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U.S. MARINE CORPS STUDY OF ESTABLISHING TIME CRITERIA FOR LOGISTICS TASKS

FINAL REPORT

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The purpose of this study was to establish time criteria for Marine Expeditionary Brigade logistics tasks and demonstrate how the established time criteria supports capacity and resource management. This study developed methods for making best logistics support decisions using estimated time criteria in a military capacity management context. It developed a decision support methodology which allows Marine Corps logistics planners the means to temporarily reallocate resources within the future Marine Corps logistics chain as described in the Logistics Operational Architecture.This study examined all tenets of the Marine Corps Planning Process and considered all processes outlined in the Logistics Operational Architecture. Time planning factors were developed for the logistics processes required to support a deployed Marine Expeditionary Brigade. The Time Criteria Logistics Model developed to establish time criteria for logistics tasks may be utilized to automate the logistics planning process.

15. SUBJECT TERMS

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Foreword

This study was funded by the Commanding General, Marine Corps Combat Development Command via the Marine Corps Studies System. The objective of this study was to develop methods for making best logistics support decisions using estimated time criteria in a military capacity management context.

Decision Engineering Associates would like to thank the Study Project Officer, Lieutenant Colonel Kenneth Lasure, of the Installations and Logistics Department, Headquarters, United States Marine Corps, and the Technical Study Project Officers, Major George Pointon and Captain Eric Wolf for their professional assistance and guidance. In addition, we would like to express our sincere appreciation to Mr. David Lick who assisted Lieutenant Colonel Lasure in his project officer duties and provided a wealth of information on key aspects of the study effort.

The study team encountered many fine professionals throughout the Marine Corps who also assisted with this study. From providing pertinent information in personnel interviews, to active participation in our Seminar Simulation Exercises, these professionals were essential to our study efforts. Without their key insights and helpful attitudes, this study would not have been possible.

Finally, we are grateful for the leadership of Mrs. Carol Lager of the Studies and Analysis Division, for her oversight and guidance during this study effort.

John M. Webb
Study Leader
Decision Engineering Associates, LLC

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EXECUTIVE SUMMARY

This Final Report provides the results of the Study of Establishing Time Criteria for Logistics Tasks. The Marine Corps redefined and documented how it intends to conduct logistics support in the future through the newly defined Logistics Operational Architecture. In order to use these new processes to plan and manage logistics support effectively, planners and operators must be able to accurately project logistics resource requirements and assess the availability of those resources against planned operations. This study is an effort to develop methods for making the best logistics support decisions using estimated time criteria in a full spectrum military capacity management context.

The current method of identifying personnel and equipment available to perform missions is mostly a manual and labor intensive effort. Near accurate time estimates for accomplishing Combat Service Support tasks are critical to logistics planning efforts and are essential assets duly required to determine how much can be accomplished given the Marine Corps' current and future resources. Establishing time criteria in logistics planning will allow the planners, or capacity managers in Logistics Operational Architecture terms, to best determine when and how many people, equipment types, and amounts of material are needed to meet every logistics requirement.

This study developed methods for making best logistics support decisions using estimated time criteria in a military capacity management context. The logistics planning time criteria addresses all tenets of the Marine Corps Planning Process and considers all processes outlined in the Logistics Operational Architecture. While the study focused on the Logistics Operational Architecture planning process, it was not limited to that process.

The study was comprised of five tasks. In Task One, the study team researched Marine Corps Logistics Planning processes. This task included literature reviews of military, academic, commercial, and industrial sources, as well as reviewed general materials related to logistics planning processes. In Task Two, the study team identified specific tasks associated with the Logistics Operational Architecture; determined the skill sets, vehicles, and equipment resources required to accomplish the logistics tasks; and provided an analysis of the impact of each critical resource on logistics capacity and the ability to accomplish logistics tasks. To provide additional subject matter input for this task, a seminar simulation exercise, based on Marine Expeditionary Brigade scenarios, was conducted in two phases to identify the specific logistics tasks in which time criteria can be established and in order to more fully understand the relationships within the logistics process.

For Task Three, the study team developed a methodology for estimating time criteria to accomplish logistics tasks. These planning estimates were provided to the Study Sponsor for approval. A Time Criteria Logistics Model was then developed and run to provide statistical information for analysis. In Task Four, the study team used Task Three findings to determine data requirements associated with identified candidate logistics tasks. Additionally, the study team documented revised data elements for consideration in the Global Combat Support System – Marine Corps shared data environment. Corrective actions and implementing strategies to resolve the missing elements were not required because no missing data elements were identified and the Marine Corps' shared data environment has not been implemented.

In Task Five, a proof of concept for the time criteria methodology was presented. The methodology, developed during Task Three, and refined during the remainder of the study, was validated by the Study Sponsor. The methodology addressed the logistics tasks and requirements identified for consideration of fulfilling product and service orders for a seabased Marine Expeditionary Brigade.

The time criteria methodology was incorporated into a logistics planning tool and this tool was successfully demonstrated. This demonstration showed how established time criteria supports capacity and resource management. The Time Criteria Logistics Model that evolved from the methodology development is a practical tool to enable logisticians to obtain time criteria information for operational planning.

The following conclusions and recommendations are provided to assist the Study Sponsor with implementing the results of the study efforts.

CONCLUSIONS.

1. That the Time Criteria Logistics Model provides an additional planning capability to supplement current logistics planning estimate methodologies.

2. That Time Criteria Logistics Model results of various scenarios allow for significant logistics planning analysis of logistics chain performance.

RECOMMENDATIONS.

1. That the Time Criteria Logistics Model be utilized to assist in the logistics planning process.

2. That logistics planning analysis derived from the Time Criteria Logistics Model be used to support resource planning, management, and utilization in support of Marine Air-Ground Task Force missions and plans.

I. Introduction

A. BACKGROUND.

This is the Final Report for the Study of Establishing Time Criteria for Logistics Tasks (M00264-01-D-002/Delivery Order: 0007) performed for the United States Marine Corps, Deputy Commandant, Installations and Logistics Department by Decision Engineering Associates, LLC.

The United States Marine Corps has redefined and documented how it intends to conduct logistics support in the future through the Integrated Logistics Capability Logistics Operational Architecture. In order for the Marines using these new processes to plan and manage logistics support most effectively, they must be able to accurately project logistics resource requirements and assess the availability of those resources against planned operations.

The current method of identifying the personnel and equipment resources available to do missions is mostly a manual and labor intensive effort. Time estimates for accomplishing Combat Service Support tasks are critical to logistics planning efforts and are required to determine how much can be accomplished given current and future available personnel and equipment resources. Establishing time criteria in logistics planning will allow the planners, known as Capacity Managers in the Logistics Operational Architecture terminology, to better determine when and how many people, what types of equipment, and the amounts of materiel needed to meet every logistics requirement. These will better enable the future planners to understand what resources they have available to meet upcoming operational requirements. This decision support requirement must be developed to successfully implement the planning process contained in the Logistic Operational Architecture.

To conduct logistics effectively, an understanding of its purpose and characteristics is required. Logistics, in its basic sense, is the process and procedures of providing resources throughout an operation. In a combat environment, logistics provides the resources, places them on the battlefield, and sustains them throughout the operations. Everything from food to bullets required to maintain the fighting posture of the force may fall under the logistics umbrella.

Figure I-1: In A Combat Environment, Logistics Provides The Resources, Places Them On The Battlefield, And Sustains Them Throughout The Operations.

Logistics is a vital component of any military operation. Logistics planning for any operation begins at the earliest inception of the operational planning process and continues throughout the campaign. Determination of the type of supplies a force requires for a certain operation of an expected duration, the transportation network required to support the supply movement, and the need to maintain flexibility in the logistics plans due to the many variables involved in combat operations, have elevated logistics to a science, though it is also an art. As a science, historical data and thorough testing of logistics plans over many generations have resulted in knowing many of the requirements for a specific evolution. The unknown that emerges in any combat operation requires that logistics planning also remain an art, best accomplished by skilled logisticians relying on their best guess or feel for a particular situation.

Marine Corps logistics is designed to meet the unique demands of naval expeditionary warfare. Marine forces are required to be rapidly deployable, self reliant, and self sustaining, while projecting power over great distances. Logistics plans are designed with deployment and sustainment in mind. Often, a logistics capability must be built where none exists. Seabased logistics presents its own set of challenges that will be addressed during this study.

This study developed methods for making best logistics support decisions using estimated time criteria in a military capacity management context. It developed a decision support methodology which allows Marine Corps logistics planners the means to temporarily re-allocate resources within the future Marine Corps logistics chain as described in the Logistics Operational Architecture.

B. PURPOSE.

The purpose of this study was to establish time criteria for Marine Expeditionary Brigade logistics tasks and demonstrate how the established time criteria supports capacity and resource management.

C. OBJECTIVE AND SCOPE.

1. Objective. The objective of this study is to develop methods for making best logistics support decisions using estimated time criteria in a military capacity management context.

2. Scope. The scope of this study encompassed several areas of consideration leading to a thorough evaluation of Marine Corps logistics demands in the Marine Expeditionary Brigade operational environment. These areas of consideration are listed in Figure I-2.

STUDY OF ESTABLISHING TIME CRITERIA FOR LOGISTICS TASKS STUDY SCOPE	
1.	Logistics planning time criteria must address all tenets of the Marine Corps Planning Process and consider all processes outlined in the Logistics Operational Architecture.
2.	This study focuses on, but is not entirely limited to, the Logistics Operational Architecture planning process.
3.	Personnel skill sets are limited to logistics military operational specialties.
4.	Equipment planning factors will be limited to those critical Table of Authorized Materiel Control Numbers that enable distribution and materiel handling of cargo and supplies.
5.	Other than estimated time criteria, the remaining logistics data will come from current Marine Corps Logistics Automated Information Systems.
6.	Future personnel administrative and force structure information systems and planning tools will be available and feed an integrated data environment.
7.	Time planning factors will be developed for all the logistics processes required to support a deployed Marine Expeditionary Brigade.

Figure I-2: The Scope Of This Study Encompassed These Areas Of Consideration Leading To A Thorough Evaluation Of Marine Corps Logistics Demands In The Marine Expeditionary Brigade Operational Environment.

D. ASSUMPTIONS.

The assumptions contained in the Statement of Work provide the reference framework for development of a sound methodology to meet study objectives within the study's scope. Figure I-3 lists the study assumptions that serve as the basis for study research, conclusions, and recommendations.

STUDY OF ESTABLISHING TIME CRITERIA FOR LOGISTICS TASKS STUDY ASSUMPTIONS	
1.	The Marine Corps mission, as prescribed in the National Security Act of 1947 (amended), will not change from Fiscal Year 2002 to Fiscal Year 2007 (Dates are inclusive of the study period).
2.	The OPTEMPO the Marine Corps is currently experiencing will remain the same for the foreseeable future.
3.	All recommended solutions must comply/integrate with the Global Combat Service Support - Marine Corps technical architecture.
4.	The Logistics Operational Architecture will be the basis for process and information exchange requirements and will not change in the near future.
5.	As logistics chain performance changes, the planners will be able to feed these new resource performance characteristics into a planning tool to adjust and update planned resource requirements and availability.

STUDY OF ESTABLISHING TIME CRITERIA FOR LOGISTICS TASKS STUDY ASSUMPTIONS	
6.	The information required to track and manage the personnel projected availability will be integrated with the personnel Administrative (morning report) tracking tools. (Manpower, Table of Organization, Table of Equipment.)

Figure I-3: The Assumptions For This Study Provided The Reference Framework For Development Of A Sound Methodology To Meet The Study Objectives Within The Study's Scope.

E. MAJOR FACTORS FOR CONSIDERATION.

The intent of this study was to develop Marine Corps logistics capacity management similar to that used by industry business leaders. However, necessary military redundancies were also considered. There were two major factors for consideration during the performance of this study:

1) This study will improve logistics planning using data captured by Marines performing a variety of logistics tasks. It is vital that any solution considers deployed units and interface with the Global Combat Support System – Marine Corps, currently under development.

2) The sponsor expects that the time criteria established in this study, in concert with data from a Global Combat Support System – Marine Corps integrated data environment, will enable the Marine Corps to implement the proposed planning methodology shortly following completion of the study.

F. METHODOLOGY.

1. Overview. As established in the Statement of Work, this study consisted of five tasks. These tasks are each described in detail in the paragraphs below; the subtasks for each comprise the technical approaches and specific methodologies that were used in performing the tasks. Figure I-4 graphically displays the five tasks for this study and their corresponding deliverable reports.

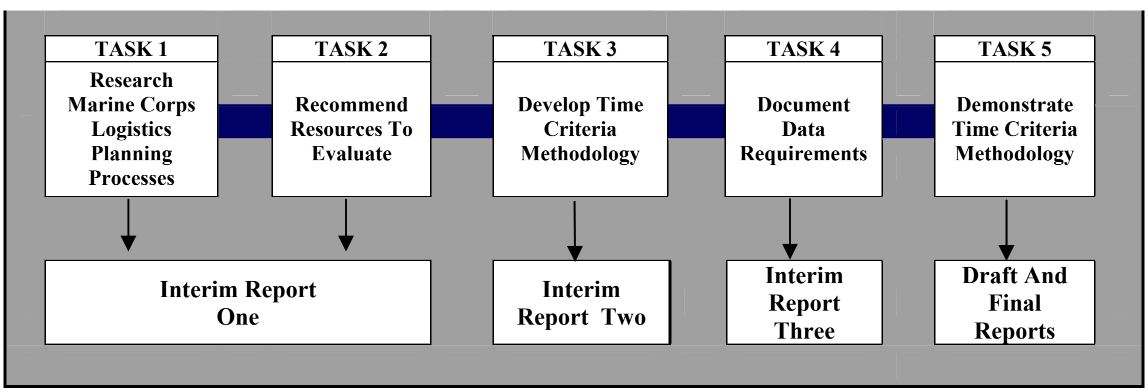

Figure I-4 : The Study Was Completed According To These Tasks And Deliverable Reports.

2. Task One - Research Marine Corps Logistics Planning Processes. In Task One, the study team conducted a literature search of the Marine Corps Planning Process doctrine as found in Marine Corps Warfighting Publication 5-1 and applications in the context of both combat service support and the Marine Logistics Command concept.

The initial research phase focused on the Marine Corps Planning Process and consisted of four elements or subtasks: (a) a literature review of military sources; (b) a literature review and personal interviews of academic sources; (c) a literature review and personal interviews of commercial and industrial sources; and, (d) a review of observations, demonstrations, war games, and general materials related to the logistics planning process, both civilian and military. The subtasks are presented in further detail in the following paragraphs.

Subtask 1a – Literature Review of Military Sources. The study team researched military, especially Marine Corps, materials on military capacity management. A search of the Marine Corps Research Center, National Technical Information System database, and the World Wide Web yielded sources of military studies, including the most current versions of the following:

- Logistics Operational Architecture (LogOA);
- Global Combat Support System - Marine Corps (GCSS-MC);
- Marine Corps Planning Process (MCWP 5-1);
- Military Occupational Specialty (MOS) Manual;
- Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance (C4ISR) Architecture Framework; and
- Common Logistics Command and Control System Support (CLC2S).

Subtask 1b – Literature Review and Personal Interviews with Academic Sources. The study team contacted academic institutions with logistics strengths to identify academic and other activities related to capacity management and planning. Contacts were made with Stevens University, Pennsylvania State University, and Georgia Institute of Technology. Additional contacts were developed as the result of a comprehensive search of on-line library catalogs of academic institutions using keyword searches. Some of the keywords included but were not limited to: capacity expansion, planning, production scheduling, decomposition, production planning and control; production planning, scheduling, sequencing distribution planning, marine transport, integer programming, inventory manufacturing, supply chain, supply chain management, capacity planning, scenario analysis, stochastic programming, distributed enterprises; logistics system design, heuristic scheduling; fleet sizing, stochastic integer programming, branch and bound model reduction, discrete event simulation, simulated annealing; heuristics, lagrangian relaxation, forecasting, performance modeling, mathematical programming, modeling, and nonlinear programming.

Subtask 1c – Literature Review and Personal Interviews with Commercial and Industrial Sources. The study team reviewed these sources and interviewed appropriate subject matter experts as they were identified. The study team updated and added to the annotated bibliography throughout the course of the study. The study team was required to review the following documents and they are annotated in Appendix A, Bibliography. Results of the research are found in Section II of this report.

- Society of Logistics Engineers (SOLE) publications;
- John Zachman (the “Zachman Framework”) materials on enterprise architecture;
- Armed Forces Communications and Electronics Association (AFCEA) materials on C4ISR Architectural Framework and Global Command and Control System (GCCS).

Subtask 1d – Review of General Materials Related to the Logistics Planning Process. A review of databases, demonstrations, models, and information technology related to logistics planning was conducted. The table of contents portion of the Marine Corps Planning Process document served as an outline to identify pertinent process information. Additional information related to outline topics were then sought to expand understanding of logistics planning.

The study team utilized several data collection techniques to capture the most accurate and complete information available. The study team blended extensive computer research, subject matter expert interviews, technical documentation reviews, seminar simulation, and validation by subject matter experts to gain the most valid information. The team continued to update and add to the research materials as the study matured. The Assumptions and Major Factors for Consideration were incorporated into the study methodology.

3. Task Two - Recommend Resources To Evaluate. This task provided the foundation for analysis needed to estimate time criteria and planning estimates. The resources determined in this task were those needed to accomplish the Logistics Operational Architecture tasks required to fill service and product orders from a seabased Marine Expeditionary Brigade. There were three subtasks: (a) identify logistics operational architecture tasks; (b) identify resources needed by logistics operational architecture tasks; and (c) analysis of resource impacts.

Subtask 2a – Identify Logistics Operational Architecture Tasks. The study team listed and described the logistics tasks required by the S_1 node of the Logistics Operational Architecture to fill service and product orders from a seabased Marine Expeditionary Brigade. These tasks were identified under various use cases focusing on the processes and procedures required to fulfill product and service orders. The study team developed a seminar simulation decision workshop held with Marine Corps logistics subject matter experts to refine and edit the task list. A discussion of the results of this subtask is found in Section II of this report; the task list is shown in Appendix B; and the seminar report is located in Appendix C of this report.

Subtask 2b – Identify Resources Needed by Logistics Operational Architecture Tasks. The study team identified critical skill sets, vehicles, and equipment necessary to accomplish the Logistics Operational Architecture tasks identified in Subtask 2a during Phase Two of the seminar simulation exercise.

Subtask 2c – Analysis of Resource Impacts. In this subtask, the study team scrutinized the critical skill sets, vehicles, and equipment as they were associated to the logistics use cases previously identified. In order to proceed to the time criteria methodology development in Task Three, an evaluation was made of how each critical resource impacts logistics capacity. As discussed in Section II, this was accomplished during the seminar simulation exercise through the identification of the frequency that each logistics task would be accomplished per day during both low tempo and high tempo operations. Knowing the number of resources available, the amount of time they were needed to fulfill service and product orders, and the number of times per day they would be required to fill specific service and product orders, an analysis was made of logistics capacity.

The study proposal originally envisioned utilizing an organic wargaming tool to generate initial timing estimates. SEAWAY (formerly known as SEAWAY LOGGY), is a commercial logistics automation program developed by California Polytechnical Institute for the Marine Corps. SEAWAY was expected to provide a list of logistics events related to the scenario developed for the study, as well as the timing estimates for each step of the logistics processes. Unfortunately, the SEAWAY model had not been purchased by the Marine Corps prior to the execution of this study task, and thus the evolution of the Task Two subtaskings proceeded independent of this course of action. At a future point, if SEAWAY becomes available, the data used in this study could be verified by this or similar logistics programs.

4. Task Three – Time Criteria Methodology. The development of a time criteria methodology is a key element of this study effort. Task Three was divided into two subtasks as detailed in the following.

Subtask 3a – Develop Time Criteria Methodology. In Task Three, the study team developed a methodology for estimating time criteria and provided planning estimates for the associated resources. Working closely with the Study Sponsor, subject matter experts, and the Technical Study Project Officer to organize and develop the recommended time criteria methodology, the general nature of the methodology is discussed below.

- **Introduction to Time Criteria Methodology.** Network Analysis is a familiar operations analysis technique that has the flexibility for studying a variety of different applications. It is an offshoot of an important electrical engineering tool that has proven practical in numerous contexts in addition to electrical engineering. The uses of varied approaches of non-electrical engineering versions of network analysis are seen in such applications as transportation (*e.g., the shortest route problem*) analysis and the planning and control of research and development projects (*e.g., PERT/CPM approaches*). Decision Engineering's preliminary intent in this study adapted a network analysis (usually termed network flow theory) approach as the principal time criteria methodology for this study. Our approach is an adaptation of the shortest route problem, but with the modification of the algorithm from a consideration of distance, to a consideration of time, instead. This is a viable approach since the network analytical methodology relies on a graph with specific sets of junction points called nodes. This graph reacts in the same way whether or not the branches represent distance, cost, wattage, time or other values. Each set of nodes is joined by a branch and the branches represent the measurable elements of the analysis. For example, the longest branch in a graph (network) depicts the longest distance of travel in a route oriented problem; but instead of distance, the orientation of the network could be changed to represent cost, and the longest branch then would be the element with the greatest cost. Our approach is to consider the elements (branches) of the network as representative of time required for the activity indicated by the branch. Thus, the algorithmic basis for our time criteria methodology has nothing to do with route distances, or costs, but presents instead the times related to events. These events are based on tasks determined from study of the Logistics Operational Architecture.

- **The PERT Three-Estimate Approach**. Although our methodology is not precisely that of PERT, it borrows the three estimate approach for time analysis on which PERT is based. Although the subject matter experts at the seminar simulation in Task Two predicted reasonably accurate estimates of the time required for each Logistics Operational Architecture task, there is always considerable uncertainty about what the timings will actually be; the timing is actually a random variable having some probability distribution. The PERT three estimate approach takes this uncertainty into account by using three different time estimates for each task and then estimating the time required for completing the tasks. The three time estimates are: a *most likely* estimate (termed *m*) which is the most realistic estimate of the time the activity is most likely to require – known as the mode in statistical terminology; an *optimistic* estimate (termed *a*) which is the very unlikely time the activity would require if absolutely everything went as well as it possibly could – in statistical terms, known as the lower bound of the probability distribution; and, finally, a *pessimistic* estimate (termed *b*) which is the least likely, but nevertheless possible, time the activity would require if all elements of the task went wrong.

Estimating the Expected Value (t_e). The distribution described by m, a, and b will be subjected to two assumptions to convert it to estimates of the expected value (t_e) and of the variance (σ^2) of the elapsed time required by each activity/task. One assumption is that σ, the standard deviation (square root of the variance), equals 1/6[th] the range of reasonably possible time requirements; that is: $\sigma^2 = [1/6(b-a)] 2$ is the desired estimate of the variance. This assumption is based on the belief that the tails of many probability distributions (such as the normal distribution) are considered to lie about three standard deviations from the mean, so that about six standard deviations spread out between the tails. The other assumption required to convert the distribution into t_e is to assume the form of the distribution as a beta distribution. We then simplify the t_e algorithm to the form: $t_e = (a + 4m + b) / 6$. This enables the time criteria methodology to be applied in the next subtask, as specified in the Statement of Work. Decision Engineering applied the t_e formula to every Logistics Operational Architecture activity, thus obtaining an expected value representing the performance time for each.

Subtask 3b – Identify and Propose Candidates for Time Criteria. The study team determined time criteria for each critical resource needed for capacity management and Logistics Operational Architecture capability planning identified and analyzed in the previous task. Decision Engineering presented these results to the Study Sponsor for approval before continuing with Task Four.

This subtask combined the results of Task Two (select resources to be used) and Subtask 3a (develop the time criteria methodology). Each of the critical resources from Task Two were processed by the PERT three estimate approach from Task 3a using timing estimates determined through research and the seminar simulation activities specified in Task Two and expanded in Task 3a. The results of the subtask were used as the basis for the computerized time criteria logistics model developed in this task.

5. Task Four – Document Data Requirements. Decision Engineering was tasked to identify data requirements from the approved candidates in Task Three and documented missing elements for consideration in the Global Combat Support System - Marine Corps Shared Data Environment. Additionally, the study team was to recommend corrective action with implementation strategy for those missing elements. This task was divided into three subtasks.

Subtask 4a - Identify Data Requirements from Task Three. Results of previous tasks were examined and data sources already in existence were identified. The data elements themselves, and the data sources to which they belong were identified and documented. New data was documented as discussed in subtask 4b.

Subtask 4b - Documentation of Missing Data Elements. Data elements not identified in the previous subtask were to be listed for consideration in the Global Combat Support System–Marine Corps shared data environment. No missing data elements were identified in this analysis, though existing data was refined to reflect better planning information and more realistic reflections of resource times and utilization.

Subtask 4c - Recommend Corrective Action. With no missing data elements identified, and the Global Combat Support System–Marine Corps shared data environment not yet available or operational, no corrective actions or implementation strategies were required. It is envisioned that the data sources and elements incorporated in the time criteria model developed in Task Three will be incorporated into the shared data environment.

6. Task Five - Demonstrate Time Criteria Methodology. Decision Engineering performed a proof of concept demonstration for the methodology in which seabased Marine Expeditionary Brigade logistics requirements were considered and, using a sponsor approved scenario, demonstrated how established time criteria supports capacity and resource management. The proof of concept demonstration utilized the study's time criteria model from Task Three and the Marine Expeditionary Brigade scenario from this task. Section II. F. details the study's methodology proof of concept demonstration.

II. STUDY FINDINGS

A. BACKGROUND.

The objective for this study requires the development of methods for making best logistics support decisions, using estimated time criteria in a military capacity management context. The stated intent of the study is to develop Marine Corps logistics capacity management similar to that used by industry business leaders, keeping in mind redundancies unique to military operational requirements. Decision Engineering has conducted analyses and collected data for development of a methodology and a logistics planning tool for the Marine Corps logistics planners. However, decision making is a constantly evolving process based on data availability and scenario development. Because of this, the study team collected data and refined the methodology throughout the conduct of the study to provide the Marine Corps with the optimal decision making tool.

In order to develop an appreciation for the importance of timeliness in logistics support, this section includes a general discussion of the challenges confronting logistics managers as they provide support in dynamic operational environments. The Logistics Operational Architecture serves as the basis for structuring the tasks and identifying the imbedded actions involved in accomplishing particular mission tasks.

Currently, time estimates for accomplishing Combat Service Support, as well as routine logistics tasks, are based on an individual's professional military experience and best judgment. This planning method is time consuming, labor intensive, and not fully automated. In current and future dynamic operational environments, a logistics manager must deal with a variety of factors, many of which are outside of his or her control, that affect the ability to respond to support requests in a timely manner. For example, requests from a shore based unit may compete for limited assets with which to transport parts, equipment, or support personnel. Having an automated source of information identifying time requirements to accomplish specific logistics support functions will enable the planner to more efficiently prepare for, manage, and execute the combat service support mission.

This report covers the results of each study task. Task One, Research Marine Corps Logistics Planning Processes, included four subtasks: a literature review of military sources; a literature review and personal interviews with academic sources; a literature review and personal interviews with commercial and industrial sources; and a review of general materials related to the logistics planning process. Task Two, Recommend Resources to Evaluate, included three subtasks: identifying logistics operational architecture tasks; identifying resources needed to support logistics operational architecture tasks; and an analysis of resource impacts. Task Three, Develop Time Criteria Methodology, included two subtasks. These were to develop time criteria methodology and identify and propose candidates for time criteria. Task Four, Document Data Requirements, included three subtasks: identifying data requirements from Task Three; documentation of missing data elements; and, recommending corrective action. Task Five, Demonstrate Time Criteria Methodology, was composed of two subtasks: demonstration performance, and preparation of draft final and final reports.

Within Task Two, the study team identified, listed, and described specific logistics tasks from the Logistics Operational Architecture as the basis for conducting the remaining study efforts. Decision Engineering hosted a seminar simulation exercise, based on Marine Expeditionary Brigade scenarios, to identify the specific logistics tasks for which time criteria can be established and to more fully understand relationships within the logistics process.

During the seminar, attended by subject matter experts from a broad spectrum of Navy and Marine Corps venues, the original list of logistics chain tasks, totaling 610 tasks in 17 use cases, was refined to 217 tasks in 15 use cases that specifically identify those actions and tasks for which human intervention is involved and, therefore, have the potential for time measurement and criteria establishment.

In Task Three, the study team used the results of Tasks One and Two to develop a methodology for estimating time requirements and criteria for completing specifically identified tasks in the Logistics Operational Architecture functional flow process. This methodology served as the basis for a tool the logistics planner can use for managing logistics resources. Additionally, using the critical resources identified and analyzed in previous tasks, the study team determined appropriate time criteria for use in measurement of logistics actions within the functional flow.

Task Four commenced upon completion of the previous tasks and approval of the methodology by the Study Sponsor. In this task, using approved candidates from Task Three, the study team would identify and document missing elements, if any, related to the Global Combat Support System – Marine Corps shared data environment. With the results of this analysis, the study team would recommend corrective actions and implementation strategies to resolve the missing elements. This task evolved, as will be described, because the Global Combat Support System – Marine Corps was not operational when the study was completed.

Task Five was a proof of concept demonstration of the methodology developed under the previous tasks. The demonstration used a sponsor approved scenario related to Marine Expeditionary Brigade logistics requirements to show how the methodology supports capacity and resource management.

B. RESEARCH MARINE CORPS LOGISTICS PLANNING PROCESSES – Task One.

1. Initial Research. The study team commenced research efforts with a thorough review of Marine Corps logistics documents, publications, orders, and regulations, and then expanded their scope to Department of Defense logistics references. This enabled the team members to gain insight into Marine Corps logistics policy and strategy, allowing them to focus on pertinent information. Further research efforts included personal interviews with subject matter experts on Marine Corps logistics, extensive computerized searches of related Internet web sites, and document research at the Marine Corps Research Center.

After establishing a sound knowledge base, research efforts focused on the Logistics Operational Architecture and related documents, some of which were provided as government furnished material. These efforts led the study team to a more complete understanding of the Marine Corps Logistics Planning Process. The study team gained additional insight from the literature review of military sources; further reviews of academic material, including a personal interview of an academician; reviews of commercial and industrial sources; and the conduct of a logistics seminar. Results of these efforts are detailed in the annotated bibliography found in Appendix A. It is important to note that the study team will continued research efforts throughout the period of study performance and updated the information contained in Appendix A for each interim report.

2. Enterprise Architecture Background. Initially, the study team planned to focus on examining the Integrated Logistics Capability Operational Architecture, now called simply the Logistics Operational Architecture. To prepare for a detailed analysis of the extensive Marine Corps Logistics Architecture, the study team first reviewed both Government and commercial documentation that described different approaches to, and formats for, enterprise architecture frameworks: the Government's Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture Framework, and the Zachman Framework from the Zachman Institute for Framework Advancement.

The study team was also able to access and review several course books related to enterprise architecture. These reviews provided the study team with insight into the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance architecture framework, which serves as the template on which the Logistics Operational Architecture is based. This insight enabled the study team to anticipate relevant information that could be derived from Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance architecture components for application in the Marine Corps Logistics Operational Architecture.

An understanding of the Supply Chain Operations Reference model is essential to understanding the Logistics Operational Architecture. The Supply Chain Operations Reference model depicts the building blocks that organizations can use to describe their supply chain and, subsequently, implement business process improvements. It is organized around five primary management processes: Plan, Source, Make, Deliver, and Return. As depicted in Figure II-1, these processes are broken down into progressively more detailed descriptions. At level two, the model identifies 26 core process categories. The Supply Chain Operations Reference model provides information to level three, the Process Element Level. The functional flows, at level four, are not provided in the Supply Chain Operations Reference document. This level is to be developed for each unique application. The Marine Corps Logistics Operational Architecture is based on information provided in the Supply Chain Operations Reference model at levels one through three and includes time related data elements. The Logistics Operational Architecture, therefore, represents level four of the Supply Chain Operations Reference methodology and uses its supply/logistics chain terminology instead of, military functional terms.

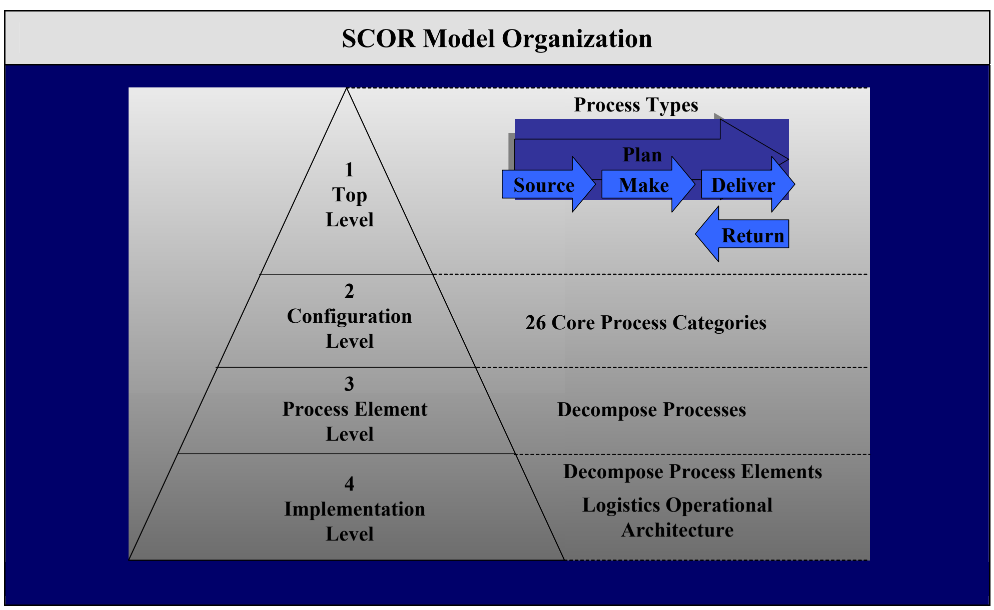

Figure II-1: The SCOR Model Is Organized Around Five Primary Management Processes And Provides Information To Level Three; The Logistics Operational Architecture Represents Level Four.

3. Logistics Operational Architecture and the Logistics Planning Process. The study team conducted a thorough review of the Marine Corps Logistics Operational

Architecture and its relation to the Marine Corps Planning Process publication. The Logistics Operational Architecture was searched for logistics tasks pertinent to this study's Task Two efforts. In order to ensure that no information was missed, all 18 Logistics Operational Architecture appendixes were analyzed individually and in relation to each other. Each appendix contains descriptive information critical to understanding the scope, purpose, and limitations, if any, of specific Logistics Operational Architecture components. Two Logistics Operational Architecture components, functional flows and use cases, are not described in the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance architecture but are of particular importance to the study.

In order to interpret the functional flows and use case components, the study team referenced the Armed Forces Communications and Electronics Association course book, *Advances in C4ISR Architectures*. The study team recognized use cases as an object oriented design tool and understood that the Global Combat Support System – Marine Corps program is expected to implement object oriented products and databases.

During a meeting with a Logistics Operational Architecture subject matter expert from Headquarters, Marine Corps, the study team learned that the functional flows and use cases are considered the heart of the Logistics Operational Architecture and, in fact, the predominance of the Marine Corps architecture effort was focused on these two components. The Logistics Operational Architecture functional flows were developed to better depict the Marine Corp's logistics chain in a functional context. They uniquely display process information across the logistics chain. The use cases were developed to validate logistics requirements on a recurring basis. The functional flow tasks became the basis for the seminar simulation exercise task list compiled during Task Two, and the use cases became the background for decision making during that seminar.

Status information on the Global Combat Support System – Marine Corps was collected during the initial research phase of the study via internet searches, monitoring the appropriate Marine Corps websites, and accessing the Marine Corps Systems Command's Command Automated Program/Information System. The study team found the Global Combat Support System – Marine Corps was tied to the Logistics Operational Architecture, since it is the basis for logistics chain transformation.

The study team conducted an analysis and comparison of industry capacity management processes, the Logistics Operational Architecture planning process, and the Marine Corps Planning Process in an effort to identify differences or gaps. Beginning this comparison, the study team evaluated the industry standard Supply Chain Operations Reference model against the Logistics Operational Architecture and found the four step processes to be identical. This was expected, as the Logistics Operational Architecture was patterned on this commercial model.

The study team then conducted a comparison between the Logistics Operational Architecture and the Marine Corps Planning Process. The Marine Corps Planning Process describes inputs, processes, and outputs for each of its six planning steps. Because those data are similar to activity models found in the Logistics Operational Architecture, the study team first assessed the architecture's Operational View – 5 Activity Model. Although the terminologies are different in each of the evaluated planning processes, they all fundamentally describe the same steps. In the Supply Chain Operations Reference model, and, thus, the Logistics Operational Architecture, four planning steps are identified to fulfill customer requirements, as opposed to the six steps delineated in the Marine Corps Planning Process.

As depicted in Figure II-2, each process begins with a mission analysis to identify and prioritize requirements. They next require an analysis of resources and then a comparison of those resources to the operational or logistical requirements. Finally, the processes lead to the logical development of plans and the execution of orders. The study team found no gaps in the comparison analysis of the Marine Corps Planning Process, the Logistics Operational Architecture, and industry capacity management.

PROCESS COMPARISON			
SCOR/LOG OA		**MARINE CORPS PLANNING PROCESS**	
ID#	**DESCRIPTION**	**ID#**	**Description**
P1.1	**Identify, Prioritize, and Aggregate Supply Chain Requirements**	**1**	**Mission Analysis**
P1.2	**Identify, Assess, and Aggregate Supply Chain Resources**	**2**	**Course of Action Development**
P1.3	**Balance Supply Chain Resources with Supply Chain Requirements**	**3**	**Course of Action War Game**
		4	**Course of Action Comparison and Decision**
P1.4	**Establish and Communicate Supply Chain Plans**	**5**	**Orders Development**
		6	**Transition**

Figure II-2: Although The Terminology Is Different, The Four Steps Of The Supply Chain Operations Reference And Logistics Operational Architecture Process Match The Six Steps Of The Marine Corps Planning Process.

4. Literature Review and Personal Interviews of Academic and Commercial Sources. During this phase of the task, members of the study team also researched various academic and commercial sources related to the understanding of logistics tasks and operational architecture frameworks. A personnel interview with an academic source was also conducted. Key materials studied include the Society of Logistics Engineers publications, Zachman materials, and Armed Forces Communications and Electronics Association documents. The results of these efforts are found in Appendix A.

The study team found these efforts to be helpful in understanding the Logistics Operational Architecture process, but only on a basic level. Further academic sources interviewed did not provide any insights beyond what had already been found. The study team was also unable to gain specific commercial logistics architecture information due to proprietary concerns. Overall research efforts, though, provided a solid foundation for the remaining study tasks.

C. RECOMMEND RESOURCES TO EVALUATE – Task Two.

1. Overview. The primary goal of Task Two was to identify, from a planning perspective, the resources needed to support logistics tasks required to fill service and product orders from a seabased Marine Expeditionary Brigade. It is important to be familiar with the specific Logistics Operational Architecture products and Logistics Operational Architecture and Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance architecture framework terminology before this resource and task identification. The role of logistics in Marine

Corps operations is also key to understanding the framework from which the task list would spring.

Class of Supply	DESCRIPTION
I	Subsistence, which includes gratuitous health and welfare items and rations
II	Clothing, individual equipment, tentage, organizational tool sets and tool kits, hand tools, administrative and housecleaning supplies, and equipment
III	Petroleum, oils, and lubricants, which consists of petroleum fuels, lubricants, hydraulic and insulating oils, liquid and compressed gases, bulk chemical products, coolants, de-icing and antifreeze compounds, preservatives together with components and additives of such products, and coal
IV	Construction, which includes all construction material; installed equipment; and all fortification, barrier, and bridging materials
V	Ammunition of all types, which includes, but is not limited to, chemical, radiological, special weapons, bombs, explosives, mines, detonators, pyrotechnics, missiles, rockets, propellants, and fuses
VI	Personal demand items or nonmilitary sales items
VII	Major end items, which are the combination of end products assembled and configured in their intended form and ready for use (e.g., launchers, tanks, mobile machine shops, vehicles)
VIII	Medical/dental material, which includes medical unique repair parts, blood and blood products, and medical and dental material
IX	Repair parts (less Class VIII), including components, kits, assemblies, and subassemblies (reparable and non-reparable), required for maintenance support of all equipment
X	Material to support nonmilitary requirements and programs that are not included in classes I though IX. (i.e., materials needed for agricultural and economic development)

Figure II-3: This Table, Taken From Marine Corps Warfighting Publication 4-1, Shows The Classes Of Supplies Logisticians Provide For Marine Corps Operations.

Marine Corps logistics is normally categorized into six functional areas: supply, maintenance, transportation, general engineering, health services, and services. These functional areas are independent in and of themselves, but all functions must be integrated into the overall logistics support framework. Logistics, then, at its most basic level, delivers these products and services to the Marine warfighters. Figure II-3 shows the supply classification descriptions typically used by logisticians. In the end, the logistics tasks identified in the Logistics Operational Architecture will either fulfill the delivery of these categories of supplies, or provide for the various services required in the other functional areas.

2. Identify Logistics Operational Architecture Tasks. The first step in developing the recommended resources was to identify tasks in the Logistics Operational Architecture related to the Supplier 1 Node. The Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance architecture framework, which serves as the basis for the Logistics Operational Architecture, defines a node as the representation of an element of architecture that produces, consumes, or processes data. In the Operational View - 1 of the Logistics Operational Architecture, Supplier 1 is described as the entity directly responsive to the demands of the customer. The Supplier 1 supports all customer demands, maintaining communication with the customer and connectivity with Supplier N. The Supplier N is any provider who can respond to the demands of a customer, as requested by Supplier 1.

Once the study team became familiar with Logistics Operational Architecture terminology, the search proceeded to link the Supplier 1 Node and logistics tasks. The Logistics Operational Architecture Operational View – 2, found in that document's Appendix 07, is the Operational Node Connectivity Descriptions that defines this link. In the Operational View – 2, logistics tasks are described as Logistics Operational Architecture Functional Process Flows. A meeting with a Headquarters, Marine Corps Logistics Operational Architecture subject matter expert validated study team use of the Logistics Operational Architecture Functional Process Flows for logistics tasks, specifically, the Operational View - 2 diagrams. For the Supplier 1 Node, this includes Order Management, all Production/Operations Management, all Execution, and all Capacity Management.

From the Logistics Operational Architecture Operational View - 2, the study team developed a draft task list spreadsheet complete with 47 Supplier 1 Functional Process Flows. Appendix 02 of the Logistics Operational Architecture contains full diagrams of the Functional Flows. The study team conducted spot verifications to ensure that the Functional Flows listed in the Operational View - 2 mapped to the Functional Flows in Appendix 02. Column headings were added to the spreadsheet denoting Number of Actions/Frequency, Shortest Time, Most Likely Time, Longest Time, Reasons for Long Delays, and Resources such as Skill Sets, Transportation Vehicles, and Equipment.

This draft task list was reviewed internally by the study team and appended with specific tasks related to the Functional Process Flows derived from the Logistics Operational Architecture. Then, study team functional experts broke down the Logistics Operational Architecture Functional Process Flows into logistics tasks and began populating the task list spreadsheet with initial resource data. This task list was submitted to the Study Sponsor for review and feedback.

The study team began searching for alternative tasks lists that could be used to supplement the draft task list. Sources discovered included: the Business Enterprise Architecture Logistics, the Universal Joint Task List, and the Universal Navy Task List. While the Universal Navy Task List was complete for Logistics, its tasks were listed in functional stove pipes rather than presented in the context of a logistics chain, as found in the Logistics Operational Architecture. The study team did not find any correlation between the Navy task list process and the Logistics Operational Architecture, making it impractical to pursue mapping the Navy process into that of the Logistics Operational Architecture.

The study team conducted a further review of the Logistics Operational Architecture and determined the Operational View - 5 Activity Model, found in its Appendix 10, would better depict tasks related to Functional Process Flows. The Logistics Operational Architecture Operational View - 5 contains a table that maps Integrated Logistics Capability Processes to functions. The functions read like task breakdowns of the functional flows. The draft task list was modified to replace the functional expert tasks with the tasks derived from the Logistics Operational Architecture Operational View - 5. This revised task list was provided to the Study Sponsor to collect feedback on the draft task list and to propose a revision to the initial draft task list.

Another representative from Headquarters, United States Marine Corps, also met with the study team to provide feedback on the draft task list and discuss the revised list. Feedback on the initial task list indicated that it would need to be revisited to ensure that all logistics tasks were traceable to the Logistics Operational Architecture. Understanding that the second draft was derived from the Logistics Operational Architecture, the representative validated the tasks described in the Operational View - 5 with the detailed tasks on individual functional flow diagrams in Appendix 02 of the Logistics Operational Architecture. Some edits were necessary for the task list to read exactly like the Logistics Operational Architecture Functional Flows. The draft task list was then appended with detailed Logistics Operational Architecture Functional Flow numbering to ensure traceability to the Logistics Operational Architecture.

Further discussions with subject matter experts showed that, while the logistics tasks on the second task list were valid, they were not in the correct format for use during the seminar simulation exercise that was scheduled to validate the list. Specifically, the task list lacked the context of the Marine Corps logistics chain necessary to derive the information required for this study. With this information, it became apparent that the study team would need to develop a revised, more suitable task list.

The final seminar simulation task list utilized the use cases found in Appendix 05 of the Logistics Operational Architecture. The use cases illustrate the application of the detailed Operational Architecture functional flows within various scenarios and illustrate the fulfillment of product and service orders in different functional areas (supply, maintenance, distribution, health services and engineering). The use cases represent a sequence of actions performed to accomplish a customer's particular stated goal. The use cases' personnel, scope, and starting and ending states are listed in the header page of each use case. Figure II-4 lists the use cases that formed the basis of the task list.

LOGISTICS OPERATIONAL ARCHITECTURE USE CASES
➢ Product Order Fulfillment for a Stocked Item
➢ Product Order Fulfillment for a Non-Stocked Item
➢ Multiple Source Request
➢ Return of Excess Item to Stock
➢ Return of MRO to Stock
➢ Return of Defective Item to Source
➢ Return of Hazardous Materiel for Disposal
➢ Maintenance at an Intermediate Maintenance Activity
➢ Maintenance at Customer
➢ Procurement Fulfillment
➢ Basic Distribution for Product Order Fulfillment
➢ Movement of Personnel and Equipment for Services, One Way
➢ Patient Movement
➢ Provide Health Services at Customer Site
➢ Engineering Services Using Organic Resources

Figure II-4: The Marine Corps Use Cases List Formed The Basis Of the Study Logistics Task List As Defined By The Logistics Operational Architecture.

The final draft task list was submitted to the Study Sponsor for review in preparation for Phase One of the seminar simulation workshop held December 18 and 19, 2003. During this workshop, the Study Sponsor determined the tasks would have to be categorized to identify those tasks dependent on manual processes and, therefore, have an associated time element that is measurable for the purposes of this study. The seminar simulation workshop subject matter experts identified manual processes as a precursor for applying estimated times and resources for use in the methodology developed in Task Three. The annotated task list, as revised from the seminar, is found at Appendix B. Appendix C contains the seminar read ahead package, list of attendees, seminar agenda, and the scenarios.

Consideration of Capacity Management, from a planning perspective, places these logistics tasks into the overall study context. Capacity Management, as it applies to military logistics, can be defined as managing, optimizing, prioritizing, and planning resources and capacity to fulfill customer demands.

Capacity Management deals with balancing the competing demands placed upon the logistics system in order to fill the demand for goods and services in the most timely and efficient manner. To accomplish this, the capacity manager must be able to plan capacity and to anticipate disruptions to the distribution network.

The logistics task list developed by the study team contains a column entitled "Number of Actions/Frequency." This column is used to document how often these tasks are utilized as part of the logistics chain. With input from subject matter experts, the study team was able to establish a baseline from which time projections may be made. By knowing how often these tasks occur, the capacity manager can better plan the use of available resources.

3. Identify Resources Needed by Logistics Operational Architecture Tasks. The December 2003 Seminar Simulation Exercise provided the foundation for compiling the list of logistics tasks required to fill service and product orders from a seabased Marine Expeditionary Brigade in the 2015 scenario. Because the overall effort to complete Task Two was still incomplete, though, seminar participants agreed to hold a second phase of the seminar after the first of the year to complete the assignment. Phase Two of the Seminar Simulation Exercise was held March 1 and 2, 2004. The purpose of Phase Two was to assign time criteria and resources to the identified tasks. Figure II-5 depicts the focus of Task Two efforts. A complete summary of both phases of the seminar is found in Appendix C.

