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A HEDGE AGAINST UNCERTAINTY: USING COMMAND, CONTROL, COMMUNICATIONS, COMPUTER (C^4) TECHNOLOGY ON THE BATTLEFIELD

by

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A paper submitted to the Faculty of the Naval War College in partial satisfaction of the Operations Department.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the department of the Navy.

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Martin Van Crevald says that certainty on the battlefield is an unattainable goal due to the "fog" and "friction" of war. Yet, the operational commanders who blindly accepts this notion without a fight is dooming his forces to certain defeat. While accepting a limited degree of uncertainty is tolerable, to resign oneself to viewing the battlefield as a three-dimensional stage for events to unfold outside the influence of the commander is unexcusable. Moreover, it is understandable that commanders are turning to command, control, communications and computer (C4) technology to solve critical information needs, thereby side stepping uncertainty in conflict. Constantly being bombarded with the requirement to make decisions that translate into decisive victories, the operational commander who fails to master the application of C4 technology as a hedge against the unpredictability in war is doomed to failure. The purpose of this paper is to address the operational mind set required with respect to C4 technology for the CINC or JTF commander to win on the battlefield.

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Abstract of

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Martin Van Creveld says that certainty on the battlefield is an unattainable goal due to the "fog" and "friction" of war.[1] Yet, the operational commanders who blindly accepts this notion without a fight is dooming his forces to certain defeat. While accepting a limited degree of uncertainty is tolerable, to resign oneself to viewing the battlefield as a three-dimensional stage for events to unfold outside the influence of the commander is unexcusable. Moreover, it is understandable that commanders are turning to command, control, communications and computer (C4) technology to solve critical information needs, thereby side stepping uncertainty in conflict. Constantly being bombarded with the requirement to make decisions that translate into decisive victories, the operational commander who fails to master the application of C4 technology as a hedge against the unpredictability in war is doomed to failure. The purpose of this paper is to address the operational mind set required with respect to C4 technology for the CINC or Joint Task Force commander to win on the battlefield.

PREFACE

I first became interested in the issue of using **C4** technology to alleviate uncertainty on the battlefield while attending the Marine Corps Command and Staff College as a student in 1988/89.[2] Expressing concern for the Marine Corps' ability to compete in a joint/combined warfare environment, it occurred to me at the time many commanders at the tactical level of war were felling to capitalize on C4 systems to aid in mission accomplishment. Consequently, effectively competing in a joint/combined arena was questionable. There was a clear lack of understanding in the technologies available, and a complete misconception on their function in filling critical information requirements (**CIRs**).[3] If this was the case at the tactical level, problems surely existed at the operational and strategic levels of war throughout each of the services. It now appears after many lessons learned, our senior military leadership is starting to get on board.

Within the past year, the Chairman of the Joint Chiefs of Staff (**CJCS**) published **C4I for the Warrior** to set the stage for a post Gulf and Cold War environment. This concept when fully understood and implemented will give the **CINC** and **JTF** commander access to all the information needed to win in war. However, there is a catch--the commander must know **what, when, where,** and **how** he wants the information.[4] To accomplish these task, the commander requires a comprehensive understanding of **C4** technology based systems, and the factors that impact their efficient employment.

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CHAPTER I

INTRODUCTION

As conditions change on the international scene, the importance of technology and its role in warfare is changing. Prior to 1990, the United States was locked in an arm race with the former Soviet Union. At the center piece of this arms race was a heavy reliance on technology to maintain the numerical age in military forces. At the same time, behind the scene the stakes were much higher. Superpower status in a growing multipolar world was the real prize. The struggle for technological dominance between the former Soviet Union and the United States began with the atomic era during WWII. Political and military leaders sought to maintain a strong military to exert political influence. How did technology figure into the arms race? Was it a quest for certainty?

Martin Van Creveld says that certainty on the battlefield is an unattainable goal due to the "fog" and "friction" of war. Fog refers to a commanders' imperfect ability to distinguish relevant information. On the other hand, friction is akin to "Murphy's Law" which says you can expect something to go wrong in the best of situations. Many commanders find it difficult to accept uncertainty in battle and rightly so. While accepting a limited degree of uncertainty is tolerable, to resign oneself to viewing the battlefield as a three-dimensional stage for events to unfold outside the influence of the commander is unexcusable. Moreover, it is understandable that commanders are turning to C4 technology to solve critical information requirements.

