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AN ANALYSIS OF STRATEGIC PLANNING TO SUPPORT THE UNITED STATES SPECIAL OPERATIONS FORCES' C^3 INTEROPERABILITY

THESIS

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Abstract

The purpose of this study was to analyze the strategic plans of USSOCOM to determine its role in resolving the C^3 interoperability issues. A model using strategic controls and Theory of Constraints was used as a standard to evaluate USSOCOM's management plans. A literature search revealed that hardware and new technology were the primary concerns of previous studies. However, the literature did not address whether the lack of a formal strategy contributed to the C^3 interoperability problems. Therefore, the determination was to adopt a fresh approach to the C^3 interoperability issues and analyze the strategic process.

The data analysis of the study suggests that USSOCOM does not utilize the formal strategy process. However, the cohesiveness of USSOCOM's plans implies that an emergent strategy underlies the coordination and direction of these plans. There was evidence that USSOCOM exercises certain elements of the strategic process.

The study's conclusions indicate that through a better understanding of the strategic process, USSOCOM could develop and maintain more effective strategic plans. The study also discovered that an overall DoD strategic process for C^3 interoperability must be established and maintained before USSOCOM or other agencies can adequately address its individual C^3 problems.

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I. Introduction

Problem Overview

Command, Control, and Communications (C^3) are vital elements of the U.S. defense posture. General John W. Vessey Jr., then Chairman of the Joint Chiefs of Staff (CJCS), said about interoperability "If you can't communicate, you can't command!" (28:59) C^3 has gained notoriety in the last fifteen years in the aftermath of operations *Desert One*, *Urgent Fury*, and *Desert Storm*. Each of these operations suffered setbacks that were a direct result of the Department of Defense's (DoD) inability to communicate among the Services. Special Operation Forces (SOF) were involved in every one of these operations and, like everyone else, they were hampered with C^3 interoperability problems that prevented the efficient exchange of data (14:42-42; 16:69-72; 11:61-70).

Vice-Admiral Jerry O. Tuttle, USN Director, Space and Electronic Warfare, Office of the Chief of Naval Operations, pointed out that during *Desert Storm*, one of the most carefully planned operations in recent history, air orders had to be couriered by fighter aircraft instead of being electronically transmitted to the battle staffs (16:69). This situation was a direct result of C^3 hardware incompatibilities, software glitches, and over saturation of the available airwaves (16:69-72; 22:37-39). Technological advancements in the past two decades have given the U.S. Services the opportunity to procure numerous sophisticated systems and various secure transmission devices. However, the compatibility for these systems among each other or with the existing systems was seldom used as a design requirement. These factors created a new concept for the military, *interoperability*, which is defined as the ability to communicate among or with each member of the group. A simple example of interoperability is the process of communications among the individual members of a tactical team. The example becomes more complex when there is also a requirement to communicate among the tactical teams assigned to a task force. Interoperability shifts upward to this new level and the communication among the tactical team members is referred to as *intraoperability*. This scenario continues to escalate until there is a requirement for interoperable communications among all the DoD Services and with our allies. This interoperability requirement in recent history, especially as a result of *Desert Storm* problems, has become a major concern of the DoD. As a result, in November 1991 the Director of Defense Information tasked the Joint Interoperability and Engineering Organization (JIEO) to define and model interoperability. One JIEO finding was that the underlying cause for the lack of interoperability was determined to be the identification of requirements by Services and Agencies (5:1-4)

General Issue

The effectiveness of the U.S. Armed Forces C^3 capability has been in question since *Desert One*, the failed attempt to rescue American hostages from the U.S. Embassy in Iran. C^3 was cited as one of the major contributing factors to the failure of *Desert One* (30:19). Our inability to quickly transfer secure data from the White House to the front lines created unnecessary delays, aborted phases, and created chaos during the withdrawal (30:19). Likewise, C^3 failures among the Services in the *Urgent Fury*, the Grenada rescue, generated unfavorable media coverage and resulted in the formation of a blue ribbon DoD panel to resolve the C^3 interoperability problems (14:42). According to Adm. Tuttle, C^3 systems were used in *Desert Storm* to micro-manage the war effort, a tasking the systems were not designed for or capable of handling. The resulting message traffic clogged the airways for hours and forced vital data to be couriered instead of electronically disbursed (16:69).

As far back as 1958, President Eisenhower informed Congress that single-service operations were gone forever (28:57). Twenty-three years later, James R. Locher III, Assistant Secretary of Defense (ASD) for Special Operations and Low Intensity Conflict (SOLIC), pointed out that "since the conclusion of World War II low intensity conflicts and threats have been the predominant form of warfare" (33:88). Now that the Soviet threat is lessening, and Third World instability has grown into a major area of concern, Special Operations Forces must "have the capability of being interoperable with conventional forces in multinational settings" (33:88-89). It is imperative that DoD discovers what is preventing or hampering the Services from communicating and electronically transferring essential data during critical missions and combat operations. This study examines the interoperability issue from a strategic planning perspective in hopes of providing ideas so others can solve or at *least control the problem.*

After each of the previously mentioned military operations, the DoD established teams of experts to identify and resolve the C^3 problems. Yet with all the expenditures of time, energy, and funds, the interoperability issues still prevailed and were again a major topic of concern after each operation (14:42; 16:69; 30:19; 33:84-89). The U.S. military has successfully used formal strategies for decades to create battle plans and solve mission planning problems. Yet, in the DoD there is a lack of emphasis or understanding for developing and maintaining formal strategies, similar to those used by businesses and corporations (3:1-6). Often in organizations there is evidence of an **emergent strategy**, which is characterized by a pattern of decisions, but little or no documentation describing why or what direction these decisions are attempting to take the organization. Emergent strategies can be found in most military organization and often are quite effective. However, due to the high turnover of personnel and continuous adjusting of problem priorities, these strategies are either lost or forgotten and must be repeatedly reconstructed. Often the new emergent strategies are a duplication of previous efforts and/or fall victim to the same mistakes as their predecessors, because there is no historical documentation. A recent study has shown that strategies are not only a useful military tool for developing tactics, but that the majority of the *Fortune 500* firms, particularly those which have permanent planning staffs, are engaged in "complete" strategic planning (17:7). Over 35% of remaining firms utilize at least some of the major phases of the strategic planning process (17:7-8). This is an important message not only to other businesses attempting to gain the competitive edge, but also to the military as its organizations continue to align more with their civilian counterparts in an attempt to improve efficiencies. This message's importance will continue to grow as the DoD proceeds to reduce its force structure, emphasizing the need for DoD to capitalize on good strategic planning. The luxury of throwing limitless man-hours and dollars at mistakes is quickly disappearing as the forces and budgets continue to shrink, reinforcing the importance of making the right decision the first time. The fact that strategy is used by an organization does not guarantee an automatic success, but formal planning greatly improves the odds (21:91-102; 17:7-184). By supplementing the strategy process with TOC techniques, for developing and maintaining the decision making process, increases the chances for success. (8:3-21).

Specific Problem

The purpose of this research was to examine the U.S. SOF's current organizational strategy regarding communications interoperability. The primary focus was on USSOCOM's strategic process for managing the interoperability issues within the SOF communities. The C^3 interoperability issues are a concern of all DoD Services. However, USSOCOM was the logical choice for this study, since it is the only major DoD organization that relies heavily on C^3 interoperability for mission success and contains each Service branch. For this reason the findings should be directly applicable to any or all DoD

C^3 interoperability issues. The effort was a qualitative review, limited to examination of existing published documentation. A policy analysis of the documents was performed to evaluate the effectiveness of USSOCOM's strategic management approach in handling their various Services' C^3 interoperability requirements. Additionally, an investigation was performed to determine how USSOCOM's strategic management techniques measured up from a theoretical perspective.

Investigative Questions

The objective of this study was to answer the following investigative questions:

1. What is the state of affairs for C^3 interoperability in the SOF communities?
2. What is the written evidence and status of strategy from a theoretical perspective?
    a. Is identification of the C^3 interoperability problem apparent?
    b. Is there a common understanding of the problem?
    c. Do the current C^3 management plans adequately address:
        1) Current C^3 systems and requirements?
        2) Future C^3 systems and requirements?
3. What, if any, are the structural and control issues?
4. How effective was USSOCOM's planning system in formulating and controlling the strategies?
5. How does USSOCOM measure to the theoretical baseline created from questions 1-4 and what are the implications?

The study was limited to analyzing and reporting on only published or written documentation. Telephone interviews were only used for clarification and guidance to additional documentation.

Scope of the Research

The research was limited to the USSOCOM strategic planning documents that addressed C^3 interoperability issues within the SOF community. Each Service's special operations organizations and the DoD's infrastructure for special operations requirements were examined by reviewing USSOCOM's documentation.

The primary concentration of this study was on the strategic management of communication interoperability issues, while command and control problems were addressed only if they applied directly to communications. Requirement validations or operational justifications were not addressed.

Summary

General background information and problem identification on the C^3 interoperability issues were outlined in this chapter, and the need to use strategic management as an aid in its control was established. The literature review presented in Chapter II provides a detailed background and a historical account of the recent C^3 problems throughout DoD, and substantiates the vital importance of why these issues must be solved. Chapter II also narrows the interoperability issues by focusing on the interoperability issues that impact the SOF community. Chapter III establishes the significance and explains the academic models of strategy and planning used to evaluate USSOCOM documents. Chapter III also describes how these two concepts were integrated for this effort. In addition, Chapter III elaborates on the methodology used to implement this research and the specific investigative questions. Chapter IV outlines the data analysis and the major findings of each research question. Chapter V summarizes each chapter, presents recommendations and conclusions based on the findings, provides an evaluation of the study, and suggestions for follow-on studies. Appendix A contains a list of acronyms and abbrevations used in this document.

II. Literature Review

Introduction

What is preventing USSOCOM and the rest of the DoD Services from procuring and maintaining communications systems that are interoperable? During the *Desert Storm* this recurring communications question again came to the forefront. Command, control, and communications was a major topic of discussion at every level. Commanders could not obtain access to satellite networks, and the maintenance personnel had their hands full setting up and maintaining elaborate communication systems (16:69-72). In 1985, General Vessey, then CJCS pointed out that

> In battle, having ammunition that doesn't fit your weapon or landing at an airfield that can't service your aircraft can range somewhere between embarrassing to downright disastrous. Being in serious danger and being within range of friendly forces but being unable to get help because you can't talk to the other friendly forces is the sort of stuff that causes lives, battles, and wars to be lost. (28:59)

The problem could be attributed to too many sophisticated systems, the lack of a true interservice focal point with the ability to control DoD communication resources and acquisitions, or the absence of a truly effective strategic plan (31:13-14).

Background

General Vessey observed that

> In his April 3, 1958, letter to Congress, President Eisenhower said, "Peacetime preparation and organization activity must conform to (this) fact. Strategic and tactical planning must be completely unified, combat forces organized into unified commands, each equipped with the most efficient weapon systems that science can develop, singly led and prepared to fight as one, regardless of Service." (28:60)

General Vessey uses this citation from President Eisenhower to substantiate his position on the importance of interoperability and jointness. The General believes it is vital that the U.S. Forces be able to operate and fight together—to create a safer world for the people of this nation (28:60). The cornerstone to this goal was one of the major objectives of the Goldwater-Nichols DoD Reorganization Act of 1986 (10:19).

The ability to conduct joint Service operations came under question again after *Urgent Fury*. Despite the U.S. victory and success, it was apparent that the Services had serious problems conducting joint operations. Interoperability was at the heart of the problem. This time Congress believed a reorganization of the Services was warranted. One of the major changes was the formation of USSOCOM. General (Ret) Robert T. Herres, Vice-CJCS, saw his role as the central thread of continuity in weaving jointness and interoperability into everything, particular in making the connection between requirements and the implementation process. General Herres believed he could achieve this connection through his newly assigned positions as the Vice-Chairman of the Defense Acquisition Board and as Chairman of the Joint Requirements Oversight Council (JROC). The JROC's charter is to provide program oversight and monitoring at the front end of the acquisition process to determine joint-program feasibility. General Herres placed special emphasis on fulfilling the requirements of the commanders in chief, while ensuring interoperability, reducing parallel and duplicative efforts, and promoting economies of scale (10:19-24).