In the time between the two seminars, the study team made further refinements of the information gathered in the first seminar and took preliminary steps to identify the critical skill sets, vehicles, and other resources associated with the identified tasks. This allowed Phase Two seminar participants to critique the study team's effort while providing a starting point for discussions. A main focus of

Phase Two was to also establish time criteria for each of the steps in the logistics use case processes. In addition, information required for the development of the time criteria methodology required in study Task Three was gathered and discussed.

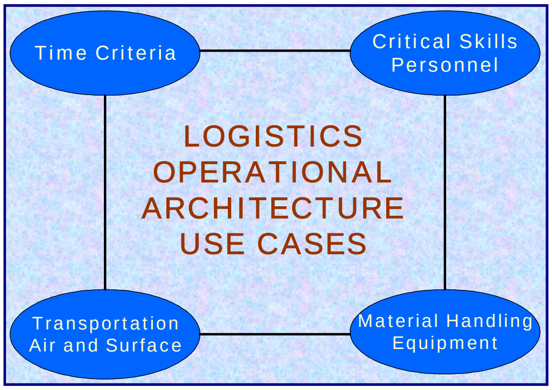

Figure II-5: The Focus Of Task Two Efforts Was To Identify Logistics Tasks From The Logistics Operational Architecture And Associate Time Criteria, Critical Skills, Vehicles, And Equipment To Those Tasks.

With the task list from the Logistics Operational Architecture narrowed to those steps requiring manual intervention in the process, the time resource to accomplish each step was identified. It was quickly apparent to seminar participants that many steps in the various use cases were duplicative. Further, it was felt that such duplication usually resulted in the same time criteria being assigned to those steps across the various use cases. Because of this, the seminar was able to focus on several key use cases in the limited time available. Later, the study team would extrapolate any data to the remaining use cases, verifying this information with the Study Sponsor in a less formal workshop.

Time criteria was assigned to each step of the annotated use cases using a shortest time the step could be expected to be accomplished, indicative of all factors working to perfection; a longest time, indicating situations where all reasonable problems would present obstacles; and a most likely time for accomplishment of the step. An assumption was made that the generic product provided under the appropriate use cases, such as a spare part, would most likely be man portable, or able to be grabbed off the shelf by one person and taken to a staging area. The times assigned were presented in hours, or fractions of hours.

Once the three time assignments were given to each step, the subject matter experts at the seminar provided information on personnel, vehicles, and equipment necessary to carry out each step. For personnel, the Military Occupational Specialty for each step was identified. An assumption was made that any particular personnel resource would be tied to that step for the time required to complete it. Vehicles required in accomplishing the steps were discussed in generic terms, such as surface and air transportation assets. Surface transportation was then broken into sea transport and land transport. Operating from a seabase, surface transportation times combine the slower ship to shore transit with the overland transit. Air transportation assets would operate directly from the seabase to the delivery point. The transportation distribution assumption made for the seminar and follow on tasks held that 70 percent of logistics trips are made by air and 30 percent by surface vehicles, such as landing craft and trucks. Finally, materiel handling equipment necessary to move and stage equipment was discussed. These items include forklifts, cranes, and other devices, both afloat and ashore.

The seminar assumption that most non-scheduled items required to support forces ashore would be man portable determined that discussion of this equipment was not necessary. Unless the product dimensions changed, which would shift the time criteria to the longer time, it was assumed that the seabase and operating forces would have sufficient materiel handling equipment to meet expected requirements.

The annotated use case task lists found in Appendix B contain the time and resource assignments garnered from the seminar and study team efforts.

4. Analysis of Resource Impacts. With logistics tasks determined, and the associated personnel, transportation, and other resources identified, it was then possible to look at interrelationships and impacts among these various factors. As a first step in this analysis, the frequency, or number of times per day these tasks would be carried out during the study scenario were determined by the subject matter experts. Next, a similar decision process determined the likelihood, or percentage of time each step of the logistics use cases would fall in the best time, most likely time, or worst case time. These estimates were assumed to be variable in a broader context, based on the particular operations undertaken.

The impact of any critical resource on logistics capacity is dependent on many factors. Personnel were originally assumed to work ten hour days, but operations to support the Marine Expeditionary Brigade were being conducted around the clock. During Task Three, the assumed workday was extended to 16 hours to better reflect the reality of combat operations. Equipment failures, particularly in the transportation area, were not considered beyond the normal assignment of expected resource hours available. Sea state would also impact operations from the seabase, as would any communications difficulties. Many of these factors were considered in determining the worst case time criteria.

Full analysis of critical resource impact would consider all of these factors. In Task Three, a model was developed incorporating all of this data for processing. Through runs of this model, the impacts of critical resources on logistics capacity were determined. This analysis is detailed in the next section of this report.

D. DEVELOP TIME CRITERIA METHODOLOGY – Task Three.

1. Overview. Following identification of the logistics tasks required to fill service and product orders for a seabased Marine Expeditionary Brigade, Task Three study efforts focused on development of a methodology for estimating time criteria and providing planning estimates for the associated resources. The methodology and planning estimates described in this section of the report were provided to the Study Sponsor for validation and approval in accordance with the study performer's technical proposal.

Building on the work reported for Task Two, the time criteria for the logistics tasks continued to mature. An extensive effort was made to refine the logistics use cases into a reasonable but comprehensive list of service and product order tasks. As detailed in the previous section, time criteria and associated resources were linked to the logistics tasks identified. With this data established, the study's time criteria methodology was developed.

2. Methodology Development. The time criteria methodology development was approached in several steps, as depicted in Figure II-6.

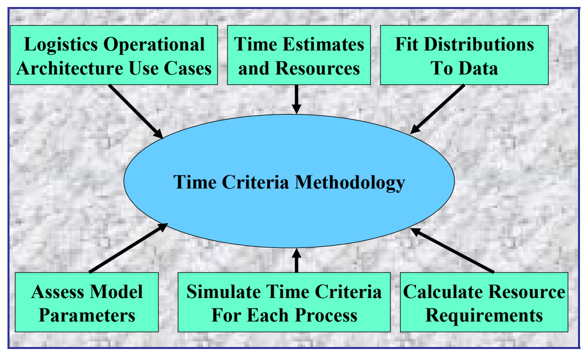

Figure II-6: The Time Criteria Methodology Development Was Approached Utilizing Six Steps And Provided A Formal, Documented, Defensible Procedure Which Included Expert Judgment In Risk Estimates For The Time Criteria.

First the tasks and processes from the Logistics Operational Architecture use cases that would be included in the time criteria logistics model were identified. Next, time estimates based on a minimum time, most likely time, and maximum time, and the associated resources of manpower and transportation for each step in every logistics process were assigned. Once this was done, the model could fit a distribution to the assessment data for each step of each use case. Additional model parameters, such as the number of requests for each task per day per battalion, were assessed. The time criteria logistics model with these inputs would then simulate time criteria for each use case and calculate resource requirements for simulated days.

This methodology combines the principles of probabilistic risk analysis with procedures for expert elicitation to incorporate major uncertainties and extraordinary events into the time criteria estimates. The methodology provides a formal, documented, defensible procedure for including expert judgment in risk estimates for the time criteria. The results include estimates of the time durations required for each of the major logistics tasks, along with important time drivers for each task and the resources required to complete each task for a simulated day.

a. Methodology Step One – Identify the Steps and Processes from the Logistics Operational Architecture Use Cases Included in the Time Criteria Logistics Model.

The heritage for each major logistics process included in the time criteria model is the Logistics Operational Architecture. The structure of each use case from the Logistics Operational Architecture was discussed and refined in a two phased seminar simulation exercise held during Task Two and is reported in Appendix C. In addition to discussing the structure of each use case, seminar participants provided parameters for each step requiring manual effort in the use cases. Appendix D contains the detailed list of steps for each use case considered in the seminar simulation exercise, eliminating those other steps that did not require manual intervention. The remaining steps could then be modeled.

A review of the 15 use cases showed many duplicative steps among them. Further, three specific use cases were essentially redundant because their processes could validly be conducted using another use case. The Multiple Source Request, Procurement Fulfillment, and Basic Distribution for Product Order Fulfillment use cases match processes detailed in the Product Order Fulfillment for a Non-Stocked Item use case. In these instances, the study team combined the use cases and included alternative steps for varying activities for modeling purposes. For example, the Multiple Source Request was not treated as a separate use case in our time criteria logistics model but was instead considered an alternative step to the time criteria required to receive the item from an external source in the Procurement Fulfillment use case. The time criteria logistics model was then structured around three major activities, or processes: procuring items, providing services, and accepting returns. Figure II-7 shows the logistics processes considered in the time criteria logistics model.

Additional assumptions were then made to increase the manageability of the task and resulted in a well defined baseline model. These assumptions included:

- Requests considered in the time criteria logistics model are only the unscheduled Class IX requests. No scheduled Class I, III, and IV requests are included. Also, the typical case considered a product request for a man portable Class IX item.
- Requests move through the processes one at a time. There currently is no benefit or efficiency allowed for handling multiple requests at once.
- The Order Manager and the Inventory Capacity Manager are on the seabase.
- The Distribution Capacity Manager can utilize air and sea assets.
- Navy impacts to the process are not considered.
- Time durations assume that the customer is not moving or engaged in hostile combat while receiving the product or service order.

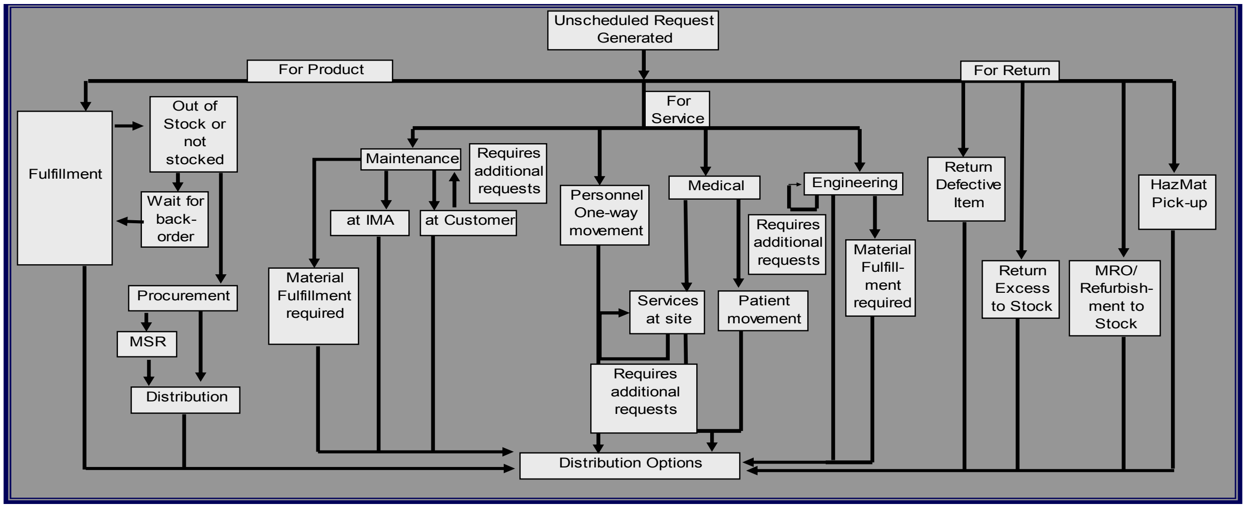

Figure II-7: The Logistics Operational Architecture Was Summarized Into Three Key Tasks For The Time Criteria Logistics Model: Provide A Product, Provide A Service, And Receive A Return. These Tasks Were Divided Into Twelve Logistics Processes For The Time Criteria Logistics Model.

b. Methodology Step Two – Assess Time Estimates and Resources For Each Step in the Use Case Processes.

The time criteria logistics model use case tables, found in Appendix D, show the steps required for each of the logistics processes considered in the time criteria model. Appendix D also includes a list of specific assumptions made in development of each use case. These tables provide the basis for all analyses, conclusions, and recommendations presented in the remainder of this section of the report. The following general assumptions were made in determining the time estimates and associated resources for each step of the use cases:

- Each list of steps is exhaustive in terms of tasks requiring manpower effort to complete the specified request.
- The time assessments presented are good representations of the shortest time, most likely time, and longest time required to complete each step. Time increments are in hours.
- The personnel and other resources identified are the only ones necessary to track for each step.

c. Methodology Step Three – Fit Distributions to Assessment Data for Each Step of the Various Use Case Processes.

The time criteria logistics model developed for study analysis was implemented in Microsoft Excel using both imbedded Visual Basic for Applications programming language and the off the shelf @Risk software package available from Palisades Corporation. The data component for the model is the data obtained from the Task Two seminar simulation exercise, detailed in Appendix C, and as described by the various use cases listed in Appendix D. This information was later supplemented with revised data in some cases. These data are organized in worksheets by process in Excel. The @Risk software package was used to sample from the defined probability distributions, run numerous sampling iterations, and calculate statistical outputs. The final portion of the modeling methodology required developing Excel macros in Visual Basic for Applications that could sum resources across processes.

For the final computer model, the basic model was expanded with a graphic user interface to create a decision support system for the Marine Corps to aid in their logistics planning process. In Task Four, specific analysis capabilities and requirements were established for the decision support system. Several modeling challenges to produce an enhanced decision support system to meet the needs of the Marine Corps were addressed as the model matured.

The study analysis utilized the @Risk software to fit continuous beta distributions for the time durations for each step in the various use case processes using the three time criteria parameters provided. The beta distribution was selected as it provides the best fit to the continuous distribution. The shape parameter is calculated from the assessed most likely value. Figure II-8 provides an example of the fitted distribution for each use case's Step Four: Request Manager sources internally or generates requests. The assessed parameters for this step were: minimum time of 0.1 hours, maximum time of 2 hours, and most likely time of 0.5 hours.

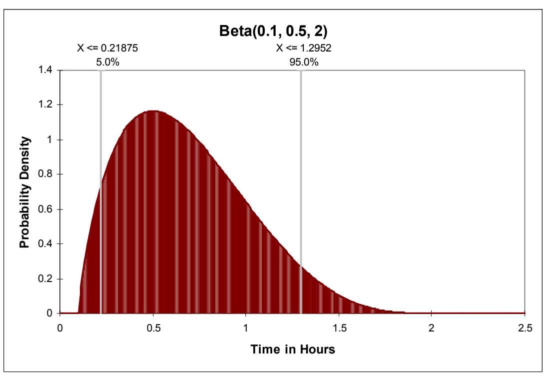

Figure II-8: Beta Distributions Were Used To Fit Continuous Distributions To The Three Assessed Parameters In The Workshop. This Distribution Was Then Used To Generate Simulated Values For Step Four In Each Of The Logistics Processes.

d. Methodology Step Four - Assess Additional Model Parameters Such as the Number of Requests for Each Task Per Day per Battalion.

As the model development matured, additional data parameters were identified. These parameters generally addressed alternative paths that could be taken in each use case and included the percentages of time that:

- A product is out of stock or not stocked.
- Given an out of stock item, the Order Manager decides to wait for a backordered product rather than initiating a procurement request. (See the alternate flow in Table 1, Appendix D.)
- A procurement requires multiple sources, as in Step 38 of Table 2, Appendix D.
- Ordered parts require installation, as in Step 30 in Table 1 and Step 51 in Table 2, Appendix D.
- A maintenance request requires maintenance to be performed at the customer.
- Given the maintenance is performed at the customer, additional requests are required to complete the process as in Step 26 of Table 4, Appendix D.
- Additional requests are required to complete a Health Services request at the customer, as in Step 26 of Table 12, Appendix D.
- Additional requests are required to complete an Engineering Services request, as in Step 26 of Table 5, Appendix D.

Table II-1 summarizes the additional data as assessed.

TABLE II-1. OTHER DATA REQUIRED FOR MODEL

	Percentage of the Time	Alternative If Applicable
Product out of stock or not stocked	15%	
Wait for backorder out of stock product	50%	Procurement
Procurement requires multiple source	70%	
Parts require installation	70%	
Maintenance requires additional requests	20%	
Maintenance at Customer	80%	at Intermediate Maintenance Activity
Health Services requires additional requests	20%	
Engineering requires additional requests	20%	

An additional piece of logistics data needed for the model was the time criteria for the transportation alternatives referred to in each use case. The time criteria model assumes that 70 percent of the distribution trips are made by air and 30 percent by surface vehicles such as boats and trucks. The corresponding time distributions are shown in Table II-2. It should be noted that these time assumptions were based on the inputs from the seminar simulation exercise reported in Appendix C and incorporate distance and speed factors based on that scenario. Also, surface transportation combines the ship to shore phase with the over land phase of the trip. These transportation durations were also fit to continuous beta distributions as described previously for the individual step time durations. After the initial phase of the action in the scenario, it was assessed that this 70-30 ratio could shift to 50 percent air trips and 50 percent surface trips during subsequent phases. The time criteria logistics model will be able to explore the impact of this change when it is determined to be an important time criteria factor. The model itself can consider any percentage shifts.

TABLE II-2. TRANSPORTATION ASSUMPTIONS			
	Shortest Time	Most Likely Time	Longest Time
	(All Times are in Hours)		
Air 70%	0.8	1	1.25
Surface 30%	2.5	3	3.75

Finally, the assessment process needed to provide the number of times, or frequency, each logistics use case would occur per day. Two scenarios, low tempo and high tempo, were considered. The data were assessed per day per battalion and are presented in Table II-3 for each of the use cases. The occurrence of each request is assumed to be uniformly distributed between the minimum and maximum value provided for a battalion. The total requests per day for two battalions are then the sum of two independent uniformly distributed random variables defined by the corresponding parameters shown in Table II-3.

TABLE II-3. PERCENTAGE OF REQUESTS PER LOGISTICS TASKS		
	Low Tempo (0 – 7 Requests)	High Tempo (5 – 20 Requests)
Product Fulfillment	25%	25%
Maintenance Request	70%	64%
One Way Personnel Movement	5%	2%
Patient Movement (Exceeds dedicated support)	0%	1%
Unplanned Engineering	0%	3%
Return Defective Item	0%	1%
Return Excess Item to Stock	0%	1%
Return Material Release Order to Stock	0%	2%
Hazardous Material Pick up	0%	0%
Health Services at Site	0%	1%

e. Methodology Step Five - Simulate Time Criteria for Each Use Case.

Two different analyses were conducted with the time criteria logistics model. The first analysis that was completed was to examine, based on the assessed data for each step, how long each use case was expected to take. Next, associated with this first analysis for each use case, an assessment was made of the primary drivers in determining the time duration. The second analysis, described in the following paragraphs, discusses the resources required to support the logistics use case processes.

All discussion and analyses presented in this report are based on the data provided in the use case tables found in Appendix D, and the additional assumptions provided in the tables above. These data constitute a base case of the model. Changes to the base case data would be made based on alternative scenarios and reevaluation of the input data associated with that data. The results and analyses that follow are for the base case only.

Table II-4 summarizes the time durations estimated for each use case, and these data will be discussed in detail below. The time durations were determined by using the @Risk simulation software package to simulate a random value according to the defined distributions for each step for each use case. The total time durations were determined by summing the individual steps for each use case. Statistics were gathered for each use case for 5,000 iterations of the simulation.

In some cases, there were variations that needed to be analyzed. For example, if a stocked item is currently backordered, sometimes it is appropriate to wait for the item rather than going directly to procurement. Also, in several of the use cases, there are often additional requests required to complete them. Each of these results is described below with graphics showing the output distributions and the primary time drivers.

TABLE II-4. SUMMARY OF TIME RESULTS (IN HOURS)					
Simulated Task Time in Hours	**Minimum**	**Maximum**	**Mean**	**0.05 percentile**	**0.95 percentile**
Stocked Fulfillment with Wait Time for Backorder	5.4	41.5	10.3	7.6	14.0
Stocked Fulfillment Time without Backorder wait	5.4	14.5	9.7	7.5	12.2
Not In Stock Procurement Time	37.0	87.6	62.4	47.3	77.5
Maintenance at Intermediate Maintenance Activity Time	11.3	27.6	18.3	14.3	23.1
Maintenance at Customer Time (first request only)	5.4	14.3	9.2	6.9	11.9
Maintenance at Customer Time with additional requests	5.4	44.5	11.5	7.0	22.4
Engineering Services Time (first request only)	6.0	16.1	9.9	7.7	12.6
Engineering Services Time with additional requests	6.4	48.3	12.4	7.8	23.8
Return of Excess Item Time	5.4	13.7	8.5	6.3	12.0
Return of Material Release Order Time	10.2	24.7	16.4	12.8	20.9
Return of Defective Item Time	4.7	13.0	7.8	5.7	11.3
Return of Hazardous Material Item Time	5.0	13.3	8.2	6.2	11.8
One Way Personnel/Equipment Movement Time	2.5	7.4	4.3	3.2	5.9
Patient Movement Time	3.3	10.4	5.6	4.1	8.4
Health Services at Customer Time (first request only)	5.1	14.5	8.9	6.7	11.5
Health Services at Customer with additional requests Time	5.1	44.9	11.1	6.8	21.7

- ***Product Order Fulfillment for a Stocked Item:*** Two cases were considered for the time to fulfill the request for a stocked item. The first was when the item was in stock. As shown in the summary Table II-4, if the cases where a wait was required for a backordered item were disregarded, the mean time to complete the fulfillment task is 9.7 hours and 90 percent of the cases are completed between 7.5 and 12.2 hours. This output time distribution is shown in Figure II-9. However, as noted in Table II-1, it was assessed that 15 percent of the time, a product is not available and in 50 percent of those instances, the Order Manager decides to wait for a backordered product. As can be seen by comparing Figures II-9 and II-10, this wait time adds a significant tail to the distribution. The mean increases by about 0.6 hours to 10.3 hours but in the worst-case, it could take up to 42 hours to complete the product fulfillment. Figures II-11 and II-12 show the input factors that have the greatest impact on the output duration (i.e., most correlated). The most significant factor is whether to transport the product by air or surface. As previously shown in Table II-2, in the most likely case, air saves two hours over surface transportation.

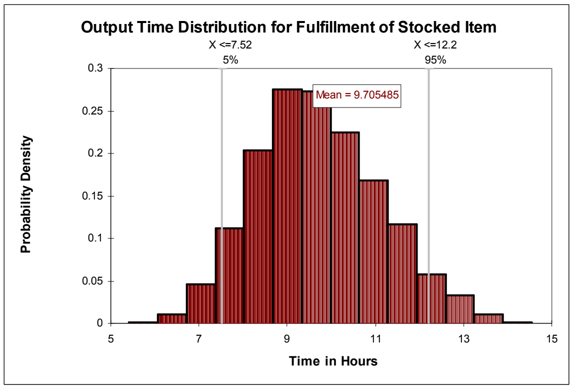

Figure II-9: The Mean Duration To Provide Fulfillment Of A Stocked Item Is 9.7 Hours And 90 Percent Of The Cases Are Completed Between 7.5 And 12.2 Hours.

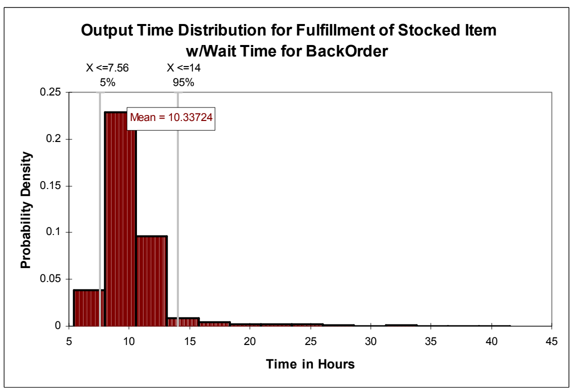

Figure II-10: The Model Assumes That In 15 Percent Of The Request Cases, A Stocked Product Is Not In Stock And In 50 Percent Of Those Cases, The Order Manager Waits For A Backorder. Waiting For A Backorder Does Not Significantly Alter The Mean Of The Distribution, But It Significantly Adds To The Tail.

The next major factors are the longest duration steps, specifically, packing and loading the product (Step 28) and whether or not installation is required (Step 30). As the time duration of a step decreases, the impact on the output time duration is less significant.

As shown in Figure II-12, waiting on the backorder was not the most significant factor, if included. This was because it only occurred in a small percentage of the cases (i.e., 50 percent of 15 percent) and in the mean, waiting on the backorder added less than an hour. The mean in this case may not be a good indicator, though, because of the potential length of the tail of the distribution.

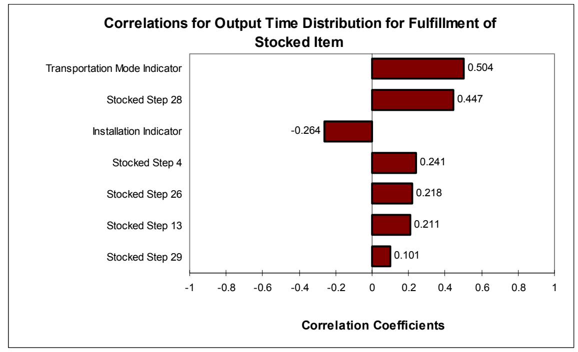

Figure II-11: The Most Significant Factors In The Duration To Complete A Stocked Item Fulfillment Request Is The Type Of Transportation (Air Vs. Surface), Followed By Time To Pack And Load The Product And Whether Or Not Installation Is Required.

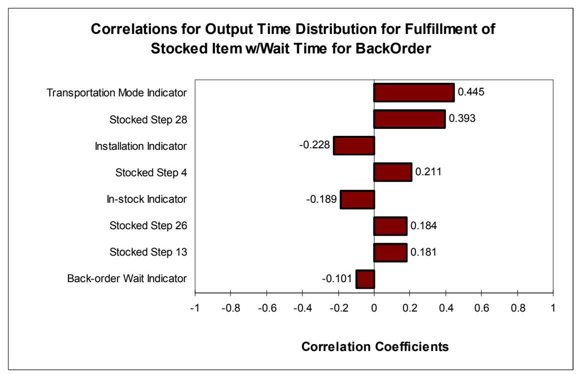

Figure II-12: Because Of The Small Percentage Of Cases Where A Backorder Wait Is Included, When This Variable Is Included, It Is Not The Most Significant Factor In Determining The Total Time Duration.

- ***Procurement for Non-Stocked or Not In Stock Items:*** In the 15 percent of the cases the product is not available, and the 50 percent of those cases the Request Manager does not wait for a backorder, it is assumed that the procurement use case is followed. The output time distribution for this use case is shown in Figure II-13. The mean of the distribution is 62.4 hours and 90 percent of the time the use case is completed between 47.3 and 77.5 hours. As shown in Figure II-14, the primary driver is Step 25, where the Procurement Executor spends between 24 and 72 hours evaluating sourcing options.

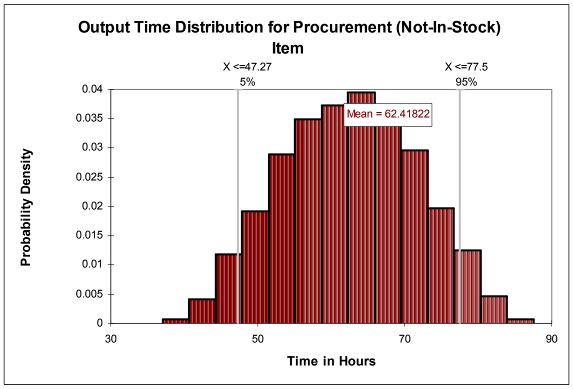

Figure II-13: If An Item Needs To Be Procured, The Procurement Process Is Followed. The Mean Of The Distribution Is 62.4 Hours And 90 Percent Of The Time The Process Is Completed Between 47.3 And 77.5 Hours.

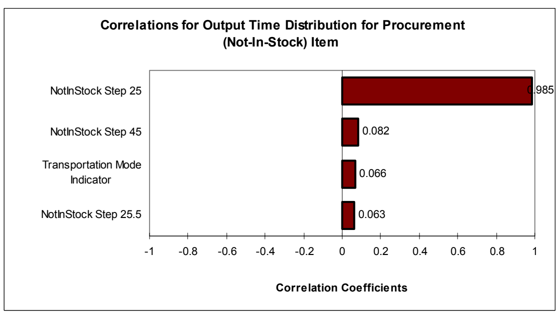

Figure II-14: The Primary Driver In Determining The Output Time Distribution For Procurement Is When The Procurement Executor Spends Between One And Three Days Evaluating Sourcing Options.

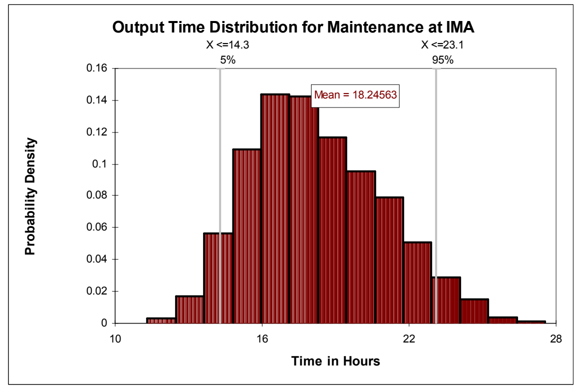

Figure II-15: Maintenance Requiring Relocation Of An Item To The Intermediate Maintenance Activity For Work Is Expected To Take 18.2 Hours To Complete The Process, And 90 Percent Of The Time, The Work Is Completed Between 14 And 23 Hours.

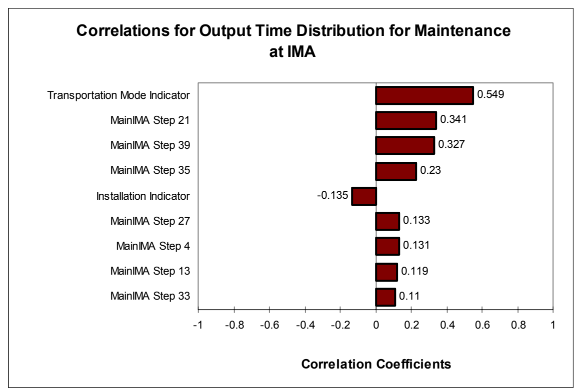

Figure II-16: The Most Significant Factor Is The Transportation Mode Because Maintenance At The Intermediate Maintenance Activity Requires A Two Way Journey To Retrograde The Item And A Return Journey To Deliver The Repaired Item.

- ***Maintenance Request at Intermediate Maintenance Activity:*** When maintenance requires relocating the equipment to the Intermediate Maintenance Activity for work, the expected time to complete the work is 18.2 hours and 90 percent of the time, the work is completed between 14 and 23 hours, as shown in Figure II-15. The most significant factor, as shown in Figure II-16, is the transportation mode because maintenance at the Intermediate Maintenance Activity requires a two way journey to retrograde the item and a return journey to deliver the repaired item. Other significant steps shown in Figure II-16 include the Distribution Production Manager routing the orders to the Distribution Executor for fulfillment, and the Maintenance Executor staging the repaired item for return to the customer.

- ***Maintenance Request Performed at Customer:*** Because of the time duration involved and the transportation resources required for multiple trips, an important initiative for the 2015 logistics supply practice is for more of the maintenance to occur at the customer. It was assessed that 80 percent of the maintenance activities would occur at the customer site in 2015. Because of the importance of this use case, several questions were analyzed. First, assuming that the correct parts are ready and sent to fix the problem,

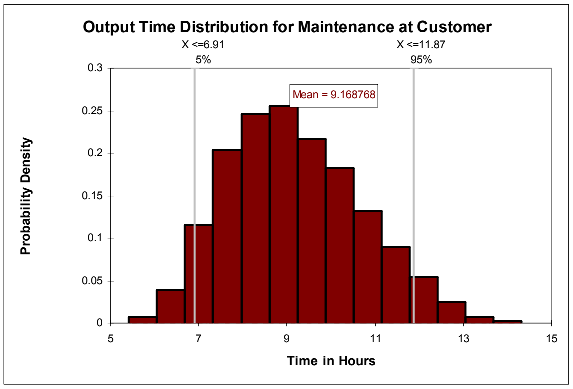

Figure II-17: Assuming The Correct Parts Are Ready And Sent To Fix The Problem, The Mean Time To Complete The Maintenance Request At The Customer Is About 9.2 Hours With 90 Percent Of The Requests Being Completed Between 6.9 And 11.9 Hours.

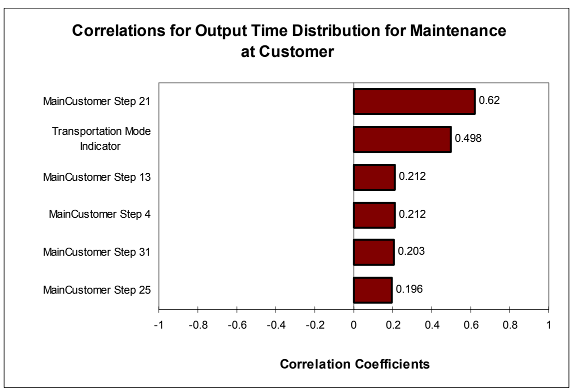

Figure II-18: The Two Primary Factors In The Output Time Duration Shown In Figure II-17 Are The Time It Takes For The Distribution Production Manager To Route The Order To The Appropriate Distribution Executor For Fulfillment And The Transportation Mode.

Figure II-17 shows that, in the mean, it will take about 9.2 hours to complete the request with 90 percent of the requests being completed between 6.9 and 11.9 hours. This is half the time modeled for Maintenance at the Intermediate Maintenance Activity. The two primary factors in the time duration, as shown in Figure II-18, are the time it takes for the Distribution Production Manager to route the order to the appropriate Distribution Executor for fulfillment and the transportation mode used.

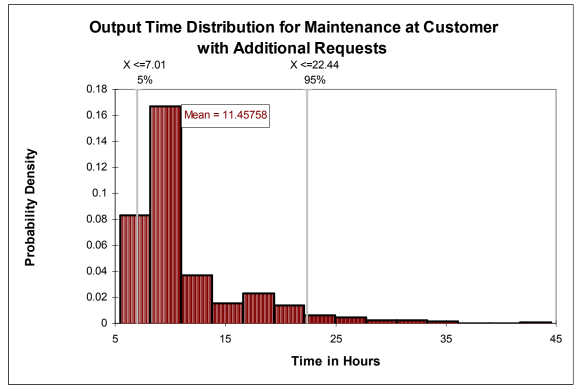

Figure II-19: Including The Potential For 20 Percent Of The Requests To Require Follow On Requests Increases The Mean Relative To Figure II-17 By Less Than Two Hours But Creates A Significant Tail With The 0.95 Percentile Shifting From 11.9 Hours To 22.4 Hours.

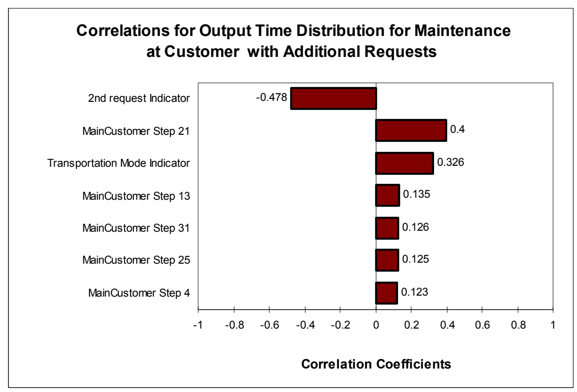

Figure II-20: The Likelihood Of A Request Requiring A Second Request Is The Most Significant Factor In The Output Time Distribution Shown In Figure II-19.

In Figure II-19, the assumption that the correct parts are sent to fix the problem is relaxed, but include the impact of the assessment that 20 percent of the maintenance requests will require a second request, and 20 percent of those will require a third, etc. Comparing Figures II-17 and II-19, a significant tail develops when we include these additional requests. The mean increases by less than 2 hours, but the 0.95 percentile shifts from 11.9 hours to 22.4 hours. And, as expected, Figure II-20 shows that the likelihood of a second request is the most significant factor. The likelihood of more than two requests is small enough to not have a significant impact.

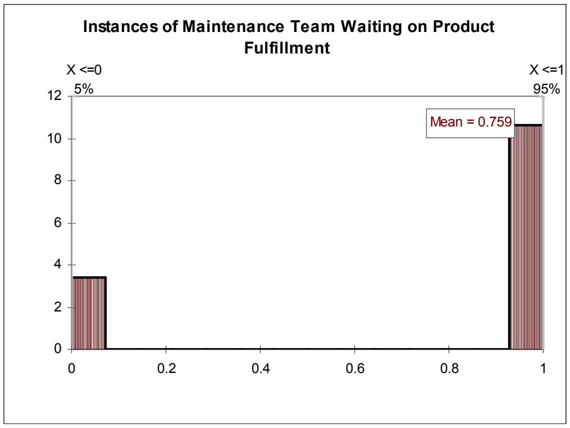

Figure II-21: In 76 Percent Of The Maintenance At The Customer Cases, The Contact Team Would Be Delayed Waiting On Product Procurement For Parts.

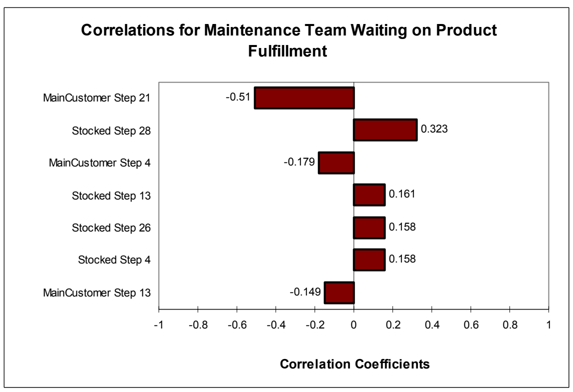

Figure II-22: The Efficiency (Or Lack Thereof) In The Steps Identified Above Are Factors In Determining If The Maintenance Process Will Be Waiting On Product Fulfillment. Main Customer Steps Refer To Steps In Table 4 And Stocked Steps Refer To Steps In Table 1 of Appendix D.

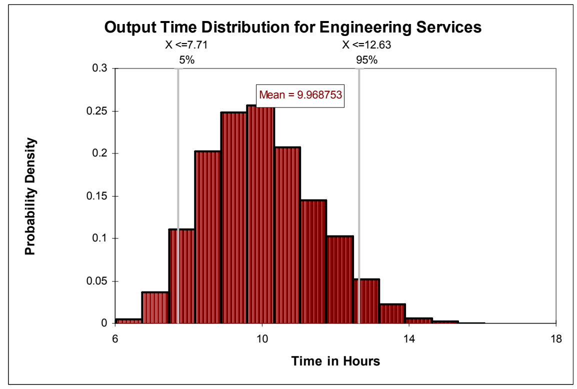

Figure II-23: Assuming The Correct Supplies Are Ready And Sent, The Mean Time To Complete The Engineering Services Request Is About 10 Hours With 90 Percent Of The Requests Being Completed Between 7.7 And 12.6 Hours.

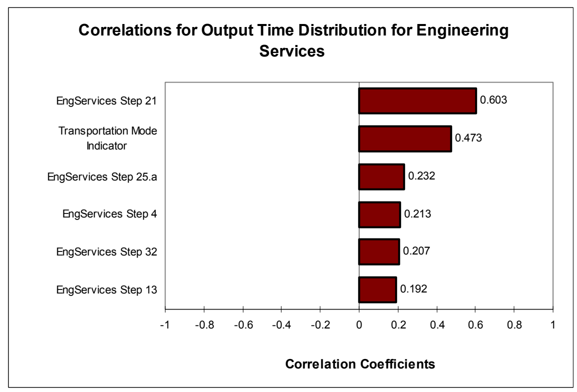

Figure II-24: The Two Primary Factors In The Output Time Duration Shown In Figure II-23 Are The Time It Takes To Route The Order For Fulfillment And The Transportation Mode Used.

An important assumption made in both Figures II-17 and II-19 is that any product or fulfillment item required is ready when the team is ready. Specifically, this means that Steps 4 - 29.1 in Table 1, Appendix D, occur in a shorter duration than Steps 4 - 21 in Table 4, Appendix D, and thus when the maintenance contact team is delivered in Step 23 of Table 4, Appendix D, the required parts are also available. Because the study focus is interested in the distributions of the use case processes, the study team did not specifically alter the assumption in the simulation, but did check to see how often the assumption was violated. Figure II-21 shows that the assumption is violated almost 76 percent of the time. As shown in Figure II-22, if the significant maintenance process steps occur efficiently then a wait will ensue, and equally, if the significant stocked item steps are not efficiently executed, then a wait will ensue.

Engineering Services Request: An equivalent analysis was done for requests for engineering services with similar results. Figure II-23 shows that the mean time to complete the engineering services process is almost 10 hours with 90 percent of the requests being completed between 7.7 and 12.6 hours. These results assumed that all product fulfillment requests were available and that multiple requests were

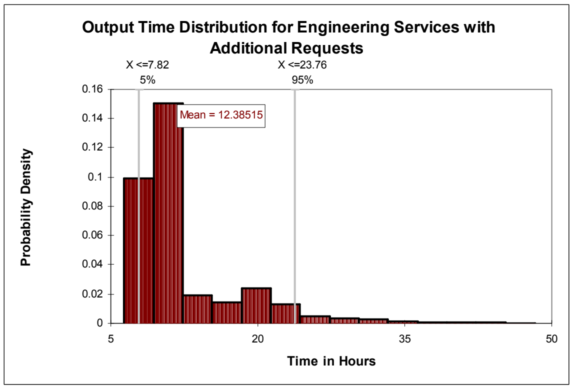

Figure II-25: Including The Potential For 20 Percent Of The Requests To Require Follow On Requests Increases The Mean Relative To Figure II-23 By Less Than 2.5 Hours But Creates A Significant Tail With The 0.95 Percentile Shifting From 12.6 Hours To 23.8 Hours.

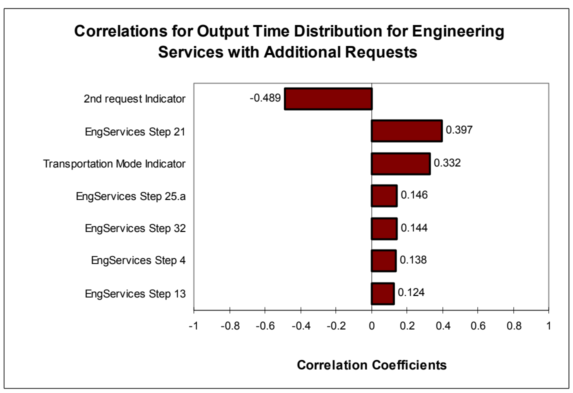

Figure II-26: The Likelihood Of A Request Requiring A Second Request Is The Most Significant Factor In The Output Time Distribution Shown In Figure II-25.

not required. Also similar to the maintenance at the customer process examined above, the important factors identified in Figure II-24 were the time it takes for the Distribution Production Manager to route the order to the appropriate Distribution Executor for fulfillment and the transportation mode used.

The results presented in Figures II-25 and 26 include the 20 percent of the engineering services requests that require additional requests, and these results were similar to those obtained in the previous maintenance process. Figure II-27 shows that in 75 percent of the engineering services cases, the engineering

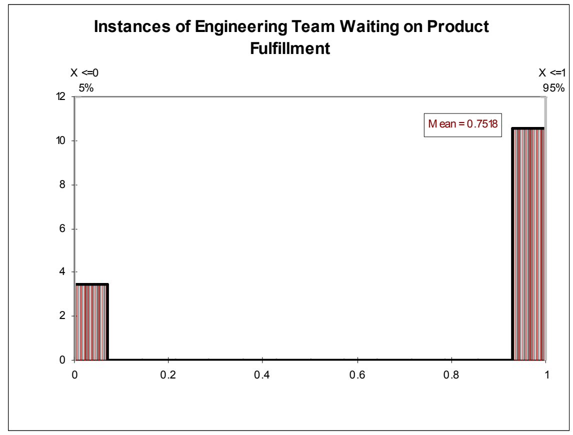

Figure II-27: In 75 Percent Of The Engineering Services Requests, The Contact Team Would Be Delayed Waiting On Product Procurement.

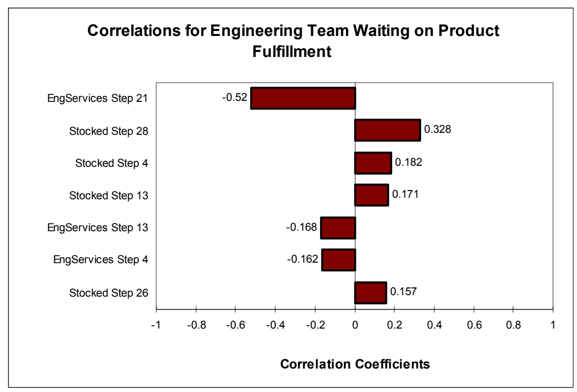

Figure II-28: The Efficiency (Or Lack Thereof) In The Steps Identified Above Are Factors In Determining If The Engineering Services Request Process Will Be Waiting On Product Fulfillment. "EngServices" Steps Refer To Steps In Table 5 And Stocked Steps Refer To Steps In Table 1 of Appendix D.

contact team will be waiting for a product fulfillment. This wait percentage was calculated from comparing Steps 4 - 29.1 in Table 1, Appendix D, with Steps 4 - 21 in Table 5, Appendix D. The important steps identified in Figure II-28 were also consistent with those identified in Figure II-22 for the maintenance process.

- ***Return of Excess Item to Stock Request:*** As shown in Figure II-29, the mean time to return an excess item to stock was 8.4 hours with 90 percent of the cases occurring between 6.3 hours and 12 hours. As shown in the figure, the distribution has a bimodal appearance

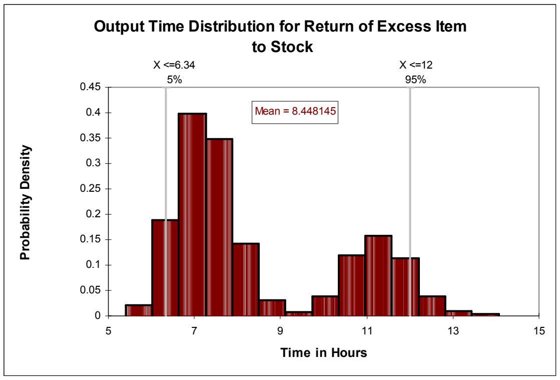

Figure II-29: The Mean Time To Return An Excess Item To Stock Is 8.4 Hours With 90 Percent Of The Cases Occurring Between 6.3 Hours And 12 Hours. The Distribution Has A Bimodal Appearance Because The Primary Factor In Determining The Time Duration For The Return Of Excess Item Process Is The Transportation Mode.

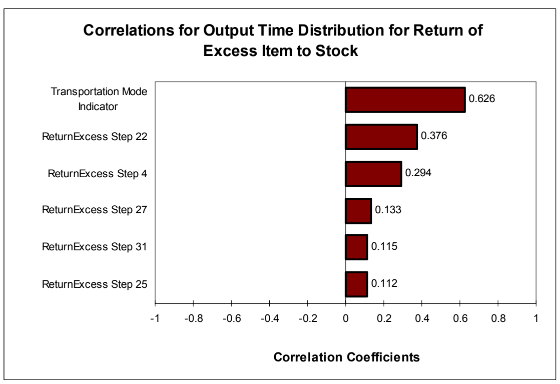

Figure II-30: The Transportation Mode Is The Most Influential Input Because For A Return To Occur, The Transportation Is Two Way.

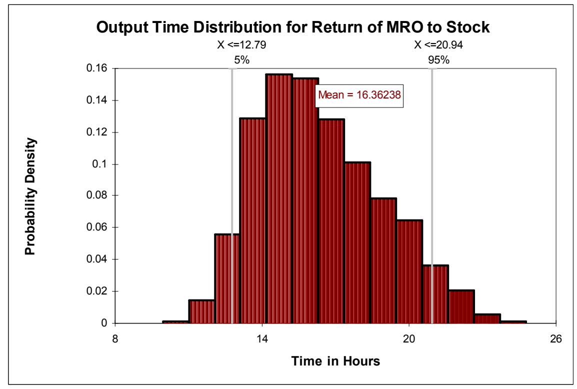

Figure II-31: The Mean Time To Return A Material Release Order Product To Stock Is 16.4 Hours With 90 Percent Of The Cases Occurring Between 12.8 Hours And 21 Hours.

