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Communications systems must be distributed networks feeding real-time battlefield pictures to all echelons of the assault force down to the level of battalions and ships. Continuous situational awareness must be available in all dimensions. Digital communications networks, capable of processing critical information, will be needed in the amphibious assault.

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ENCLOSURE (9)

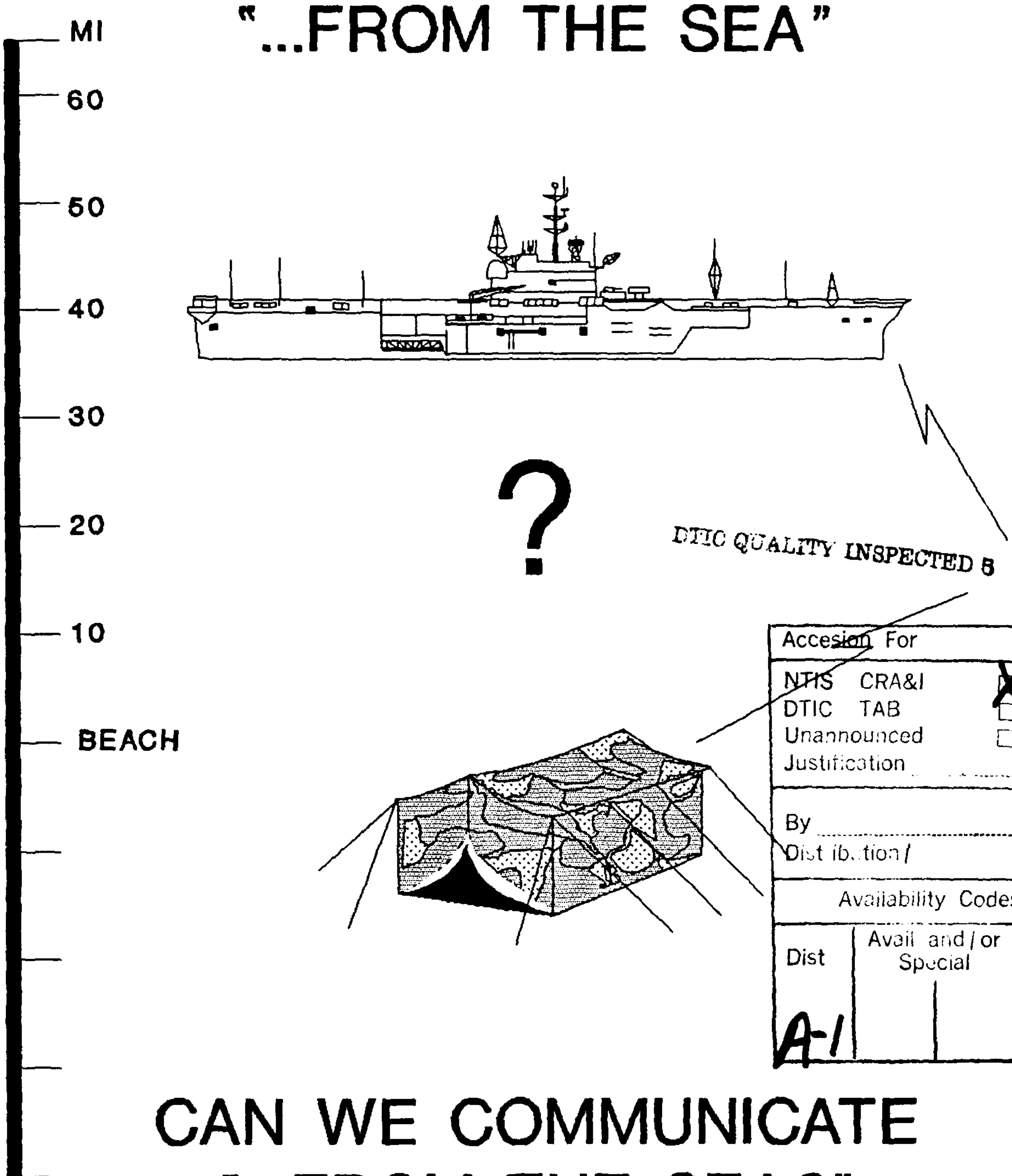
In addition to communications support between the Navy and Marine Corps, full integration of communications systems will be required in the joint environment. Though service-internal communication systems may be difficult to integrate, it is imperative that communications systems across service lines are fully integrated and interoperable. This paper addresses joint operations based on OMFTS and examines the problems encountered, while offering some possible solutions.

Future systems research and procurement must be done jointly, across service lines. Cost and funding solutions are not addressed in this paper, and it is realized that these are primary factors when developing future communications systems. However, much of the equipment and technology currently exists and can be procured "off-the-shelf" to support OMFTS.

OMFTS is the future of amphibious warfare. Communications to support command and control during OMFTS has surfaced as the most critical element in executing this new and bold concept.

The choice is simple - we either develop new communications methods and obtain the required equipment to support OMFTS or we maintain the status quo, attempting to support the concept with old technology and methods. The first choice will ensure success. The second choice will doom us to failure.

OPERATIONAL MANEUVER WARFARE "...FROM THE SEA"



CAN WE COMMUNICATE "...FROM THE SEA?"

NAVAL WAR COLLEGE
Newport, R.I.

OPERATIONAL MANEUVER WARFARE "... FROM THE SEA"
CAN WE COMMUNICATE "... FROM THE SEA?"

By

Charles Cooke and Bill Spencer
Lieutenant Colonels, USMC

A paper submitted to the faculty of the Naval War College in partial satisfaction of the requirements of the Department of Advanced Research.

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

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EXECUTIVE SUMMARY

In July 1992, the Secretary of the Navy (SECNAV), in conjunction with the Chief of Naval Operations (CNO) and the Commandant of the Marine Corps (CMC), produced a baseline document entitled "From The Sea." This paper outlined a vision for the Navy-Marine Corps Team and emphasized the expeditionary warfare role the Sea Services would play in the future. "Brown-water" vice "Blue-water" warfare was identified as the most probable area of operations for future conflict.

As a follow-on, CMC has produced a document entitled "Operational Maneuver ...From The Sea." This paper offers a vision of future amphibious warfare and addresses projecting naval power ashore in support of littoral warfare.

Based on the modern-day weapons threat, numerous potential enemies of the United States have the capability to inflict many casualties on an assault force coming from the sea. The Marine Corps, recognizing this, has been moving toward the over-the-horizon amphibious assault for a decade. Littoral warfare only reinforces the need to conduct over-the-horizon amphibious assaults. Whereby assault forces, unseen by the enemy, will attack over great distances from the sea. New technology and evolutionary tactics will now link maritime forces with maneuver on land, creating an unbroken chain of maritime power projection.[1]

Operational Maneuver From The Sea's (OMFTS) critical component is command and control. Command and control of an

over-the-horizon amphibious assault is difficult and complex. This paper identifies seven requirements that a commander must achieve to successfully execute OMFTS. Additionally, this paper identifies communications as the key that unlocks the door to successful command and control in OMFTS.

Traditional communications methods will not work using OMFTS. The seaborne forces will be miles from the land. New and innovative methods of communicating will be required when executing OMFTS.

In this paper, a solution to resolving current communications difficulties derived from OMFTS, is offered. Its basis is Battlefield Situational Awareness for the commander based on multi-spectrum satellite usage that stresses a primary communications network comprised of high speed data equipment with multiple capabilities.

Communications systems must be distributed networks feeding real-time battlefield pictures to all echelons of the assault force down to the level of battalions and ships. Continuous situational awareness must be available in all dimensions.[2] Digital communications networks, capable of processing critical information, will be needed in the amphibious assault.

In addition to communications support between the Navy and Marine Corps, full integration of communications systems will be required in the joint environment. Though service-internal communication systems may be difficult to integrate, it is imperative that communications systems across service lines are fully integrated and interoperable. This paper addresses joint operations based on OMFTS and examines the problems encountered, while offering some possible solutions.

Future systems research and procurement must be done jointly, across service lines. Cost and funding solutions are not addressed in this paper, and it is realized that these are primary factors when developing future communications systems. However, much of the equipment and technology currently exists and can be procured "off-the-shelf" to support OMFTS.

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PREFACE

1.1. **Purpose**.

The world of command and control is rapidly changing. Communications architecture in support of command and control has to be robust and redundant, but more importantly, integrated and interoperable as we prepare to conduct amphibious operations in a joint environment. Speed is of the essence and amphibious command and control, based on over-the-horizon assaults, has become a complex problem to solve.

Future amphibious operations, though based tactically on the same tenets as in World War II, will not look anything like the amphibious assault of 2001. Amphibious operations will be even more complex and difficult to control.

We are in a period of transitioning from the days of single-channel radio to the new world of up-to-the-minute data systems. Command and Control will be digitally based and the supporting communications system will no longer be identified by specific function, but rather, by information processing capability and capacity. Commanders will be able to view near real-time battlefield information (i.e., visual situational reports) on display screens right on the battlefield rather than relying on "grease boards." To achieve this, information processing systems networked together will permit the flow of vital information between command nodes, not considering what path it goes over or how it gets there. The Commander, Amphibious Task Force (CATF), Commander Landing Force (CLF), and Commander Joint Task Force

(CJTF) will be required to have a complete, integrated picture of the area of operations, sharing information as needed to promote battlefield situational awareness.

Currently, there is a "communications gap" in Operational Maneuver From the Sea (OMFTS). The OMFTS is a superb operational concept that stresses movement and maneuver, providing the Commander Landing Force (CLF) with a variety of options.

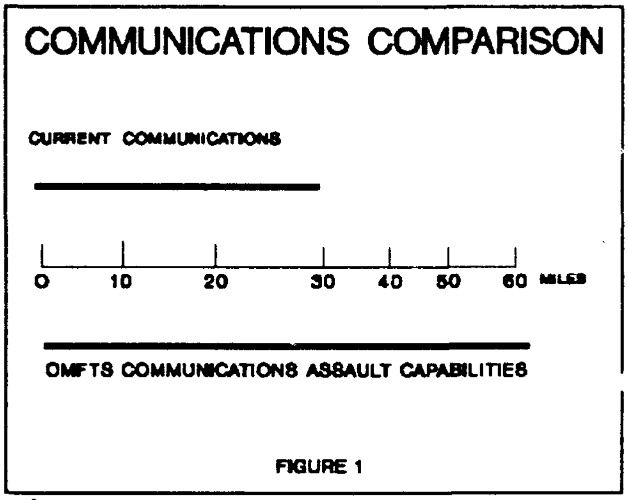

Figure 1

But, in order to command and control those forces executing the amphibious assault--either in a benign or a hostile environment--you need reliable communications systems that can support the mission. **The communications systems presently in the inventory do not meet the challenge of OMFTS.** For example, present very high frequency (VHF) radio systems generally have a maximum range of twenty-five miles. Figure 1 illustrates this and the subsequent communications gap in OMFTS. The communications hardware and accompanying information systems required to fully control a complex amphibious assault from 40 to 50 miles out is the missing piece of the puzzle. Figure 2 shows where the gap problem exists.

However, this is not an insurmountable problem. This paper will address interim measures that can be taken to control an

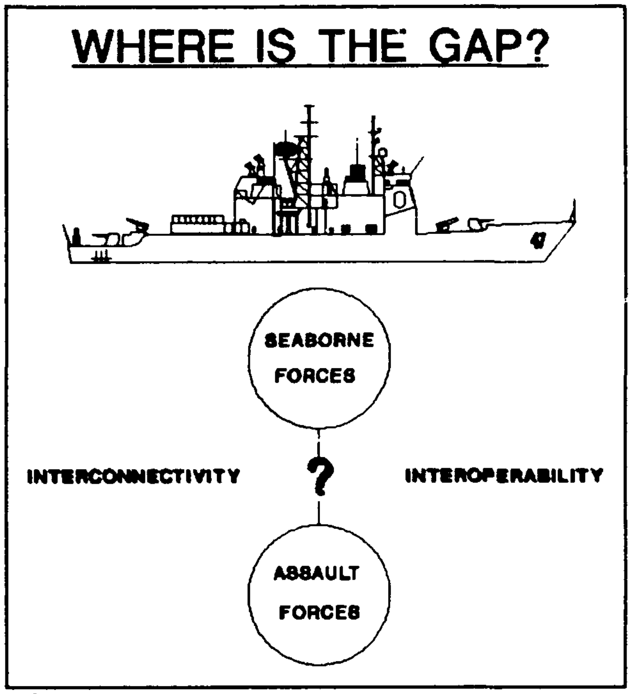

Figure 2

amphibious assault based on OMFTS. Additionally, future systems integration will be examined and proposed methods to communicate outlined to determine the best course of action to fill in the communications gap.

This paper will examine requirements as they apply to the informational needs of the commander. There are sever functional areas that have the commander's interest. These are the **tactical picture, imagery, the air tasking order, voice communications, press communications, intelligence, and data bases** in support of decision making.[3] If these "Magnificent Seven" and their accompanying functional areas can be successfully captured, the execution of an amphibious operation will be greatly enhanced.

Communications connectivity, based on interoperable systems, is the key to success. Communications hardware applications, applied appropriately in support of the seven functions, will enable the CATF, CLF, and CJTF to command and control and use surveillance assets--both on land and sea.

1.2. Study Parameters.

This study will focus on the communications required to support **Operational Maneuver From the Sea** during an amphibious assault. It is an advanced research project commissioned by the Naval War College in Newport, Rhode Island. There are four operational capabilities required by OMFTS, and include **Command, Control, and Surveillance**; Battlespace Dominance; Power Projection; and Force Sustainment. Of these four capabilities, command, control, and surveillance permeates the other three and is required to successfully execute any of the remaining three capabilities. Therefore, command, control, and surveillance is the heart of OMFTS and is of primary importance to the commander. More specifically, communications connectivity and interoperability are the driving factors in successful command, control, and surveillance operations. This study will examine communications needlines, paths, and systems operations. The study will use existing systems, but will consider future communications interoperability needs until the year 2010. The study will utilize appendices, graphs, and illustrations; thus, reference to the same will be made throughout this study.

This study will not encompass the five phases of amphibious operations, and will not go beyond D-Day plus six hours as the baseline for ashore operations. Specifically, it will address amphibious assault operations only.

Note that the systems and concepts discussed here--Navy Tactical Command System-Afloat (NTCS-A) and the Marine Tactical Command and Control System (MTACCS)--will likely be subject to significant changes over time, particularly in this present environment of budgetary constraints and changing threats. For this reason, some of the assumptions made in this paper about these systems are "best guesses" and issues/solutions based on them may have to be modified in the future.

Appendix 1 in this study has been provided for ready reference and lists frequently used abbreviations. Although the authors attempted to maintain a non-technical style in this paper, a portion of the subject matter dictated the use of limited technical terms and abbreviations.

1.3 Study Methodology.

In response to the assignment, this study was researched using personal interviews, military publications and documents, technical journals, and personal experiences. Because of the vast area of command, control, and surveillance and all it encompasses, communications systems needed for an over-the-horizon assault will be the area of concentration; thus, this will be the primary focus of the study. However, communications will be categorized as information processing systems and will be based on capabilities rather than specific functions.

After the initial topic was chosen and this study approved, research of the subject matter began. A week of personal visits to the Marine Corps Combat Development Command, Quantico, Virginia; the Pentagon; and Headquarters Marine Corps were accomplished during the first week in April. During said interviews, it was discovered that a plethora of varying systems are on line and available for use in OMFTS. In this study, these systems will be examined and researched to determine the best type of configuration that can be devised for amphibious assault operations.

Two documents, the U.S. Marine Corps' "MTACCS/Copernicus Integration Study" and "The Copernicus Architecture" printed by the Copernicus Architecture Office, were of immense value regarding integration of MTACCS and NTCS-A systems. Joint systems, such as the Army's Tactical Command and Control System (ATCCS) and the Air Forces's Contingency Tactical Air Control System (TACS) Automated Planning System (C-TAPS), were also examined as part of the overall integration effort.

The central focus of this paper is the amphibious assault based on Operational Maneuver From the Sea. This is the underlying theme in each of the chapters. However, each chapter addresses a specific area of interest for present and future amphibious planners.

Each chapter will have a "focus section," which will state the specific area the chapter addresses relating to OMFTS. For example, in Part Two, Chapter One, The Commander's Seven Central Requirements are discussed and the profound affects they will have on the amphibious assault of the future is examined.

Technical information and specific connectivity for communications systems supporting an amphibious assault are presented in the form of appendices. It is not the intent of this study to lay down a "communications plan," but the necessity of having information such as this in the appendices is recognized.

1.4 **Scenarios**.

The scenarios used in this study are based on an amphibious assault in a benign or hostile environment. The command and control equipments and accompanying communications support will be relatively the same. However, in a hostile environment, supporting arms requirements will increase extensively; thus this must be considered during the assault. The command structure scenarios are limited to three. The first scenario examines naval forces as component commanders (CATF/CLF), and includes the external communications required while operating as component forces in a joint environment. For the Marine Corps, the scenarios are appropriate for a Marine Expeditionary Unit (MEU), Marine Expeditionary Force (MEF) Forward, or MEF; though a MEU will not have the extensive communications systems required by the other two Marine MAGTF's.

The second scenario looks at commanders of a joint task force. In this particular scenario, afloat and ashore requirements are examined. The Naval Tactical Command System - Afloat (NTCS-A) receives emphasis.