Today, technology provides the tools necessary for a nation to exert its influence through

power. Simultaneously, it allows nations to reduce military spending through the application of "high tech" weapon systems. As communism declines, and the former Soviet Union focuses within, defense spending and force structure reductions will require a wiser and more knowledgeable CINC capable of exploiting C4 technology. To do this, he requires a more complete understanding of the forces at work with respect to C4 technology which impacts decisions on the battlefield.

Effective employment of C4 technology implies that the operational commander is able to identify his CIRs (what, when, where, and how). To accomplish the mission, the commander requires a comprehensive understanding of C4 technology based systems, and the factors that impact their efficient employment. Information management, deliberate/adaptive planning, doctrine, and a technology understanding are the principle factors which impact success. Failing to master the above with respect to C4 technology increases the influence of uncertainty and increases the likelihood of unfavorable war termination.

CHAPTER II

QUEST FOR CERTAINTY

One of the principle prerequisites for effective employment of C4 technology is information management. Without it, uncertainty rules while subjecting the commander to the increased risk of failure. To win in battle, the CINC seeks accurate and timely information to make certain that his actions are correct. "Information is the basic ingredient that bonds and focuses effort at all levels and its importance cannot be overstated."[5] The CINC "must avoid information overload if he is to focus information and convey his influence over his forces and the enemy."[6] Clausewitz acknowledges, however, that even with all the information "a great part of the information obtained in war is contradictory, a still greater part is false, and by far the greatest part is uncertain."[7] Nonetheless, by fulfilling his CIRs, the CINC is able to enhance his decision process. Examples of critical information might be:[8]

- Friendly situation and location. What is the status of our forces?
- Enemy situation and location. What is the enemy doing?
- Enemy critical vulnerability. How can I hurt him most?
- Our vulnerabilities. How can he hurt me most?
- Time. How long will take us to...? How long will it take the enemy to...?
- Future. What will the situation be in--hours? Days?
- Current situation. What is my most important action now?

As the operational commander starts to gain all the information he needs, and he uses a rational process to sort, collate, and further disseminate it, he must turn his attention to the planning

process.

In the planning process to further hedge against uncertainty, the CINC or JTF commander must determine the method of accomplishing assigned tasks and begin directing the action necessary to accomplish his mission. Irrespective of whether deliberate or crisis action planning is employed, he must:[9]

- receive and analyze the task to be accomplished,
- review the enemy situation and begin to collect necessary intelligence,
- develop and compare alternative courses of action,
- select the best alternative,
- develop and get approval for its concept,
- prepare a plan, and
- document the plan.

While all this is ongoing, the J-6 is responsible for developing the C4 Systems Estimate in support of the commander's estimate. The J-6 staff estimate is the "heart" of the process which begins the plan to exploit C4 technology. The very success or failure of a military operation can hinge on the detailed C4 planning or the lack thereof.[10] The final aim in any conflict should be to win a decisive victory whether militarily, politically or economically. Detail or adaptive planning will provide the bridge to assist in the efforts to identify our C4 support systems which will aide in our success. But, there is another factor which must be considered in our decision process.

Given the commander's critical information requirements are not complex, the interaction between man and machine technology is complex. Often times it is the imperfect alliance

between the two which causes the phenomenon of "fog and friction" increasing the uncertain outcome in war. The operational commander's interaction with machine technology is less than perfect.

A study of history reveals many examples of the human element causing confusion and uncertainty in conflict. Commanders, influenced by the imperfections of man, make good and bad decisions. Often times, these decisions change the destiny of nations. Consider this incident in the war torn region of the Persian Gulf. On 3 July 1988, an Aegis cruiser, the U.S.S. Vincennes was participating in an oil tanker escort mission. Armed with the Aegis air-defense system, the cruiser felt confident it could defend herself. The Aegis system is a highly automated target tracking system capable of tracking 16 aerial targets at a time. While moving through the gulf, the cruiser detected an aircraft on its radar and mistook it for an attacking Iranian F-14. The combat information center (CIC) reported to the captain that the Vincennes was under attack. Reacting quickly, the ship tried to contact the approaching aircraft with no success. The captain of the ship ordered the plane shot down. The missile hit its target which turned out to be a commercial Iranian airliner (Fl 655) with 290 civilians aboard. There were no survivors.

