

AU/ACSC/108/2001-04

AIR COMMAND AND STAFF COLLEGE

AIR UNIVERSITY

DO WE MAKE INTEROPERABILITY
A HIGH ENOUGH PRIORITY TODAY?

by

Michelle D. Schmith, GS-13, USAF

A Research Report Submitted to the Faculty

In Partial Fulfillment of the Graduation Requirements

Advisor: Colonel John T. Sheridan

Maxwell Air Force Base, Alabama

April 2001

Distribution A: Approved for public release; distribution is unlimited

Report Documentation Page

Report Date 01APR2002	Report Type N/A	Dates Covered (from... to) -
Title and Subtitle Do We Make Interoperability a High Enough Priority Today?	Contract Number	
	Grant Number	
	Program Element Number	
Author(s) Schmith, Michelle D.	Project Number	
	Task Number	
	Work Unit Number	
Performing Organization Name(s) and Address(es) Air Command and Staff College Air University Maxwell AFB, AL	Performing Organization Report Number	
Sponsoring/Monitoring Agency Name(s) and Address(es)	Sponsor/Monitor's Acronym(s)	
	Sponsor/Monitor's Report Number(s)	
Distribution/Availability Statement Approved for public release, distribution unlimited		
Supplementary Notes The original document contains color images.		
Abstract		
Subject Terms		
Report Classification unclassified	Classification of this page unclassified	
Classification of Abstract unclassified	Limitation of Abstract UU	
Number of Pages 45		

Disclaimer

The views expressed in this academic research paper are those of the author and do not reflect the official policy or position of the US government or the Department of Defense. In accordance with Air Force Instruction 51-303, it is not copyrighted, but is the property of the United States government.

Contents

	<i>Page</i>
DISCLAIMER	ii
ILLUSTRATIONS	v
PREFACE	vi
ABSTRACT	viii
INTRODUCTION	1
Background.....	2
Methodology.....	3
Limitations.....	3
Definitions	4
A Broad Definition of Interoperability.....	4
Joint Vision 2020.....	6
Interoperability	7
Multinational Operations.....	7
Joint Command and Control.....	8
A COMPLEX ENVIRONMENT	10
Shifting from the ‘Cold-War Mentality’ ...changing the paradigm!.....	12
ANALYSIS OF OPERATION ALLIED FORCE.....	17
US Perspective... Operation Allied Force Lessons Learned.....	18
Lack of Secure Communications.....	19
Ability To Identify Friend or Foe.....	19
Dependence on US Strategic Mobility	19
Tackling the Problem.....	20
Current Multi-National Operations... Working Issues.....	23
RECOMMENDATIONS AND CONCLUSION	29
Emphasis on Multi-National Operations	29
Campaign—“Teamwork—Key to Multi-National Operations”	29
Engage Senior International Officers and Exchange Officers.....	30
Establish Multi-National Operation Forums	31
Who’s In Charge?.....	31

Build Multi-National Interoperability Considerations into Acquisition Process/JROC	31
Enforce Discipline into the Joint Strategic Planning System (JSPS)	32
Multi-National Operational Exercises	32
BIBLIOGRAPHY	35

Illustrations

	<i>Page</i>
Figure 1 CWAN Basic Architecture.....	25

Preface

I am confident that this paper is only one of many that will address multi-national operations and the US military's role in the future. This is an exciting era where everything is changing so fast including the way we are dealing with conflict and war. The US military has spent several years realizing the necessity of "jointness" where the services come together to form one powerful military to defend vital interests or those of her allies. Regardless of whether true jointness has been acquired—the time has come to become multi-national. In the future the US must not go to war alone—the time to make multi-national interoperability a priority is now!

I would like to thank several individuals for their assistance in this study. First, from O'Fallon, Illinois my 12 year old daughter, Melissa, for understanding that her Mother was where she needed to be this year, and fond appreciation towards my husband for keeping our family together during my absence. A special thank you to Colonel Sheridan, Commandant, Air Command and Staff College, for agreeing to be my Faculty Resource Advisor. Col Sheridan provided great advice, while exercising patience with me, as I conducted the research required to write this paper. I was given the opportunity to interview the professional military men and women from the armed services on the Joint Staff at the Pentagon, Air Mobility Command, and the Tanker Airlift Control Center. Their professionalism in addressing my questions was truly outstanding. While

the number is too large to note each of these officials, a special debt of gratitude is owed to General Richard B. Myers, Brig Gen Croom, and Brig Gen Hawk.

Abstract

Recently, the Joint Chiefs of Staff voiced concern that JV 2020 will impact future multi-national operations. Because of the pursuit of technology on the battlefield, the US may be leaving her friends and allies behind. My hypothesis is that while there is definitely a technology gap between US force capabilities and that of our allies/coalition partners, the problems of multi-national interoperability go much deeper. In fact, given our National Security Strategy (NSS), the US must be prepared to “go it alone” into battle if ever called to do so, hence our high tech systems are critical to support our NSS. But, more than likely, we will fight future conflicts as part of a coalition, and hence to be best prepared for this likely course of future events, all the components of multi-national interoperability (training, policy, doctrine, personnel, materiel, logistics, support, and technology) must get higher priority billing for resources and support within the United States Government and with our allies and coalition partners. The United States this past year spent twice as much money on defense than the other members of NATO total. Some current major multi-national operation initiatives are the NATO-led multi-national operation systems architecture, and the Combined Wide Area Network managed by the Directorate of Command, Control, Communications, and Computers (C4). The JV 2020 appropriately addresses multi-national operations and future considerations that will allow the US to participate effectively in them. There are many technological initiatives underway that have been previously identified as gaps during multi-national operations.

If we truly believe that we will not go to war alone in the future then what choice do we have but to make multi-national interoperability a very high priority today?

Chapter 1

Introduction

“We have learned that we cannot live alone at peace. We have learned that our own well being is dependent on the well being of other nations far away. We have learned to be citizens of the world, members of the human community.”

— President Franklin Delano Roosevelt

The purpose of this paper is to prove that while there is definitely a technology gap between US forces capabilities and that of our allies/coalition partners, the problems of multi-national interoperability go much deeper. In fact, given our National Security Strategy (NSS), the US must be prepared to “go it alone” into battle if ever called to do so, hence our high tech systems are critical to support our NSS. But more than likely, we will fight future conflicts as part of a coalition, and hence to be best prepared for this likely course of future events, all the components of multi-national interoperability (training, policy, doctrine, personnel, materiel, logistics, support, and technology) must get higher priority billing for resources and support within the United States Government and with our allies and coalition partners. This paper will discuss today’s complex environment: Joint Vision 2020 (JV 2020) as it pertains to multi-national interoperability, Operation Allied Force, current interoperability initiatives, the future, and recommendations. If the US is truly serious about achieving JV 2020, *“America’s Military: Preparing for Tomorrow,”* the US military team must continue to strive to

ensure available means are targeted toward this goal—which means, as previously stated, the components of multi-national interoperability should become a high priority.

