors)**

The broad underlying question for this attribute is:

*What impact do socio-cultural factors have on the level of collaboration needed to achieve the goals?*

#### **4.1. Goals**

How shared are the goals of the collaboration?

1. Perceived commitment of each organisation to the collaboration and its goals. Measure: the congruence of national, economic, political and military strategic goals and the nature of the mandate.

#### **4.2. External constraints**

What is the effect of external constraints on the collaboration?

1. Legislation and constitutional arrangements (includes issues of national security)
2. Political and economic environments and goals e.g. strategic interests, budgetary constraints, scope of mission, operational constraints
3. Public opinion including business and special interest groups
4. Information sources e.g. nature and freedom of the media
5. Nature of society e.g. languages spoken, historic, ethnic or 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).

#### **4.3. Personnel arrangements and organisational factors**

What are the impacts of differences in personnel arrangements and organisational factors?

1. 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
2. Organisational structure e.g. size, rigidity/flexibility of internal structuring

#### **4.4. Perceived levels of trust and respect**

What are the impacts of perception of risk and trust on the collaboration?

1. Perceived level of risk for each participating organisation
2. Perceived level of reliability of each participating organisation e.g. dependable, fulfils commitments
3. Perceived level of openness and honesty of each participating organisation e.g. behaviour seen as genuine, negotiates honestly
4. Perceived competence of each participating organisation
5. Perceived level of concern of each participating organisation for the interests of each of the other organisations (after Mishra, 1995)

The reference model on the next page is then used as the means for evaluation and comparison. Each attribute is evaluated in turn. The overall level is determined by the level of the lowest scoring attribute.

**Table 3** Revised OIM Levels and Attributes

	Preparation	Understanding	Command and co-ordination	Ethos
4 Unified	Completely integrated preparation resulting in normal day to day working. Common doctrine covers all aspects of operations. All other agreements are in place. High levels of integrated training and experience using common doctrine, communication and information system, tools and agreed operational processes.	Completely integrated knowledge building. Shared interpretation. Communication and information system capabilities correspond to LISI enterprise level.	Homogeneous command structure with a single chain of command. No difference in command and leadership style.	A high level of commitment to shared goals. Minimal impact of external constraints. Complete trust and respect. Minimal impact from differences in personnel arrangements and organisational culture.
3. Combined	A high level of preparation. Most other agreements are in place. Common doctrine covering most aspects of operations. Moderately high levels of training and experience using common doctrine, communication and information system, tools and agreed operational processes.	High levels of information exchange and integrated knowledge building. Shared interpretation. Communication and information system capabilities correspond to LISI domain level.	One chain of command but with interaction with home organisation. At most, a few minor problems with fitting into the command structure. Minimal differences in command and leadership styles.	A high level of commitment to goals. Little impact from external constraints. High levels of trust and respect. Little impact from differences in personnel arrangements and organisational culture.

2. Collaborative coalition)	General doctrine in place. Some formal and informal agreements. Some combined training and experience.	Sharing of information and knowledge restricted to specific topics. Some shared interpretation. Communication and information system capabilities correspond to LISI functional level.	Separate reporting lines of responsibility overlaid with a single command chain. At most, a few major problems with fitting into the command structure. May be some differences in command and leadership styles.	Shared purpose. Moderate level of commitment to goals. At most, a few moderate impacts from external sources. Moderate levels of trust and respect. A few impacts from differences in personnel arrangements and organisational culture.
1. Cooperative	General guidelines in place. Some informal agreements in place. Limited combined training and experience.	Exchange of information restricted. Little shared interpretation. Communication and information system capabilities correspond to LISI connected level.	Separate reporting lines of responsibility. Co-ordination only at the highest levels. Significant differences in command and leadership styles.	Shared purpose. Some major impacts from differences in personnel and organisational culture.
0 .Independent	Almost no preparation.	Almost no exchange of information. Communication and information system capabilities correspond to LISI isolated level.	Separate command structures with little interaction. Major differences in command and leadership styles.	Limited shared purpose. Minimal trust and respect. Some major impacts from differences in personnel and organisational culture.