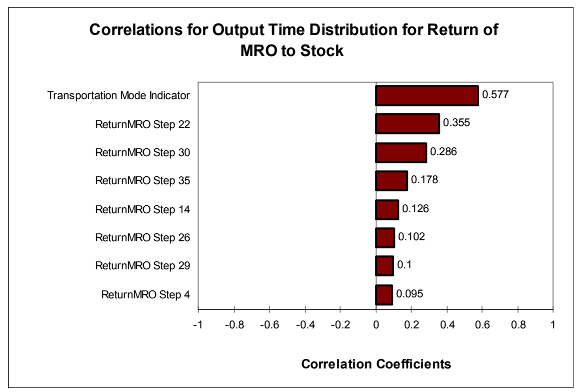

Figure II-32: Transportation Is A Significant Factor Because There Are Three Journey Legs: A Two Way Journey To Retrieve The Item And A One Way Journey To Return The Item. Other Important Steps In The Time Criteria Logistics Model Include Routing The Order For Fulfillment And Staging The Repaired Item For Return.

because the primary factor in determining the time duration for the Return of Excess Item process was the transportation method (air vs. surface). Transportation was a significant factor because for a return, the transportation is two way, and the other steps identified in this use case are of fairly short duration. As shown in Figure II-30, after the mode of transportation, the time durations for routing the order for fulfillment and generating the request were most influential on the overall time durations.

- ***Return of Material Release Order Product to Stock:*** As shown in Figure II-31, the mean time to return a Material Release Order Product to stock was 16.4 hours with 90 percent of the cases occurring between 12.8 hours and 21 hours. Transportation was a significant factor because there are three journey legs: a two way journey to retrieve the item and a one way journey to return the item to the Inventory Executor. We assume that the mode of transportation for pick up was independent of the mode of transportation used for return. As shown in Figure II-32, other important steps in the time criteria model included routing the order for fulfillment and staging the repaired item for return.

- ***Return of Defective Item to Source Request:*** The results for a request to return a defective item to the source were similar to

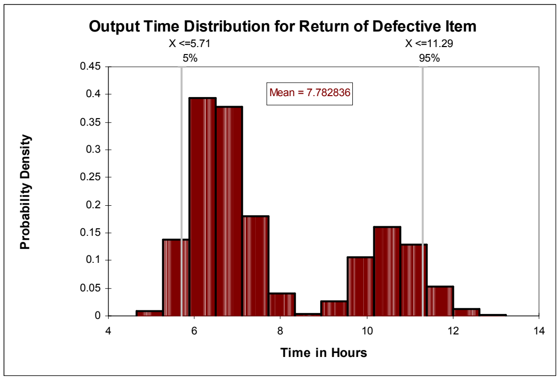

Figure II-33: The Mean Time To Return A Defective Item Is 7.8 Hours With 90 Percent Of The Cases Occurring Between 5.7 Hours And 11.3 Hours. The Distribution Has A Bimodal Appearance Because The Primary Factor In Determining The Time Duration Is The Transportation Mode.

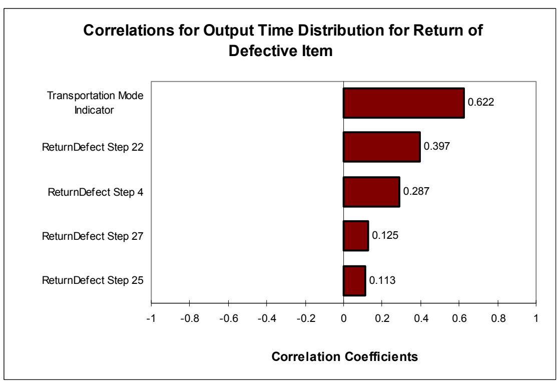

Figure II-34: The Transportation Mode Is The Most Influential Input Because For A Return To Occur, The Transportation Is Two Way.

those shown for returning an excess item. In the Logistics Operational Architecture, the process for returning a defective item included steps to ultimately return the item to the source. It is assumed that once the Inventory Executor has received the defective item, it will be returned to its designated source at a time that has no impact on Marine Expeditionary Brigade resources. Therefore, as noted previously when describing this use case, the time criteria model stopped cumulating time for this task when the item was received. This assumption made the process similar to the return of an excess item to stock. As shown in Figure II-33, the mean time to return a defective item to stock is 7.8 hours with 90 percent of the cases occurring between 5.7 hours and 11.3 hours. These times were

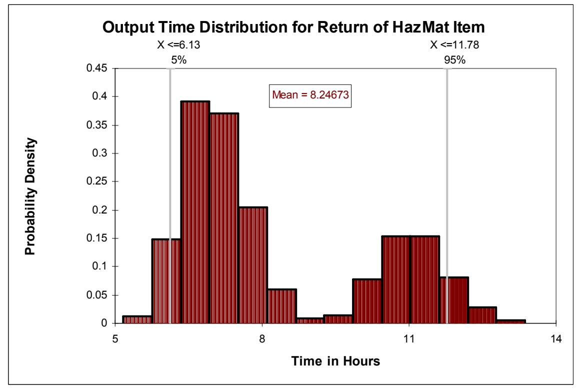

Figure II-35: The Mean Time To Return A Defective Item Is 8.2 Hours With 90 Percent Of The Cases Occurring Between 6.1 Hours And 11.8 Hours. The Distribution Has A Bimodal Appearance Because The Primary Factor In Determining The Time Duration Is The Transportation Mode.

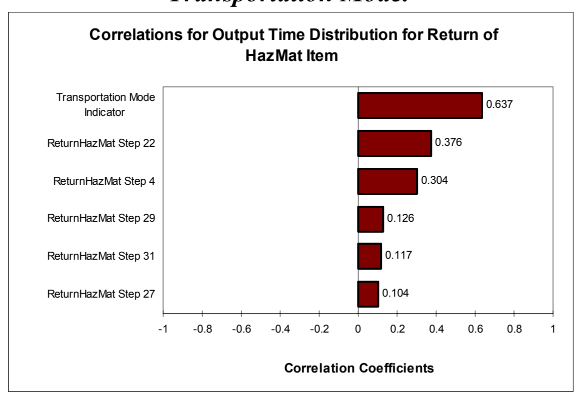

Figure II-36: The Transportation Mode Is The Most Influential Input Because For A Return To Occur, The Transportation Is Two Way.

slightly less than for returning an excess item, because they included time to put the excess item away. Similar to Figure II-29, the distribution in Figure II-33 has a bimodal appearance because the primary factor in determining the time duration was the transportation mode. Transportation was a significant factor because for a return, the transportation is two way, and the other steps identified in the use case were all of fairly short duration. As shown in Figure II-34, after the mode of transportation, the time durations for routing the order to the appropriate Distribution Executor for fulfillment and the Request Manager generating the request were most influential on the overall time durations.

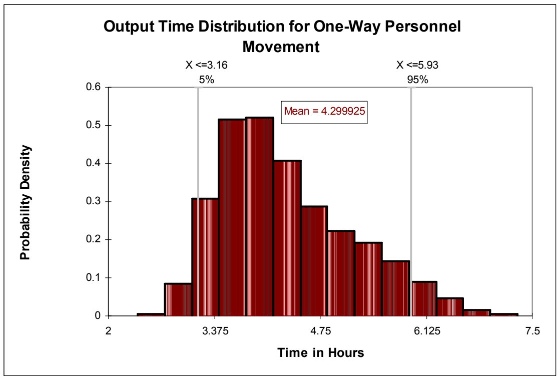

Figure II-37: The Mean Time To Fulfill A One Way Personnel And/Or Equipment Movement Request Is 4.3 Hours With 90 Percent Of The Cases Being Completed Between 3.2 Hours And 5.9 Hours. These Times Are Half Those Required To Complete A Product Fulfillment Request.

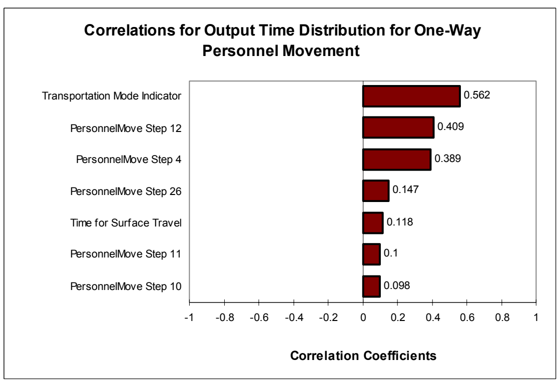

Figure II-38: Consistent With Other Processes, The Most Significant Time Criterion Is The Transportation Time. Other Important Steps Involve Reconciling The Customer Terms And Conditions And Generating The Request.

- ***Return of Hazardous Material Item for Disposal Request:*** The processes and results for handling a request for returning hazardous material for disposal were equivalent to the process for returning either an excess or defective item previously discussed. As shown in Figure II-35, the mean time to return a defective item to stock was 8.2 hours with 90 percent of the cases occurring between 6.1 hours and 11.8 hours. As shown in Figure II-36, after the mode of transportation, the time durations for the Distribution Production Manager routing the order to the appropriate Distribution Executor for fulfillment and the Request Manager generating the request were most influential on the overall time durations.

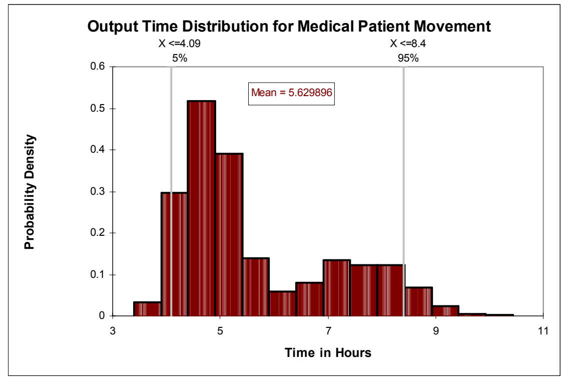

Figure II-39: The Mean Time To Fulfill A Medical Patient Movement Request Is 5.6 Hours With 90 Percent Of The Cases Being Completed Between 4.1 Hours And 8.4 Hours.

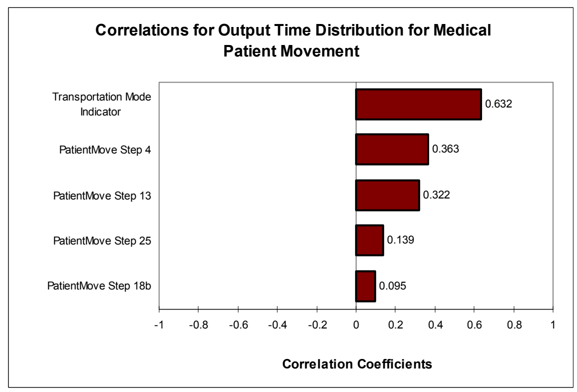

Figure II-40: The Most Significant Time Criterion Is The Transportation Time. Other Important Steps Are Generating The Request And Reconciling The Customer Terms And Conditions.

- ***One Way Personnel and Equipment Movement Request:*** Of the twelve cases identified in the time criteria model, the time required for a one way personnel and/or equipment movement request was the shortest. Again, Table II-4 contains a summary of the results for all twelve processes. The times were half those required to complete a product fulfillment request. As shown in Figure II-37, the mean time to fulfill a one way personnel and/or equipment movement request was 4.3 hours with 90 percent of the cases being completed between 3.2 hours and 5.9 hours. The most significant time criterion was the transportation time as shown in Figure II-38.

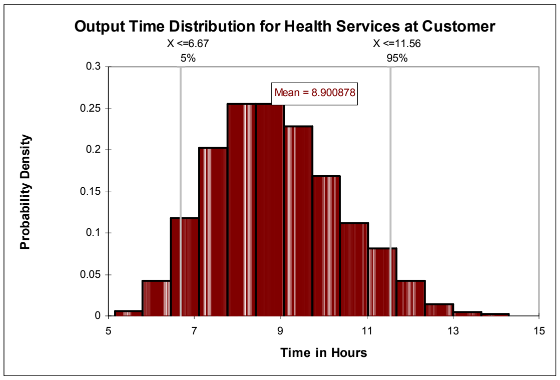

Figure II-41: Assuming That Only One Request Is Required, The Mean Time To Complete This Health Services Request Is 8.9 Hours With 90 Percent Of The Requests Being Completed Between 6.7 And 11.6 Hours.

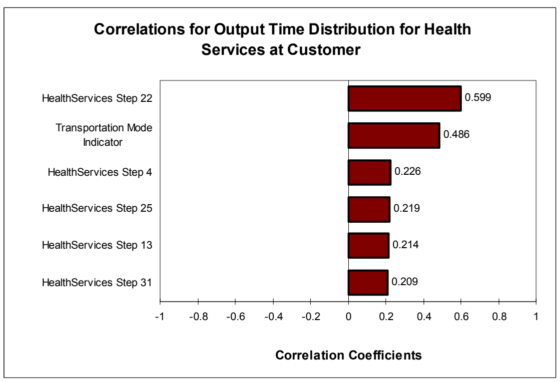

Figure II-42: The Two Primary Factors In The Output Time Duration Are The Time It Takes To Route The Order For Fulfillment And The Transportation Mode Utilized.

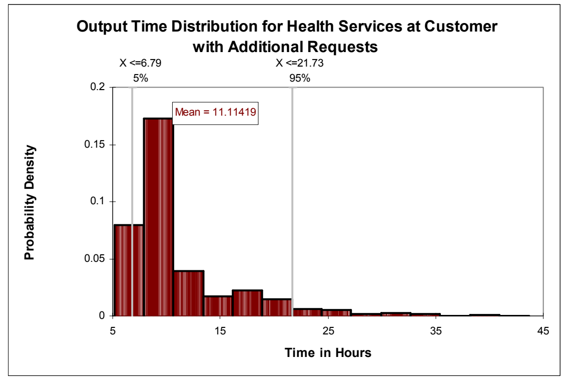

Figure II-43: Including The Potential For 20 Percent Of The Requests To Require Follow On Requests Increases The Mean Relative To Figure 35 By Less Than 2.5 Hours But Creates A Significant Tail With The 0.95 Percentile Shifting From 11.6 Hours To 21.7 Hours.

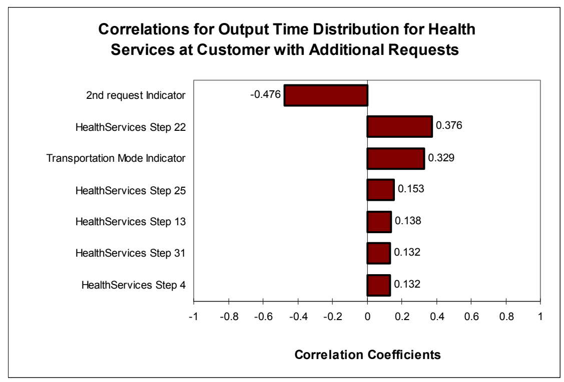

Figure II-44: The Likelihood Of A Request Requiring A Second Request Is The Most Significant Factor In The Output Time Distribution Shown In Figure II-43.

This is consistent with other processes. Other important steps were the Order Manager reconciling the customer terms and conditions and the Request Manager generating the request.

- ***Request for Medical Patient Movement:*** Completing a request for medical patient movement was the second shortest process identified in the time criteria logistics model. As shown in Figure II-39, the mean time to fulfill a request for medical patient movement was 5.6 hours with 90 percent of the cases being completed between 4.1 hours and 8.4 hours. As shown in Figure II-40, the most significant time criterion was the transportation time. Other important steps involved generating the request and reconciling the customer terms and conditions.

- ***Request for Health Services at Customer:*** Figure II-41 shows the mean time to complete the health services process was almost 8.9 hours with 90 percent of the requests being completed between 6.7 and 11.6 hours. This result assumed that multiple requests were not required. These times were consistent with the results presented for a maintenance request at the customer. Also similar to the maintenance at the customer process, the important factors identified in Figure II-42 were the time it takes to route the order for fulfillment and the transportation mode utilized. The results presented in Figures II-43 and II-44 include the

20 percent of the health services requests that require additional requests, and these results were similar to those obtained in the previous analyses of maintenance and engineering services requests.

f. Methodology Step Six - Calculate Resource Requirements For Simulated Days.

Once the study established the duration of each use case process, it was then concerned with how often each process occurs per day and what impact these requests have on the resources available. Table II-5 presents the summary statistics for both the total number of requests per day and the number of requests per process per day. All results were for two battalions. The table has separate entries for each of the two cases considered: Low Tempo and High Tempo operations. These results were generated by simulating two uniform random variables in the ranges specified in the assessment data (see Table II-3). The sum of these two uniform random variables represent the number of requests for the scenario's simulated day for the two battalion case. The simulation was run for 1,000 days. It is important to remember that the sum of two uniform random variables is no longer a uniform random variable, so the shapes of the distributions are generally distributed normally around the mean, where the mean is two times the mean of the uniform distribution for one battalion. This result is consistent with the central limited theorem.

For each of the 1,000 simulated days considered, the number of hours of each resource is required to complete the number of requests per process, where the resources are specified in the personnel resources and other resources columns of the use case tables, were totaled. For example, assuming there is one request for a product fulfillment on the first day, and that Steps 4, 13, and 29.3 in Table 1, Appendix D, each take 0.5 hours, then 1.5 hours of Request Management would be required on that simulated day to fulfill product order requests.

TABLE II-5. SUMMARY STATISTICS FOR REQUESTS PER DAY FOR TWO BATTALIONS

Requests Per Day	Minimum Requests	Maximum Requests	Mean Requests	0.05 percentile	0.95 percentile
Total Requests Per Day, Low Tempo	2	13	6.8	3	10
Total Requests Per Day, High Tempo	12	36	24.1	17	31
Stocked Item Requests, Low Tempo	0	3	1.6	0	3
Stocked Item Requests, High Tempo	2	10	5.77	3	8
Not in Stock Item Requests, Low Tempo	0	2	0.12	0	1
Not in Stock Item Requests, High Tempo	0	4	0.48	0	2
Maintenance at Intermediate Maintenance Activity Requests, Low Tempo	0	6	1.4	0	4
Maintenance at Intermediate Maintenance Activity Requests, High Tempo	0	13	4.7	1	8
Maintenance at Customer Requests, Low Tempo	0	8	3.4	1	6
Maintenance at Customer Requests, High Tempo	3	21	11.3	6	17
Engineering Services Requests, Low Tempo	0	0	0	0	0
Engineering Services Requests, High Tempo	0	1	0.88	0	1
Requests for Excess Item Returns, Low Tempo	0	0	0	0	0
Requests for Excess Item Returns, High Tempo	0	0	0	0	0
Requests for Material Release Order Returns, Low Tempo	0	0	0	0	0
Requests for Material Release Order Returns, High Tempo	0	1	0.5	0	1
Requests for Return of Defective Items, Low Tempo	0	0	0	0	0
Requests for Return of Defective Items, High Tempo	0	0	0	0	0
Requests for Return of Hazardous Material, Low Tempo	0	0	0	0	0
Requests for Return of Hazardous Material, High Tempo	0	0	0	0	0
Requests for One way Personnel/ Equipment Movement, Low Tempo	0	1	0.18	0	1
Requests for One way Personnel/ Equipment Movement, High Tempo	0	1	0.5	0	1
Requests for Patient Movement, Low Tempo	0	0	0	0	0
Requests for Patient Movement, High Tempo	0	0	0	0	0
Requests for Medical Services at Customer, Low Tempo	0	0	0	0	0
Requests for Medical Services at Customer, High Tempo	0	0	0	0	0

Table II-6 describes the summary statistics for each resource in hours per day. Place holders for material handling equipment, special tools, and special equipment are found in the table and were added into the model. No requirements for these resources, though, were specified in the baseline model but may be added depending on the scenario selected for modeling.

TABLE II-6. SUMMARY STATISTICS IN HOURS FOR RESOURCE REQUIREMENTS PER DAY FOR TWO BATTALIONS

Resource Requirements Per Day	Minimum Hours	Maximum Hours	Mean Hours	0.05 percentile	0.95 percentile
Hours of Request Management Per Day, Low Tempo	1.4	20.8	10.2	4.9	15.8
Hours of Request Management Per Day, High Tempo	18.8	58.0	36.3	25.6	47.8
Hours of Order Management Per Day, Low Tempo	2.1	23.4	11.8	5.0	18.5
Hours of Order Management Per Day, High Tempo	22.2	64.2	42.1	28.3	55.2
Hours of Distribution Capacity Management Per Day, Low Tempo	0.7	10.6	5.3	2.2	8.5
Hours of Distribution Capacity Management Per Day, High Tempo	9.3	28.2	18.6	12.4	24.7
Hours of Inventory Capacity Management Per Day, Low Tempo	0.0	1.8	0.7	0.3	1.3
Hours of Inventory Capacity Management Per Day, High Tempo	0.9	4.9	2.7	1.6	3.8
Hours of Distribution Production Management Per Day, Low Tempo	1.1	34.2	14.4	5.0	24.7
Hours of Distribution Production Management Per Day, High Tempo	23.9	81.8	51.4	33.8	70.4
Hours of Inventory Execution Per Day, Low Tempo	0.0	11.7	4.7	1.6	8.6
Hours of Inventory Execution Per Day, High Tempo	6.5	28.9	17.0	9.7	24.5
Hours of Distribution Execution Per Day, Low Tempo	3.7	39.4	18.0	8.9	28.9
Hours of Distribution Execution Per Day, High Tempo	29.7	102.8	65.0	45.4	85.9
Hours of Procurement Capacity Management Per Day, Low Tempo	0.0	0.6	0.0	0.0	0.2
Hours of Procurement Capacity Management Per Day, High Tempo	0.0	0.8	0.1	0.0	0.4
Hours of Procurement Production Management Per Day, Low Tempo	0.0	1.8	0.1	0.0	0.9
Hours of Procurement Production Management Per Day, High Tempo	0.0	3.8	0.4	0.0	1.6
Hours of Inventory Production Management Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Inventory Production Management Per Day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Procurement Execution Per Day, Low Tempo	0.0	115.2	5.9	0.0	51.6
Hours of Procurement Execution Per Day, High Tempo	0.0	198.7	24.5	0.0	95.6
Hours of Maintenance Capacity Management Per Day, Low Tempo	0.0	9.6	4.3	1.4	7.5
Hours of Maintenance Capacity Management Per Day, High Tempo	5.7	23.9	14.3	8.3	20.2
Hours of Maintenance Production Management Per Day, Low Tempo	0.0	5.0	2.2	0.6	3.9
Hours of Maintenance Production Management Per Day, High Tempo	2.7	13.0	7.4	4.3	10.4
Hours of Maintenance Execution Per Day, Low Tempo	0.0	57.1	21.5	6.4	38.2
Hours of Maintenance Execution Per Day, High Tempo	24.5	126.7	72.1	40.7	101.4
Hours of Engineering Services Capacity Management Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Engineering Services Capacity Management Per Day, High Tempo	0.0	1.5	0.9	0.0	1.3
Hours of Engineering Services Production Management Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Engineering Services Production Management Per Day, High Tempo	0.0	0.8	0.5	0.0	0.7
Hours of Engineering Services Execution Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Engineering Services Execution Per Day, High Tempo	0.0	7.0	3.7	0.0	6.1
Hours of Health Services Capacity Management Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Health Services Capacity Management Per Day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Health Services Production Management Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Health Services Production Management Per Day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Health Services Execution Per Day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Health Services Execution Per Day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Air Transportation Per Day, Low Tempo	0.0	16.2	6.3	2.0	11.3
Hours of Air Transportation Per Day, High Tempo	8.9	39.1	23.1	14.0	32.5
Hours of Surface Transportation Per Day, Low Tempo	0.0	23.2	7.2	0.0	15.3
Hours of Surface Transportation Per Day, High Tempo	0.0	56.6	25.9	12.2	42.3
Hours of Materiel Handling Equipment per day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Materiel Handling Equipment per day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Special Equipment per day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Special Equipment per day, High Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Special Tools per day, Low Tempo	0.0	0.0	0.0	0.0	0.0
Hours of Special Tools per day, High Tempo	0.0	0.0	0.0	0.0	0.0

Table II-7 shows the same results in terms of individuals rather than hours by assuming individuals work 16 hours per day.

TABLE II-7. SUMMARY STATISTICS FOR INDIVIDUALS FOR RESOURCE REQUIREMENTS PER DAY FOR TWO BATTALIONS

Individual Requirement Per Day	Minimum People	Maximum People	Mean People	0.05 percentile	0.95 percentile
Request Management People Per Day, Low Tempo	1	2	1	1	1
Request Management People Per Day, High Tempo	2	4	3	2	3
Order Management People Per Day, Low Tempo	1	2	1	1	2
Order Management People Per Day, High Tempo	2	5	3	2	4
Distribution Capacity Management People Per Day, Low Tempo	1	1	1	1	1
Distribution Capacity Management People Per Day, High Tempo	1	2	2	1	2
Inventory Capacity Management People Per Day, Low Tempo	0	1	1	1	1
Inventory Capacity Management People Per Day, High Tempo	1	1	1	1	1
Distribution Production Management People Per Day, Low Tempo	1	3	1	1	2
Distribution Production Management People Per Day, High Tempo	2	6	4	3	5
Inventory Execution People Per Day, Low Tempo	0	1	1	1	1
Inventory Execution People Per Day, High Tempo	1	2	2	1	2
Distribution Execution People Per Day, Low Tempo	1	3	2	1	2
Distribution Execution People Per Day, High Tempo	2	7	5	3	6
Procurement Capacity Management People Per Day, Low Tempo	0	1	1	0	1
Procurement Capacity Management People Per Day, High Tempo	0	1	1	0	1
Procurement Production Management People Per Day, Low Tempo	0	1	1	0	1
Procurement Production Management People Per Day, High Tempo	0	1	1	0	1
Inventory Production Management People Per Day, Low Tempo	0	0	0	0	0
Inventory Production Management People Per Day, High Tempo	0	0	0	0	0
Procurement Execution People Per Day, Low Tempo	0	8	1	0	4
Procurement Execution People Per Day, High Tempo	0	13	2	0	6
Maintenance Capacity Management People Per Day, Low Tempo	0	1	1	1	1
Maintenance Capacity Management People Per Day, High Tempo	1	2	1	1	2
Maintenance Production Management People Per Day, Low Tempo	0	1	1	1	1
Maintenance Production Management People Per Day, High Tempo	1	1	1	1	1
Maintenance Execution People Per Day, Low Tempo	0	4	2	1	3
Maintenance Execution People Per Day, High Tempo	2	8	5	3	7
Engineering Services Capacity Management People Per Day, Low Tempo	0	0	0	0	0
Engineering Services Capacity Management People Per Day, High Tempo	0	1	1	0	1
Engineering Services Production Management People Per Day, Low Tempo	0	0	0	0	0
Engineering Services Production Management People Per Day, High Tempo	0	1	1	0	1
Engineering Services Execution People Per Day, Low Tempo	0	0	0	0	0
Engineering Services Execution People Per Day, High Tempo	0	1	1	0	1
Health Services Capacity Management People Per Day, Low Tempo	0	0	0	0	0
Health Services Capacity Management People Per Day, High Tempo	0	0	0	0	0
Health Services Production Management People Per Day, Low Tempo	0	0	0	0	0
Health Services Production Management People Per Day, High Tempo	0	0	0	0	0
Health Services Execution People Per Day, Low Tempo	0	0	0	0	0
Health Services Execution People Per Day, High Tempo	0	0	0	0	0

In addition to the total hours required of each resource, the study looked at which of the logistics use case processes were using the majority of a particular resource. Figure II-45 shows the distribution of Request Management resources by process for the low tempo case and Figure II-46 shows the equivalent distribution for the high tempo case. Maintenance request required the largest percentage required the largest percentage of Request Management resources (on average 65 percent in low tempo and 60 percent in high tempo), followed by product fulfillment (on average 33 percent in low tempo and high tempo).

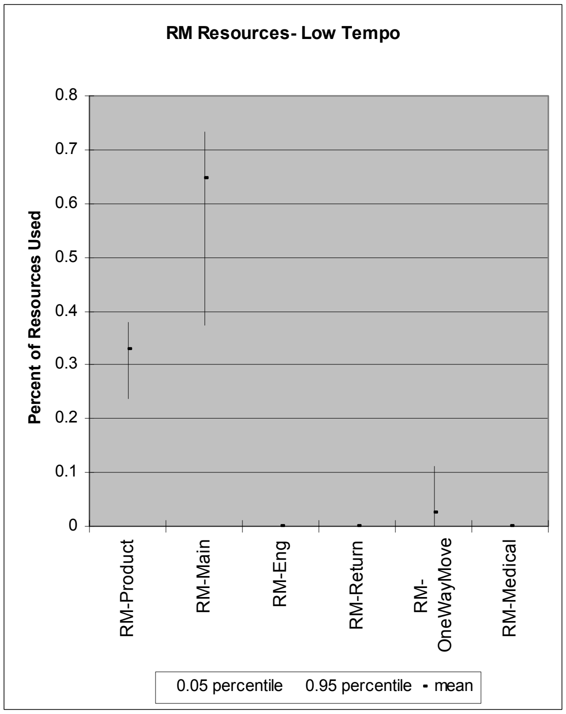

Figure II-45: Product Fulfillment Requests And Maintenance Requests Require The Majority (About 98 percent On Average) Of The Request Management Resources In Low Tempo.

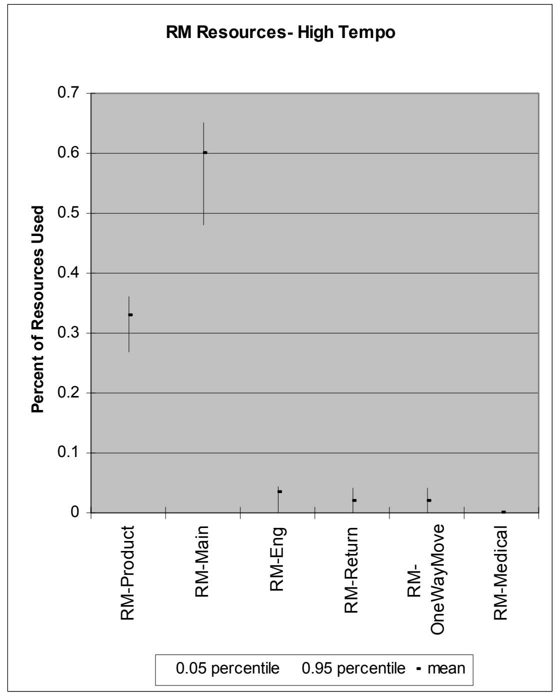

Figure II-46: Product Fulfillment Requests And Maintenance Requests Still Require The Majority Of The Request Management Resources In High Tempo But Slightly Less Than In Low Tempo (93 Percent On Average, Down From 98 Percent In Low Tempo).

For the Order Management resource, maintenance required the largest percentage of the resources. (See Figures II-47 and II-48.) Maintenance also required the largest percentage of the Distribution Capacity Management resource at close to 78 percent on average. See Figures II-49 and II-50.

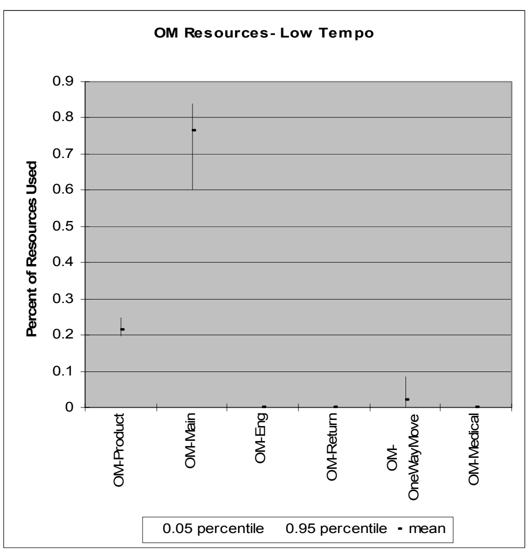

Figure II-47: Maintenance Requests Require The Majority (About 76 Percent On Average) Of The Order Management Resources In Low Tempo. Product Fulfillment Is Second With About 21 Percent On Average.

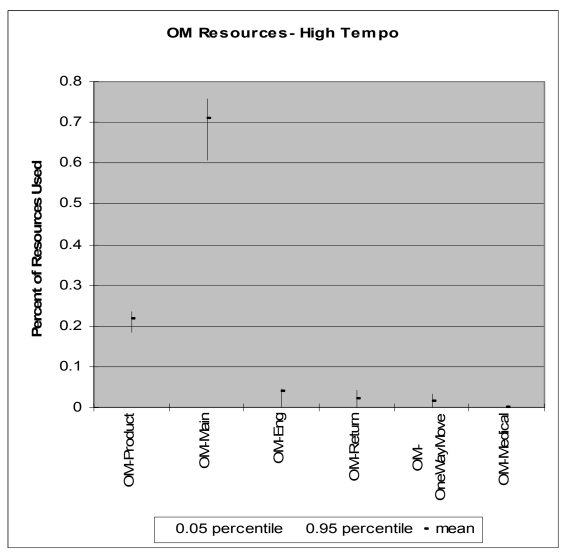

Figure II-48: In High Tempo, Maintenance Requests Still Require The Majority Of The Order Management Resources (About 71 Percent).

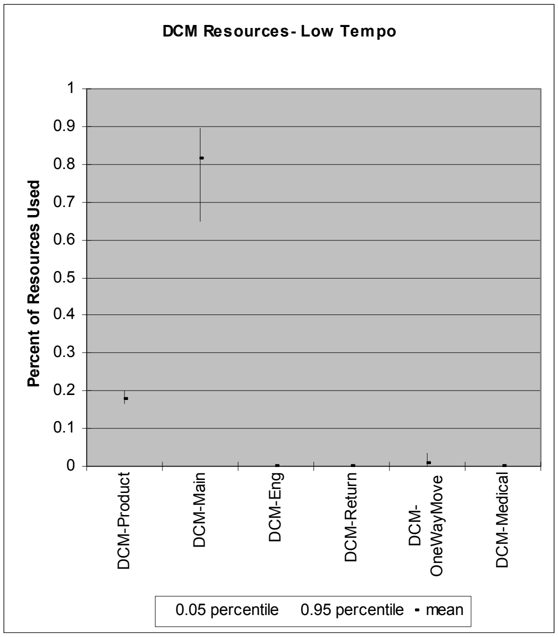

Figure II-49: Maintenance Requests Require The Majority (About 81 Percent On Average) Of The Distribution Capacity Management Resources In Low Tempo.

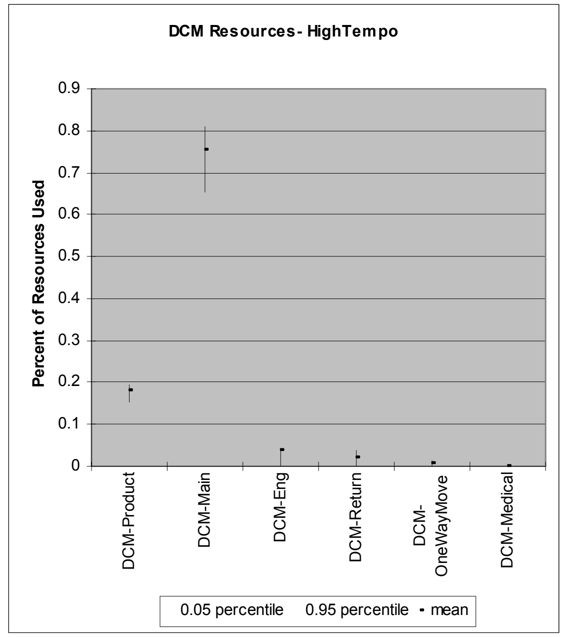

Figure II-50: Maintenance Requests Require The Majority (About 75 Percent On Average) Of The Distribution Capacity Management Resources In High Tempo.

As shown in Figures II-51 and II-52, maintenance requires the largest percentage of the Distribution Production Management resources, over 90 percent on average.

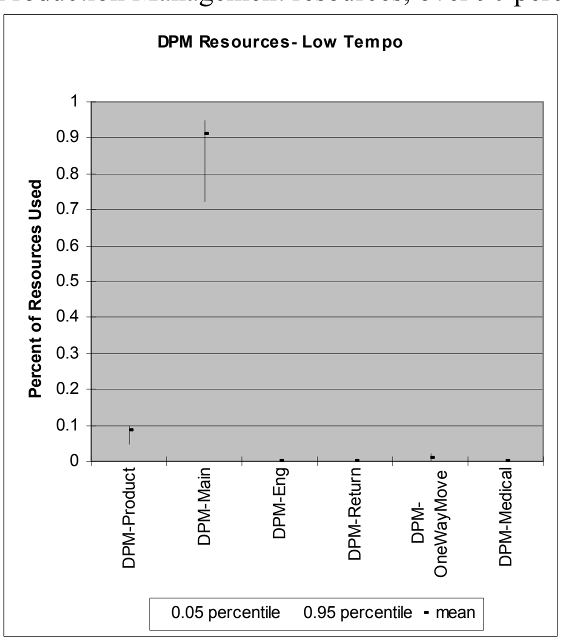

Figure II-51: Maintenance Requires The Majority Of The Distribution Production Management Resources (91 Percent On Average).

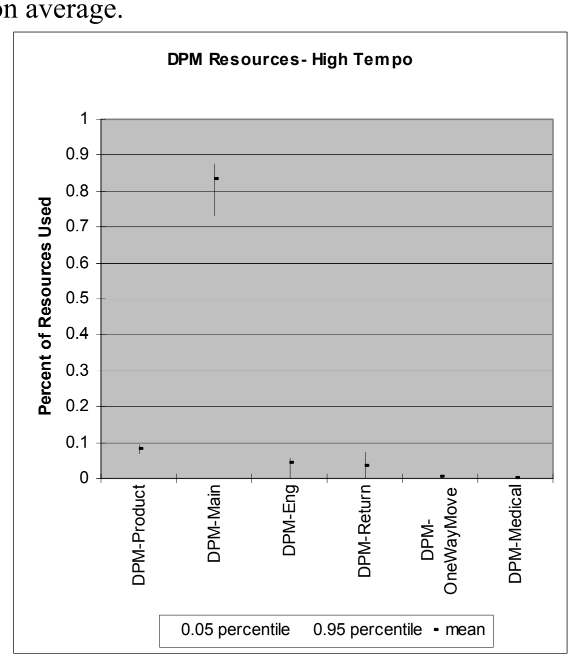

Figure II-52: Maintenance Requires The Majority Of The Distribution Production Management Resources (83 Percent On Average).

As shown in Figures II-53 and II-54, a substantial proportion of the Distribution Execution resources are being used to return defective items; over 20 percent of the resources on average.

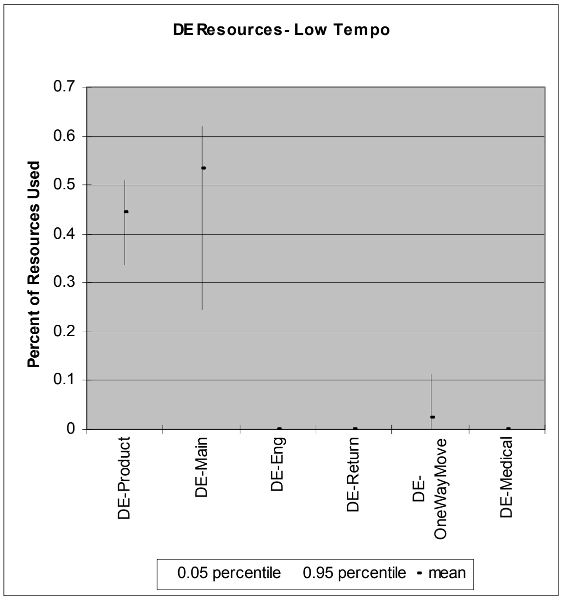

Figure II-53: Maintenance Claims 53 Percent Of The Distribution Execution Resources.

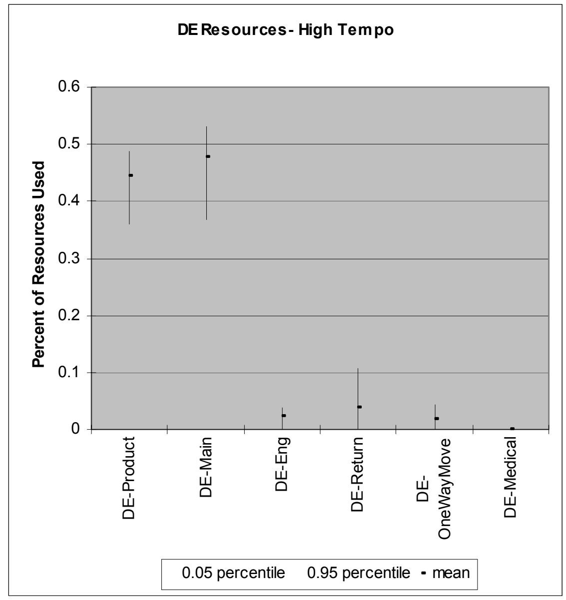

Figure II-54: In The High Tempo Case, Maintenance Requests Average 48 Percent And Product Fulfillment Requests Average 44 Percent.

Figures II-55 through II-58 show the resource requirements for air and surface transportation. These figures show between 90 and 99 percent of the air resources are on average being used for product fulfillment and maintenance requests. Surface resources for these items are utilized 90 to 97 percent of the time.

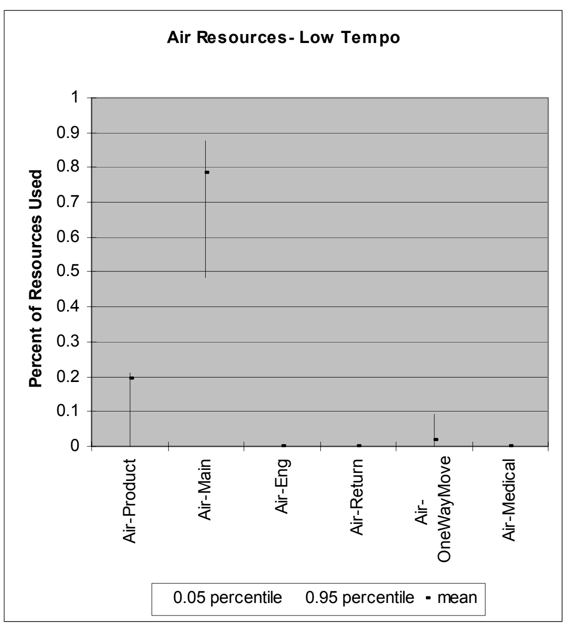

Figure II-55: Close To 98 Percent (On Average) Of The Air Resources Are Being Used To Handle Product Fulfillment And Maintenance Requests.

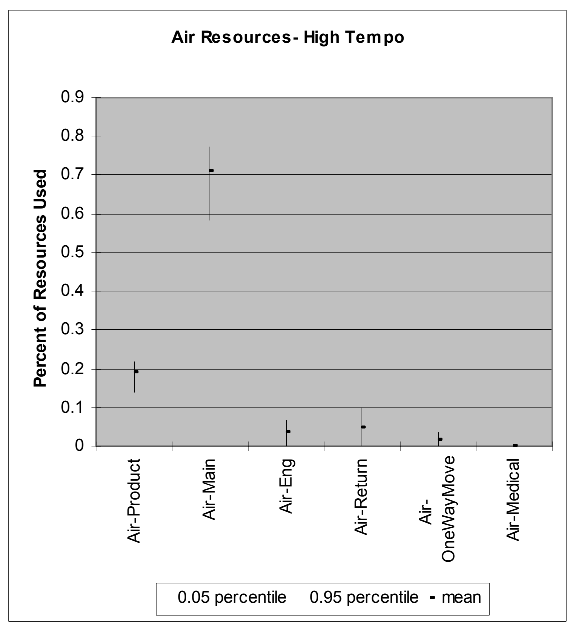

Figure II-56: Maintenance Requests Encompass 71 Percent Of Air Resources.

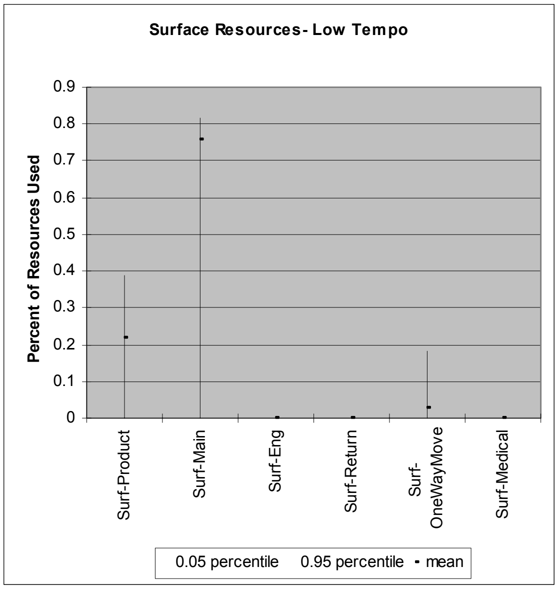

Figure II-57: The Results For Surface Resources, Low Tempo, Are Consistent With Those Identified In Figure II-55 For Air Transportation.

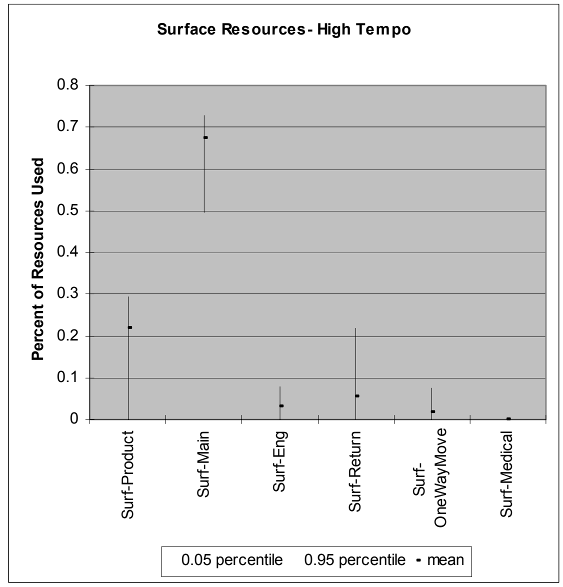

Figure II-58: Maintenance Requests Utilize 68 Percent And Product Fulfillment 22 Percent Of Surface Resources.

Graphics for the Inventory Capacity Management and Inventory Execution Resources yielded no significant data due to the small number of requests generated utilizing the summary statistics provided in Table II-6. For this reason, they are not included.

3. Methodology Development Conclusion. After the successful completion of the seminar simulation exercise to assess time criteria for key processes in the Logistics Operational Architecture, the study team developed a time criteria logistics model for the base case, or seminar, data. In the process of building the model, completing the analyses, and reviewing the results, many assumptions were made as detailed in this section. During Task Four, corrections identified by the Study Sponsor to these data and assumptions were incorporated into the revised model. The tables and figures provided in this report incorporate all of the Task Four updates and provide the detail needed to fully review the time criteria logistics model and its associated assumptions.

E. DOCUMENT DATA REQUIREMENTS – Task Four.

1. Overview. Task Four was originally envisioned to identify data requirements from the use case tasks identified in Task Two and utilized in Task Three for time criteria establishment to document missing elements for consideration in the Global Combat Support System – Marine Corps Shared Data Environment. Corrective action with an implementation strategy for those missing elements would then be provided.

Task Four was divided into three subtasks to accomplish this objective. In the first subtask, the data elements and sources to which they belong would be identified and documented. In the second subtask, any data elements not identified would be listed for consideration in the shared data environment. Finally, those missing data elements would be added or recommended corrective actions would be proposed.

As will be explained, the Global Combat Support System – Marine Corps is still in the early stages of development, and thus does not contain any of the data elements from the Logistics Operational Architecture. Task Four, therefore, evolved to consider final changes to the time criteria model developed during Task Three to match the objectives of the subtasks proposed. This portion of the study report addresses these efforts.

2. Identify Data Requirements from Task Three. The study team continued to meet with government logistics experts to refine and clarify data gathered and used during the Seminar Simulation Exercises held to develop the use case task lists. During Task Three this sub-tasking was essentially completed. The identification of data elements, such as the time criteria establishment, personnel resources, and other resources, to include transportation modes, was made. The data sources to which they belong are the associated Logistics Operational Architecture task steps. These data elements form the input parameters to the baseline time criteria logistics model. Appendix D contains the use cases along with the associated data elements.