Later, a navy investigation revealed that human error caused the misidentification of the aircraft and that the Aegis System worked. The captain of the Vincennes made his decision to fire based on data provided by his CIC which was in error. Perhaps the crew of the U.S.S. Vincennes reacted too quickly, or it remembered the incident of the frigate U.S.S. Stark a year earlier. Operating in the same region, the Stark did not react and was hit by an Iraqi missile which killed 37 sailors. Did the operational commander promulgate clear rules of engagement

(ROE) to his operating forces? "Human error in a battle environment kills a lot of people," says Norman Polmar of the U.S. Naval Institute.

It is impossible to envision a C4 system which avoids the potential imperfections of man in either its design or use. The United States' dropping a smart weapon on a suspected command and control complex in Baghdad during the Gulf War in 1991 is another example of the imperfect alliance between man and machine. Civilians were reported to have occupied the structure when the bomb hit its mark. "No single communications or data processing technology, no single system of organization, no single procedure or method, is in itself sufficient to guarantee the successful or even adequate conduct of command in war."[11] As long as the human element remains in the loop some uncertainty in combat will exist. Commanders and subordinates alike must accept this idiosyncrasy and move forward with the conduct of war. They must stand prepared to respond to the imperfections of men and deal with the results of fog and friction. While many military thinkers continue to espouse the notion that achieving certainty on the battlefield is a futile quest, a degree of certainty is possible with the advances in C4 technology. An understanding and correct application of C4 technology can reduce the uncertainty in battle.

While Martin Van Creveld refers to the maddening pursuit of technology as "the futile quest for certainty," it is difficult to embrace fully this concept. Both the former Soviet Union and United States subscribed to a military defense policy which center pieced technology. It was the pursuit of technology which eventually gave rise to the democratic revolution in Russia. While the former Soviet Union is "against the ropes," the United States still remains a political, military, and economic superpower. Our National Security Strategy has undergone some minor

changes since the collapse of the Soviet Union, but it still stresses the importance of technology in order to maintain our position in the international arena.

> **The United States must continue to rely heavily on technological superiority to offset quantitative advantages, to minimize risk to US forces, and to enhance the potential for swift, decisive termination of conflict...Advancement in and protection of technology is a national security obligation.**[12]

CHAPTER III

DOCTRINE

Not immune to fog and friction, well developed doctrine can help alleviate uncertainty in conflict if it recognizes the capabilities and limitations of its forces and equipment. Doctrine as defined by the Webster Dictionary is a set of beliefs or principles codified by a group of people or organization. The combat doctrine of maneuver warfare is not immune to fog and friction if it fails to consider the full range of forces in air, land, and sea operations. At the heart of success in maneuver warfare is the issuance of mission-type orders.

> **Maneuver warfare, applied to operational maneuver from the sea or sustained operations ashore, implements the basic principles of tactical mobility, operational speed, and flexibility at extended distances. Increased operational complexity, compressed factors of time and space, and rapidly changing situations drive the commander's decision cycle.[13]**

Mission-type orders specify *what* must be done without prescribing how it must be done. An understanding of the "commanders' intent" is the most crucial element in the equation. A full understanding of intent frees the commander or his subordinate without guidance to seize the initiative to exploit or destroy the enemy. Additionally, decentralized control provides greater flexibility. During the American Revolution, the German term for this type of warfare was "Auftragstaktik." Similarly, regional conflict means a greater reliance on maneuver in a littoral environment.