Background

As stated in the Air Command and Staff Research Database, recently the JCS voiced concern that JV 2020 will impact future multi-national operations. Because of the pursuit of technology on the battlefield, the US may be leaving her friends and allies behind. Unable or unwilling to match the pace or extent of US force modernization, multi-national partners may no longer be able to effectively integrate with US forces on the battlefield.¹ The US National Security Strategy emphasizes the importance of working with other international organizations or coalitions in support of building security in the next century. It is also worth noting that the strategy states when necessary the US will be prepared to act alone:

International cooperation will be vital for building security in the next century because many of the challenges we face cannot be addressed by a single nation. Many of our security objectives are best achieved – or can only be achieved – by leveraging our influence and capabilities through international organizations, our alliances, or as a leader of an *ad hoc* coalition formed around a specific objective. Leadership in the United Nations and other international organizations, and durable relationships with allies and friendly nations, are critical to our security. A central thrust of our strategy is to strengthen and adapt the formal relationships we have with key nations around the world, create new relationships and structures when necessary, and enhance the capability of friendly nations to exercise regional leadership in support of shared goals. At other times, we seek to shape a favorable international environment outside of formal structures by building coalitions of like-minded nations. But we must always be prepared to act alone when that is our most advantageous course, or when we have no alternative.²

There is a transatlantic capability gap most pronounced in cutting-edge areas of warfare, such as precision strike, command-and-control, and intelligence, associated with

the emerging Revolution in Military Affairs (RMA).³ Before the Kosovo Operation, defense analysts on both sides of the Atlantic worried that US programs to incorporate information technologies into the armed forces would outpace the efforts of other alliance members.⁴ As a result, as the US invests in a new generation of military technology, many allies continue to fall behind.⁵

Methodology

A literature search was conducted to identify the current multi-national interoperability initiatives. Information was also collected from the Vice Chairman of the Joint Chiefs of Staff from a personal interview. Interviews were also conducted with JCS professionals from the Directorate for Strategic Plans and Policy (J5), Command, Control, Communications, and Computer Systems Directorate (J6), and Operational Plans and Joint Force Development Directorate (J7). The literature search and personal interviews were then used to address the purpose of the paper which is to argue that the overriding factor of multi-national interoperability is one of resource allocation, not technology, by the US, allies, and coalition partners.

Limitations

The focus of technology in this research is Command, Control, Communications and Computers (C4) and will not include stealth programs, future weaponry, or political issues.

Definitions

Key terms such as multi-national operations, coalition, alliance, interoperability, resource, jointness, and C4 will be used; therefore, it is necessary to provide common definitions. Multi-national operations is a collective term used to describe military actions conducted by forces of two or more nations usually undertaken within the structure of a coalition or alliance.⁶ Coalition is an ad hoc arrangement between two or more nations for common action.⁷ An alliance is a result of formal agreements between two or more nations, for broad long-term objectives.⁸ Resource in this context refers to personnel, time, and money.⁹ Command, control, communications, and computer (C4) systems -- integrated systems of doctrine, procedures, organizational structures, personnel, equipment, facilities, and communications designed to support a commander's exercise of command and control across the range of military operations.¹⁰ The term joint (jointness) connotes activities, operations, organizations, etc., in which elements of two or more Military Departments participate.¹¹

A Broad Definition of Interoperability

Interoperability is a measure of the degree to which various organizations or individuals are able to operate together to achieve a common goal. Interoperability is desirable with overtones of standardization, integration, cooperation, and even synergy.¹²

Interoperability can occur at various levels—strategic, operational, tactical and technological. Normally, interoperability issues are likely to be raised when problems emerge. Interoperability is taken for granted when problems are not present.¹³

Interoperability comes at a price—it is not cheap. Costs, however, may be difficult to define and estimate because they consist of military expenditures to enhance

interoperability as well as economic and political costs incurred. Therefore, the issue becomes what kinds of interoperability are worth what costs. The following definition for interoperability is appropriate due to its various levels and multiple dimensions:

The ability of systems, units, or forces to provide 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.¹⁴

However, the complexity of interoperability and its multiple dimensions make it difficult to understand the nature of the benefits, costs, and tradeoffs that the US and NATO allies will face in future efforts to improve the interoperability of coalition forces. In fact, much of the value of interoperability is intangible and not easily measured or quantified as described below from Myron Hura, et al, *Interoperability: A Continuing Challenge in Coalition Air Operations*.

Interoperability supports US national security and US national military strategies. It can enable coalition building with coalition partners. It can sustain coalitions by reducing the costs of participation and increasing burden sharing. And it offers an opportunity to enhance future coalition operations. This final benefit confers additional advantages beyond the specific coalition operation. For example, effective allied forces will be better able to carry the continued burden of peace operations while US forces can be re-deployed to a major crisis or to an MTW. Furthermore, effective and efficient coalitions will improve the prospects that coalition partners will join future coalitions.¹⁵

The Directorate for Command and Control, Communication and Computer (C4) Systems, J6I, offers the following comment relative to interoperability:

Everyone equates interoperability with ability to communicate aka C4. There is more to it than that. A lack of common procedures and doctrine will limit our ability to share battlespace just as much as C4 problems. Another problem is that US initiatives to improve interoperability are frequently seen as a “Buy US” effort, while at the same time the allies frequently do not back up their complaints with concrete action to improve interoperability—it’s a 2-way street.

Joint Vision 2020

Since the JCS has voiced concern that by the US achieving goals set forth in JV 2020, her allies and those involved in multi-national operations will be left behind unable to contribute to the fight. Therefore, it is important to address the contents of JV 2020. JV 2020, particularly the sections on interoperability, multi-national operations, and command and control, acknowledges the fact that the United States when operating as part of a multi-national operation may be technologically advanced. This vision also addresses future courses of action necessary to adapt to multi-national operations.¹⁶ More importantly the search for innovation must encompass the entire context of joint operations—which means the Armed Forces must explore changes in doctrine, organization, training, materiel, leadership and education, personnel, and facilities as well as technology. The ultimate goal is to develop reasonable approaches with enough flexibility to recover from errors and unforeseen circumstances.¹⁷ This vision is centered on the joint force in 2020 addressing flexibility and responsiveness as key to operational success in the future. One could argue that multi-national operations should be the center of the vision. During an interview, on 16 Jan 01, the Vice Chairman of the Joint Chiefs of Staff shared with me when discussing the issue of multi-national operations “We must get our own house in order first.” The Vice Chairman meant, in other words, fix our joint issues first. This might be difficult to do since multi-national operations issues must be addressed today. JV 2020 emphasizes interoperability as the foundation of effective joint, multi-national, and interagency operations.¹⁸

Interoperability

As stated in JV 2020 interoperability is the foundation of effective joint, multi-national, and interagency operations.¹⁹ The vision further indicates that the joint force has made significant progress toward achieving an optimum level of interoperability but that there must be a concerted effort toward continued improvement when conducting future operations.²⁰ The areas of improvement include refinement of joint doctrine, further development of common technologies and processes, exercises, personnel exchanges, agreement on standardized operating procedures, individual training and education, and planning.²¹ In addition, highly skilled professionals, that understand interoperability issues, are necessary to teach members to appreciate the full range of capabilities available to them.²²

Multinational Operations

JV 2020 recognizes that potential multi-national partners will possess varying levels of technology, coupled with a tailored approach to interoperability, will accommodate a wide range of needs and capabilities.²³ This document further states that the US must be capable of operating with allies and coalition partners whom may be technologically incompatible, particularly at the tactical level.²⁴ In addition to the interoperability issue, information is another consideration when discussing multi-national operations.