3. Documentation of Missing Data Elements. During this subtask, data elements not previously identified were to be listed and included for consideration in the Global Combat Support System – Marine Corps Shared Data Environment. As found during research, though, the Global Combat Support System – Marine Corps is still in the early stages of development, and thus does not contain any of the data elements from the Logistics Operational Architecture. The first phase of implementation of this system is planned for fiscal year 2006.

The Global Combat Support System – Marine Corps is still in a conceptual stage, though it will soon begin basic integration of dozens of legacy logistics, maintenance, personnel, and other support systems. It will be a web-based portfolio of Commercial Item (formerly known as commercial off the shelf) and Government off the shelf logistics information systems. The Global Combat Support System – Marine Corps will establish standards for logistics information and data exchange throughout the Marine Corps, and feed into a Joint Service data environment. It will be a fully integrated Information Technology suite and the system parameters will align with Level 4 of the Supply Chain Operations Reference model. Logistics Operational Architecture functions (Order Management, Capacity Management, etc.) will feed into the Global Combat Support System – Marine Corps.

When it is fully implemented, the Global Combat Support System – Marine Corps will deliver integrated functionality across supply, maintenance, transportation, finance, engineering, and health and manpower systems. The Marine Corps' strategy is to document the complete Logistics Operational Architecture to identify the requirements of the operating forces, and to support these requirements with a shared data environment. This will provide consistent information to all levels of command when and where it is needed achieving a high level of efficiency in operations. The improvement in logistics response capabilities, as a result, may reduce the logistics footprint and provide greater flexibility in sustainment of combat operations.

During Task Four, the study team continued refinement of the data elements utilized in the earlier tasks. There were no additional data elements identified, though a review of the baseline model parameters resulted in revision of certain estimates and assumptions. The first major process driver involved the assumed ten hour work day for individuals involved in the scenarios's operations. Because the scenario provides for combat operations from a seabase early in the operation, this ten hour workday was changed to a more realistic 16 hour workday. The model developed is capable of changing this and other input parameters as necessary to encompass a variety of scenarios.

The data review also concluded that the logistics task volume was significantly less than originally envisioned, particularly for most of the use cases considered. Low tempo of operations went from a minimum of zero and a maximum of 20 tasks per day to zero and seven respectively. During high tempo operations, minimums of ten tasks and maximums of 50 tasks changed to five and 20. It was then felt that the percentage of time these tasks could be expected to be performed would provide a more reasonable approach to the problem than a direct numerical assignment. The model was modified to reflect this approach. As a result of assigning high percentages to product order fulfillment and maintenance requests, the other use cases, and their associated resources, diminished in their operational impact. According to Marine Corps logistics experts, this is a better reflection of combat operations reality. The Second Interim Report prepared for this study contained several graphics, including depictions of distributions of hours per day per human resource (Request Manager, Capacity Manager, etc.) and probability density functions for total requests by process in both low and high tempo operations, that no longer provided meaningful data based on these changes. Therefore, they are not included in this report. The revised graphics and other data from subsequent model runs otherwise replaced earlier information and are found in Section II-D of this report.

The model inputs were also updated to reflect the potential use of materiel handling equipment and other special equipment, though usage rates were not established based on the scenario and assumptions utilized to establish the baseline for the model. Model inputs can be modified when necessary to incorporate usage rates. Each human resource also reflects the percentage of time a particular task actually requires that resource. For example, if in the most likely case the task lasts for one hour but the Request Manager is really only utilized for 15 minutes of that time, then the expected percentage (25 percent) is placed in that input cell. The updated time criteria logistics model use case input information found in Appendix D reflects these changes. The model will have the flexibility to change any of these values.

Model runs, based on the baseline and future scenarios, will provide inputs to the Global Combat Support System – Marine Corps. During Task Five, a proof of concept demonstration was held to show what information will be available to the Transformation Task Force.

4. Recommend Corrective Action. With no missing data elements identified, and the shared data environment not yet available to incorporate the time criteria logistics model information, no corrective actions or implementation strategy, as envisioned for this subtask, are necessary. It is envisioned that the Marine Corps shared data environment Transformation Task Force will utilize the Logistics Operational Architecture use case information and time criteria logistics model to populate the appropriate logistics portions of the Global Combat Support System – Marine Corps.

F. DEMONSTRATE TIME CRITERIA METHODOLOGY – Task Five.

1. Background. The purpose of Task Five was to provide a proof of concept for the time criteria methodology in which Marine Expeditionary Brigade logistics requirements were demonstrated. Throughout the development of the time criteria methodology, the study team worked closely with the Study Sponsor to obtain an accurate, comprehensive, and practical method of establishing time criteria standards. As the study effort developed further, the Study Sponsor determined that a formal proof of concept as envisioned for this task was not required. The Time Criteria Logistics Model that evolved from the methodology development is the practical tool to enable logisticians to obtain the time criteria information for operational planning.

2. Time Criteria Logistics Model Proof of Concept Demonstration. Though a formal proof of concept demonstration was not held, the Study Sponsor met with the study team on a frequent basis to prove the operational value of the Time Criteria Logistics Model. As displayed in Section II-D of this report, accepted time criteria have been established for the Marine Expeditionary Brigade logistics tasks required to support service and product orders from a sea base. The sponsor approved scenario utilized during the task development seminars provided the baseline for time and resource considerations.

At a meeting between the study team, the Study Sponsor and other government representatives, held June 3, 2004, the utility of the Time Criteria Logistics Model was discussed and evaluated. The Study Sponsor later determined this meeting constituted the proof of concept demonstration. The government representatives noted that the model provides the Marine Corps with a tool it has not had previously. The model provides an ability to assess and quantify the processes, emphasizing the establishment of time standards involved in the Logistics Operational Architecture. The government representatives agreed the model is a valuable tool with much utility and the potential to expand in capability. The Time Criteria Logistics Model and the User's Manual (Appendix E), provides the user with the information necessary to evaluate a variety of logistics problems and scenarios.

3. Capacity and Resource Management. Capacity may be considered a potential output standard, such as the physical number of logistics tasks capable of accomplishment over a given period. Capacity management looks at the ability to control, or manage, multiple tasks. In the Logistics Operational Architecture, the capacity management function plans, prioritizes, and optimizes capacity. The resources available to support accomplishment of the logistics tasks are tied to capacity management in that they must balance the output potential without being limited.

The establishment of time criteria for logistics tasks supports capacity and resource management in a variety of ways. By knowing the expected time to accomplish a specific logistics task, and then associating the resources, such as people, vehicles, and material handling equipment required to fulfill the task, logisticians may plan operations to optimize their logistics capacity. The primary results of this study, detailed in Section II-D, provide the answers to the questions of how often and how long specific logistics tasks take to accomplish. The Summary of Time Results found in Table II-4 provide the anticipated times to fulfill the variety of service and product orders for the Marine Expeditionary Brigade. Transportation resources, as depicted in various graphics in Section II-D, impact the overall time to accomplish the tasks. Managers can, therefore, modify transportation schedules when necessary to meet prioritized requirements. The graphics also clearly show the numbers of personnel, designated as Request Managers, Order Managers, Production Managers, etc., military commanders will need to support logistics operations. These established time criteria are essential to all facets of capacity and resource management.

4. Summary. The use of the Time Criteria Logistics Model by future logisticians will provide them with the tool needed to efficiently, accurately, and quickly plan their part of military operations. The ability to easily change key data elements in the model will allow them to simulate various scenarios in search of optimal performance capabilities. This tool provides a valuable resource that ties logistics planning efforts to the Logistics Operational Architecture. As such, the model brings a unique capability to the Marine Corps.

III. CONCLUSIONS AND RECOMMENDATIONS

A. GENERAL.

The purpose of this study was to establish time criteria for logistics tasks to support a deployed Marine Expeditionary Brigade and demonstrate how the established time criteria supports capacity and resource management. Time estimates for accomplishing Combat Service Support tasks are critical to logistics planning efforts and are required to determine how much can be accomplished with available personnel and equipment resources. Establishing time criteria in logistics planning will allow the planners to better determine when and how many people, what type of equipment, and the amounts of material needed to meet every logistics requirement. These will better enable future logistics planners, or Capacity Managers in the Logistics Operational Architecture terminology, to understand what resources they have available to meet upcoming operational requirements.

The study objective, to develop methods for making best logistics support decisions using estimated time criteria in a military capacity management context, has been met. A Time Criteria Logistics Model was developed for this study to assist in the decision process. Estimated time criteria for logistics tasks, based on the model parameters and study research efforts are displayed in Table II-4 of this study report. During the course of this study, some issues emerged as sufficiently important to be considered an outcome of the study. The following conclusions and recommendations are provided to assist the Study Sponsor with implementing the results of the study efforts.

B. CONCLUSIONS.

1. Conclusion - That the Time Criteria Logistics Model provides an additional planning capability to supplement current logistics planning estimate methodologies.

Combat Service Support operations to accomplish routine logistics tasks are carried out in dynamic environments where many factors may impact the time required to complete the tasks. Distance, weather, sea state, tides, availability of transportation assets, manpower, and the combat environment are just some of the factors that impact logistics operations. In order to adequately plan for asset management during these complex operations, logisticians have long relied on historical data, assumptions, and even best guesses or intuition. In the future, as operations are expected to be more complex, the logistics managers will need the capability to respond to support requests in a timely and accurate manner.

Table II-4, found in Section II-D.2.e. of this report, provides estimated time criteria for logistics tasks based on a seabased Marine Expeditionary Brigade scenario. The time estimates were established using the Time Criteria Logistics Model after modeling parameters and assumptions were entered. Through manipulation of these elements, other scenarios may be constructed and time estimates established.

See Section II-A, Section II-D, and Section II-F.4. of this report.

2. Conclusion - That Time Criteria Logistics Model results of various scenarios allows for significant logistics planning analysis of logistics chain performance.

Modeling of various logistics scenarios yields significant data from which analysis can be used to measure processes associated with planning and management of logistics operations. The Time Criteria Logistics Model provides significant analysis capability over previously used intuition. From the modeling exercise completed for this study, with the assumptions as stated, many interesting insights can be gained. While detailed in the body of the report, a few cogent examples include:

- In all use cases, the transportation mode selected (air or surface) was one of the most significant drivers in the amount of time required to complete the process. This impact was amplified for the Return use cases because of the two way journey required. Transportation is always a significant driver in logistics operations and, therefore, all negative impacts to transportation will delay operations. The model allows for measurement of these delays.

- In several use cases, one or two steps in the process could be identified as significant time drivers and would thus be possible steps to consider for further technology support or automation. For example, in the Maintenance at the Customer use case, the time it takes for the distribution production manager to route an order to the appropriate distribution executer for fulfillment (Step 21) required a significant amount of time relative to other steps in the process. Further analysis of the procedures required to accomplish this step may yield possible efficiencies that could be introduced to the process.
- With the assumptions as stated for this study, in both the Maintenance at the Customer and the Engineering Services use cases, the contact team would be delayed approximately 75% of the time waiting on parts procurement. Enablers to speed up parts procurement would provide significant time savings for these processes.

In addition, the model provides important support for staffing decisions because of the capability to provide quantitative estimates of the resources demanded. For example, the analysis shows that in the low tempo case, staffing only one request manager should be sufficient, and in less than 5% of the cases would a second request manager be required. However, a second order manager in the low tempo case is required 15% of the time.

See Section II-D.2.e. and Section II-D.2.f. of this report.

C. RECOMMENDATIONS.

1. Recommendation - That the Time Criteria Logistics Model be utilized to assist in the logistics planning process.

The Time Criteria Logistics Model should be especially useful to the Marine Corps' Transformation Task Force for use in integrating the Logistics Operational Architecture use cases and established time criteria and resource allocations into the Global Combat Support System – Marine Corps. Having an automated source of information identifying time requirements to accomplish specific logistics tasks will enable logisticians to efficiently prepare for, manage, and execute combat service support missions. The Time Criteria Logistics Model developed for this study provides the means to automate and simplify the logistics planning process and give reliable time criteria estimates for specific logistics tasks. The model is a tool that may be adjusted to reflect the dynamics of military operational environments.

Reference Conclusion 1.

2. Recommendation - That logistics planning analysis derived from the Time Criteria Logistics Model be used to support resource planning, management, and utilization in support of Marine Air-Ground Task Force missions and plans.

Marine Corps logisticians should exercise the Time Criteria Logistics Model over a variety of scenarios in order to develop a comprehensive summary of time estimates for logistics tasks and associated resource requirements. Time criteria established for the variety of logistics tasks required to support Marine Corps warfighting operations supports capacity and resource management efforts as the study report details. Analysis of personnel and equipment required to fulfill the service and product orders for Marine Air-Ground Task Force operations, based on the data obtained from a variety of model runs, will provide for measurable efficiencies and accuracy of projected requirements.

Reference Conclusion 2.

APPENDIX A: BIBLIOGRAPHY

An extensive research, data collection, and review was completed on military, government and commercial publications, orders, and regulations pertaining to the Study of Establishing Time Criteria for Logistics Tasks requirements. This research effort included personal interviews, broad internet searches, and library research. The personal interviews also provided a number of leads to acquire additional valuable data as well as supplementary leads to other media sources. This appendix is divided into the sections listed below.

List of Attachments

LIST OF REFERENCES

1. **Article; <u>A Comparative Study Of Performance Of Push And Pull Systems In The Presence Of Emergency Orders</u>; International Journal of Production Research, Volume 40, Number 7, Pages 1627-1646(20); Kim, K.; Chhajed D.; Palekar, U.S.; Sogang University, Seoul, Korea and University of Illinois at Urbana-Champaign; Champaign, Illinois. 01 May 2002. UNCLASSIFIED.**

   Upon receiving emergency orders, managers often expedite the orders when inventories are insufficient to fulfill orders from current stocks. These practices not only disrupt production flow on the shop floor, but also complicate capacity planning because of unexpected set ups. While the use of safety stock is a clear option that can be used to overcome the impact of emergency orders, the effectiveness of the option needs to be examined. The performance of push and pull systems with explicit consideration of order expediting and capacity constraints is compared. Service level, operating costs, and delivery time for late orders as relevant performance measures are used to provide insights for managers who suffer from uncertain demand. This article was used by the study team to research industry capacity management.

2. **Article; <u>A Heuristic Methodology for Sizing a Large-Scale System of Constrained, Reusable Resources</u>; Journal of Heuristics, Volume 2, Number 4, Pages 287-301(15); Mcginnis, M.L.; Department of Systems Engineering, United States Military Academy; West Point, New York. 1997. UNCLASSIFIED.**

   This paper proposes a methodology for sizing certain large scale systems of reusable, capacity constrained resources engaged in tasks of varying duration. A heuristic program schedules resources throughout a finite planning horizon using two decision variables: varying resource capacity for meeting demand and varying task duration. A model of the problem and heuristic scheduling program are presented. A sequential, iterative sizing procedure determines the number of system resources to meet demand at each stage of the problem. Results compare the methodology with heuristics used in practice to schedule resources and size a real world, large scale training system. The study team used this article to gather data on logistics system design, heuristic scheduling and fleet sizing.

3. **Article; <u>A Hierarchical Planning Approach For A Production-Distribution System</u>; International Journal of Production Research, Volume 37, Number 16, Pages 3759-3772(14); Ozdamar, L.; Yazgac, T. 15 November 1999. UNCLASSIFIED.**

   A production/distribution model involving production and transportation decisions in a central factory and its warehouses is developed. The model is based on the operating system of a multi-national company producing detergents in a central factory from which products are distributed to geographically distant warehouses. The overall system costs are optimized considering factory and warehouse inventory costs and transportation costs. Constraints include production capacity, inventory balance and fleet size integrity. Here, a hierarchical approach is adopted in order to make use of medium range aggregate information, as well as to satisfy weekly fluctuating demand with an optimal fleet size. Thus, a model which involves an aggregation of products, demand, capacity, and time periods is solved. In the next

planning phase, the aggregate decisions are disaggregated into refined decisions in terms of time periods, product families, inventory and distribution quantities related to warehouses. Consistency between the aggregate and disaggregation models is obtained by imposing additional constraints on the disaggregation model. Infeasibilities in the disaggregated solution are resolved through an iterative constraint relaxation scheme which is activated in response to infeasible solutions pertaining to different causes. Here, the authors investigate the robustness of the hierarchical model in terms of infeasibilities occurring due to the highly fluctuating nature of demand in the refined time periods and also due to the aggregation process itself. The information derived from this article contributed to the development of study methodology.

4. **Article; A Military Logistics Perspective: "Enablers to Ensure A Future Logistics Enterprise"; Eaton, Rear Admiral (Retired) Donald R.; Naval Postgraduate School; Monterey, CA. Published in The International Society of Logistics Newsletter, Volume 6, 7. July 2003. UNCLASSIFIED.**

   Rear Admiral (Retired) Eaton, the Admiral Stanley Arthur Chair of Logistics at the Naval Postgraduate School in Monterey, California, presents a Military Logistics Perspective in this article. The Admiral writes of the cultural barriers that undermine logistics practices and expresses the need for cultural change to maximize operational availability in the Future Logistics Enterprise. Review of this article offered the study team insight necessary to stimulate comparative analysis for study research and evaluation.

5. **Article; A Simulation Optimization Approach In Production Planning Of Failure Prone Manufacturing Systems; Journal of Intelligent Manufacturing, Volume 12, Number 5/6, Pages 421-431(11); Kenne, J.P.; Gharbi, A.; University of Quebec; Montreal, Quebec, Canada. October 2001. UNCLASSIFIED.**

   In this paper, the implementation of a new method to control the production rate of manufacturing systems, based on the combination of stochastic optimal control theory, discrete event simulation, experimental design and response surface methodology is outlined. The system under study consists of several parallel machines, multiple product manufacturing system. Machines are subject to failures and repairs and their capacity process is assumed to be a finite state Markov chain throughout the analytical control model. The problem is to choose the production rates so as to minimize the expected discounted cost of inventory/backlog over an infinite horizon. The authors first show that, for constant demand rates and exponential failure and repair times distributions of the machines, the hedging point policy is optimal. The structure of the hedging point policy is then parameterized by factors representing the thresholds of involved products. With such a policy, simulation experiments are combined to experimental design and response surface methodology to estimate the optimal control policy. The authors conclude that the hedging point policy is also applicable to a wide variety of complex problems including non-exponential failure and repair times distributions and random demand rates. Analytical solutions may not be easily obtained for such complex situations. This article contains information on stochastic optimal control, numerical methods, simulation, experimental design, and response surface methodology for application to development of time criteria methodology.

6. **Article; <u>Aggregate Planning In Hybrid Flowshops</u>; International Journal of Production Research, Volume 36, Number 9, Pages 2463-2477(15); Aghezzaf, E. H.; Artiba, A. 01 September 1998. UNCLASSIFIED.**

   The authors present a linear programming based heuristic for the solution of a class of aggregate level planning problems in hybrid flowshops (flowshops with several machines per stage). First, the general planning problem is modeled as multi-level with parallel processors, multi-item, capacitated, lot sizing with set up times. The authors suggest a hierarchical approach which sequentially loads the stages; each stage is constrained by the solution of its preceding stage and each stage is treated as a multi-item, capacitated, lot sizing problem with setup times on parallel processors. The paper shows how this latter problem may be reformulated and solved heuristically as a sequence of network problems (trans-shipment problems) in which the amount of capacity lost in setups is fixed for each period and each processor. The model is within the computing reach of a personal computer. Review of this paper contributed to development of the time criteria model and provided information on stability measures for rolling schedules with application to capacity expansion planning, master production scheduling, and lot sizing.

7. **Article; <u>An Application Of Lagrangian Relaxation To A Capacity Planning Problem Under Uncertainty</u>; Journal of the Operational Research Society, Volume 52, Number 11, Pages 1256-1266(11); Lucas, C.; MirHassani, S.A.; Mitra, G.; Poojari, C.A.; Brunel University; Uxbridge, United Kingdom. November 2001. UNCLASSIFIED.**

   A supply chain network planning problem is presented as a two stage resource allocation model with 0-1 discrete variables. In contrast to the deterministic mathematical programming approach, scenarios are used to represent the uncertainties in demand. This formulation leads to a very large scale mixed integer-programming problem which is intractable. Lagrangian relaxation and its corresponding decomposition of the initial problem is applied in a novel way, whereby the Lagrangian relaxation is reinterpreted as a column generator and the integer feasible solutions are used to approximate the given problem. This approach addresses two closely related problems of scenario analysis and two stage stochastic programs. Computational solutions for large data instances of these problems are carried out successfully and their solutions analyzed and reported. The model and the solution system have been applied to study supply chain capacity investment and planning.

8. **Article; <u>An Experimental Comparison Of Capacity Rationing Models</u>; International Journal of Production Research, Volume 35, Number 6, Pages 1639-1650(12); Patterson, J. W.; Balakrishnan, N.; Sridharan, V. 01 June 1997. UNCLASSIFIED.**

   This paper evaluates two approaches to capacity rationing to manage demand in make to order manufacturing firms that face seasonal demand in excess of installed capacity. The authors assume that the firms produce two classes of products, one having a higher profit contribution per unit of capacity than the other. In the first approach, capacity is reserved for the higher profit class in a dynamic fashion using an expected value analysis each time an order is received for the lower profit class. In the second approach, the amount of capacity reserved for the higher profit class is set at the beginning of the planning horizon and never changed. The two approaches are evaluated relative to the case with no capacity rationing (i.e. orders are accepted as they arrive as long as capacity is available) for a wide array of experimental situations by varying the ratio of unit profit contributions for the two product classes, the ratio of total available capacity to total expected demand, the ratio of order arrival rates and order sizes for the two classes, and variability in demand for each class. The results show that both rationing models produce significantly higher levels of profit than the model with no capacity rationing. The models and their comparison have been applied to industry capacity management research data.

9. **Article; <u>Concepts of the Framework for Enterprise Architecture</u>; Zachman, John A. Zachman International; Los Angeles, California. 1996. UNCLASSIFIED.**

A generic framework concept that is logical, comprehensive, and neutral is presented in this article by the author. The framework, when applied to enterprises, is a tool for sorting out complex technology and methodology choices and issues. The study team reviewed this article to understand and evaluate the author's concepts, and to determine if the six framework concepts are useful in the study methodology.

10. **Article; <u>Determination Of Master Production Schedule Replanning Frequency For Various Forecast Window Intervals</u>; International Journal of Operations and Production Management, Volume 18, Number 8, Pages 767-777(11); Nathan, J., St. John's University; Jamaica, New York; Vankataraman, R., Penn State University; Erie, Pennsylvania. 18 September 1998. UNCLASSIFIED.**

This paper examines the impact of forecast window intervals on replanning frequencies for a rolling horizon master production schedule. The problem environment for this study is an actual master production schedule operation of a paint company and includes features such as multiple production lines, multiple products, capacity constraints, minimum inventory requirements. A mixed integer goal programming model formulated for the master production schedule problem is used to analyze the impact of forecast window interval length on replanning frequencies and master production schedule performance in a rolling horizon setting. Given demand certainty, results indicate that the length of the forecast window interval influences the choice of replanning frequency for this company environment. A three month forecast window interval with a two month replanning frequency provided the best master production schedule performance in terms of total cost. Information derived on forecasting, modeling, planning, and production schedules have been applied to study capacity management and planning.

11. **Article; <u>Dynamic Capacity Acquisition and Assignment Under Uncertainty</u>; Annals of Operations Research, 200311, Volume 124, Number 1-4, Pages 267-283(17); Ahmed, S.; Garcia R.; School of Industrial and Systems Engineering, Georgia Institute of Technology; Atlanta, Georgia. November 2003. UNCLASSIFIED.**

Given a set of m resources and n tasks, the dynamic capacity acquisition and assignment problem seeks a minimum cost schedule of capacity acquisitions for the resources and the assignment of resources to tasks, over a given planning horizon of T periods. This problem arises, for example, in the integrated planning of locations and capacities of distribution centers, and the assignment of customers to the distribution centers, in supply chain applications. The dynamic capacity acquisition and assignment problem in an environment where the assignment costs and the processing requirements for the tasks are uncertain are considered. Using a scenario based approach, a stochastic integer programming model for this problem is developed. The highly non-convex nature of this model prevents the application of standard stochastic programming decomposition algorithms. The authors use a recently developed decomposition based branch and bound strategy for the problem. Encouraging preliminary computational results are provided. Review of this information contributed to data research on capacity expansion and stochastic integer programming.

12. **Article; <u>Dynamic Metamodelling In Capacity Planning</u>; International Journal of Production Research, Volume 36, Number 1, Pages 197-210(14); Stahlman, E.J.; Cochran, J.K. 01 January 1998. UNCLASSIFIED.**

    Traditional capacity planning modeling techniques focus on the steady state behavior of a system. This is because transient behavior complicates the problem, both conceptually and analytically, and solutions tend to be time consuming. Nevertheless, the transient behavior of a system is often of equal consequence to that of the steady state behavior and requires methods for characterization. Further, today's increasingly powerful personal computers allow complex, dynamic behaviors to be modeled in a timely manner. This paper presents a model for incorporating dynamic behavior into capacity planning.

13. **Article; <u>Effective Logistics Change—The ILC Focus</u>; Lermo, Lieutenant Colonel Erick J.; Marine Corps Gazette. June 2002. UNCLASSIFIED.**

    The Integrated Logistics Capability concept, as discussed in this article, is currently being tested at II Marine Expeditionary Force, and adjustments will be made accordingly. The Integrated Logistics Capability is focused on determining the appropriate logistics process.

    The author states that the chaotic nature of traditional logistics approaches has to change. The Marine Corps can no longer count on the luxury of six month buildup periods prior to launching campaigns against enemies, nor can it transport millions of tons of excess material during the buildup process. Further, with the strategic lift assets shrinking and a Department of Defense transformation underway, the Marine Corps must enhance strategic logistic responsiveness, reduce the logistics footprint, and introduce a fundamental change in doctrine, procedures, and force structure.

    The ultimate intent of Integrated Logistics Capability is to ensure the logistics capabilities of the Marine Air Ground Task Force are enhanced and made more combat effective. According to the author, the Marine Corps currently fragments logistics processes. The information provided in this article provided background details about the Integrated Logistics Capability concept.

14. **Article; <u>Enterprise Architecture and Legacy Systems</u>; Zachman, John A.; Zachman International; Los Angeles, California. 1995. UNCLASSIFIED.**

    The author focuses on how his framework for enterprise architecture can be employed as a thinking tool. Utilizing his strategy, the author supports, helps to understand complex issues, and assists in the development of deliberate and enduring strategies which create enterprises with the flexibility to change in the modern era.

Review of this document provided the study team with background information on techniques used to understand complex issues.

15. **Article; <u>GCSS Marine Corps: Making the Warfighter Part of the Logistics Solution</u>; Ferris, David, Program Manager; Marine Corps Gazette. June 2001. UNCLASSIFIED.**

    This article was written for the Marine Corps Gazette by the Program Manager for Information Systems at Marine Corps Systems Command. This document provides a strategic overview of the Global Combat Support System - Marine Corps program, its goals and plans for meeting Department of Defense warfighter requirements. This article was used to compile status information on the Global Combat Support System - Marine Corps program.

16. **Article; <u>Identifying Resistance to Organizational Changes in a Logistics Defense Organization (A Hofstede Cultural Multi-Dimensional Model Approach)</u>; Manomenidis, Ioannis E. and Neroulia, Aikaterini A.; The International Society of Logistics – Logistics Spectrum. April-June 2003. UNCLASSIFIED.**

    This article, by Hellenic Air Force Squadron Leader Ioannis E. Manomenidis and Aikaterini A. Neroulia, addresses the post cold war era and the significant changes in NATO logistics organizations and the shift towards more flexible and efficient defense acquisition processes in order to anticipate changes of the international political and military environment. Review of this article offers insights to stimulate comparative analysis for study research and evaluation.

17. **Article; <u>Internet Based Supply Chain Management: A Classification Of Approaches To Manufacturing Planning And Control</u>; International Journal of Operations & Production Management, Volume 21, Number 4, Pages 516-525(10); Kehoe, D.; Boughton, N.; MCB University Press. 06 April 2001. UNCLASSIFIED.**

    The Internet provides a real opportunity for demand data and supply capacity data to be visible to all companies within a manufacturing supply chain. Consequently there is a need for manufacturing organizations to explore alternative mechanisms for the management of their operations network, in particular the role of manufacturing planning and control systems. This paper describes current research which examines the classification of manufacturing supply chains and positions Internet based applications in order to identify the operations management challenges for the next generation of manufacturing planning and control systems. This article was used by the study team in the research phase of the study to understand manufacturing and supply chain processes, planning, and control systems.

18. **Article; <u>Kanban Made Simple: Demystifying and Applying Toyota's Legendary Manufacturing Process</u>; The International Society of Logistics Newsletter, Volume 2, 3. July 2003. UNCLASSIFIED.**

    The International Society of Logistics reviewed this book by John M. Gross and Kenneth R. McInnis on Toyota Corporation's manufacturing process. Known as Kanban, this process revolutionized the way corporations and suppliers achieve maximum efficiency in getting products to and from the assembly line. The technique minimizes waste, avoids overproduction, and ensures quick response to changes and problems. The study team reviewed this newsletter for potential applicability of Toyota's just in time supply process to logistics chain activities.

19. Article; <u>Marine Inventory Routing: Shipments Planning</u>; Journal of the Operational Research Society, Volume 53, Number 1, Pages 108-114(7); Ronen, D.; University of Missouri-St Louis, College of Business Administration; Saint Louis, Missouri. January 2002. UNCLASSIFIED.

This paper addresses a shipments planning problem faced by producers of large volume liquid bulk products. Producing origins with limited tank storage capacity supply multiple products by ships (or barges) to consuming destinations that also have limited storage capacity. Timing, origin, destination, and product quantities of shipments have to be determined in a manner that minimizes costs and does not violate storage capacity constraints at both ends (neither stopping production at the origins, nor running out of stock at the destinations). A mixed integer-programming model is used to derive cost effective solutions within a few minutes. A cost based heuristic algorithm is used to assure that acceptable solutions are obtained quickly. Study team review of this paper contributed to understanding distribution planning, marine transport, integer programming, supply chain and inventory problems, and the solution as they pertain to capacity management.

20. Article; <u>Modelling And Analysis For Capacity Expansion Planning In Warehousing</u>; Journal of the Operational Research Society, Volume 50, Number 1, Pages 52-59(8); Cormier, G.; Gunn, E.A.; Canada. January 1999. UNCLASSIFIED.

In this paper, a dynamic programming model is developed for the purpose of establishing a warehouse capacity expansion schedule and underlying multi-item inventory policy that are jointly optimal. The optimal warehouse size over any segment of the planning horizon is obtained by solving a nonlinear optimization problem, this being accomplished efficiently by exploiting the Kuhn–Tucker conditions. Repeating this procedure between each pair of time periods results in a discrete state space, so that the optimal capacity expansion schedule corresponds to a shortest path in a network. Managerial insights are provided through experimentation with the model.

21. Article; <u>On The Importance Of Sequencing Decisions In Production Planning And Scheduling</u>; International Transactions in Operational Research, Volume 9, Number 6, Pages 779-793(15); Dauzère–Pérès, S.; Lasserre, J.; IRCCyN/Ecole des Mines de Nantes, France and LAAS–CNRS; Toulouse, France. November 2002. UNCLASSIFIED.

The article discusses the traditional hierarchical approach to production planning and scheduling, emphasizing the fact that scheduling constraints are often either ignored or considered in a very crude way. In particular, the authors underline that the way scheduling is carried out is crucial for the capacity constraints on the lot sizes. Usual methods to handle capacity in theory or in practice are reviewed. Finally, an approach that tries to overcome these drawbacks by capturing the shop–floor capacity through scheduling considerations is presented. This article was used in the research phase of the study to compile data on industry capacity management.

22. **Article; <u>Order Planning For Networked Make-To-Order Enterprises—A Case Study</u>; Journal of the Operational Research Society, Volume 51, Number 10, Pages 1116-1127(12); Azevedo, A.L.; Sousa, J.P.; Portugal. October 2000. UNCLASSIFIED.**

    From the general trend towards global markets and a growing customer orientation, new concepts and forms of organization are emerging, such as distributed or networked enterprises. One key requirement of these new paradigms is the availability of models and tools to support order negotiation with the optimization of manufacturing routes and logistics and ensuring the coordination of all participating entities. The authors address the problem of planning an incoming customer order to be produced in a distributed (multi-site) and multi-stage production system. In particular, as a case study of the industry of semiconductors in the business area of application specific integrated circuits. The problem is tackled in a hierarchical model, in two levels: there is a global network planning procedure, and a set of local capacity models associated to the different production units reflecting their particular features. An approach based on simulated annealing is presented, as well as a specially designed constructive heuristic, that takes into account many of the real world constraints and complexities. The general performance of the simulated annealing algorithm is assessed through some preliminary computational experiments. The case study provided information on distributed enterprises, supply chain management, simulated annealing, and heuristics for study application.

23. **Article; <u>Predictive Capacity Planning: A Proactive Approach</u>; Information and Software Technology, Volume 39, Number 3, Pages 195-204(10); Sia, C.-L.; Ho, Y.-S.; Republic of Singapore. 1997. UNCLASSIFIED.**

    There are a number of difficulties associated with traditional capacity planning studies which adopt a fix it later approach. An underestimation of the costs of remedial action which produces only incremental improvements is an example of such difficulties. To address these difficulties, a proactive approach is proposed which uses a prediction based performance model within a capacity planning framework to recommend either the configuration for a new computer system or the reconfiguration of an installed system. The model used in the framework predicts the resource usage of applications, comprising the potential workload of a system, given the structure of the application programs, the resource usage of their basic components, and forecasted workload characteristics. This information is used to identify applications which may compete for certain system resources if they are executed concurrently in the system. By characterizing the resource usage of the forecasted workload, the occurrence of capacity problems may be pre-empted. The study team reviewed this article to research performance modeling and capacity planning.

24. **Article; <u>Reduced Discrete-Event Simulation Models for Medium-Term Production Scheduling</u>; Systems Analysis Modelling Simulation, Volume 43, Number 7, Pages 867-883(17); Völker, S.; Gmilkowsky P. July 2003. UNCLASSIFIED.**

    Medium term production scheduling tends to be unsatisfactory in many industrial enterprises because it is usually based on escapist assumptions of fixed lead times and a mere summarizing of the capacity supply and demand. These assumptions and the simplicity of the methods applied do not match the complexity of the scheduling problems to be solved. Thus the goals of the scheduling frequently fail to be achieved. Help might be at hand from simulation based optimization. Such optimization, however, causes high computational costs, which will stand in the way of its practical application.

This article reports a method of creating reduced simulation models of discrete production processes. The use of such reduced models instead of detailed ones lessens the computational costs considerably and hence makes the application of simulation based optimization for medium term production scheduling possible. The reduction method was subjected to empirical investigation, the results of which are also presented here. The study team used this article in the research phase of the study to support methodology development.

25. Article; <u>Sea Basing: What's New?</u>; Corbett, Colonel Art, United States Marine Corps; and Goulding, Colonel Vince, United States Marine Corps (Retired); Naval Institute Proceedings. November 2002. UNCLASSIFIED.

This article was written by Colonel Art Corbett and Colonel Vince Goulding and discusses the developing concepts of seabasing.

Several alternate definitions for seabasing are available in the article including Enhanced Network Seabasing. The article discusses the sea base concept in general to include the phased at sea arrival and assembly, selective offload, sustainment and reconstitution at sea components. All of these components add up to an important asset available to the Joint Force Commander allowing him/her to quickly adjust the configuration of a force for the current mission. Changes can be quickly made to the force composition to adjust to ever changing missions. The article provides information on seabasing as a concept utilizing access, maneuver, operational tempo, and initiative to support military operations from safe, secure, and unobtrusive locations.

26. Article; <u>Stability Measures For Rolling Schedules With Applications To Capacity Expansion Planning, Master Production Scheduling, And Lot Sizing</u>; Omega, Volume 26, Number 3, Pages 355-366(12); Kimms, A., Christian-Albrechts University; Kiel, Germany. 01 June 1998. UNCLASSIFIED.

This contribution discusses the measurement of (in-)stability of finite horizon production planning when done on a rolling horizon basis. As examples, strategic capacity expansion planning, tactical master production scheduling, and operational capacitated lot sizing are reviewed. An iterative method to dampen the nervousness is presented. This article provides information on rolling horizon, nervousness, rescheduling, capacity expansion, master production scheduling, and lot sizing and supported development of study methodology.

27. Article; <u>The Application Of Reliability Constrained Stochastic Capacity Planning Models To The Service Sector</u>; European Journal of Operational Research, Volume 97, Number 1, Pages 34-40(7); Boronico, J.S.; Monmouth University; West Long Branch, New Jersey. 16 February 1997. UNCLASSIFIED.

Emphasis on quality management has recently permeated not only the manufacturing sector, but the service sector as well. Consequently, quality service and consumer satisfaction have become realities for many monopolistic service oriented industries facing competition. In order to effectively implement timely service within these industries capacity plans must be developed which provide adequate staffing during both peak load and off peak hours, as well as optimal prices and reliability of service. This paper builds on the results of Boronico (1992) in illustrating how reliability constrained marginal cost, within which optimal price is embodied, and minimum cost capacity plans may be determined for a service provider facing stochastic demand. Excess demand is not lost, but is deferred: a characteristic that typifies the operation of many delivery systems, such as postal services. Results indicate that marginal costs are convex with respect to reliability of service, while changes in the demand distribution's variability may impact optimal capacity by either increasing or decreasing required capacity. Review of the mathematical programming, modeling, and nonlinear programming information contributed to development of study methodology.

28. Article; <u>The Challenge Is Change: A Management Paper</u>; Zachman, John A.; Zachman International; Los Angeles, California. 1995. UNCLASSIFIED.

Mr. Zachman discusses the dynamics associated with enterprise change and relevancy in a changing environment. The study team assessed this paper for use in the study methodology.

29. Article; <u>World Wide Express – A New Tool for the Transporters Toolbox</u>; Kirk, Pierre duQuesnay, Naval Transportation Support Center; 15 April 2003. UNCLASSIFIED.

This article provides first hand knowledge of the Air Mobility Commands World Wide Express service for time definite, door to door delivery of high priority small packages. The packages must be 150 pounds or less, unclassified, and non-hazardous material. Although designed for continental United States to overseas locations, there is also some limited in country service.

The World Wide Express began in Fiscal Year 1999 after the aging C141 and C5 fleets of aircraft began to show significant wear and tear and the C17 aircraft acquisition program was changed from a one for one replacement of C141s to a heavy hauler only.

Navy shippers can currently use the service to fixed locations only, but efforts are underway to allow shipment to ships and squadrons. If Navy shippers elect to use commercial carriers, then the program is a mandatory use contract. What this means is that if the shipper elects to send a package by commercial aircraft, and package fits the parameters of the program, then the shipper must use World Wide Express. It is anticipated that, in the near future, shippers may be able to choose the commercial carrier.

Although not designed to replace Air Mobility Command's services, it is an augmentation to the transportation system that allows for transporters to get the goods to the customer quickly and dependably. The study team used this reference as background information.

30. Book; <u>Computer Simulation in Logistics: With VISUAL BASIC Application</u>; Nersesian, Roy L. and Swartz, G. Boyd; Quorum Books; Westport, Connecticut. 1996. UNCLASSIFIED.

This textbook discusses logistics being the movement of materials, and the study of logistics being the study of movement. Selecting the best choice of transport, in quantitative analysis, is normally accomplished by selecting the best choice by comparing freight rates. Heuristic rules, or "it has always been done this way", are usually used when quantitative aspects grow in complexity.

Evaluation of alternatives can also be achieved in a low cost and accurate way using computer simulation. Evaluation, using simulation, can be carried out by performing painless experimentation to appraise the performance of any system employing diverse decision rules without actually running the test. Experiments run by simulating reality are conducted with no adverse consequences of actually running a costly unsuccessful trial. Simulation can aid in establishing decision rules instead of relying on heuristic rules whose basis has vanished over time.

This textbook provides an understanding of computer simulation using VISUAL BASIC. It allows a logistics manager to become aware of two versions of this computer language in dealing with logistics problems that are to be solved using computer simulation. The program statements used in the book can be translated into another computer language and used as a basis for simulation design. The text was used as reference material in the research phase of the study.

31. Book; <u>Introduction to Management Science</u>; Cook, Thomas M. and Russell, Robert A.; Prentice-Hall, Inc.; Englewood Cliffs, New Jersey. 1985. UNCLASSIFIED.

Operations research/management science is described in this textbook as an interdisciplinary field with elements of mathematics, economics, computer science, and engineering. Computers have expanded this content enormously.

Many technical accomplishments were achieved using the scientific method to help in the process of making decisions in a physics and chemistry laboratory environment. The operations of organizations and associated decision making processes lend themselves well to analysis through scientific methodology. Organizations always look for new ways to handle problems that confront them.

This textbook provides an understanding of the field of operations research and management science. The text includes examples of real world scenarios and operations research and management science applications used in solving them. There is also a section on computers used as a basis for problem solving. It discusses information on software packages and inherent advantages and disadvantages in using computer based methodology. The text was used as reference material in the research phase of the study.

32. Book; <u>Naval Expeditionary Logistics: Enabling Operational Maneuver From the Sea</u>; Naval Studies Board, National Research Council, Washington, D.C. 1999. UNCLASSIFIED.

Chapter 4 of the Naval Expeditionary Logistics publication addresses specifics on force sustainment. Particularly significant for this study is the sub-chapter on Supporting Forces from the Sea that was used by the study team in the research phase of the study to assess seabasing concepts.

33. Book; <u>Operational Logistics: The Art and Science of Sustaining Military Operations</u>; Kress, Moshe; Center for Military Analyses; Israel; Kluwer Academic Publishers. 2002. UNCLASSIFIED.

Published in 2002, this book concisely defines and describes Operational Logistics, forecasting logistics demands, and includes a chapter devoted to Optimizing the Logistics Network. This book was used by the study team as background material.

34. Brief; <u>Future Logistics Enterprise</u>; Morales, The Honorable Diane K., Deputy Under Secretary of Defense, Logistics and Materiel Readiness; (downloaded 02 January 2003). UNCLASSIFIED.

This brief provides the Honorable Diane K. Morales' concept of how logistics will be conducted in the future for the Department of Defense. The slides present an overview of the depot future relationship to Defense Logistics Agency, private industry, and other services and how the warfighter will be resupplied. The study team used this briefing as background research for the study and to assess how the Future Logistics Enterprise would impact logistics support.

35. Brief; <u>GCSS-MC Day: United States Marine Corps Logistics Enterprise Integration</u>; Headquarters, United States Marine Corps; Quantico, Virginia. 2003. UNCLASSIFIED.

This brief (undated) contains an overview of the emerging Marine Corps Order Fulfillment process, a strategic Evaluation Context Diagram showing the components of the proposed Global Combat Support System - Marine Corps, and operational scenarios. This brief contains screen captures of the Global Combat Support System - Marine Corps Oracle Evaluation tool set and process steps for employment using various scenarios. This website was used by the study team to compile status information on the Global Combat Control System program.

36. Brief; <u>GCSS-MC United States Marine Corps Materiel Command ILC Training Offsite</u>; Headquarters, United States Marine Corps; Washington, D.C. 25 September 2003. UNCLASSIFIED.

This brief, presented on 25 September 2002 by Lieutenant Colonel Scott Koster for a Materiel Command Integrated Logistics Capability Training Offsite, contains a Global Combat Support System - Marine Corps Planning and Execution slide depicting milestones to include Common Logistics Command and Control System Support version one implementation in the 2003 – 2005 timeframe. Also, this document contains Global Combat Support System - Marine Corps Functional Architecture graphics and milestones, capability graphics and descriptions, and

information on the Expanded Validation at Second Marine Expeditionary Force. This brief was used to compile status information on the Common Logistics Command and Control System Support and Global Combat Support System - Marine Corps programs.

37. Brief; <u>Velocity Management: An Approach for Improving the Responsiveness and Efficiency of Army Logistics Processes</u>; Dumond, John; Eden, Rick; Folkeson, John; Arroyo Center, RAND. 1995. UNCLASSIFIED.

This documented brief, which contains detailed speaker notes, describes the Army's approach to improving the responsiveness and efficiency of Army logistics. This documented brief provided information on the United States Army's business process scheme and was used by the study team for comparative analysis in the research phase of the study.

38. Chairman of the Joint Chiefs of Staff Manual 3500.04C; <u>Universal Joint Task List (UJTL)</u>; Joint Staff; Washington, D.C. 01 July 2002. UNCLASSIFIED.

The Universal Joint Task List provides a common language and reference system for various users to include joint force commanders, strategic and operational planners, combat developers, combat support personnel, and trainers. When augmented with the Service task lists, it is a comprehensive integrated menu of functional tasks, conditions, measures, and criteria supporting all levels of the Department of Defense in executing the National Military Strategy. The study team used the Universal Joint Task List as a source of basic information to provide a common language and reference system for various users and study analysts.

39. Data Sheet; <u>Common Logistics Command and Control System</u>; Command Automated Program/ Information System; Headquarters, United States Marine Corps; Washington, D.C. 03 December 2003. UNCLASSIFIED.

The Marine Corps Systems Command Command Automated Program/Information System contains information on the Global Combat Support System - Marine Corps program certified as of 26 August 2003. The Common Logistics Command and Control System is a web enabled automated combat service support planning and execution tool. It is designed to provide the commander and his logisticians with an effective means to plan and execute combat service support functions, tasks, and missions. The objective of this system is to improve small unit logistics through increased efficiencies in combat service support units. The system is planned to provide the capability to retrieve information from a variety of logistics systems. This information outlined how the Small Unit Logistics program provided the baseline for this program. The study team used this website to compile status information on Common Logistics Command and Control System program.

40. Data Sheet; <u>Global Combat Support System</u>; Command Automated Program/ Information System; Headquarters, United States Marine Corps; Washington, D.C. 03 December 2003. UNCLASSIFIED.

The Global Combat Support System is a concept for implementing Joint Vision 2010 Focused Logistics. Focused Logistics is the fusion of information, logistics, and transportation technologies to enable warfighters to be more mobile and versatile.

The system integrates currently operating systems with emerging technologies in the shared data environment across the spectrum of combat service support functions. This database was used to compile status information on the Global Combat Support System - Marine Corps program.

41. Database; <u>Logistics Management Information System Database</u>; KPMG Consulting; Arlington, Virginia. 19 June 2002. UNCLASSIFIED.

The Logistics Management Information System database consists of three distinct files. The Troop List file provides the description and reference data for individual units in the Marine Corps. The Equipment Allowance file lists the established equipment allowances for units. The Item Data File contains the description and reference data for principal end items of equipment.

This document is the Item Data File portion of the data dictionary for the Logistics Management Information System database. The document provides details of all the data elements in each field and in each column of the Logistics Management Information System database. The study team used this document to interpret the Logistics Management Information System database.

42. Department of Defense News Release Number 775-03; <u>DoD Announces Radio Frequency Identification Policy</u>; Department of Defense; Washington, D.C. (www.defenselink.mil) 23 October 2003. UNCLASSIFIED.

This Department of Defense announcement establishes a Radio Frequency Identification Policy to improve the management of inventory. The new policy requires electronic tags on all inventory except bulk commodities such as sand, gravel, and liquids. The Radio Frequency Identification will account for and identify inventories which will allow the Department of Defense to realign resources, streamline business processes, and facilitate all aspects of the supply chain. This reference pertains to most Department of Defense materiel provisioning and handling operational procedures and techniques and was reviewed for study application.

43. Doctrine; <u>Marine Corps Doctrinal Publication 1-0 Excerpts (EMW, OMFTS and STOM)</u>; Headquarters, United States Marine Corps; Washington, DC. 21 September 2001. UNCLASSIFIED.

This document explains how Expeditionary Maneuver Warfare, Operational Maneuver from the Sea, and Ship to Objective Maneuver are inter-related. Expeditionary Maneuver Warfare focuses on support and sustainment: providing focused logistics to enable power projection independent of host nation and against distance objectives across the breadth and depth of a theater of operations. It is the Marine Corps capstone operational concept. The doctrine focuses on realizing the *Marine Corps Strategy 21* vision of future Marine forces with enhanced expeditionary power projection capabilities linking Marine Corps concepts and vision for integration with emerging joint concepts.

