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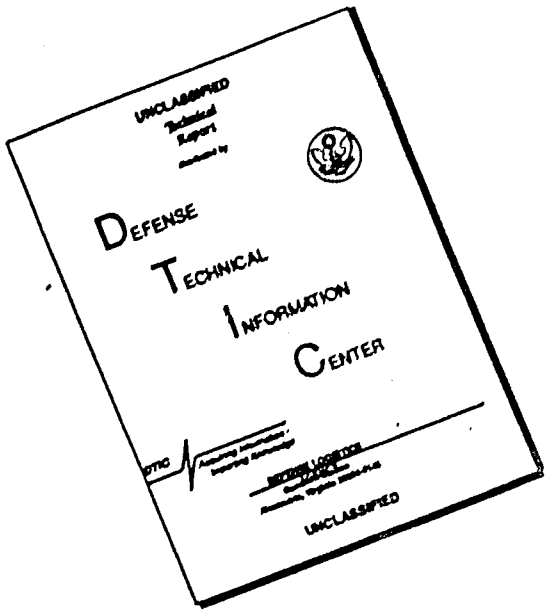

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RESEARCH IN AMPHIBIOUS WARFARE FOR THE U. S. MARINE CORPS OF THE FUTURE

A Bibliography

Under Office of
Naval Research Contract
Nonr 2332(00)

NAVAL WARFARE RESEARCH CENTER
STANFORD RESEARCH INSTITUTE
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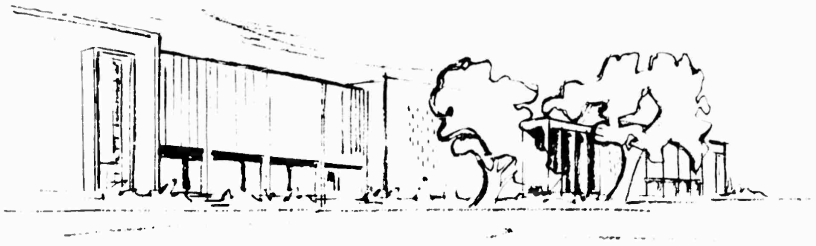

Stanford Research Institute is an independent, non-profit, scientific research organization. Within the purpose envisioned by its founders, the Institute's first and paramount goal is high-quality, objective research with emphasis on a multidisciplinary approach.

SRI's research interests are broad--the physical and life sciences, the engineering sciences, economics and the management sciences. Its geographical scope is wide--regional, national, and international. Its research clients are diversified--business, industry, and government.

A substantial portion of SRI's research concerns defense and military preparedness. These defense programs, for various agencies of the United States government, include many studies of major importance to the decision-maker--allocation of research and development funds among alternative programs, determination of optimum technical approach to produce a stated capability, and selection of military systems most appropriate in light of prevailing technology, mission, and environment.

October 1963

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FOREWORD

The Naval Warfare Research Center (NWRC), under Office of Naval Research contract Nonr 2332(00) to Stanford Research Institute (SRI), conducts a program of research embracing future naval warfare systems and technology. The broad mission of this program is to perform operations research and systems analysis studies as required by the Chief of Naval Research and, insofar as possible, the rest of the Navy Department Staff in CNO, the Marine Corps, and the Material Bureaus. NWRC also provides assistance in sound long-range planning of the Navy's research and development programs. In general, the functions of NWRC are to:

1. Study advanced warfare systems, with major emphasis on the applications of new and future technology.
2. Study advanced Marine Corps systems and concepts.
3. Study the interaction between the characteristics of future Naval systems and the outputs of the basic and applied research programs of ONR and the scientific community. This includes:
    a) Assessing advances in basic research to determine their usefulness to future systems.
    b) Reviewing Naval systems to provide guidance for basic and applied research.

In conducting this research program, NWRC calls on the extensive and varied competence of the entire SRI technical staff, as well as that of Stanford University. Although NWRC has a carefully selected staff with a wide background of training and advanced degrees in a variety of disciplines, the number of professional specialists from other SRI research groups employed by NWRC on Navy and Marine Corps projects is sometimes equal to the permanent NWRC staff. Consultants from Stanford University and from industry are employed as required.