The third scenario places Army or Air Force Commanders as the commanders of a joint task force, both ashore and afloat; here too, their respective command and control systems are viewed in terms of needed integration. These systems are the Army

Tactical Command and Control System (ATCCS) and the Air Force's Contingency TACS Automated Planning System (C-TAPS).

Also, the scenarios are based on the amphibious assault phase and will cover that period of time from the actual assault to D-Day plus six hours. This study will not detail communications established ashore after D-Day plus six hours because of the study's focus.

The scenarios deal with the present time period and use systems which exist currently or are projected to be in the inventory within the next year. However, future equipment and system integration requirements will be examined and are scenario-based.

1.5 **Major Assumptions**.

This study is a dynamic one and ever-changing requirements make it difficult to structure the study precisely. Therefore, based on the scenarios involved, the following assumptions apply to this study:

o That the systems identified for use in an amphibious operation will be or become interoperable, either by hardware or software functions.

o That adequate satellite equipment and channelization will be available.

o That the amphibious scenarios depicted will have U.S. forces with air and naval superiority.

o That the amphibious assault will not be administrative in nature, but in an environment ranging from benign to high-intensity.

o That systems control and technical control service organizations will be present and will provide the operational and technical guidance required between the services.

o That satellite bandwidth will continue as a limitation for rapid buildup of systems ashore up to the year 2010.

o That the amphibious assault will be based on OMFTS and minimum distance for the command platform from the beach will be 40 miles.

o That no additional personnel will be required.

o That cost incurred in developing OMFTS C2 networks will not be prohibitive.

PART ONE: INTRODUCTION

The command and control (C^2) of military forces at all levels is as much a problem of information management as it is carrying out difficult and complex warfighting tasks. Command, control, communications, and computer (C^4) systems supporting our military forces must have the capability to filter the information that is important, determine who or what needs it, and ensure that it gets there in time to use it. Therefore, the fundamental objective of a C^4 system is to get the critical and relevant information to the right place in time to allow forces to seize the opportunity and meet the objectives of the operational continuum.[4] The command and control objective for the naval services' is the same as for the Joint Staff. We can support our forces when operating independently afloat and ashore; but, we fall short when supporting our forces assaulting from ship-to-shore.

CHAPTER 1: COMMAND AND CONTROL FOR OMFTS

1.1. **Focus**.

This section will concentrate on the definition of OMFTS and provide an overview. Battlespace dominance based on superior command and control will be needed to support OMFTS. This chapter provides background information on OMFTS and defines the criticality to robust and reliable communications to make it all work.

1.2. **Operational Maneuver From The Sea**.

> ...If you're going to do something [militarily, in most cases] it has to come **From the Sea**. I think the proof is in the pudding. We're withdrawing from Europe and other places as part of the drawdown...so who's still out there? The **Navy** and **Marines** afloat.[5]

Throughout history the sea has provided the ultimate maneuver space for those who control it. It provides protection without commitment of land security forces, while offering a broad avenue over which strong, sustainable forces may strike at will or linger threateningly offshore. Likewise, forces ashore have always contended for the advantages of maneuver, but only in modern times have the engines of mobility and the technology of information dominance allowed the almost simultaneous total disruption of enemy forces throughout a theater. In the past, the link between ship to shore required a break in the assault flow; thus a break in maneuver warfare on the sea had terminated prior to the beginning of land maneuver. Admittedly, the advantages of the highway of the sea were so great that this impediment was rarely defeating; but the full effect of naval power was dampened, even when the landing was unopposed. The emergence of truly amphibious battlefield mobility assets with the necessary tactics, training, and command and control technology now provides the opportunity to close this gap and seamlessly transition from maneuver in ships to maneuvering ashore. This replacement for the linear transportation of assault forces from debarkation to a beach is accurately entitled **"Ship to Shore Maneuver."**

Ship to Shore Maneuver is that portion of Operational Maneuver From the Sea (OMFTS) which projects land combat power ashore. It entails the landing of assault units against a defended area at the time, place, and in the formations which best support the landing force scheme of maneuver toward inland objectives. The principles in this concept apply equally to the execution of any future amphibious operation, whether conducted as operational maritime maneuver, as tactical level support of sustained operations ashore, or in any of the myriad of expeditionary operations conducted by U.S. Naval forces. It is the parameters and options of the inherent OMFTS tactics, techniques, and procedures which will change with mission requirements and objectives.

The expanding requirement for maneuverability inherent in OMFTS has significant implications for the landing force. The purpose of this "Ship to Shore Maneuver" concept is to complete the vision of OMFTS operations by addressing challenges posed by the future operational environment, identifying key departures from traditional operations, and outlining--for both the operating forces and the combat development process--the future requirements for planning and executing Ship to Shore Maneuver.

1.3. **The Battlespace**.

Battlespace organization is the way naval expeditionary force commanders visualize how they are going to fight and structure their command and control to ensure victory. Battlespace is an area of operations viewed in three dimensions: air/space, surface, and subsurface. **The commander relates his/her forces to each other in terms of sea, air, and land operations and to the enemy in terms of time.** The Commander must know not only the location of the enemy, but how fast the Marine Air Ground Task Force (MAGTF) can react to the enemy's initiatives and how fast the enemy can react to the MAGTF.

The commander's understanding of time and space relationships and systems capabilities determines his reaction time and ability to maintain operational momentum. Once the battlespace area and time factors are determined, the commander facilitates command and control by organizing his C^2 organization support system into a framework that orders the battle, provides control measures, and establishes rules of engagement in order to achieve the desired effect on the enemy. This framework of operations is characterized as deep, close, and rear operations. Fighting within this framework requires a unified force that can conduct deep, close, and rear operations simultaneously.

See Figure 3 (Naval Expeditionary Force Battlespace).

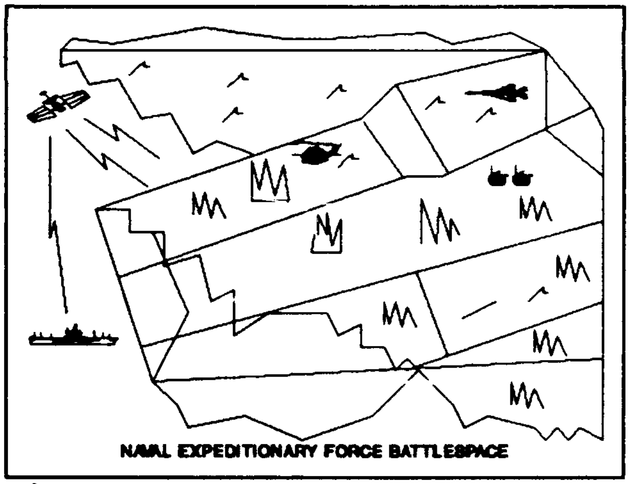

Figure 3

Control and domination of battlespace is the heart of naval expeditionary warfare. Naval power projection is accomplished through the dominance and operational maneuver of naval expeditionary forces in the world's littoral areas. **Navy and Marine Corps combined-arms forces generate precise offensive power** at the decisive time and place through massive firepower, rapid maneuver, and sustained logistical support due to their ability to exploit U.S., coalition, and space-based command and control resources. This is the essence of the Navy-Marine strategy that ensures effective transition from open ocean to littoral areas and from sea to land and back again.[6]

1.4. <u>**Command, Control, and Surveilance**</u>.

Battlespace dominance in amphibious operations will occur because superior command and control and surveillance will reduce the enemy's capability to respond in a capable manner. Command, control, and surveillance is the critical area of OMFTS.

The vital role of command and control is clear: it tightly integrates and unifies the MAGTF. Command is a process that demands continuous, clear thinking and problem solving under the most demanding conditions. The commander's mind is the focus of Marine command and control. Through the extension of control, the commander's influence becomes the focus of the total command and control infrastructure and forms the fundamental conduit of command authority. The commander must have information that is relevant, essential, timely, and easily understood if he is to balance and focus his command's organization and C^3 support system resources toward his mission objectives.

> Improving all aspects of C^2 is the key to fighting smarter. Having belatedly come to recognize this fact, we can't afford to ignore it just because defense budgets shrink. Improved C2 will continue to be the basis for doing more with less.[7]

Operational Maneuver From the Sea, the concept which will support the actions described in the preceding paragraphs, requires a fine-tuned command and control system. The heart of the command and control system is communications.

However, communications must not be viewed as a specific functional area, but rather a combined information processing system based and driven by requirements and capabilities. This viewpoint must transcend each phase of an amphibious operation.

1.5. Communications - The Key To Information Flow.

> In the context of C^4, the term "communications" usually refers to equipment - radios, telephones or other devices. Such equipment converts voices and other data-carrying media into electronic signals which can be transmitted over short or

> long distances. People who use such equipment don't want to have to think about how to get it in the hands of those with whom they wish to communicate. In other words, they want it to be transparent, easy to use.[8]

The key that unlocks the door to successful command, control, and surveillance is communications. The communications system must be capable of transporting vast amounts of information in a timely and accurate manner.

The system needs to be fully integrated and interoperable (both hardware and software) between services and Department of Defense (DoD) Agencies that may be in direct support of amphibious operations. For example, intelligence collected by national agencies may have critical importance for the amphibious commander prior to the assault. The communications system must be able to receive and process this information up to and even during the assault phase.

Communications systems can no longer be thought of in terms of performing a specific function (i.e., established to process only intelligence information; system links for communications coordination only; etc.). Presently, and in the future, the communications systems established prior to, during and after the amphibious assault must permit the commanders to receive and process multiple information requirements. Data packets of information and visual displays sent to and from the assault force commander will require high-speed data communications because specific single-channel radio nets can no longer handle the load.

Communications for the amphibious assault must be simple, yet provide the commander the ability to command and control the amphibious assault from great distances with data, augmented by voice. The commander has to be able to "pull" information from the supporting systems or sub-systems as needed.

The communications network for the amphibious assault must:

- Provide seamless, secure connectivity.
- Use multiple, highly flexible nodes.
- Transmit all other operational elements and data bases (which are automatically updated and desired information can be pulled for any assigned mission).[9]

Amphibious operations will be over-the-horizon and will require near-real-time information processing and battlefield situational displays. The CATF and CLF will require digitized informational processing systems based on an open communications architecture. Local and wide-area networks, digital equipment using graphic symbology, intelligence analysts connected terminal to terminal, and assault craft heading to the beach and connected electronically to sea control ships are but a few examples of near-real-time information systems that must be operating in an amphibious operation.

Figure 4 is an example of the communications connectivity required now and for the future.[10] External communications networks and the internal communications networks of the assault force have to be "fused" into a coherent and comprehensive

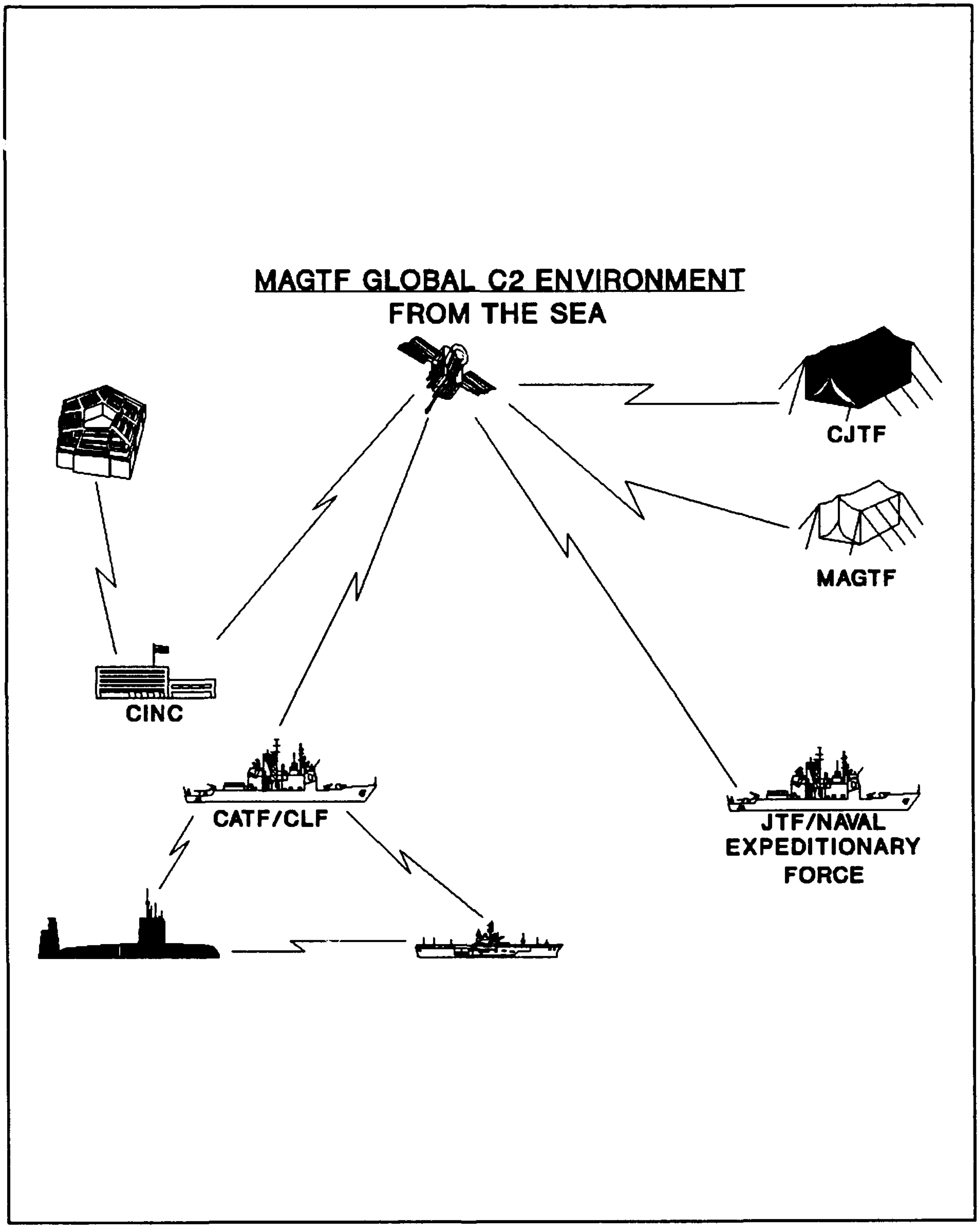
MAGTF GLOBAL C2 ENVIRONMENT
FROM THE SEA
CJTF
MAGTF
CINC
CATF/CLF
JTF/NAVAL
EXPEDITIONARY
FORCE

Figure 4

communications system.

Aboard ship, the Navy's Tactical Command System-Afloat will gather information from the entire battlespace. Information will arrive from external sources and agencies from outside the task force, such as from Fleet Intelligence Centers. From within the task force, information on diverse subjects from enemy positions to weather fronts can be received and displayed on large screens, and distributed to various operating spaces within the ship. The key is to know what information is needed, where it is needed, and how to "fuse" it together so decisions can be made on the land-sea battle.

Conversely, the commander of the assault forces will have large screen displays aboard ship and will be able to know how well the assault is proceeding and if any changes are required to the attack plan. Ultimately, it will have the ability to send and receive information, using graphic symbology, to and from the assault force craft while moving to the beach. Voice information may not even be needed.

Once ashore, the commander, equipped with multi-spectrum satellite technology will be able to maintain constant communications with the seaborne forces. Unlike traditional amphibious operations of the past, there will not have to be a "break" in command and control as the assault forces slowly build-up ashore. The Commander, Amphibious Task Force (CATF) and the Commander Landing Force (CLF) will have the same tactical picture. The CLF, either from a tent, shelter, or mobile vehicle will be able to see the same tactical picture enjoyed by the CATF on ship, displayed initially on small video display screens (computer screens). The seaborne forces will be linked to the assault forces by digital communications networks, permitting information to be gathered, fused, and passed between forces.

The revolution in communications technology especially in the area of lightweight, portable, satellite/data terminals will make the aforementioned scenario a reality.

PART TWO: COMMANDER'S REQUIREMENTS

CHAPTER 1: THE SEVEN CENTRAL REQUIREMENTS

2.1. **Focus**.

> ...An ideal command system, then, should be able to gather information accurately, continuously, comprehensively, selectively, and fast. Reliable means must be developed to distinguish the true from the false, the relevant from the irrelevant, the material from the immaterial. Displays must be clear, detailed, and comprehensive. The mental matrix, individual or collective, against which information is analyzed and transformed into an estimate of the situation must correspond to the actual world rather than to one that existed twenty-five years previously or not at all.[11]

2.2. **The Magnificent Seven**.

C^4 systems have a finite capacity; commanders must prioritize all C^4 requirements to ensure capacity for their priority requirements. Priority intelligence requirements are an example of a commander's prerogative. The level of C^4 assets devoted to intelligence requirements, which may affect all C^4 systems capacities, must be considered by the commander in campaign and operations planning.[12] This is especially critical when prioritizing communications systems to support "From the Sea" operations.

The significant change in command and control (C^2) supporting "From the Sea" may be traced to the role that we expect our information systems to play. The Navy's new direction based on "...From the Sea" highlights our need to combine the best of the sea C^2 communications systems plus the best of the land C^2 communications systems to bridge the ship to shore communications gap in amphibious operations. The "communications gap" is caused by dependence on secure, line-of-sight, single channel radio during the assault phase of an amphibious operation. If we are to adequately support "over the horizon" assaults from the sea, we must employ SHF and UHF satellite communications systems at lower levels during the assault phase of amphibious operations.