The existence of these relationships does not imply access to information without constraints.²⁵ The US participating in a multinational operation must exercise suitable judgement regarding the protection of sensitive information and information sources.²⁶ Information sharing is necessary in multi-national operations to maintain the tempo of integrated operations and obtain a mutual understanding of the operating procedures.²⁷

The primary means to extending the joint vision to multi-national operations is through command and control.²⁸

Joint Command and Control

Command and control includes planning, directing, coordinating, and controlling forces and operations, and is focused on the effective execution of the operational plan; but the central function is decision making.²⁹ The increased importance of multi-national and interagency aspects of the operations add complexity and heightens the challenge of effective command and control.³⁰ The expanding roles for multi-national and interagency partners will require collaborative planning capabilities, technological/interoperability, and mechanisms for efficient information sharing.³¹ The thrust of the command and control section of JV 2020 is that it should be conceptually based rather than technology or material based.³² JV 2020 also states that command and control serves as a focal point for humans and technology, evolving operational capabilities, and the capabilities of the services. The development of effective joint command and control for the future will require rigorous and wide-ranging experimentation focusing on organizational innovation and doctrinal change.³³ I believe that if JV 2020 is implemented according to the way it is written the advancement in technology by the US should not adversely impact the effectiveness of a multi-national operation. I am not confident, however, that all the suggestions pertained to US advances in technology and interoperability relative to multi-national operations are being acted upon.

Notes

¹ Statement contained in the ACSC Data Base, December 1999.

² A National Security Strategy for a New Century, December 1999.

Notes

³ The International Institute for Strategic Studies, Strategy Survey 1999/2000, May 2000: 16.

⁴ Ibid.

⁵ Ibid.

⁶ Joint Publication 1-02, *DoD Dictionary for Military and Associated Terms*, March 1994.

⁷ Ibid.

⁸ Ibid.

⁹ Webster's Third New International Dictionary, G. & C. Merriam Publisher, Springfield Massachusetts, U.S.A.

¹⁰ Joint Publication 1-02, *DoD Dictionary for Military and Associated Terms*, March 1994.

¹¹ JP 1-02, *DoD Dictionary of Military and Associated Terms*

¹² Myron Hura et al., *INTEROPERABILITY: A Continuing Challenge In Coalition Air Operations*, (Santa Monica, RAND, 2000): 7-15.

¹³ Ibid.

¹⁴ Host nation support such as communication networks, infrastructure, air bases, and aircraft squadrons and special forces are examples of services, units, and forces. See Joint Staff (1999), p 229.

¹⁵ Hura et al., 7-15.

¹⁶ Joint Vision 2020, (June 2000): 1-36.

¹⁷ Ibid.

¹⁸ Ibid.

¹⁹ Ibid.

²⁰ Ibid.

²¹ Ibid.

²² Ibid.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid.

²⁶ Ibid.

²⁷ Ibid.

²⁸ Ibid.

²⁹ Ibid.

³⁰ Ibid.

³¹ Ibid.

³² Ibid.

³³ Ibid.

Chapter 2

A Complex Environment

Almost every time military forces have deployed from the US it has been as a member of—most often lead—coalition operations.

— General Robert W. Riscassi, USA

The dramatic shift in international strategic circumstances occasioned by the Soviet collapse requires a shift in the pursuit of our goals as well as strategy. It is not a shift to “normalcy.” The environment today is enormously complex—it requires a shift in thinking from posturing against a single enemy to preparing for an uncertain threat. The US Military will likely fight future wars as part of a multi-national operation. JV 2020 prepares America’s Armed Forces to fight and win the nation’s wars in the future.¹ In this post-Cold War era, the maintenance of a decent and hospitable international order requires continued American leadership to resist, and when possible undermine rising dictators. American leadership is also crucial to defend against biochemical and asymmetrical threats, weapons of mass destruction, terrorist attacks, and provide assistance to those struggling against the more extreme manifestations of human evil.² Of course, there are also those uncertain “wild cards” that the US must contend with in the future. Americans must shape this order, for if refrained from doing so, others will shape it in ways that reflect neither interests nor US values--this should be no surprise.³ Today’s international system is built not around a balance of power but around an

American leader on the world stage.⁴ The international financial institutions were fashioned by Americans and serve American interests.⁵ The international security structures are chiefly a collection of American-led alliances.⁶ What Americans like to call international “norms” are really reflections of American and West European principles.⁷ Since today’s relatively benevolent international environment is a product of influence from a leader on the world stage, any lessening of that influence will allow others to play a larger part in shaping the world to suit their needs.⁸ The future is in collaboration and shared information. This country must be prepared to “win” across the full range of military operations in any part of the world; to operate with multinational forces; and to coordinate military operations, as necessary, with other government agencies and international organizations. Sharing information and collaboration are critical.⁹ States such as China and Russia, if given the chance, would configure the international environment quite differently.¹⁰ America with the help of her multi-national partners must continue to shape the international order.

During an interview, 16 Jan 01, the Vice Chairman of the Joint Chiefs of Staff, General Richard B. Myers indicated that the US is not at the level needed as far as compatibility in the area of C4I with the majority of the US allies. He further indicates that we can talk together and share some data, but not at the level needed in today’s combat environment.

Shifting from the ‘Cold-War Mentality’...changing the paradigm!

There has been a gap during some of our operations. As we have gotten more sophisticated in the field of C4I and our allies have spent less money in these areas. Some of it has been caused by technological difference and some of it has been caused by our security regulations not changing with the time. We still have a Cold War mindset that we need to overcome.

—General Richard B Myers

The US Military of today finds itself in a very different situation than that of the Cold War years leading up to the collapse of the Soviet Union. The world has changed, therefore, the US Military must also appropriately evolve to be able to influence world order and protect US national security. Since the Cold War the US military has reshaped the structure of the military from one of containment to one of an expeditionary nature.