USSOCOM's strategies and missions dictate that they have the ability to communicate interoperably and process data at every level of joint and allied commands. At the same time, USSOCOM must fulfill the special C^3 needs of their tactical teams (29:7-9). A good example of how DoD's C^3 strategies did not meet the users' needs occurred during *Desert Storm*. The U.S. Military was supported by literally hundreds of communication systems, yet had to resort to flying copies of air tasking orders to each ship or command center because systems were either not compatible, not available, or not able to handle the workload (16:69). According to Admiral Tuttle, if Iraq had sustained its original jamming capabilities, the resulting complications would have, at a minimum, delayed operations and significantly reduced air sorties (16:69-70). The demand for ultra high frequency (UHF) and super high frequency (SHF) satellite communication systems were grossly underestimated because the U.S. had never had a C^3 system with the ability to track all sea and air contacts (16:69). The efforts to use C^3 to micro-manage the *Desert Storm* were not only beyond the capacity of these communication systems, but also frequently encumbered operations (16:69-72).

Since *Desert One*, the military has been unable to resolve completely the interoperability issues. For the past twelve years operations have been continually plagued with communication systems that were either incompatible among the Services or simply substandard. In Admiral Holloway's report on why *Desert One* failed, communication systems were listed as one of the contributing factors. Strict radio silence kept vital weather information from one aircraft and resulted in an unnecessary abort (30:19). Radio silence was mandated due to the lack of compatible secure radios among the SOF rescue aircraft and the U.S.S. Nimitz. President Carter's requirement to be involved with each phase of the operation also added hours of communication delays between the White House and Southwest Asia. Command and control (C^2), the predecessor to C^3, was mentioned as one of the major contributors that led to the downfall of the operation. The inability to directly transmit and receive data among the White House, the mission commander, and command centers during the mission not only hindered the operation, but was also the contributing factor for the non-destruction of the classified equipment and documents that were inadvertently abandoned at the crash site (11:61-71; 12:140-144; 13:84-91).

Urgent Fury, the code name for the October 1983 rescue of Grenada, was also plagued with severe communication problems. An Army forward air controller who was unable to use his portable system to transmit bombing coordinates to Air Force (AF) aircraft, due to incompatibilities, resorted to using a pay phone to call Fort Bragg, NC, to relay data to the AF. Simultaneously, Army Rangers and Navy Sea, Air, Land Teams

(SEALs) had their assaults hampered by interoperability problems due to incompatible radios. In recognition of the magnitude of the problem, the DoD set up a special group known as the Joint Tactical Command, Control, and Communications Agency to eliminate the inability to coordinate joint Service efforts and solve the problem of each Service having unique systems and communication protocols. Yet during *Desert Storm*, the Services were still hampered with communication problems. Besides the interoperability problems, many of the systems were restricted to night use due to the 120^{o}F daytime temperature, and others suffered numerous equipment failures caused by the desert sand, which can be as fine as talcum powder. These supposedly superior systems of today's military experienced similar incompatibility and insufficient access as the systems which existed twelve years ago (14:42-43).

Electronic Battlefield

The role of communications is no longer limited to using radios to relay messages. In today's battlefield, C^3 electronic systems are transmitting information in various forms and for numerous reasons. These systems have the potential to be encumbered with interoperability problems. The global positioning system (GPS) is a navigation system that receives transmissions from special GPS satellites to locate the user's position within 5 to 10 meters in a horizontal position with a handheld device. Larger, non-portable GPS systems have even greater accuracies and the ability to provide fire control data for airborne applications and targeting information for ground-launch weapons. GPS also provides the calculation data needed for constructing maps of uncharted areas (20:20-22).

Maneuver Control System (MCS) is an integration of computers and communications systems designed to furnish battalion commanders, their staffs, and battalion leaders with the necessary information to execute combat operations. MCS was the Army's primary C^3 system for *Desert Storm* operations. The system has the capability to display charts, reports, maps, or spreadsheets, and with a single keystroke it can transmit the data to 35 different recipients. There are several upgrades projected for MCS that will expand its message handling capacity, allow use of commercial telephone lines, improve transportability, and enhance data analysis proficiencies (20:20-24; 2:45-46).

Other major communication systems employed during *Desert Storm* operations included Joint Surveillance Target Attack Radar System (Joint STARS), Unmanned Aerial Vehicles (UAV), Tri-Service Communications (TRI-TAC), and Mobile Subscriber Equipment (MSE). Joint STARS "is a system used to track hostile units and initiate the appropriate bombing or shelling strikes" (20:18). UAVs provide commanders at lower levels of command with real-time enemy composition data, and are used to adjust fire on targets and to modify attack strategies (20:18-19). TRI-TAC and MSE are communications systems for echelons above the corps level (22:37-29). These and all other communication systems have to be addressed when interoperability concerns are collaborated in USSOCOM's C^3 management plans.

High Technology Debate

Like most problems in DoD, the preferred solution to the C^3 problem is to obtain more highly sophisticated systems to get the latest and greatest. In some cases this philosophy has helped the C^3 problems, but in others it has worsened the situation. John A. Wickham Jr., General (Ret), U.S. Army, President and CEO of the Armed Forces Communications and Electronics Association (AFCEA), believes the military Services have made substantial progress in adopting common communications protocols, a standard operating system, and common hardware. However, he believes more commitment is required to achieve the type of compatibility among the Services and with our allies that will be essential for success in future conflicts. Consequently, a level of technology issue emerges as focus for the debate regarding whether high or low technology systems are necessary and which ones are affordable (31:13-14; 32:15-16).

The next debate is over the use of commercial off-the-self (COTS) and non-development item (NDI) systems. The big question is, "Is it feasible for the military to utilize COTS hardware and NDI to satisfactorily meet mission requirements?" (31:14). Many such systems performed superbly in *Desert Storm* with substantial dollar savings. Yet the military is reluctant to use them because they are not militarized or ruggedized (31:13-14). The performance of GTE's MSE systems is touted as one of the biggest COTS and NDI success stories of *Desert Storm.* The 4.2 billion dollar procurement of MSE has not only saved the Army three billion dollars in acquisition costs but provided them with virtually the entire backbone of the tactical communications network for *Desert Storm* (6:5-7). Several other NDI/COTS systems performed as well as or better than their military counterparts. The performance of these COTS systems strengthens the argument for the Services to procure more COTS systems without the costly MIL-Standard requirements normally associate with military acquisitions. Wickham thinks that before these problems can be resolved, the DoD needs "an agency with the leadership and clout that can focus on establishing policies, budgeting, keeping requirements simple, avoiding waste, strengthening industrial incentives for research, and developing and fostering a strong, ethical dialogue with industry" (31:14). The problem is that interoperability will be more difficult to maintain because COTS technology evolves at a much faster pace and to gain the cost advantage, modifications must be avoided (6:5-7).

In another article, Wickham points out that the U.S. coalition was fortunate that Iraq lost the ability to jam allied communications (32:15). Otherwise, operations would have been severely hampered. The fact that Saddam Hussein prohibited his troops from using radios, and allowed communication by landlines only, resulted in a quick loss of his command and control, as the allies easily destroyed his ground communications. These two factors placed the Iraqis at a great disadvantage and afforded the U.S. coalition unlimited access to the airways and ample time to respond—a luxury that will probably not be afforded in future conflicts. Wickham points out that while most military equipment performed well during *Desert Storm*, communication improvements are still needed for helicopters, heavy equipment transporters, for the avoidance of friendly-fire casualties, and for an airborne means of assessing battle damage (32:16). Admiral Tuttle's concerns over the inability of the AF and the Navy to transmit air tasking orders and access UHF and SHF satellite communications illustrate the need to bolster and maintain basic communication systems and the necessity for future high technology systems (16:69-72).

Pitfalls

During *Desert Storm* the electronic systems were plagued with every expected type failure and several that were totally unforeseen. Software field maintenance, writing or patching software lines of code, normally a major taboo, became common practice in the sand dunes of Saudi Arabia. Hardware failures or incompatibilities often had to be fixed by rewriting the software lines of code on site at the risk of losing configuration control. Maintenance personnel and Signal Commanders resolved issues of integration and verification by developing a priority tasking system. Adequate numbers of MCS and TRI-TAC systems were not available to handle the volume of message traffic. In addition, both systems were troubled with interfacing and compatibility problems. The lack of proper digital conversion systems also hampered issuance of battle plans and air taskings. The majority of digital systems were not able to use analog landlines or switch terminals, thereby contributing to the overloading of satellite systems. Commercial off-the-self-systems also required software "Band-Aid" fixes so they could interface with other commercial and military systems. Daily message counts ranged from 25,000 to 40,000 and would have been higher if the systems were not besieged with these and other interoperability obstacles (22:37-39; 27:61-62).

The Joint Interoperability Engineering Organization (JIEO) study points out that historically the Services and other government agencies have developed their operational requirements in isolation and without a joint plan for assuring interoperability (5:1). They concluded that all C^4I (the successor to C^3, which adds Computers and Intelligence) systems have the inherent potential to interoperate in joint operations and in intra-Service operations. A significant number of the Services are formulating and implementing unique solutions that have not been integrated into the DoD-wide solution (5:1-8).

Future Plans

In the immediate future, satellite communications will take on a new look as non-terrestrial, lightweight, tactical satellites provide multichannel, narrow-narrowband, secure voice or data communications capabilities. This technology will allow deployed commanders in low intensity conflicts to attain secure satellite communications anywhere in the world within 72 hours. Smaller portable systems are currently under test to augment the mobile base stations (23:53-54). According to the DoD's C^3 Systems Center Director, Joseph Pucilowski, "The systems of tomorrow will borrow the best technology to make radios, computers, displays, and other adjuncts of the C^3 process will all but invisible to the users so they can focus on the received information instead of the devices" (2:45-46). Automatic routing, self-mending, graceful degradation, millimeter wave local area networks, and bandwidth linkages are the vernacular of future systems, and all introduce high technology advancements as well as high technology problems. It is imperative that strategic plans address and resolve those potential interoperability problems before the new systems enter the DoD inventories, or the current situation could easily become uncontrollable (2:45-46; 23:53-54).

The JIEO is currently conducting a series of tests and performing modeling simulations on C^4I systems. The results of these tests and the modeling should be available by Summer 1992. The JIEO is evaluating the potential economics to be gained in merging on-going initiatives. Hardware analysis appears to be the major focus of the studies. The JIEO has recommended to the ASD, for C^3I, that FY92 be the last year that new acquisitions and modifications for C^4I systems be allowed to enter the DoD system without adhering to functional application interoperability (5:1-8).

Who is in Charge

The Defense Communications Agency is responsible for managing U.S. defense communications, but delegates most of its authority to each of the Service's communication commands (4:75). The AF is currently reducing its Communications Command from 55,000 people to a workforce of less than 8,000. The responsibilities for field operation communications, computers, and air traffic services will be transferred to the major commands. "This approach is in support of the new composite wing concept, where units supporting a base are united together under the unit they support" (27:62). Gunter Air Force Base will function as the technical management center and information bridge for developing, procuring, and implementing AF communication projects (27:61-62).

The determination of who, how, and when the interoperability requirements will be addressed is still in abeyance. This requirement was recognized before *Desert One*, but its non-existence was cited as a contributing factor to the operation's failure. *Urgent Fury* again demonstrated the need for such systems, and the DoD formed a special team to solve the problem. As a result of *Desert Storm's* communication problems, Admiral Tuttle and Director of Defense Information believe there is still a need for more efficient interoperable systems. This problem affects all branches of the Service, and not just special operations (13:91; 6:42-43; 16:69-72 33:84-90; 5:1-8).

USSOCOM Interoperability Status

USSOCOM is placing special emphasis on developing flexible C^2 systems and integrating communications systems for special operations and conventional forces at every level of command. In addition, USSOCOM recognizes the need to provide expert and technologically advanced C^3 systems to theater unified commanders. It supports communications and data processing capabilities at every level of joint and allied command. To meet the readiness portion of the mission, USSOCOM stresses the importance of exploiting appropriate advanced technologies. The interoperability concerns of USSOCOM have been documented in its management plans (26:1-9).