## 8<sup>th</sup> ICCRTS – Coalition Interoperability

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# Organisational Interoperability: Evaluation and Further Development of the OIM Model

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DSTO Australia*

*Presented by John O'Neill  
at 8<sup>th</sup> ICCRTS, Washington, June 2003*

## Contents

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- **Interoperability**
- **Overview of the OIM model**
- **Evaluations – INTERFET, AUSMIN, MNLOE2**
- **Further development of the model**

## Introduction

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- *“Interoperability is the ability of systems, units or forces to provide the services to, and accept the services from other systems, units or forces”*  
and  
*“the need of one group to interact in some way with another group”*
- Our focus is on the sharing of information and the exchange of knowledge.



## Types of Interoperability

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1. **Technical Compliance**
  2. **Systems Interoperability**
  3. **Operational Interoperability**
  4. **Organisational Interoperability**
    - **Legal and doctrinal framework**
    - **Command issues**
    - **Trust**
    - **Culture...**
- LISI*
- OIM*

# Framework of OIM Model

## Attributes

Levels

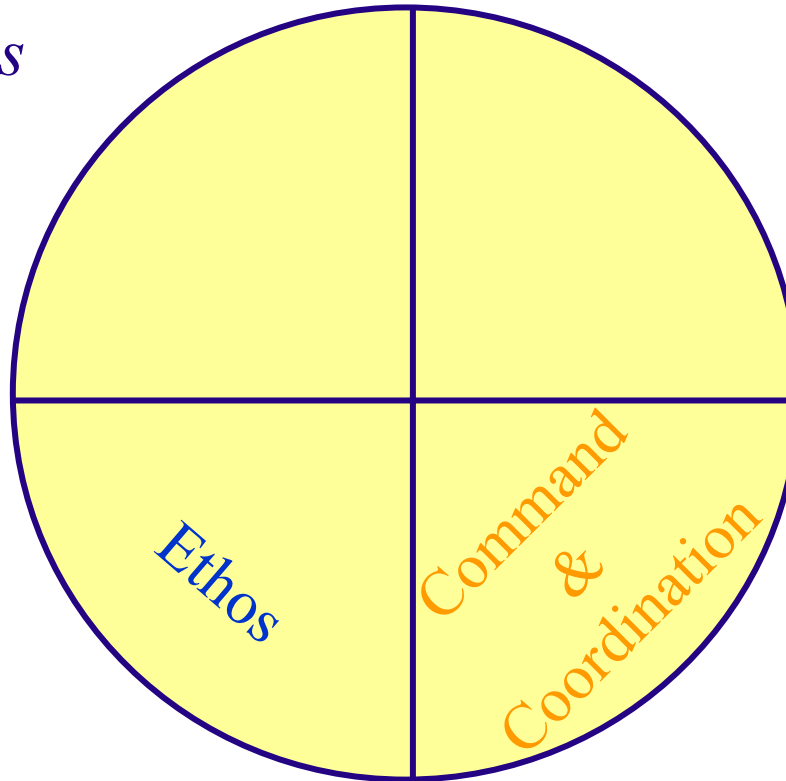
	Preparation	Understanding	Command and Co-ordination	Ethos
4. Unified				
3. Combined				
2. Collaborative				
1. Cooperative				
0. Independent				

## OIM Attributes

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*How well prepared are collaborators to perform the goals?*

*What impact do socio-cultural factors have?*



*How well developed is the level of mutual understanding and knowledge sharing?*

*How well do collaborators fit into the command structure and adapt to the command style?*