With the threat of the former Soviet Union gone, our new National Security Strategy directs us to focus doctrine on regional conflicts and the prospects for "littoral warfare.[14] Regardless

of the environment, the operational commander must be capable of effectively employing his forces with minimum risk. The speed and confusion which are likely to accompany such warfare still necessitates the CINC or JTF commander promulgating clear commander's intent. A subordinates component commander's lack of understanding of the commanders' intent runs the risk that the mission will be a failure. Having a doctrine that allows commanders to exploit C4 technology can assist in battlespace dominance.

In littoral warfare, maritime forces must be capable of using the full range of technologies to gain and maintain control of the sea, air, and land environment. "This dominance implies that Naval Forces can bring to bear decisive power on and below the sea, on land, and in the air. We must use the full range of U.S., coalition and spaced-based assets (**C4 technology**) to achieve dominance in space as well."[15] Crucial to the employment of technology in warfare is a better understanding by the commander on the influence technology has over doctrine.

Historically, war fighters normally think of technology driving doctrine. However, the nature of modern warfare has changed so dramatically because of weapon lethality, speed, and time factors that technology is now dictating terms to the operational commander. This becomes obvious as you view the evolution of C4 technology as it has taken on more of the responsibility to solve the commander's CIRs. As military decision tools and weapons technology have progressed from analog to digital formats, "the fact is that future weapons will have to be high tech to survive. The real question is, just how high tech--and what kind of weapons?"[16]

Chapter IV provides two illustrations to show the importance of C4 planning and its application to solve the commanders information requirements.

CHAPTER IV

APPLICATION

Operations Eagle Claw (**Iranian Hostage Rescue**) and Desert Shield/Storm (**Iraqi-Kuwait Conflict**) are two excellent examples of C4 systems planning and execution on either end of the spectrum in terms of their impact on conflict termination success. First, the Iranian hostage rescue which was launched on 24 April 1980 to rescue 53 Americans being held in Teheran was a total failure. The JTF commander, Major General Vaught, was responsible for pulling together approximately 200 personnel into a cohesive combined/joint task force to affect the rescue of the hostages.

Needless to say, the operation was doomed because command and control relationship failed. Air Force and Marine pilots lacked a clear organizational structure that had as its goal unity of command. The ground force commander (Delta Force commander) lacked a clear command and control structure that would provide him the means to coordinate the C-130 (Air Force) and hellos (Marine) in support of ground forces. Additionally, personnel were inserted into the JTF chain of command without operating forces understanding their official responsibilities or limits of responsibility. Colonel Pittman, USMC, is just one example of an officer who worked for the JTF without official tasking. These factors collectively impacted on the C4 systems planning and final implementation.[17]

While the **C4 systems** support for **Operation Eagle Claw** were extensive, "major aspects of the communications arrangements were flawed."[18] Communications systems were planned

and implemented around a flawed command and control structure almost ensuring its failure. Ground forces were unable to effectively communicate with airborne forces. Communications and cryptologic equipment were incompatible, thereby causing information to be relayed through third parties. Communications external to the JTF worked well, but this served as a double edge sword when JTF internal and lateral connectivity was a problem.[19] The breakdown in C4 systems support was a direct reflection of the commanders poor understanding of technology and its ability to assist in solving critical information requirements. The war in the Gulf is on the opposite end of the spectrum of success.

> **First come the drones, wheeling high in the sky like vultures. The robot planes stay aloft for days, scanning the terrain, eavesdropping on radio chatter, and feeding information to intelligence specialists safely ensconced in a bunker 100 miles away. Ten miles to the east a group of skyborne, smaller robot aircraft wait for the silent enemy to turn on his radar. At the first electronic pulse, these kamikaze machines will swoop down on the enemy's gun emplacements...**[20]

"Operation Desert Storm owes much of its success to C3I systems that got the job done."[21] The above futuristic account of a 21st century Remotely Piloted Vehicle (RPV) employing the latest technology became a reality in the Gulf. Technology was a success story primarily because of the leadership and systems awareness exhibited at each level of war. General Schwarkopf at the operational level earns the biggest praise for his unrelenting commitment to reduce the risk to ground forces by using all available resources. His determination and success in maintaining unity of command under his stewardship was the key factor to planning and implementing a responsive C4 system to assist in meeting critical information needs and aiding

in decision making.