A knowledge-based "expert system," Communications Link Interface Planning System (CLIPS), was developed by the Naval Electronic Systems Engineering Activity (NESEA) for USSOCOM. The USSOCOM communication planners now have a tool to assist them in assuring the interoperability of the equipment chosen to support each node of the communications chain during a mission. NESEA designed the system to assist SOF communicators to plan rapidly the intra-Service and inter-Service tactical radio communications links in the HF, VHF, and UHF bands. The concept behind CLIPS is to address interoperability during mission planning to minimize communication compatibility problems for Tactical Radios, Modems, Tactical Cryptos, and Data Terminals. The intent of CLIPS is to quickly and automatically provide the planner with the "best" system solution for each node of the communication network (15:1-2--4-2).

James Locher, ASD for SOLIC, believes one of U.S.'s highest priorities is to upgrade and tailor C^3 capabilities for special operations. On the top of his priority list is the joint advanced special operations radio system. The new radio system will provide SOF tactical teams with a reliable lightweight manpack (single person transportable units) which has a low probability of interception or detection, with the necessary secure mode communications capability, and which is jointly interoperable (33:84-85).

Conclusion

Desert One's failure twelve years ago brought attention to a serious communication shortfall, and other recent military operations have continued to reiterate the same shortcomings. The U.S. Services still do not have an answer for achieving interoperability. The U.S. Armed Forces have every conceivable type of communication system in their inventories. Yet this technology has not resolved the problem of basic communications among the Services or maintaining interoperable C^3 systems. The solution for interoperability may be elusive because the Services chase after technology instead of formulating strategies that address and solve the problems. It also might be that no one is really in charge of synthesizing a strategy to resolve the issues.

The AF is decentralizing its communications operations in hopes of providing better service to its wing commanders. Yet, strategies do not currently address how and who is going to assure these wings will be able to communicate with other agencies and who is going to stop them from procuring unique systems that will further compound the current situation. *Desert Storm*, the recent failure of Communism, and the fact that "since the conclusion of World War II low intensity conflict threats have been the predominate form of warfare" (33:89), point out that joint Service operations will continue to be the predominate combat scenario. Therefore, it is imperative that U.S. Services possess totally interoperable communications systems.

The first logical step is to conduct a survey of USSOCOM's various communications entities, perform a thorough examination of current regulations and policies, and analyze why current strategies and management efforts have been unable to achieve the compatibility necessary to support the interoperability requirement. This information will assist the formulation of recommendations to help determine the best management approach for USSOCOM to gain greater control over the interoperability issues.

III. Methodology

Chapter Overview

This chapter introduces two management techniques and explains how they will be integrated for the purpose of this study. These techniques were chosen for their ability to assess the C^3 interoperability issues and for their potential to establish and maintain strategies and address most organizational problems. The remainder of the chapter describes the methodology used to analyze USSOCOM's strategic approach to the interoperability issues associated with communications and electronic transfer of essential data, during critical missions and combat operations. In order to focus the study and yet still provide a true picture of interservice communication interoperability problems within USSOCOM, the study was limited to published documents that reflect the strategy or tools used by the USSOCOM headquarters staff. The sample population was USSOCOM's C^3 staff, which has the responsibility for all interoperability issues.

USSOCOM's structure includes each DoD Service and represents a realistic picture of the interoperability issues that impact each Service separately and jointly. The SOF community was also chosen because it is the only DoD branch whose day-to-day operations require interservice communications. This choice should allow the findings and arguments of the study to be applicable to the overall DoD interoperability issues without any unnecessary extrapolations.

The specific problem is to evaluate USSOCOM's current organizational strategy regarding communications interoperability. The primary focus is on USSOCOM's documented strategic process for managing the interoperability issues within the SOF communities. The effort was a qualitative review limited to the examination of existing published documents. A policy analysis of the documents was performed to evaluate the effectiveness of USSOCOM's strategic management approach in handling the various

Services' C^3 interoperability requirements and their different C^3 applications for special operation missions. Additionally, an investigation was performed to determine how USSOCOM's strategic management techniques measured up from a theoretical perspective and the Theory of Constraints (TOC) planning model. TOC's five-step approach and cause and effect analysis were used to evaluate how USSOCOM established and controled its strategic plans. The TOC concept has the ability to address other future organizational problems. TOC was applied in this study because of its ease of implementation, diverse applicability to any organization, capability to act as a catalyst for other management approaches, short learning curve, and powerful problem solving abilities. Together. strategic management and TOC offer an organization and its managers the tools necessary to address effectively and efficiently the interoperability problems or similar issues (7:3-121; 5:3-35).

Several investigative questions were used to ascertain if USSOCOM has an effective strategy addressing the C^3 interoperability problems. The first investigative question examined the current status of interoperability in USSOCOM by asking, "What is the state of affairs for interoperability in the SOF communities?" The second investigative question, "What was the written evidence and status of strategy from a theoretical perspective?" elicited the following questions:

1. Is identification of the C^3 interoperability problem apparent?
2. Is there a common understanding of the problem?
3. Do the current C^3 management plans adequately address:
   a) Current C^3 systems and requirements?
   b) Future C^3 systems and requirements?

Question three focused on the strategic management and administrative portion of USSOCOM's strategy: "What, if any, were the structural and control issues?" In the fourth question, USSOCOM's strategic methods are assessed using a new management philosophy: "How effective was USSOCOM's planning system in formulating and controlling the strategies?" The final investigative question provides an overall appraisal of the current strategies as it asks, "How does USSOCOM measure to the theoretical baseline created from Questions 1-4 and what are the implications?"

The research was limited to C^3 interoperability issues within the SOF community. Each Service's special operation organization and the DoD's infrastructure for special operations requirements were examined by reviewing USSOCOM's documentation. The primary concentration of this study was on communication interoperability issues, while addressing command and control problems as they applied to communications. Requirement validations or operational justifications were not addressed.

Strategic Management

The word *strategy* conjures up many different meanings, especially for DoD organizations and personnel. The current DoD practice is to use strategies to document requirements by outlining the overall objectives of an organization. Often, when these plans or solutions are implemented, they are disappointing and frequently leave the situation worse than if nothing had been done. Managers seldom use the best available methods to achieve an understanding of what their goals should be and how to use resources to solve their problems (3:5-20; 18:1-11).

Like many other government agencies and non-profit organizations, the DoD has attempted to apply business strategy concepts in an effort to improve its effectiveness. Unfortunately, strategic management concepts are still relatively new and poorly understood disciplines in many DoD organizations. Initial efforts have not always met with full success (3:5). For purposes of this document, strategy will be synonymous with the business view of strategy which is: "a major force that provides a comprehensive and integrated blueprint for the organization as a whole" (9:2) and not the traditional military concept which focuses primarily on warfighting strategies and battle tactics. In many organizations, it is more important to manage today's problems than to document strategies that address how problems will be attacked, or how the organization will progress into the future. The situation is further intensified by the limited staffing of organizations that should be publishing strategies. Frequently the data analysis workload is either perceived as or actually becomes so large that it is impossible for managers to provide reasonable attention to the strategy process without neglecting their normal duties (1:38). These circumstances are becoming worse in the Armed Forces as personnel draw-downs continue and more emphasis is placed on the operational units. It is vital during the Armed Forces' period of restructure to a "leaner and meaner" military force that DoD gain a better understanding of the power of strategy and its potential as an effective management tool. Often strategies address only the mission or highlight the perceived objectives of the organization. Most DoD managers are quite capable of recognizing the main objectives of their organizations, but frequently lack the skills to properly document these objectives and control them with effective management strategies (1:37-39; 3:5-116; 17:7-239).

Recently, strategic planners and management theorists have refocused their attentions on a concept called *strategic control.* This new emphasis is a direct result of organizations experiencing difficulties in responding promptly to planning failures and unexpected developments. The cause of these failures is often attributed to lack of valid information pertaining to the strategic plan. Theorists suggest that managers must evolve the classical feedback process of strategic control to a model, whose framework provides a feedforward information network. This philosophy will move managers from a post-action or reactive mode of dealing with strategic actions to one of real-time intervention. The problem with waiting for feedback is that the information is not available until the strategy has been totally implemented. Often this feedback data is misleading because the circumstances for which the strategy was originally calculated have changed significantly, thus rendering the strategic controls obsolete and missing the opportunity or flexibility to respond accordingly (17: 91-101).

Because it is impossible to develop a strategic plan that will never require corrections or updates during the planning period, it is imperative that managers be able to revise their control philosophies in real time and react with the proper contingency activities. The ambiguity of strategic planning is further intensified as the complexity of the plan increases or as the plan's duration grows. These conditions make it even more important that managers develop a feedforward approach to formulate and maintain their strategic plans (17: 91-100; 3:5-30).

Georg Schreyögg and Horst Steinmann have developed a three-step model for strategic control that capitalizes on the use of the feedforward process. The strength of their model is that strategic control is no longer merely an adjunct to the planning function, but is used real-time to evaluate progress and adjust the plans as necessary. Strategic controls are no longer used only to determine if the actual performance is progressing according to the plan's standards, and as the last step of the strategic planning process. Schreyögg and Steinmann believe that control should be seen as a vital, continuous process that begins with the formulation of the plan and continues throughout the plan's life. Strategic control continuously reviews the validity of the plans and evaluates the time and effectiveness of the response options in order to redirect the organization's plan for the highest gains. Schreyögg and Horst see planning and controlling as countervailing processes that are simultaneously performed (17:91-100).

Their initial step is *domain definition;* the strategic process begins by formulating a strategy that is based on the prioritization of one specific domain and then collaborating the succession of selective acts to accentuate the plan's effectiveness. Strategy formulation begins at time t_0 (see Figure 1 for visual picture of the control process [17: 91-101]).

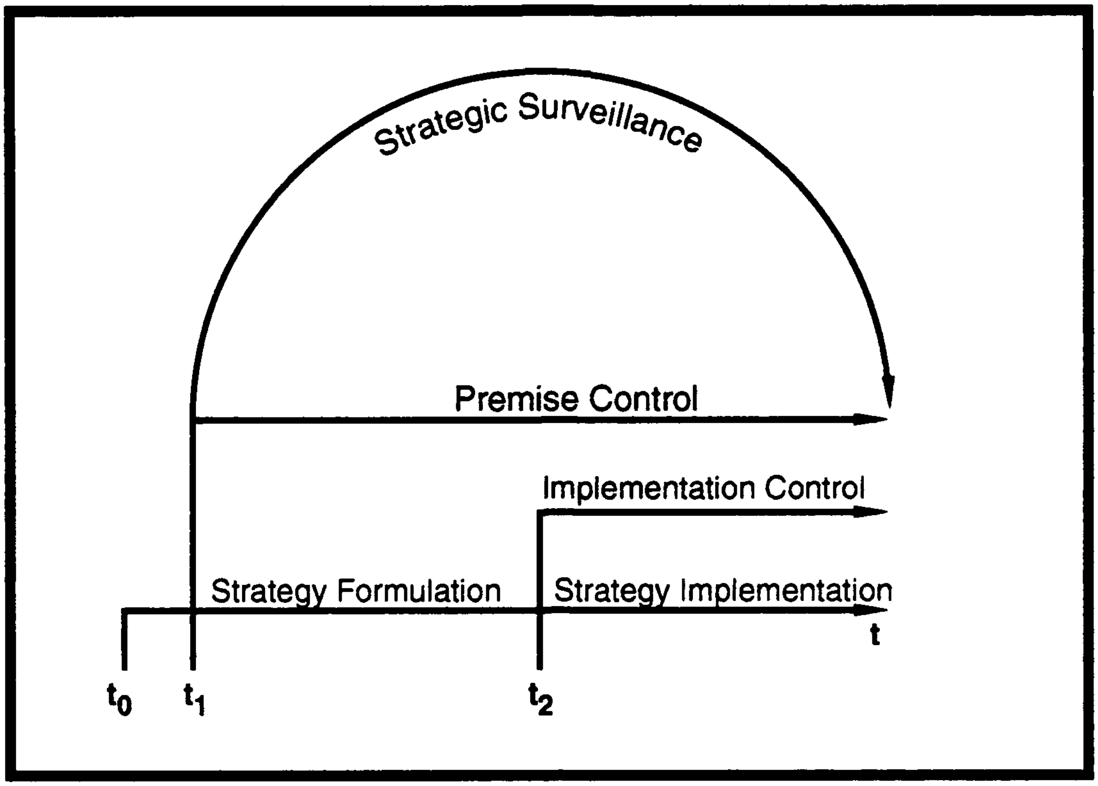

Figure 1. Strategic Controls in the Strategic Process (17:96).