An example of how the US military has evolved is the Expeditionary Air Force (EAF) concept. The EAF is how the Air Force organizes, trains, and equips to better meet today’s challenges—to be “mobile warriors.”¹¹

The Air Expeditionary Force (AEF) is a group of capabilities within the Air Force designed to meet a specific theaters’ requirement, provides total force packaging to include combat air forces, humanitarian relief capability, airlift and combat support units.¹² The AEFs will provide unique needs to the theater combat commander and CINCs using the total force. The culture will be expeditionary--moving away from the fixed base mind-set of the past. Operationally the focus is on the capability to rapidly deploy worldwide emphasizing light, lean, and lethal elements as key.

During an AEF update, 18 Jan 01, the Chief of Staff of the Air Force, General Ryan, put the respective Air Force “functional areas” to task to ensure each career field develops its unit type codes right-sized and ready to deploy rapidly! His goal may best

be summed up in his statement: “When I press the war button, I want to see the entire Air Force light up!”¹³ Due to the fact that there is less US forward presence around the world a heavier reliance on others for “footholds” exists. As the US military deploys AEFs worldwide to protect US vital interests, it is more critical than in the past that the US is able to participate effectively in multi-national operations.

Another shift in thinking since the cold war is not to conduct business as usual but to examine our policies and processes.¹⁴ For example, during Operation Allied Force the lack of interoperability within the US-NATO command, control, and communication (C3) architecture was a challenge.¹⁵ NATO classified products were developed and distributed using the Crisis Response Operations NATO Open System (CRONOS).¹⁶ While at the same time sensitive US products were produced and disseminated using a Secure Internet Protocol Network (SIPRNet) which is available only to individuals with a US Secret clearance.¹⁷ Current US security policy does not allow for local area networks (i.e. CRONOS or SIPRNet) with different levels of classification to be connected.¹⁸ Air operations were adversely impacted by this lack of interconnectivity.¹⁹ There were cases where critical operational and intelligence products, such as air tasking orders and mission reports, were not disseminated in time to US forward units due to lack of access to NATO networks.²⁰ As a result of this lack of interoperability within the C3 architecture unnecessary duplication of effort occurred to an already overworked staff.²¹

Another example of business as usual was during the US purchase of the Secure Telephone Equipment (STE). to consider multi-national interoperability as part of the criteria within the acquisition process.²² The STE system enables the joint US forces to communicate worldwide with each other. The current general user secure voice

instrument, the Secure Telephone Unit, Third Generation (STU-III) is out of production and becoming difficult and expensive to support.²³ It must be replaced. The STE offers many positive features: interoperability with the STU-III, very portable and usable worldwide, quick call set up time, simple installation and set up, and compliance with worldwide connectivity standards.²⁴

The STE system has a place in the Air Forces future secure voice.²⁵ STE offers higher quality voice and higher data rates at higher cost per terminal with additional cost for Integrated Services Digital Network (ISDN). The device will not support interoperability with the third nation STU-IIB.²⁶ The DoD is actively working to resolve this interoperability issue. This initiative is currently on hold while contract issues concerning NATO standardization is being addressed.²⁷

In order to successfully accomplish national security objectives, especially now in this world of uncertainty, serious consideration must be given towards the US Military's ability to posture itself to adapt to this new environment. It is imperative that the cold war thinking and rules are recognized and eliminated.

A new way of thinking, however, does not come cheap. As the US invests in a new generation of military technology, many allies continue to fall behind. European defense spending in 1999 was roughly half that of the US, and their military research and development spending was just one-quarter of US levels.²⁸ The US spent \$47 billion dollars on procurement; European states spent \$28 billion dollars. The US spent \$283 billion dollars on defense in 1999.²⁹ The European members of NATO spent a combined total of \$174 billion dollars, and many NATO allies are cutting their defense expenditure.³⁰ As a matter of fact, what European governments spend goes not towards

technology or better training, but towards the costs of short-term conscripts, pensions and infrastructure.³¹

Sustaining defense expenditure is a major challenge to such countries as France, Germany, Italy, the Netherlands and Spain that have yet to meet the Maastricht Treaty's criteria for government debt.³² Some avenues open to these states to realize efficiencies in defense spending are reforming their procurement systems, cutting the size of their armed forces, and eliminating excess infrastructure.³³ Furthermore, economic factors complicate the capability gap.³⁴ The weak euro has made American military technology more expensive in Europe and increased the competitiveness of European defense exports, giving European governments an incentive to prioritize exports over procurement.³⁵

The Vice Chairman of the Joint Chiefs of Staff, General Richard B. Myers, provides his remarks regarding the solution to allied Command, Control, Communications, Computer Systems, and Information (C4I) compatibility problems:

I believe it's a combination of things. We need to ensure that we don't automatically sacrifice our knowledge superiority when we do coalition operations. Knowledge superiority is the way to win in the future. I think that requires us to share information with our allies and that means walking away from some of our Cold War rules. Our allies must also make the appropriate investment in technologies. We can't pay for all the world's C4I equipment.

The Command, Control, Communications, and Computer (C4) Directorate provides the following comment pertaining to allies defense spending:

Our allies can be more efficient in how they spend their defense \$, most spend a far higher percent than we do on Personnel, plus there is room for cooperative procurement rather than each of 19 NATO countries making the same infrastructure investments individually. Plus, remember—the US spends a higher percentage of GDP on defense than do almost all of our allies, even though Europe's combined GDP is almost equal to ours—its not that they can't afford to spend more, they just don't choose to.

Notes

- ¹ Joint Vision 2020, (June 2000): 1.
- ² The Complex Environment, Popular Mechanics, February 2001
- ³ Ibid.
- ⁴ Ibid.
- ⁵ Ibid.
- ⁶ Ibid.
- ⁷ Ibid.
- ⁸ Ibid.
- ⁹ Information Superiority, Making the Joint Vision Happen.
- ¹⁰ The National Interest, Spring 2000.
- ¹¹ Briefing, Air Combat Command, Subject: AEF Overview, January 2001.
- ¹² Ibid.
- ¹³ Ibid.
- ¹⁴ Remy, David. "Interoperability: A Continuing Challenge for NATO." Politics of NATO, Air War College, October 2000.
- ¹⁵ Ibid.
- ¹⁶ Ibid.
- ¹⁷ Ibid.
- ¹⁸ Ibid.
- ¹⁹ Ibid.
- ²⁰ Ibid.
- ²¹ Ibid.
- ²² Notes. Wilson, Cpt Daniel, HQ AF SCMIP.
- ²³ Ibid.
- ²⁴ Ibid.
- ²⁵ Ibid.
- ²⁶ Ibid.
- ²⁷ Ibid.
- ²⁸ *The International Institute for Strategic Studies 1999-2000* (Arundel House: OXFORD University Press, 2000), 19.
- ²⁹ Ibid.
- ³⁰ Ibid.
- ³¹ Ibid.
- ³² *The International Institute for Strategic Studies*, Strategic Survey 1999/2000, May 2000.
- ³³ Ibid.
- ³⁴ Ibid.
- ³⁵ Ibid.