The Research Program in Amphibious Warfare for the Marine Corps

The Naval Warfare Research Center conducts, for the Marine Corps, research in system requirements and in the utility of future technology to provide guidance for R&D planning in the Landing Force aspects of amphibious operations. While the focus of the program is on the poten-

tial contribution of new and future technology, much of the work necessarily involves system requirements as the basis for assessments of new technological applications.

For the past several years, NWRC has been building an integrated program designed to examine, in considerable depth, Landing Force needs and the direction of technical development effort in four major areas:

1. Information Systems
2. Logistics Research
3. Fire Support Systems
4. Mobility Research

Major research effort in the Information System area has been devoted to a comprehensive analysis of the target acquisition problem. Additional work is planned in satellite information systems and command and control within the Landing Force.

In the Logistics area, research has embraced studies in supply distribution, transport requirements, fuel distribution systems, area requirements for an MEF, ground Lines of Communications (LOC) capabilities, and engineer and shore party support requirements. Future work is planned in supply, maintenance, and casualty evacuation requirements, in echelonment of logistic capability, and in the evaluation of alternative logistic concepts.

Research in Fire Support Systems has included studies in the mobility of direct-support and general-support artillery and in the role and feasibility of amphibian artillery.

Mobility Research has been directed primarily to strategic transport systems for the MEF, with major emphasis on developing a means of simulating the deployment and projection ashore of FMF units. In an integrated study of shipping requirements, work has been completed on LPH-LPD requirements in VTOL assault and on alternative mixes of landing ships for surface assault. Studies are planned for future transport systems with particular attention to the feasibility of submersible systems.

A BIBLIOGRAPHY OF RESEARCH IN AMPHIBIOUS WARFARE FOR THE U.S. MARINE CORPS OF THE FUTURE

Reports prepared by the Naval Warfare Research Center for the Marine Corps are listed on the following pages. Title, date of publication, classification of report, study objectives, conclusion areas, and distribution are given for each entry in the bibliography.

The distribution of these reports is controlled by the client and not by SRI. Release of copies of the reports to interested agencies not on the original distribution list must be approved by the client. Written requests for reports should be addressed to:

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Code AX
Headquarters, U.S. Marine Corps
Washington, D.C., 20380

Other inquiries should be addressed to:

Director
Naval Warfare Research Center
Stanford Research Institute
Menlo Park, California, 94025

Title | ACQUISITION OF GROUND TARGETS IN AMPHIBIOUS WARFARE (U)

Date of Publication: November 1963 (Draft Report)

Classification: SECRET

Objectives of Study

1. To provide a basis for determining performance requirements for future target acquisition systems.
2. To demonstrate the expected capabilities of alternative technical approaches in performing the functions of detection, identification, and location of ground targets.

List of Conclusion Areas

1. Quantitative estimates of the performance of 1973 systems for performing target acquisition in terms of area coverage, detection probability, identification probability, location accuracy, age of target information when acted on by weapons, and vulnerability to detection by the enemy.
2. The most critical gaps in the programmed 1973 complex of systems.
3. Qualitative analysis of the advantages and limitations of all alternative types of target acquisition systems, including multi-sensor systems.
4. Demonstration of the degradation of systems and sensitivity to the natural environment and to enemy alternatives.
5. Determination of the most effective combinations of systems for detecting, identifying, and for locating:
    a) Components of the enemy's command and control complex
    b) Enemy weapons
    c) Close-in enemy forces.

Distribution List

Commandant of the Marine Corps	5
Office of Naval Research	
Code 405	1
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Code 493	1
Coordinator, Marine Corps Landing Force Development Activity	14

Title | AMPHIBIAN ARTILLERY (U)

Date of Publication: August 1963 (Final Report)

Classification: SECRET

Objectives of Study

1. To examine potential roles for amphibian artillery in future amphibious assault operations.
2. To determine the feasibility of mounting each of several selected direct support and general support weapons on the proposed LVTP-X11 chassis.
3. To provide a summary comparison of the candidate vehicle-weapon combinations in each of the three roles--dual, direct support, and general support.

Conclusions

The conclusions reached concerned the following subject areas:

1. Alternatives to amphibian howitzer for providing suppressive fire in beach supporting fire gap.
2. Requirement for an amphibian gun/howitzer optimized for a direct support role.
3. Application of amphibian gun/howitzer to general support mission-role.
4. Compatibility of D/S and G/S weapons with LVTP-X11 hull.