The first task of the strategic control process is to monitor the premises established during the planning phase. **Premise control** is established when the premising process begins and continues as a vital part of all future steps (premise control begins at time t_1). Premise control allows the planner to observe the ambiguities of complexities and uncertainties caused by the internal and external environments during the life of the strategic plan. The purpose of premise control is to check systematically and continuously whether or not the premise (assumptions) conceived during the planning and implementation processes are still valid. It is recognized that premising in itself is inherently misapplied due to the complexities of the internal and external environments. Also, because it is impossible to predict the future or have insight for all the unknowns, there must be a means to detect, address, or foresee situations that might influence the critical factors and events. Therefore, the *implementation process* is used as a source of information (17: 91-100).

During the implementation process, the critical factors and events have the most potential to hamper actions or distort results. As the implementation process of the strategy begins (at time t_2 in Figure 1), so does the third control source of feedforwarding information, **implementation control**. The role of implementation control is to allow planners to determine if the whole strategic course should be altered considering past events. This role does not suggest that operational control is replaced by implementation control, or that it is no longer required, both are important to managing the strategic process. The implementation control process alone cannot identify all the threats, especially those that are not yet affecting the implementation process. Also, there must be a means of measuring the effectiveness of the implementation process. For both reasons the second step, *strategic surveillance*, is recommended (17:93-100).

Strategic surveillance acts as a safeguarding control device that gives a broad picture of the activities (strategic surveillance begins at time t_1 in Figure 1). Strategic surveillance should act as an overarching control device that continuously monitors and provides a security buffer of the implementation and premise controls. Surveillance must be kept as unfocused as possible so it can assure that the detailed steps of the other two controls are maximizing the situational circumstances (making the best of the situation) (17:93-100).

Organizations must be prepared to systematically establish their strategic course and document it carefully. They must then continuously question and reevaluate their strategic plan's itinerary throughout its existence. To meet this challenge, organizations require individuals who have extreme fortitude, exceptional independence, high tolerance for frustration, and egos that allow them to search for and recognize their own errors. Also, organizations must accept that strategic control is resistant to extensive formalization and centralization due to the irregular and discontinuous flow of data and its highly ambiguous state. However, for implementation control, rules are needed to determine who should measure what results and when. To meet this need effectively, managers should establish predetermined milestones as well-defined control objects. The process for all three controls is the same in that they require diagnosis, data exchange, validation, interpretation, and impact analysis. This effort should be done as an organization group effort and not by one or two individuals. It is important that final decisions reflect the best interest of the system as a whole and not just a select few functional areas (17:91-101).

Only published documents that reflected USSOCOM's C^3 interoperability strategies were evaluated. The non-documented, or emergent strategies, would have required classified interviews or questionnaires to adequately quantify their significance in the strategic planning process. This effort could only be conducted at USSOCOM and each Service's special operations headquarters, groups, wings, battalions, squadrons, and units, and thus was beyond the current administrative capabilities of this study. A few emergent strategies were considered because they assisted in clarifying the objectives of the documentation, provided greater insight into the issues at hand, and helped to provide an appreciation for the use and purpose of CLIPS.

The strategy process requires more than a means of control; it also requires a method of clearly focusing on the proper objectives and effectively applying the resources to accomplish the organization's goals. There are numerous management approaches being touted today as the technique that surpasses all others, but most often these approaches are specialized and produce results only after a tremendous expenditure of time, energy, and resources. One approach, which is quickly gaining popularity and high-level endorsements, is Theory of Constraints (TOC). TOC has the capability to solve virtually any organizational problem. The power, simplicity, ease of implementation, quick results, and common sense philosophy are just a few of the reasons TOC was selected for this study.

Introduction of Theory of Constraints

In 1984, Eliyahu Goldratt introduced the world to his system for organizational management, "Theory of Constraints," with his book *The Goal.* Goldratt wrote his management text in the form of a love story using the Socratic method to entice the readers to accept not only his ideas but also to stimulate the reader to invent and take ownership of ideas that substantiate Goldratt's position. General Ronald W. Yates, Commander of AFMC, points out in one of his system acquisition policy letters, the vitality and power of TOC. General Yates advocates TOC as the tool to develop information and to continuously improve processes by searching for organizational policies and practices, whether self-generated or government imposed, that reduce throughput and/or increase its investments and/or operating expenses (30:1).

Theory of Constraints is a philosophy that helps individuals verbalize their own intuitions in order to solve organizational problems. TOC allows managers to address organizational problems from a scientific perspective. Some tenets of TOC have been around for a long time, going back over 2500 years to the Socratic method. However, its current foundation started about seventy years ago with Henry Ford's approach to management and production. The concepts of TOC are harmonious with many of today's latest management concepts: just-in-time (JIT), synchronous manufacturing, quality, manufacturing resource planning (MRP), customer satisfaction, total quality management (TQM), competitive edge, effect-cause-effect, simulations, and throughput. The TOC axiom concentrates on taking advantage of these concepts' best attributes, verbalizing their philosophies, and sprinkling in a good dose of common sense (8:16-125; 25:7-134). Simply put, TOC is identifying the goal (objective) of an organization, discovering what is preventing or hindering the successful achievement of that goal, then systematically eliminating or reducing that hindrance's impact. New hindrances are repeatedly discovered and minimized in a continuous search to improve the system.

Theory of Constraints is a way of thinking that does not honor any "sacred cows" (including regulations, policies, and standard operating procedures). When it comes to problem solving, TOC advocates that every approach is worthy of exploration. Theory of Constraints advocates that managers should always remember that what was the right answer for yesterday's problems may not be the right answer for today's obstacles, and that all options should be scrutinized with an open mind. As with most philosophies, TOC is not a procedure that is mastered overnight and requires some effort to understand and implement properly. Unlike other management techniques, TOC supplies managers with tools that help produce results immediately, in contrast with other systems, such as MRP and JIT, which regularly require a complete overhaul of the current operations, often taking several years to implement, and even longer to reap the results. Also, unlike other concepts that will only benefit certain organizations, TOC is applicable to any organization (8:4). Theory of Constraints has several definitions that must be understood to gain a complete comprehension of what TOC is and what it is trying to accomplish. A few key definitions that are pertinent to this study and USSOCOM's interoperability issues, from a manufacturing business and a government agency perspective, are as follows:

1. **Goal**—for any business is to make money. For DoD, it is to meet the users' requirements and, when appropriate, keep costs to a minimum.

2. **Constraint**—for any business it is any element that prevents the system from achieving the goal of making more money. For DoD, it is anything that keeps or limits an organization from obtaining the goal and achieving better performance. (Note: Every organization or program has at least one constraint and it is likely to change over time.)

3. **Non-constraint**—is anything that is not presently a "Constraint," but that could become a constraint if mismanaged. Also, once the system is changed to manage the current constraints, the non-constraints could become constraints.

4. **Capacity constraint resource (CCR)**—is any resource whose utilization must be properly scheduled and managed. Otherwise, the organization's operation will most likely deviate from the planned product flow or cause a program disruption.

5. **Throughput**—for any business is the rate at which money is generated by the system through sales. For DoD it is the velocity and volume at which an organization achieves its ideal objective.

6. **Inventory**—for any business is all the money that the system has invested in purchasing things it intends to sell. For DoD it is the value of the components an organization has invested, in order to generate or fulfill the ideal objective.

7. **Operating Expense**—for any business is all the money that the system spends in order to turn inventory into throughput. For DoD it is the cost to maintain all the support required to turn inventory into throughput (7:3-100; 8:3-39; 25:80-124).

Managers must understand these definitions of throughput, inventory and operating expense so they can utilize them as metrics for evaluating the local impacts of their decisions on the organization's overall goal. An ideal solution would improve the system by increasing throughput while decreasing both inventory and operating expenses. For a decision to be considered correct it does not always have to render these exact results. In some cases it could be acceptable to see small percentile increases in throughput and large percentile increases in inventory or operating expenses or even possibly both. A commercial example would be increasing the advertising budget (operating expenses) to increase sales (throughput). The decision is considered to be good, as long as the increased sales more than compensate for the increased advertising expenditures. The justification of increasing either inventory or operating expenses is usually predicated on value of the increase in throughput, but could be weighted by customer satisfaction, market share, short term benefits versus long term objectives, or several other management objectives. The key is how well does the decision align with the company's goal. Goldratt's management viewpoint prioritizes the importance of his metrics: throughput, inventory, and operating expense. This view is in contrast with the traditional management philosophies' prioritizations of operating expense, throughput, and inventory. The government frequently takes this traditional approach in an attempt to save money, but often ends up spending additional funds or not achieving its objectives (7:3-39; 8:3-9; 25:80-101).

The interoperability issue is a case in point. In an attempt to minimize expenditures or operating expense, each Service and frequently its components are allowed to procure, in isolation from the other Services, communication systems tailored to its specific requirements (5:1-8). Instead, DoD should focus on the throughput aspect, of achieving interoperability among the Services. The initial expense to acquire the systems may seem greater as the DoD attempts to meet every user's requirements simultaneously. However, this type of acquisition approach would have overall savings for DoD and interoperability because interoperability would be built in from the beginning, instead of reverse-engineered after the fact. A joint DoD acquisition for a radio system is one example. The DoD could insure that the system fulfills each user's requirements while achieving interoperability, instead of allowing each Service to procure its own unique radio. The initial cost may seem greater, but the Services could pool their funds and they would no longer have to spend funds to remedy interoperability issues for that system. On a smaller scale, USSOCOM could use the same acquisition approach with its SOF C^3 procurements.

TOC managers use the following steps when explaining how they implement Goldratt's systematic approach to improve system performance or resolve their organization's issues:

1. Identify the constraints in the system.
2. Decide how to exploit the system constraints in order to improve the performance of the system.
3. Subordinate everything else to that decision.
4. Elevate the system's constraints and carry out the steps necessary to improve the performance of the system.
5. If, during the process of the previous steps, a constraint has been broken or new constraint develops, go back to step 1 (8:3-8; 25:80-106). If managers are properly implementing these five TOC steps, their systems will be in constant revision, because if an organization is to genuinely improve, it must do so constantly or it will fall behind (7:3-39; 8:3-9; 25:80-101).

To consistently make the correct decisions, the first step must be to identify the constraints in the system. This step also includes the prioritization of the constraints according to how they impact the goal, while ascertaining what is in short supply. Short supply means to the extent that an item limits the entire system. Non-constraints must never delay or stop the throughput of a constraint (8:3-14 25:98-101).

Developing the best possible strategy is the next step, focusing on how the constraints must be exploited and managed to minimize their limiting characteristics. The vast majority of an organization's resources are non-constraints and should be managed so their utilization maximizes the throughput of CCRs. Managing the non-constraints to supply anything more than the CCR is capable of handling is fruitless, because the system is bound to the limitations of the CCR (8:3-14; 25:80-101).

The objective of the third step is to implement the strategy of step two in the best possible manner. It is important to recognize during this step that actions that are not directly sustaining the strategy will either artificially limit throughput, if they are less; or create excess inventory, if they are more than required. All resource utilization should be evaluated on how well it supports the chosen strategy (8:3-14; 25:80-101).

In the fourth step the aim is to break the current constraint. Upper management must be involved and take the necessary steps to improve the system to the point that the current constraint is no longer limiting the system. Often policies require changes or procurement of new or additional equipment is necessary. Tradeoff analysis must be done to determine what is the best alternative for the system (8:3-14; 25:80-101).

The final step applies when the constraint is broken or if a new constraint has developed as a result of previous actions. At that point, the manager must go back to step one, and repeat the process. It is dangerous to assume that the system will operate after a single change has occurred. The system must be continuously reevaluated for new constraints and to improve the operation. It is not uncommon to discover that policies established for yesterday's problems are now creating unnecessary obstacles in resolving today's problems.