Chapter 3

Analysis of Operation Allied Force

Our forces have seen firsthand the destruction Milosevic has perpetrated against his own people in Kosovo. We must stay the course. We know NATO's mission is just and NATO's actions justifiable, and we know NATO's forces will prevail. It may take time, but it is inevitable.

— General Mike Ryan

Operation Allied Force provided a real world laboratory for Command, Control, Communications, and Computer (C4) interoperability and its effects on the joint and multi-national war fighting environment. For example, for the first time NATO commanders used video teleconferencing as a major instrument for exercising command and control. These video teleconferences spanned the strategic, operational, and tactical levels of command greatly compressing the normal command and control processes.¹

From 24 March through 9 June 1999 the North Atlantic Treaty Organization (NATO) flew more than 38,000 sorties prosecuting the air war over Serbia. The US Air Force, in support of NATO, flew 78 days of intensive aerial combat operations with the loss of only two manned aircraft and no casualties as a result of enemy action. The air campaign successfully allowed NATO to achieve its overall political objectives in the Serbian province of Kosovo.²

Documentation states that interoperability has always been a cornerstone of NATO and is tightly integrated into all its policy, procedures, training and equipment. I believe

that on paper this may be true but operationally I do not believe this to be the case. Operation Allied Force demonstrated that, in many respects, NATO has not achieved a working degree of interoperability. An examination of the USAF lessons learned provides insight into interoperability issues between the US and NATO partners.

US Perspective...Operation Allied Force Lessons Learned

The Command, Control, Communications and Computer (C4), J6B Directorate provides the following comment regarding Operation Allied Force:

During Allied Force, US personnel were not allowed to process NATO classified information on the SIPRNET. NATO security policies are more stringent than US policy for equivalently classified US information. Many US organizations have a requirement to store, process and transmit NATO classified information on their computer networks. We are pursuing revision of, or relief from, NATO security policies with the objective being to protect and handle NATO classified in the same manner as we treat equivalently classified US information. Hard as this is, it is only the first step toward national policy changes and technology advances, required to achieve an “anyone can plug in” filtering capability as you describe. We are also working to address joint and combined interoperability issues during the earliest phases of acquisition and planning.

General John Jumper, Commander of the United States Air Forces in Europe, outlined the following areas of concern related to interoperability, which directly affected our ability to operate with our NATO Allies during Operation Allied Force: lack of secure communications, availability of precision guided munitions, ability to identify friend or foe (IFF), dissemination of operational data and intelligence products, and dependence on US strategic mobility.³ Due to the limitations of this paper the following areas will be addressed: lack of secure communications, ability to identify friend or foe, and dependence on US strategic mobility. The dissemination of operational data and intelligence products was addressed in Chapter 2.

Lack of Secure Communications

Command and Control Interoperability concerns had many facets--from the basics of simply not having enough of the right equipment to incompatible hardware and software. Not only do these systems operate between US assets but also between NATO Allies.⁴ In the case of airborne radio communications, not all aircraft had compatible, jam-resistant, secure radios requiring transmissions to be made “in the clear” resulting in the potential compromise of sensitive information. Secure communications between NATO and US ground activities and functions were also not reliable.⁵

Ability To Identify Friend or Foe

To reduce the risk of fratricide and ensure confidence in air-to-air targeting, identification of friend or foe (IFF) is absolutely critical.⁶ The ability of battle managers to maintain an accurate, complete picture of ongoing air operations was hampered because several types of allied aircraft were not equipped with the necessary IFF equipment that would distinguish them from enemy aircraft.⁷ In order for the US to maximize beyond visual range capability, NATO must guarantee that all its members have an effective, compatible combat identification system.⁸

Dependence on US Strategic Mobility

Lastly, NATO’s ability to project forces was not evident during this operation.⁹ The US during rapid buildup of forces provided significant strategic airlift and mobility augmentation.¹⁰ NATO partners do not possess the airlift capacity necessary to transport large numbers of forces and equipment.¹¹ Insufficient air mobility assets among the allies slowed the deployment of KFOR ground forces.¹² However, the buildup was highly

successful despite the shortfall in airlift capacity.¹³ To ensure success in the future, we must encourage the allies to develop strategic mobility capability.¹⁴

It is fair to say that none of these lessons are particularly surprising, but when demonstrated so vividly on the battlefield, they take on an entirely new and more dramatic reality.¹⁵ Kosovo simply reinforced the urgency of implementing a program to close these previously identified gaps.¹⁶

Tackling the Problem

The Defense Capabilities Initiative (DCI) was introduced in the spring of 1998 by Secretary of Defense William Cohen and was formally adopted by NATO at the 1999 Washington Summit. The aim of the DCI is to ensure that the Alliance can meet the security challenges of the 21st century. According to Lord Robertson, NATO Secretary General, “the Defense Capabilities Initiative is designed to ensure that all allies not only remain interoperable, but that they also improve and update their capabilities to face the new security challenges.”¹⁷ At the time the DCI is fully implemented, it will enhance allied military capabilities in five key areas: deployment and mobility, sustainability and logistics, effective engagement, survivability of forces and infrastructure, and command and control, and information systems.¹⁸ William Cohen reminded attendees at a recent NATO Defense Ministers meeting that “Kosovo showed the need for progress in all these areas and there was clear agreement at the conference to move forward on all fronts.”¹⁹

A fundamental part of the effort to achieve information superiority is the development of a systems architecture that can be used to guide investment and isolate areas for improvement.²⁰ As the Command, Command and Control (C3) architect for the Alliance, the NATO C3 Agency located in Brussels, and in the Hague, NL, has

undertaken this important work.²¹ Building on their prior work in the area, they are scheduled to have completed the “as-is” systems baseline by the end of 2001 and the objective or “reference” architecture by the end of 2002.²² The architecture will be an important tool in achieving interoperability between national and NATO C2 systems.²³

A temporary High-Level Steering Group (HLSG) was established to oversee the implementation of DCI and to coordinate, prioritize, and integrate the efforts of other appropriate NATO committees.²⁴ The HLSG is working hard to make DCI a reality.²⁵ According to Assistant Secretary of Defense for International Security Affairs Franklin Kramer, “the HLSG has already focused high-level attention on the DCI thereby creating a heightened sense of purpose and urgency.”²⁶ Kramer also emphasized that, “unresponsive defense budgets continue to erode Alliance capabilities, “ but he said “that we are beginning to see hopeful signs of movement towards increased defense spending.”²⁷