The "enabling force" in the assault can be a naval force or a joint force. A myriad of communications systems exist to support these commanders; however, the "fusion" of communications systems at the critical time is the intelligent way to maximize capability. In this paper, we researched the critical requirements needed by a commander to command and control his forces. The results produced the "Magnificent Seven" expeditionary warfare requirements: Tactical Picture, Air Tasking Orders, Imagery, Voice Communications, Press (when required), Intelligence, and Data Base exchanges.

Part or all of the above "Magnificent Seven" communications requirements were deemed critical by naval commanders to support "...From the Sea." In the examination of each category, commanders expected the systems to generate and evaluate options, review and critique commander judgement and plan and replan battles in real-time or near-real-time scenarios.

TACTICAL PICTURE

Commanders expect the tactical picture to give them real-time pictures or graphics of the ground forces, air forces, and sea forces during ship-to-shore phase of an amphibious operation. Can our current naval communications systems do that? The answer is **yes**! The Navy's NTCS-A 2.0 software supports the command, control, and intelligence (C^2I) mission requirements of joint, Navy and Marine Corps commanders as well as facilitating information exchange with national, joint, and theater level command authorities. NTCS-A provides timely, accurate, and complete all source information management, display, and dissemination capabilities, through extensive communications interfaces, all source data fusion, and analysis and decision making tools.[13]

NTCS-A is aimed at providing enhanced support to power projection in the littoral zone in direct response to "...From the Sea." Recent conflicts in the Balkans, Somalia, and Iraq emphasize the need for increasing support to forces ashore, including the monitoring and control of assets moving in and between the land, air, and sea zones of operation. NTCS-A 2.0 software builds on the success and lessons learned in recent real world operations and exercises, where the ability to be inter-operable with joint forces was recognized as a high priority.

AIR TASKING ORDER (ATO)

The Air Tasking Order (ATO) is one of the most critical items needed by CATF, CLF or CJTF during the assault phase of an amphibious operation. Command and control of air forces in support of ground forces requires an uninterrupted communications path. The USAF's Contingency TAC Automated Planning System (CTAPS) system meets this requirement when connected to an SHF communications path. Our proposal in this paper is to fill this "communications gap" by providing UHF and SHF connectivity to the Joint Force Air Component Commander (JFACC).

The commander must give the ATO a high priority in his concept of communications systems employment during ship to shore movement. On selected workstations on the NTCS-A LAN, NTCS-A 2.0 has an X-window interface to the Air Force Contingency TAC Automated Planning System, permitting the rapid application of air power and projecting mission planning support data in the joint environment. Additionally, the Air Tasking Order can be pushed via super high frequency (SHF) or ultra high frequency (UHF) connectivity to assault forces ashore prior to air command and control being passed ashore.[14] In the future, the Marine Corps Tactical Command and Control System (MTCCS) will interface with NTCS-A. With an SHF communications path, Naval forces can function as the JFACC.

IMAGERY AND INTELLIGENCE

Imagery and intelligence communications systems are also considered critical to the commander during the ship-to-shore phase of an amphibious operation. Again NTCS-A 2.0 software, plus the Marine Corps Intelligence Analysis System (IAS) over SHF or single channel UHF tactical satellite, provide the backbone for supporting over the horizon (OTH) communications in support of "...From the Sea." NTCS-A 2.0 software includes several new intelligence products designed to improve overall system effectiveness. The NTCS-A Intelligence Processing Services

(NIPS) 2.0 implementation includes full integration of a central data server on the NTCS-A LAN to support core Joint Operational Tactical System (JOTS) services and optional applications such as Strike Plot, Space and Electronic Commander (SEWC) Module, and the NTCS-A Imagery Exploitation Workstation (NIEWS).

VOICE COMMUNICATIONS

> In our judgment, many C^2 systems have failed because requirements analyses were either not performed or not performed adequately. It is impossible to design a system from indirect inferences about how or why a system should support a commander; requirements data must be collected and validated on-site. But on-site has its own connotations. While it is important to understand the battlefield on which the commander must maneuver, it is equally important to understand the human information processing principles that determine his behavior on the battlefield.[15]

One cannot over-estimate the importance of the commander's voice in "warfighting." This is one of the most important ways he exercises "leadership." His intent and actions can be communicated directly to the battlefield by voice communications. We must be careful not to become overly dependent on C^2 high technology. While high technology is necessarily the foundation of our current generation of C^2 systems architectures, it is also at times untested and can betray us. The "technology push" must be balanced against the "requirements pull."[16]

The core system recommended for use by commanders during the ship-to-shore movement of an amphibious operations is single channel UHF tactical satellite radios. Its operation should be on the landing force command net, which is configured to facilitate voice and data transmissions. Voice communications allows the commander flexibility in the execution of the assault. Once a secure beach head is established, critical core communications should be conducted over secure SHF voice and data paths, and single channel radio should become back-up communications systems to data packet systems.

PRESS COMMUNICATIONS

Press communications during expeditionary warfare is a necessary and required commitment that must be planned for. No commander likes to have a Cable News Network (CNN) drive his concept of operations. Press criticality during "...From the Sea" operations cannot be ignored. Non-combat Evacuation Operations (NEO) and humanitarian operations arouse public interest and the political impact is tremendous. The press is continuously speculating about military operations and want to get their story out. Commanders need to provide them with a transmission means to do this. Of course this is dependent upon communications availability with regards to the mission. But, the bottom line is the press has a communications requirement that must be planned for.

"...From the Sea" commanders should not make the mistake of leaving the press out. However, depending on the mission, they may limit press coverage. Sharing of communications paths with the press during the ship-to-shore assault phase (not during movement to the beach) of an amphibious operation can be planned for and supported by communications systems recommended in this paper. Time-sharing of communications links and systems with the press will satisfy their requirements. Most media sources come with their own hardware and usually only require security and a communications path.

DATA BASE EXCHANGES

> Today, improved technology in mobility, weapons, sensors, and C^4 systems continue to reduce the the factors of time and space, cause faster tempos of operations, and generate voluminous amounts of information. This information overload, if not managed may ultimately degrade the reactions of personnel and ultimately the warfighting force. It is essential to employ C^4 systems that are designed to complement human capabilities and limitations.[17]

Data base exchanges are designed to assist the commander in decision making and provide critical information which allows him/her to respond immediately to changing situations on the battlefield. The communications systems needed to support the data base requirements of an enabling force "From the Sea" must be interoperable, seamless, and open. Our research has determined that the most vulnerable period for data base limitations is during the ship-to-shore phase of an amphibious operation.

To support forces "From the Sea," naval forces must have information to operate -- information that is relevant, essential, timely, and formatted so that humans can quickly understand and act on it. Data bases for joint planning and execution systems can be supported by communications systems going ashore during the assault phase of an amphibious operation.

These systems would include the proposed Assault Reaction Package (ARP) and the Modular Assault Package (MAP). The systems can be set up on a secure beach in about 45 minutes. Over-the-horizon communications systems support using SHF and UHF communications paths, provide continuous data base information for planning, execution and logistics. SHF further allows the commander to collect data from theater and global locations through the Defense Communications System (DCS).

"From the Sea" requires additional data base exchange support. Communications paths cannot be allowed to limit a warrior's flexibility and decision-making capability. We believe the ARP and MAP communications packages will fill the communications gap identified in the assault phase of the ship-to-shore movement.

PART III: COMMUNICATING FROM THE SEA.

Chapter 1: AMPHIBIOUS ASSAULT COMMUNICATIONS.

3.1. **Focus**. This chapter will focus on the communications required to support command and control in an over-the-horizon assault. It will offer solutions on how to presently communicate from the sea.

3.2. **The Amphibious Assault Phase I - Silent and Simple**.

This phase stresses simplicity and ease of coordination. It is appropriately named because voice communications will not be used and continuous electronic emissions will be limited.

However, in this phase, there still remains a sufficient amount of communications to support command and control needs in an OMFTS amphibious assault. The Commander Amphibious Task Force (CATF) and Commander Landing Force (CLF) will still be able to have a tactical picture of the assault, imagery, and limited intelligence using systems organic to the task force that are made interoperable. Communications systems support for the CLF begins when the attack force is being launched.

First, Remotely Piloted Vehicles (RPV's) will be launched from the task force from 40 miles out. These vehicles will go toward the beach and upon arrival, begin sending back valuable imagery to the CLF. This picture can be "fused" into the Navy Tactical Command System-Afloat (NTCS-A) and the picture provided to various spaces, such as the Landing Force Operations Center (LFOC), aboard the command ship. The imagery will be stored, recalled when needed, and disseminated.[18] NTCSA-A can further provide this imagery information to supporting ships that need it, such as those assigned N... Gunfire Support (NGF). In this first element of the assault, the battlespace picture begins to take shape.

As the assault craft are launched to the beach, the CATF and CLF will be able to see their progress and locations by using Position, Locating, and Reporting System (PLRS) equipment. With a master station located on the command ship, such as the LHD class, the CATF and CLF will have the ability to physically see the movement of assault craft and assault helicopters on a large screen display.

Using the master station and PLRS units, graphic symbology is entered into NTCS-A and a tactical picture of the assault is produced. Additionally, PLRS users can send back messages in a "chatter mode." Though limited text can be transmitted, coordinating instructions can be sent and received. This method can be used as a substitute for voice communications.

A similar system to PLRS is the Navy's AN/KSQ-1, an Amphibious Assault Direction System, which will be on board the Navy's assault craft and control ships--also providing graphically the positions of the assault craft and control ships in the amphibious assault. This system will be made interoperable with NTCS-A also; so not only will the CATF and CLF share the location picture, but other ships as well.

These three systems -- RPV, PLRS, and KSQ-1--can provide the required imagery, tactical assault picture, and limited intelligence to the commander during the movement to the beach. There will be no requirement to communicate by voice. See Figure 5. This phase begins with centralized control, and it becomes decentralized as the assault movement begins. Pre-planned fires and air support will hit the beach prior to the assault force. Mission-type orders will be issued to the maneuver elements. An assault from over-the horizon must be well planned, and communications kept simple while movement commences toward the beach. Systems, such as the AN/KSQ-1 can also assist in the control for clearance of mined areas. Mine fields can be identified and the information on specific mine locations transmitted back to the command ship via AN/KSQ-1 relay paths.

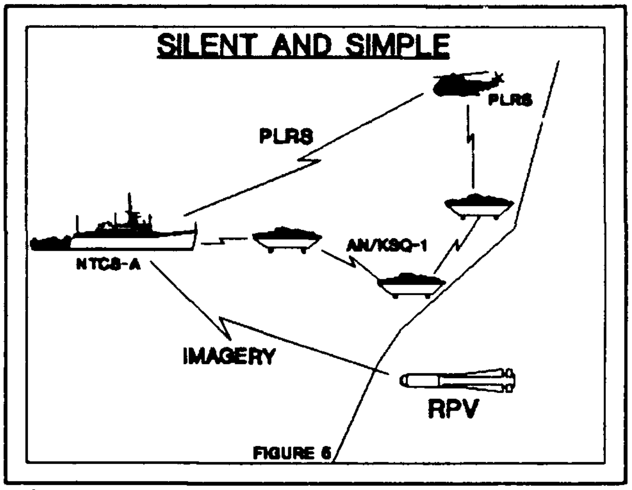

Figure 5

If, however, the assault force begins to come under fire while heading to the beach or is discovered in another manner, limited voice communications can be activated. The transition to Phase II begins either when the forces engage or when the first assault craft hits the beach.

3.3. <u>The Amphibious Assault Phase II - Critical and Confusing</u>.

In an over-the-horizon assault, this is when the landing force is most vulnerable, and will require suppression of enemy fires if it is a non-permissive environment. The ability to command and control forces and call for supporting fires at this point is critical.

Communications connectivity will build on the existing systems already in use - PLRS, AN/KSQ-1, RPV's, and Global Positing Systems (GPS). The transition will begin from seaborne control to land control of the assault.

How will this be accomplished? Due to the complex nature of command and control in an amphibious assault, and especially since this is magnified by the distance of the over-the-horizon assault, the initial communications must be quick, reliable, and simple to establish.

In this part of the amphibious assault, voice communications will be required for critical command and control needs. With the initial landing forces, UHF voice satellite terminals will be needed. There should be a minimum of one terminal per battalion and company. For example, if a infantry battalion makes the assault from over-the-horizon and has three companies in the assault, there should be four UHF voice satellite terminals. One for the Battalion Command Element (CE), and one per company. In addition, terminals should be provided to each of the Tactical Air Control Parties (TACP's); the Air Support Liaison Team (ASLT) from the Direct Air Support Center (DASC); the NGF Spotter (or whatever smart weapons observer we will have); and the Fire Support Coordination Center (FSCC). Also, a voice/data terminal for the battalion commander will be required for his use and serves as a backup terminal for the command element. The minimum number of terminals is then ten.

It must be stressed that at this critical stage of the assault, rapid, reliable, and robust communications are absolutely essential for the distances encountered. The ten UHF satellite terminals are, by no means, a luxury. They are needed to close the communications gap created by the use of an over-the-horizon assault.

To support these ten terminals, two satellite channels are needed. The first channel would be for command, and this would consist of the command element staff, the company commanders, and the NGF Spotter. The NGF Spotter would be placed on the command channel because of the anticipated amount of use by the NGF Spotter or (Smart Weapons Spotter). Additionally, logistics information can be sent and received over this channel.

The second channel would consist of the DASC's Air Support Liaison Team, the Tactical Air Control Parties, and the FSCC. This channel is dedicated to air requests, fire support coordination, and general support. Needs pertaining to air command and control, to include MEDEVACS, would be conducted over this channel. Figure 6 illustrates an

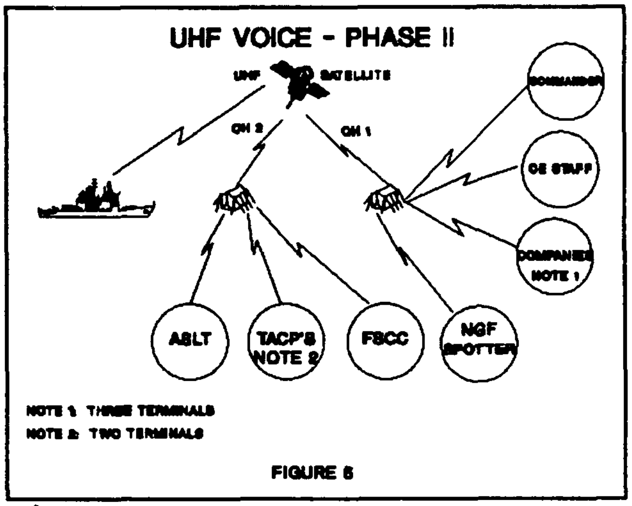

Figure 6

example of the establishment and configuration of the UHF voice satellite terminals in the initial portion of the assault.

In addition to the UHF SATCOM in use, high frequency (HF) radios will be used as a backup communications network. Selected HF command and control circuits would be activated as soon as the assault forces arrive at the beach.

Once enemy small arms, artillery, and heavy weapons fires have been suppressed and firm control of the beach head is established, the transition from voice to data begins. The communications system starts to provide a full picture of the "Magnificent Seven" to the CATF and CLF aboard ship.

To accomplish this, a Modular Assault Package (MAP)--contained in two Highly Mobile Multipurpose Vehicles (HMMV)--is required. The MAP would come ashore with the Ground Combat Command Element. Most likely, this would be a Regimental or Battalion Headquarters.

The MAP can come ashore either by Landing Craft Air Cushion (LCAC) or CH-53 helicopter. It can arrive and be operating in voice mode immediately. The data mode will take between 30-45 minutes for complete operation. Appendix 2 is a detailed illustration of the MAP.

With the ability of the MAP to be transported quickly ashore, significant voice and data capabilities are provided to the commander ashore. He can talk reliably by voice to the ship and agencies such as the Tactical Air Command Center (TACC), the Supporting Arms Coordination Center (SACC), and the Landing Force

Operations Center (LFOC) on the command ship 40 to 50 miles from ashore.

More importantly, once the MAP's computer terminals are up and operating, data can be passed to the ship and its agencies and back, permitting commanders to have a "fused" picture. Enhanced battlespace situational awareness will allow seaborne and assault forces to be mutually supporting, unify the command effort, and speed-up the critical decision-making process as it pertains to the battle. The commander ashore, whether conducting a benign NEO or a hostile assault, will be able to walk to his computer terminal/display screen located directly adjacent to the MAP and send or receive a fused battlefield picture.

The MAP is mobile and light, and will not hinder the movement of the battalion commander. The MAP would be tailored to the type of assault conducted; but generally, one vehicle would consist of UHF satellite equipment and the other would consist of SHF satellite equipment. These two assets--combined with their inherent communications connectivity capabilities--can provide the beach assault commander, the CLF,and the CATF with a tactical picture, voice communications, data base exchange capability, intelligence, the ATO/air frags, and press communications. Six of the seven critical commander's requirements would be provided by the MAP.

Imagery, the remaining critical element (provided by the RPV's) at this point in the assault, would not be fused into the network because of bandwidth needs. The imagery would go directly back to the ship for processing. Once command and control is fully phased ashore, RPV imagery into a fused picture could be examined and planned.

Figure 7 shows the configuration of the MAP and what it can support. This package provides a "fused picture" extremely early in the assault and combined with other assets such as PLRS and GPS, permits the commander to receive near real-time information to enhance battlefield situational awareness.