Managers must not allow inertia to create a system constraint or become complacent with their successes, but constantly strive to improve their systems. Japan's recent success in the U.S. business industry has lured American companies in to a new corporate trap. Frequently corporations, in an attempt to cash in on Japan's success, are copying Japan's techniques with no consideration for their own company's uniqueness. The fallacy with this practice is that a competitor's approach does not take into consideration the strengths and weaknesses of other companies. If managers are going to use a competitor's approach, they must tailor it to address the constraints of their own company. Figures Two and Three illustrate what happens if managers simply wait to copy their competitors' practices, even if those practices are right. The diagrams illustrate how the managers' organization will lag the competition and overtime the gap will increase, causing them to fall further and further behind (8:3-14 25:80-101).

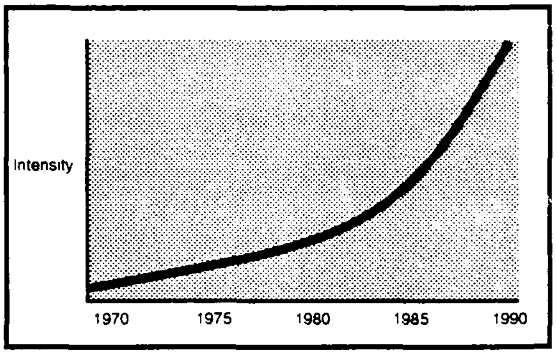

Figure 2. Demands Placed on a Company Over Last Twenty Years (8:12).

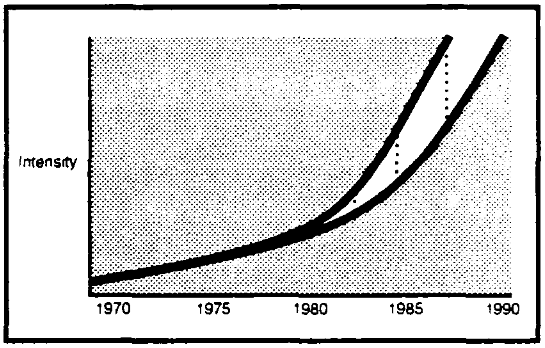

Figure 3. A Company Copying a Competitor's Actions (8:13).

In keeping with the Socratic method the following three steps summarize the five-step approach:

a. What to change?

First pinpoint the core problem.

b. What to change to?

Construct simple, practical solutions.

c. How to cause the change?

Induce the appropriate people to invent such solutions (8:19-21).

It is often easier to recognize what must be done to improve the system than it is to motivate the people involved to react favorably to the change. Managers have many obstacles that must be overcome before any successful change can be implemented. One of the most difficult obstacles to overcome is people's reluctance to accept change, even when they recognize the benefits. The next obstacle is individuals' tendency to claim, "It is not my problem." A third major obstacle is that the usual method individuals use to prove something is simply not effective. Employing TOC's Socratic method of inducing individuals to invent their own solutions, regardless of whether it is directly under their control, has proven to be quite effective, because those individuals are now substantiating their own solutions to themselves. By using their own proof, people are less likely to reject the solutions and more apt to support and defend the changes. A tool that easily transitions and leads people to inventing their own ideas, while exploiting the constraints of the system, is Cause and Effect Analysis (8:3-22).

Goldratt promotes using a scientific approach to finding resolutions. This approach applies intrinsic logic to a given situation or problem, instead of the normal management style of using examples or references to discover or substantiate the solution strategies. This Socratic method of proof is called *Effect-Cause-Effect* (ECE) and is used extensively in the physical sciences. ECE was used in this study to analyze USSOCOM's strategic approach to solving the interoperability issues. There are three distinct stages that every problem must go through if the most correct solution is to be formulated: classification, correlation, and effect-cause-effect (8:22-36).

The technique of **classification** began in prehistory with the most ancient of sciences, astronomy. The ancient Greeks developed the most popular set of classifications during their studies of the stars, when they segmented the skies into twelve astrological sectors that they referred to as the signs of the Zodiac, and are still cited today in astronomy and horoscopes (8:22-36).

Ptolemy of Alexandria is given credit for starting the first known **correlation** over 2000 years ago. He established that the planets move along a circle, whose center moves along another circle, whose center is the earth. Even though this correlation was later corrected, it was quite elaborate and profound even by today's standards (8:22-36).

The third stage, **effect-cause-effect**, was the creation of Sir Isaac Newton (and probably the inspiration for a current popular beer commercial "Why ask Why?"). Newton's doctrine of searching out the question, "Why," is believed to have started with his discovery of the gravitational law, when he asked "Why do apples fall straight to the ground rather than fly off in another direction." Newton's persistence in discovering the logical cause for this phenomenon instead of accepting "because that is just the way it is," not only led to his discovery of the gravitational law, but also the birth of the scientific "proof," opening a new dimension to science and taking humans out of the role of just being observers. Past experience was no longer the only tool. Now through the use of logical derivations based on existing causes, one could predict the outcome of effects and entirely new situations. It is only once the effect-cause-effect is established and the logical deductions or explanations are solidified, that the subject of science is fully recognized. Goldratt has successfully demonstrated over the past eight years that this approach is not only applicable to the study of sciences, but is a highly effective tool for managers or organizations in resolving any problem, implementing the five-step method, or achieving the goal. An immense advantage to this approach over other management approaches like MRP and JIT, is there is not the enormous requirement for data, time, training, funds, and total revampment of the existing systems. Using cause and effect as a tool in implementing the TOC five-step technique, in contrast to JIT or MRP, allows an organization to quickly discover resolutions and benefit immediately from its chosen course of action (8:22-36).

The ECE analysis can be described as a process of speculating a cause for a given effect and then validating its existence by predicting another effect stemming from that cause (8:32). Performance problems, whether they are communication interoperability deficiencies or other technological issues, are usually resolved by engineers who are accustomed to solving problems in a scientific manner. They should be comfortable with the systematic steps of cause and effect analysis. The process begins by listing at least five and no more than ten undesirable effects (UDEs) pertaining to the current system. The UDEs are simply items or symptoms in the current system that are either bothersome or unacceptable. The technique is to systematically dissect the system, searching for the causes of each component or UDE, and their relating effects to the other components to discover the core problem. Diagramming the problem by putting each component in its own individual box and using connecting arrows to show cause and effect relationships of inputs and outputs provides a visual picture that can be easily interpreted and often resembles a tree with a multitude of branches. The objective is to expose the root cause of the situation so the entire tree can be nurtured instead of just treating the symptom, a branch or some leaves (8:3-36; 7:3-136).

The procedure for checking the solution is to reverse the process. If a certain corrective action is chosen, its predicted reactions are traced through each component and its effects on the components they affect and the process is repeated or followed through until there are no longer any components affected. The resulting picture provides the manager with a tailored illustration of the system that is used to identify and exploit the limiting factor (constraint or highest risk item), and thus performance is tracked and measured by risk. The manager's portrayal of performance risk is then focused and easily documented and is constantly ready and available for the next review. Another reason to use cause and effect trees for risk reviews is that people are easily convinced by this type of analysis. The purpose for supplying the complete thought process is individuals are more confidence with the findings. The thought process includes the entire logical flow: hypothesizing reasons, deriving the resulting different effects, checking for their existence and when not finding them; changing the hypothesis (8: 35). Cause and effect trees are also applicable for cost and schedule problems. However, the analytical and systematic process may not be as easy for accountants or forecasters to accept.

Goldratt's TOC organizational management concepts are capable of acting as a catalyst to any management philosophy and advocates the formulation and implementation of strategies. This capability was the main reason for choosing TOC to assist in analyzing and evaluating USSOCOM's strategy for interoperability.

Strategic Management Utilizing Theory of Constraints

The concept of managers including strategies, particularly when it encompasses a feedforward strategic control model, in their management arsenal is not only compatible with, but is significantly enhanced when TOC's five-step process, the ECE analysis, and the metric are integrated into the process. The five-step approach of TOC and its use of ECE analysis, when applied to formulating and controlling strategies, will provide managers a clearer, more systematic, and efficient technique for developing, implementing, and monitoring their strategic plans. The art of becoming more than just an adequate strategic planner is almost as difficult as finding a definition of strategy that most theorists would agree upon, because the guidelines are either obscure, ambiguous, or too rigid to be used in any area other than originally intended. Strategic planning will become increasingly more flexible and simpler to apply when it is integrated with the TOC philosophy. The five-step process of TOC can be merged harmoniously into strategic planning (7:79-222 8:3-36; 17:91-102).

Before beginning the five-step process or attempting to formulate a strategy, managers should first identify the organization's goal and define the domain. The ECE analysis is an effective tool for verbalizing the situation, identifying the expected state, and establishing a basis to check assumptions or premises. The resulting ECE diagram is referred to as a *current reality tree*. The objective of domain definition is to transform the complex problems of a system's survival into a set of long-range objectives by prioritizing one specific domain. Once the ECE diagram is built, the constraints and objectives of the organization become clearly visible and create a starting point for the modified five-step process to take over. The detailed procedures for developing and utilizing current reality trees and the ECE analysis can be found in Goldratt's books *Theory Of Constraints* and *The Haystack Syndrome* (7:79-222 8:3-36; 17:91-102).

1. Identifying the constraints in the system, or the domain, becomes the first step. Goldratt's use of system is interchangeable from Schreyögg's domain definition. Theory of Constraints focuses this step into identifying the one thing that is preventing the system from achieving the ultimate goal and working on it first. The TOC methodology requires

the focus to be on one issue at a time. This type of focusing provides more concentration on the individual constraints and enhances both present and future controls. Including this type of detail in the strategic plan and then updating with the feedforward information provides an excellent road map and historical record of where the system was supposed to go, versus where it actually went, while explaining how the decisions were made along the way. In DoD organizations, where constant personnel turnover is common, such a document would also reduce the amount of time new managers needed to understand the system, as well as provide them with a lessons-learned data base, precluding the repeating of the same mistakes. This overall strategy approach identifies the constraints that are preventing system success and chooses the one that is the foremost problem. The manager then concentrates on eliminating the constraint until it is no longer a problem and then converges on the next constraint. It is important to remember that TOC addresses only one constraint at a time, because as one is solved others may no longer be an issue, or there may be a change in order of importance, or a new set of constraints may appear (7:79-222 8:3-36; 17:91-102).

2. Deciding how to exploit the system constraints in order to improve the performance of the system will establish the original premises. Managers must align the premises to the corresponding exploitation decisions and then assign personnel or departments to monitor systematically and continuously, whether or not the premises remain valid. In doing so, premise control is initiated and the feedforward process begins. The ECE analysis used to created the current reality tree addresses the internal and external environments in such a manner that premises are a direct fallout. In fact, managers should be able to reduce a significant amount of the misapplication commonly associated with the premising process and select the proper alternatives by supplementing their decision process with the ECE analysis. The strategy will then not only be a historical record that documents the thought process, cause and effect diagrams, and strategy plan decisions, but

a detailed road map. This information can be used to reevaluated the system in case the chosen course did not achieve the desired results. Additionally this information supplements the lesson-learned database. (7:79-222 8:3-36; 17:91-102).

3. The next step, subordinating everything else to step two's decision, is an important intensifying point of TOC that most strategic theorists underplay. In strategic management the chosen course of action is normally referred to as global guidelines or general guidance (17:91-95). In contrast, TOC theorists contend that actions must support focused improvements and emphasize the importance of concentrating on only one issue at a time. This type of discipline allows for expedient results and greater control of the system. Attempting to resolve several non-constraints simultaneously will result in either over- or under-expenditure of resources creating an imbalance of inventory or operating expenses (25:80-101). For this reason, this study recommends focusing on one constraint at a time.

4. Goldratt's fourth step, "elevating the system's constraints and carrying out the steps necessary to improve the performance of the system," is synonymous with the strategy implementation process. In this step, Schreyögg's concept of using all three control functions—strategic surveillance, premise control, and implementation control—to monitor the progress of the strategy execution as a feedforward data tool enhances the TOC process. The **strategic surveillance** is a broad monitoring activity providing a big picture view without focusing on any one particular area. **Premise control** commences with the first step when it begins monitoring the validity of the assumptions created during the planning process. Its role is now expanded to include monitoring the assumptions of the implementing process. The role of **implementation control** is to safeguard the system by identifying critical strategic threats in the early stages and then in a less selective fashion measure the effects of the implementation on the process. Implementation control will supply feedforward information to the managers so they will have a more accurate

picture of what to expect as the new constraint in step 5. This early notification will provide managers an extra cushion for their response times. The feedforward data, accumulated by the premise control's postulation focus established during the initial and implementation phases, keeps the managers informed on the status of their assumptions. In addition, the control information could be used to update the cause and effect analysis or evaluate the potential impacts of new ambiguities identified in the collection of actual data from the on-going actions. Both would immensely help to reduce future risk (17:91-103).