# OIM Reference Model

	<b>Preparation</b>	<b>Understanding</b>	<b>Command and co-ordination</b>	<b>Ethos</b>
<b>4. Unified</b>	<p>Completely integrated preparation resulting in normal day to day working. Common doctrine covers all aspects of operations. All other agreements are in place. High levels of integrated training and experience using common doctrine, communication and information system, tools and agreed operational processes.</p>	<p>Completely integrated knowledge building. Shared interpretation. Communication and information system capabilities correspond to LISI enterprise level.</p>	<p>Homogeneous command structure with a single chain of command. No difference in command and leadership style.</p>	<p>A high level of commitment to shared goals. Minimal impact of external constraints. Complete trust and respect across the organisation. Minimal impact from differences in personnel arrangements and organisational culture.</p>

## OIM Reference Model

	<b>Preparation</b>	<b>Understanding</b>	<b>Command and co-ordination</b>	<b>Ethos</b>
<b>0. Independent</b>	Almost no preparation.	Almost no exchange of information. Communication and information system capabilities correspond to LSI isolated level.	Separate command structures with little interaction. Major differences in command and leadership styles.	Limited shared purpose. Minimal trust and respect. Major impacts from differences in personnel and organisational culture.

## INTERFET – On Patrol in East Timor



## INTERFET Organisational Interoperability Evaluation



- **Preparation:** AS DJFHQ had recently exercised with other ABCA members and AS had trained with Thai, Fijian and Filipino forces.
- **Understanding:** Shared understanding less with ASEAN partners owing to language differences.
- **Command & Coordination:** INTERFET as a whole was not an integrated command.
- **Ethos:** Shared purpose but significant differences in operating philosophies and caveats on the use of forces.

# INTERFET Organisational Interoperability Evaluation

	AS	US	NZ	Thai	Phil
US	2				
NZ	2	2			
Thai	1	0	0		
Phil	1	0	0	0	
ROK	0	0	0	0	0



## AS-US Interoperability Review

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- **Preparation:** higher for AS-USPACOM due to familiarity with ASUS Planning Manual, regular combined exercises and some operational experience.
- **Understanding:** higher for AS-USPACOM as some communication facilities and informal communication were channels shared and well used whereas AS-USCENTCOM had no direct communication channels at the time.

## AS-US Interoperability Review (cont)

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- **Command & Coordination:** lower for USCENTCOM due to lack of familiarity.
- **Ethos:** lower for USCENTCOM due to lower levels of trust.

# AS-US Interoperability Review

AS-US Review	Preparedness	Understanding	Command Style	Ethos	Overall
AS-USPACOM	2	2	2	2	2
AS-USCENTCOM	1	0	1	1	0

# MNLOE2 Organisational Interoperability Evaluation



## MNLOE2 Organisational Interoperability Evaluation

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- **Preparation:** unilateral development of the doctrine by the US, inadequate AS training.
- **Understanding:** audio problems, minor differences in language, information management.

## MNLOE2 Organisational Interoperability Evaluation



- **Command & Co-ordination:** flat command structure and leadership style, experimental setup did not permit communication with national superiors or other agencies.
- **Ethos:** players felt that cultures were similar but some cultural differences emerged, AS staffing levels much lower than for the US.

# MNLOE2 Organisational Interoperability Evaluation

MNLOE 2	Preparation	Understanding	Command and Co-ordination	Ethos	Overall
AS-US	2	2	2	3	2