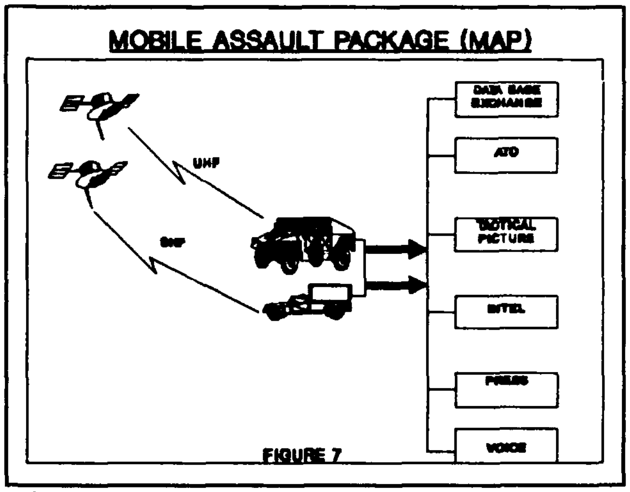

Figure 7

The heart of the SHF side of the MAP will consist of a lightweight satellite terminal - 8000 (LST-8000), which can provide six SHF channels. The significance of this system is that in the initial assault all channels could be voice configured and then switched to data to process packets of information and fuse the picture. Support data terminals can be interfaced with the LST-8000 and fulfill the commander's command and control requirements from over-the-horizon. For example, one of the channels could have a

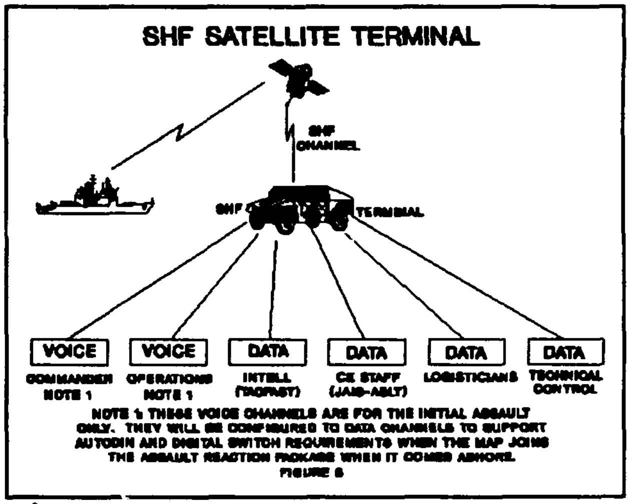

Figure 8

Tactical Forward Analysis Support Terminal (TACFAST) to provide intelligence and data base information exchange. Another channel could be configured and used in conjunction with the Joint Area Information System (JAIS) for the assault or JAIS-ASSAULT. This package consists of computer terminals which could be used directly by the command or battalion element staff sections to transmit and receive data pertaining to the assault. In addition, other data networks and satellite voice communications are available. The bottom line is that the SHF portion of the MAP can be configured to fit the needs of the assault commander. Figure 8 is a proposed configuration of the SHF MAP to be used for future over-the-horizon amphibious assaults.

We also have the UHF portion of the MAP. This would be used similar to the SHF package, but would require a dedicated satellite channel for each piece of equipment. The primary system make-up of the UHF MAP would be a AN/PSC-3 and a LST-5.

The UHF MAP would be used for establishment of voice communications. A fire support command circuit and a voice command circuit would be the primary configuration. This also provides an alternative system to SHF satellite connectivity. Figure 9 shows the proposed configiuration. A fire support command circuit and a voice command circuit would be the primary configuration. Transmitting the information via uplink to the satellite and then downlink to the ship can be done presently. However, information transmitted via the satellite channels must be "fused" into a complete picture aboard ship.

The key to fusion aboard ship is the Navy's Tactical Command System Afloat (NTCS-A). The NTCS-A must be able to receive the data information provided over the satellite channels, interpret it, and send it to the appropriate spaces (CATF/CLF) aboard ship, thereby sending out a "fused picture" of the assault. NTCS-A will have to have hardware and software changes so the preceding information can be processed. The NTCS-A, for all intents and purposes, will become a key server for all battlespace data.

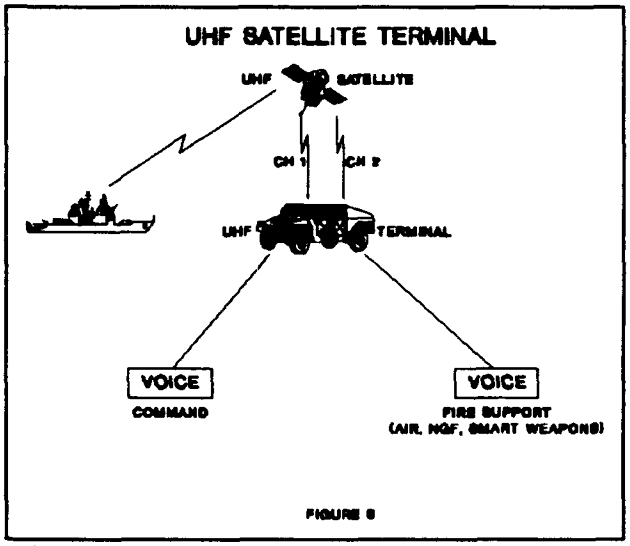

Figure 9

Voice communications will continue to be received at the assigned space in accordance with the radio plan. However, it must be emphasized that data, rather than voice communications, provides the best situational awareness picture.

Air command and control and fire support are critical to the success of an over-the-horizon assault. Although pre-planned air targets and fire missions will be used, the ability to request air and fire support is required. The voice satellite communications will fill this void in an over-the-horizon assault. It is imperative that voice terminals and satellite channels be provided for this effort. Appendix 3 demonstrates how air missions would be requested using the communications assets needed in an over-the-horizon amphibious assault. Appendix 4 illustrates fire missions for other supporting arms.

The distances involved drive the communications in an over-the-horizon amphibious assault; thus, we must have reliable satellite support -- period. The days of the assault forces seeing the ships three to five miles from shore are over. Data will replace voice as the primary means to pass information. We have to adjust our thinking in the way we communicate in the Marine Corps.

Conversely, the Commanders in Chiefs (CINC's) have to realize that OMFTS is a concept that provides them and the CJTF with an enormous amount of capability and flexibility. OMFTS will have Navy and Marine units as enabling forces, able to influence enemy action. It is, therefore, imperative that requirements such as satellite channel requests be fulfilled and emphasis be placed on amphibious operations.

3.4. <u>The Amphibious Assault Phase III - Established Ashore</u>.

As stated previously, the communications to support over-the-horizon amphibious assaults based on OMFTS will utilize a "building block" approach. The third part of the amphibious assault's "communications trilogy" begins when the beach head is

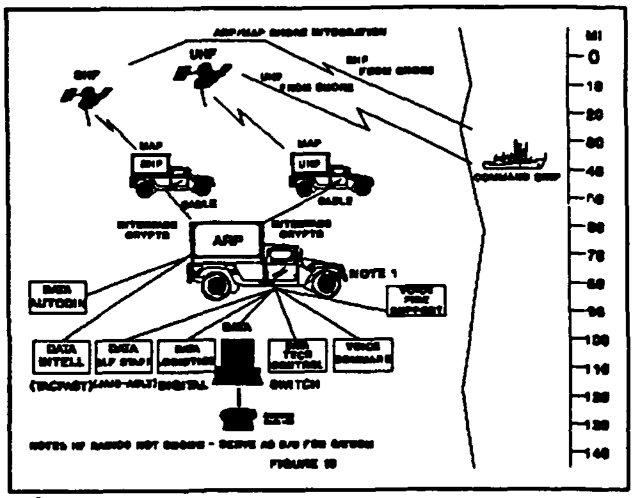

Figure 10

secured and sustained operations commence. See figure 10. The keystone of Phase III communications operations is the Assault Reaction Package, or ARP. The ARP builds on the MAP previously sent ashore to initially assist the primary maneuver element's ability to command and control the action of the early assault. When land operations begin after the assault is over, the battalion would return the MAP back to the CLF's command element and use its own organic assets for command and control (to include the UHF SATCOM terminals previously provided).

As the CLF command group arrives ashore, the MAP would be combined with the ARP and provide a significant, albeit temporary, command and control suite ashore until the establishment of the Marine Tactical Command and Control System (MTACCS). Once the MTACCS is established, the ARP and MAP would be returned to the ship or used for Marine operations elsewhere if needed. Figure 11 shows the timeline that covers the operational periods for the MAP and ARP.

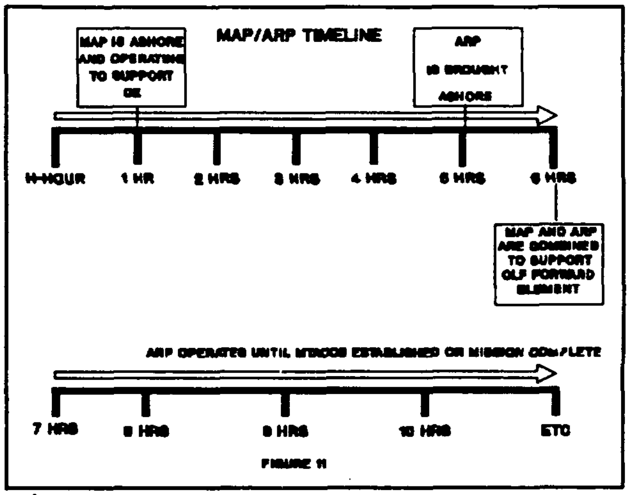

Figure 11

The ARP is designed to add to the capabilities provided by the MAP. It can be configured to the operation's needs, but will have the capability to provide record message traffic (AUTODIN), secure facsimile, voice switching, and digital technical control.

The ARP will be housed in a shelterized van (i.e., S-280) mounted on a five-ton truck. Power will be provided by a 100KW trailer-mounted generator to be pulled behind the five-ton truck. This powerful generator can also support staff initial power requirements.

Contained in the shelter will be five primary communications means. First, there will be two complete teletype terminals, which are Autodin compatible, and capable of up to 9.6 operation. The entry into the Defense Communications System (DCS) Autodin Network would be made via an SHF channel contained in the MAP. This will provide the CLF's forward elements with record message traffic capability.

Second, a digital telephone switch, a SB-3865, will be established in the shelter to provide digital telephone switching back to the command ship. An SHF channel from the MAP would be used as the transmission means. The SB-3865 would provide digital telephone connectivity using secure telephone units (STU-III's) and TA-938's. This provides a secure telephone and data transfer capability for the CLF's staff. The switch on the command ship would be a AN/TTC-42 (or AN/TTC-39). It is envisioned that the AN/TTC42 would also be trunked to other SB-3865s onboard ships of the Amphibious Task Force (ATF). The transmission paths between the ships would be via SHF satellite and require a dedicated channel. A digital switch network contained within the ATF will provide numerous advantages. For example, if a logistician needs to find out the status of an ammunition shipment coming from one of the ships, he would merely dial the number to that particular ship and could talk directly to the responsible person to obtain the status of the ammunition offload. Staffs could talk freely within the task force from the shore and coordinate a variety of functions.

Third, a digital technical control panel would be installed in the shelter. This provides a method of establishing and operating the digital type of communications network needed to support the commanders. This network will require detailed planning, as a basic communications network begins to develop. It is not an easy task, but a very integral and necessary function that has to be done proficiently. If the communications network based on the MAP and ARP can be properly brought on-line and activated, it will not only make the eventual establishment and transition to the MTACCS that much easier, but it will also enhance the ability to provide battlespace situational awareness to the commanders.

Fourth, the ARP would contain secure facsimile devices. This would permit exchange of maps, overlays, and other pertinent information between ship and shore. The communications medium to send and receive secure facsimile would be over an available SHF satellite channel or plugged into the digital switch for use with a digital phone (STU III). This equipment would provide limited imagery, but can not be fused into the NTCS-A at this time. However, in the future--with appropriate translators--this can become a capability.

Lastly, voice communications, both UHF and SHF, would be remoted into the ARP or staff area using the AN/PSC-3 and LST-5 housed in the UHF MAP. This provides a great deal of flexibility if additional data needs to be transmitted. In addition, two HF radios would also be installed and with the USC-43 modem/crypto device, providing secure data and voice capability if required.

Appendix 5 is an inside layout of the ARP shelter with MAP support and the communications equipment requirements contained inside. With proper engineering, this shelter can provide a mobile and reliable communications configuration for the CLF and his staff elements during the transition of command and control ashore. It closes the communications gap between at-sea assault ships and the beach assault forces.

Personnel requirements to man the MAP include two Marines with an augmentation of two Marines from the supported unit's communications section. The four Marines manning the MAP would be part of the CLF's staff, probably provided from a communications battalion or squadron. The personnel augmenting the MAP from the supported unit would return to their original unit once the MAP is joined to the ARP.

The ARP personnel would be from a communications battalion or squadron and will require twelve Marines of varying military occupational specialties plus one officer and one staff non-commissioned officer (SNCO). A personnel table with numbers and MOS's is provided in Appendix 6. Personnel will not be increased to support the MAP and the ARP. Present tables of organization

(T/O) would be used. The personnel used to support the MAP and the ARP would have this function as an initial additional duty, then return to their regular duties upon the end of the MAP/ARP mission.

In summary, the ARP combined with the MAP, eliminates the distance gap that develops when employing the concept of OMFTS. This package provides full command and control capabilities to support the CATF and CLF and permits the fusion of information required to create battlefield situational awareness and supports the critical decisions required to execute a complex amphibious operation from the sea.

PART IV: IS JOINT COMMAND POSSIBLE FROM THE SEA?

CHAPTER 1: WELCOME TO THE JOINT WORLD.

4.1. Focus.

> Where other forces are also deployed, self-sustained forces will be integrated with a joint task force; and the efforts of all components will be complementary and unified by one commander and one mission![19]

4.2. Introduction.

The "joint warfighting concept" is not new to crisis responses for Department of Defense. Since Desert Storm, Just Cause, Grenada, and the Libyan bombing, the services have clearly proven they can handle demanding "joint operations" -- **when there is an appropriate amount of planning/practice time**. However, the challenge is **to do well on short notice.** Part IV of this paper is designed to identify communications systems that interface with the Joint Staff's C^4 intelligence "open" systems environment. Every communications and data system is considered to be a joint system unless it meets a service unique requirement. The intent of this chapter is to identify **joint** command, control, and communications (C^3) systems that enable the **Navy** to support **"Joint" Operational Maneuver From The Sea (OMFTS)** by successfully executing the following:

- O Command, Control and Surveillance
- O Battlespace Dominance
- O Power Projection
- O Force Sustainment

4.3 Joint Communications To Support OMFTS.

Currently, joint forces, in general, and naval forces, in particular, are concentrating on littoral warfare and maneuver from the sea. This new direction signals a need for change in doctrine, education, service integration, acquisition, operations, and risk reduction. Paramount among the Navy's tasks is the development of a doctrine for Expeditionary Warfare.[20]

To participate fully in future Joint Task Force operations when supporting an amphibious assault, the Navy needs to prepare for joint communications by being capable of:

o Serving as or hosting the Commander, Joint Task Force (CJTF) afloat;

o Serving as or hosting the Joint Force Air Component Commander (JFACC) afloat;

o Communicating with ashore commands, especially the CJTF and JFACC.

To achieve these operational objectives, the Navy should emphasize the following:

o Upgrade communications suites on flag-capable ships, and especially fleet flagships, that provide suitable spaces for a CJTF or JFACC;

o Upgrade communications providing both the volume and variety that an afloat CJTF or JFACC would require in an over-the-horizon amphibious assault.

o Install communications systems that adhere to common, joint standards to simplify coordination with the assault forces and the embarked non-Navy staffs requiring joint connectivity.[21]

The command and control platform of the future for CJTF, Fleet, and Fleet Marine Force Commanders will be a "vital" array of distributed nodes consisting of multiple ship classes and ashore agencies. Every major ship is a potential fusion hub. Every JTF component or Marine/Army Expeditionary Force/Brigade/Unit is a potential fusion hub. Designation as the hub of the command and control system will be dependent on the location of the **commander** at any given moment in time. For this to occur, we need to change our command, control, and communications processes and systems, incorporating distributed databases interconnected by networks which are smartly manipulated to support the decision-making process.[22] We need to ensure our current systems are fused and interoperable so a current battlespace picture can be provided. Figure 12 depicts the joint communication systems that support command and control.

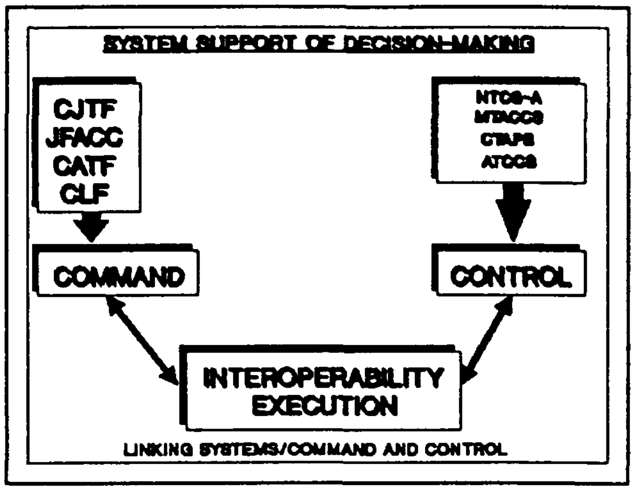

Figure 12

Joint communication systems must be distributed networks feeding realtime pictures to all echelons of the joint force down to the level of battalions and ships. Continuous situational awareness must be available in all dimensions to all commanders, especially during an over-the-horizon assault.[23] Figure 13 shows major component headquarters requiring voice and data integration.