5. If during the process of the previous steps, a constraint has been broken or new constraint develops, then go back to step one. Like step three, this discipline provides structure and focus for the overall implementation and updating of an organization's strategy. If during the process, the constraint is rendered to a non-constraint status, or if during the course of action a new constraint appears, only then should managers consider changing their current procedures and begin working on the system's new constraint. This type of discipline keeps the manager's efforts focused while eliminating the potential for multiple actions. If this regimen is not maintained, then the process itself can easily introduce new problems. The effects of these new problems often cannot be segregated from the current constraint, causing the managers to aimlessly move from one problem to another without achieving the organization's goal. Again, it is important to remember today's solution may not solve tomorrow's problems (7:79-222 8:3-36; 17:91-102).

Integrating Schreyögg's strategic philosophy with Goldratt's TOC approach to problem solving equips managers with a means to measure and quickly assess the current system's situation and build and maintain a strategy that will advance their organization towards the appropriate goal. This integrated approach is also a valuable tool for evaluating current strategies and decision processes. The insight gained from the ECE trees is enhanced significantly when the actual system managers participate as information sources and evaluators for the alternative selection process. This urging for participation at every level, from worker to corporate manager, does not decree management by committee or consensus, but affirms that including the human resources, within reason, will improve the alternative selection process (8:3-36).

Specific Methodology

The nature of the C^3 problem required that the research focus on specific issues. Otherwise, the study would have become too widespread and unmanageable. The qualitative questions under investigation required that the personnel directly involved with SOF C^3 provide the necessary direction or clarification needed for interrupting the actual issues and documents, and without introducing any personal biases or opinions. Qualitative questions were used only to gain insight, and a literature review was conducted to evaluate the culture (attitudes, perceptions, environment, and how business is conducted) and the structure (administration, control, objectives, and dissemination of information) of USSOCOM's strategic planning process while ascertaining if any of the problems with C^3 are created by procedures. The sampling was limited to USSOCOM's C^3 personnel and their documents.

The first investigative question, "What is the state of affairs for interoperability in the SOF communities," looked at how the documentation projected the significance of the problem, its current status, and overall view. Various documents were reviewed and their strategies were analyzed to determine if they portrayed the same problem, and if their strategies were supportive of each other. The urgency and priority of solving the various issues were also reviewed to see if they tracked to the next level and kept the same level of importance.

The second investigative question, "Evidence and status from the theoretical perspective," is actually several questions which combine to determine the overall condition. The questions differ from the first question in that now, the viewpoint is how well does USSOCOM apply the previously described principles of strategic management? The intent of segmenting the basic question was to provide a clearer picture of USSOCOM strategic management's strengths and weaknesses as illustrated in both strategic planning and TOC. The first sub-question analyzes the USSOCOM documentation to determine if the problem or constraint is apparent and in this case clearly documented. This area is further dissected to ascertain if interoperability is explained sufficiently. The second sub-question searches for evidence that indicates that all concerned parties understand the issues and are working toward the same objectives. The third sub-question was broken down into two areas because often plans either adequately address current or future requirements, but not both simultaneously. Again, the intent was to evaluate how well each area documents the requirements and guidance USSOCOM is establishing for its organizations. In asking "Do the current strategies satisfy the current and projected requirements?" the objective is to align documented strategies with actual documented requirements to determine if administrative procedures are an issue and to see if the interoperability situation will continue to be exacerbated in the future.

The third investigative question, "What are the structural and control issues," was used to isolate the mechanics of USSOCOM's strategic management and administrative techniques for evidence of how it followed the recommended theoretical steps of establishing and controlling their strategies. The emphasis was on how well their documentation matched the actual strategic process.

In the fourth research question, "How effective was USSOCOM's planning system in formulating and controlling the strategies?," the objective is not only to observe how the model was used but also to evaluate how planning systems like TOC could be instrumental in fulfilling USSOCOM's strategic requirements.

The final question, "How does USSOCOM measure to the theoretical baseline created from the first four research questions and what are the implications," brings the research questions together in a big picture perspective of USSOCOM's strategic process. The intent of the question was to evaluate the overall performance of the current strategy process.

Sample

To focus and limit the scope of the study, USSOCOM was selected as the sample study group. The SOF organizations were selected for this research specifically because they are represented by each Service and are a small control group. This sample group allowed for a cross sampling of both inter- and intra-Service issues. The measurement tools gathered only qualitative data. The SOF's various missions require a culmination of almost every C^3 capability so each unit has the ability to communicate with its parent Service, U.S. counterparts, and foreign Service complements. This sampling method should allow the results to be generalized not only for all SOF organizations, but also for other DoD interservice applications.

Summary

Limitations of the findings and the process will be discussed in Chapters Four and Five to clarify shortfalls of the effort, their impacts, and possible resolutions. The qualitative research questions were limited to analyzing and reporting on only published or written documentation. Telephone interviews were used to verify and substantiate findings, gain clarification on interpretations, or guidance to locate additional documentation.

The selection and merging of Schreyögg's strategic controls and Goldratt's TOC management approaches to the strategy process does not only provide a means to evaluate USSOCOM's interoperability issues, but a method for their managers to solve these and other problems. This new technique is not intended to be a management cookbook with a recipe for formulating strategies that have the ability to solve problems. However, this approach should allow managers to understand and create their own procedures for developing successful strategic plans.

IV. Data Analysis and Inferences

Introduction

The primary focus of all the research questions was to draw conclusions only from documented strategies addressing the SOF C^3 interoperability issues. Emergent strategies were discussed to maintain continuity among the plans and research questions. This chapter's information and findings have applicability to most DoD strategic processes and should provide insight to an approach that has the ability to solve any issue. Conclusions and recommendations are provided in Chapter Five.

Current Status of Interoperability

It was apparent from the literature review that C^3 interoperability is an issue of the utmost importance. Nearly every article and every government document addressed the issues of interoperability with only a variance in the level of emphasis. The magnitude of emphasis varied from "an important issue" to "an urgent problem requiring immediate attention." In the fall of 1991, the Joint Interoperability and Engineering Organization concluded from their process discovery analysis that the U.S. Services and Agencies have their own "unique" C^4I requirements and solutions. They also deduced that all C^4I applications have an inherent potential to interoperate with each other in joint and intra-service operations. Their recommendations to the ASD for C^3I advised that aggressive measures to achieve interoperability were feasible and warranted. Throughout the JIEO's interim report, they substantiated the seriousness of the interoperability situation and the importance of resolving the issues. In several areas the JIEO referred to the emerging National Military Strategy and its requirement for interoperability. The JIEO highlighted the requirements for each Service's C^4I systems to exchange data with each of the other Services to the lowest organizational level (battalion/squadron/ship). The JIEO discusses several plans but does not mention an all encompassing strategic plan. Even though USSOCOM's strategies and management plans address the interoperability issues with the same vigor and conceptual approach, there is no mention of the National Military Strategy interoperability requirements and impacts (5:1-8; 26:1-10).

A Strategic Perspective, published by USSOCOM, outlines the SOF role in the U.S. Defense Posture. The plan delineates a global view of the capabilities and characteristics of the SOF missions and the importance of C^3 in achieving these missions. Two of USSOCOM's five fundamental principles advocate, directly or indirectly, the importance of C^3 interoperability in fulfilling their missions. In the area of "Technological Superiority," USSOCOM gives special emphasis to developing flexible command and control systems and integrating communication systems for special operations and conventional forces at every level of command (26:1-10).

In the section "Versatility and Readiness," a major focus is on assuring that interoperable C^3 systems are available among the theater unified commanders and all forces under their authority during conflicts. These communication systems are required to operate at every level of joint and allied command. In addition, these systems must also be tailored for SOF's rapid deployment and readiness requirements (26:3-9).

Other USSOCOM management plans address in detail the current C^3 interoperability requirements. These plans provide matrixes showing a clear picture of what C^3 system types are needed for what missions, and the areas that are currently deficient. In addition, USSOCOM's CLIPS system allows the users to perform preplanning in an attempt to alleviate interoperability problems. The SOF mission planners can use the CLIPS system to select communication suites that will be interoperable with all the units involved in the mission. The resources that USSOCOM has already expended to address C^3 interoperability attest to its high priority. The recognition given to interoperability in USSOCOM's planning documents suggests, besides the significance of the problem, that the solution is not yet apparent(15:2-4--4-5).

Even though there is evidence of advancement and successes, interoperability will continue to be a major issue for both DoD and USSOCOM into the foreseeable future. However, interoperability does not seem to have any barriers that are considered a terminating factor for any mission. The actual strategy issues and potential causes for the seemingly endless stream of interoperability issues are discussed in the following sections of this chapter.

Evidence and Status of Strategy

In this section a theoretical perspective was used to discover how USSOCOM's documentation reflected their strategic process and how well it aligned to a business-type strategy in addressing the following concerns:

a. Is identification of the C^3 interoperability problem apparent?

b. Is there a common understanding of the C^3 interoperability problem?

c. Do USSOCOM's plans adequately address:

  1) Current system requirements for C^3 interoperability?

  2) Future system requirements for C^3 interoperability?

Each of these questions will be discussed in the paragraphs below. The approach to these questions was to attempt to ignore the known emergent strategies and focus purely on how judiciously the strategies and management plans paralleled the strategy process outlined in Chapter Three. The findings are not all inclusive, nor do they imply that USSOCOM is not adequately addressing the C^3 interoperability issues. Instead, the findings simply point out the strengths and weaknesses of USSOCOM's strategic process from a theorist's view of how a strategy should address the C^3 interoperability issues.

Is identification of the C^3 interoperability problem apparent? It was not apparent that USSOCOM's documentation specifically identifies interoperability as a problem. There was no documentation dedicated to explaining the terms of interoperability and how they apply to USSOCOM and their subordinate organizations. The current documentation does not clearly identify the objectives, describe the successes and mistakes, or outline the on-going procedures. Also, there was an absence of an interoperability definition, problem statement, resolution plan, history, lessons-learned, or a timeline. If new managers, who are unfamiliar with interoperability, were assigned to USSOCOM to remedy the interoperability issues, they might be unsuccessful due to this lack of a C^3 strategy plan that furnishes a road map of the organization's interoperability objectives. Instead, the new managers would find fragmented management plans that address the issues, to include shortfalls, requirements, and potential future acquisitions. The managers would discover that the emergent strategies of the organization are heavily relied upon and have the potential of addressing any of their concerns. To understand and appreciate the USSOCOM strategies for C^3 interoperability issues, new managers would have to talk to the individuals who are already familiar with the objectives and are aware of the developments and history of the issues.

There is no evidence of Schreyögg's strategic controls, which may be why it appears that USSOCOM does not have a formal strategy. If USSOCOM planners used strategic controls, they could define the domains and establish both the premises and control procedures. This initiative would bound the C^3 problem while establishing a benchmark for measuring progress. In addition, if managers built and documented a current reality tree (see Chapter III), they could then focus on identifying the interoperability constraints of each specific area. The ECE analysis might reveal that USSOCOM's current efforts are not focused in the proper direction. The purpose of the ECE analysis and strategy process is to identify the constraints that are preventing interoperability and choose the one that is the foremost problem and concentrate on it until it is no longer a problem, and then tackle the next constraint. The analysis might also detect that external forces are causing the problem and must be resolved before USSOCOM can effectively resolve its unique issues. This type of discovery would require the problem be evaluated by upper management, so they could take the proper actions. Though it is obvious from the documentation that USSOCOM is aware of the interoperability issues and is taking corrective measures, the problem is not properly documented from the theoretical perspective.