Operational Maneuver from the Sea applies maneuver warfare to expeditionary power projection in naval operations as part of a joint or multinational campaign. Operational Maneuver from the Sea allows the force to exploit the sea as maneuver space while applying combat power ashore to achieve operational objectives. It enables the force to shatter the enemy's cohesion; pose menacing dilemmas; apply disruptive firepower; establish superior tempo; focus efforts to maximize effect; exploit opportunity; and strike unexpectedly.

Ship to Objective Maneuver is the tactical implementation of Operational Maneuver from the Sea by the Marine Air Ground Task Force to achieve the joint force commander's operational objectives. It is the application of maneuver warfare to amphibious operations at the tactical level of war. The study team used these excerpts as background research related to seabasing and logistics support tasks.

44. Document: Advances in C4ISR Architectures: AFCEA Coursebook 504D; Levis, Alexander H. and Wagenhals, Lee W.; The Armed Forces Communications and Electronics Association; Fairfax, Virginia. 09-11 May 2001. UNCLASSIFIED.

This coursebook contains briefing materials presented during the AFCEA Course. This document describes Object Orientation, includes product examples, and maps Object Orientation products to Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture products. Additionally, this course describes Architecture evaluation through Petri Net model execution.

Advances in Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture is a course offered through the Armed Forces Communications and Electronics Association Educational Foundation that addresses Object Orientation and architecture model evaluation. This document was used to interpret the Integrated Logistics Capability Operational Architecture developed based on the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture Framework. Specifically, this document was reviewed to help understand non-specific Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture products included in the Integrated Logistics Capability Operational Architecture (e.g. the functional flows).

45. Document; Analysing Amphibious Logistics Capabilities In The Joint Theater Level Simulation (JTRLS); Cwick, Major Mark J.; United States Marine Corps; United States Naval Academy, Naval Postgraduate School; Monterey, California. September 1996. UNCLASSIFIED.

The objective of this thesis is to develop a methodology for quantitatively evaluating the data produced by Computer Aided Exercise and presenting graphical analysis. This thesis is based on the Universal Joint Task List and was reviewed as a sample analysis of logistics operations relative to this study.

46. Document; Business Enterprise Architecture – Logistics (BEA-LOG) Operational View Model Guide; United States Marine Corps. 27 August 2003. UNCLASSIFIED.

The Business Enterprise Architecture Logistics is a process oriented model reflecting logistics from the Office of the Secretary of Defense perspective. It is organized in alignment with the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture Framework and uses Supply Chain Operations Reference Model components to describe the Office of the Secretary of Defense Supply Chain. This model depicts the logistics function of the Department of Defense's business Enterprise Architecture. The goal is to incorporate the entire logistics domain into this architecture.

The Business Enterprise Architecture Logistics looks very similar to the Integrated Logistics Capability Operational Architecture; this is likely because both models are built using Supply Chain Operations Reference components. The study team used this product to search for any tasks that may be pertinent to this study.

47. Document; <u>C4ISR Architecture Framework Implementation: AFCEA Workbook 5030</u>; Levis, Alexander H. and Wagenhals, Lee W.; The Armed Forces Communications and Electronics Association; Fairfax, Virginia. 23-26 January 2001. UNCLASSIFIED.

This document defines and describes the various components of the Government standard Enterprise Architecture Framework: The Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture Framework. This architecture is comprised of three views: Operational, Technical, and Systems. Each view is comprised of many products that detail the architecture view and is accomplished through text narratives and graphic examples. The document contains a glossary, acronym list, reference models, sources, delineates essential products, and discusses product interrelationships.

The Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture is the Department of Defense framework for standardized architecture development and presentation. This document was used to interpret the Integrated Logistics Capability Operational Architecture that was to be developed based on the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Architecture framework.

48. Document; <u>Implementing and Managing Enterprise Architecture</u>; Barnett Data Systems and The Zachman Institute for Framework Advancement; Pinckney, Michigan. UNCLASSIFIED.

The Zachman Enterprise Architecture is a framework for capturing and codifying data on what, how, where, who, when, and why of an organization; these interrogatives translate to data, function, network, people, time, and motivation in the Zachman Framework. Enterprise information is captured at the highest level from the planner perspective defining the scope of the enterprise. Subsequent levels downward on the framework increase granularity in describing the enterprise for the owner, then designer, then builder, and then finally the subcontractor.

The purpose of developing an enterprise architecture is to document a business in sufficient detail to manage and implement change in the organization. An enterprise architecture is an essential foundation for successful Information Technology/Information System design.

The Zachman Enterprise Architecture Framework is an example of commercial sector enterprise architecture. These materials were used by the study team as background reference material to better understand the purpose, development, and implementation of enterprise architectures.

49. Document; <u>Integrated Logistics Capability Operational Architecture, Final Deliverable</u>; Stanley Associates, Inc.; Alexandria, Virginia. 20 June 2002. UNCLASSIFIED.

This document was developed for the Integrated Logistics Capability Center at Headquarters, Marine Corps. The Integrated Logistics Capability Operational Architecture is based on the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance framework that outlines Department of Defense architecture artifacts. The Marine Corps logistics architecture is a blueprint for planning, managing, executing, and measuring the Marine Corps Logistics enterprise. The purpose of the architecture effort was to develop an Operational Architecture for the Marine Corps that will support implementation of enterprise wide processes for combat service support via Global Combat Support System - Marine Corps. The Integrated Logistics Capability Operational Architecture displays a standard and generic view of the "To be" Marine Corps logistics enterprise for implementation in the 2004-2006 timeframe. The "To be" supply chain, referred to as the logistics chain, is responsible for demand generation, operator level maintenance, and resources. The Supplier 1 function supports all customer demands and maintains communication with the customer and connectivity with the supplier N; Supplier 1 node functions are the boundary for this study.

The Functional Flows became the focal point of analysis and information from the Functional Flows (pertaining to the Supplier 1) was extracted to become the basis for the study task matrix. This document was used by the study team to compile the list of Supplier 1 Node Tasks required for the foundation of study.

50. Document; <u>Mapping the Zachman Framework to the C4ISR Architecture Framework</u>; Mitre Corporation. 03 September 1999. UNCLASSIFIED.

This brief compares the commercial sector framework of the Zachman Enterprise Architecture Framework to the Government Architecture Framework (the Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance Framework). This document was used to interpret the Integrated Logistics Capability Operational Architecture and to mitigate the risk of any possible subject area shortfalls.

51. Document; <u>Marine Corps Strategy 21</u>; Headquarters, United States Marine Corps; Washington, D.C. 03 November 2000. UNCLASSIFIED.

This document is the Marine Corps "axis of advance" into the 21st Century and focuses the service's efforts and resources toward a common objective. This strategy enables the Marine Corps to build upon its foundations of heritage, innovation, and excellence in order to succeed on tomorrow's battlefields.

Marine Corp Strategy 21 provides the visions, goals, and aims to support the development of future combat capabilities. It provides strategic guidance to Marines and civilian personnel who will make America's Marines win our Nation's battles and create quality citizens by optimizing the Marine Corps operating forces, support, sustainment base, unique capabilities, and capitalizing on innovation, experimentation, and technology.

Drawn from the strategic guidance contained in the *National Security Strategy, National Military Strategy, Joint Vision 2020*, and *Forward…From the Sea* and crafted from the Marine Corps' Vision and the philosophy contained in Marine Corps Doctrinal Publication 1, *Warfighting, Marine Corps Strategy 21* provides the framework necessary to forge our future Corps. This document describes how the Marine Corps will evolve, grow, and transition for the future and was used to determine future operational concepts and derive logistical support tasks.

52. Document; <u>Maritime Prepositioning Force 2010 and Beyond</u>; Headquarters, United States Marine Corps; Washington, D.C. 30 December 1997. UNCLASSIFIED.

This document explores the current concepts for supporting littoral power projection, and the role of the Maritime Prepositioning Force in these operations. It discusses the Maritime Prepositioning Forces role in sustainment, reconstitution, regeneration, and seabasing.

Maritime Prepositioning Force 2010 and Beyond is the concept by which next generation Maritime Prepositioning Force's will contribute to forward presence and power projection; capabilities that will remain central to United States deterrence and conflict resolution strategies well into the future. The enhancements envisioned in this document will expand the functionality of the future Maritime Prepositioning Force across an increased range of contingencies. This concept is best illustrated through an examination of the pillars of future Maritime Prepositioning Force operations, force closure, amphibious task force integration, indefinite sustainment, and reconstitution.

Maritime Prepositioning Force 2010 and Beyond established a true United States seabasing capability, while enhancing force protection for forward deployed Soldiers, Sailors, and Marines. Free from dependence on shore based facilities and overflight considerations, this concept offers operational flexibility to civilian and military leaders. The study team used this document for background research into seabasing, and the projected role of the Maritime Prepositioning Force in support of future Marine Corps logistical support tasks.

53. Document; <u>Supply Chain Operations Reference Model Version 5.0</u>; Supply Chain Council, Inc.; Pittsburgh, Pennsylvania. 2000. UNCLASSIFIED.

This document defines and describes the Supply Chain Operations Reference model. The model is organized around five primary management processes of Plan, Source, Make, Deliver, and Return. These processes are broken down into progressively more detailed descriptions categorized by levels. At level two, the model provides 30 process categories. The Supply Chain Operations Reference model provides information to level three, the process element level. The implementation model, level four, is not provided in the Supply Chain Operations Reference document; this level is to be developed by each individual enterprise based on the artifacts provided in the Supply Chain Operations Reference model at levels one through three. The Supply Chain Operations Reference model diagrams are building blocks that organizations can use to describe their supply chain and subsequently implement business process improvements. The Supply Chain Operations Reference model was the basis for the Integrated Logistics Capability Operational Architecture.

The Supply Chain Operations Reference model is used to describe business activities associated with all phases of satisfying a customer's demand. This document was used to understand information in the Integrated Logistics Capability Operational Architecture; specifically, to understand references made to the Supply Chain Operations Reference model throughout the Integrated Logistics Capability Operational Architecture documentation.

54. Document; United States Marine Corps Logistics Campaign Plan - 2002; Headquarters, United States Marine Corps; Washington, D.C. 2002. UNCLASSIFIED.

The Marine Corps Logistics Campaign Plan was developed to articulate the logistics strategy for achieving the current and future vision of the Marine Corps. The goals, objectives, and tasks outlined in this plan are designed to position and/or evolve specific logistics functions and capabilities to enhance the expeditionary and joint warfighting capabilities of the entire Marine Air Ground Task Force. The plan addresses logistics at the strategic, operational, and tactical levels. It validates and implements Integrated Logistics Capability recommendations regarding secondary repairable management and echelons of maintenance.

Current capabilities and future warfighting concepts embodied by Expeditionary Maneuver Warfare will be defined by Marine Corps logistics capabilities or limitations, hence the commitment to this plan by all echelons of the logistics community. The study team used this document as background information in the research phase of the study.

55. Document; United States Marine Corps Military Occupational Specialty Chart; Training and Education Command, United States Marine Corps; Washington, DC. April 2003. UNCLASSIFIED.

The United States Marine Corps Military Occupational Specialty Chart identifies all the occupational specialties available in the Marine Corps by numeric code, title, grade, and Department of Defense code, for both officer and enlisted specialties. The chart was used to assist in identifying those specialties that will be involved with the various logistics tasks identified in the S1 node, as well as subordinate tasks required to provide measurable functions to determine time criteria for logistics tasks.

56. Information System; Command Automated Program/Information System (CAPS); Marine Corps Systems Command; Quantico, VA. March 2003. UNCLASSIFIED.

The Command Automated Program/Information System is a Marine Corps Systems Command database which provides for the development and generation of electronic documents in standard format; conversion of on hand paper and microfilm documents into electronic digital images; distribution of those documents to authorized users; manipulation of the documents; provision of improved user access, control and storage of files; and enhancement of overall productivity of the command. The study team utilized this information system to research tables of organization and tables of equipment to identify critical skill sets, equipment, and vehicles.

57. **Internet Website; <u>Marine Corps Logistics Enterprise Integration Center LPV-4 Website</u>; Headquarters, United States Marine Corps; Washington, D.C. (www.hqmc.usmc.mil/ LPI.NSF/). 03 December 2003. UNCLASSIFIED.**

This website defines Global Combat Support System - Marine Corps and outlines what the program offers the Marine Corps. Additionally, this site contains links to the Global Combat Support System - Marine Corps charter, organization chart, strategy and process approaches, integration Planning and Strategy, Portfolio, and a Marine Corps Systems Command developed Marine Corps Gazette article. This website was used to compile status information on the Global Combat Support System program.

58. **Internet Website; <u>Naval Facilities Engineering Service Center</u>; United States Navy. (http://www.nfesc.navy.mil). 03 December 2003. UNCLASSIFIED.**

This website contains program descriptions for 25 projects to include Common Logistics Command and Control System Support and its predecessor, the Small Unit Logistics program. A position paper on Common Logistics Command and Control System Support was discovered by conducting an internet search. While information on the Common Logistics Command and Control System Support program is limited to a one sentence description, detailed information was available on the Small Unit Logistics program to include a reference model depicting its system integration capabilities: legacy applications, Rapid Request Tracking, Asset Management, and Unit Readiness and Critical Alerts, etc. Additionally, information on Operational Maneuver From the Sea Modeling and Simulation Tools contained detailed information on two projects: The Tactical Logistics Distribution System, know as T.LoaDS and Seabased Logistics Distribution System or C.LoaDS. These tools assess current or future tactical or seabased distribution systems. The system owners and developers believe these models can be used to support the development of new simulations exploring the service and transportation demands of other combat support and combat service support functions. These tools are in the beta stage of development and are conditionally available to Department of Defense users. This website was used to compile status information on Common Logistics Command and Control System Support and to research logistics simulation tools.

59. **Marine Corps Bulletin 3000; <u>Table of Marine Corps Ground Equipment Resource Reporting (MCGERR) Equipment</u>; Commandant, Headquarters United States Marine Corps; Washington, D.C. 10 January 2003. UNCLASSIFIED.**

Equipment readiness reporting provides information which can be used to measure a unit's ability to perform its assigned wartime mission. This bulletin publishes the ground equipment that is readiness reportable by Marine Corps organizations. This equipment has been determined to be mission essential.

This bulletin details the tabular information contained within the enclosures describing the information and what it means to the user. Three enclosures are in the document. Enclosure (1) identifies the actual list of readiness reportable equipment. It includes Table of Allowance Control Numbers, functional area codes, weapon system codes, item description, and Table of Equipment numbers. If a Table of Equipment number exists in column five for any Table of Allowance Control Numbers then the item is considered a pacing item. Enclosure (2) summarizes the equipment added, deleted or changed since the last update. Enclosure (3) contains the current list of weapon system management codes, telephone numbers by functional area, and weapon system codes. These codes help to facilitate life cycle management of the equipment contained in the bulletin.

Not all Marine Corps principal end items are contained in the document. Only a representative sample is included to provide adequate measure of equipment status and capability within the Marine forces. All Marine units including active, reserve, Maritime Prepositioning Ships, Norway Air Landed Marine Expeditionary Brigade and supporting establishments must report the status of their ground equipment in Enclosure (1) of this bulletin. All equipment listed in Enclosure (1) must be tracked in Marine Integrated Maintenance Management System and Asset Tracking for Logistics and Supply System Phase II+. The bulletin provides several action paragraphs to cover various unit configurations and mission configurations regarding what must be reported. This source document was used by the study team in the research phase of the study to identify readiness reportable equipment.

60. Marine Corps Doctrinal Publication 4; <u>Logistics</u>; Headquarters, United States Marine Corps; Washington, D.C. 21 February 1997. UNCLASSIFIED.

This Marine Corps Doctrinal Publication describes the theory and philosophy of military logistics as practiced by the Marine Corps. Marine Corps doctrine recognizes that logistics is an integral part of Warfighting. Logistics provides the resources to support combat power, brings them to the battlefield, and sustains them throughout military operations. The dynamic nature of Warfighting requires flexible and adaptable response to ever changing conditions.

The publication is broken down into three chapters: The Nature of Logistics, Logistics Theory, and Creating Effective Logistics. Each builds upon the preceding information to provide a comprehensive overview of Marine Corps Logistics practices. The study team used this document as background information to understanding logistics operations.

61. Marine Corps Order P1200.7Y; <u>Military Occupational Specialties Manual</u>; Headquarters, United States Marine Corps; Washington, DC. 07 April 2003. UNCLASSIFIED.

Marine Corps Order P1200.7Y is the Marine Corps Occupational System that allows the Human Resource Development Process to meet the needs of the Marine Corps in terms of personnel. The system identifies and codifies the personnel and skill requirements from the Combat Development System. Using the framework of occupational fields and military occupational specialties provided in the Military Occupational Specialties Manual, Total Force Structure is able to flesh out the various Marine Corps tables of organizations.

Marine Corps Order P1200.7Y will be used by the study team as background information for development of methodologies and algorithms.

62. Marine Corps Order 4400.192A; <u>Logistics Management Information System (LMIS)</u>; Headquarters, United States Marine Corps; Washington, D.C. 21 November 1997. UNCLASSIFIED.

This Marine Corps Order provides an update to policy and clarifies the source of data to support the automated logistics requirements of the Logistics Management Information System in support of the Marine Corps. The Logistics Management Information System contains the official table of equipment allowances and item descriptions within the Marine Corps. The study team used this document to identify vehicles and equipment and to evaluate how each impacts logistics capacity.

This document also provides a description of the three distinct files within the Logistics Management Information System database. The Troop List file provides the description and reference data for individual units in the Marine Corps. The Equipment Allowance File lists the established allowances for units. The Item Data File contains the description and reference data for principal end items of equipment.

63. Marine Corps Order, P4400.39H; <u>War Reserve Materiel Policy Manual</u>; Headquarters, United States Marine Corps; Washington, D.C. 12 March 2002. UNCLASSIFIED.

This Marine Corps Order published policy for general sustainment planning for the War Reserve Materiel Program. The objective of the War Reserve Materiel Program is to ensure that acceptable levels of materiel are available, when directed for assignment to a unified commander, to sustain the operating forces during crisis or combat operations in support of an assigned mission. The order was used by the study team to determine sustainment procedures for the operating forces.

64. Marine Corps Warfighting Publication 4-12; <u>Operational-Level Logistics</u>; Headquarters, United States Marine Corps; Washington, D.C. 30 January 2002. UNCLASSIFIED.

This Marine Corps War Publication addresses fundamental principles for the planning and execution of logistics for the Marine Corps component within a theater of operations; the relationships between the Marine Force logistics staff, the Marine Logistics Command, Marine Expeditionary Force logistics staff, and the Force Service Support Group.

The document also delineates the division of labor between the Marine Logistics Command and the Force Service Support Group by providing logistics employment guidance. This information was used by the study team as background information.

65. Marine Corps Warfighting Publication 5-1; <u>Marine Corps Planning Process</u>; Headquarters, United States Marine Corps; Washington, DC. 05 January 2000. UNCLASSIFIED.

The Marine Corps Planning Process describes and illustrates a variety of planning tools used to support the decision maker at the Marine Corps component, Marine Expeditionary Force, and major subordinate command levels. A responsible and flexible process that can adapt to the needs of any sized unit and timetable. Maneuver warfare doctrine of top down planning, single battle concept, and integrated planning to generate and maintain tempo is best demonstrated through the planning process. The study team used the information contained in this document as background information for development of methodologies and algorithms.

66. **Navy and Marine Corps 2907; <u>Maritime Prepositioning Force (MPF) Prepositioning Objective (PO)</u>; Department of the Navy; Washington, DC. 31 July 2002. UNCLASSIFIED.**

The Navy and Marine Corps 2907 provides a detailed listing of all supplies and equipment either loaded aboard a Maritime Prepositioning Ship Squadron or in the fly in echelon of a Maritime Prepositioning Force for an entire Marine Expeditionary Brigade. Updated annually through a series of working seminars, the document provides detailed operations planning information for Maritime Prepositioning Force exercises, deployments, and training.

Used in conjunction with Marine Corps Bulletin 3501, the document provides the most comprehensive description of a Marine Expeditionary Brigade and will be used by the study team as background information for development of methodologies and algorithms.

67. **OPNAVINST 3500.38A; <u>Universal Navy Task List (UNTL) Version 2.0</u>; Chief of Naval Operations; Washington, D.C. 01 May 2001. UNCLASSIFIED.**

The Universal Navy Task List is designed to promote interoperability for joint force and naval commanders by describing standard tasks, conditions, and measures in a common language and structure for the development of Navy Mission Essential Task Lists. The Universal Navy Task List is a combination of both the Universal Joint Task List for Strategic and Operational levels of war tasks and the Navy Tactical Task List. These tasks can be applied at multiple levels of war; for example, strategic, operational, and tactical, and represent actions or processes performed as part of an operation. The study team used this list as a source of basic information to provide a common language and reference system for various users and study analysts.

68. **Position Paper; <u>Ground Logistics Command and Control (GLC2) Information System</u>; Headquarters, United States Marine Corps; Washington, D.C. (Downloaded 03 December 2003 from www.hqmc.usmc.mil/LPI.nsf/). UNCLASSIFIED.**

This position paper describes a gap regarding a Ground Logistics Command and Control capability. Additionally, this paper describes capability requirements and profiles resources available to support a Ground Logistics Command and Control capability that includes Small Unit Logistics and Common Logistics Command and Control System Support funding. This paper was used to compile status information on the Common Logistics Command and Control System Support program.

69. **Report; <u>Designing and Assessing Supportability in DOD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint</u>; Office of Secretary of Defense, Department of Defense; Washington, D.C. 18 June 2003. UNCLASSIFIED.**

This report deals with efforts to increase the reliability and decrease the logistics footprint of Department of Defense weapons systems. It is a guide to provide program managers and their teams to design in and then assess the effectiveness of total life cycle systems management responsibilities in implementing performance based logistics strategies anywhere along the system's life cycle.

The report was provided to the study team by Professor Dinesh Verma of Stevens Institute of Technology and was used in research and background information.

70. Report; <u>TAM Summary Report-2002</u>; (Master Work Schedule); United States Marine Corps Materiel Command; Washington, D.C. 14 August 2002. UNCLASSIFIED.

This summary lists each principal end item and its major subcomponents. It is set up in table format and lists the Table of Authorized Materiel Control Numbers, the National Stock Number of the item and its subcomponents, the equipment nomenclature, and the Funded and Unfunded Quantities provided for at each maintenance center or other maintenance activity. The study team used this document as background information in the research phase of the study to identify equipment.

INTERVIEW SUMMARIES

Name of Person
***Visited/Interviewed*:** Mr. Henry C. Oxley

***Title*:** Project Director

***Organization*:** Marine Corps Systems Command
Marine Corps Logistics Base
Albany, Georgia 31704

***Date*:** 16 July 2003

Summary: The study team observed the final stages of the SEAWAY user acceptance testing. SEAWAY is a joint decision support system for Seabased logistics planning and coordination. The intended operator for SEAWAY will be the operating forces.

The SEAWAY software is due for delivery in August 2003. This delivery will constitute Interim Operating Capability for the program, with Full Operating Capability scheduled for January/February 2004.

Information gathered during this interview:

- The SEAWAY program is not a program of record meaning that it does not have its own approved funding line. The program falls into the Global Combat Support System - Marine Corps portfolio.

- Currently the program does not have an Acquisition Category designation because of the low dollar threshold – although they are likely to cross that line soon.

- SEAWAY currently interfaces with the Integrated Computerized Deployment which is the Joint Migration Embarkation system.

- SEAWAY is planned to become part of the Global Combat Support System – Marine Corps. No specific plans or schedules are available.

- SEAWAY is planned to interface with the Common Logistics Command and Control System in the future.

- SEAWAY functionally takes off where the Integrated Logistics Capability supply chain process ends. The two software packages are functionally complementary.

Mr. Oxley agreed to send us an informational CD ROM on SEAWAY being prepared by the developer at the end of July 2003. This information has not be received by the study team to date. The SEAWAY program may contain algorithms and/or data (factors) that may be used in this study.

Name of Person
Visited/Interviewed: Mr. A. Wood

Title: Vice President

Organization: CDM Technologies
2975 McMillan Avenue, Suite 272
San Luis Obispo, CA 93401

Date: 16 July 2003

Summary: Mr. Wood provided the functional details of SEAWAY, a Joint Decision Support System for Seabased Logistics Planning and Coordination. SEAWAY is a computer based battle space simulation program that provides current and future planning for a joint military exercise. The program is designed to assist by monitoring situational changes, providing alerts and warnings, and proposing appropriate changes in the execution plan. The SEAWAY program seeks to monitor that the right item is delivered at the right time, in the right amount, to the right unit, in the right package, and at the least cost in terms of re-supply capability.

The SEAWAY program is designed to allow for multiple computer users/multiple input that affects the battle space while tracking consumption rates for classes of supply. The program provides warnings as stocks are depleted that require re-supply and tracks real time movement of supplies which affects the operational aspect of the battle. Mr. Wood explained that SEAWAY tracks all shipping as it leaves the continental United States enroute to the objective area, as well as identifies what supplies are onboard each vessel, where they are stowed, and how long it will take to arrive in country. Using SEAWAY, operational commanders will have visibility of the impact that logistics trains have on their maneuver capability and the significance logistics has on the battle. Using SEAWAY, logisticians will be able to diagnose bottlenecks that effect the re-supply and develop workable solutions to ensure the continuous flow to the war fighter.

This demonstration provided a limited glimpse of the SEAWAY program and not a detailed analysis. This information is based on discussions with Mr. Wood and a few discussions with his technicians present in the room during a half hour of observation of the program. The study team researched the SEAWAY program to review the algorithms and data factors for study applicability. However, because the SEAWAY program has not yet been purchased by the Marine Corps, the study team was unable to review the data factors.

Name of Person
Visited/Interviewed: Mr. Juan Figueroa

Title: Analyst

Organization: Marine Corps Combat Development Command
Quantico, Virginia 22134

Date: 15 August 2003

Summary: Mr. Figueroa was interviewed because of his association as the lead contractor/analyst working with Mr. O'Bryan, the definitive resource for the Maritime Prepositioning Force (Future), and because of his knowledge of the Baseline 2015 Marine Expeditionary Brigade table of organization.

Mr. Figueroa verified that the Baseline 2015 Marine Expeditionary Brigade table of organization would provide the best example of a notional table of organization for planning purposes. However, he noted that changes to the table of organization, specifically how the Marine Expeditionary Brigade would deploy, were being presented to the Marine Requirements Oversight Council in October 2003. The overall numbers would not change, but the number deployed ashore and those to be seabased would. It is not clear how this would impact the Time Logistics Study at this time.

Mr. Figueroa did not believe that a notional table of equipment was available and agreed that a Maritime Prepositioning Ship Squadron table of equipment could be used.

Mr. Figueroa suggested to the team that a later discussion with Mr. O'Bryan upon his return would be beneficial.

The Baseline 2015 Marine Expeditionary Brigade table of organization and Maritime Prepositioning Ship Squadron table of equipment would provide the foundation for further development in the Timed Logistics Study.

Name of Person Visited/Interviewed: Mr. Francis P. Donahoe

Title: Deputy Director
Total Force Structure Division

Organization: Marine Corps Combat Development Command
Quantico, Virginia 22134

Date: 15 August 2003

Summary: Mr. Donahoe discussed the prospect of developing a notional table of organization and table of equipment for use during the Time Logistics Study. In discussion with Mr. Donahoe, it was understood that Total Force Structure has never developed a notional table of organization or table of equipment for study use. However, with Mr. Donahoe's insight into the force structure business for the Marine Corps, he was able to provide guidance to the study team on potential table of organizations and table of equipment that would be appropriate.

The Baseline 2015 Marine Expeditionary Brigade, developed for the Maritime Prepositioning Force (Future) study, does offer the best solution to a notional table of organization. The direction the baseline Marine Expeditionary Brigade table of organization is taking has been approved by the Marine Requirements Oversight Council, but the actual figures used in the table of organization have not. Still, it does offer a generic table of organization that would support the teams study efforts.

It was suggested to Mr. Donahoe that if the 2015 Marine Expeditionary Brigade table of organization were used, that perhaps a Maritime Prepositioning Ship Squadron table of equipment could be used to support it. Although it is a mechanized heavy table of equipment that does not directly fit the Baseline 2015 Marine Expeditionary Brigade, Mr. Donahoe thought that it could be used for planning purposes.

Mr. Donahoe suggested that Mr. Pat O'Bryan, Marine Corps Combat Development Command, could provide additional insight into the Baseline table of organization.

The Baseline 2015 Marine Expeditionary Brigade table of organization and Maritime Prepositioning Ship Squadron table of equipment would provide the foundation for further development in the Timed Logistics Study.

Name of Person Visited/Interviewed: Mr. Pat O'Bryan

Title: GS-13
Expeditionary Warfare Training, MPF(F)

Organization: Marine Corps Combat Development Command
Quantico, Virginia 22134

Date: 19 August 2003

Summary: Mr. O'Bryan, the definitive resource for the Maritime Prepositioning Force (Future), provided information on the Baseline 2015 Marine Expeditionary Brigade table of organization and table of equipment.

Mr. O'Bryan explained that the Baseline 2015 Marine Expeditionary Brigade table of organization was not approved by the Marine Requirements Oversight Council, but that the direction Mr. O'Bryan's study team was taking was approved. In October 2003, Mr. O'Bryan will be presenting an updated version of the table of organization that includes the numbers for seabasing and those deploying ashore. The presentation will also include a Maritime Prepositioning Force version and an amphibious version, the differences being primarily who stays afloat and who goes ashore. Despite the fact that the council has not approved the data for the Marine Expeditionary Brigade table of organization, Mr. O'Bryan said that the table of organization is the best example of a notional table of organization and could be used for planning purposes.

Furthermore, Mr. O'Bryan and his team developed a Baseline 2015 Marine Expeditionary Brigade table of equipment to support the table of organization. The table of equipment is available in Level Four detail. As such, this table of equipment is the best example of a notional table of equipment and could be used by the Timed Logistics Study.

Finally, Mr. O'Bryan explained that, currently, there is no notional table of organization or table of equipment available for study purposes. The Baseline 2015 Marine Expeditionary Brigade table of organization and table of equipment provide the best opportunity for this. He is currently trying to find a way to make the data available online to everyone, including contractors, but currently there are legal issues that prohibit its release. It is possible for the Timed Logistics Study to get a copy for planning purposes as Government Furnished Material and the study team will approach the study sponsor for access.

The Baseline 2015 Marine Expeditionary Brigade table of organization and table of equipment would provide the foundation for further development in the Timed Logistics Study.

Name of Person
Visited/Interviewed: Professor Dinesh Verma

Title: Director
Systems Design & Operational Effectiveness Program

Organization: Stevens Institute of Technology
Castle Point on Hudson
Hoboken, New Jersey 07030

Date: 12 September 2003

Summary: Professor Verma did not have any firsthand knowledge of the issues involved in the Timed Logistics study effort. However, he did send a copy of a recent report prepared by his research team for Office of the Secretary of Defense, "Designing and Assessing Supportability in DOD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint." This report deals with efforts to increase the reliability and decrease the logistics footprint of Department of Defense weapons systems.

The report provided by Professor Verma was read by the study team for applicability; the summary is contained in the List of References section of this Appendix.

Name of Person
Visited/Interviewed: Mr. Keith Rineaman

Organization: Headquarters, Code LPI
United States Marine Corps
Washington, D.C. 20380

Date: 15 September 2003

Summary: Mr. Rineaman is a Government Subject Matter Expert on the Marine Corps Logistics Operational Architecture (formerly known as the Integrated Logistics Capability Operational Architecture) from Headquarters, Marine Corps (Code LPI). He and the study team discussed issues regarding the Logistics Operational Architecture and its use in the study. Mr. Rineaman was familiar with the specific artifacts of the Logistics Operational Architecture and confirmed that the Functional Flows, provided in appendix 02, equate to the logistics tasks contained in the Logistics Operational Architecture. Mr. Rineaman indicated that the Functional Flows are the architecture and serve as the core of the model. He directed the study team to specific architecture components that would help with the study to include the future process to roles allocation. Mr. Rineaman further suggested the study team reuse some of the use cases presented in the Logistics Operational Architecture as seabase scenarios are developed and as the study progresses.

Based on meeting discussions, Mr. Rineaman agreed to provide identified information to the study team: the Supply Chain Operational Reference model, a Logistics Operational Architecture, and Business Enterprise Architecture Logistics mapping brief, as well as some preliminary algorithms for metrics analysis.

This interview/meeting pinpointed applicable artifacts of the Logistics Operational Architecture pertinent to this study and confirmed the study team's analysis of the Logistics Operational Architecture.

Name of Person Visited/Interviewed: Mr. David Lick

Title: Maintenance Analyst

Organization: SRA International, Inc.
4300 Fair Lakes Court
Fairfax, Virginia 22033

Date: 25 November 2003

Summary: Mr. Lick met with the study team to discuss the draft task list prepared for the study seminar. This meeting developed in response to a request for the complete Integrated Logistics Capability Operational Architecture Activity Model (Operational View - 5). The study team requested this missing chapter of the architecture after determining that it contained task data relevant to the task list. Mr. Lick agreed to meet at the Decision Engineering facilities to deliver the missing activity model information and to discuss the possibility of revising the previously submitted draft task lists with new data derived from the Operational View - 5.

Mr. Lick mentioned that he had concerns about the previously submitted draft task list; specifically that it did not map directly in the Logistics Operational Architecture Functional Flows. Mr. Lick updated the study team on current Logistics Modernization activities to include the acquisition of a web enabled architecture repository and collaboration between the Office of the Secretary of Defense Future Logistics Enterprise architecture. The new architecture repository should facilitate subscribership functions to update partners with the most current Logistics Operational Architecture artifacts. Mr. Lick informed the study team that the version of the Supply Chain Operations Resource model used to develop the Logistics Operational Architecture was an earlier version than currently published by the Supply Chain Command.

The study team briefed Mr. Lick on their process and sources used to produce the draft task list. Also, the study team presented Mr. Lick with a proposed revised draft task list that included tasks derived from the Operational View - 5 Supply Chain Operations Reference model mapping to the Logistics Operational Architecture Process Flows document.

Mr. Lick responded that the Operational View - 5 has not been validated by functional experts and he preferred that we use tasks in the functional flows to complete the task list. Additionally, Mr. Lick mentioned that the Logistics Operational Architecture had never been cross validated to ensure full information integration and consistency between all of the architecture components.

The study team and Mr. Lick agreed that the follow on step was to recompile the task list using Supplier One related tasks identified in the Operational View - 2 and the functional flow tasks in preparation for the upcoming study seminar.

Name of Person
Visited/Interviewed: Mr. David Lick

Title: Maintenance Analyst

Organization: SRA International, Inc.
4300 Fair Lakes Court
Fairfax, Virginia 22033

Date: 01 December 2003

Summary: The study team contacted Mr. Lick by telephone to follow up on the 25 November 2003 meeting. Specifically discussed was a draft copy of the task list under development for the 18-19 December 2003 study seminar. Mr. Lick mentioned the tasks were correct on the draft submitted to him the previous week. The study team also described additional modifications made to the draft task list. The study team incorporated Mr. Lick's comments from the 25 November 2003 meeting on the original draft task list to ensure all tasks are traceable to the Integrated Logistics Capability Operational Architecture Functional Flows. To highlight the relationship between the Functional Flows and the seminar task list, individual Functional Flow task numbers (taken directly from the Functional Flows artifact) were added to the seminar task list. The study leader would have the authority to submit the revised draft copy to the Government for review/approval.

Additionally, Mr. Lick mentioned that the Government wished to filter out non-critical tasks related to planning/management. Options the Government might want to consider to accomplish their desired filtering, such as color coding and rearranging task data to filter without permanently deleting them from the task list, were discussed. The final Government decision would have to be discussed further by the principal decision makers in preparation for the study seminar.

After listening to several examples provided by Mr. Lick, the study team queried whether the draft task list was laid out appropriately to capture the right information at the study seminar. Mr. Lick replied that it was not and that the study team should investigate an alternative format.

The information exchanged during this meeting directly affected the product, the task list, for the upcoming study seminar scheduled for 18-19 December 2003.

Name of Person
Visited/Interviewed: Mr. David Lick

Title: Maintenance Analyst

Organization: SRA International, Inc.
4300 Fair Lakes Court
Fairfax, Virginia 22033

Date: 03 December 2003

Summary: Via a telephone conversation, the study team contacted Mr. Lick to follow up on their 01 December 2003 phone conversation. Regarding the format of the draft task list, the study team asked Mr. Lick if the task list should be presented in the format of the Integrated Logistics Capability Operational Architecture Use Cases because they are functional oriented scenarios that mimic everyday work environment activities. Mr. Lick confirmed the best format would be that of the Integrated Logistics Capability Operational Architecture Use Cases.

Name/Title/Organization of Person Visited/Interviewed: Commander R.A. Edgar, HQMC, Medical Logistics
Major Craig Barnett, HQMC, Ground Supply Officer
Major Fred Hyden, HQMC, Traffic Management Officer
Major Calvin Hynes, MCCDC, Electronic Maintenance Officer
Major C.R. Johnson, HQMC, Logistics Officer
Major Kenneth Lasure, HQMC, Logistics Officer
Major G.D. Pointon, HQMC, Aviation Supply Officer
CWO-5 M.T. Brletich, HQMC, Supply Officer
CWO-5 Norm Kilgore, HQMC, Motor Transport Officer
CWO4 T.L. Kunneman, HQMC, Fuels Officer
Master Gunnery Sergeant K.M. Carter , HQMC, Maintenance Management SNCO
Master Gunnery Sergeant W.T. Richardson, HQMC, Embarkation Officer
Master Sergeant, R.J. Goode, HQMC, Ordnance Vehicle Maint Chief
Mrs. Carol Lager, MCCDC, COR
Mr. David Lick, HQMC, Ordnance Officer

Date: 18-19 December 2003

Summary: This interview provides a summary of the Study of Establishing Time Criteria for Logistics Tasks Seminar Simulation Exercise (Phase One) conducted December 18 and 19, 2003 at Decision Engineering Associates, LLC, Dumfries, Virginia. The purpose of the seminar was to bring together a diverse group of United States Marine Corps logistics and operational experts to evaluate the logistics tasks, and the time and resources required to complete those tasks in support of a forward deployed, seabased Marine Air Ground Task Force.

The seminar began with introductions of all attendees, administrative remarks, and a brief discussion of the study background and efforts to date. The original purpose of the seminar was established to link logistics tasks from the Logistics Operational Architecture, to the time and the associated resources of personnel, vehicles, and materiel handling equipment required performing the task. However, given the time constraints available to conduct the seminar, and the length of the task list to review, a determination was made to reduce the scope of the seminar to include a review of those tasks requiring specific manual intervention to accomplish.

The seminar began with a discussion of the scenario to be used to place the logistics tasks in the context of a Marine Expeditionary Brigade, constituted as envisioned for 2015 by the Marine Corps, operating from a seabased environment, and utilizing the Maritime Prepositioning Force (Future). The seminar scenario and notional force list was provided in a read ahead package.

The use cases discussed and analyzed during the seminar were taken from the Logistics Operational Architecture and these were described. The use cases focused on the processes and procedures to fulfill product orders. It was noted the Logistics Operational Architecture was designed for ground systems and does not cover Marine Corps aviation.

Seminar participants reviewed each use case task list to identify those steps where a person is clearly involved in the operation. Other steps were deemed to be accomplished by an automated system and would not require a significant amount of time, nor any additional resources, to accomplish. As such, those steps would provide no value to the study. By removing those steps, the task list was narrowed down to a manageable level. Time and resource criteria will be assigned to those tasks during phase two of the seminar. Knowing there are a variety of products, a notional small, medium, and large commodity will be used to establish the time criteria for the logistics tasks. Each use case was discussed, with some duplication of tasks noted. A consensus, where possible, formed around the designation of each task requiring manual intervention. If there was some doubt, a question mark was used to identify those tasks where further analysis would be necessary.

The seminar conducted provided the Study Team with solid information necessary to continue to further refine the logistics tasks associated with each use case. These specific use cases are the baseline for the study.

Name/Title/Organization of Person
Visited/Interviewed: Major Calvin Hynes, MCCDC, Electronic Maintenance Officer
Major C.R. Johnson, HQMC, Logistics Officer
Major Kenneth Lasure, HQMC, Logistics Officer
Major G.D. Pointon, HQMC, Aviation Supply Officer
Captain Eric Wolf, HQMC, Logistics Analyst
CWO-5 M.T. Brletich, HQMC, Supply Officer
Master Sergeant, R.J. Goode, HQMC, Ordnance Vehicle Maintenance Chief
Master Sergeant Alvin Winborne, HQMC, MT Occupational Field Sponsor
Mrs. Carol Lager, MCCDC, COR
Mr. David Lick, HQMC, Ordnance Officer

Date: 01-02 March 2004

Summary: This interview provides a summary of the Study of Establishing Time Criteria for Logistics Tasks Seminar Simulation Exercise (Phase Two) conducted March 1 – 2, 2004 by Decision Engineering Associates, LLC, at the Wargaming Division, Marine Corps Base, Quantico, Virginia. The purpose of the seminar was to bring together a diverse group of United States Marine Corps logistics and operational experts to evaluate the logistics tasks, and the time and resources required to complete those tasks in support of a forward deployed, seabased Marine Air Ground Task Force. This seminar completes the process begun in the December 2003 seminar simulation exercise.

In the time between the two seminars, the study team made further refinements of the information gathered in the first seminar and took preliminary steps to identify the critical skill sets, vehicles, and other resources associated with the identified tasks. This allowed phase two seminar participants to critique the study team's effort while providing a starting point for discussions. A main focus of phase two was to also establish time criteria for each of the steps in the logistics use case processes. In addition, information required for the development of the time criteria methodology required in study Task Three was gathered and discussed.

Subject matter experts assisted Decision Engineering logisticians with filling in the blanks on the logistics task matrix created by the study team in order to establish task timings using a best case, most likely, and worst case estimate, and then identified critical resources needed to fulfill the tasks.

Critical resources identified included personnel, by Military Occupational Specialty, transportation assets required, and materiel handling equipment. An assumption was made that the generic product provided under the appropriate use cases, such as a spare part, would most likely be man portable, or able to be grabbed off the shelf by one person and taken to a staging area. It was quickly apparent to seminar participants that many steps in the various use cases were duplicative. Further, it was felt that such duplication usually resulted in the same time criteria being assigned to those steps across the various use cases. Because of this, the seminar was able to focus on several key use cases in the limited time available.

An assumption was made that any particular personnel resource would be tied to that step for the time required to complete it. Vehicles required in accomplishing the steps were discussed in generic terms, such as surface and air transportation assets. Surface transportation was then broken into sea transport and land transport. Operating from a seabase, surface transportation times combine the slower ship to shore transit with the overland transit. Air transportation assets would operate directly from the seabase to the delivery point. The transportation distribution assumption made for the seminar and follow on tasks held that 70% of logistics trips are made by air and 30% by surface vehicles, such as landing craft and trucks. Finally, materiel handling equipment necessary to move and stage equipment was discussed. These items include forklifts, cranes, and other devices, both afloat and ashore. The seminar assumption that most non-scheduled items required to support forces ashore would be man portable, determined discussion of this equipment is not necessary. Unless the product dimensions changed, which would shift the time criteria to the longer time, it was assumed that the sea base and operating forces would have sufficient materiel handling equipment to meet expected requirements.

The seminar conducted provided the study team with solid information necessary to proceed with determining a methodology for estimating time criteria based on the logistics tasks associated with each use case.

Name of Person Visited/Interviewed: Mr. David Lick
Major George Pointon

Title: Ordnance Officer (Study Sponsor's Representative)
Marine Corps Aviation Supply Officer, Technical Study Project Officer

Organization: Headquarters
United States Marine Corps
Washington, D.C. 20380

Date: 23 March 2004

Summary: The purpose of this meeting and informal workshop was to review the work performed on the 15 use cases by the study team since the Seminar Simulation Exercise held on March 1 and 2, 2004. During the seminar, representative cases were considered and evaluated by the participants. Using that data as a basis for further analysis, the study team calculated times and determined resources for the remaining use cases.

During this meeting, the government's Technical Study Project Officer and the Study Sponsor's representative reviewed the data to verify its accuracy. Upon completion of the review, the study team asked whether or not the government wanted an updated version of the use cases containing the government feedback from this meeting. The Technical Study Project Officer responded that was not necessary at this time, but to wait until the model is ready before doing additional work on the use cases.

Further discussion involved the production of the model. Dr. Dillon-Merrill briefed the government representatives on model progress to date. The Technical Study Project Officer requested to see the model as soon as a workable draft product was available. This is expected to be approximately sometime between April 2-8, 2004. Tentative plans were made to meet during that time.

Name of Person Visited/Interviewed: Major George Pointon
Captain Eric Wolf

Title: Marine Corps Aviation Supply Officer, Technical Study Project Officer
Marine Corps Logistics Analyst

Organization: Headquarters, Installations & Logistics (LX)
United States Marine Corps
Washington, D.C. 20380

Date: 2 April 2004

Summary: The purpose of this meeting, held at Georgetown University, was to provide the study team with government feedback on work being done with the Logistics Operational Architecture Use Cases. Dr. Dillon-Merrill provided attendees with the latest version of the use cases with items that needed to be discussed highlighted for ease of reference. The following were key points from the discussion.

Major Pointon stated that the distributions assessed for each of the steps in each use case in general is pessimistic (skewed to the right) especially for the year 2015. Dr. Dillon-Merrill will develop and present a proposal for a uniform way to consider a distribution that is shifted to the left but that is still based on the assessments from the workshop. This will be presented as an alternative to compare to the base-case that will be a beta distribution with parameters fit from the workshop assessments.

The last step in the Stocked and Non/Not/Out of Stock use case (Item is installed, if required) will only occur some of the time. Per Major Pointon, for now, the study team can assume 20%. However, further input on that number will be needed.

The frequency/number of actions per day ranges provided (0-20, etc.) are currently used as minimum and maximum values to define uniform distributions for the likelihood of each process. Assuming a uniform distribution is probably not a good assumption, but to improve this, most likely values are also needed. Major Pointon and Captain Wolf will provide further input on these values, but this could be simply a refinement that needs to occur in Task Four.

At this stage, the study team will constrain anything based on resources, but instead use the simulation to identify "how many hours of …" each resource will be required for a typical day. For example, the study team will determine hours of Request Management, Order Management, Distribution Capacity Management, Inventory Capacity Management, air transportation, surface transportation, Inventory Execution, Distribution Execution, etc.

In addition to the results based on the item above, the study team will present all the cumulative times for each Process (use case that in some instances was modified or simplified as appropriate), and also the top five drivers of the times (i.e., transportation, step #38, etc.) in a graphical form. The time criteria model and methodology discussion formed the basis for Task Three of the study.

Name of Person Visited/Interviewed: Captain Wilfred Rivera

Title: Captain, United States Marine Corps

Organization: Headquarters, Installations & Logistics (LPV-3)
United States Marine Corps
Washington, D.C. 20380

Date: 05 May 2004

Summary: Captain Rivera was referred to the study team by the study sponsor Major Lasure, as an expert of the Global Combat Support System – Marine Corps. Decision Engineering representatives met with Captain Rivera and Mr. Beeler at the Installations and Logistics office.

Global Combat Support System – Marine Corps is still in a conceptual stage. It is anticipated the system will serve as a replacement for legacy logistics tracking systems, such as Asset Tracking for Logistics and Supply System Phase II, Retail Ordnance Logistics Management System, Marine Integrated Maintenance Management System, etc. Global Combat Support System – Marine Corps will be a web based portfolio of Commercial Item (formerly known as commercial off the shelf) and Government off the shelf logistics information systems. The Commercial Item contract process is in progress, and, with an integrator component, is expected to become available in September 2004.

Global Combat Support System – Marine Corps will establish standards for logistics information and data exchange throughout the Marine Corps, and feed into a Joint data environment. It will be a fully integrated Information Technology suite and will come online in three phases: Block One will replace legacy systems; Block Two will focus towards Logistics Command and Control and Distribution; and Block Three will provide system enhancers. Block One is expected to be operational in third quarter, Fiscal Year 2006; Block Two in Fiscal Year 2007, and Block Three in Fiscal Year 2008.

The system parameters will align with Level 4 of the Supply Chain Operations Reference model. Logistics Operational Architecture functions (Order Management, Capacity Management, etc.) will feed into Global Combat Support System – Marine Corps. The program will be tested first with deployed units, then in the shipboard environment, and finally in garrison – hardest to easiest.