The joint staff's C^4I vision and roadmap for the warrior is a good start in generating a common focus in C^4I. However, is this the best and most economical roadmap? No one really knows; but what we do know is joint-interoperable communications systems are needed now to support OMFTS at the required distances. We also know that a centralized approach to acquisition and interoperability under a single agency is a <u>must</u>. The Defense Information Support Agency (DISA) has been tasked to lead this process, and the Naval forces agree this is the best approach to supporting joint "warfighting" from the sea.

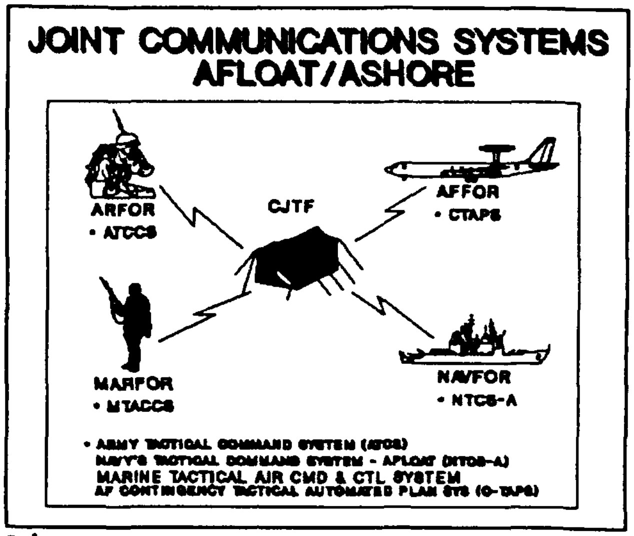

Figure 13

4.4. **<u>Filling The Joint Communications Gap From The Sea</u>**.

> Increasing the number of LCC's in the fleet is unlikely, especially with the diminishing resources available in today's budgetary environment. Increasing the number of communications nets emanating from existing ships might be possible on the margin, but significant improvements would defy the laws of physics.[24]

While the CJTF and JFACC are operating afloat and ashore, prior to the start of an assault, the communications and data-exchange requirements between Commanders-in-Chiefs', JTF

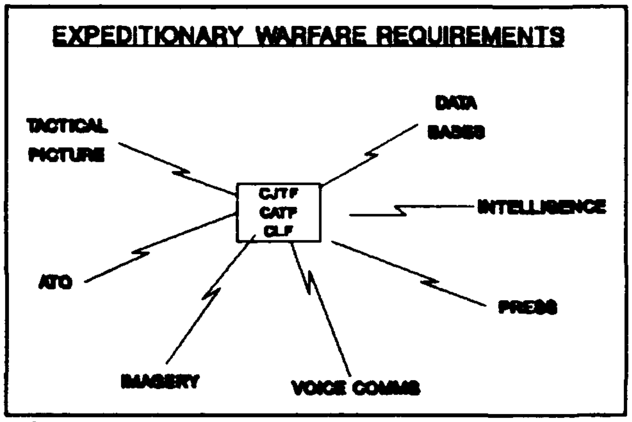

Figure 14

Commanders, and component commanders are not much different from those required by the CATF and CLF. Figure 14 shows those basic expeditionary warfare requirements. Future "quick-fix off-the-shelf" systems must interface with major service systems to support joint operations. The Marine Corps Tactical Command and Control System (MTCCS), the Navy's Tactical Command System - Afloat (NTCS-A), the Air Forces's Contingency Tactical Air Control System (TACS) Automated Planning System (CTAPS), and the Army's Tactical Command and Control System (ATCCS) comprise the services' major voice and data systems respectively. However, smaller, portable off-the-shelf sub-communications-systems can be used in the initial assault forces ashore during amphibious and contingency operations. Quick-fix interoperable sub-systems can also be pulled off-the-shelf to support short term warfighting requirements. These portable systems include the lightweight satellite system (LST) 8000 (See Appendix 7), and Joint Area Assault Information System (JAIS-ASSAULT) (See Appendix 8), previously discussed in the preceding chapter.

To support the joint commander, the defense department's "open system" environment concept requires development of new technologies and techniques to meet the needs of joint/combined warfighting. Technologies for integration of MTACCS, NTCS-A, CTAPS, and ATCCS systems are not mature enough for total implementation today. However, partial quick-fix interoperable systems are needed to fill today's "communications gap" during ship-to-shore assaults in support of Joint Task Force (JTF) Commanders and Joint Force Air Component Commanders (JFACC). The early development of interoperable communications systems to support CJTF and JFACC requires extensive quick-fix objectives. Implementation of these objectives as part of a quick-fix solution will require such capabilities as increased SHF channel capacity, fiber optic cabling aboard ships, and extensive employment of state of the art personal computers. The implication of this is that communications capacity will cease to be the limiting factor for a naval vessel to perform extensive command and control functions. Thus, the ability to employ warfighting functions and support on a variety of naval vessels will increase dramatically.[25]

One method to assist the joint commander at sea is by using the Deployable Joint Task Force Augmentation Cell (DJTFAC). DJTFAC augmentation is a force multiplier for "warfighting" From the Sea. The LST 8000 and the JAIS-ASSAULT portable communications systems reduce the communications gap in ship-to-shore assault communications. DJTFAC joint communications personnel bring key joint contingency publications plus, a wealth of expert se concerning joint communications systems.

Another consideration in OMFTS in a joint environment is the possible embarkation of the JFACC aboard the command ship. The communications systems in support of the JFACC...From the Sea must be fully interoperable with major systems of the Joint Force Commander (JFC). This arrangement is required because the JFACC derives his authority from the JFC, who will establish procedures for the JFACC to employ those air forces and interdiction capable missile missions assigned to him.[26] See Appendix 9 for JFACC organization.

The service component designated as the JFACC is responsible for planning and activating all validated communications links that support the JFACC mission. The ability of the JFACC to exchange information via reliable secure communications with the JFC, Joint Targeting Coordination Board (JTCB), each component commander, and other coordination cells associated with the joint force mission is **key to the successful integration of the joint air effort.**

An over-the-horizon amphibious assault is difficult, but becomes even more so if the JFACC is embarked. Special care will have to be given to communications planning to ensure that sufficient communications assets are onboard to support a JFACC requirement. A possible solution is to permit the JFACC to bring portable satellite equipment, with high gain antennas and allow the deck mounting of this equipment. This would alleviate some of the difficulty in priortizing communications connectivity for over-the-horizon amphibious assault with the JFACC embarked.

PART FIVE: ARE WE GETTING THERE?

Chapter 1: CHALLENGES NOT PROBLEMS.

5.1. **Focus**.

This chapter will focus on the current status of command and control--based on OMFTS.

5.2. **Current Status**.

The need exists to fill the communications gap for over-the-horizon amphibious operations. The vast distances required to communicate preclude Navy and Marine forces from operating in the traditional manner, -- that is to say, from an off-shore distance of three to six miles.

Part three discussed communications connectivity based on OMFTS. Using existing equipment currently in the inventory, a method to solve the communications problem from over-the-horizon was proposed, based on a three-phase building block approach. The use of a Modular Assault Package (MAP) and Assault Reaction Package (ARP) provided the foundation for resolution of the communications gap.

The use of the MAP and ARP, and the ancillary equipment that goes with them, was intended to be a "quick-fix" solution. Future equipment acquired and procured will be totally integrated and interoperable, capable of covering the great distances involved with OMFTS.

The current proposal set forth in this paper, although meeting the communications needs of OMFTS, is not the optimum solution. Using equipment that is currently in the inventory does present problems. First, all the equipment is not completely interoperable and requires detailed communications planning by the amphibious planners. This will ensure appropriate hardware and software match ups take place prior to commencement of operations. A Standard Operating Procedures (SOP) [recommendations based on OMFTS], which specifically addresses methods of operation, hardware, and software settings would enhance the chances for success. For example, pin connections on cryptographic equipment will require the proper settings to ensure they will work and interface with one another. Another example is the software that is used. The software used by specified data systems must be the right versions designated in the plan. This seems like common sense; however, with the fact that all four services may be involved in OMFTS, either in a direct or indirect role, precise planning in the data arena is required.

Second, the equipment systems to currently support OMFTS are "throw down." In other words, the equipment we now possess has to be thrown together and made to work. It was not procured with a systems approach in mind. Specific equipment was obtained for specific functions. That has to change and a systems approach in research development, procurement, and acquisition must take place to support OMFTS. Presently, the use of interface devices and translators will have to be used to ensure that throw down systems can operate with one another--not an easy task. For example, the NTCS-A is a system with significant capabilities, and can act as the primary "server" aboard the command ship and entire task force during the assault. It would be senseless to waste a system like NTCS-A by not purchasing the required interface devices and translators to make sure that existing ashore data systems (CLF) can operate and interface with those at sea (CATF). Thus, ashore and afloat systems can pass vast amounts of data within their systems architecture, using NTCS-A as a server. Work has begun in this area between the Navy and Marine Corps. The Marine Corps Tactical Command and Control System (MTACCS) is being examined to determine interface possibilities with the NTCS-A.

Third, when we use our current communications systems to support OMFTS, we must be innovative. For example, if insufficient quantities of satellite equipment cannot be obtained to support OMFTS, command and control may initially fall back on VHF and UHF radio systems. Since the distance from the shore to the ship will be extensive, a relay system will have to be used. Traditionally, either ships of the task force or helicopters were used as relay points. Instead of ships or helicopters, why not utilize an aircraft for airborne relay that can stay on station for long periods of time and has significant room inside and outside to outfit it with the needed communications relay equipment and antennas to support VHF and UHF radio relay? The perfect aircraft for this currently in the inventory is the Navy's P-3. As the P-3's primary mission declines, use this available aircraft for an airborne platform in amphibious assaults. The aircraft has sustainability, can fly great distances, and is large enough to support a variety of airborne relay missions. See figure 15.

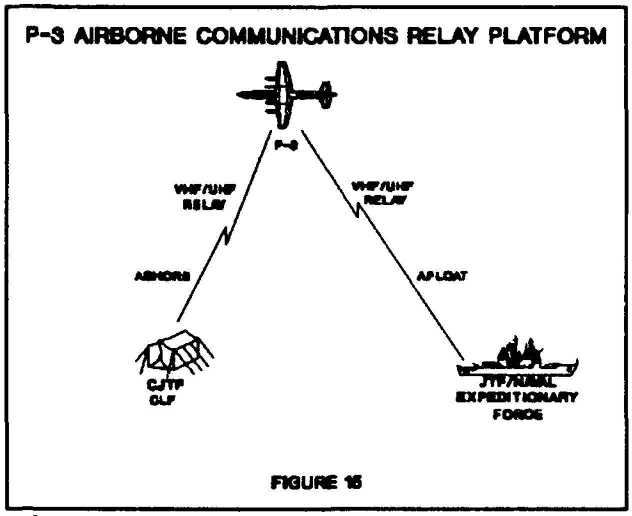

Figure 15

If the operation is conducted outside the range of land-based air, organic assets from the task force (i.e. UH-HUEY) will have to be used. The remaining option would be to not to use any type of airborne relay.

Commanders using our current communications and data systems must learn the systems, know what they need from them, and specify to the amphibious communication planners what their needs are. The thought process of a specific communications system to support a specific function must change. Communications systems are merely information networks available to pass information in and out of the existing architecture to support the commander. Information systems must be "open" so the commander can "push or pull" the information out of a "seamless" architecture.[27] Commanders must educate themselves now so they will know how to use the information systems. The future of OMFTS is based on an information systems approach.

Lastly, training (specifically in the area of communications planning and operations) has to be continually conducted to support OMFTS. Marine and Navy staffs, and when appropriate, Army and Air Force staffs, must plan and train together to ensure that command and control based on OMFTS can be accomplished. There are a variety of ways to do this, but quarterly command post exercises (CPX) between Navy and Marine Corps staffs would help immensely in testing and validating communications connectivity and procedures to support OMFTS. Command and control procedures could be practiced by the Navy aboard ship while Marine forces could participate from their home station. For example, the Amphibious Group Commander and his staff--based in Norfolk, Virginia--embarked on an SHF configured flagship could train with MEF Forward (based at Camp Lejeune, NC) and using the Modular Assault Package, participate at their headquarters or in the field. The duration of the exercise would be twenty-four hours, with a prior setup time of 48 hours. It could be held every third month at the same designated time. Furthermore, this training could be tailored to test the communications and data systems to ensure they can work between ship/shore, and it could also test equipment operation and settings, software, cryptographic equipment, and technical control procedures; thus providing training for communications personnel and the staff. These exercises do not have to be elaborate productions. On the contrary, they should be short, simple, and stick to identifying communications and staff requirements and implementing information system procedures to support the commander's basic seven requirements.

5.3. The Mid-Term Phase - Transition To The Future.

As the defense budget shrinks, amphibious assault forces provide great potential as enabling forces. With the ability of "seamless" command and control, the force can be directed anywhere along an enemy's coastline as they come in from the sea.

This future amphibious assault scenario can only take place if we have the required command and control to support it. Specifically, we need communications systems that are totally interoperable, with the ability to send and receive critical information--either voice or preferably data--over vast expanses of ocean as the assault force comes in from over-the-horizon. Excluding press requirements during the assault, six of the critical commanders requirements are needed during the amphibious assault; thus it will have to be addressed by future voice and data systems. These requirements are critical in an over-the - horizon assault and must be fulfilled so the CATF and CLF have a total and fused picture of the battlespace. This will permit sound decisions to be made based on the information being received on large screen displays in the command spaces.

To support the required command and control needed for OMFTS, future communications systems for the amphibious assault must be compact, lightweight, and capable of sending and receiving data bursts. Voice communications will be in a secondary role. Updated versions of grid reference systems will be interoperable with the services command and control systems--so commanders will have instant situation reports based on the ability to pass graphic symbology in a seamless and open communications system.

Tactical communications and information nodes will be interconnected in support of joint and combined operations, to include over-the-horizon amphibious assaults, irrespective of time, place, or service/agency sponsorship.[28] Assault craft, heading to the beach and equipped with the latest communications technology, can be directed to change course by the CLF during an over-the-horizon assault from miles away. This type of command and control capability during the assault makes the assault force from the sea a true enabling force, capable of landing anywhere along a stretch of enemy coastline.

Future systems must have the ability to increase information from ship-to-shore through the use of multi-spectrum satellite equipment to communicate from the sea.[29] The communications system will be digitally based, and the equipment will evolve toward a single, common, unified, and interoperable system[30] with equipment needs tailored to the assault.

To install, operate, and maintain these digital assault systems, will require extensive planning and sufficient technical control nodes are required to manage the communications and data networks for the assault and landing. Planning systems and decision aids will be used in transit, prior to the assault to ensure communication plans, orders, and systems are interoperable and ready to go. Consequently, the communications system must be planned and rehearsed in detail prior to the assault. With digital switchboards interconnecting the ships, this planning capability needed prior to the assault will exist.

There are three things that have to be accomplished to ensure the Mid-Term Phase is successfully implemented to support amphibious assaults based on OMFTS. First, there is a plethora of communications and data systems in our current inventory. These systems have to be phased out so ones that are completely interoperable are procured and brought on line. We can no longer afford to purchase a system to meet a specific need and then "jerry rig" it to match other existing systems.

Second, we have to standardize our communication and data systems prior to procurement. We have to ensure that all systems are interoperable prior to being assigned to a service. For example, Marine Tactical Air Command and Control units have to be able to interface and operate with Air Force Tactical Air Command Centers as they arrive on the beach, especially if the Marines are a component command in a joint operation and the Air Force is acting as the Joint Force Air Component Commander (JFACC).

Third, we have to have an agency that can manage the standardization process for equipment and ensure that each service's equipment meets all interoperability requirements prior to being placed in operation. This action will prevent loss of communications during the amphibious assault. For example, if an Army force is assigned an amphibious assault, they must be able to come in with their communications equipment and operate with Navy ships, as the Marines do. The world of "purple communications" must be fully implemented during the **Mid-Term** Phase if we are truly serious about an "open" and "seamless" communications system to support command and control as it transitions from the sea to the shore.

The Defense Information Systems Agency (DISA) exists today to perform the aforementioned mission. To date, it has been difficult for DISA to do this because the CINCS and the Services often have their own prticular agenda with regards to communications needs. DISA must become a "TZAR" for communications and data systems, so one individual is in charge of the validation of the requirements and has the authority to reject or approve the system--ensuring it is not duplicative in nature and is interoperable. The DISA Commander must become a four-star billet and have the required authority to make the decisions required to maintain interoperability among the services.

The **Mid-term** Phase is rapidly approaching. We can no longer think in single-channel radio terms, but must be innovative and realize we need to support OMFTS with digitized, high speed, secure, data information systems.