Distribution List

MCLFDC, Quantico, Va.	70
ONR (Code 405)	2
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Title | AN AMPHIBIOUS DEPLOYMENT SIMULATION MODEL--THE MARADS SYSTEM
NWRC Research Memorandum 19

Date of Publication: July 1963

Classification: UNCLASSIFIED

Objectives of Study

1. To develop a simulation model that will account for all major events in the deployment process from the time the deployment of a force is started until it is delivered ashore in the objective area.
2. To make input data preparation as simple as possible and provide easy-to-read output.
3. To design a system that will run quickly and cheaply, so that repeated case examples can be solved at low cost. (For example, the MARADS system can solve a typical amphibious deployment problem--force definition, ship-to-shore simulation, and embarkation--in about five minutes.)

Scope of the Research Memorandum

A general description of the model is provided, followed by detailed descriptions of the programs for:

1. The efficient organization, storage, and retrieval of data regarding equipment, personnel, supplies, organizations, ships, and transfer vehicles.
2. The conversion of simple statements identifying organizations into detailed listings of personnel, equipment, and supplies.
3. The allocation of personnel, equipment, and supplies to subforces and the assignment of subforces to transfer vehicles.
4. The simulation of the ship-to-shore operation, including the computation of the number of transfer vehicles needed, by type.
5. The computation of the number of ships, by type, required to transport the forces and transfer vehicles.
6. The computation of key times throughout the entire deployment and assault operations.

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Title | AN AMPHIBIOUS LOGISTIC MODEL

Date of Publication: June 1962 (Final Report)

Classification: UNCLASSIFIED

Objectives of Study

1. To develop a logistic model and a computer simulation program relating to ship-to-shore systems required for transfer of men, equipment, and supplies and multiple-stage, inland supply transfer systems in amphibious operations.
2. To determine assault shipping space required by logistic equipments, vehicles, or systems.

List of Conclusion Areas

1. The model and simulation facilitate comparative analyses of alternative transfer vehicles, materials handling equipments or techniques, and supply distribution systems.
2. Measures of comparative systems effectiveness for each alternative situation or system in terms of:
    a) Numbers of transfer vehicles and materials handling equipment required
    b) Manpower requirements
    c) Investment costs of vehicles and equipments
    d) Annual readiness costs, including manpower, maintenance, and fuel
    e) Shipping space requirements for transport of the system to the objective area
    f) Total system costs, considering vehicle, equipment, manpower, and shipping space requirements for a given system capability.
3. Recommendations for possible future technical modifications of the model and program.

Distribution List

	Report	Flow Chart
ONR (Code 493)	6	4
NCEL	23	10

Title | ANALYSIS OF THE ECCM CAPABILITY OF THE PREPRODUCTION MTDS (U)
NWRC Research Memorandum 16

Date of Publication: November 1962 (Working Paper)

Classification: SECRET

Objectives of Study

To provide recommendations concerning hardware-means of improving MTDS and associated communications performance in an ECM environment.

List of Conclusion Areas

Recommendations were made for improvements in the following areas:

a) Use of data from Hawk and interceptors
b) Use of angle-only data
c) Use of remote radars
d) Selective control of automatic data processing
e) Design of radars specifically for MTDS
f) Methods of selecting and controlling ECCM circuits
g) Operational flexibility of external communications
h) Tests and training using ECM.

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Marine Corps Liaison Officer, SRI	1
CO, Marine Air Control Squadron 3	2

Title | ANALYSIS OF THE MARINE CORPS FIFTH ECHELON REPAIR/REBUILD PROGRAM (U)

Date of Publication: April 1962 (Final Report)

Classification: UNCLASSIFIED, FOR OFFICIAL USE ONLY

Objectives of Study

To examine the effectiveness of the depot repair program.

List of Conclusion Areas

1. Modifying criteria for decision to rebuild or replace equipment
2. Repair cost data needs
3. Cost accounting system
4. Major repair and rebuild in the field
5. Limiting depot maintenance to rebuild and augmenting lower echelons
6. Reducing inventory of unserviceable equipment at supply centers.