Captain Rivera noted that as legacy systems are retired, their data will be archived. The integration function will be difficult because the various systems have incompatible data elements. They will then have to find commonality between services. Captain Rivera also noted that our study's use cases will fit into a Global Combat Support System – Marine Corps decision support system and may feed the Logistics Command and Control component.

Captain Rivera will provide the study team with a copy of the Global Combat Support System– Marine Corps PowerPoint presentation he used in our discussions.

APPENDIX B: ANNOTATED LOGISTICS OPERATIONAL ARCHITECTURE TASK LIST

The Annotated Logistics Operational Architecture Task List identifies tasks critical to the Marine Corps logistics chain. The original task list, found in Appendix C, was compiled using the following components of the Logistics Operational Architecture:

- Appendix 02 - Functional Flows;
- Appendix 05 - Use Cases; and
- Appendix 07 - Operational Node Connectivity Description.

Details of this compilation process are described in Section II of this report.

The original task list was presented for discussion during the Phase One Seminar Simulation Exercise. The list was used to identify logistics tasks expected to have manual, and therefore, measurable components in the future Marine Corps logistics chain. In Phase Two of the Seminar Simulation Exercise, the task lists were further annotated, adding time estimates and associated skill sets, resources, and vehicles.

Throughout the duration of this study, this annotated list was updated and populated with the applicable information. The contents of this list were utilized to develop a methodology that led to the algorithms necessary to establish the time criteria for the various tasks.

➢ **List of Attachments**	

The following table identifies the column title and description of the contents of the Annotated Logistics Operational Architecture Task List.

Column Title	Description
Use Case Name	Logistics Operational Architecture use case titles.
Step #	Sequential activity step number assigned to each use case in the Logistics Operational Architecture.
Step Description	Text narrative for each step of a Logistics Operational Architecture use case.
Manpower Requirement	Indicator for tasks requiring manual involvement. An "X" indicates a Manpower Requirement exists for that task. A "?" indicates that additional research is required. A blank cell indicates that the task is automated.
Seminar Notes	Comments collected during the Seminar Simulation Exercise pertinent to further re-examination and research of the task.
# Actions/Frequency	The number of actions per appropriate frequency (e.g., 26 requests per day).
Shortest Time	Least amount of time to perform the individual task.
Most Likely Time	Most common time to perform the individual task.
Longest Time	Greatest amount of time to perform the individual task.
Reasons for Long Delays	Description of factors causing the increased time to perform the individual task.
Resources – Skill Sets	Military Occupational Specialties related to the performance of the task.
Resources – Transportation Vehicles	Types of transportation vehicles related to the performance of the task.
Resources – Equipment (MHE)	Types of Material Handling Equipment related to the performance of this task.

KEY DEFINITIONS/ACRONYMS

Term	Definition	Source	Area of Supply Chain	Definition Type
ATP	Available to Promise	Marine Corps Glossary		Business Rules
C2 (Command & Control)	The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. C2 is an input to the processes depicted in the OA. C2 has been depicted at the MAGTF HQ level only.	DoD Dictionary	Functional Flows	General to the OA
Capacity	The maximum logistics capability per unit of time that a given entity (organization, work center, machine, individual, or supplier) can perform under specified conditions. Capacity may be measured in man-hours, machine hours or by a physical measurement such as square footage or inventory quantity.	Production & Inventory Control Handbook	OV-1	General to the OA
Capacity Management (CM)	An operational element or role that plans, prioritizes, and optimizes capacity within a particular domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within their domain.	Logistics Operational Architecture		Roles
CTP	Capable to Promise	Marine Corps Glossary		Business Rules
Customer Service Executer/Execution/Fulfillment (CSE)	An operational element or role within Customer Service that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles

Term	Definition	Source	Area of Supply Chain	Definition Type
Customer Service Management (CSM)	An operational element or role that plans, prioritizes, and optimizes Customer Service within that domain. The primary responsibilities of this role are to execute tasks to fulfill orders and report execution status.	Derived from other SME Validation Session Definitions		
Customer Service Production/Operations Management (CSPM)	An operational element or role within Customer Service that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Derived from other SME Validation Session Definitions		
Distribution Capacity Management (DCM)	An operational element or role within Distribution that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Distribution Executer/Execution/Fulfillment (DE)	An operational element or role within Distribution that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles
Distribution Production Management (DPM)	An operational element or role within Distribution that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Engineering Services Capacity Management (ESCM)	An operational element or role within Engineering Service that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Engineering Services Executer/Execution/Fulfillment (ESE)	An operational element or role within Engineering Service that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles

Term	Definition	Source	Area of Supply Chain	Definition Type
Engineering Services Production/Operations Management (ESPM)	An operational element or role within Engineering Service that plans and controls execution within the domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Executer/Execution/Fulfillment (E)	An operational element or role that executes tasks within a particular domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles
Financial Management (FM)	An operational element or role that oversees financial transactions and certain budgetary functions.	Logistics Operational Architecture		Roles
Health Service Executer/Execution/Fulfillment (HSE)	An operational element or role within Health Service that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles
Health Services Capacity Management (HSCM)	An operational element or role that plans, prioritizes, and optimizes capacity within the domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Health Services Production Management (HSPM)	An operational element or role within Health Services that plans and controls execution within the domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Inventory Capacity Management (ICM)	An operational element or role within Inventory that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Inventory Executer/Execution/Fulfillment (IE)	An operational element or role within Inventory that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles

Term	Definition	Source	Area of Supply Chain	Definition Type
Inventory Production Management (IPM)	An operational element or role within Inventory that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Logistics Chain Management (LCM)	A high level planning function that looks both internally and externally from suppliers to end-users to make decisions on supplier strategies, customer strategies, and network design.	Logistics Operational Architecture		Roles
Maintenance Capacity Management (MCM)	An operational element or role within Maintenance that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Maintenance Executer/Execution/Fulfillment (ME)	An operational element or role within Maintenance that executes tasks within that domain to fulfill orders and reports execution status.	Logistics Operational Architecture		Roles
Maintenance Production/Operations Management (MPM)	An operational element or role within Maintenance that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Material Release Order (MRO)	A Material Release Order product refers to a product issued by the Intermediate Supply Activity with a Material Release Order.	Logistics Operational Architecture		
O Plan	Operations Plan	Marine Corps Glossary		
Order Management (OM)	An operational element or role that serves as the supported unit's primary advocate. The primary responsibilities of this role are to manage customer orders from start to completion, to communicate order status externally and order requirements internally, and to coordinate order requirements with capacities and capabilities of other operational elements.	Logistics Operational Architecture		Roles

Term	Definition	Source	Area of Supply Chain	Definition Type
Procurement Capacity Management (PCM)	An operational element or role within Procurement that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.	Logistics Operational Architecture		Roles
Procurement Execution (Executer)	An operational element or role within Procurement that executes tasks within that domain to fulfill orders and reports execution status.	Derived from other SME Validation Session Definitions		
Procurement Production Management (PPM)	An operational element or role within distribution that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Logistics Operational Architecture		Roles
Production/Operations Management (PM)	An operational element or role that plans and controls execution within a particular domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within their domain.	Logistics Operational Architecture		Roles
Request Management (RM)	An operational element or role that receives requirements from supported units and translates requirements into a request to be submitted to Order Management.	Logistics Operational Architecture		Roles
Resources	Everything necessary to perform a given activity, including people, money, materials, faculties, equipment, tools, energy, utilities, and data.	Production & Inventory Control Handbook	OV-1 Production Management	General
Service Capacity Management (SCM)	An operational element or role within the services area such as maintenance, distribution, etc., that plans, prioritizes, and optimizes capacity within those domains. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within those domains.	Logistics Operational Architecture		Roles

Term	Definition	Source	Area of Supply Chain	Definition Type
Other Services Capacity Management (xCM)	An operational element or role within the Other Services domain that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain	Derived from other SME Validation Session Definitions		
Other Services Executer/Execution/Fulfillment (xE)	An operational element or role within Other Services that executes tasks within that domain to fulfill orders and report execution status.	Derived from other SME Validation Session Definitions		
Other Services Production/Operations Management (xPM)	An operational element or role within Other Services that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.	Derived from other SME Validation Session Definitions		

LOGISTICS OPERATIONAL ARCHITECTURE USE CASES

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	**STEP DESCRIPTION**								**Skill Sets**	**Transportation Vehicles**	**Equipment (MHE)**
USMC Use Case: Product Order Fulfillment for a Stocked Item **SCOPE:** Typical customer (defined as using unit) identifies a need for a product that must be fulfilled by the logistics chain (garrison or deployed). Product is stocked at designated storage locations. Product is on hand.			An item that is **"not stocked"** is not on the shelf at designated storage locations. An item that is **"non-stocked"** is not in the system.	**Number of Actions per Battalion per Day. 0-20 for Low Op Tempo; 10-50 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2	Info System or Comm System are down. The backup is telephone call, etc.	04xx (Logistics), 30xx (Supply)	None	IT/Comm (2 or 3 terminals for entering requirements)
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, 30xx	None	IT/ Comm
10	OM checks with ICM to determine availability of product [Available to Promise (ATP)]	X			0.05	0.1	0.25		04xx, 30xx		IT/Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
ALT FLOW	**Alternate Flow – Supply-1.1 Normally stocked item out of stock (i.e., not on shelf at designated storage locations)**		***20% of the items are backordered. Frequency needs to handle 3 BNs (Tanks, Arty, AAV, H&S). Could go to Distro; Procure/Distro; Produce Locally; Return to Customer (not avail);***								
ALT FLOW	**If the requested item is out of stock, OM makes determination on waiting (back order) or buying (Procurement/Source) that item. If item is not stocked, go to procurement flow.**	**X**	***20% of the items are backordered. Frequency needs to handle 3 BNs (Tanks, Arty, AAV, H&S). Go To Procurement use case***		**0.25**	**0.5**	**48**		**04xx, 30xx**	**None**	**IT/ Comm**
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X			0.1	0.25	0.5	The longest time is based on need to coordinate with Navy personnel.	04xx, 30xx, 31xx (Distribution or Transportation MOS Skill Set)	None	IT/ Comm
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx	None	IT/ Comm
13	OM reconciles customer (RM) terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)	X			0.1	0.5	2		04xx, 30xx	None	IT/ Comm
14	OM signals FM and FM commits/obligates funds										
15	OM reserves and schedules product through ICM										
16	OM sends DCM advance notice that the product has been reserved/scheduled through ICM										
17	ICM sorts and groups product orders										
18	ICM reserves and schedules IPM										
19	ICM notifies DCM of shipping requirements										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
20	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5	It is most likely, the DCM and ICM are co-located on same ship.	04xx, 30xx, 31xx	None	IT/ Comm
21	ICM signals OM that pickup has been coordinated with DCM to meet delivery requirements										
22	OM manages fulfillment issues by exception.										
23	IPM routes order to appropriate IE for fulfillment										
24	IE receives the product order										
25	DCM reserves and schedules DPM										
26	DPM routes order to appropriate DE for fulfillment	X			0.1	0.5	2		04xx, 30xx, 31xx	None	IT/ Comm
27	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)										
28	IE picks, packs and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)	X			0.5	2	4	This involves the physical labor of picking, wrapping, etc.	04xx, 30xx, 31xx	None	MHE, Forklift
29	DE receives the item from the IE	X			0.25	0.5	1	Inspecting the item for proper packing, etc., is included in this step.	04xx, 30xx, 31xx		MHE, Forklift
29.1	DE loads the item onto distribution mode	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x (Transportation Operator)	Air, Ground, Sea	MHE, Forklift
29.2	DE transports item to designated node	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)			Air, Ground, Sea	

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
29.3	DE fulfills distribution service order (item is unloaded, sorted, received by RM and staged at designated node)	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x		MHE, Forklift
29.4	DE fulfills distribution service order (item is unloaded, sorted, received by using unit - point of consumption)	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x		MHE, Forklift (Dependent upon type and quantity of stocked item being handled)
30	Item is installed, if required	X			0.5	1	2		Maint-xx		

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	RESOURCES		
STEP #	STEP DESCRIPTION							Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Product Order Fulfillment for a Non-Stocked Item **SCOPE:** Typical customer (defined as using unit) identifies a need for a product that must be fulfilled by the logistics chain (garrison or deployed). Product is not in the system and therefore not on hand at designated storage locations.			**NON-stocked = Not in system** **NOT-stocked = Not on Shelf**	**Number of Actions per Battalion per Day.** **0-20 for Low Op Tempo; 10-50 for High Op Tempo**	**All times are in Hours**					
1	Requirement is identified within using unit									
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary									
3	Requirement is routed to RM									
4	RM sources internally or generates request	X			0.1	0.5	2	04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes requests									
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)									
7	OM receives request									
8	OM processes and validates request									
9	OM transforms request into a customer order	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
10	OM checks with ICM and confirms that item is not stocked	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
11	ICM checks with PCM for ability/availability to acquire product	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
12	ICM provides OM updated information on ability/availability to acquire product	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
13	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X			0.1	0.25	0.5	04xx, 30xx	None	IT/Comm
14	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5	04xx, 30xx	None	IT/Comm
15	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)	X			0.1	0.5	2	04xx, 30xx	None	IT/Comm
16	OM signals FM and FM commits/obligates funds									
17	OM reserves and schedules item(s) through ICM									
18	OM sends DCM advance notice									
19	ICM sorts and groups orders									
20	ICM signals PCM									

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	RESOURCES		
STEP #	STEP DESCRIPTION							Skill Sets	Transportation Vehicles	Equipment (MHE)
21	PCM sorts and groups orders									
22	PCM reserves and schedules PPM									
23	PPM routes order to appropriate PE for fulfillment	X			0.1	0.5	2	04xx, 30xx	None	IT/Comm
24	PE reviews provider options	X			0.5	1	1.5	04xx, 30xx, 31xx (Distribution)	None	IT/Comm
25	PE evaluates source options (availability and capacity). [PE assesses organic and external capability to deliver to the customer - PE reviews options for delivery of product within the terms and conditions of the customer's request and selects appropriate capability for delivery (RDD etc.) (Capable to Promise [CTP])]	X			24	48	72	04xx, 30xx, 31xx	None	IT/Comm
26	PE negotiates with suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's request and selects provider (RDD, etc.) (Capable to Promise [CTP])	X			1	1.5	4	04xx, 30xx, 31xx	None	IT/Comm
27	PE notifies PCM (through PPM) of provider selected for product and the option selected for delivery of that product									
28	PCM notifies ICM of provider selected for product and the option selected for delivery of that product									
29	PE creates sourcing order and releases to source/provider	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
30	PCM (based on input from PPM/PE) signals ICM and items are ordered	X			0.05	0.1	0.25	04xx, 30xx	None	IT/Comm
31	ICM informs OM (available to promise [ATP])									
32	ICM reserves and schedules IPM									
33	ICM notifies DCM of shipping requirements and requests pickup									
34	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5	04xx, 30xx, 31xx	None	IT/Comm
35	ICM signals OM that pickup has been arranged									
36	OM manages fulfillment issues by exception									
37	IPM routes order to appropriate IE for fulfillment									
38	IE receives the product order and prepares to receive item(s) or coordinates its direct delivery to customer by external source/capability	X			0.1	0.25	0.5	04xx, 30xx, 31xx	None	IT/Comm
39	IE receives items ordered from external source and notifies IPM	X			0.1	0.25	0.5	04xx, 30xx, 31xx, 353x (Transportation Operator)	Air, Ground, Sea	MHE, Forklifts
40	IPM signals ICM that items ordered from external source have been received									
41	IPM signals OM that the product order has been received									

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	RESOURCES		
STEP #	STEP DESCRIPTION							Skill Sets	Transportation Vehicles	Equipment (MHE)
42	OM signals FM of receipt verification of external items and FM expenses / liquidates funds									
43	DCM reserves and schedules DPM									
44	DPM routes order to appropriate DE for fulfillment	X			0.1	0.5	2	04xx, 30xx, 31xx	None	IT/Comm
45	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)									
46	IE picks, packs, and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)	X			0.5	2	4	04xx, 30xx	None	MHE, Forklift
47	DE receives the item from the IE	X			0.25	0.5	1	04xx, 30xx, 31xx		MHE, Forklift
48	DE loads the item on distribution mode	X			0.25	0.5	1	04xx, 30xx, 31xx, 353x		MHE, Forklift
49	DE transports item to designated node	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	04xx, 30xx, 31xx, 353x	Air, Ground, Sea	
50	DE fulfills distribution service order (item is unloaded, sorted, received by RM and staged at designated node)	X			0.25	0.5	1	04xx, 30xx, 31xx, 353x		MHE, Forklift
51	DE fulfills distribution service order (item is unloaded, sorted, received by using unit)	X			0.25	0.5	1	04xx, 30xx, 31xx, 353x	Air, Ground, Sea	MHE, Forklift
52	Item is installed, if required	X			0.5	1	2	Maint-xx		

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Multiple Source Request **SCOPE:** Typical customer (defined as using unit) identifies a need for multiple products that must be fulfilled by the logistics chain (garrison or deployed). Products are cataloged items. Products are acquired from multiple sources and delivered as a completed layette. Internal items are not sourced from multiple organic warehouses, but some items are sourced from the same warehouse where the layette is being built.				**Number of Actions per Battalion per Day. 0-20 for Low Op Tempo; 10-50 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes requests										
6	Designated representative assesses funding availability and sends request. (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, 30xx	None	IT/ Comm
10	OM checks with ICM and confirms that multiple sources are required. ICM checks with organic sources and PCM for ability/availability to acquire product	X	The data entered in this row for Step 10 combines that from Steps 10a and 10b.		0.05 (from Step 10b)	0.1 (from Step 10b)	0.25 (from Step 10b)		04xx, 30xx	None	IT/ Comm
10.a	OM checks with ICM and confirms that multiple sources are required										
10.b	ICM checks with organic sources and PCM for ability/availability to acquire product	X			0.05	0.1	0.25		04xx, 30xx	None	IT/ Comm
11	ICM provides OM updated information on ability/availability to acquire product	X			0.05	0.1	0.25		04xx, 30xx	None	IT/ Comm
12	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X			0.1	0.25	0.5		04xx, 30xx, 31xx (Distribution)	None	IT/ Comm
13	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
14	OM reconciles customer terms and conditions with ATP/CTP and obtains initial customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)	X			0.1	0.5	2		04xx, 30xx	None	IT/ Comm
15	OM signals FM to commit/obligate and FM commits/obligates funds										
16	OM reserves and schedules product through ICM. OM sends DCM advance notice										
17	ICM sorts and groups orders										
18	ICM sources organic items and signals PCM to source external item(s). ICM informs OM [ATP]										
19	ICM reserves and schedules IPM										
20	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 20 combines that from Steps 20a, 20b, 20c, and 20d.		0.1 (from Step 20b)	0.25 (from Step 20b)	0.5 (from Step 20b)		04xx, 30xx, 31xx, 9954	None	IT/ Comm
20.a	ICM notifies DCM of shipping requirements										
20.b	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/ Comm
20.c	ICM signals OM										
20.d	OM manages fulfillment issues by exception										
21	IPM routes order to appropriate IE for fulfillment (Note: When sourcing from multiple organic warehouses, treat them as external sources inbound to the layette). IE receives the product order	X	The data entered in this row for Step 21 combines that from Steps 21a and 21b.		0.1 (from Step 21b)	0.25 (from Step 21b)	0.5 (from Step 21b)		04xx, 30xx, 31xx	None	IT/ Comm
21.a	IPM routes order to appropriate IE for fulfillment (Note: When sourcing from multiple organic warehouses, treat them as external sources inbound to the layette)										
21.b	IE receives the product order and prepares to receive item(s) or coordinates its direct delivery to customer by external source/capability	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/ Comm
22	IE receives item(s) ordered from external source(s) and notifies IPM. IPM signals ICM. ICM notifies OM.	X	The data entered in this row for Step 22 combines that from Steps 22a, 22b, and 22c.		0.25 (from Step 22a)	0.5 (from Step 22a)	1 (from Step 22a)		04xx, 30xx, 31xx	None	MHE, Forklift
22.a	IE receives items ordered from external sources and notifies IPM	X			0.25	0.5	1		04xx, 30xx, 31xx	None	MHE, Forklift
22.b	IPM signals ICM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	**STEP DESCRIPTION**								**Skill Sets**	**Transportation Vehicles**	**Equipment (MHE)**
22.c	ICM notifies OM										
ALT FLOW 22	**Alternate Flow –Supply-3.1 Source delivers to government system**										
ALT FLOW 22.1	**Source delivers to government system**										
ALT FLOW 22.2	**Government system delivers to ICM or customer**	**X**			**0.1**	**0.25**	**0.5**		**04xx, 30xx, 31xx**	**Air, Ground, Sea**	**MHE, Forklift**
	Flow proceeds as normal from 22										
23	OM signals FM of receipt verification of external items and FM expenses / liquidates funds										
24	IE consolidates items to the layette	X			0.25	0.5	1		04xx, 30xx, 31xx	None	MHE, Forklift
25	DCM reserves and schedules DPM										
26	DPM routes order to appropriate DE for fulfillment	X			0.1	0.5	2		04xx, 30xx, 31xx	None	IT/Comm
27	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)										
28	IE picks items and sends to layette	X			0.25	0.5	1		04xx, 30xx, 31xx	None	MHE, Forklift
29	IE assembles, packs, and stages order and generates shipping documents (Shipping manifests, packing lists, etc)	X			0.5	2	4		04xx, 30xx	None	MHE, Forklift
30	DE receives the item from the IE	X			0.25	0.5	1		04xx, 30xx, 31xx		MHE, Forklift
31	DE loads the item on distribution mode	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x (Transportation Operator)		MHE, Forklift
32	DE transports item to designated node	X	Default to Look- Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, 353x	Air, Ground, Sea	

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
33	DE fulfills distribution service order (items are unloaded, sorted, received by RM and staged at designated node)	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x		MHE, Forklift
34	DE fulfills distribution service order (items are unloaded, sorted, received by using unit)	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x		MHE, Forklift
35	Item is installed, if required	X			0.5	1	2		Any MOS		
36	DCM (based on input from DPM/DE) signals OM of item delivery										
37	OM verifies receipt of layette (by customer signature, auto-receipt, etc) and installation (if required)										
38	OM signals FM of receipt verification and FM expenses/liquidates funds for layette										
39	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Return of Excess Item to Stock **SCOPE:** Typical customer (defined as using unit) identifies a need for a serviceable excess product return (garrison or deployed). Product is a cataloged item. Product is stocked at designated storage locations. Product is managed by ISA.				**Number of Actions per Battalion per Day. 0 for Low Op Tempo; 0-2 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit.										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
10	OM checks with ICM and determines disposition	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP])	X	Possible monitoring. Combine #11 & #12?		0.05	0.1	0.25		04xx,30xx, 31xx	None	IT/Comm
12	OM checks with DCM and confirms availability of distribution to pick up from customer and to deliver (Available to Promise [ATP])	X	Possible monitoring. Combine #11 & #12?		0.1	0.25	0.5		04xx,30xx, 31xx	None	IT/Comm
13	OM assesses capability of DCM to deliver product and ICM to receive product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/Comm
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc)	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/Comm
15	OM signals FM and FM credits funds (if necessary)										
16	OM reserves and schedules product return through ICM. OM sends DCM advance notice										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
17	ICM sorts and groups orders										
18	ICM reserves and schedules IPM										
19	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 19 combines that from Steps 19a, 19b, 19c, and 19d.		0.1 (from Step 19b)	0.25 (from Step 19b)	0.5 (from Step 19b)		04xx, 30xx, 31xx, 9954	None	IT/ Comm
19.a	ICM notifies DCM of shipping requirements										
19.b	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/ Comm
19.c	ICM signals OM										
19.d	OM manages fulfillment issues by exception										
20	IPM routes order to appropriate IE for fulfillment. IE receives the order.										
20.a	IPM routes order to appropriate IE for fulfillment										
20.b	IE receives the order										
21	DCM reserves and schedules DPM										
22	DPM routes order to appropriate DE for fulfillment	X			0.5	1	3		30xx, 31xx	None	IT/ Comm
23	OM signals customer to stage product based on input from ICM. If appropriate, inventory adjustments are made										
24	Transportation and any required personnel and/or material are dispatched to using unit site designated for pick-up of excess item for return	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
25	Excess item for return is loaded onto transportation mode at using unit site	X			0.25	0.5	1		Transportation Operator	Air, Ground, Sea	MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
26	Excess item for return transported from using unit site to designated node	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
27	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for return)	X			0.25	0.5	1		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
28	DCM (based on input from DPM/DE) signals OM of item delivery										
29	IE receives return product	X			0.05	0.1	0.25		30xx	None	MHE, Forklift
30	IE verifies items received, records and reports discrepancies and signals IPM	X			0.05	0.1	0.25		30xx	None	IT/ Comm
31	IE puts item away	X			0.25	0.5	1		30xx		MHE, Forklift
32	OM verifies receipt (e.g. by signature, auto-receipt, etc)										
33	OM signals FM of receipt verification and FM expenses and liquidates (if applicable)										
34	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Return of Material Release Order (MRO) to Stock **SCOPE:** Typical customer (defined as using unit) identifies a need for a product return due to MRO (garrison or deployed). Product is a cataloged item. Product is managed at the ISA.				**Number of Actions per Battalion per Day. 0-1 for Low Op Tempo; 0-4 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
10	OM checks with MCM and confirms availability of maintenance resources (Available to Promise [ATP])	X			0.1	0.25	0.5		04xx, Maint-xx	None	IT/Comm
11	OM checks with ICM and confirms availability to receive product [ATP]	X	Combine #11 & #12?		0.05	0.1	0.25		04xx,30xx, 31xx	None	IT/Comm
12	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X	Combine #11 & #12?		0.1	0.25	0.5		04xx,30xx, 31xx	None	IT/Comm
13	OM assesses capability of MCM to complete repair, ICM to receive product and DCM to deliver product within the terms and conditions to complete customer's request for pickup (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx (Supply), Distribution-xx, Maint-xx	None	IT/ Comm
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)	X			0.1	0.5	2		04xx, 30xx	None	IT/ Comm
15	OM signals FM and FM commits/obligates funds										
16	OM reserves and schedules MCM. OM sends DCM and ICM advance notice										
16.a	OM reserves and schedules MCM.										
16.b	OM sends DCM and ICM advance notice										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
17	MCM sorts and groups orders										
18	MCM reserves and schedules MPM										
19	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 19 combines that from Steps 19a, 19b, 19c, and 19d.		.10 (from Step 19b)	.25 (from Step 19b)	.5 (from Step 19b)		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
19.a	MCM notifies DCM of shipping requirements.										
19.b	DCM and MCM coordinate pickup to meet delivery requirements.	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
19.c	MCM signals OM.										
19.d	OM manages fulfillment issues by exception.										
20	MPM assigns resources (ME) to the service order	X			0.1	0.25	0.5		Maint-xx	None	IT/ Comm
21	DCM reserves and schedules DPM										
22	DPM routes order to appropriate DE for fulfillment	X	Includes Planning and Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
23	OM signals customer to stage product based on input from MCM										
24	Item(s) requiring repair loaded onto transportation/distribution mode at using unit site	X			0.25	0.5	1		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
25	DE retrogrades item(s) requiring repair to maintenance facility and notifies DCM (through DPM). DCM notifies OM		The data entered in this row for Step 25 combines that from Steps 25a and 25b.		Refer to Look-Up Table(s) (from Step 25a)	Refer to Look-Up Table(s) (from Step 25a)	Refer to Look-Up Table(s) (from Step 25a)		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
25.a	DE retrogrades item(s) requiring repair from using unit site to maintenance facility and notifies DCM (through DPM).	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
25.b	DCM notifies OM										
26	MPM coordinates with ICM to take custody of assets returned										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
27	ME performs inspection and diagnosis	X	The time for dissassembly, inspection, diagnosis, and capturing the cause of failure will be dependent on item (see Scenario - beyond 4 Hours will not do it).		0.2	0.75	2		Maint-xx		MHE, Forklift
28	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM		Case Dependent								
29	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair										
30	ME performs repair and conducts quality control	X			0.25	0.75	2		Maint-xx		MHE, Forklift
31	ME stages repaired item(s) for return	X			0.5	2	4		04xx, 30xx, 31xx, Maint-xx	None	MHE, Forklift
32	MCM arranges with ICM for return of item(s). ICM reserves and schedules IPM.										
33	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals MCM and OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 33 combines that from Steps 33a, 33b, 33c, and 33d.		0.1 (from Step 33b)	0.25 (from Step 33b)	0.5 (from Step 33b)		04xx, 30xx, 31xx, 9954	None	IT/ Comm
33.a	ICM notifies DCM of shipping requirements										
33.b	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/ Comm
33.c	ICM signals MCM and OM										
33.d	OM manages fulfillment issues by exception										
34	IPM routes order to appropriate IE for fulfillment										
35	DCM reserves and schedules DPM										
36	DPM routes order to appropriate DE for fulfillment	X			0.5	1	3		30xx, 31xx	None	IT/ Comm
37	Repaired item(s) loaded onto transportation/distribution mode for delivery to IPM/IE	X			0.25	0.5	1		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
38	DE transports repaired item(s) to IPM/IE	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
39	DCM (based on input from DPM/DE) signals OM of item(s) delivery										
40	IE receives return product	X			0.05	0.1	0.25		30xx	None	MHE, Forklift
41	IE verifies item(s) received, records and reports discrepancies and signals IPM. IPM notifies ICM.	X	The data entered in this row for Step 41 combines that from Steps 41a and 41b.		0.05 (from Step 41a)	0.1 (from Step 41a)	0.25 (from Step 41a)		30xx	None	IT/ Comm
41.a	IE verifies item(s) received, records and reports discrepancies and signals IPM.	X			0.05	0.1	0.25		30xx	None	IT/ Comm
41.b	IPM notifies ICM.										
42	IE puts item(s) away	X			0.25	0.5	1		30xx		MHE, Forklift
43	OM verifies receipt (by signature, auto-receipt, etc)										
44	OM signals FM of receipt verification and FM expenses/liquidates funds										
45	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Return of Defective Item to Source **SCOPE:** Typical customer (defined as using unit) identifies a need for a product return due to defects (garrison or deployed). Product not required to be replaced.				**Number of Actions per Battalion per Day. 0-10 for Low Op Tempo; 10-20 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
10	OM checks with ICM and determines disposition	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP])	X	Combine #11 & #12?		0.05	0.1	0.25		04xx,30xx, 31xx	None	IT/Comm
12	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X	Combine #11 & #12?		0.1	0.25	0.5		04xx,30xx, 31xx	None	IT/Comm
13	OM assesses capability of ICM and DCM to complete return within the terms and conditions to complete customer's request (RDD, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/Comm
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc)	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/Comm
15	OM signals FM and FM credits funds (if necessary)										
16	OM reserves and schedules ICM. OM sends DCM advance notice										
17	ICM sorts and groups orders										
18	ICM reserves and schedules IPM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
19	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 19 combines that from Steps 19a, 19b, 19c, and 19d.		0.1 (from Step 19b)	0.25 (from Step 19b)	0.5 (from Step 19b)		04xx, 30xx, 31xx, 9954	None	IT/ Comm
19.a	ICM notifies DCM of shipping requirements.										
19.b	DCM and ICM coordinate pickup to meet delivery requirements.	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/ Comm
19.c	ICM signals OM.										
19.d	OM manages fulfillment issues by exception.										
20	IPM routes order to appropriate IE for fulfillment										
21	DCM reserves and schedules DPM										
22	DPM routes order to appropriate DE for fulfillment	X			0.5	1	3		30xx, 31xx	None	IT/ Comm
23	OM signals customer to stage product based on input from ICM. If appropriate, inventory adjustments are made										
24	Transportation and any required personnel and/or material are dispatched to using unit site designated for pick-up of defective item for return	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
25	Defective item for return is loaded onto transportation mode at using unit site	X			0.25	0.5	1		Transportation Operator	Air, Ground, Sea	MHE, Forklift
26	Defective item for return transported from using unit site to designated node	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
27	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for return)	X			0.25	0.5	1		04xx, 30xx, 31xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
28	DCM (based on input from DPM/DE) signals OM of item return										
29	IE receives return product	X			0.05	0.1	0.25		30xx	None	MHE, Forklift
30	IE verifies items received, records and reports discrepancies and signals IPM. IPM signals ICM. ICM notifies OM	X	The data entered in this row for Step 30 combines that from Steps 30a and 30b.		0.05 (from Step 30a)	0.1 (from Step 30a)	0.25 (from Step 30a)		30xx	None	IT/ Comm
30.a	IE verifies items received, records and reports discrepancies and signals IPM	X			0.05	0.1	0.25		30xx	None	IT/ Comm
30.b	IPM signals ICM										
30.c	ICM notifies OM										
28	OM consolidates with other turn-in requirements (as appropriate) and schedules turn-in appointment with source										
29	IE stages defective item(s) for return	X									
30	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 30 combines that from Steps 30a, 30b, 30c, and 30d.		0.1 (from Step 30b)	0.25 (from Step 30b)	0.5 (from Step 30b)		04xx, 30xx, 31xx, 9954	None	IT/ Comm
30.a	ICM notifies DCM of shipping requirements.										
30.b	DCM and ICM coordinate pickup to meet delivery requirements.	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/ Comm
30.c	ICM signals OM.										
30.d	OM manages fulfillment issues by exception.										
31	DCM reserves and schedules DPM										
32	DPM routes order to appropriate DE for fulfillment	X			0.5	1	3		30xx, 31xx	None	IT/ Comm
33	DE receives the item from IE	X			0.25	0.5	1		04xx, 30xx, 31xx		MHE, Forklift
34	DE loads the item on distribution mode	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x (Transportation Operator)		MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
35	DE transports/delivers defective item to designated source	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, 353x	Air, Ground, Sea	
36	DCM (based on input from DPM/DE) signals OM of item delivery										
37	OM verifies receipt (by signature, auto-receipt, etc)										
38	OM signals FM of receipt verification and FM expenses/liquidates funds (if applicable)										
39	OM closes customer order after completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Return of Hazardous Materiel for Disposal **SCOPE:** Typical customer (defined as using unit) identifies a need for return of Hazardous Materiel to include waste (garrison or deployed) for disposal.				**Number of Actions per Battalion per Day. 0-1 for Low Op Tempo; 0-4 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply)	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx,30xx	None	IT/Comm
10	OM checks with ICM and determines special handling requirements and availability to receive product	X			0.1	0.25	0.5		99xx (9954-Hazmat Specialist), 31xx (Distribution)	None	IT/Comm
11	OM checks with DCM and confirms availability of qualified distribution to support movement requirements (Available to Promise [ATP])	X			0.1	0.25	0.5		04xx,30xx, 31xx	None	IT/Comm
12	OM assesses capability of DCM to deliver return product and ICM to receive product and dispose product within the terms and conditions of the customer's request OM (Time, Location, etc) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/Comm
14	OM signals FM to make necessary adjustment to funds (if required)										
15	OM reserves and schedules product return through ICM. OM sends DCM advance notice.										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
15a	OM reserves and schedules product return through ICM.										
15b	OM sends DCM advance notice										
16	ICM sorts and groups orders										
17	ICM reserves and schedules IPM (Disposal)										
18	ICM notifies DCM of shipping requirements										
19	DCM and ICM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, 30xx, 31xx, 9954	None	IT/ Comm
20	ICM signals OM										
21	OM manages fulfillment issues by exception										
22	IPM (Disposal) routes order to appropriate IE (Disposal) for fulfillment		Will need to put together a team to handle disposal of hazardous material.		0.5	1	3		30xx, 31xx, 9954	None	IT/ Comm
23	DCM reserves and schedules DPM										
24	DPM routes order to appropriate DE for fulfillment	X	The time for this step takes place concurrently with Step 22 (includes planning and direction time). Time for this step is included in Step 22.		See Step 22	See Step 22	See Step 22		30xx, 31xx, 9954	None	IT/ Comm
25	OM signals to customer to stage product based on input from ICM. If appropriate, inventory adjustments are made										
26	DE sends transportation and required personnel/materiel to using unit site designated for pick-up of item	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator, 9954	Air, Ground, Sea	MHE, Forklift
27	Item is loaded on to transportation mode at using unit site	X			0.25	0.5	1		Transportation Operator	Air, Ground, Sea	MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
28	DE transports item from using unit site to designated node for return of hazardous material	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Transportation Operator, 9954	Air, Ground, Sea	MHE, Forklift
29	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for disposal at designated node)	X			0.25	0.5	1		04xx, 30xx, 31xx, Transportation Operator, 9954	Air, Ground, Sea	MHE, Forklift
30	DCM (based on input from DPM/DE) signals OM of item delivery										
31	IE (Disposal) receives return product	X	Unload/stage time		0.25	0.5	1		30xx, 9954, Navy-xx		MHE, Forklift
32	IE (Disposal) verifies items received, records and reports discrepancies and signals IPM (Disposal)										
33	IE (Disposal) disposes Hazardous Material according to specification and signals IPM (Disposal). IPM (Disposal) signals ICM. ICM notifies OM of item disposal.		Not Required for this Study								
33a	IE (Disposal) disposes Hazardous Material according to specification and signals IPM (Disposal)	X	Not Required for this Study								
33b	IPM (Disposal) signals ICM		Not Required for this Study								
33c	ICM notifies OM of item disposal										
34	OM signals FM of disposal and FM expenses/liquidates funds (if applicable)										
35	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Maintenance at Intermediate Maintenance Activity (IMA) **SCOPE:** Typical customer (defined as using unit) identifies a need for a maintenance service that must be fulfilled by the logistics chain (garrison or deployed). IMA has capability to perform this service. Service performed at maintenance site. This use case applies to both parts on hand and for parts out of stock. It applies to both scheduled and unscheduled maintenance.			**Subject Matter Experts (SMEs) estimated that the number of Actions per Battalion per Day for all Maintenance Requests would be 0-20 for Low Op Tempo and 10-50 for High Op Tempo. SMEs estimated that approximately 20% of these Maintenance Requests will be handled at the IMA or a designated maintenance activity by 2015.**	**Number of Actions per Battalion per Day. 0-4 for Low Op Tempo; 2-10 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if required										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), Maint-xx	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, Maint-xx	None	IT/Comm
10	OM checks with MCM and confirms availability of maintenance resources (available to promise [ATP])	X			0.1	0.25	0.5		04xx, Maint-xx	None	IT/Comm
11	OM checks with DCM and confirms availability to support movement requirements [ATP]	X	Automated		0.1	0.25	0.5		04xx, Distribution-xx	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (Required Delivery Date (RDD), Location, etc.) (Capable to promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx (Supply), Distribution-xx, Maint-xx	None	IT/ Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)	X			0.1	0.5	2		04xx, 30xx	None	IT/ Comm
14	OM signals FM and FM commits/obligates funds										
15	OM reserves and schedules maintenance through MCM. OM sends DCM advance notice										
16	MCM sorts and groups orders										
17	MCM reserves and schedules MPM										
18	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 18 combines that from Steps 18a, 18b, 18c, and 18d.		.10 (from Step 18b)	.25 (from Step 18b)	.5 (from Step 18b)		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
18.a	MCM notifies DCM of shipping requirements.										
18.b	DCM and MCM coordinate pickup to meet delivery requirements.	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
18.c	MCM signals OM.										
18.d	OM manages fulfillment issues by exception.										
19	MPM assigns resources (ME) to the order	X			0.1	0.25	0.5		Maint-xx	None	IT/ Comm
20	DCM reserves and schedules DPM										
21	DPM routes order to appropriate DE for fulfillment	X	Includes Planning and Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
22	OM signals customer to stage product based on input from MCM										
23	Item(s) requiring maintenance loaded onto transportation/distribution mode at using unit site	X			0.25	0.5	1		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
24	DE retrogrades item requiring maintenance/repair to maintenance site	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
25	DCM (based on input from DPM/DE) signals OM of item delivery										
26	ME receives item	X			0.25	0.5	1		04xx, 30xx, 31xx, Maint-xx		MHE, Forklift
27	ME verifies items received and signals MPM. MPM signals MCM. MCM notifies OM.										
27.a	ME verifies items received and signals MPM.										
27.b	MPM signals MCM.										
27.c	MCM notifies OM.										
28	ME performs disassembly (if required), inspection, and diagnosis and captures the cause of failure for possible Quality Deficiency Report (QDR) submission and trend analysis	X	The time for dissassembly, inspection, diagnosis, and capturing the cause of failure will be dependent on item (see Scenario - beyond 4 Hours will not do it).		0.2	0.75	2		Maint-xx		MHE, Forklift
29	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM		Case Dependent								
30	MCM determines if customer's ATP/CTP can be met based on need for additional resources and parts										
31	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
32	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated										
33	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair.										
34	ME performs repair and conducts quality control	X			0.25	0.75	2		Maint-xx		MHE, Forklift
35	ME notifies MPM of completed repair. MPM signals MCM. MCM notifies OM										
36	ME stages repaired item for return to customer	X			0.5	2	4		04xx, 30xx, 31xx, Maint-xx	None	MHE, Forklift
37	MPM releases repaired item										
38	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.	X	Data entered in this row for Step 38 combines that from Steps 38a, 38b, 38c, & 38d.		.10 (from Step 38b)	.25 (from Step 38b)	.5 (from Step 38b)		04xx, Maint-xx, Distribution-xx	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
38.a	MCM notifies DCM of shipping requirements										
38.b	DCM and MCM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
38.c	MCM signals OM										
38.d	OM manages fulfillment issues by exception										
39	DCM reserves and schedules DPM										
40	DPM routes to appropriate DE for fulfillment (if required)	X	Includes Planning & Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
41	Repaired item(s) and maintenance contact team (if required) loaded onto transportation/distribution mode for delivery to designated node	X			0.25	0.5	1		04xx, Maint-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
42	DE transports/delivers repaired item(s) and maintenance contact team (if required) to designated node	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx	Air, Ground, Sea	MHE, Forklift
43	Repaired item is installed (if required). Note: ME contact team will perform installation (if required)	X			0.5	1	2		Maint-xx		
44	DE picks up and transports maintenance contact team to designated node	X	Default to Look Up Table(s) that will provide time based on distance to be traveled & the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx	Air, Ground, Sea	IT/ Comm
45	DCM (based on input from DPM/DE) signals OM of item delivery										
46	OM verifies receipt and satisfactory condition with customer										
47	OM signals FM of receipt verification and FM expenses/liquidates funds										
48	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Maintenance at Customer **SCOPE:** Typical customer (defined as using unit) identifies a need for a maintenance service that must be fulfilled by the logistics chain (garrison or deployed). Maintenance Capacity Management (MCM) has capability to perform this service. Service performed at customer site. Parts on-hand and/or parts not on hand.			**Subject Matter Experts (SMEs) estimated that the number of Actions per Battalion per Day for all Maintenance Requests would be 0-20 for Low Op Tempo and 10-50 for High Op Tempo. SMEs estimated that approximately 80% of these Maintenance Requests will be handled at the customer's site by 2015.**	**Number of Actions per Battalion per Day. 0-16 for Low Op Tempo; 8-40 for High Op Tempo**	**All Times are in Hours**				**NOTE:** There was a comment that Distribution-xx was not 31xx.		
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if required										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), Maint-xx	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into an order	X			0.05	0.1	0.25		04xx, Maint-xx	None	IT/Comm
10	OM checks with MCM and confirms availability of maintenance resources (available to promise [ATP])	X			0.1	0.25	0.5		04xx, Maint-xx	None	IT/Comm
11	OM checks DCM availability to support movement requirements (ATP)	X	Automated		0.1	0.25	0.5		04xx, Distribution-xx	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (request delivery date (RDD, Location, etc.) (Capable to promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx (Supply), Distribution-xx, Maint-xx	None	IT/ Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.)	X	May be manual in combat		0.1	0.5	2		04xx, 30xx	None	IT/ Comm
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)										
15	OM reserves and schedules maintenance with MCM. OM sends DCM advance notice.										
15a	OM reserves and schedules maintenance with MCM										
15b	OM sends DCM advance notice										
16	MCM sorts and groups orders										
17	MCM reserves and schedules MPM										
18	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. Om manages fulfillment issues by exception.	X	The data entered in this row for Step 18 combines that from Steps 18a, 18b, 18c, and 18d.		.10 (from Step 18b)	.25 (from Step 18b)	.5 (from Step 18b)		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
18a	MCM notifies DCM of shipping requirements										
18b	DCM and MCM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
18c	MCM signals OM										
18d	OM manages fulfillment issues by exception										
19	MPM assigns resources (ME) to the service order	X			0.1	0.25	0.5		Maint-xx	None	IT/ Comm
20	DCM reserves and schedules DPM										
21	DPM routes order to appropriate DE for fulfillment	X	Includes Planning and Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
ALT FLOW	**Alternate Flow: If maintenance wil be at IMA**										
22	OM signals customer to stage product based on input from MCM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
23	DE delivers ME (Contact Team/resources) to work site	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx	Air, Ground, Sea	MHE, Forklift
24	DCM (based on input from DPM/DE) signals OM of contact team on site										
25	ME performs disassembly (if required), inspection, and diagnosis and captures the cause of failure for possible QDR submission and trend analysis	X	The time for dissassembly, inspection, diagnosis, and capturing the cause of failure will be dependent on item (see Scenario - beyond 4 Hours will not do it).		0.2	0.75	2		Maint-xx		MHE, Forklift
26	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM	X	Exception Based. The working group estimated that this will occur approx. 15% of the time by 2015 and beyond.		0.1	0.25	0.5	This will require another loop through the process.	04xx, Maint-xx		
ALT FLOW	**Alternate Flow: If additional resources and parts are needed**										
27	MCM determines if customer's ATP/CTP can be met based on need for additional resources and parts										
28	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	X			0.1	0.25	0.5		04xx, Maint-xx, Distribution-xx	None	IT/ Comm
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated										
30	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair.										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
31	ME performs repair and conducts quality control	X			0.25	0.75	2		Maint-xx		MHE, Forklift
32	ME notifies MPM of completed repair. MPM signals MCM. MCM notifies OM.										
32a	ME notifies MPM of completed repair										
32b	MPM signals MCM										
32c	MCM notifies OM										
33	ME releases/delivers repaired item to customer		Maintenance at the customer - no time. 40% of time requires contact team								
34	OM verifies receipt and satisfactory condition with customer										
35	MPM arranges with DCM for return of contact team as required										
36	DE picks up and transports maintenance contact team to designated node	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Maint-xx, Distribution-xx	Air, Ground, Sea	IT/ Comm
37	OM signals FM of receipt verification and FM expenses/liquidates funds										
38	OM closes customer order on completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Procurement Fulfillment **SCOPE:** Appropriate capacity management (xCM) identifies or receives a need for a product/service that must be fulfilled by the logistics chain (garrison or deployed) that must be sourced externally.				**Number of Actions per Battalion per Day. 0-20 for Low Op Tempo; 10-50 for High Op Tempo**	**All Times are in Hours**						
1	PCM receives order from xCM										
2	PCM sorts and groups orders										
3	PCM reserves and schedules PPM										
4	PPM routes order to appropriate PE for fulfillment	X	Automated		0.1	0.5	2			None	IT/ Comm
5	PE reviews provider options	X			0.5	1	1.5	PE will know the provider options for their location.	3044 (Supply - Purchasing and Contracting Specialist), 9656 (Contracting Officer) , 9657 (Systems Acquisition Management Officer)	None	IT/ Comm
6	PE evaluates supplier options (availability and capacity)	X	Common - Lumber (easier to obtain - will require less time) Complex - Engineer Part (more difficult to obtain - will require more time)		24	48	72		3044, 9656, 9657	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	**STEP DESCRIPTION**								**Skill Sets**	**Transportation Vehicles**	**Equipment (MHE)**
7	PE assesses capability of suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's requirement (e.g., volumes, lead times, purchase vehicle) (RDD etc.) (Available to Promise [ATP])	X	The time for this step takes place concurrently with Step 6. Time for this step is included in Step 6.		See Step 6	See Step 6	See Step 6		3044, 9656, 9657	None	IT/ Comm
8	PE negotiates with suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's request and selects provider (RDD etc.) (Capable to Promise [CTP])	X			1	1.5	4		3044, 9656, 9657	None	IT/ Comm
9	PE creates sourcing order and releases to supplier/provider. PE signals PPM. PPM signals PCM.	X	The data entered in this row for Step 9 combines that from Steps 9a, 9b, and 9c.		0.05 (from Step 9a)	0.1 (from Step 9a)	0.25 (from Step 9a)		3044, 9656, 9657	None	IT/ Comm
9.a	PE creates sourcing order and releases to supplier/provider	X			0.05	0.1	0.25		3044, 9656, 9657	None	IT/ Comm
9.b	PE signals PPM										
9.c	PPM signals PCM										
ALT FLOW	**Alternate Flow: If this is a Multiple Source Request**										
ALT FLOW	**IE consolidates items**										
10	PCM (through PPM) notifies PE of receipt verification and supplier payment		Automated								
11	PE closes sourcing order and signals PPM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Basic Distribution for Product Order Fulfillment **SCOPE:** Distribution of ordered product from one point to another. May use organic and/or external sources of distribution.					**All Times are in Hours**						
1	DCM receives order from ICM										
2	DCM sorts and groups orders										
3	DCM reserves and schedules DPM										
4	DPM selects mode	X	There will be an Air and Ground DPM.		0.25	0.5	1		04xx (Logistics), 30xx (Supply), 31xx (Distribution or Transportation), 7041 (Aviation Operations Specialist), Navy-xx	None	IT/Comm
5	DPM consolidates orders by mode/location and destination		Automated								
6	DPM builds load plan and notifies ICM of requirements	X	Manual by exception.		0.25	0.5	1		04xx, 31xx	None	IT/Comm
7	DPM rates and routes shipment		Commercial Only. For Distribution Personnel								
8	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals ICM and OM.		Manual by exception. For Distribution Personnel								
8a	DPM evaluates carrier capability, availability, and cost										
8b	DPM selects/schedules carrier and signals ICM and OM										
9	DPM modifies load plan to match actual carrier specifications.	X			0.25	0.5	1		04xx, 31xx	None	IT/Comm
10	DPM coordinates with ICM to finalize load sequence plan										
11	DPM schedules resources (e.g., Distribution Execution, Material Handling Equipment (MHE), special handling equipment, etc.)										
12	DE receives order										
13	DE loads the load	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x (Transportation Operator), Navy-xx, Aviation-xx	Air, Ground, Sea	MHE, Forklift
14	DE finalizes shipping documents		Automated								