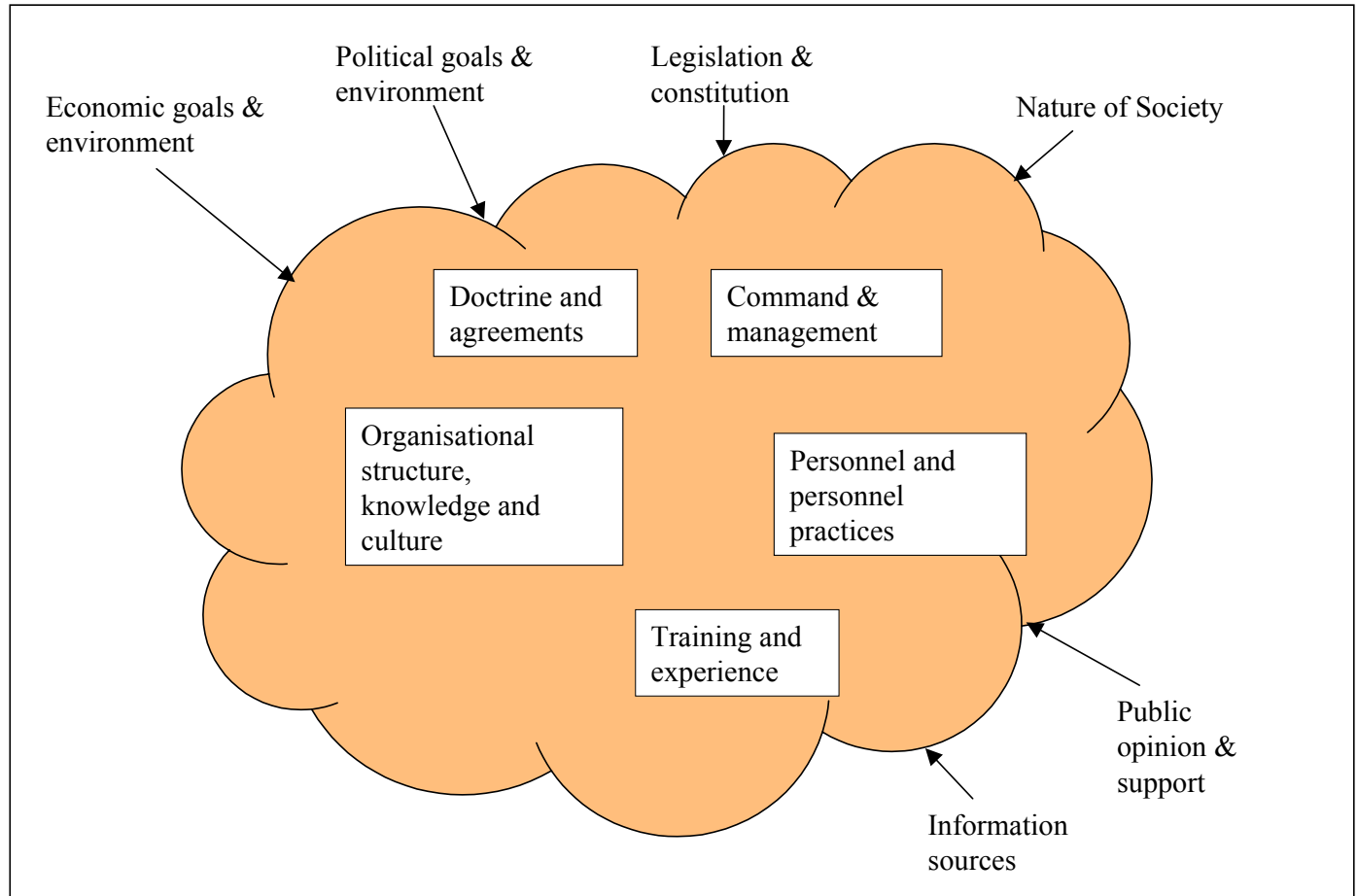
## Further Development of the Model

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- Initial development of the OIM model was based on discussions with SMEs and the original authors' analytical experience.
- Need for the model to be more explicit in the criteria used to perform evaluations and additional sub-attributes needed.



# Further Development of the Model



## Conclusion

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- **The OIM model has been used and found to provide a useful framework for evaluating organisational interoperability and identifying major organisational interoperability problems.**
- **The revisions made to the model make it easier to use and understand. The model is also based on more comprehensive set of sub- attributes.**

# Questions?

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