Is there a common understanding of the C^3 interoperability problem? USSOCOM's plans and assessments contained a wealth of information about current C^3 requirements and deficiencies. Both the plans and assessments used a wide variety of formats, including charts, matrixes, graphs, tables, lists, diagrams, rankings, symbols, and brief descriptions to convey the information. USSOCOM used various scenarios to clarify individual C^3 deficiency issues. This technique was so detailed that each system was rated for the following: severity, magnitude, priority and conditions of the requirements, capabilities, status, and dependence levels, values, and deficiencies. Often the same information was illustrated in several different forms and appeared in various sections of the documentation. This documentation frenzy seems to be an attempt to more accurately portray each system status. USSOCOM's various plans and assessments did an excellent job in maintaining information integrity. The information always depicted the same message. The use of support contractor services was apparent (and confirmed) in that all the documents were standardized with the same style, format, and terminology. All the requirements and problems tracked from one document to another, and were aligned from the same perspective. However, in reviewing the various theater assessments, the documents were encumbered with boilerplating. The majority of the wording was identical and many of the charts and diagrams were duplications, except for theater name and title corrections. It appears that each theater's uniqueness was lost or obscured. Each theater assessment contained problem descriptions that outline its deficiencies. These problem descriptions addressed the C^3 hardware, personnel, and technological deficiencies. The similarities of the descriptions were so strong that they demonstrated either a cogent common understanding of the problems or the support contractor's documentation style has left the research with a false sense of security.

Do USSOCOM's plans adequately address current system requirements for C^3 interoperability? Even with all the redundant capitulations, the strongest and most consistent attribute of the USSOCOM literature was the documentation of current C^3 systems. USSOCOM and its support contractors used almost every feasible means of documenting the current status of interoperability. Mission requirements and scenarios were also documented with the same zeal. The current systems and their requirements were integrated with their deficiencies. The same types of charts, matrixes, tables, and diagrams were used to document the systems while simultaneously identifying the deficiencies and dependence levels. In addition to this information, each plan or assessment contained brief descriptions of each system's capabilities and in-some cases an overview of on going activities.

However, the information is not assembled in a format that represents a strategy. There is no problem statement that explains the overall domain, the C^3 interoperability issues, or follow-on problem statements that explain the individual domains of each C^3 system. The chosen course of actions that govern the current systems was not documented or substantiated. There was no direct evidence of any strategic controls monitoring the current system plans. Also, there was little historical data or progress status available for review. The plans do not read like plans, but instead seem to be collections of facts and information. The theater assessments contain requirements, deficiencies, and recommendations which were not validated in the USSOCOM plans. It is important to disclose whether the theater assessments are supported by USSOCOM and document the resulting actions. Otherwise, continuity is lost because it appears that the theater assessments are unfounded and the recommendations require no action.

USSOCOM's current plans do not exploit CLIPS potential as a strategic tool. Direction or guidance that mandates the use of CLIPS is not contained in any of the USSOCOM plans. Its absence from the theater assessments could mean that theater personnel do not know about or use CLIPS. The usefulness of CLIPS was not thoroughly tested or evaluated. However, its conceptual potential dictates that CLIPS be incorporated into the strategic planning documents, and that if deficiencies exist they be resolved.

The information that has been assembled throughout the USSOCOM documentation and for CLIPS demonstrates USSOCOM is mostly using emergent strategies to address current system requirements. The effectiveness of this strategic approach is not measurable. Modifying the plans to a formal strategy with controls will allow USSOCOM to evaluate how effective their resources are consumed in resolving the current interoperability requirements. Many elements of the strategic process were evident in USSOCOM's plans. Domains and premises were indirectly identified. However, implementation actions, feedforward or feedback data, and evidence strategic controls were missing.

Do USSOCOM's plans adequately address future system requirements for C^3 interoperability? Future C^3 system requirements are not substantiated with the same amount or quality of documentation as the current C^3 systems. Correlations are needed to determine which current interoperability deficiencies are satisfied by which future system procurement. The plans furnish brief synopsis of each system, but do not address in detail the requirements or status. The information on future systems appears to address only those acquisitions that USSOCOM controls directly. The lack of insight into other Services' C^3 could easily perpetuate new C^3 interoperability issues. It is essential that USSOCOM not only be aware of all C^3 procurements that have the potential of interfacing with their operations, but include them in their strategic planning. It may be appropriate for USSOCOM to participate and track the acquisition process of these systems. It also may be apropos for USSOCOM to function as the DoD representative in such procurement activities. It would be in the unique position of knowing its own projects as well as each of the other Service's programs and the potential impacts. If this role is beyond USSOCOM's realm, then it should support an initiative for the ASD for C^3I to establish such an office and interface accordingly. This type of involvement would help USSOCOM's strategic process by providing feedforward data to plan and initiate interoperability actions before the systems create new interoperability problems.

Besides not having a formal strategy for future systems, USSOCOM did not document any strategic information. There appears to be an emergent strategy guiding the future C^3 systems, but without clearer requirements and some of the strategy elements it is too difficult to evaluate.

It is difficult to determine if current strategies, including emergent, either for current or future systems satisfy USSOCOM's C^3 requirements. The reason is there is not enough evidence of a strategy, strategic controls, or strategy performance data to pass judgment. The requirements and deficiencies seem to be adequately documented. However, without ECEs or another type of problem evaluation technique it is impossible to ascertain if the emergent strategies are addressing the right problems and with the proper alternatives. The administrative control portion of the strategic process must be improved before a value judgment can be rendered other than "there is no strategy."

Structural and Control Issues

As the previous questions' findings have indicated, USSOCOM's strategic structure and control require the most improvement. There was little direct evidence that USSOCOM followed any of the steps that Schreyögg recommends for establishing or controlling a strategy. Some indirect domain identifications were established when

USSOCOM formulated its Warfighting Environments. Even though the documentation does not state that this was USSOCOM's intent, the identifications serve to characterize the environments and therefore indirectly define the domains. Again, indirectly USSOCOM did establish some premises with the documenting of the status, deficiencies, and requirements. However, there was no indication that these premises had any follow-up. This situation demonstrates the need for premise control. Also, there was no proof that either strategic surveillance or implementation control was practiced as part of USSOCOM's strategic process. The strong influence of USSOCOM's emergent strategy on current documentation invites the conclusion that USSOCOM may already be fulfilling many of the requirements for strategy formulation and control, but is just not documenting the process correctly. The importance of good documentation not only allows the process to be evaluated, but brings credibility to the strategy. A large portion of the data required to assimilate a formal strategy is readily available throughout the various USSOCOM documents. The remainder of the information should reside with USSOCOM's C^3 staff provided the aggregation of emergent strategies has not become a casualty of recent personnel turnovers. Once the formal strategy process has been established and maintained, then a reevaluation of the structural and control performance should be conducted. At this point there is not enough documented evidence to accomplish a detailed analysis.

USSOCOM's Effectiveness in Handling Strategies

The initial objective of this research question was to discover how instrumental TOC could be in formulating and controlling strategies. As in the previous questions, the lack of a fully documented strategic process prevented a measurable evaluation. There was not enough direct strategic data available to ascertain if TOC was effective in formulating and controlling USSOCOM's C^3 strategies.

There was plenty of indirect evidence that facsimiles of the TOC process were used to corroborate the positions that USSOCOM established and documented. When reviewing USSOCOM's plans from the three-step common sense approach, it was easy to identify "What to change?" The core problems were the items listed in the priority lists. USSOCOM began the next step, "What to change to?" by distinguishing the deficiencies. These deficiencies are the UDEs needed to formulate the ECE analysis, which assists in developing simple practical solutions. Without the ECE analysis and the rest of the TOC process, it was difficult to determine if the chosen course of action was the most appropriate alternative. The lack of data prevents an appraisal of the third step "How to cause the change?" It also was impossible to ascertain if the right people were involved in the process and if their solutions were proper. The use of surveys may have helped in overcoming this shortfall. However, time constraints and late discovery of the issue prevented the use of surveys in this investigation.

Assessing USSOCOM's strategic process from the merged strategic controls and TOC management approach did uncover several interesting findings. The first is USSOCOM could identify goals from the priority lists and define domains from the Warfighting Environments. However, USSOCOM did not link the two adequately to determine if the items from the priority lists have the same impact on each environment. An overall current reality tree addressing interoperability is the most logical starting point. The items from the priority lists also could function as the UDEs. This ECE analysis would determine if there were any relationships among the problems and if the priority list contained the proper items and sequence.

The TOC philosophy was also used to evaluate USSOCOM's strategic process. Each TOC step and strategy control was seen as a goal, and then overlaid on USSOCOM's plans to see if any constraints were preventing their maximum effectiveness. In most cases the total lack of supporting data allowed for rapid conclusions. The cases where indirect and minimal support data existed, applying the TOC process made it easier to discover alliances and benefits between the USSOCOM data and the research question under investigation. The use of this technique revealed several indicators that had previously gone unnoticed. For example, it was discovered that the items from USSOCOM's priority list could be used as UDEs to build a current reality tree to isolate the core problems.

The main finding from this research question is that USSOCOM has already done the majority of the information gathering needed to support the TOC process. The actual effectiveness of TOC for establishing and controlling was not substantiated in this study, due to the state of USSOCOM's strategic process. The current management process does appear to indicate that the TOC philosophy could be instrumental in fulfilling strategic requirements by organizing, establishing, controlling, and following through on the need procedures.

Theoretical Baseline

The first instinct is to declare that USSOCOM from the big picture perspective does not have a strategy for solving its interoperability issues. However, a closer look shows that many of the elements needed for a sound strategy are documented but not in the fashion of a strategy. The cohesiveness of the various documents indicates there was some form of strategic guidance taking place. This assemblage of data in itself is not a strategy but indicates that a strategy could be close at hand.

The overall inference from the first four research questions substantiates there is little credence that a strategy exists for solving interoperability. In retrospect, each question also elicited evidence that elements of the strategic process subsisted or that planning behaviors were steered by an emerging strategy. The data and methods used to document the current system requirements and deficiencies have the greatest potential for a smooth transformation to a formal strategy.

Additional questions may have been necessary to discover why these documents did not resemble the theoretical strategies. The difficulty in answering follow-on questions is that the key individuals responsible for developing the documents are no longer readily available. Current USSOCOM personnel would be dealing with second hand information or hypothesizing. Different studies have corroborated that other military organizations attempting to implement formal strategies in similar scenarios either misunderstood or misapplied the strategic process (3: 5-116). This study could easily draw the same conclusions with USSOCOM's strategic process. Without additional data the only other deduction is that USSOCOM does not have an adequate strategic process.

Summary

Overall the chapter may have unfairly painted a problematic picture of USSOCOM's strategic process. The intent was to focus on the documented portion and not every facet of USSOCOM's strategic process. As indicated in several areas, emergent strategies seem to be the primary force behind USSOCOM's current actions. This type of strategic process is not all bad and in fact it can be productive. However, formal strategies have demonstrated their success in achieving organizational goals with the most effective use of resources (172:7-107). Conclusions and recommendations to the findings and the study are provided in Chapter Five.

V. Conclusions and Recommendations

Introduction

This chapter suggests a few pragmatic explanations for the findings and outlines some practical solutions. An evaluation of the strengths and weaknesses of this study will be deliberated along with recommendations for potential follow-on research.

Conclusions and Recommendations from the Findings

USSOCOM's documentation more than adequately details the status of C^3 interoperability. However, a suitable definition for interoperability and a problem statement are missing. Only the USSOCOM's theater assessments provide a definition for interoperability (and it is a DoD definition buried in the glossary). The DoD definition is generic and does not begin to explain the intricacies of interoperability. An updated definition of interoperability is needed that addresses the aspects of USSOCOM's interoperability requirements and should be included in all USSOCOM C^3 planning documents. An overall problem statement is needed in the introduction portion of each documents. Every document section should follow-up with detailed problem statements that address the specific concerns of that section. The problem statements should be accompanied by appropriate definitions and key guidance.

The USSOCOM documentation that addressed current systems and requirements was outstanding. However, two annexations could improve this area. First, a cross-referenced matrix of the problems or deficiencies should be provided to help identify common C^3 issues. Next, a chart should be included showing C^3 requirements according to the National Military Strategy and how USSOCOM's actions meet or exceed those requirements. These two additions would provide additional focus and credibility for current actions or concerns. The information gained also would assist in establishing ECEs.

Future C^3 systems and requirements were not substantiated in the USSOCOM plans with the same amount or quality of documentation as the current systems. Correlation charts are needed to determine which future system could satisfy or resolve each current deficiency. Separate plans are needed to adequately address future systems and their on-going acquisitions.