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Title | AREA AND LINES-OF-COMMUNICATION REQUIREMENTS FOR MEF OPERATIONS (U)

Date of Publication: October 1963 (Final Report)

Classification: SECRET--Special Handling Required, Not Releasable to Foreign Nationals

Objectives of Study

1. To determine the minimum area requirements for installations in rear of the combat area for three forces--an MEF, an MEF less the fixed-wing combat aircraft of the Marine Air Wing, and a reinforced Marine Division--under alternative dispersion levels.
2. To determine the effects of terrain on minimum area requirements.
3. To determine the lines-of-communication requirements and capabilities under varying terrain environments.

List of Conclusion Areas

1. Area requirements for MEF, MEF(-), and DIV(+)
    a) Under ideal terrain conditions with and without dispersion
    b) Under actual terrain conditions
    c) With SATS
2. Ground LOC capacities
3. SATS associated LOC requirements
4. Terminal delay time.

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CG, FMFPac	2
CG, FMFLant	3
CG, Aircraft, FMFPac	1
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CG, ForTrps, FMFLant	1
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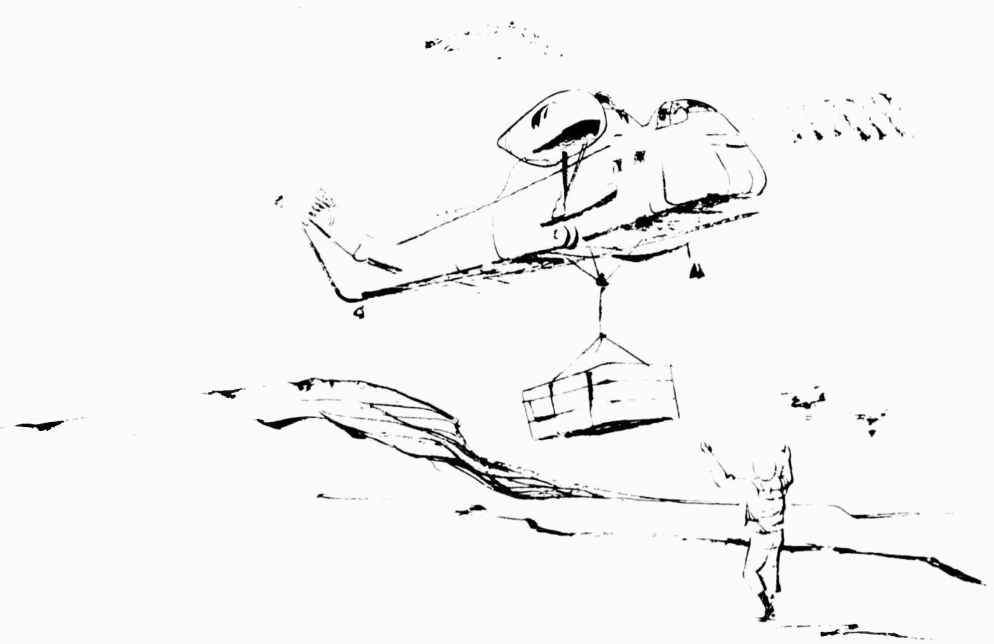

Title | AN EXAMINATION OF THE EFFECTS OF TRAINING, PERSONNEL, AND MATERIEL FACTORS ON COMBAT READINESS (U)

Date of Publication: July 1962 (Draft Report)

Classification: CONFIDENTIAL

Objectives of Study

To estimate relationships among:

1. Training (type, duration, and frequency) and
2. Combat readiness of
   a) Units
   b) Equipment.

List of Conclusion Areas

1. Combat-readiness measurement
2. Importance of materiel status to combat readiness
3. Importance of training and personnel to combat readiness
4. Training achievement and combat readiness
5. Impact of training on materiel use
6. Training and intensity of equipment use
7. Intensity of equipment use and deadlining
8. Comparative operability levels among types of equipment
9. Personnel stability
10. Attrition of personnel through non-training activities
11. Suggested directions of future research

Distribution List

HQ, USMC, Washington 25, D.C., C. E. Wise	20
ONR (Code 493)	2

Title | AN EXAMINATION OF THE MARINE CORPS REPLACEMENT AND EVACUATION PROGRAM (U)

Date of Publication: April 1962 (Final Report)

Classification: UNCLASSIFIED, FOR OFFICIAL USE ONLY

Objective of Study

To examine the validity of the replacement and evacuation program relative to alternative concepts of maintaining readiness of major materiel.