Operation Desert Shield/Storm earn the title of being the first "space war." Recognizing the potential for space based technology, commanders exploited Global Position, Navigation, Meteorological, Missile defense and Early Warning Satellite systems.[22] The Gulf War left little doubt in the war fighters minds that C4 technology served as a force multiplier and would do so in future conflicts.

> **At the height of the Persian Gulf conflict, the automated message information network passed nearly 2 million packets of information per day through gateways in Southwest Asia theater of operations. Efficient management of information increased the pace of combat operations, improved the decision making process, and synchronized various combat capabilities. the technology developed to support these networks proved to be a vital margin that saved lives and helped achieve victory.**
>
> **Colin L. Powell, Chairman JCS[23]**

CHAPTER V

FUTURE BATTLEFIELDS

As we look toward the future in the defense arena, we see an agenda of new issues and opportunities...The restructuring and reshaping of the entire Department of Defense must continue, along with the development of new strategies and doctrines. In addition, we must continue to exploit technological opportunities, taking full advantage of the military-technical revolution in weapons, electronics, and organization. We need advanced sensor and other surveillance and reconnaissance systems, communications, as well as precision lethal and non-lethal weapons, and we need to integrate them more effectively. In peacetime, they will be a deterrent. In wartime, they will be essential to survival and success on the battlefield.[24]

The modern battlefield and the battlefield of the future will have one major thing in common--they will be C4 system intensive. Our over-the-horizon capability will steadily improve. The amphibious assault forces will see bigger and faster ships (LHD-1, LSD-41, and LCAC). Marine forces will see greater maneuverability with the V/STOL-AV-8B Harrier and the V-22 Osprey. Increased investments in space are likely--fueled in part by the our success in the Gulf. Now that the space shuttle program and alternative space launch vehicles appear to be on track, greater access to space means more C4 satellites and greater control and maneuverability of U.S. combined/joint warfare forces. Many other initiatives, sponsored by the services, seeks to address our command, control, and communications needs in concert with our current National Security Strategy which focuses on regional conflict in a littoral environment.

At the center of this strategy is the quest for certainty through the application of technology to process critical information. The goal is to provide commanders with the necessary resources

to make accurate and timely decisions. All war fighters stand to benefit from investments in C4 systems.

Advances in communications and computer technology are providing the edge to the commander. One such development is in media burst technology with such devices as the Digital Communications Terminal (DCT). By taking advantage of the latest technology advances in burst transmissions, the radio frequency (RF) signature of units in combat are smaller. A reduced radio signature means the enemy is less likely to locate, jam, or destroy friendly units.

Communications equipments and computers are important tools to aid the commander in creating an atmosphere of certainty. By using systems like the Position Reporting and Location System (PLRS) and Global Reporting System (GPS), operational commanders are able to exercise better operational control over their assigned forces and enhance battlespace management. The Gulf War demonstrated how important this can be in a highly uncertain environment against an unpredictable enemy. The **CINC** or **JTF** commander who understands the effective application of computers and communications technology along with its limitations will reduce risk and uncertainty on the modern and future battlefields.

CHAPTER VI

CONCLUSION

Command, control, communications, and computer systems provide the resources necessary to create an atmosphere of certainty on the battlefield. "Deterring and defeating aggression requires more than combat forces and a logistical support system...It also requires command, control, communications, and intelligence (C^3I) systems."[25] The success of the commander on the battlefield rests on three factors. First, he requires the skills to discern his critical information needs. Secondly, he needs the ability and knowledge that will allow him to select those C4 systems which will assist him in solving his critical information requirements. Finally, the commander requires an understanding of C4 system limitations.

With automation fully integrated into the battle plan, the commander's ability to process and analyze information from many sources is a reality. Given the large amounts of information to process, and the speed at which modern warfare unfolds, it becomes necessary for the "warrior" to have a greater understanding of C4 systems to survive. Technology provides the resources necessary to create an atmosphere of certainty on the battlefield by aiding the commander in meeting his critical information requirements. While robust and responsive C4 system fails to assure success, its benefits serve as a force enhancer **[multiplier]** when used effectively, thereby serving as a hedge against uncertainty.

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