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
15	DE delivers shipment	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) vehicle. Delivery is to Point of Consumption		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, 353x, Navy-xx, Aviation-xx	Air, Ground, Sea	MHE, Forklift
15.1	DE fulfills distribution service order (item is unloaded, sorted, received by RM and staged at designated node)	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x, Navy-xx, Aviation-xx		MHE, Forklift
15.2	DE fulfills distribution service order (item is unloaded, sorted, received by using unit)				0.25	0.5	1		04xx, 30xx, 31xx, 353x, Navy-xx, Aviation-xx		MHE, Forklift
16	DCM (based on input from DPM/DE) notifies OM of delivery										
17	OM verifies receipt (by customer signature, auto-receipt, etc)										
18	OM signals FM of receipt verification and FM expenses/liquidates funds										
19	OM closes customer order after the completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Movement of Personnel and Equipment for Services, One Way **SCOPE:** Basic movement of unit passengers (PAX) and equipment from one location to another.				**Number of Actions per Battalion per Day. 0-2 for Low Op Tempo; 0-10 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), 30xx (Supply), 31xx (Distribution or Transportation MOS Skill Set)	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, 30xx, 31xx	None	IT/ Comm
10	OM checks with DCM and confirms availability of distribution to deliver from location to final destination (Available to Promise [ATP])	X			0.1	0.25	0.5		04xx, 30xx, 31xx	None	IT/ Comm
ALT FLOW	**Alternate Flow – Distribution-2.1 Critical Casualty/Wounded Evacuation**		Requires manual interface because you cannot measure time.								
ALT FLOW 1	Customer/RM identifies request to DCM										
ALT FLOW 2	DCM reconciles available assets against request										
ALT FLOW 3	DCM turns request into an order										
ALT FLOW 4	DCM notifies OM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
ALT FLOW 5	DCM selects mode (if required)										
ALT FLOW 6	DCM selects distribution asset/carrier										
ALT FLOW 7	DPM notifies and coordinates with customer										
ALT FLOW 8	DPM routes movement										
ALT FLOW 9	DE executes order (pick-up/load/deliver)	X	Default to Look- Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, 30xx, 31xx, Navy-xx	Air, Ground, Sea	
ALT FLOW 10	**DPM captures cost and communicates to FM**										
11	OM assesses capability of DCM to complete service within the terms and conditions of the customer's request (Required delivery date [RDD], location, etc; capable to promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx, 31xx, Maint-xx	None	IT/ Comm
12	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual pick-up/delivery date, time window, actual pick-up/delivery locations, etc)	X			0.1	0.5	2		04xx, 30xx	None	IT/ Comm
13	OM signals FM and FM commits/obligates funds (if required)										
14	OM reserves and schedules DCM										
15	DCM sorts and groups orders										
16	DCM reserves and schedules DPM										
17	DPM selects mode										
18	DPM builds load plan for PAX and equipment and signals DCM. DCM notifies OM	X	By exception		0.1	0.25	0.5		04xx, 30xx, 31xx, Maint-xx	None	IT/ Comm
19	DPM consolidates orders by mode/location and destination										
20	DPM rates and routes shipment	X	By exception		0.05	0.1	0.25		04xx, 30xx, 31xx	None	IT/ Comm
21	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals DCM. DCM notifies OM	X	By exception		0.05	0.1	0.25		04xx, 30xx, 31xx	None	IT/ Comm
21.a	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals DCM										
21.b	DCM notifies OM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
22	DPM modifies load plan to match actual carrier specifications										
23	DPM generates load sequence plan and signals DCM. DCM notifies OM.										
23.a	DPM generates load sequence plan and signals DCM										
23.b	DCM notifies OM										
24	DPM schedules resources (e.g., DE, MHE, special handling equipment, etc.)										
25	DE receives order										
26	DE loads the load	X			0.25	0.5	1		04xx, 30xx, 31xx, 353x (Transportation Operator)	Air, Ground, Sea	MHE, Forklift
27	DE finalizes shipping documents										
28	DE delivers shipment	X	Default to Look- Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)			Air, Ground, Sea	
29	DCM (based on input from DPM/DE) notifies OM of delivery										
30	OM verifies receipt (by customer signature, auto-receipt, etc)										
31	OM signals FM of receipt verification and FM expenses/liquidates funds										
32	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Patient Movement **SCOPE:** Typical customer (defined as using unit) identifies a need for patient movement that must be fulfilled by the logistics chain (garrison or deployed). Health Services Support (HSS) has the capacity to perform the appropriate level of patient care required. Service performed at the next level of care with all materials available.				**Number of Actions per Battalion per Day. 0 for Low Op Tempo; 0-2 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if required										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics) , Navy-xx	None	None
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, Navy-xx	None	IT/Comm
10	OM checks with HSCM and confirms availability of health resources to provide services (Available to Promise [ATP])	X			0.05	0.1	0.25		04xx, Navy-xx	None	IT/Comm
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]	X			0.1	0.25	0.5		04xx, Navy-xx	None	IT/Comm
12	OM assesses capability of HSCM to provide health services and DCM to provide distribution services within the terms and conditions of the customer's request (required delivery date [RDD], location, etc.) (Capable to Promise [CTP])	X			0.1	0.25	0.5		04xx, Navy-xx	None	IT/Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.)	X			0.1	0.25	2		04xx, Navy-xx	None	IT/Comm
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)										
15	OM reserves and schedules with HSCM. OM sends DCM advance notice.										
15a	OM reserves and schedules with HSCM										
15b	OM sends DCM advance notice										
16	HSCM sorts and groups orders										
17	HSCM reserves and schedules HSPM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
18	HSCM notifies DCM of shipping requirements. DCM and HSCM coordinate pickup to meet delivery requirements. HSCM signals OM. OM manages fulfillment issues by exception.										
18a	HSCM notifies DCM of shipping requirements										
18b	DCM and HSCM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, Distribution-xx, Navy-xx	None	IT/Comm
18c	HSCM signals OM										
18d	OM manages fulfillment issues by exception										
19	HSPM assigns resources (HSE) to the service order	X			0.05	0.1	0.25		04xx, Navy-xx	None	IT/Comm
20	DCM reserves and schedules DPM										
21	DPM routes order to appropriate DE for fulfillment										
22	DE sends transportation and required personnel/materiel to using unit site designated for pickup of patient	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Distribution-xx, Transportation Operator, Navy-xx	Air, Ground, Sea	
23	Patient is loaded on to transportation mode at using unit site				0.1	0.25	0.5		Transportation Operator	Air, Ground, Sea	
24	DE moves patient requiring treatment from using unit to next level of care	X	Default to Look-Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Distribution-xx, Navy-xx	Air, Ground, Sea	
25	DE fulfills distribution service order (patient is unloaded, sorted, received, and staged for treatment at designated node)	X			0.25	0.5	1		04xx, Distribution-xx, Navy-xx	Air, Ground, Sea	
26	DCM (based on input from DPM/DE) signals OM of patient movement										
27	OM verifies receipt (by customer signature, auto-receipt, etc)										
28	OM signals FM of receipt verification and FM expenses/liquidates funds										
29	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Provide Health Services at Customer Site **SCOPE:** Typical customer (defined as using unit) identifies a need for health services support that must be fulfilled by the logistics chain (garrison or deployed). Health Services Support (HHS) has the capacity/capability to perform the appropriate level of health service required. Service performed at the customer's site (planned or unplanned).				**Number of Actions per Battalion per Day. 0-1 for Low Op Tempo; 0-4 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if required										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), Navy-xx	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, Navy-xx	None	IT/Comm
10	OM checks with HSCM and confirms availability of resources (available to promise [ATP])	X			0.1	0.25	0.5		04xx, Navy-xx	None	IT/Comm
11	OM checks with DCM for availability of distribution to support movement requirements (available to promise [ATP])	X	Automated		0.1	0.25	0.5		04xx, Distribution-xx	None	IT/ Comm
12	OM assesses capability of HSCM to complete health service and DCM to provide distribution service within the terms and conditions of the customer's request (required delivery date [RDD], Location, etc.) (Capable to promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx (Supply), Distribution-xx, Navy-xx	None	IT/ Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc)	X	May be manual in combat		0.1	0.5	2		04xx, 30xx	None	IT/ Comm
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)										
15	OM reserves and schedules health services through HSCM. OM sends DCM advance notice										
16	HSCM sorts and groups orders by common characteristics such as priorities, locations, nature of health service requested, etc. for further processing										
17	HSCM reserves and schedules HSPM										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
18	HSCM notifies DCM of shipping requirements. DCM and HSCM coordinate pickup to meet delivery requirements. HSCM signals OM. OM manages fulfillment issues by exception.	X	The data entered in this row for Step 18 combines that from Steps 18a, 18b, 18c, and 18d.		.10 (from Step 18b)	.25 (from Step 18b)	.5 (from Step 18b)		04xx, Navy-xx, Distribution-xx	None	IT/ Comm
18.a	HSCM notifies DCM of shipping requirements.										
18.b	DCM and HSCM coordinate pickup to meet delivery requirements.	X			0.1	0.25	0.5		04xx, Navy-xx, Distribution-xx	None	IT/ Comm
18.c	HSCM signals OM										
18.d	OM manages fulfillment issues by exception										
19	HSPM routes order to appropriate HSE for fulfillment	X									
20	DCM reserves and schedules DPM										
21	OM signals customer to stage personnel based on input from HSCM										
22	DPM routes order to appropriate DE for fulfillment	X	Includes Planning and Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
23	DE delivers HSE (Contact Team/resources) to work site	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Navy-xx, Distribution-xx, Transportation Operator	Air, Ground, Sea	MHE, Forklift
24	DCM (based on input from DPM/DE) signals OM of contact team on site										
25	HSE contact team conducts assessment	X	The time for conducting an assessment will be dependent on type of injury.		0.2	0.75	2		Navy-xx		MHE, Forklift

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	**STEP DESCRIPTION**								**Skill Sets**	**Transportation Vehicles**	**Equipment (MHE)**
26	HSPM (based on input from HSE) identifies and requests additional resources and supplies to effect health service (if required) and signals HSCM	X	Exception Based. The working group estimated that this will occur approx. 15% of the time by 2015 and beyond.		0.1	0.25	0.5	This will require another loop through the process.	04xx, Navy-xx		
27	HSCM determines if customer's ATP/CTP can be met based on need for additional resources and supplies										
28	If necessary, HSCM determines new ATP/CTP with DCM and other xCM based on HSE diagnosis. If necessary, HSCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	X			0.1	0.25	0.5		04xx, Navy-xx, Distribution-xx	None	IT/ Comm
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated										
30	If necessary, HSCM signals appropriate xCM for additional resources and supplies and reserves additional capacity/capability (as needed) to effect treatment.										
31	The HSE contact team performs service	X			0.25	0.75	2		Navy-xx		
32	The HSE contact team notifies HSPM of completed services. HSPM notifies HSCM. HSCM signals OM of completed services.										
32.a	The HSE contact team notifies HSPM of completed services										
32.b	HSPM notifies HSCM										
32.c	HSCM signals OM of completed services										
33	If required, OM verifies satisfactory performance with customer										
34	HSCM arranges with DCM for return of HSE contact team as required										
35	DE picks up and transports HSE contact team to designated node	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Distribution-xx, Navy-xx, Transportation Operator	Air, Ground, Sea	IT/ Comm
36	OM signals FM of receipt verification and FM expenses/liquidates funds										
37	OM closes customer order upon completion of all child orders										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC Use Case: Engineering Services Using Organic Resources **SCOPE:** For engineering services that can be performed using organic resources (skills, man hours) with support equipment and supplies on-hand.				**Number of Actions per Battalion per Day. 0-1 for Low Op Tempo; 0-4 for High Op Tempo**	**All Times are in Hours**						
1	Requirement is identified within using unit										
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary										
3	Requirement is routed to RM										
4	RM sources internally or generates request	X			0.1	0.5	2		04xx (Logistics), Engr-xx	None	IT/Comm
5	Designated representative authorizes and prioritizes request										
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)										
7	OM receives request										
8	OM processes and validates request										
9	OM transforms request into a customer order	X			0.05	0.1	0.25		04xx, Engr-xx	None	IT/Comm
10	OM checks with ESCM and confirms availability of resources (available to promise [ATP])	X			0.1	0.25	0.5		04xx, Engr-xx	None	IT/Comm
11	OM checks with DCM for availability of distribution to support movement requirements [ATP]	X	Automated		0.1	0.25	0.5		04xx, Distribution-xx	None	IT/ Comm
12	OM assesses capability of ESCM to complete engineering service and DCM to provide distribution within the terms and conditions of the customer's request (Required Delivery Date [RDD], Location, etc.) (Capable to promise [CTP])	X			0.1	0.25	0.5		04xx, 30xx (Supply), Distribution-xx, Engr-xx	None	IT/ Comm
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc)	X	May be manual in combat		0.1	0.5	2		04xx, 30xx, Engr-xx	None	IT/ Comm
14	OM signals FM and FM commits/obligates funds										
15	OM reserves and schedules engineering services through ESCM. OM sends DCM advance notice										
15.a	OM reserves and schedules engineering services through ESCM.										
15.b	OM sends DCM advance notice										
ALT FLOW	**Alternate Flow - Engineering 1.1-External Source**										
ALT FLOW 15	If external source, reserve and schedule through external source										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
16	ESCM sorts and groups orders										
17	ESCM reserves and schedules ESPM										
18	ESCM notifies DCM of shipping requirements. DCM and ESCM coordinate pickup to meet delivery requirements. ESCM signals OM. OM manages fulfillment issues by exception	X	The data entered in this row for Step 18 combines that from Steps 18a, 18b, 18c, and 18d.		.10 (from Step 18b)	.25 (from Step 18b)	.5 (from Step 18b)		04xx, Engr-xx, Distribution-xx	None	IT/ Comm
18.a	ESCM notifies DCM of shipping requirements.										
18.b	DCM and ESCM coordinate pickup to meet delivery requirements	X			0.1	0.25	0.5		04xx, Engr-xx, Distribution-xx	None	IT/ Comm
18.c	ESCM signals OM										
18.d	OM manages fulfillment issues by exception										
19	ESPM assigns resources (ESE) to the service order	X			0.1	0.25	0.5		04xx, Engr-xx		
20	DCM reserves and schedules DPM										
21	DPM routes order to appropriate DE for fulfillment	X	Includes Planning and Direction Time		0.75	2	6		Distribution-xx	None	IT/ Comm
22	DE delivers ESE (Contact Team/resources) to work site	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Engr-xx, Distribution-xx	Air, Ground, Sea	Engineer Equipment, MHE, Forklift
23	DCM (based on input from DPM/DE) signals OM of contact team on site										
24	ESE conducts site survey	X			0.2	0.5	1		Engr-xx	Engineer Vehicles	IT/ Comm, Engineer Equipment
25	ESE produces detailed engineer estimate and signals ESPM. ESPM signals ESCM. ESCM notifies OM on estimate status		The data entered in this row for Step 25 combines that from Steps 25a, 25b, and 25c.		0.2 (from Step 25a)	0.75 (from Step 25a)	2 (from Step 25a)		Engr-xx	None	IT/ Comm

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
25.a	ESE produces detailed engineer estimate and signals ESPM.	X	The time for a detailed engineer estimate will be dependent on engineering service required (see Scenario - beyond 4 Hours will not do it).		0.2	0.75	2		Engr-xx	None	IT/ Comm
25.b	ESPM signals ESCM.										
25.c	ESCM notifies OM on estimate status										
26	ESPM (based on input from ESE) identifies and requests additional resources and parts to effect engineering service (if required) and signals ESCM	X	Exception Based. The working group estimated that this will occur approx. 15% of the time by 2015 and beyond.		0.1	0.25	0.5	This will require another loop through the process.	04xx, Engr-xx	None	IT/ Comm
27	ESCM determines if customer's ATP/CTP can be met based on need for additional resources and parts										
28	If necessary, ESCM determines new ATP/CTP with DCM and other xCM based on ESE diagnosis. If necessary, ESCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer	X			0.1	0.25	0.5		04xx, Engr-xx, Distribution-xx	None	IT/ Comm
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated										
30	If necessary, ESCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect engineering service										
31	ESCM assembles required resources and notifies ESPM. ESPM signals ESE										
31.a	ESCM assembles required resources and notifies ESPM.	X			0.1	0.25	0.5		Engr-xx	Engineer Vehicles	Engineer Equipment
31.b	ESPM signals ESE										
32	ESE executes engineering service and conducts quality control	X			0.25	0.75	2		Engr-xx	Engineer Vehicles	Engineer Equipment
33	ESE signals ESPM engineering service is complete. ESPM signals ESCM. ESCM notifies OM										
33.a	ESE signals ESPM engineering service is complete.										
33.b	ESPM signals ESCM.										
33.c	ESCM notifies OM										
34	OM verifies receipt/satisfactory performance with customer (by customer signature, auto-receipt, etc)										

USE CASE NAME		Manpower Requirement	Seminar Notes	# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
STEP #	STEP DESCRIPTION								Skill Sets	Transportation Vehicles	Equipment (MHE)
35	ESCM arranges with DCM for return of contact team and retrograde of resources no longer needed, as required										
36	DE picks up and transports Engineering Services contact team to designated node	X	Default to Look Up Table(s) that will provide time based on distance to be traveled and the speed of the transportation (distribution) system		Refer to Look-Up Table(s)	Refer to Look-Up Table(s)	Refer to Look-Up Table(s)		04xx, Distribution-xx, Navy-xx, Transportation Operator	Air, Ground, Sea	IT/ Comm
37	OM signals FM of receipt verification and FM expenses/liquidates funds										
38	OM closes customer order upon completion of all child orders										

APPENDIX C: SEMINAR SIMULATION EXERCISE SUMMARY REPORT

➤ **Study of Establishing Time Criteria for Logistics Tasks Seminar**

A two phase Seminar Simulation Exercise was held during study Task Two to identify all critical skill sets, vehicles, and equipment necessary to accomplish logistics tasks required by the Logistics Operational Architecture S_1 Node to fill service and product orders from a seabased Marine Expeditionary Brigade. The Seminar Simulation Exercise brought together a diverse group of United States Marine Corps logistics and operational experts to evaluate logistics tasks, and the time and resources required to complete those tasks in support of a forward deployed, seabased Marine Air Ground Task Force.

Phase One of the Seminar Simulation Exercise was conducted at Decision Engineering Headquarters December 18 and 19, 2003. During this phase, seminar participants conducted analysis of Logistics Operational Architecture use cases to identify those logistic tasks for which manual intervention is required and for which a time criteria could be established.

Phase Two of the Seminar Simulation Exercise, held at the Wargaming Division, Marine Corps Base, Quantico, Virginia on March 1 and 2, 2004, accomplished the goal of associating time criteria, skill sets, and resources to the previously identified logistics tasks. From this, a methodology was developed to estimate time criteria in study Task Three.

This appendix contains the background, purpose, and objective of the seminar, as well as methodology, scenario, and the initial findings and recommendations.

➤ **List of Attachments**

United States Marine Corps
Study of Establishing Time Criteria for Logistics Tasks

Seminar Simulation Exercise
Summary Report

PHASE ONE
December 18 – 19, 2003

PHASE TWO
March 1 - 2, 2004

Decision Engineering Associates
17491 Jefferson Davis Highway
Dumfries, VA 22026
(703) 441-6538

Summary of the Seminar Simulation Exercise
in support of the
Study of Establishing Time Criteria for Logistics

Introduction. The Study of Establishing Time Criteria for Logistics Tasks Seminar Simulation Exercise was conducted in two phases. Phase One was held 18-19 December 2003 at Decision Engineering Associates, LLC, Dumfries, Virginia. Phase Two was held 1-2 March 2004 at Wargaming Division, Marine Corps Base, Quantico, Virginia. The study is being conducted for the Commanding General, Marine Corps Combat Development Command, Quantico, Virginia. The study sponsor is the Deputy Commandant of the Marine Corps for Installations and Logistics, Code LPI.

Purpose. The purpose of the seminar was to bring together a diverse group of United States Marine Corps logistics and operational experts to evaluate the logistics tasks, and the time and resources required to complete those tasks in support of a forward deployed, seabased Marine Air Ground Task Force. A list of seminar participants for each phase is included in this appendix.

Background. The Study of Establishing Time Criteria for Logistics Tasks is an effort to develop methods for making best logistics support decisions using estimated time criteria in a military capacity management context. The Marine Corps has redefined and documented how it intends to conduct logistics support in the future through the Logistics Operational Architecture. In order for the Marines using these new processes to plan and manage logistics support most effectively, they must be able to project logistics resource requirements accurately and assess the availability of those resources against planned operations.

The current method of identifying who and what are available to perform missions is mostly a manual and labor intensive effort. Time estimates for accomplishing Combat Service Support tasks are critical to logistics planning efforts and are required to determine how much can be accomplish given Marine Corps current and future available personnel and equipment resources. Establishing time criteria in logistics planning will allow the planners (i.e., Capacity Managers) to better determine when and how many people, what types of equipment, and the amounts of material needed to meet every logistics requirement. These will better enable logistics planners to determine which resources they have available to meet upcoming operational requirements.

The study is intended to develop a decision support methodology which allows Marine Corps logistics planners the means to allocate resources within the future Marine Corps logistics chain as described in the Integrated Logistics Capability Logistics Operational Architecture.

Concept and Methodology.

Concept. Part of the study is to determine how each critical resource impacts logistics capacity. The seminar simulation exercise, based on Marine Expeditionary Brigade scenarios, was utilized to spotlight each resource according to its role in the accomplishment of tasks. The seminar also examined the Logistics Operational Architecture tasks, and through the expert opinions of the seminar attendees estimated tasks timings. To aid in generating initial timing estimates, we used Decision Engineering staff members currently assigned to the Marine Corps Wargaming Division to assist in supporting the seminar. This staffing ensured a seminar/model support staff which consisted of experts current in performing war games and seminar simulations.

Methodology. The seminar was conducted as a single sided (no interactive RED play) seminar style workshop. The seminar started with a review of the scenario and the vignettes. This included the force list and equipment list to be utilized. Assumptions were provided and discussed prior to beginning the simulation. Once all agreed on the assumptions, the scenario and the first vignette were briefed. In Phase One, seminar participants identified those logistics tasks requiring manual intervention and utilization of resources. During Phase Two, participants then attempted to fill in the blanks on the logistics task matrix created by the study team in an attempt to establish the time it takes to complete a task, as well as identify the equipment and personnel required to perform each task. By walking through each task, the study team, with the help of the subject matter experts, was able to verify whether the information used to compile the matrix was valid. This process was repeated in an attempt to look at differing factors associated with providing support to a deployed, seabased Marine Expeditionary Brigade.

Discussion. The seminar began with introductions of all attendees, administrative remarks, and a brief discussion of the study background and efforts to date. The purpose of the seminar was established to link logistics tasks from the Logistics Operational Architecture, to the time and the associated resources of personnel, vehicles, and material handling equipment required performing the task. Due to the time constraints available to conduct the seminar, and the length of the task list to review, a determination was made to split the seminar into two phases. The scope of Phase One would include a review of those tasks requiring specific manual intervention to accomplish. Phase Two would complete remaining objectives.

The seminar began with a discussion of the scenario to be used to place the logistics tasks in the context of a Marine Expeditionary Brigade, constituted as envisioned for 2015 by the Marine Corps, operating from a seabased environment, and utilizing the Maritime Prepositioning Force (Future). The seminar scenario and notional force list was provided in a read ahead package. A copy of the Read Ahead package is included in this appendix.

There were questions from seminar participants on aspects of the scenario. These were:

1. Currently, the fly in echelon of the brigade does not proceed to a sea base, so how would that work for this scenario?

Response. The fly in echelon, doctrinally, is also being referred to as the flow in echelon. The Maritime Prepositioning Force (Future) seabasing issues are not resolved at this time. Flow to the sea base may involve advanced high speed vessels. The current flow in echelon is associated with a significant amount of equipment, but perhaps, in the future, this may decrease. A more thorough description of the seabased Marine Expeditionary Brigade was provided.

2. The next question asked if there would be a push toward joint force logistics functions during the timeframe of this scenario.

Response. Seminar participants agreed that there is a need to merge logistics functions and streamline the associated processes to fit a joint logistics environment.

3. What is the distance from the sea base?

Response. The sea base for this scenario will be operated from 30 nautical miles offshore, with the objective positioned 60 miles inland. This will allow for some easier logistics calculations, recognizing that in future seabased operations, these distances will be two or three times what are given here. The equipment list provided for the scenario was missing some engineering equipment and will be reviewed by Decision Engineering. Assumptions for the scenario will include that communications connectivity, at least initially, will be good and that other facets of the operation run smoothly. For this seminar, the focus will be on D+2 operations for support of the maneuver elements ashore.

It was agreed on that in 2015, technicians may be able to diagnose an equipment problem, input the problem into a computer tracking system with software that generates the maintenance request and parts orders. Onboard diagnostics or imbedded sensors may automate the process significantly. In any case, a need is identified, the request is sent to the sea-base, and the issue is resolved according to the appropriate doctrine, likely, the Global Combat Support System - Marine Corps. Logistics in 2015 should rapidly identify maintenance requirements, supply needs, medical services, and other issues. Discussion included a brief description of various steps involving customer requests.

Use Cases. The use cases discussed and analyzed during the seminar were taken from the Logistics Operational Architecture. The use cases focus on the processes and procedures to fulfill product and service orders. It was noted the Logistics Operational Architecture was designed for ground systems and does not cover Marine Corps aviation. The use cases are found in the read ahead package included in this appendix.

In Phase One, seminar participants went through each use case task list to identify those steps where a person is clearly involved in the operation. Other steps were deemed to be accomplished by an automated system and would not require a significant amount of time, nor any additional resources, to accomplish. As such, those steps would provide no value to the study. By removing those steps, the task list was narrowed down to a manageable level. The time and resource criteria will be assigned to those tasks. Knowing there are a variety of products, a notional small, medium, and large commodity will be used to establish the time criteria for the logistics tasks.

Phase Two of the seminar provided participants with the opportunity to further refine the use cases and associate the logistics tasks to critical skills, resources, and vehicles required to accomplish them. Time criteria, based on an estimated best time, longest time, and most likely time, along with the frequency these tasks are performed, were also applied to the tasks.

Each use case was discussed, with some duplication of tasks noted. A consensus, where possible, formed around the designation of each task requiring manual intervention. If there was some doubt, a question mark was used to identify those tasks where further analysis would be necessary. It identifies those tasks the seminar participants determined would or may require manual intervention, and thus use for the study.

Conclusion. The seminars provided the study team with solid information necessary to continue further refinement of the logistics tasks associated with each use case. These specific use cases will be the base line for the study Task Three methodology. The Annotated Logistics Operational Architecture Task List can be found at Appendix B in this report of the Time Criteria for Logistics Tasks Study.

Recommendation. None.

Time Criteria for Logistics Tasks Study
Seminar Simulation Exercise (SSE) Attendance Roster

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24	Marshall, Bob	Mr.	NA	DE	Study Team	703-441-6538	rmarshal@de-group.net
				Phase Two - March 1-2, 2004			
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6	Hynes, Calvin	Major	2802	MCCDC	Electronic Maint Officer	703-784-3984	calvin.hynes@usmc.mil
7	Johnson, C. R.	Major	0402	HQMC, I&L	Logistics Officer	703-695-8958	JohnsonCR@hqmc.usmc.mil
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10	Lick, David	Mr.	2110	SRA, Inter, INC	Ordnance Officer	703-695-5939	LickDC.ctr@hqmc.usmc.mil
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United States Marine Corps
Study of Establishing Time Criteria for Logistics Tasks

Seminar Simulation Exercise

PHASE ONE
December 18 – 19, 2003

PHASE TWO
March 1 - 2, 2004

Decision Engineering Associates
17491 Jefferson Davis Highway
Dumfries, VA 22026
(703) 441-6538

Note: The following Read Ahead information was provided prior to Phase One of the seminar simulation exercise. For Phase Two, the same basic information, such as scenario and force composition was provided. Essential Phase Two information is included in this annotated Read Ahead package. A revised, annotated use case task list was also provided for Phase Two.

Read Ahead Information

Purpose.

The purpose of the Time Criteria Seminar Simulation Exercise is to bring together a diverse group of logistics and operational experts to evaluate logistics tasks, the time required to complete those tasks, and the resources needed to accomplish them. The seminar will be held on December 18 and 19, 2003 at the offices of Decision Engineering Associates, LLC in Dumfries, Virginia. [Phase Two of the seminar will be held on March 1 and 2, 2004 in building 2076, Breckinridge Hall, Room 14, Marine Corps University, Quantico, Virginia.] This read ahead package contains the necessary information to familiarize participants with key study elements and prepare them for the seminar.

Background.

The Study of Establishing Time Criteria for Logistics Tasks is an effort to develop methods for making best logistics support decisions using estimated time criteria in a military capacity management context. The Marine Corps has redefined and documented how it intends to conduct logistics support in the future through the Logistics Operational Architecture. In order for the Marines using these new processes to plan and manage logistics support most effectively, they must be able to project logistics resource requirements accurately and assess the availability of those resources against planned operations.

The current method of identifying who and what are available to perform missions is mostly a manual and labor intensive effort. Time estimates for accomplishing Combat Service Support tasks are critical to logistics planning efforts and are required to determine how much can be accomplish given Marine Corps current and future available personnel and equipment resources. Establishing time criteria in logistics planning will allow the planners (i.e., Capacity Managers) to better determine when and how many people, what types of equipment, and the amounts of material needed to meet every logistics requirement. These will better enable logistics planners to determine which resources they have available to meet upcoming operational requirements.

The study is intended to develop a decision support methodology which allows Marine Corps logistics planners the means to allocate resources within the future Marine Corps logistics chain as described in the Integrated Logistics Capability Logistics Operational Architecture.

Time Criteria Seminar Simulation Exercise.

As a part of the study, it must be determined how each critical resource impacts logistics capacity. A seminar simulation exercise based on Marine Expeditionary Brigade scenarios will be used to spotlight each resource according to its role in the accomplishment of tasks. The seminar simulation will also examine the Logistics Operational Architecture tasks and through the expert opinions of the seminar attendees will estimate tasks timings. To aid in generating initial timing estimates, we will use of Decision Engineering staff members who are currently assigned to the Marine Corps Wargaming Division for normal duties, and who are temporarily available for this unique task, will assist in seminar simulation. This staffing will ensure a seminar/model support staff consisting of current experts in performing wargames and seminar simulations.

Time Criteria Seminar Simulation Exercise Phase Two.

As a part of the study, it must be determined how each critical resource impacts logistics capacity. A seminar simulation exercise based on Marine Expeditionary Brigade scenarios was held December 18 and 19, 2003 to spotlight each resource according to its role in the accomplishment of tasks. The seminar simulation also examined the Logistics Operational Architecture tasks and through the expert opinions of the seminar attendees determined those tasks requiring human intervention and resource allocation, and thus are able to establish a time criteria. Use cases from the Logistics Operational Architecture were evaluated during the seminar. The seminar process led to refinement of the task lists from 610 tasks in 17 use cases to 217 tasks in 15 use cases. The results of this seminar were reported in the study's First Interim Report.

During Phase Two of the seminar simulation exercise, subject matter experts will assist Decision Engineering logisticians with development and analysis of the time criteria for the remaining logistics tasks and will estimate tasks timing and identify critical resources needed to fulfill the tasks. The annotated task list is found in Annex B to this Read Ahead Package. Annex C contains a first draft of the completed use cases for initial discussion.

Methodology for Time Criteria for Logistics Seminar Simulation.

The seminar will be conducted as a single sided (no interactive RED play) seminar style workshop. The seminar will start with a review of the scenario and the vignettes. This will include the force list and equipment list to be utilized. Any assumptions will be provided and discussed prior to beginning the simulation.

Once all have agreed on the assumptions, we will brief the scenario and the first vignette.

We will then attempt to fill in the blanks on the matrix created by the study team in an attempt to establish the time it takes to complete a task, as well as the equipment and personnel required to perform each task. By walking through each task, the study team, with the help of the subject matter experts, will be able to verify whether the information used to compile the matrix is valid.

This process will be repeated for each vignette in an attempt to look at differing factors associated with providing support to a deployed, seabased Marine Expeditionary Brigade.

Once we have filled in as much data as possible, the study team will analyze the results for inclusion in the overall study report.

Agenda

Study of Establishing Time Criteria for Logistics Tasks
Seminar Simulation Exercise
December 18 - 19, 2003

Thursday, December 18, 2003

0800	Study Sponsor Briefing
0900	Seminar Commences
	◆ Introduction of Participants
	◆ Administrative Items
	◆ Time Criteria Study Overview
1000	Tasks, Time, and Resources – Measures of Performance
	◆ Discussion
1100	Break
1300	Session 1
1500	Session 1 Debrief

Friday, December 19, 2003

0800	Seminar Reconvenes/Review
0830	Session 2
1100	Session 2 Debrief
1200	Break
1300	Session 3
1530	Session 3 Debrief
1630	Seminar Review and Wrap Up

Note: This seminar simulation exercise will be held at the UNCLASSIFIED level.
Breaks will be scheduled as necessary.

Agenda

Study of Establishing Time Criteria for Logistics Tasks
Seminar Simulation Exercise – Phase Two
March 1 – 2, 2004

<u>Monday, March 1, 2004</u>

0900		Seminar Commences
	◆	Introduction of Participants
	◆	Administrative Items
	◆	Time Criteria Study Overview
	◆	Review of the December Seminar Simulation Exercise
	◆	Time Criteria Methodology Overview
1000		Overview of First Use Case
	◆	Discussion
1200		Lunch Break
1300		Use Case Discussions Continue
1600		Session 1 Debrief

<u>Tuesday, March 2, 2004</u>

0800	Seminar Reconvenes/Review
0830	Session 2 – Continue Use Case Development
1200	Lunch Break
1300	Continue Use Case Development
1600	Session 2 Debrief
1630	Seminar Review and Wrap Up

Note: This seminar simulation exercise will be held at the UNCLASSIFIED level.
Breaks will be scheduled as necessary.

SCENARIOS

Background. The seabased variant of the 2015 MEB will operate from the Maritime Prepositioning Force (Future) [MPF(F)] Ship Squadron in consonance with the Expeditionary Strike Group (ESG). The ESG is the new version of the Amphibious Ready Group/Marine Expeditionary Unit (ARG/MEU)—a three ship amphibious squadron plus what was formerly called a Surface Action Group (SAG)—cruiser and destroyers, supported by an nuclear submarine (SSN). With the assistance of the ESG, the MPF(F) Squadron will provide the Sea Base support, along with other Fleet elements, from which the Seabased MEB will project forces ashore. The logistics support will be provided from the Sea Base. There will be no build up of Combat Service Support (CSS) ashore as in traditional amphibious doctrine. This does not mean that there will be no CSS elements ashore. In a nutshell, the Ground Combat Element (GCE) ashore will have minimal combat trains. The majority of the Combat Service Support Element (CSSE) will support from the Sea Base. Some CSSE personnel and equipment may be with the GCE combat trains, but this will be minimal. If the situation warrants, Mobile Combat Service Support Detachments (MCSSDs) can augment the combat trains. Situations will arise when CSS personnel from the CSSE and the Aviation Combat Element (ACE) will be ashore temporarily to conduct contact team and other temporary functions ashore. In some cases, Forward Arming and Refueling Points (FARPs) will be conducted for both ACE and GCE elements ashore, with the FARP personnel, equipment, and supplies being moved from the Sea Base, the resupply and services required performed, and assets returned to the Sea Base. Transportation of personnel, equipment, and supplies to/from the Sea Base to the MEB elements ashore is a key function of providing Seabased Logistics support.

Seabasing Logistics Vignette (SBLV) #1

Location: Sumesia [fictitious country resembling real island nation in SE Asia]

Forces Involved: Seabased MEB and ESG/Aircraft Carrier Battle Group (CVBG) other supporting United States forces as required. Host Nation Support (HNS) available in Singapore—use of airfield and port facilities as required.

General Situation: The crumbling national government of Sumesia has asked the US to intervene in a rebellious province where rebels have killed and kidnapped numerous foreign tourists, missionaries, and workers. The armed forces of Sumesia have had no success in even penetrating the areas in question. The US commits an MPF(F) Squadron, CVBG, and other naval forces. After 14 days of flowing in the Fly In Echelon (FIE) elements, the MPF(F) MEB is in place aboard the MPF(F) Squadron and ready to conduct operations. The CVBG has been in place and ready to conduct operations since C+11.

Special Situation: On D-Day, a reinforced two Battalion Task Forces (Bn TF) from the MPF(F) MEB is inserted ashore with only minor opposition. One Battalion lands by surface in Advanced Armored Assault Vehicles (AAAVs) while the other Battalion lands by helicopter/tiltrotor in an Landing Zone (LZ) approximately 12 miles from the surface landed Battalion. By evening of D-Day, the surface Bn Task Force has linked up with the air landed Bn TF. Still no significant opposition, but intelligence indicates that rebel formations are moving to make contact. MEB objectives include ultimately the capitol of the rebel province, the neutralization of the key current rebel leadership, and freeing about 100 foreign hostages being held in at least three locations. Expectations are that on D+2, the MEU Battalion Landing Team (BLT) will move ashore to operate separately from the two Bn TFs projected ashore on D-Day. The third Bn TF of the MPF(F) MEB will remain afloat in Reserve until needed.

The rebels have been reliably confirmed to have the capability to launch anti-ship cruise missiles. This dictates that the MPF(F) Squadron, the ESG, and the CVBG all remain over the horizon. The MPF(F) Squadron and ESG will remain at approximately 30 miles offshore, with an average distance from the Sea Base to forces ashore at approximately 60 miles. The MEB G-4 and the CSSE commander and their staffs are planning to sustain at least a three Battalion force ashore at all times. There will be times when the force ashore will exceed this size. The MEB planners are working with the MEU planners to consolidate logistics support. While the ESG and its integral MEU remain under separate command, logistics support from the Sea Base to forces ashore will be consolidated and, hopefully, seamless.

The Logistics Concept of Operations: The forces ashore will be supported primarily from the Sea Base. The combat trains will normally carry one Day of Supply (DOS) of Class I, III, and V, while the combats units will carry the same quantity, for a total ashore of 2 DOS or Classes I, III, and V. Resupply will be as requested by the commander ashore, but will most likely be on a daily basis or as required. Two resupply methods will be used depending on the situation and desires of the supported unit. What has traditionally been called supply point distribution and what has been called unit distribution. In supply point distribution the resupply method will be by air to logistics node, then by surface mode to final user. In unit distribution, supplies and services will be flown directly from the Sea Base to the end user. A less desirable subset of both methods would be the movement entirely by surface, from ship to shore to end user or logisticsnode. Maintenance will be on site by integral technicians at the operating unit level traveling with the unit or by contact team if necessary. Components will be swapped out on site if possible. Minimal medical teams with the combat forces will stabilize only to the point that patients can be evacuated to the Sea Base for comprehensive care. The burden on transportation planning and executions will be large, since the connectivity with the Sea Base is paramount. Any interruption of the transportation link, for whatever the reason, will necessitate reevaluation or curtailment of operations until adjustments can be made.

Vignette Logistics Play:

<u>D+2</u>: With the movement ashore of the BLT from the MEU/ESG, there are three Battalion sized Task Forces ashore, plus a small MEB Command Group. On D+2, the surface landed, AAAV mounted Bn TF 1 makes contact with moderate sized enemy forces, is engaged for three hours. At about 1830, with only one hour of effective daylight remaining, contact is broken by the severely damaged enemy. Friendly casualties are 30 Wounded In Action (WIA), 7 Killed In Action (KIA). The WIA range from 6 emergency to 20 priority to 4 no evacuation necessary. Equipment casualties to Principal End Items (PEIs) are 2 M1 Tanks in need of maintenance that can't be performed by techs ashore with small parts needed from Sea Base. Two HMMWVs destroyed. Four HMMWVs damaged and capable of repair by techs ashore with parts from Seabase. Six communications-electronics items (vehicle mounted radios, back pack radios, air support beacon) need repair or replacement. One ordnance item (81mm mortar sight) destroyed. Need replacement of one DOS of Class V (exception two DOS of 60mm and 81mm mortar HE). Need Class I (rations and water). Need Class III JP-8. Distance from MEU BLT ashore to center of mass of Sea Base is 40 miles. [OpOrder and MEB Standing Operating Procedures (SOP) calls for standard re-supply to be one DOS of all commodities with exceptions (plus or minus) to be noted.]

Standard resupply for units not making contact.

<u>D+3</u>: No significant enemy contact. Standard resupply for units not making contact.

<u>D+4</u>: Enemy contact by all Bn TFs is moderate on D+4. Only significant equipment casualty is M1 Tank needing new power pack for MEB Bn TF 1(surface) Turret repairman also needed by same unit. Both MEB Bn TF 1(surface) and MEU BLT need Light Armored Vehicle (LAV) tire replacement, 6 and 4 respectively. Distance from Sea Base center of mass to units is: MEU BLT—40 miles; MEB Bn TF 1(surface)—50 miles; MEB Bn TF 2(air)—50 miles. [MEB Command Group is moving with MEB Bn TF (surface).] Resupply for all three is standard one DOS with exception of two DOS of both types of mortar High Explosive (HE) ammo for all GCE elements.

<u>D+5 to D+10</u>: Minimal enemy contact. All units moving north up the island (displacement of 20 miles per day) and Sea Base moving in parallel fashion. Same distance to Sea Base maintained by Bn TFs and BLT. [Vehicle fuel and helo lift of MEB Bn TF (airlift) are high demand items.] Normal resupply every day per SOPs.]

<u>D+11</u>: Decision is made by MEB Commander to increase to 2 DOS being held by CSSE elements ashore, to be built up by D+13. Included in this will be selected Class IX requiring one Medium Tactical Vehicle Replacement (MTVR) with M105 trailer to haul for each Bn-sized unit ashore. This is because of predicted bad flying weather over next 30 days.

<u>D+12</u>: MEB Bn TF 3, currently in Reserve, is moved ashore by surface means to provide security for 250 man Seabee Bn Det to emplace Expeditionary Airfield (EAF). The Seabee Detachment and equipment will begin movement ashore by surface means on D+13, with completion of movement desired NLT D+16. Seabee PEIs include 15 D-7 equivalents, 25 MTVR equivalents, 20 HMMWV equivalents, 2 Heavy Equipment Trailer (HET) equivalents.

<u>D+13</u>: MEB Bn TF 1 (surface) returns to the Sea Base to become the MEB reserve. Movement to be completed before darkness. Extensive clean up of equipment and routine maintenance of equipment is to be completed within 48 hours.

<u>D+14</u>: MEU BLT makes contact with strong enemy force, result is 20 WIA, 5 KIA, 2 LAV destroyed. Distance 50 miles from Sea Base center. Needs immediate Class V resupply to attain normal stocks, having reduced to approximately .5 DOS of Class V in unit and CSSE-held ammo.

<u>D+15</u>: Marine Wing Support Squadron (MWSS) begins to move personnel and equipment ashore to staff EAF. One half of personnel and equipment of MWSS will go ashore to support rotary wing operations.

D+15 to D+45: Continuation of events to exercise logistics play and analysis of Seabased MEB.

<u>Logistics Questions/Concerns/Considerations to be discussed during Seminar Simulation</u>:

Relative time to perform logistics functions on Sea Base versus ashore in an MCSSD environment? (Consider all six CSS functions and most sub-functions, with emphasis on Supply, Maintenance, and Transportation).

Different strategies in providing Logistics support from Sea Base (or Shore Base/CSSA ashore) to mobile forces ashore. Centralize or decentralize?

Competing strategies of Just In Time (JIT) Logistics support versus Logistics Trains and MCSSDs moving with mobile combat elements.

Logistics communications strategies and techniques. Automatic resupply versus on call resupply (push versus pull).

Maintenance strategies in Seabasing and mobile operations. Fix forward or evacuate to the Sea Base? Carry parts and technicians in MCSSD or let GCE be unencumbered? Time trade offs versus transportation availability.

What services should be provided ashore versus on the Sea Base/Rear Base?

Are Marine logistics elements staffed, equipped, and trained to plan for and execute resupply of the Sea Base/CSSA? What factors will impact such requirements at the CSSE and Marine Air Ground Task Force (MAGTF) headquarters level? If there are deficiencies in performing these tasks, what must be changed to overcome the deficiencies?

What changes to organization/task organization of the current logistics organizations and what changes to logistics doctrine and Tactics, Techniques and Procedures (TTPs) in the GCE/ACE/CSSE will be necessary to support from the Sea Base and in mobile combat operations or expeditionary maneuver warfare?

Annex A: Marine Corps Composition

Marine forces are deployed as fully integrated Marine Air Ground Task Forces (MAGTFs) of different sizes, all of which are task organized combined arms forces. MAGTFs normally include a Command Element (CE), Ground Combat Element (GCE), Aviation Combat Element (ACE), and a Combat Service Support Element (CSSE). MAGTFs come in four sizes:

- Marine Expeditionary Force (MEF)
- Marine Expeditionary Brigade (MEB)
- Marine Expeditionary Unit (MEU)
- Special Purpose MAGTF (SPMAGTF)

The **MEB** is normally organized with a regimental landing team as its GCE and a composite air group as its ACE.

A **MEB** can also operate as an independent organization to accomplish specific tasks. Each MEB is capable of limited independent combat operations and can sustain itself for 30 days.

Maritime Prepositioned Ships (MPS).

MPS assets are available to support the worldwide response of Marine Forces. Each MPS squadron consists of a combination of container and RO/RO ships, containing equipment for three MAGTFs, roughly one half to one third of a MEF in size. The MPS squadrons can offload pier side or at anchor (in stream) in a secure environment for arrival, assembly operations, and marriage with airlifted forces.

The MEB is the mid-sized MAGTF and is normally commanded by a brigadier general. The MEB bridges the gap between the MEU, task organized to provide a forward deployed presence, and the Marine expeditionary force (MEF), task organized to fight and win the nation's battles. With 30 days of sufficient supplies for sustained operations, the MEB is capable of conducting amphibious assault operations and Maritime Prepositioning Force (MPF) operations. During potential crisis situations, a MEB may be forward deployed afloat for an extended period to provide an immediate combat response. A MEB can operate independently or serve as the advance echelon of a MEF. The MEB command element is embedded in the MEF command element and identified by line number for training and rapid deployment.