List of Conclusion Areas

1. Disadvantages of the R&E program
2. Advantages of the dynamic float replacement system
3. Needs for standards and definitions of unserviceability.

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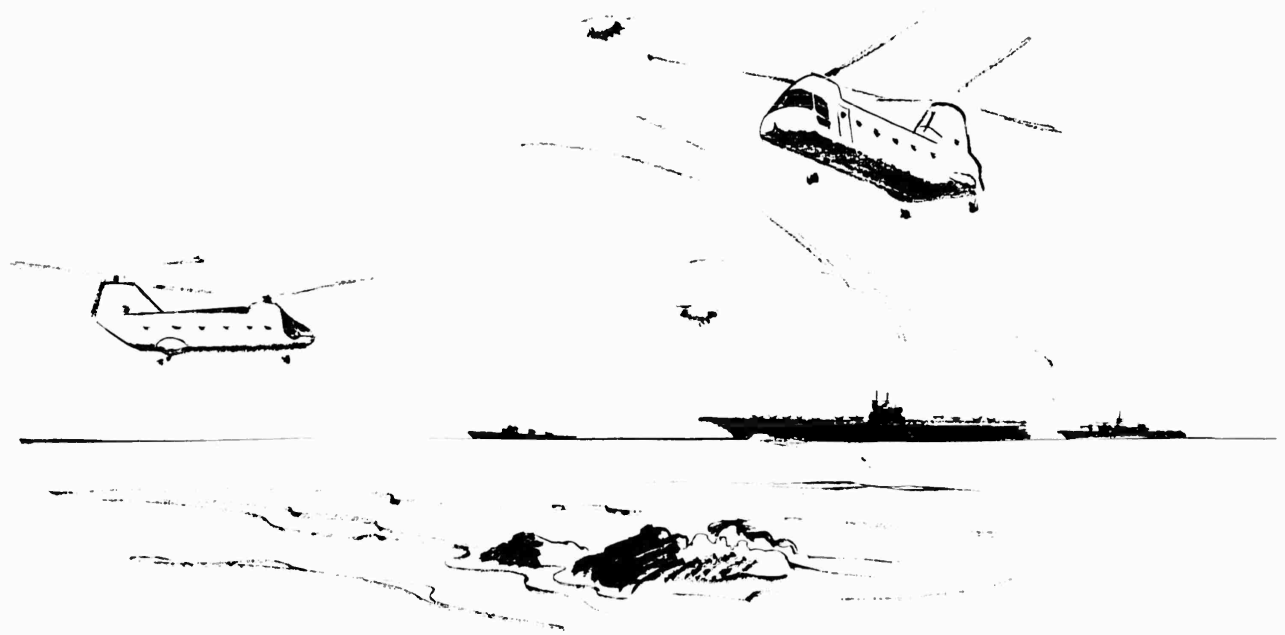

Title

FUTURE AMPHIBIOUS OPERATIONS: TRADE-OFFS BETWEEN MOBILITY AND FIREPOWER AND SOME IMPLICATIONS OF FUTURE OPERATIONAL CONCEPTS, WEAPONS, AND LOGISTIC SYSTEMS (U)
(A Presentation for the Second Tripartite Symposium on Naval Operational Research, London, England)

Date of Presentation: April 1961

Classification: UNCLASSIFIED

Objectives of Paper

1. To demonstrate the relationship between the strategic lift requirements of an amphibious assault force and the composition of the tactical forces deployed.

2. To demonstrate that this relationship can be examined quantitatively to achieve a more balanced relationship between strategic mobility, tactical mobility, and firepower.

3. To suggest two methods for increasing our amphibious flexibility--and particularly strategic mobility.

List of Conclusion Areas

1. Efficiency of means in force composition--the most efficient systems, techniques, and equipments for a specific force composition with proper consideration to the entire system effects, including strategic lift requirements.

2. Principle of proportion in force composition--an economic balancing of the elements within a force composition to achieve a proper balance between strategic mobility, tactical mobility, and firepower.