Technology transfer is a continuing topic of debate within NATO.²⁸ Sharing technology risks national economic strength.²⁹ Although NATO is a military alliance, its member nations compete against one another in world markets.³⁰ Technology transfer is a combination of the willingness to buy as well as the willingness to sell products.³¹ The US protects its technology, yet wants to sell its products in world markets.³² The increasing world trade combined with the tremendous pace of technical innovation, makes this a difficult policy to balance.³³ Therefore, it can be said, American policies contribute to some of the interoperability issues.³⁴ The United States is working with several NATO partners to improve the export licensing system within the DoD and reengineering the Foreign Military Sales program.³⁵

One other item of interest is the relationship between DCI and the European Security and Defense Identity (ESDI). The ESDI fundamental objective is for European nations to establish a military capability to perform crisis management operations in cases where NATO chooses not to become engaged, its success ultimately depends on improving allied military capabilities in the same areas targeted by the DCI. According to Franklin Kramer, “The success of ESDI, like that of DCI, is an integral part of equipping the Alliance with the tools and options it will need to deal with the challenges of the new century.”³⁶

Operation Allied Force achieved many successes in terms of Alliance cooperation, but fell short in the areas of secure communication, precision guided munitions, identification of enemy forces, electronic distribution of critical operational and intelligence products. NATO is attempting to address these discrepancies through DCI. If the technology gap between the US and European Allies is allowed to widen, the ability to inter-operate will continue to be challenged. Again, technology is an issue with multi-national operations but it is only one of many issues. Lord Robertson warns that, “We must avoid... a two-class NATO, with a precision class and a bleeding class. That would be politically unsustainable.”³⁷

Europe has recognized the disparities in capabilities and challenges to interoperability demonstrated once again in Operation Allied Force.³⁸ The success or failure of DCI rests with our European Allies and their willingness to provide the necessary funding to make DCI a reality.³⁹

According to Franklin Kramer, “the hard fact remains, however, that reform is difficult and in the end improved capabilities will require resources – or at least no more

cuts in defense budgets overall.⁴⁰ They also call for the political will to change established patterns and challenge entrenched ways of doing business.”⁴¹

The Directorate for Command and Control, Communication and Computer (C4) Systems, J6I, provides the following comment relative to DCI:

The DCI target of interoperable communications has been translated by the NATO C3 Board into a number of activities needed to reach that goal. Overall, the US and the allies are in accord on these activities and good progress is being made. Stress between US and NATO is always present, particularly the political pressure on the national participants to ensure their national industry has a share in NATO’s follow-on satellite constellation. We believe there are valid military requirements, which drive us toward certain solutions. Some allies, in order to ensure their industry can compete for the contracts, seem willing to accept less optimal solutions that we believe present unacceptable levels of risk. With or without the DCI, such stresses will be present.

Current Multi-National Operations... Working Issues

We need to ensure that we don’t automatically sacrifice our knowledge superiority when we do coalition operations. Knowledge superiority is the way to win in the future. I think that requires us to share information with our allies and that means walking away from some of our Cold War rules. Our allies must also make the appropriate investment in technologies. We can’t pay for all the world’s C4I equipment.

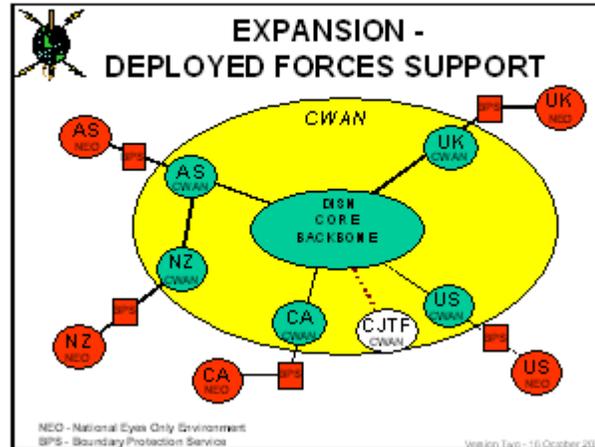
—General Richard B. Myers

There are many US military professionals doing tremendous work on the Joint Staff in the area of multi-national operations. The C4 Directorate, Defense-Wide Networks Division, recently briefed the Military Communications Electronic Board (MCEB) on matters such as the Defense Planning Guidance (DPG), and the latest release of encrypted devices to NATO.⁴² Also, the Combined Communications Electronic Board (CCEB) directed engineering of a Combined Wide Area Network (CWAN).⁴³

The Defense Planning Guidance FY 01-05 did not contain any coalition interoperability language.⁴⁴ However, the Defense Planning Guidance FY 02-07 addressed coalition interoperability as a critical enabler.⁴⁵ The draft Joint Planning Document (JPD) FY 03-07 language states that there are challenges relative to interoperability between coalition and allied partners and that we will continue to explore and field solutions to improve interoperability across all levels of military operations.⁴⁶ The recommendation to incorporate this language into FY 03-07 JPD was approved. The JPD is on hold due to the fact that the new administration is conducting the second Quadrennial Defense Review (QDR). The multi-national partners will soon receive Internet protocol encrypted devices (both voice and data), SV-7 HAS (E1), and KG 175 (4 to 45 MBS IP & ATM). CWAN is another important initiative, which will address “lessons learned” from previous multi-national operations.

CWAN is technically achievable! It will provide the following basic features: a means for strategic and operational planning staff within the CCEB nations (Australian, Canada, New Zealand, United Kingdom, and US) to exchange secure e-mail with attachments to assist in coalition planning. The customers will be the US audience, CINC, and Joint Staff planner communities. The CCEB CWAN uses existing national C2 system workstations. It will be expandable to France and Germany later on and also expandable to future applications and CJTF environment.⁴⁷

CCEB CWAN Basic Architecture



UNCLASSIFIED

Figure 1 CWAN Basic Architecture

CWAN represents an information environment that places the US warfighting decision-maker on a peer-to-peer network with allied counterparts.⁴⁸ Within that environment, the decision-makers use a subset of their national command & control systems to directly plan and execute in a real-time environment.⁴⁹ The concept was proven viable in Joint Warfighter Interoperability Demonstrations (JWIDs) 97 through 00.⁵⁰

These JWIDs acted as the springboard to transition the CWAN to a longer-term, combined RT&E network, the Combined Federated Battle Laboratories Network (CFBLNet).⁵¹ Creation of the CFBLNet leverages JWID resources, existing US Federated Battle Laboratories assets, service/joint experimentation and combined battle laboratories/test beds.⁵² As such it will not be a solely US owned/operated network, but a combined network with the members having equal say in its utilization and management.⁵³ The JWID CWAN and CFBLNet will also be used to template policies and procedures for implementation of a longer-term operational CWAN or rapid creation

of a CWAN for operational contingencies.⁵⁴ The CBFL operates at a Combined Secret-Releasable level for JWID under an “Approval to Operate” basis. JWID has provided sufficient documentation to permit combined security accreditation authorities to fully accredit the CFBLNet.⁵⁵

The Directorate for Operational Plans and Joint Force Development (J7) has just completed a Draft Vision Implementation Plan. This instruction conveys the Joint Vision Implementation Master Plan (JIMP) and provides policy and guidance for implementation of the Chairman of the Joint Chiefs of Staff’s (CJCS’s) long-range vision document, Joint Vision 2020. The JIMP describes the generation, coordination, approval, and implementation process for joint Doctrine, Organization, Training, Material, Leadership, Personnel, and Facilities (DOTMLPF) recommends and defines roles and responsibilities within that process. Joint Vision in this CJCSI refers to the Chairman’s Joint Vision 2020 document.⁵⁶

It is fair to say that right now it is very challenging in today’s environment to strive to obtain true military “jointness” in addition to capturing the multi-national operations dynamics. Although the professionals on the Joint Staff are working very hard with the services to capture or resolve joint issues it is safe to conclude that there is still work to be done to reach “true jointness.”