The new plans should be developed with separate chapters or sections dedicated to each system or add separate sections to the current documents. The documentation for each system should include the following information:

1. Mission need statements that outline why the system is necessary.
2. References that link the documentation to the originating organization and requirements.
3. Status or assessment documents similar to those already used to track current systems.
4. Brief description of the system to include capabilities and potential applications.
5. References to procuring and support agencies activities and current and potential users assessments.
6. Documentation of all interoperability requirements and activities. Documentation should state specifically what systems it must interoperate with and what steps are being taken to assure success.

The plans also should document the strategy that was used to select the system and monitor its procurement progression. As with any strategy, attention should be given to the feedforward controls and documentation should reflect the entire process.

Also, the TOC process should be used before system selection to ascertain if new technology or equipment is truly necessary or if there are more appropriate alternative methods available to fulfill the requirements. A TOC analysis at this early stage also could predict potential acquisition constraints and impacts. USSOCOM should continue to use TOC throughout the acquisition process so it can compare its TOC findings with AFMC's.

An expansion of the CLIPS system to include future systems also would be advantageous. Adding future systems to CLIPS would provide excellent means to monitor how future systems will interoperate with current and other future systems. The acquisition vulnerability and risks could be reduced if managers had clear insight to the impacts caused by delays and cancellations of programs. Workarounds could be easily and quickly established because cross-referenced data would already be compiled, thus allowing the managers to choose which current or future systems would have to be adjusted to reconcile the changes.

The first recommendation to improve USSOCOM's structure and control process would be to develop an overall current reality tree for interoperability. The ECE analysis should use the priority list items as the UDEs. This type of analysis would illustrate the C^3 interoperability issues from the big picture perspective and discover any common problems. The analysis would isolate which issues are standalone problems and depict the dependencies of the others. The data collected from the analysis would assist in establishing the proper sequence to solve the issues. However, if it is assumed that priority list items are the right objectives and correct starting points, then several current reality trees will be needed. The first step is to evaluate them as individual systems and discover the one thing that is preventing them from resolving their respective interoperability issues. The similarities of the items make it appropriate to create current reality trees for each issue before taking any other actions. The reason for this recommendation is that once all the current reality trees are in place, a cross analysis may show that problems or sections should be combined; concurrent activities are necessary or prohibitive; or solving one issue will solve another. Once the reorganization of items from the priority list is accomplished. they should be managed as individual chains. It is important to note that for these individual current reality trees USSOCOM's documented deficiencies and residual deficiencies should be used as the UDEs, and they may or may not be the actual system constraints. An ECE analysis must be done to make that determination. Additional ECE analysis also may be needed to group problems.

The next recommendation to improve the C^3 problem is to establish strategic controls. Many of USSOCOM's premises are already stated in the form of requirements and deficiencies, so premise control would be relatively simple to establish. This is an area where it would be appropriate for USSOCOM to delegate monitoring responsibilities to those units that are most directly impacted by that portion of the strategy. For example, involving one or two tactical teams in the acquisition of communication systems intend for their use. These individuals would be best suited for establishing and monitoring premises concerning their mission requirements (e.g., weight, durability, ruggedness and ergonomics). Other organizations should assist in monitoring the premises that relate to their area of expertise. Mission planners could monitor frequencies, range, and interoperability requirements. Involving functionals and documenting their findings from their perspective would begin to satisfy the concepts of premise control. Combining this information with USSOCOM's C^3 staff perspective would satisfy the concepts of premise control and strategic surveillance. Implementation control could then be established by having USSOCOM or its representative, in case of an acquisition strategy, monitor and document the implementation progress. The remainder of the TOC and strategy procedures would have to be followed through, as highlighted in Chapter Three, in order to take full advantage of the strategic process.

The lack of references to DoD and Joint Chiefs of Staff (JCS) documents or strategies, formal or emergent, indicates that the flow of information is not reaching the Unified Commands. It appears the Defense Communications Agency's role needs to be redefined or a new agency is needed with the jurisdiction and personnel to establish, monitor, and, when necessary, dictate regulations and policies that will ensure the Services can communicate (25:13-14). The task becomes increasingly difficult as technology develops faster and advances in sophistication. The level of effort will increase significantly as commercial off-the-self systems are allowed to enter the military inventory. The rapid pace at which commercial systems advance and their multiple configurations will only complicate the interoperability issues.

USSOCOM should monitor acquisitions that are intended for use by SOF or conventional organizations that are allocated to augment SOF missions. It was difficult to gauge USSOCOM's involvement in the various acquisitions from the current documentation. It appears that additional USSOCOM involvement in the acquisition process is necessary. USSOCOM's implementation of a formal strategic process may not be the answer, but it is definitely part of the solution.

Study Appraisal and Recommendations

The study changed complexions several times before the current approach was accepted. The study's first direction was to create a matrix of the C^3 systems and the SOF missions to evaluate the true status of C^3 interoperability. This approach was abandoned when the CLIPS system and USSOCOM's management plans were analyzed and it was discovered the effort had already been accomplished. The notion of investigating C^3 interoperability from the strategic planning perspective evolved as a result of the literature review. During the literature review it was uncovered that hardware analysis was at the heart of almost every study. It appeared that several blue ribbon teams chose actions to solve the immediate C^3 interoperability issues under investigation. These actions seem to endure only until the next conflict. The idea behind the study was that DoD's strategic process might have been hindering C^3 interoperability, and not the equipment.

An inital assumption of the research was that USSOCOM's documentation would include a C^3 interoperability strategy. The research was originally prepared for a worse case scenario of USSOCOM's strategic plans being disjointed or unorganized. Instead, it was discovered was that USSOCOM's plans were well organized, and the data flowed smoothly from one plan to another. There just was no immediate evidence of a strategy. The only recourse was to dissect the plans and determine the cohesive force.

A significant finding and strength of the research was the use of the TOC process. In an attempt to isolate the force behind the plans and maintain some merit for the study, the TOC five-step approach and ECE analysis were applied as evaluation tools. Fortunately, the technique was successful in isolating some strategic process elements. A more meaningful find was the common thread that ran among the various documents—USSOCOM's emergent strategy. Without applying the TOC method, the research would have only concluded that there was "no strategy."

The research method from the beginning should have included a contingency plan for not discovering a formal strategy. One recourse for this oversight could have been to survey USSOCOM's C^3 personnel and its subordinating Services' C^3 personnel. The surveys could have gathered data from every level on the effectiveness and perceptions of USSOCOM's strategies.

Another overlooked factor was the impact of personnel turnovers. Many of USSOCOM's key C^3 personnel have recently left the organization. Besides the loss of continuity, the workload for the remaining individuals has increased significantly. Access to individuals and the endless flow of information was curtailed. The timing of the turnovers also prevented any hope of using surveys to evaluate the emergent strategies.

The research should have included surveys from the onset and the determination to use the data could have been made at anytime.

Follow-on research is definitely warranted. The research should cover two major areas. The first would be to discover a means to successfully link the strategies from the National Military Strategy to the base level strategies. The strategic requirements should flow through every strategy plan. The strategy details should expound on how the organization will achieve its responsibilities received from the proceeding strategies and delegate responsibilities to its subordinate organizations. Requirements should flow in both directions and strategies should reflect both negative and positive support positions.

The second research emphasis should investigate the DoD-wide perception that to resolve C^3 interoperability the answer must include new equipment. The literature review illustrated the Services' fascination with new technology and how often it is seen as the answer.

Additional studies are needed to determine how organizations develop, maintain, and flow C^3 strategies. The studies should include research to determine if standardized strategy procedures are necessary or if training would be a sufficient method of bringing continuity to the DoD strategic process. The analysis should begin at the JCS level and ripple through each Service and Unified Command and continue down to the unit level. The rationale is that managers must build strategies that complement each other in order to resolve C^3 interoperability issues. Many of USSOCOM's and DoD's C^3 interoperability issues originated from the parent Service using or developing systems unknown to USSOCOM or the other Services. This naïveté leads not only to many interoperability problems, but often requires extensive and expensive reverse engineering of systems for remedies. Before C^3 interoperability issues can be resolved, DoD and its Services need sound executable strategies that are interoperable. The C^3 interoperability issue will never be solved if each organization continues to use or introduce new C^3 systems without apprising the other organizations. USSOCOM will not have a strategy to solve C^3 interoperability until all DoD Agencies are working from the same overall strategic plan.

Appendix A: Acronyms and Abbreviations List

AFCEA	Armed Forces Communications and Electronics Association
AFMC	Air Force Material Command
ASD	Assistant Secretary for Defense
C^2	Command and Control
C^3	Command, Control, and Communication
C^3I	Command, Control, Communication, and Intelligence
C^4I	Command, Control, and Communication, Computers, and Intelligence
CCR	Capacity Constraint Resource
CJCS	Chairman Joint Chiefs of Staff
CLIPS	Communications Link Interface Planning System
COTS	Commercial Off-The-Self
DoD	Department of Defense
ECE	Effect-Cause-Effect
GPS	Global Positioning System
HF	High Frequency
JCS	Joint Chiefs of Staff
JIEO	Joint Interoperability Engineering Organization
JIT	Just-In-Time
Joint STAR	Joint Surveillance Target Attack Radar System
JROC	Joint Requirements Oversight Council
MCS	Maneuver Control System
MRP	Manufacturing Resource Planning
MSE	Mobile Subscriber Equipment
NDI	Non-Development Item
NESEA	Naval Electronic Systems Engineering Activity
SEALs	Sea Air Land Teams
SHF	Super High Frequency
SOF	Special Operations Force
SOLIC	Special Operations Low Intensity Conflict
TOC	Theory Of Constraints
TQM	Total Quality Management
TRI-TAC	Tri-Service Communications
U.S.	United States
UAV	Unmanned Aerial Vehicles
UDE	Undesirable Effects
UHF	Ultra High Frequency
USAF	United States Air Force
USN	United States Navy
USSOCOM	United States Special Operations Command
VHF	Very High Frequency

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Vita

Capt George M. Pierce II was born on 21 January 1954 in Pueblo, Colorado. He graduated from Herscher High School in Herscher, Illinois, in 1972. He enlisted in the Air Force in 1972 and worked as an Avionics Specialist for thirteen years. As an Avionics Specialist he performed flightline and shop technician duties for the following aircraft: T-29, KC-135, B-52D,F,G, EC-121, F-4C,E,G, F-105, HH-60D,E, and the MC-130. He has held positions as a Shop Chief, Line Chief, Master Instructor, and Test Evaluator. He received his Bachelor of Science in Aviation Management from Southern Illinois University in 1985. He was commissioned in 1986 and assigned as an Acquisition Manager to the Special Operations Force's System Program Office. He held positions as an Integrated Logistics Manager, Assistant Deputy Program Manager for Logistics, and Reliability and Maintainability Test Manager. He was chosen as a Site Activation Commander for the four MC-130H beddowns (two CONUS and two overseas). His responsibilities included: orchestrating quarterly meetings at each location, out-briefing the wing, theater, and unified commanders, coordinating the facility constructions at each location, and managing the fifty member team. As a result of his successes in resolving numerous programmatic issues he was selected as the Chief Program Manager for the APQ-170 radar and MC-130H support equipment. He held those positions until entering the School of System and Logistics, Air Force Institute of Technology, in May 1991.

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The purpose of this study was to analyze the strategic plans of USSOCOM to determine its role in resolving the C^3 interoperability issues. A model using strategic controls and Theory of Constraints was used as a standard to evaluate USSOCOM's management plans. A literature search revealed that hardware and new technology were the primary concerns of previous studies. However, the literature did not address whether the lack of a formal strategy contributed to the C^3 interoperability problems. Therefore, the determination was to adopt a fresh approach to the C^3 interoperability issues and analyze the strategic process.

The data analysis of the study suggests that USSOCOM does not utilize the formal strategy process. However, the cohesiveness of USSOCOM's plans implies that an emergent strategy underlies the coordination and direction of these plans. There was evidence that USSOCOM exercises certain elements of the strategic process.

The study's conclusions indicate that through a better understanding of the strategic process, USSOCOM could develop and maintain more effective strategic plans. The study also discovered that an overall DoD strategic process for C^3 interoperability must be established and maintained before USSOCOM or other agencies can adequately address its individual C^3 problems.

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