Distribution List

Special

Title | LANDMINE WARFARE AND VERTICAL ENVELOPMENT, AN OPERATIONAL ANALYSIS OF THE THREAT IN SELECTED GEOGRAPHIC AREAS (U)

Date of Publication: October 1958 (Final Report)

Classification: SECRET--Special Handing Required, Not Releasable to Foreign Nationals (except authorized nationals of United Kingdom, Canada, India, and Pakistan)

Objectives of Study

1. To evaluate potential enemy use of landmines against Marine Corps vertical envelopment forces.
2. To evaluate devices and techniques for detecting and clearing landmines and minefields.
3. To suggest areas of research and development for equipment and procedures to counter the use of landmines.

List of Conclusion Areas

1. Threat of landmine warfare to vertical envelopment operations
2. Effects of terrain and vegetation on the threat
3. Landmine detection
4. Clearing and breaching
5. Passive defense measures.

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Title

MARINE CORPS LOGISTIC SYSTEMS STUDY (U)
Vol I REPORT
Vol II APPENDIXES A and B
Vol III APPENDIXES C, D, E, F, and G

Date of Publication: April 1962 (Final Report)

Classification: Vols I and III SECRET, Vol II CONFIDENTIAL

Objectives of Study

To recommend improved methods, techniques, transport vehicles, and equipment to provide supplies for all elements of an FMF engaged in expeditionary operations.

List of Conclusion Areas

1. Initial combat supply allowances
2. Supply replenishment
3. Future Marine Corps assault helicopter design
4. Ship-to-shore distance in relation to future assault vehicles
5. Ship-to-shore distance in relation to future logistic vehicles
6. GEM design needs
7. Off-road ground transport vehicles
8. Inland transport of fuel
9. Ship-to-shore fuel transfer

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Research Analysis Corp	3
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Title | MOBILITY OF MEF ARTILLERY (U)

Date of Publication: December 1962 (Final Report)

Classification: CONFIDENTIAL

Objectives of Study

To investigate and analyze mobility requirements of the MEF field artillery fire-support system in supporting the landing force concept of operations in a limited war environment.

List of Conclusion Areas

A. General

1. Comparative ranking of direct support batteries
2. Special cases of direct support artillery
3. Comparative ranking of general support batteries

B. Specific

1. Direct support artillery
2. Special cases of direct support artillery
3. General support artillery
4. Ship-to-shore by surface transfer vehicles
5. Helicopter transportability
6. Cross-country mobility
7. Shipping
8. Cost.

Distribution List

MCLFDC, Quantico, Va.	70
ONR (Code 405)	2
(Code 407M)	2
(Code 493)	2

Title | SEABORNE MOBILE LOGISTIC SYSTEMS (U)

Date of Publication: October 1963 (Final Report)

Classification: SECRET

Objectives of Study

1. To describe and analyze the requirements of a logistic system using a seaborne mobile logistic support base for support of amphibious landing force operations ashore.
2. To compare the effectiveness of the seaborne mobile logistic support system with alternative logistic concepts under various operating situations.

List of Conclusion Areas

1. Relationship of seaborne system to buildup of logistic capabilities ashore
2. Relationship of seaborne system to future organization of combat service support units
3. Effects of seaborne system on amphibious shipping requirements
4. Capability of seaborne system for supporting lightly equipped forces in rapid maneuver, quick withdrawal, or redeployment
5. Support of a heavily reinforced landing force
6. Maintenance in the objective area
7. Relationship of the sea based system to the landing force ashore
8. Tactical or transport aviation ashore
9. Requirement for high-speed logistic support vehicles
10. Command and control
11. Comparative vulnerability

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CG, 1st Mar Div (Reinf)	1
CG, 2nd Mar Div	1
CG, 3rd Mar Div (Reinf)	1
CG, 1st MAW	1
CG, 2nd MAW	1
CG, 3rd MAW	1
CG, 1st Mar Brig	1
CG, ForTrps, FMFPac	1
CG, ForTrps, FMFLant	1
CG, LFTU, ATCLant	1
CG, LFTU, ATCPac	1
Director, MCLFDC	1.5
Director, MCEC	2
CO, 1st FSR	1
CO, 2nd FSR	1
CO, 3rd FSR	1
ONR	
(Code 405)	1
(Code 407M)	1
(Code 493)	1
COMPHIBLANT	1
COMPHIBPAC	1
Chairman, Amphibious Warfare Evaluation Board, PHIBTRAPAC	1
Chairman, Amphibious Warfare Evaluation Board, PHIBTRALANT	1
Defense Documentation Center	10