In summary, the US is staying actively engaged in the multi-national operations issues and has made much progress toward multi-national interoperability. Great ideas and new initiatives take dedicated professionals to follow through and make multi-national interoperability happen! In order to focus on multi-national initiatives in the future we must take a hard look at what we are currently focusing on and perhaps shift

our energies, do more with less or increase our workforce. The bottom line is that resource allocation is the overriding factor to achieve our multi-national operations goals, not technology!

Notes

¹ Report to Congress, Kosovo/Allied Force Final Report to Congress (U), 31s Jan 2000, p 28.

² USAFE Studies & Analysis, Initial Report, The Air War over Serbia, April 2000, p vii.

³ Message, R. 041029Z Jan 00, The Future of US and NATO Interoperability, HQ USAFE/CC to HQ CSAF, January 4, 2000.

⁴ AWC Paper, Interoperability: A Continuing Challenge for NATO, Mr. Remy, October 2000: 3-5.

⁵ Ibid.

⁶ Ibid.

⁷ Ibid.

⁸ Ibid.

⁹ Ibid.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

¹⁴ Ibid.

¹⁵ Ibid.

¹⁶ Ibid.

¹⁷ NATO Fact Sheet: NATO's Defense Capabilities Initiative, August 9, 2000, On-line. Internet, October 13, 2000. Available from <http://www.nato.int/facts>.

¹⁸ NATO Fact Sheet: NATO's Defense Capabilities Initiative, April 24, 1999. On-line. Internet, October 9, 2000. Available from <http://www.nato.int/docu/facts/2000/nato-dci-htm>.

¹⁹ Sharon Hobson, "NATO allies agree need to upgrade capability", *Janes Defense Weekly*, September 29, 1999.

²⁰ Notes. Schaffer, Charles Mr, C4, J6, Pentagon Washington D.C.

²¹ Ibid.

²² Ibid.

²³ Ibid.

²⁴ Ibid.

²⁵ Ibid.

²⁶ Ibid.

²⁷ Franklin Kramer, testimony to Senate Foreign Relations Committee on European Capabilities, March 9, 2000. On-line. Internet. <http://www.usembassy.ro/USIS/Washington-File/5000/00-03-10/eur522.htm>.

Notes

²⁸ AWC Paper, Interoperability: A Continuing Challenge for NATO, Mr. Remy, October 2000.

²⁹ Ibid.

³⁰ Ibid.

³¹ Ibid.

³² Ibid.

³³ Ibid.

³⁴ Ibid.

³⁵ Ibid.

³⁶ Kramer, 7.

³⁷ Kitfield, 61.

³⁸ Ibid.

³⁹ Ibid.

⁴⁰ Kramer, 2.

⁴¹ Ibid.

⁴² Lt Col Giorlando, The Joint Staff/J6T, C4 Directorate, Defense-Wide Networks Division.

⁴³ Ibid.

⁴⁴ Ibid.

⁴⁵ Ibid.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid.

⁴⁹ Ibid.

⁵⁰ Ibid.

⁵¹ Ibid.

⁵² Ibid.

⁵³ Ibid.

⁵⁴ Ibid.

⁵⁵ Ibid.

⁵⁶ Draft Chairman of the Joint Chiefs of Staff Instruction, Joint Vision Implementation Master Plan, 2001

Chapter 4

Recommendations and Conclusion

The bravest are surely those who have the clearest vision of what is before them, glory and danger alike, and yet notwithstanding go out to meet it.

—Thucydides

Emphasis on Multi-National Operations

The first recommendation is to jumpstart the paradigm shift from “jointness” to “multi-national” operations. An emphasis placed on multi-national operations from highest levels of government through every echelon. Discussions with organizations at various levels indicate uneasiness about what this leap implies. It implies we should not wait until “true jointness” is reached but press now with multi-national operational issues and work both joint and multi-national issues simultaneously. In my opinion, true jointness is static and can be individual perceptions. When dealing with more than one service there will always be some type of joint issue that must be worked. The emphasis to focus on both joint and multi-national operations will eliminate any fear and stimulate intellectual discussion on both topics.

Campaign—“Teamwork—Key to Multi-National Operations”

The second recommendation is to launch a year long campaign throughout the DoD, the proposed theme would be: *“Teamwork--Key to Multi-National Operations.”* This campaign will serve four purposes: create synergy around multi-national operations as a

priority, instill an awareness of how the US Military will fight in the future, provide a means to educate DoD professionals on the subject, and increase cooperation with our allies and potential multi-national partners. This will send a clear message that in the future we will fight as part of a team! This proposal has tremendous possibilities. The synergy must come from the highest level of leadership. The Chairman of the Joint Chiefs of Staff must support this message. The awareness will stimulate intellectual discussions throughout the DoD. The possibilities are tremendous. Leaders from the State Department, such as Secretary Powell, could support this campaign. In addition, this will generate discussions of the State Department processes which could have unlimited possibilities. Senior leadership should support this theme at every opportunity through speeches, videos, and government articles. This synergy could indicate to our allies and potential multi-national partners that this is a priority to the US Military and result in an increased interest from them in terms of their participation. At the conclusion of the year the US Military would be ready to transition into the next recommendation.

Engage Senior International Officers and Exchange Officers

The third recommendation is to engage Senior International Officers and Exchange Officers. They could be invited as guest speakers at all levels of the DoD to include the professional military schools. They would discuss what it means to be a part of a Joint Task Force. Not only would the DoD professionals benefit, the open discussion could lead to the identification of multi-national issues such as interoperability. These issues then can be formally addressed perhaps resulting in a smoother multi-national operation in the future. Professionals from the State Department could teach the ethnic and cultural differences between particular countries. In addition, place international officers

permanently within existing coalitions/multi-national combined air operation centers (CAOCs).

Establish Multi-National Operation Forums

The fourth recommendation is to establish forums for open discussions relative to multi-national operational issues. These discussions could take place in video teleconferences, meetings, and conferences.

Who's In Charge?