5.4 The Objective Phase - A Dream Or Reality?

> The Department of the Navy is committed to providing a command and control structure that will exploit the unique contributions that Naval expeditionary forces bring to littoral operations. Our goal is to ensure efficient joint operations through a command, control, communication, computers, and intelligence (C^4I) architecture which can adapt from sea to shore. The information and

data aspects must be user supportive and sources to all potential users.[31]

The Joint Staff's C^4I Warrior **Objective** Phase for communications systems extends beyond the year 2000, and is very dependent upon advanced technology drivers. The concept description itself should provide the focus needed by the research, development, and acquisition communities to generate solutions. It is unconstrained by nostalgia, and free of the design predictability that prematurely dismisses relevant options applications, multi-level security, data compression and data fusion and common operating interface environments.[32]

Attaining the Joint Staff's Objective Phase goals requires a combination of technological and human fixes. In pursuing the "technological fix," we must look for evolutionary technological solutions to address the continuously evolving needs, their evolution triggered to some extent by the solutions themselves.[33] We must remember that as technology advances to solve some problems, it also changes them. For example, the use of satellites has changed forever the collection and transmission of information; it has also introduced the problem of satellite survivability; thus, the very nature of the survivability problem for C^4I systems has changed.

Given all the considerations, the naval services have accepted the challenge to develop and interface the Joint Staff's C^4I information systems requirements by the year 2010. Is this a dream or reality? Naval forces believe it is a reality! They feel the paradox of continuing commitments and declining budgets are being resolved by fundamental changes in the way the Naval Service does business. Change and innovation are the new order of the day -- new organizational and operational concepts, increased joint interoperability, and where possible, the multiplier effects of new technology.[34]

We believe the naval forces see warfighting in the same manner as M. Van Creveld saw it in his book Command in War -- that "command and control in war consists essentially of an endless quest for certainty about the state and intentions of enemy forces, about the ...environment, and about the state, activities, and intentions of one's own forces." Thus, we may postulate that the unifying concept in OMFTS is bridging the "communications gap" from sea-to-shore.

During exercise Tandem Thrust 92, naval forces demonstrated the ability to conduct CJTF as well as JFACC functions afloat. However, this was a C^4I quick-fix/mid-term goal; the ultimate goal for C^4I's Objective Phase is for the Naval forces to provide all joint afloat commands with fully integrated command and control capabilities, with appropriate attention to the various command transitions such as sea-to-sea, sea-to-shore, shore-to-sea, and shore-to-shore.

So, what can we conclude? Is the Objective Phase a dream or a reality? In this paper, we have tried to show that while some future informational systems may be a dream, C^4I information systems in support of ...From the Sea is very real.

PART SIX: ACTIONS AND RECOMMENDATIONS.

Chapter 1: **WHAT IS THE FUTURE?**

6.1. **Focus**. This chapter will discuss the current and future status of OMFTS with regard to communications for command and control.

6.2. **We Can Do It Now**!

This paper has shown the communications gap that exists to support command and control procedures for over-the-horizon amphibious assaults based on maneuver warfare from the sea. Also it has addressed the current situation and offered a solution predicated on existing equipment and systems.

Over-the-horizon communications must be reliable and robust to ensure that the desired command and control to support the seven primary requirements of the commander (CATF and CLF) are provided. Execution of these seven requirements will permit the use of an amphibious unit as an enabling force and provide the commander with Battlespace and Situational Awareness. The amphibious task force has to have the capability to command and control its forces from an over-the-horizon distance of at least forty miles. Consequently, communications must be planned and executed to support the ship-to-shore movement from a greater distance than the previous traditional methods of amphibious operations. Additionally, over-the-horizon assaults based on OMFTS provides the CATF and CLF with a great deal of flexibility.

For example, in a forcible entry situation, using command and control systems with reliable communications, an assault force could change its landing in mid-assault based on the threat at the landing beach. If the first beach objective area is mined and heavily defended, the assault force can change its objective location and be directed to another landing area based on grid reference system connectivity and secure satellite-based voice communications. This provides the CATF and CLF with enormous flexibility, and these types of decisions can be made because the assault force is so far out over-the-horizon--thus, unseen by the enemy--that there is time to change the plan if reliable communications systems are present.

Another example of OMFTS' value can be seen in a Non-combatant Evacuation Operation (NEO), or in a low-intensity conflict (LIC), based on action centered on littoral warfare--the type of actions that can go from benign to hostile very quickly. Using OMFTS, command could remain afloat and not have to be passed ashore. This would prevent ships from coming into harm's way, and significantly reduce the number of troops ashore from command elements. This enables more "tooth than tail" to be ashore to handle the required operations. Therefore, the communications equipment that is presently used will not suffice for use by an enabling force.

Currently, OMFTS will require communications distances that exceed forty miles. Present systems to support the amphibious assault are based on voice communications in the very high frequency and ultra high frequency range. These systems were reliable and effective supporting amphibious assaults near shore, but quickly became ineffective when the ship went out of range or in some instances, changed its course. The multichanneled VCC-2, Navy UHF transceivers, and high frequency equipment onboard ship were the heart of the communications plan for the assault.

The configuration of the communications support described in the preceding paragraph did not support data requirements. Additionally, the equipment was old, and in the case of the VCC-2, often neglected.

New equipment, such as the SINGARS family of radios, will not alleviate the distance problem caused by OMFTS in the future. Based on the operational requirements of SINGARS, the equipment range is the same as existing equipment, and does not exceed 35 KM or 21 miles. Therefore, SINGARS is significantly insufficient for voice command and control communications in an over-the-horizon assault.

New and innovative methods of communicating from the sea will have to be used. In the quick-fix phase, the following steps have to be taken to fill the present communications gap for over-the-horizon assault:

(1) SHF and UHF satellite equipment will have to be given to Marine amphibious forces to use and train with. Assets currently held at the CINC level, are an example of the type of equipment needed by Marine assault forces. This type of equipment will have to be either procured by the Marine Corps in

sufficient quantities or redistributed by the CINC for use by the Marines temporarily. CINCs and Fleet Commanders will have to carefully consider the priority of the assets. It is essential that assault forces have the capability to conduct over-the-horizon missions. Equipment currently in the inventory can make this happen. This will enable the ARP and MAP concept to become a reality for over-the-horizon assaults.

(2) Interoperability between grid systems, such as PLRS, global positioning systems (GPS) and the Navy's AN/KSQ-1, will have to be developed and implemented immediately using new interface devices and translators. This interface is critically important to the development of the NTCS-A concept afloat.

(3) Satellite channels, both SHF and UHF, must be provided to assault forces. No longer can single channel radio carry the load in amphibious assaults. The ability to transmit data packets at high speeds and have reliable long-distance voice communications is a must for OMFTS. Satellite communications is the primary path to success. Thus, sufficient SHF and UHF satellite channels are required in the assault and must be prioritized to ensure Marine forces will have sufficient channelization to conduct the assault from 40 or more miles away. This may change the way we do business, as satellite channels for naval forces take on less of a priority than those of Marine assault forces going ashore from over-the-horizon. With appropriate and combined staff planning, this priority of satellite channels can be worked out.

(4) Equipment to support OMFTS must be compact, lightweight, and portable. A prime example of what is needed is Miniaturized Integrated Satellite Terminal Equipment (MISTE). It is a secure UHF satellite terminal that provides data exchange capability, voice, and facsimile. It is available for use now. Off-the-shelf procurement of systems such as MISTE are needed to support assault forces in OMFTS.

(5) The plethora of information systems currently in use or about to come on line require interoperability. Translators and interface desires must be developed immediately to ensure that when these systems are "throw down" for an assault using OMFTS, that they can operate together.

(6) Digital switching systems onboard Navy ships must be installed. This will provide a capability to develop a digital switching system at sea for the planning and movement phases, thereby enhancing operational planning. Additionally, Navy ships can be tied into ashore switching systems; thus, this will provide secure telephone capabilities between ashore and afloat units--a capability that will vastly improve coordination and control.

(7) With the advent of a digital backbone network, a portable digital technical control facility will be required to permit the establishment of over-the-horizon communications. Additionally, this will ease the transition from the command and control network established to support the over-the-horizon assault to the communications network needed for ashore

operations (i.e., MTACCS).

(8) Communications will have to be upgraded aboard Navy ships to support a Commander, Joint Task Force (CJTF) and/or a Joint Force Air Component Commander (JFACC). Satellite connectivity will be required; this, added to the existing OMFTS requirements, will strain the flagship. An alternative would be to permit deck-mounting of satellite terminals using high-gain portable antennas. However, the frequency plan would have to be worked in detail to prevent mutual interference. Another alternative, if the CJTF is going to be afloat, is to ensure a second flag-configured command ship is present to provide adequate command and control for Component Naval Forces executing OMFTS.

(9) Single-channel radio provides a good backup to satellite systems for OMFTS and should not be discounted. However, for VHF and UHF equipment, radio relay will be required. We must provide relay platforms for single channel radio and grid reference systems. Use of current alternative aircraft, such as Navy P-3's, can be examined.

(10) Training between Navy and Marine staffs should commence immediately, using the OMFTS concept as the basis for the scenario. Communications training, using UHF and SHF satellite systems from Navy ships to Marine ashore commands is required to ensure procedures are established to install, operate, and maintain the communications systems and interfaces required to support OMFTS. This is especially true in attempting

to pass data information from terminal to terminal. Combined training between Navy and Marine staffs cannot be overemphasized. Staffs have to know how to use, manipulate, and appreciate the command and control system that will be established to support Operational Maneuver From The Sea. Continuous training will only serve to enhance the operational readiness of amphibious staffs as they prepare for amphibious operations based on Operational Maneuver From The Sea. Additionally, staff training using satellite equipment and computer terminals from home station is an extremely effective way of training while keeping operating costs for training minimized.

6.3. Into The Future.

By mid-term of the year 2000, there will be total interoperability for new command and control systems. Joint-wide data networks will be operating between the forces so that information can be exchanged, and so that the commander can access various interoperable systems to pull out what is needed by his forces. Information can be tailored to the commander's needs; this, in itself, will prevent information overload.

(1) Communications systems must be viewed as information systems carrying important data that has to be fused together on the flagship to provide battlespace situtational awareness to the commander. The continued development of the NTCS-A to fuse this information together is the keystone of information processing. Current systems in support of OMFTS must be able to interface with the NTCS-A. Eventually, a seamless

architecture will develop to tie in NTCS-A, MTACCS, ATACCS, and CTAPS, so that a total "purple" communications architecture develops.

(2) Standardized and interoperable systems are required to obtain a "seamless architecture." The Defense Information Systems Agency (DISA) must be the lead agency to ensure that this action occurs and requirements are validated.

6.4. 2010 And Beyond.

Finally, in the Objective (long-term) Phase, extending beyond the year 2010, advanced technologies and all its appropriate advantages will see research, development, and acquisition based from a common baseline of total interoperability. The CATF and CLF will be able to not only communicate at great distances, but freely exchange data base information with internal and external units to the task force. New technology, such as lasers and computers using artifical intelligence, will permit information exchange and decision making with the touch of a button prior to and during an amphibious assault. No voice communications will be required, unless desired.

C^4I for the warrior provides the "vision" for command and control in the future. We must ensure that the amphibious assault, based on OMFTS, sets the same course as C^4I For the Warrior, and continues to stress data information flow and interoperable systems.

6.5. Summary.

OMFTS is the concept for future amphibious assaults. With proper planning and procurement of the communications systems addressed in this paper, it can be accomplished!

Battlefield situational awareness encompasses all levels of command. Presently, OMFTS makes it difficult to obtain and maintain situational awareness. But, using existing equipment and procured equipment off-the-shelf, the concept can become a reality. Lip-service cannot be paid to communications required to execute OMFTS. Tables of equipment (T/E's) have to be changed so appropriate satellite equipment can be given to those units supporting OMFTS. Grid reference systems have to interface with existing command and control systems.

Commanders must recognize the days of traditional amphibious operations are gone. New technologies and smart weapons complement OMFTS. But, we must learn the concept and how to use it. We must train using OMFTS!

The Marine Corps led the way in the past, and was innovative in designing and using such things as landing craft and helicopters. The situation is no different. We, as Marines, must now be innovative and lead the way in learning how to communicate "...From the Sea."

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APPENDICES

APPENDIX 1

GLOSSARY OF TERMS

AANT	Amphibious Assault Network Technology (USMC)
AAP	Amphibious Assault Planner (USMC)
AAW	Anti-Air Warfare
ABNCP	Airborne Command Post
ACDS	Advanced Combat Direction Center (USN)
ACE	Air Combat Element
ACP	Allied Communications Publication
AFATDS	Advanced Field Artillery Tactical Data System (USA)
AI	Artifical Intelligence
AIS	Automated Information System
AJ	Anti-Jam
ALE	Automatic Link Establishment
AMHS	Automatic Message Handling System
AMPE	Automatic Message Exchange
AMW	Amphibious Warfare
ANDVT	Advanced Narrowband Digital Voice Terminal
ANSI	American National Standards Institute
AOA	Amphibious Objective area
AOR	Area of Responsibility
API	Application Program Interface
ARG	Amphibious Ready Group
ASARS	Advanced Synthetic Aperature RADAR System
ASAS	All Source Analysis System (USA)
ASC	AUTODIN Switching Center
ASCII	American Standard Code for Information Exchange
ASDI	Analog Simple Data Interface
ASIS	Amphibious Support Information System
ASW	Anti-Submarine Warfare
ASUW	Anti-Surface Warfare
ATACC	Advanced Tactical Air Command Central (USMC)
ATCCS	Army Tactical Command & Control System
ATF	Amphibious Task Force
ATO	Air Tasking Order
AUTODIN	Automatic Digital Network
BER	Bit Error Rate
BGPHES	Battle Group Passive Horizon Extension System
BITS	Base Information Transfer System
BLOS	Beyond Line-of-Sight
BLT	Battalion Landing Team
BPS	Bits (or Bytes) per second
C41	Command, Control, Communications & Intelligence
CAEMS	Computer Aided Embarkation Management System
CALS	Computer-Aided Acquisition & Logistics System
CAFMS	Computer Assisted Force Management System
CATF	Commander, Amphibious Task Force
CCB	Configuration Control Board
CCT	Commander's Tactical Terminal
CCTV	Closed Circuit Television

CD-ROM	Compact Disk-Read Only Memory
CDC	Combat Direction Center (USN)
CDS	Combat Direction System
CE	Command Element
CECOM	US Army Communications Electronics Command
CFE	Commerical Furnished Equipment
CHBDL	Common High Band Data Link
CIM	Corporate Information Management
CJTF	Commander, Joint Task Force
CLF	Commander, Landing Force
CMIP	Common Management Information Protocol
COC	Combat Operations Center
COE	Common Operating Environment
COMINT	Communications Intelligence
COPERNICUS	USN C4I Architecture
COTS	Commerical Off-The-Shelf
CPU	Central Processing Unit
CRITICOM	Critical Intelligence Communications
CSAW	Cryptological Support to Amphibious Warfare
CSS	Communication Support System/Combat Service Support
CSSE	Combat Service Support Element
CTAPS	Contingency TACS Automated Planning System (USAF)
CTT	Commander's Tactical Terminal
CUDIXS	Common User Digital Information Exchange Subsystem (USN)
CVBG	Carrier Battle Group
CVIC	Carrier Intelligence Center
CWC	Composite Warfare Commander (USN)
DAMA	Demand Assigned Multiple Access
DARPA	Defense Advanced Research Projects Area
DCT	Digital Communications Terminal
DDN	Defense Data Network
DISA	Defense Information Systems Agency (formerly DCA)
DISN	Defense Integrated Systems Network
DMA	Defense Mapping Agency
DMS	Defense Meteorological Service
DMSP	Defense Meteorological Satellite Program
DNVT	Digital Non-Secure Voice Terminal
DODIIS	DOD Intelligence Information System (DIA)
DSCS	Defense Satellite Communications System
DSN	Defense Switched Network
DSNET	Defense Secure Network
DSNET 3	Defense Secure Network 3 (TS/SCI Level)
DSVT	Digital Secure Voice Terminal
DTC	Desktop Tactical Computer
DTE	Digital Terminal Equipment
DTG	Digital Transmission Group/Date Time Group
DVITS	Digital Video Imagery Transmission System
DWTS	Digital Wideband Transmission System
E-MAIL	Electronic Mail
ECP	Engineering Change Proposal
ELINT	Electronic Intelligence

EMI	Electromagnetic Intelligence
EPLRS	Enhanced Position Location Reporting System
FDDI	Fiber Distributed Data Interface
FDDS	Flag Data Display
FDS	Field Demonstration System
FEC	Forward Error Correction
FEP	Front End Processor
FIST	Fleet Imagery Support Terminal
FMF	Fleet Marine Force
FOC	Full Operational Capability
FONS	FMF Operational Need Statement
FSCC	Fire Support Coordination Center
FTP	File Transfer Protocol
GCE	Ground Combat Element
GENSER	General Service Communications
GFE	Government Furnished Equipment
GFI	Government Furnished Information
GLOBIXS	Global Information Exchange System
GMF	Ground Mobile Forces
GOTS	Government Off-The-Shelf
GPS	Global Positioning System
GWC	Global Weather Center
HDC	Helicopter Direction Center
HIT	High Interest Track
HVAC	Heating, Ventilation & Air Conditioning
HW (H/W)	Hardware
HZ	Hertz
I&W	Indications & Warnings
IAS	Intelligence Analysis System
IDASC	Improved Direct Air Support Center
IDB	Integrated Database
IEEE	Institute of Electrical & Electronics Engineers
IFF	Identification, Friend or Foe
IMINT	Imagery Intelligence
INCA	Intelligence Communications Architecture
INMARSAT	International Martime Satellite
IOC	Initial Operational Capability
IOM	Install, Operate and Maintain
IOT&E	Initial Operational Test & Evaluation
IPB	Intelligence Preparation of the Battlefield
ISDN	Integrated Services Digital Network
ISOR	Initial Statement of Operational Requirement
ITAWDS	Integrated Tactical Amphibious Warfare Data System
ITDN	Integrated Tactical Data Network
ITSDN	Integrated Tactical Strategic Data Network
JAMPS	JINTACCS Automated Message Preparation System
JNAP	Joint Army-Navy-Air Force Publication
JCMC	Joint Crisis Management Center
JCSE	Joint Communications Support Element
JDISS	Joint deployable Intelligence support System
JFACC	Joint Force Air Component Commander
JIC	Joint Intelligence Center