The fifth recommendation is to establish entities at the MAJCOM level to deal with multi-national operations issues. This structure will support a single entity on the Joint Staff. This entity on the Joint Staff will then be the single point of contact for the Chairman concerning Multi-national operations issues.

Currently, JV 2020 is written in the Directorate for Strategic Plans & Policy (J5), the JV 2020 Implementation Plan is written and maintained in the Directorate for Operational Plans & Interoperability (J7), and the Directorate for C4 (J6) manages the technology issues. Each of these directorates focus on some aspect of multi-national operations and J5 combines all of the initiatives to a single briefing to the Chairman. This should continue as at least a hot topic briefing to the Chief. There are other directorates within the Joint Staff that I have not mentioned that are probably working similar issues they should all be consolidated within J5.

Build Multi-National Interoperability Considerations into Acquisition Process/JROC

The sixth recommendation is to ensure that multi-national interoperability considerations are built into the Acquisition Process as well as the Joint Requirement

Oversight Committee (JROC). This will help alleviate delays such as those experienced with the Secure Telephone Equipment.

Enforce Discipline into the Joint Strategic Planning System (JSPS)

The seventh recommendation is for the CINCs to comply with the JSPS and submit their interoperability requirements through the integrated priority list (IPL). Because this process takes time, the CINCs routinely take dollars from somewhere else to fund a multi-national operational requirement. By establishing “work arounds” the issue of the cost of interoperability can not be formally addressed.

Multi-National Operational Exercises

The eighth recommendation is to continue to promote multi-national exercises. These exercises continue to improve annually. This forum provides tremendous opportunities in terms of introducing new capabilities and addressing issues such as interoperability. Ultimately these exercises better prepare the multi-national team to go to the fight!

The ninth recommendation is to continue to seek resolution pertaining to the SIPRNET issue involving the CINCs ability to release information to multi-national partners during an operation. This issue primarily involves the Defense Information System Agency, the Director of C4 Systems (J6), the National Security Agency, and the Defense Intelligence Agency.

We have achieved the necessary level of interoperability to succeed in past conflicts and will continue to strive for the necessary level of interoperability to succeed in future conflicts. We acknowledge the need to improve and maintain interoperability with our allies. But, the greater challenge is preparing our military to win wars and contribute to

peace as the nation deals with a wide range of interests, opportunities, and challenges. The warfighters visions/concepts such as JV 2010, and JV2020, capture how the military must prepare itself for that greater challenge. Under their visions and concepts, the need for decisive force, power projection, overseas presence, force protection and strategic agility often leads to programs and projects to improve C3 at a rate, which may outpace allies in some areas. We can maintain the core interoperability required through ongoing allied engagement.¹

Today, is a very dangerous, fast pace environment where it is very difficult to predict what tomorrow will bring. Technology is causing revolutionary changes in the way military operations are conducted—the US military is leading the way today in technological advancement. The success in developing technology does not guarantee continued dominance on the battlefield. It will be critical in the future for the US to go to war with multi-national partners—not alone. Today the US enjoys the position of being the leader on the world stage. The US is such a young country and history indicates she may not enjoy that position forever. Therefore, the US must learn to get along with her neighbors. The US will fight from this point on as a part of a “multi-national team.” We must learn how to do that to the best of our abilities. Now is the time for America to build bridges one step at a time. That means we must be interoperable with our multi-national forces. We can do that by ensuring that all of the major commands create offices or cells that work multi-national initiatives. The challenge is looking to the future and determining where to allocate precious resources, our people, time, and money. It will be extremely important that multi-national interoperability be considered at the beginning of the acquisition process through to the JROC. Today’s environment is so complex and

fast paced that the US can not afford to experience delays in capability due to interoperability oversight. There is one thing that has been proven time and time again. When the US is called to duty she goes and she prevails. If the US is serious about multi-national operations she has no choice but to make it a priority now!

Notes

¹ Directorate for Command and Control, Communications, Computers (C4) Systems, J6B.

Bibliography

- A NATIONAL SECURITY STRATEGY FOR A NEW CENTURY*, The White House, December 1999.
- AFTER KOSOVO: IMPLICATIONS FOR U.S STRATEGY & COALITION WARFARE*. 1999 Topical Symposium, National Defense University, November 1999.
- America's Air Force Vision 2020*.
- Enabling the Joint Vision*, The Joint Staff, C4 Systems Directorate, Information Superiority Division, May 2000.
- Headquarters United States Air Force Initial Report: The Air War over Serbia Aerospace Power in Operation Allied Force*, United States Air Forces in Europe Studies and Analysis Directorate. Available from <http://www.usafe.af.mil>
- Hura, Myron, et al. *Interoperability*. RAND Project AIR FORCE, 1999
- INFORMATION SUPERIORITY Making the Joint Vision Happen*, Department of Defense. Available from <http://www.defenselink.mil>.
- JOINT VISION IMPLEMENTATION MASTER PLAN*, CHAIRMAN OF THE JOINT CHIEFS OF STAFF INSTRUCTION, January 2000.
- Krygiel, Annette J. *BEHIND the WIZARD'S CURTAIN: A Integration Environment for a System of Systems*. CCRP Publications Distribution Center, 1999.
- National Defense*, Budget of US Government FY 2001
- National Military Strategy of the United States of America*, CHAIRMAN OF THE JOINT CHIEFS OF STAFF.
- NATO POLICY FOR C3 INTEROPERABILITY*, NATO C3 BOARD INTEROPERABILITY SUB-COMMITTEE (ISC), June 1999.
- NEW WORLD COMING: AMERICAN SECURITY IN THE 21ST CENTURY*. The United States Commission on National Security/21st Century, September 1999
- Precision Engagement: A Collaborative Targeting Process*, A Common PERSPECTIVE, Combat Command Distribution, October 2000.
- Protection of NATO Classified Information Stored, Processed or Transmitted in U.S. Communication and Information (CIS) Systems and Networks*. DEPUTY SECRETARY OF DEFENSE, September 2000.
- REGIONAL OVERVIEW AND CONTRIBUTIONS OF KEY ALLIES*, Allied Contributions to the Common Defense 2000, Chapter 2, March 2000.
- Remy, David. "Interoperability: A Continuing Challenge for NATO." *Politics of NATO*, Air War College, October 2000.
- REPORT OF THE QUADRENNIAL DEFENSE REVIEW*, May 1997.
- Safire, William. "Cold-War Mentality." *New York Times*, Vol 149, pA29.
- Security Requirements for Automated Information Systems (AIS)*. Department of Defense DIRECTIVE, NUMBER 5200.28, March 1988.

Seymour, N. “*GLOBAL SECURITY IN THE TWENTY FIRST CENTURY – THE CHALLENGE TO INTERNATIONAL ORGANIZATIONS, ALLIANCES AND COALITIONS.*” USAWC STRATEGY RESEARCH PROJECT, 1999.

The International Institute for Strategic Studies, Strategic Survey 1999/2000, May 2000.