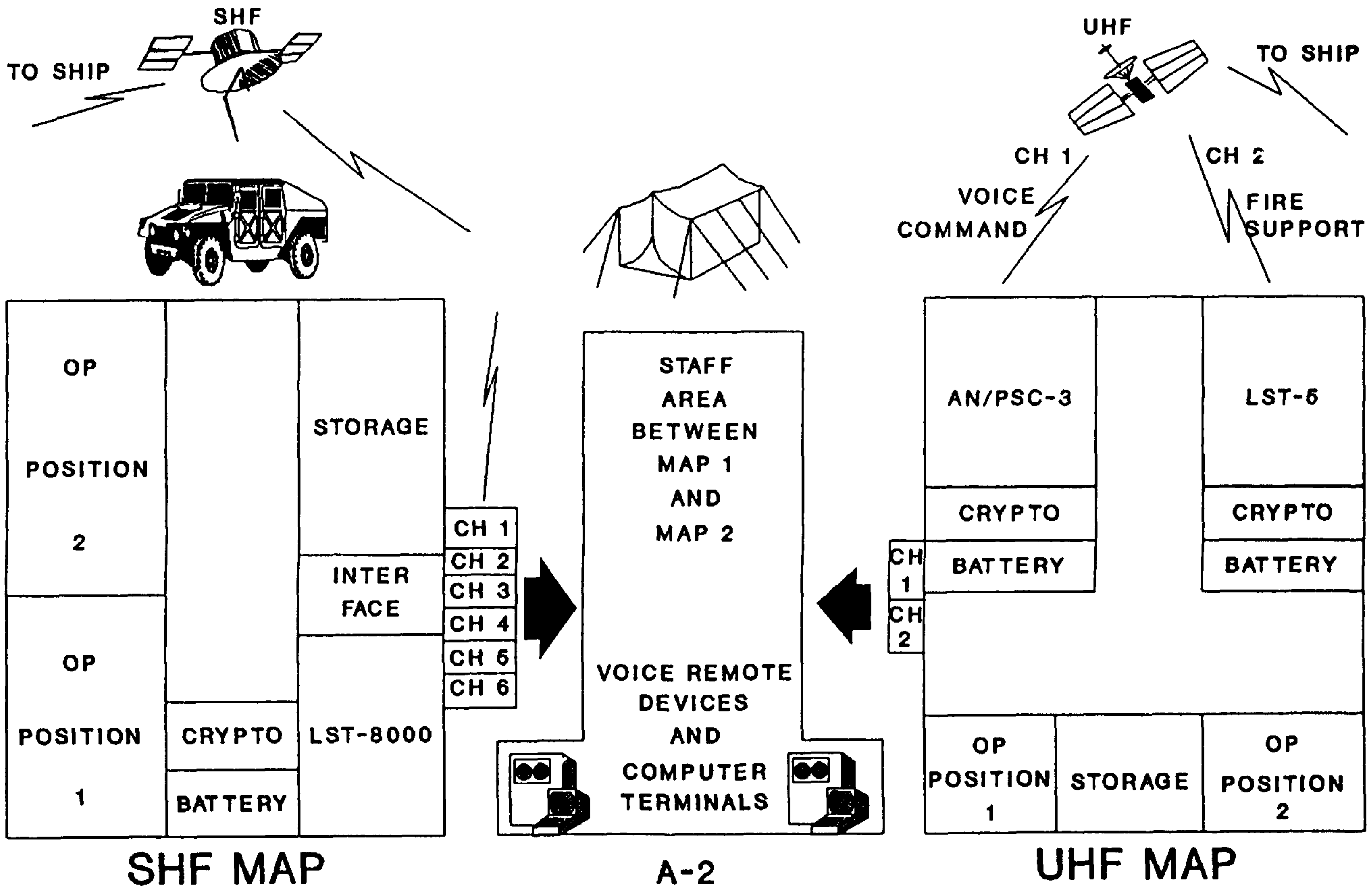
JIEO	Joint Interoperability Engineering Office (formerly JTC3A)
JILE	Joint Intelligence Liaison Element
JINTACCS	Joint interoperability Tacticanl Command & Control System
JMC	Joint Message Center
JOPES	Joint Operational Planning & Execution System
JOTS	Joint Operational Tactical System
JROC	Joint Requirements Oversight Council
JSIPS	Joint Service Imagery Processing System
JSTARS	Joint Surveillance & Target Attack RADAR System
JTF	Joint Task Force
JTIDS	Joint Tactical Information Distribution System
JWICS	Joint Worldwide Intelligence Communications System
K	Kilo (1×10^3)
KVG	Key Variable Generator
LAN	Local Area Network
LCAC	Landing Craft Air Cushion
LCC	Amphibious Command Ship
LCU	Lightweigh Computer Unit/Landing Craft, Utility
LEDS	Lightweight LINK 11 Real-time Display
LF	Landing Force
LFOC	Landing Force Operations Center
LHA	Amphibious Assault Ship, General Purpose
LHD	Amphibious Assault Ship, Multi-purpose
LKA	Amphibious Cargo Ship
LINK 1	NATO Point-to-Point Data Link
LINK 4A	UHF Digital Data Link (TADIL C)
LINK 11	HF/UHF Digital Data Link (TADIL A)
LINK 14	Data Link from NTDS to Non-NTDS Units (TTY)
LINK 16	JTIDS Data Link
LMF	Language Media Format
LOS	Line-of-Sight
LPI	Low Probability of Intercept
LRI	Limited Range Intercept
LSD	Dock Landing Ship (Cargo Variant)
LST	Tank Landing Ship
MACCS	Marine Air Command & Control System
MAFC	MAGTF All-source Fusion Center
MAGIS	Marine Air-Ground Intelligence System
MAGTF	Marine Air Ground Task Force
MAN	Metro Area Network
MARCORSYSCOM	Marine Corps Systems Command
MART	Mobile AUTODIN Remote Terminal
MC & G	Mapping, Charting & Geodesy
MCASS	MTACCS Common Application Support Software
MCCDC	Marine Corps Combat Development Command
MCDN	Marine Corps Data Network
MCEB	Military Communications-Electronics Board (J6)
MCHS	Marine Common Hardware Suite
MCM	Mine Counter-Measures

MCSF	Mobile Cryptologic Support Facility
MCSSCS	Marine Combat Service Support Control System
MCTSSA	Marine Corps Tactical System Support Activity
MEB	Marine Expeditionary Brigade
MEDS	Meterological Data System
MEF	Marine Expeditionary Force
MEU	Marine Expeditionary Unit
MHS	Message Handling System
MIIDS	Military Intelligence Integrated Data System
MILNET	Military Network
MILSTAR	Military EHF Communications Satellite
MINTERM	Minature Terminal (ANDVT)
MLS	Multi-level Security
MMI	Man-Machine Interface
MNS	Mission Need Statement
MOMSS	Mode & Message Selection System
MTACCS	Marine Tactical Command & Control System
MTF	Message Text Format
MTS	Marine Tactical System
MUX	Multichannel
NADP	Non-Acquisition Development Program
NALCOMIS	Naval Aviation Logistics Cmd Mgmt Information System
NAVCOMPARS	Naval Communications Processing & Routing System
NAVMACS	Naval Modular Automated Communications System
NAVSEA	Naval Sea Systems Command
NCCOSC	Naval Command, Control & Ocean Surveillance Center
NCTAMS	Naval Computer & Telecommunications Area Master Station
NDI	Non-Development Item
NGF	Naval Gunfire
NIPS	NTCS-A Intelligence Processing System
NRL	Navy Research Lab
NSFS	Naval Shore Fire Support
NTCS-A	Navy Tactical Command System - Afloat
NTDS	Navy Tactical Data System
NTSS	Navy Tactical Support System
NWTDB	Naval Warfare Tactical Database
OMFTS	Operational Maneuver From The Sea
OR	Operational Requirement
ORD	Operational Requirement Document
OS (O/S)	Operating System
OSE	Open System Environment
OSS	Operating Support System
OT&E	Operational Test & Evaluation
OTC	Officer-in-Tactical-Command/over The Counter
OTCIXS	Officer-in-Tactical-Command Information Exchange Subsystem
OTH	Over-The-Horizon
OTH-T	Over-The-Horizon - Targeting
PBX	Private Branch Exchange
PC	Personal Computer

PCE	PLRS Communications Enhancement
PCO	Primary Control Officer
PCS	Primary Control Ship
PHIBRON	Amphibious Squadron
PIC	PLRS Interface Controller
PIP	Product Improvement Program
PLA	Plain Language Address
PLRS	Position Location Reporting System
POM	Program Objective Memorandum
POSIX	Portable Operating System Interface Exchange
PRM	Program Resource Manager
PSN	Packet Switching Node
RAM	Random Access Memory
ROC	Required Operational Capability
ROTERM	Receive Only Terminal
RPV	Remotely Piloted Vehicle (also UAV)
SACC	Supporting Arms Coordination Center
SAFENET	Survivable Adaptable Fiber-optic Embedded Network
SATCOM	Satellite Communications
SCI	Special Compartmented Information
SCIF	Sensitive Compartmented Information Facility
SCN	Ship Construction, New
SCO	Secondary Control Officer
SCR	Single Channel Radio
SCS	Secondary Control Ship
SCSI	Small Computer System Interface
SEW/SEWC	Space Electronic/SEW Commander
SI	Special Intelligence
SID	Secondary Imagery Distribution
SIDS	Secondary Imagery Distribution System
SIE	System Integration Environment
SIGINT	Signals Intelligence
SITS	Secondary Imagery Transmission System
SMTP	Simple Mail Transfer Protocol
SNA	Systems Network Architecture
SNAP	Shipboard Non-tactical Automated Data Processing
SPARC	Scalable Processor Architecture
SPAWAR	Space & Naval Warfare Systems Command
SSES	Ship's Signal Exploitation Space
SSIXS	Submarine Satellite Information Exchange Subsystem
STEL	Commerical MODEM-Stanford Telecommunications, Inc.
STICS	Scalable Transportable Intelligence Communications System
STU	Secure Telephone Unit
SVTC	Secure Video Teleconferencing
SW (S/W)	Software
T1	Communications Circuit with throughput of 1.544 MBPS
T2	Communications Circuit with throughput of 24.7 MBPS
T3	Communications Circuit with throughput of 45 MBPS
TAC	Tactical Advanced Computer
TACC	Tactical Air Control Center

TACELINT	Tactical Electronic Intelligence
TACFIRE	Tactical Fire Direction System (USA)
TACGRU	Tactical Air Control Group
TACINTEL	Tactical Intelligence (SI)
TACLOG	Tactical-Logistics Group
TACRON	Tactical Air Control Squadron
TACS	Tactical Air Control System
TACSAT	Tactical Satellite
TACSIIP	Tactical Systems Inter/Interoperability program
TADIL	Tactical Digital Information Link
TADIX	Tactical Data Information Exchange Subsystem
TAMPS	Tactical Air Mission Planning System
TAO	Tactical Action Officer
TASS	Tactical Automated Switching System
TCAC	Technical Control Analysis Center
TCC	Tactical Command Center/Transmission Control Code
TCDN	Tactical Communications Distribution Node
TCO	Tactical Combat Operations
TCP/IP	Transmission Control Protocol/Internet Protocol
TDA	Tactical Decision Aid
TDMA	Time Division Multiple Access
TED	Trunk Encryption Device
TERPES	Tactical Electronic Recon Processing Evaluation System
TESS	Tactical Environmental Support System
TFCC	Tactical Flag Command Center
TIDP	Technical Interface Design Plan
TIMS	TFCC Information Management System
TIPS	Tactical Information Processing System
TLR	Top Level Requirement
TRAP	Terrorism Research & Analysis Project
TRE	Tactical Receive Equipment
TROJAN SPIRIT	TROJAN Special Purpose Integrated Remote Intelligence Terminal
TROPO	Tropospheric Scatter
TTY	Teletype
ULCS	Unit Level Circuit Switch
URDB	User Requirements Database
UTM	Universal Transverse Mercator
VDS	Video Distribution System
VMF	Variable Message Format
VTC	Video Teleconferencing
VTP	Virtual Terminal Protocol
WAN	Wide Area Network
WIN	WWMCCS Intercomputer Network
WS (W/S)	Workstation
WWMCCS	Worldwide Military Command & Control System
WZ/WEAX	Weather
X.25	Packet Switching Protocol
XIDB	Extended Integrated Database

APPENDIX 2: MOBILE ASSAULT PACKAGE (MAP)



APPENDIX 2 CONT'D: ASSAULT PACKAGES

SHF MAP CONSISTING OF:

O LST 8000 SARCOM TERMINAL

O CRYPTOGRAPHIC EQUIP (KG-84)

O POWER - 110/220 VAC, 46-64 HZ

3 KW

O HIGH GAIN ANTENNA (6' DISH)

PROVIDES:

SHF SATELLITE TERMINAL CAPABLE OF FULL DUPLEX OPERATIONS THROUGH DSCS SATELLITES. WILL PROVIDE SIX SHF CHANNELS.

UHF MAP CONSISTING OF:

O AN/LST-5 AND AN/PSC-3

O CRYPTOGRAPHIC EQUIP (KY-57'S)

O POWER 27 VDC (BATTERIES)

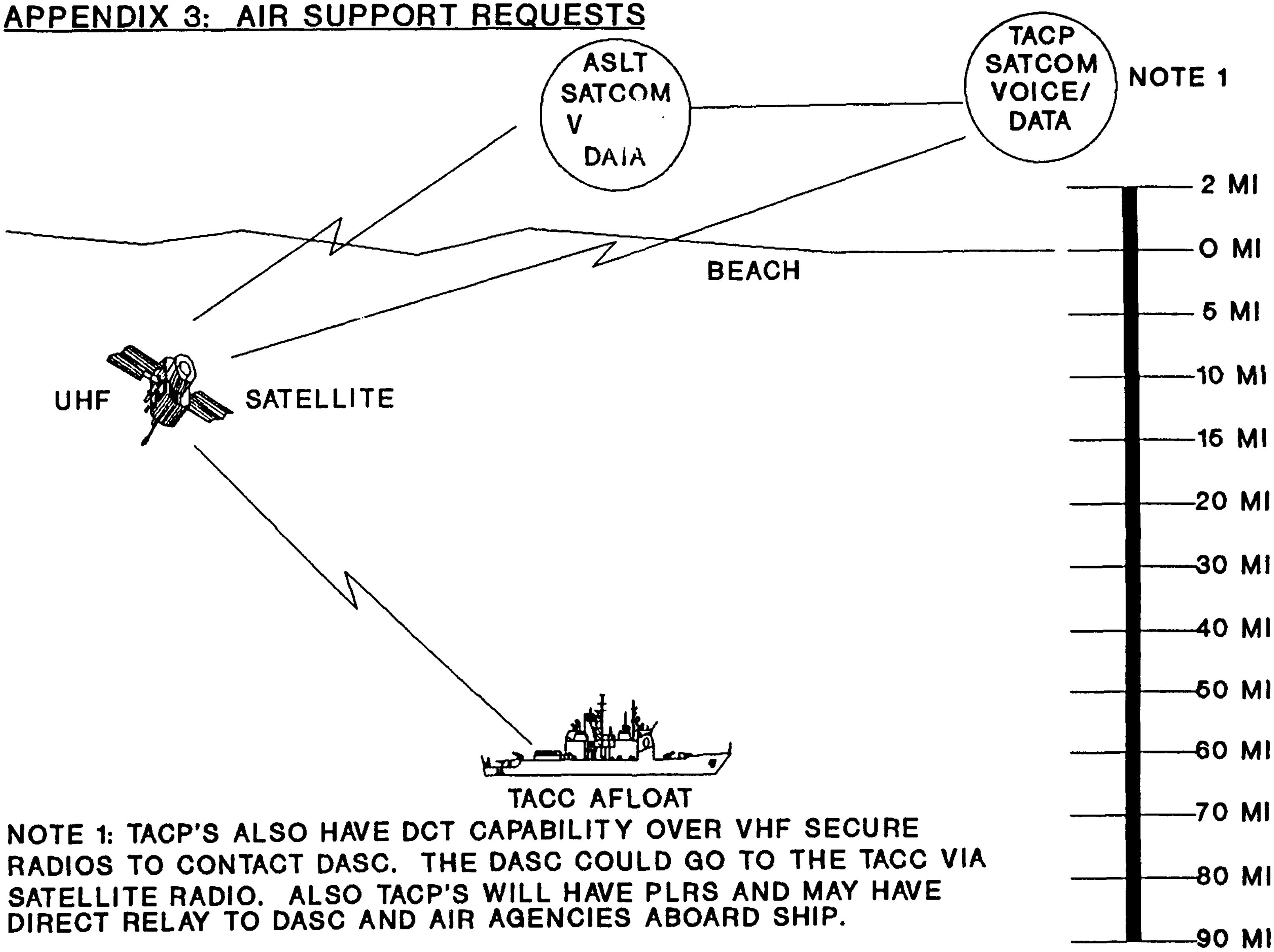
O HIGH GAIN ANTENNA

PROVIDES:

PROVIDES:

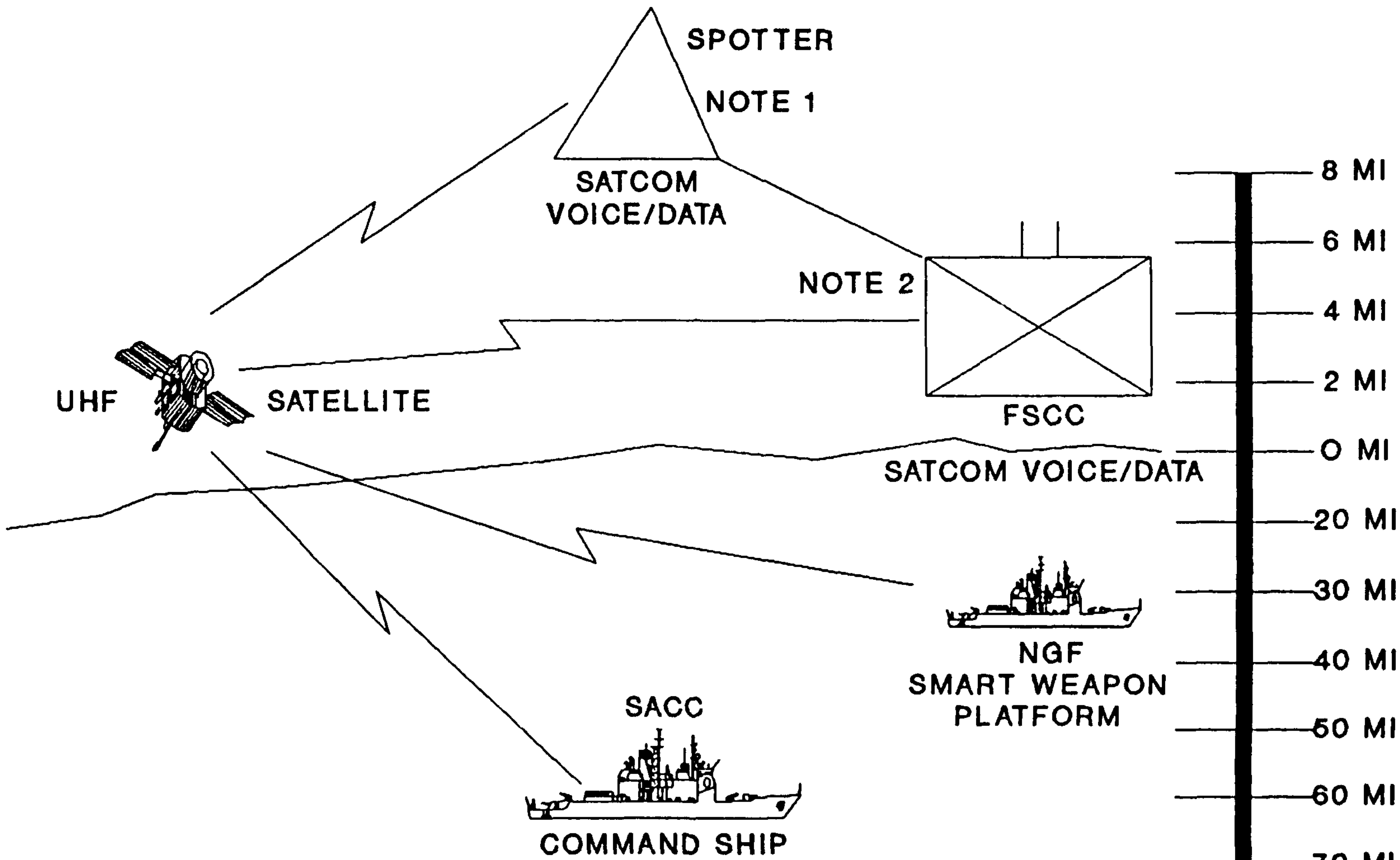
TWO UHF SATELLITE CHANNELS CAPABLE OF VOICE OR DATA OPERATIONS.

APPENDIX 3: AIR SUPPORT REQUESTS



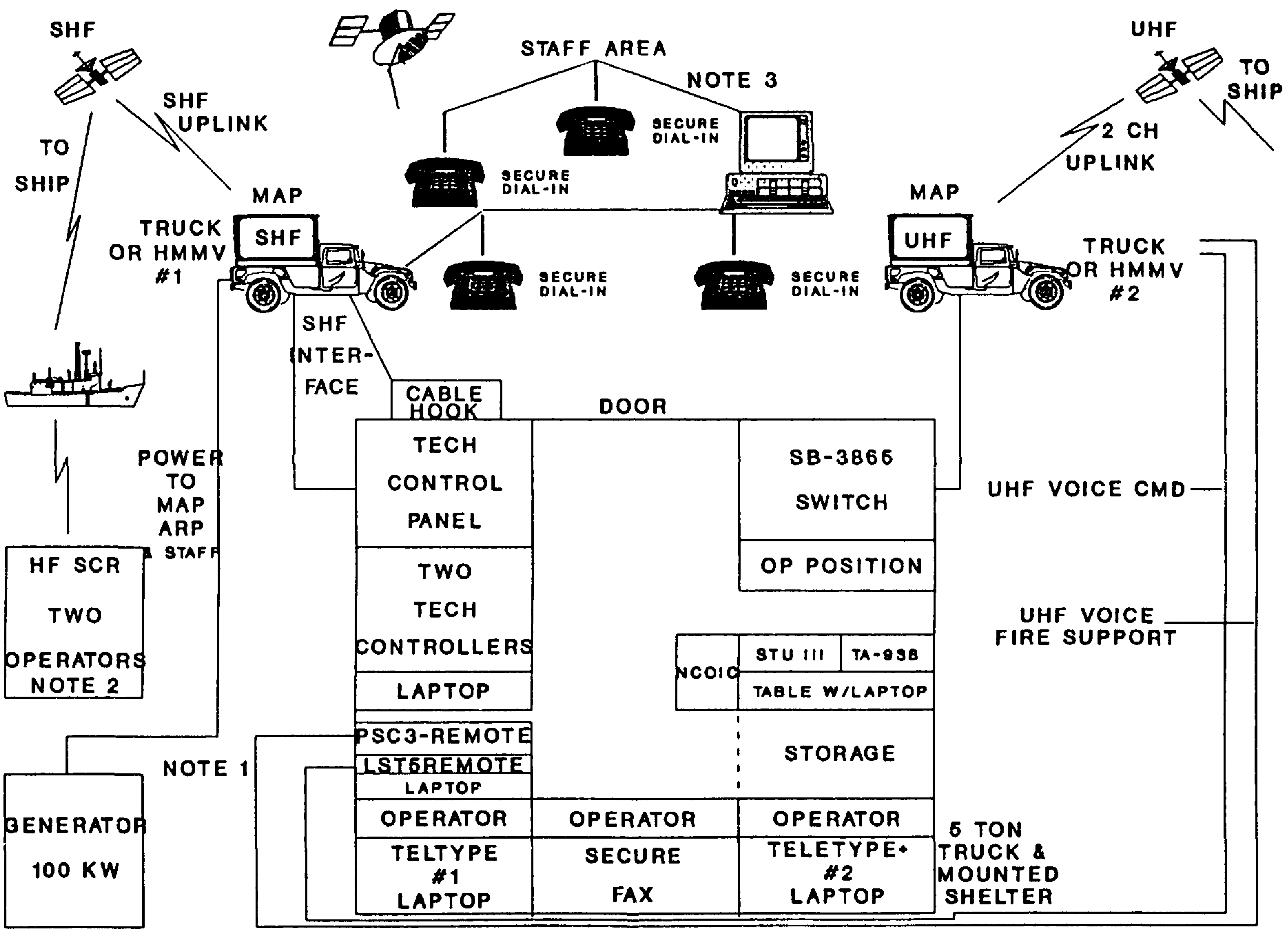
NOTE 1: TACP'S ALSO HAVE DCT CAPABILITY OVER VHF SECURE RADIOS TO CONTACT DASC. THE DASC COULD GO TO THE TACC VIA SATELLITE RADIO. ALSO TACP'S WILL HAVE PLRS AND MAY HAVE DIRECT RELAY TO DASC AND AIR AGENCIES ABOARD SHIP.

APPENDIX 4: FIRE SUPPORT MISSION USING NGF OF SMART WEAPONS



NOTE1: NGF SPOTTER ALSO HAS VHF AND HF SECURE SINGLE CHANNEL RADIO AS A BACKUP. ALSO, IF PLRS RELAY ESTABLISHED SPOTTER COULD USE TO REQUEST FORE MISSION.
NOTE 2: SPOTTER CAN ALSO RQT VIA SCR OR DCT & FWD VIA SATCOM

APPENDIX 5: THE ARP AND MAP COMBINED A-5



APPENDIX 5 CONT'D: THE ARP AND MAP

NOTE 1

WHEN MAP AND ARP ARE COMBINED FOR CLF OPS ASHORE, SIX SHF AND TWO UHF CHANNELS WILL BE ACTIVE; PROVIDED BY MAP 1 AND MAP 2 RESPECTIVELY.

NOTE 2

SINGLE CHANNEL HF RADIO CAN BE SET UP AND USED AS BACKUP FOR VOICE AND DATA. VHF AND UHF EQUIPMENT CAN BE ADDED IF REQUIRED.

NOTE 3

STAFF WILL ALSO HAVE GRID REFERENCE DEVICES AND USE RELY SYSTEMS TO PASS INFORMATION.

APPENDIX 5 CONT'D: THE ARP AND MAP

ARP SHELTER HAS:

- O DIGITAL TECH CONTROL PANEL AND ANCILLARY EQUIPMENT
- O TWO UHF VOICE REMOTES IN VAN (OR STAFF AREA)
- O SB-3865 DIGITAL SWITCH
- O TWO FULL DUPLEX AUTODIN TERMINALS
- O ONE FAX (COMMERICAL OR MIL)
- O FIVE LAPTOP COMPUTERS

ARP SHELTER PROVIDES:

ABILITY TO INTERFACE DIGITAL BACKBONE NETWORK WITH NAVY/JTF AT SEA. CAN FUSE INFORMATION AT COMMAND CENTERS. PROVIDES SIX SHF AND TWO UHF CHANNELS. STAFF CAN FULLY FUNCTION USING COMPUTERS, DIGITAL PHONES, SECURE FAX AND VOICE. ALSO, CAPABILITY EXISTS TO RE-CONFIGURE AND MAINTAIN SYSTEM THROUGH DIGITAL TECH CONTROL.

APPENDIX 6: TABLE OF ORGANIZATION (T/O) FOR THE MAP AND THE ARP.

ARP TABLE OF ORGANIZATION (T/O)

QTY	MOS	DESCRIPTION	RANK
1	1142	GENERATOR TECH	CPL
1	2512	WIREMAN	CPL
1	2513	WIREMAN/SB SUPV	SGT
1	2531	RADIO SUPERVISOR	SGT
1	2531	RADIO OPERATOR	LCPL
1	2542	COMM CENTER MAN	CPL
1	2542	COMM CENTER MAN	LCPL
1	2823	TECH CONTROLLER	SGT
1	2823	TECH CONTROLLER	SGT
1	4023	DATA NETWORK OPER	CPL
1	2519	ARP NCOIC	GYSGT
1	2502	ARP OIC	CAPTAIN
1/11 TOTAL			
1	2531	RADIO SUPERVISOR	SGT
1	2531	RADIO OPERATOR	LCPL/PFC
1	2531	RADIO OPERATOR	LCPL/PFC
1	2843	RADIO REPAIRMAN	CPL
0/4 TOTAL			

NOTE: CRYPTO REPAIR WILL HAVE TO BE PROVIDED EXTERNAL TO THE ARP/MAP. OPTIMUM SOLUTION IS TO HAVE SUFFICIENT CRYPTOGRAPHIC ASSETS ON-HAND FOR BACKUP AND REPLACEMENT.

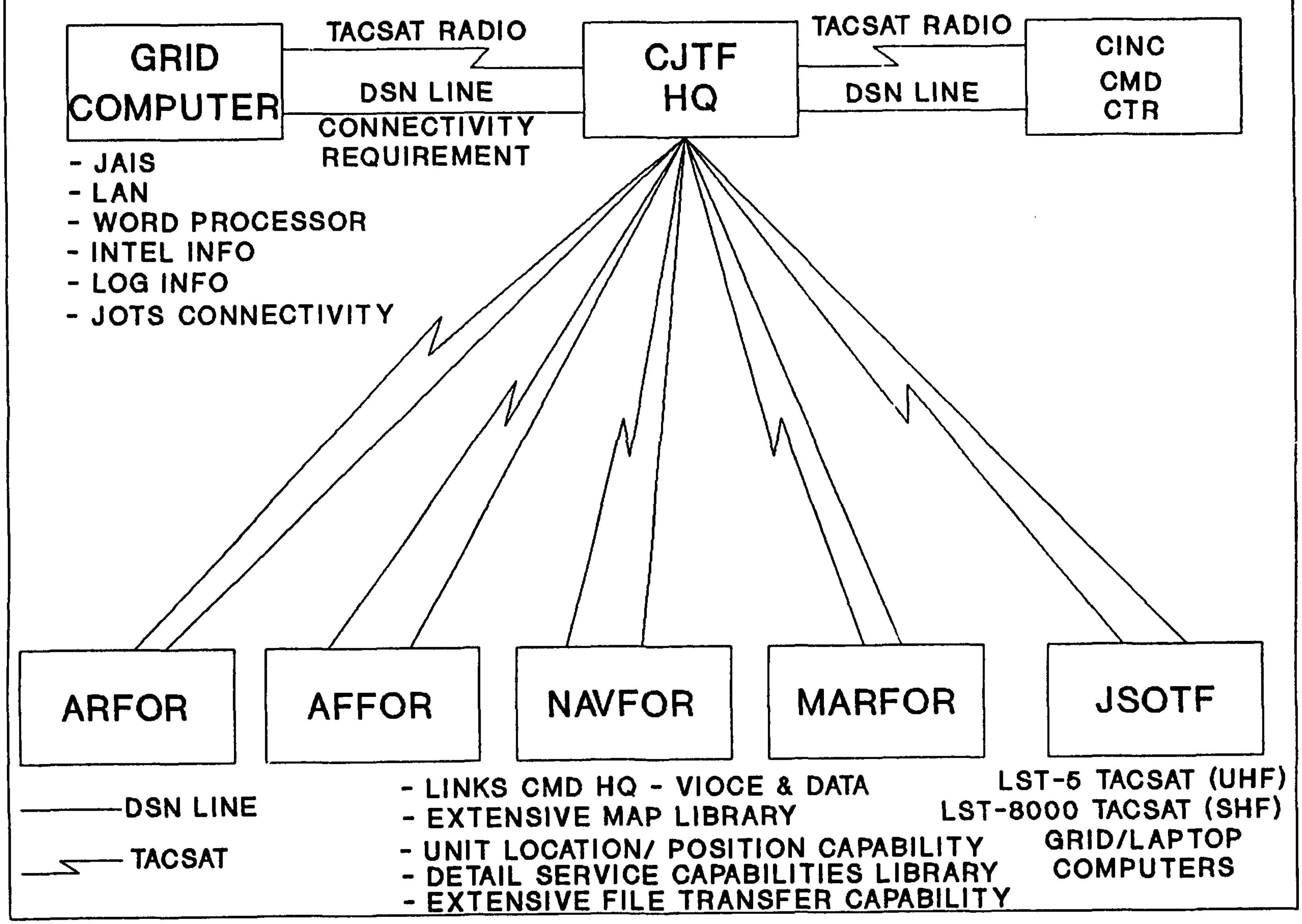
OMFTS COMMAND AND CONTROL

LST-8000

SYSTEM CAPABILITIES

- O SHF SATELLITE TERMINAL
- O PORTABLE/MOBILE PACKAGE
- O 6 FOOT ANTENNA INCLUDED IN PACKAGE
- O MAXIMUM DATA RATE 256 KBPS
- O INTERFACES SPECIAL USER DATA CIRCUITS
  - IMAGERY SYSTEMS
  - PACKET DATA SYSTEMS
  - LOCAL/WIDE AREA NETWORKS
- O TRANSPORTABLE ON PALLET, TRUCK, OR COMM A/C

APPENDIX 8: JAIS-ASSAULT CAPABILITIES A-8



OMFTS COMMAND AND CONTROL

JFACC

RADIO NETS

AC-1 JOINT AIR COORDINATION NET UHF TACSAT SECURE VOICE

AC-1A JOINT AIR COORDINATION NET ON CALL
ALTERNATE FOR AC-1 HF SECURE VOICE

AC-11 TADIL-A (LINK-11)

OMFTS COMMAND AND CONTROL

JFACC

DATA INFO EXCHANGE SYSTEM

- O WWMCCS - USCP/USCL WIN TELECONFERENCING
- O JDISS - JOINT DEPLOYABLE INTELLIGENCE SUPPORT SYSTEM
- O CTAPS - CONTINGENCY TACS AUTOMATED PLANNING SYSTEM

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