The MEB can provide supported combatant commanders with a credible operational capability that is rapidly deployable and possesses the capability to impact all elements of the battlespace. If required, a MEB command element is capable of assuming the role of joint task force headquarters for small operations with additional MEF command element augmentation. As an expeditionary force, it is capable of rapid deployment and employment via amphibious shipping, strategic air/sealift, geographical or maritime prepositioning force assets, or any combination thereof.

The MEB command element normally is embedded in the MEF command element and identified by line number for training and rapid deployment. When the MEB is activated, designated personnel and equipment assigned to the MEF command element form the MEB command element.

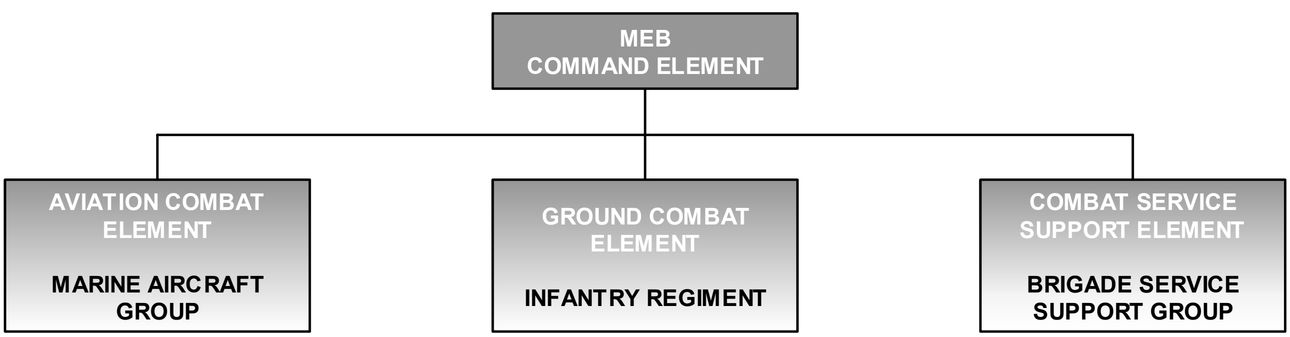
Capabilities.

All MEBs have the following capabilities:

- Inherently expeditionary combined arms force.
- Robust and scalable command and control capability.
- A full range operational capability…forcible entry to humanitarian assistance.
- Task organized for mission accomplishment.
- Capable of rapid deployment and employment by amphibious shipping, strategic air/sealift, or any combination.
- Sustainable.
- Brings increased command and control and significantly expanded battlespace functions and capabilities.
- Aviation element is capable of all six aviation functions: offensive air support, anti-air warfare, assault support, air reconnaissance, electronic warfare, control of aircraft and missiles.
- Exercise command and control of aircraft and airspace.
- Full spectrum of expeditionary combat service support: supply, maintenance, transportation, general engineering, health services, services, messing.

Organization.

The MEB is a task organized MAGTF normally composed of a command element, a reinforced infantry regiment, a composite Marine Aircraft Group (MAG), and a Brigade Service Support Group (BSSG). The task organization of a MEB varies according to the mission, forces assigned, and the AO. MEB forces are designated in the activation order.



Marine Expeditionary Brigade Organization.

Command Element.

The MEB command element provides command and control for the elements of the MEB. When missions are assigned, the notional MEB command element is tailored with required support to accomplish the mission. Detachments are assigned, as necessary, to support subordinate elements. The MEB command element is fully capable of executing all of the staff functions of a MAGTF (administration and personnel, intelligence, operations and training, logistics, plans, communications and information systems, public affairs officer, staff judge advocate, comptroller, and OPSEC).

Ground Combat Element.

The GCE is normally formed around a reinforced infantry regiment. The GCE can be composed of from two to five battalion sized maneuver elements (infantry, tanks, light armored reconnaissance) with a regimental headquarters, plus artillery, AAA battalion, reconnaissance, anti-tank units, and engineers.

Aviation Combat Element.

The ACE is a composite MAG task organized for the assigned mission. It usually includes both helicopters and fixed wing aircraft, and elements from the Marine Wing Support Group (MWSG) and the Marine air control group (MACG). The MAG has more varied aviation capabilities than those of the aviation element of a MEU. The most significant difference is the ability to command and control aviation with the Marine Air Command and Control System (MACCS). The MAG is the smallest aviation unit designed for independent operations with no outside assistance except access to a source of supply. The ACE headquarters will be an organization built upon an augmented MAG headquarters or provided from other MAW assets.

Combat Service Support Element.

The BSSG is task organized to provide combat service support beyond the capability of the supported air and ground elements. It is structured from personnel and equipment of the Force Service Support Group (FSSG). The BSSG provides the nucleus of the Landing Force Support Party (LFSP) and, with appropriate attachments from the GCE and ACE, has responsibility for the landing force support function when the landing force shore party group is activated.

Deployment.

The MEB is deployed by a continuous flow of task organized forces. As an expeditionary force, it is capable of rapid deployment and employment via amphibious shipping, strategic air/sealift, marriage with geographical or maritime prepositioning force assets, or any combination thereof. The MEB deploys with sufficient supplies to sustain operations for 30 days. The MEB may be comprised of units from MPF, Air Contingency Force (ACF), or the Amphibious Task Force (ATF).

Employment.

The MEB mission is to plan, coordinate, and conduct sustainable combined arms combat and other expeditionary operations across the spectrum of conflict. MEB tasks include:

- Forcible entry.
- Deploy to combatant commander's area of responsibility as part of a joint or combined force.
- Provide a nucleus joint task force headquarters.
- Enable follow on forces.
- Be prepared to act as the Marine Corps Service component.
- Be prepared to serve as the advance echelon of a MEF.

Maritime Prepositioning Force Marine Expeditionary Brigade.

The MPF MEB is slightly larger than an amphibious MEB and more heavily equipped with armor and mechanized assets. It is capable of combat against a sophisticated mechanized force.

The prepositioning of MPF equipment afloat reduces strategic airlift requirements and global response time. MPF squadrons are afloat until married up with the MPF MEB. Marines are flown into the AO by strategic airlift.

The purpose of the MPF MEB is to rapidly project combat power into an area. Once established ashore, it can be operationally ready for combat within 10 days and capable of sustaining operations for 30 days. There are approximately 16,000 Marine and 900 Navy personnel assigned. MPF operations are a strategic deployment option.

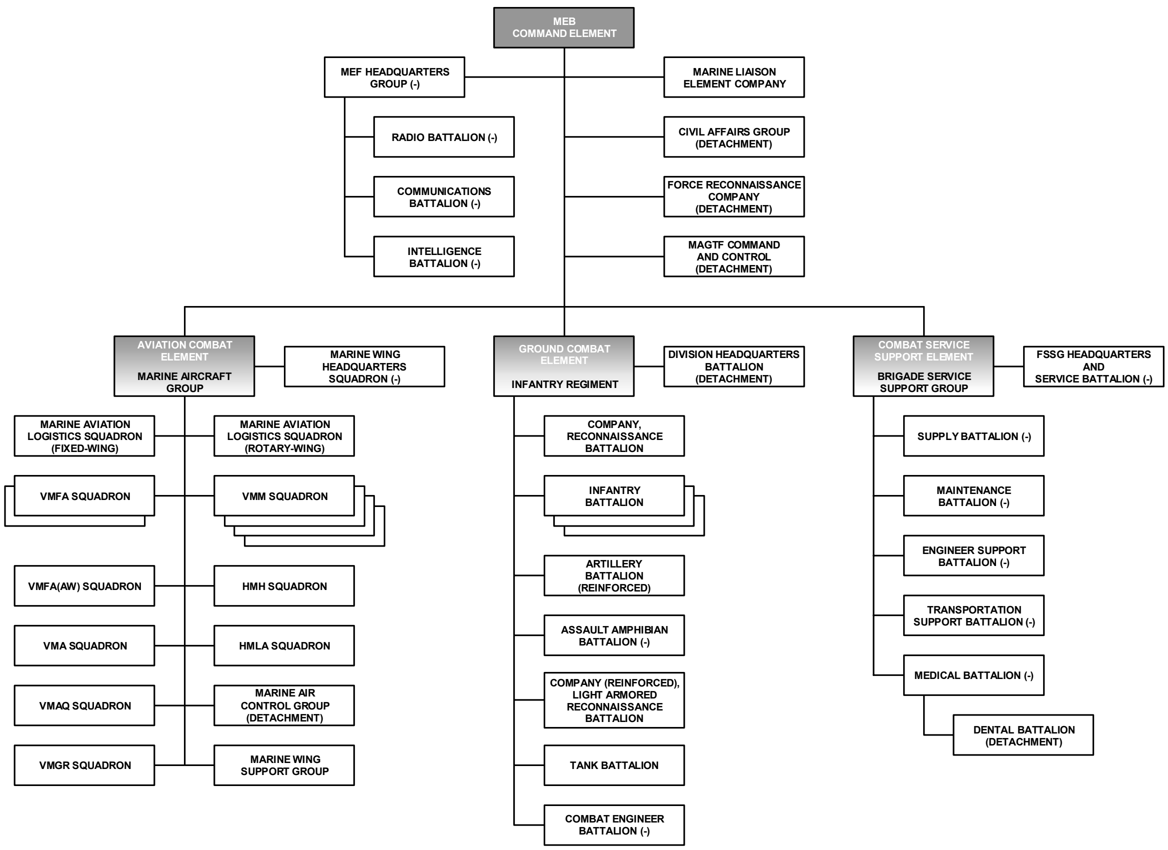
Element	Composition
Command Element	Detachments from the MEF Headquarters Group, communications battalion, radio battalion, civil affairs, force reconnaissance, intelligence, and the Marine logistics group.
Ground Combat Element	A reinforced infantry regiment which can consist of the following: • Three to five infantry battalions. • Artillery battalion (REIN). • Tank battalion (-). • Combat engineer battalion (-). • Reconnaissance company. • Assault amphibian battalion (-). • LAR company (REIN).
Aviation Combat Element	Operates from supporting ships, existing sites ashore, or Forward Operating Bases (FOBs). It is composed of a task organized MAG which can consist of the following: • Rotary/fixed-wing aircraft squadrons. • Detachments from MACG organizations. • Detachments from MWSG squadrons. • Marine Aviation Logistics Squadron (MALS).
Combat Service Support Element	Has supplies to support the MEB in combat for 30 days. Provides the full spectrum of combat service support capabilities to the MEB. Consists of a BSSG that is normally task organized from permanent organizations of the FSSG.

Amphibious Marine Expeditionary Brigade.

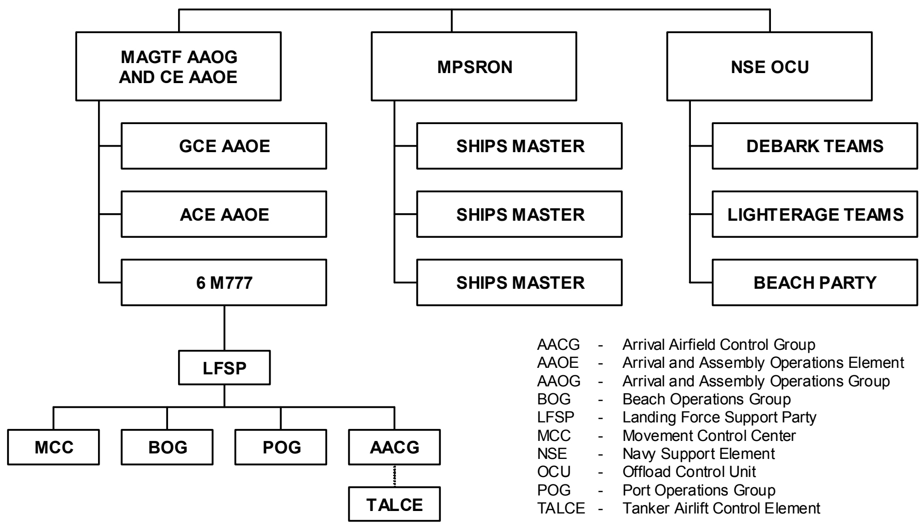
The amphibious MEB is the mid-sized MAGTF. The CE, GCE, and selected units from the ACE and CSSE form the assault echelon of an amphibious MEB and deploy aboard Navy amphibious shipping as a balanced force. The remaining forces of the amphibious MB deploy as an assault follow on echelon. There are approximately 14,000 to 15,000 Marine and 900 Navy personnel assigned, depending on mission and available shipping.

Element	Composition
Command Element	Detachments from the MEF Headquarters Group, communications battalion, radio battalion, civil affairs, force reconnaissance, intelligence, and the marine logistics group.
Ground Combat Element	A reinforced infantry regiment which can consist of the following: • Three to five infantry battalions. • Artillery battalion (REIN). • Tank companies. • Combat engineer company. • Reconnaissance company. • Assault amphibian company(s). • LAR company (REIN).

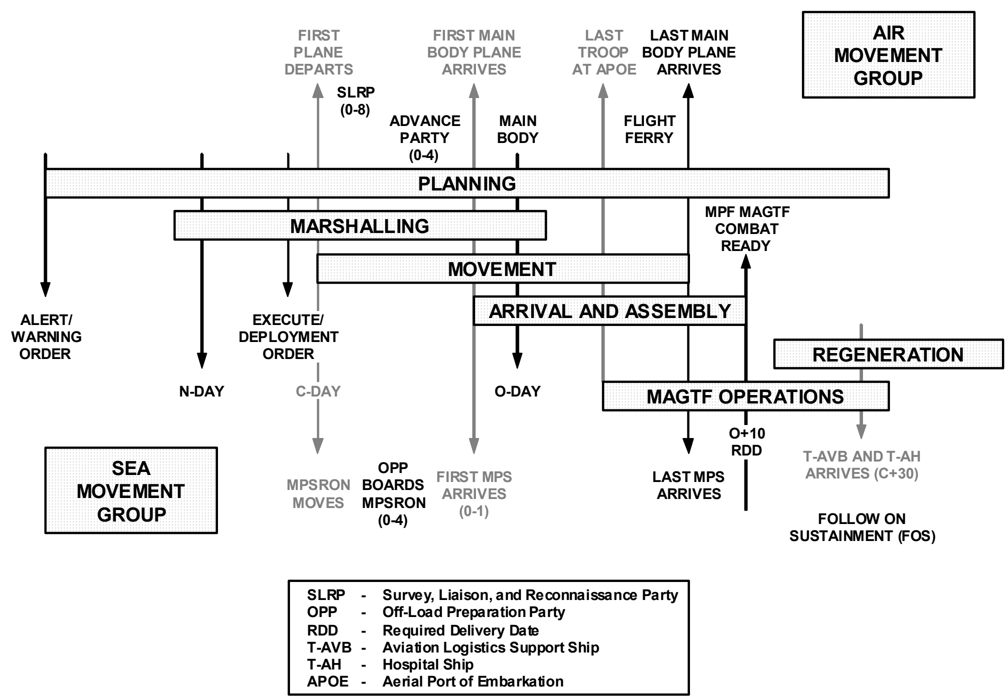
Element	Composition
Aviation Combat Element	Operates from supporting ships, existing sites ashore, or FOBs. It is composed of a task organized MAG which can consist of the following: • Rotary/fixed-wing aircraft squadrons. • Detachments from MACG organizations. • Detachments from MWSG squadrons. • MALS.
Combat Service Support Element	Has supplies to support the MEB in combat for 30 days. Provides the full spectrum of combat service support capabilities to the MEB. Consists of a BSSG that is normally task organized from permanent organizations of the FSSG. The BSSG is organized to accomplish a specific mission.
Naval Construction Force	Task organized to support the MEB's mission ashore. It is normally built around the assets of a naval mobile construction battalion.



Marine Expeditionary Brigade Organization.



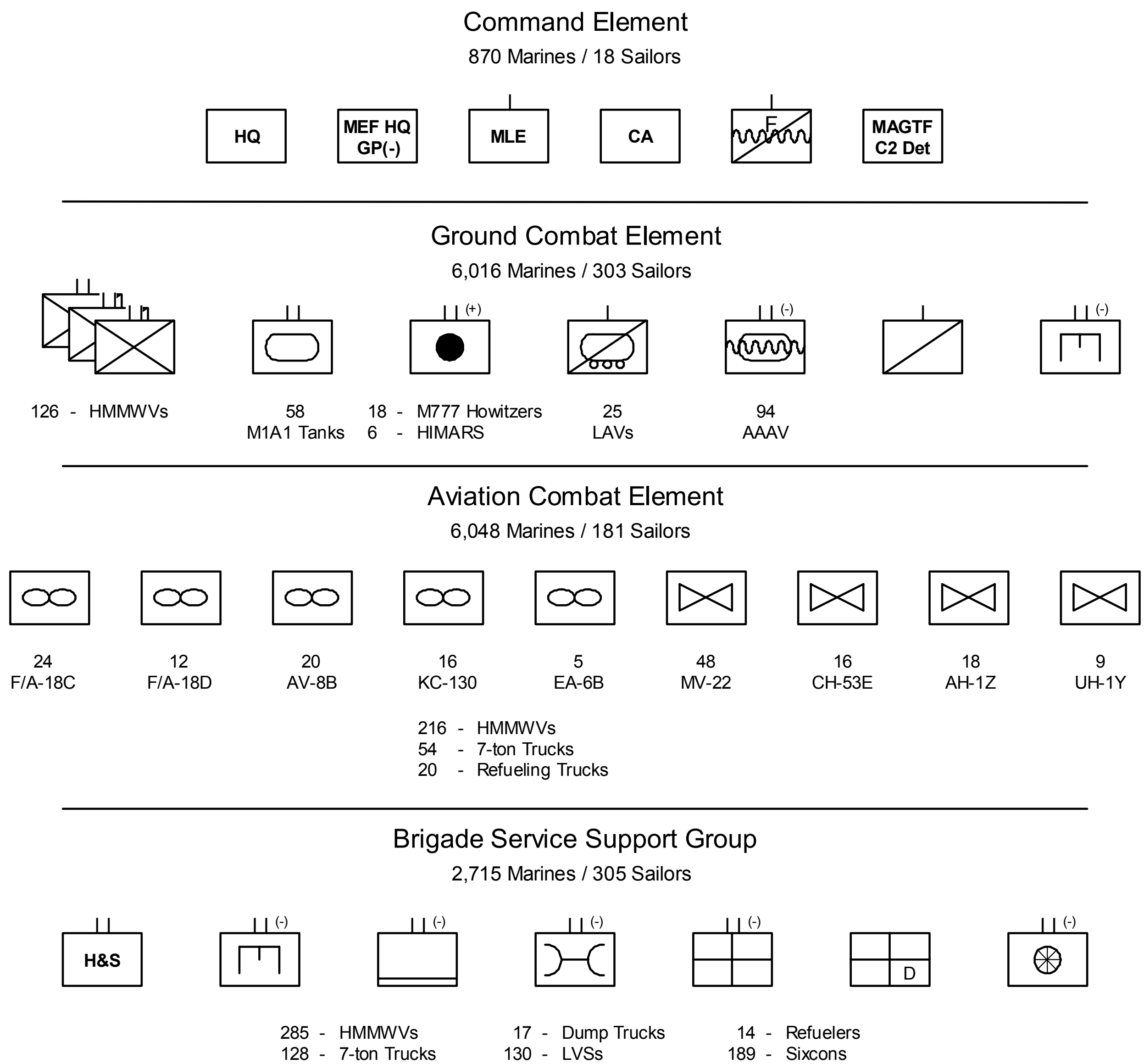
Maritime Prepositioning Ship Squadron Organization.



Phases of a Maritime Prepositioning Force Operation.

Maritime Prepositioning Force Support.

T-AVBs	MPS
• T-AVB-3 USNS Wright (West). • T-AVB-4 USNS Curtiss (East). • Will arrive in AO 15-20 days after notification of movement. • Provides sealift of intermediate logistics support. Marries up with aircraft, personnel, and support prepositioned by FIE and MPS.	• Usually in theater before T-AVB. • When combined with FIE and FISP allowances, provides ACE 30 days of combat operations sustainment until arrival of T-AVB.



Marine Expeditionary Brigade Laydown.

Notional MPF Brigade
Table of Organization

Command Element (CE) (111 MO/635 ME/5 NO/10 NE/2 CIV) **763**
- Command Element (70/80/4/1/0) 155
  - Detachment, Communications Battalion (9/257/0/2/0) 268
  - Detachment, Force Reconnaissance Company (5/36/0/2/0) 43
  - Detachment, Intelligence Battalion (15/76/0/0/2) 93
  - Detachment, MEF Headquarters Group (4/80/1/3/0) 88
  - Detachment, Marine Liaison Element (3/12/0/0/0) 15
  - Detachment, Radio Battalion (5/94/0/2/0) 101

Ground Combat Element (GCE) (315/5468/18/272) **6073**
- Detachment, Headquarters Battalion, Division (5/117/0/0) **122**
  - Detachment, H&S Company (1/10/0/0) 11
  - Detachment, Communications Company (1/16/0/0) 17
  - Detachment, Truck Company (2/63/0/0) 65
  - Detachment, Military Police Company (1/28/0/0) 29

- Detachment, Reconnaissance Battalion (3/69/0/3) **75**

- Infantry Regiment (158/2688/11/202) **3059**
  - Headquarters, Infantry Regiment (32/147/2/4) 176
  - H&S Company, Infantry Battalion (x3) (22/178/3/66) 807
  - Rifle Company, Infantry Battalion (x9) (6/176/0/0) 1638
  - Weapons Company, Infantry Battalion (x3) (5/141/0/0) 438

- Artillery Battalion (Reinforced) (64/863/5/19) **951**
  - Detachment, Headquarters Battery, Artillery Regiment (1/16/0/0) 17
  - HQ Battalion (Reinforced) (23/167/5/4) 199
  - Artillery battery (x5) (8/136/0/3) 735

- Detachment, Amphibious Assault Battalion (20/535/0/9) **564**
  - Detachment, H&S Company (0/6/0/5) 11
  - Amphibious Assault Company (x2) (6/190/0/0) 392

- Detachment, Combat Engineer Battalion 912/298/0/4) **314**
  - Detachment, H&S Company (0/4/0/4) 8
  - Combat Engineer Company (x2) 5/109/0/0) 228
  - Detachment, Combat Engineer Support Company (2/76/0/0) 78

- Detachment, Light Armored Reconnaissance Company (5/140/0/5) **150**
  - Detachment, H&S Company (0/6/0/5) 11
  - Light Armored Reconnaissance Company (5/134/0/0) 139

- Tank Battalion (48/758/2/30) **838**
  - H&S Company (28/434/2/30) 464
  - Tank Company 9x4) (5/81/0/0) 344

Aviation Combat Element (ACE) (608/4470/35/130) **5243**

Headquarters, ACE (42/153/4/5) **204**

Detachment, MWHS (6/45/1/1) 53
Direct Support Team (1/7/0/0) 8
Special Security Communications Team (0/11/0/0) 11

Marine Air Control Group (77/955/1/14) **1047**

Detachment, HQ MACG (5/13/1/1) 20
Detachment, MTACS (10/62/0/1) 73
Detachment, HQ MACS (1/60/0/3) 64
Detachment, TAOC (14/85/0/1) 100
Detachment, ATC (x2) (4/72/0/0) 152
Detachment, MWCS (8/240/0/0) 248
Detachment, MASS (19/74/0/2) 95
Detachment, H&S LAAD (1/25/0/1) 27
Firing Battery LAAD Battalion (5/137/0/3) 145
VMU (6/115/0/2) 123

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USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC USE CASE: PRODUCT ORDER FULFILLMENT FOR A STOCKED ITEM									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and confirms availability of product (Available to Promise [ATP])								
	Alternate Flow – Supply-1.1 Normally stocked item not in stock								
10.1	Determine wait (back order) or buy (Procurement/Source)								
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)								
14	OM signals FM and FM commits/obligates funds								
15	OM reserves and schedules product through ICM. OM sends DCM advance notice								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
16	ICM sorts and groups product orders								
17	ICM reserves and schedules IPM								
18	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
18.a	ICM notifies DCM of shipping requirements.								
18.b	DCM and ICM coordinate pickup to meet delivery requirements.								
18.c	ICM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	IPM routes order to appropriate IE for fulfillment. IE receives the product order								
19.a	IPM routes order to appropriate IE for fulfillment.								
19.b	IE receives the product order								
20	DCM reserves and schedules DPM								
21	DPM routes order to appropriate DE for fulfillment								
22	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)								
23	IE picks, packs and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)								
24	DE fulfills distribution service order								
25	Item is installed, if required								
26	DCM (based on input from DPM/DE) signals OM of item delivery								
27	OM verifies receipt (e.g. by customer signature, auto-receipt, etc) and installation (if required)								
28	OM signals FM of receipt verification and FM expenses/liquidates funds								
29	OM closes customer order upon completion of all child orders								
USMC USE CASE: PRODUCT ORDER FULFILLMENT FOR A NON-STOCKED ITEM									

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes requests								
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and confirms that item is not stocked. ICM checks with PCM for ability/availability to acquire product								
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)								
14	OM signals FM and FM commits/obligates funds								
15	OM reserves and schedules item(s) through ICM. OM sends DCM advance notice								
16	ICM sorts and groups orders								
17	ICM signals PCM								
18	PCM sorts and groups orders								
19	PCM reserves and schedules PPM								
	Alternate Flow – Supply-2.1 Direct delivery to customer (external source)								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
19.1	PE reviews provider options								
19.2	PE evaluates source options (availability and capacity)								
19.3	PE assesses organic and external capability to deliver to the customer								
19.4	PE negotiates with external source to deliver product within the terms and conditions of the customer's request and selects provider (RDD etc.) (Capable to Promise [CTP]) and notifies PCM (through PPM). PCM signals ICM. ICM notifies OM.								
19.5	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)								
19.6	PE creates sourcing order and releases to source/provider								
19.7	External source delivers to customer								
	(Continue flow at step 34)								
20	PPM routes order to appropriate PE for fulfillment. PE sources item and reserves the order								
20.1	PE reviews provider options								
20.2	PE evaluates source options (availability and capacity)								
20.3	PE assesses organic and external capability to deliver to the customer								
20.5	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)								
21	PCM (based on input from PPM/PE) signals ICM and items are placed on back-order. ICM informs OM (available to promise [ATP])								
21.a	PCM (based on input from PPM/PE) signals ICM and items are placed on back-order.								
21.b	ICM informs OM (available to promise [ATP])								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
22	ICM reserves and schedules IPM								
23	ICM signals DCM of shipping requirements and requests pickup. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
23.a	ICM notifies DCM of shipping requirements and requests pickup.								
23.b	DCM and ICM coordinate pickup to meet delivery requirements.								
23.c	ICM signals OM.								
23.d	OM manages fulfillment issues by exception.								
24	IPM routes order to appropriate IE for fulfillment. IE receives the product order								
25	IE receives items ordered from external source and notifies IPM. IPM signals ICM. ICM signals OM.								
25.a	IE receives items ordered from external source and notifies IPM.								
25.b	IPM signals ICM.								
25.c	IPM signals OM								
26	OM signals FM of receipt verification of external items and FM expenses / liquidates funds								
27	DCM reserves and schedules DPM								
28	DPM routes order to appropriate DE for fulfillment								
29	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)								
30	IE picks, packs, and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)								
31	DE fulfills distribution service order								
32	Item is installed, if required								
33	DCM (based on input from DPM/DE) signals OM of item delivery								
34	OM verifies receipt (e.g. by customer signature, auto-receipt, etc.) and installation (if required)								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
35	OM signals FM to expense/liquidate and FM expenses/liquidates funds								
36	OM closes customer order upon completion of all child orders								
USMC USE CASE: MULTIPLE SOURCE REQUEST									
1	Requirement is identified within using unit.								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes requests								
6	Designated representative assesses funding availability and sends request. (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and confirms that multiple sources are required. ICM checks with organic sources and PCM for ability/availability to acquire product								
10.a	OM checks with ICM and confirms that multiple sources are required.								
10.b	ICM checks with organic sources and PCM for ability/availability to acquire product								
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
13	OM reconciles customer terms and conditions with ATP/CTP and obtains initial customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)								
14	OM signals FM to commit/obligate and FM commits/obligates funds								
15	OM reserves and schedules product through ICM. OM sends DCM advance notice								
16	ICM sorts and groups orders								
17	ICM sources organic items and signals PCM to source external item(s). ICM informs OM [ATP]								
18	ICM reserves and schedules IPM								
19	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
19.a	ICM notifies DCM of shipping requirements.								
19.b	DCM and ICM coordinate pickup to meet delivery requirements.								
19.c	ICM signals OM.								
19.d	OM manages fulfillment issues by exception.								
20	IPM routes order to appropriate IE for fulfillment (Note: When sourcing from multiple organic warehouses, treat them as external sources inbound to the layette). IE receives the product order								
20.a	IPM routes order to appropriate IE for fulfillment (Note: When sourcing from multiple organic warehouses, treat them as external sources inbound to the layette).								
20.b	IE receives the product order								
21	IE receives items ordered from external sources and notifies IPM. IPM signals ICM. ICM notifies OM.								
21.a	IE receives items ordered from external sources and notifies IPM.								
21.b	IPM signals ICM.								
21.c	ICM notifies OM.								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
	Alternate Flow –Supply-3.1 Source delivers to government system								
21.1	Source delivers to government system								
21.2	Government system delivers to ICM or customer								
	Flow proceeds as normal from 21								
22	OM signals FM of receipt verification of external items and FM expenses / liquidates funds								
23	IE consolidates items to the layette								
24	DCM reserves and schedules DPM.								
25	DPM routes order to appropriate DE for fulfillment								
26	IE generates pick list and packing configuration and signals IPM (by exception e.g., denials, change in packing configuration, etc.)								
27	IE picks items and sends to layette								
28	IE assembles, packs, and stages order and generates shipping documents (Shipping manifests, packing lists, etc)								
29	DE fulfills distribution service order								
30	Item is installed, if required								
31	DCM (based on input from DPM/DE) signals OM of item delivery								
32	OM verifies receipt of layette (by customer signature, auto-receipt, etc) and installation (if required)								
33	OM signals FM of receipt verification and FM expenses/liquidates funds for layette								
34	OM closes customer order upon completion of all child orders								
USMC USE CASE: RETURN OF EXCESS ITEM TO STOCK									
1	Requirement is identified within using unit.								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and determines disposition								
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP])								
12	OM checks with DCM and confirms availability of distribution to pick up from customer and to deliver (Available to Promise [ATP])								
13	OM assesses capability of DCM to deliver product and ICM to receive product within the terms and conditions of the customer’s request (RDD, Location, etc) (Capable to Promise [CTP])								
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc)								
15	OM signals FM and FM credits funds (if necessary)								
16	OM reserves and schedules product return through ICM. OM sends DCM advance notice								
17	ICM sorts and groups orders								
18	ICM reserves and schedules IPM								
19	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
19.a	ICM notifies DCM of shipping requirements.								
19.b	DCM and ICM coordinate pickup to meet delivery requirements.								
19.c	ICM signals OM.								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
19.d	OM manages fulfillment issues by exception.								
20	IPM routes order to appropriate IE for fulfillment. IE receives the order.								
20.a	IPM routes order to appropriate IE for fulfillment.								
20.b	IE receives the order.								
21	DCM reserves and schedules DPM.								
22	DPM routes order to appropriate DE for fulfillment								
23	OM signals customer to stage product based on input from ICM. If appropriate, inventory adjustments are made								
24	DE fulfills distribution service order								
25	DCM (based on input from DPM/DE) signals OM of item delivery								
26	IE receives return product								
27	IE verifies items received, records and reports discrepancies and signals IPM								
28	IE puts item away								
29	OM verifies receipt (e.g. by signature, auto-receipt, etc)								
30	OM signals FM of receipt verification and FM expenses and liquidates (if applicable)								
31	OM closes customer order upon completion of all child orders								
USMC USE CASE: RETURN OF MRO TO STOCK									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with MCM and confirms availability of maintenance resources (Available to Promise [ATP])								
11	OM checks with ICM and confirms availability to receive product [ATP]								
12	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
13	OM assesses capability of MCM to complete repair, ICM to receive product and DCM to deliver product within the terms and conditions to complete customer's request for pickup (RDD, Location, etc) (Capable to Promise [CTP])								
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)								
15	OM signals FM and FM commits/obligates funds								
16	OM reserves and schedules MCM. OM sends DCM and ICM advance notice								
16.a	OM reserves and schedules MCM.								
16.b	OM sends DCM and ICM advance notice								
17	MCM sorts and groups orders								
18	MCM reserves and schedules MPM								
19	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.								
19.a	MCM notifies DCM of shipping requirements.								
19.b	DCM and MCM coordinate pickup to meet delivery requirements.								
19.c	MCM signals OM.								
19.d	OM manages fulfillment issues by exception.								
20	MPM assigns resources (ME) to the service order								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
21	DCM reserves and schedules DPM								
22	DPM routes order to appropriate DE for fulfillment								
23	OM signals customer to stage product based on input from MCM								
24	DE retrogrades item requiring repair to maintenance facility and notifies DCM (through DPM). DCM notifies OM								
24.a	DE retrogrades item requiring repair to maintenance facility and notifies DCM (through DPM).								
24.b	DCM notifies OM								
25	MPM coordinates with ICM to take custody of assets returned								
26	ME performs inspection and diagnosis								
27	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM								
28	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair								
29	ME performs repair and conducts quality control								
30	ME stages repaired item for return								
31	MCM arranges with ICM for return of items. ICM reserves and schedules IPM.								
32	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals MCM and OM. OM manages fulfillment issues by exception.								
32.a	ICM notifies DCM of shipping requirements.								
32.b	DCM and ICM coordinate pickup to meet delivery requirements.								
32.c	ICM signals MCM and OM.								
32.d	OM manages fulfillment issues by exception.								
33	IPM routes order to appropriate IE for fulfillment								
34	DCM reserves and schedules DPM								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
35	DPM routes order to appropriate DE for fulfillment								
36	DE picks up return product and delivers to designated IPM/IE								
37	DCM (based on input from DPM/DE) signals OM of item delivery								
38	IE receives return product								
39	IE verifies items received, records and reports discrepancies and signals IPM. IPM notifies ICM.								
39.a	IE verifies items received, records and reports discrepancies and signals IPM.								
39.b	IPM notifies ICM.								
40	IE puts item away								
41	OM verifies receipt (by signature, auto-receipt, etc)								
42	OM signals FM of receipt verification and FM expenses/liquidates funds								
43	OM closes customer order upon completion of all child orders								
USMC USE CASE: RETURN OF DEFECTIVE ITEM TO SOURCE									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and determines disposition								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP])								
12	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
13	OM assesses capability of ICM and DCM to complete return within the terms and conditions to complete customer's request (RDD, Location, etc) (Capable to Promise [CTP])								
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc)								
15	OM signals FM and FM credits funds (if necessary)								
16	OM reserves and schedules ICM. OM sends DCM advance notice								
17	ICM sorts and groups orders								
18	ICM reserves and schedules IPM								
19	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
19.a	ICM notifies DCM of shipping requirements.								
19.b	DCM and ICM coordinate pickup to meet delivery requirements.								
19.c	ICM signals OM.								
19.d	OM manages fulfillment issues by exception.								
20	IPM routes order to appropriate IE for fulfillment								
21	DCM reserves and schedules DPM								
22	DPM routes order to appropriate DE for fulfillment								
23	OM signals customer to stage product based on input from ICM. If appropriate, inventory adjustments are made								
24	DE fulfills distribution service order								
25	DCM (based on input from DPM/DE) signals OM of item return								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
26	IE receives return product								
27	IE verifies items received, records and reports discrepancies and signals IPM. IPM signals ICM. ICM notifies OM								
27.a	IE verifies items received, records and reports discrepancies and signals IPM.								
27.b	IPM signals ICM.								
27.c	ICM notifies OM								
28	OM consolidates with other turn-in requirements (as appropriate) and schedules turn-in appointment with source								
29	IE stages defective item(s) for return								
30	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
30.a	ICM notifies DCM of shipping requirements.								
30.b	DCM and ICM coordinate pickup to meet delivery requirements.								
30.c	ICM signals OM.								
30.d	OM manages fulfillment issues by exception.								
31	DCM reserves and schedules DPM								
32	DPM routes order to appropriate DE for fulfillment								
33	DE picks up return product and delivers to designated source								
34	DCM (based on input from DPM/DE) signals OM of item delivery								
35	OM verifies receipt (by signature, auto-receipt, etc)								
36	OM signals FM of receipt verification and FM expenses/liquidates funds (if applicable)								
37	OM closes customer order after completion of all child orders								
USMC USE CASE: RETURN OF HAZARDOUS MATERIEL FOR DISPOSAL									

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ICM and determines special handling requirements and availability to receive product								
11	OM checks with DCM and confirms availability of qualified distribution to support movement requirements (Available to Promise [ATP])								
12	OM assesses capability of DCM to deliver return product and ICM to receive product and dispose product within the terms and conditions of the customer's request OM (Time, Location, etc) (Capable to Promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc)								
14	OM signals FM to make necessary adjustment to funds (if required)								
15	OM reserves and schedules product return through ICM. OM sends DCM advance notice								
15.a	OM reserves and schedules product return through ICM.								
15.b	OM sends DCM advance notice								
16	ICM sorts and groups orders								
17	ICM reserves and schedules IPM (Disposal)								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
18	ICM notifies DCM of shipping requirements. DCM and ICM coordinate pickup to meet delivery requirements. ICM signals OM. OM manages fulfillment issues by exception.								
18.a	ICM notifies DCM of shipping requirements.								
18.b	DCM and ICM coordinate pickup to meet delivery requirements.								
18.c	ICM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	IPM (Disposal) routes order to appropriate IE (Disposal) for fulfillment								
20	DCM reserves and schedules DPM								
21	DPM routes order to appropriate DE for fulfillment								
22	OM signals to customer to stage product based on input from ICM. If appropriate, inventory adjustments are made								
23	DE fulfills distribution service order								
24	DCM (based on input from DPM/DE) signals OM of item delivery								
25	IE (Disposal) receives return product								
26	IE (Disposal) verifies items received, records and reports discrepancies and signals IPM (Disposal).								
27	IE (Disposal) disposes Hazardous Material according to specification and signals IPM (Disposal). IPM (Disposal) signals ICM. ICM notifies OM of item disposal								
27.a	IE (Disposal) disposes Hazardous Material according to specification and signals IPM (Disposal).								
27.b	IPM (Disposal) signals ICM.								
27.c	ICM notifies OM of item disposal								
28	OM signals FM of disposal and FM expenses/liquidates funds (if applicable)								
29	OM closes customer order upon completion of all child orders								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC USE CASE: MAINTENANCE AT IMA									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if required								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with MCM and confirms availability of maintenance resources (available to promise [ATP])								
11	OM checks with DCM and confirms availability to support movement requirements [ATP]								
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (Required Delivery Date (RDD), Location, etc.) (Capable to promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)								
14	OM signals FM and FM commits/obligates funds								
15	OM reserves and schedules maintenance through MCM. OM sends DCM advance notice								
16	MCM sorts and groups orders								
17	MCM reserves and schedules MPM								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
18	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.								
18.a	MCM notifies DCM of shipping requirements.								
18.b	DCM and MCM coordinate pickup to meet delivery requirements.								
18.c	MCM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	MPM assigns resources (ME) to the order								
20	DCM reserves and schedules DPM								
21	DPM routes order to appropriate DE for fulfillment								
22	OM signals customer to stage product based on input from MCM								
23	DE retrogrades item requiring repair to maintenance site								
24	DCM (based on input from DPM/DE) signals OM of item delivery								
25	ME receives item								
26	ME verifies items received and signals MPM. MPM signals MCM. MCM notifies OM.								
26.a	ME verifies items received and signals MPM.								
26.b	MPM signals MCM.								
26.c	MCM notifies OM.								
27	ME performs disassembly (if required), inspection, and diagnosis and captures the cause of failure for possible Quality Deficiency Report (QDR) submission and trend analysis								
28	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM								
29	MCM determines if customer's ATP/CTP can be met based on need for additional resources and parts								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
30	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.								
31	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated								
32	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair.								
33	ME performs repair and conducts quality control								
34	ME notifies MPM of completed repair. MPM signals MCM. MCM notifies OM								
35	ME stages repaired item for return to customer								
36	MPM releases repaired item								
37	MPF notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.								
37.a	MCM notifies DCM of shipping requirements.								
37.b	DCM and MCM coordinate pickup to meet delivery requirements.								
37.c	MCM signals OM.								
37.d	OM manages fulfillment issues by exception.								
38	DCM reserves and schedules DPM								
39	DPM routes to appropriate DE for fulfillment (if required)								
40	DE fulfills delivery of repaired item (if required)								
41	Repaired item is installed (if required). Note: ME will perform installation (if required)								
42	DCM (based on input from DPM/DE) signals OM of item delivery								
43	OM verifies receipt and satisfactory condition with customer								
44	OM signals FM of receipt verification and FM expenses/liquidates funds								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
45	OM closes customer order upon completion of all child orders								
USMC USE CASE: MAINTENANCE AT CUSTOMER									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if required								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into an order								
10	OM checks with MCM and confirms availability of maintenance resources (available to promise [ATP])								
11	OM checks DCM availability to support movement requirements (ATP)								
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (request delivery date (RDD, Location, etc.) (Capable to promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.)								
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)								
15	OM reserves and schedules maintenance with MCM. OM sends DCM advance notice								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
15.a	OM reserves and schedules maintenance with MCM.								
15.b	OM sends DCM advance notice								
16	MCM sorts and groups orders								
17	MCM reserves and schedules MPM								
18	MCM notifies DCM of shipping requirements. DCM and MCM coordinate pickup to meet delivery requirements. MCM signals OM. OM manages fulfillment issues by exception.								
18.a	MCM notifies DCM of shipping requirements.								
18.b	DCM and MCM coordinate pickup to meet delivery requirements.								
18.c	MCM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	MPM assigns resources (ME) to the service order								
20	DCM reserves and schedules DPM								
21	DPM routes order to appropriate DE for fulfillment								
22	OM signals customer to stage product based on input from MCM								
23	DE delivers ME (Contact Team/resources) to work site								
24	DCM (based on input from DPM/DE) signals OM of contact team on site								
25	ME performs disassembly (If required), inspection, and diagnosis and captures the cause of failure for possible QDR submission and trend analysis								
26	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM								
27	MCM determines if customer's ATP/CTP can be met based on need for additional resources and parts								
28	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated								
30	If necessary, MCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect repair.								
31	ME performs repair and conducts quality control								
32	ME notifies MPM of completed repair. MPM signals MCM. MCM notifies OM								
32.a	ME notifies MPM of completed repair.								
32.b	MPM signals MCM.								
32.c	MCM notifies OM								
33	ME releases/delivers repaired item to customer								
34	OM verifies receipt and satisfactory condition with customer								
35	MPM arranges with DCM for return of contact team as required								
36	OM signals FM of receipt verification and FM expenses/liquidates funds								
37	OM closes customer order on completion of all child orders								
USMC USE CASE: PROCUREMENT FULFILLMENT									
1	PCM receives order from xCM								
2	PCM sorts and groups orders								
3	PCM reserves and schedules PPM								
4	PPM routes order to appropriate PE for fulfillment								
5	PE reviews provider options								
6	PE evaluates supplier options (availability and capacity)								
7	PE assesses capability of suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's requirement (e.g., volumes, lead times, purchase vehicle) (RDD etc.) (Available to Promise [ATP])								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
8	PE negotiates with suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's request and selects provider (RDD etc.) (Capable to Promise [CTP])								
9	PE creates sourcing order and releases to supplier/provider. PE signals PPM. PPM signals PCM.								
9.a	PE creates sourcing order and releases to supplier/provider.								
9.b	PE signals PPM.								
9.c	PPM signals PCM.								
10	PCM (through PPM) notifies PE of receipt verification and supplier payment								
11	PE closes sourcing order and signals PPM.								
USMC USE CASE: BASIC DISTRIBUTION FOR PRODUCT ORDER FULFILLMENT									
1	DCM receives order from ICM								
2	DCM sorts and groups orders								
3	DCM reserves and schedules DPM								
4	DPM selects mode								
5	DPM builds load plan and notifies ICM of requirements								
6	DPM consolidates orders by mode/location and destination								
7	DPM rates and routes shipment								
8	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals ICM and OM.								
9	DPM modifies load plan to match actual carrier specifications.								
10	DPM coordinates with ICM to finalize load sequence plan								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
11	DPM schedules resources (e.g., DE, Material Handling Equipment (MHE), special handling equipment, etc.)								
12	DE receives order								
13	DE loads the load								
14	DE finalizes shipping documents								
15	DE delivers shipment								
16	DCM (based on input from DPM/DE) notifies OM of delivery								
17	OM verifies receipt (by customer signature, auto-receipt, etc)								
18	OM signals FM of receipt verification and FM expenses/liquidates funds								
19	OM closes customer order after the completion of all child orders								
USMC USE CASE: MOVEMENT OF PERSONNEL AND EQUIPMENT FOR SERVICES ONE-WAY									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request. (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with DCM and confirms availability of distribution to deliver from location to final destination (Available to Promise [ATP])								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
	Alternate Flow – Distribution-2.1 Critical Casualty/Wounded Evacuation								
1	Customer/RM identifies request to DCM								
2	DCM reconciles available assets against request								
3	DCM turns request into an order								
4	DCM notifies OM								
5	DCM selects mode (if required)								
6	DCM selects distribution asset/carrier								
7	DPM notifies and coordinates with customer								
8	DPM routes movement								
9	DE executes order (pick-up/load/deliver)								
10	DPM captures cost and communicates to FM								
11	OM assesses capability of DCM to complete service within the terms and conditions of the customer's request (Required delivery date [RDD], location, etc; capable to promise [CTP])								
12	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual pick-up/delivery date, time window, actual pick-up/delivery locations, etc)								
13	OM signals FM and FM commits/obligates funds (if required)								
14	OM reserves and schedules DCM.								
15	DCM sorts and groups orders								
16	DCM reserves and schedules DPM								
17	DPM selects mode								
18	DPM builds load plan for PAX and equipment and signals DCM. DCM notifies OM								
19	DPM consolidates orders by mode/location and destination								
20	DPM rates and routes shipment								
21	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals DCM. DCM notifies OM								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
21.a	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals DCM.								
21.b	DCM notifies OM								
22	DPM modifies load plan to match actual carrier specifications								
23	DPM generates load sequence plan and signals DCM. DCM notifies OM.								
23.a	DPM generates load sequence plan and signals DCM.								
23.b	DCM notifies OM.								
24	DPM schedules resources (e.g., DE, MHE, special handling equipment, etc.)								
25	DE receives order								
26	DE loads the load								
27	DE finalizes shipping documents								
28	DE delivers shipment								
29	DCM (based on input from DPM/DE) notifies OM of delivery								
30	OM verifies receipt (by customer signature, auto-receipt, etc)								
31	OM signals FM of receipt verification and FM expenses/liquidates funds								
32	OM closes customer order upon completion of all child orders								
USMC USE CASE: PATIENT MOVEMENT									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if required								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with HSCM and confirms availability of health resources to provide services (Available to Promise [ATP])								
11	OM checks with DCM and confirms availability of distribution to support movement requirements [ATP]								
12	OM assesses capability of HSCM to provide health services and DCM to provide distribution services within the terms and conditions of the customer's request (required delivery date [RDD], location, etc.) (Capable to Promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.)								
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)								
15	OM reserves and schedules with HSCM. OM sends DCM advance notice								
15.a	OM reserves and schedules with HSCM.								
15.b	OM sends DCM advance notice								
16	HSCM sorts and groups orders								
17	HSCM reserves and schedules HSPM								
18	HSCM notifies DCM of shipping requirements. DCM and HSCM coordinate pickup to meet delivery requirements. HSCM signals OM. OM manages fulfillment issues by exception.								
18.a	HSCM notifies DCM of shipping requirements.								
18.b	DCM and HSCM coordinate pickup to meet delivery requirements.								
18.c	HSCM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	HSPM assigns resources (HSE) to the service order								
20	DCM reserves and schedules DPM								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
21	DPM routes order to appropriate DE for fulfillment								
22	DE moves patient requiring treatment to next level of care								
23	DCM (based on input from DPM/DE) signals OM of patient movement								
24	OM verifies receipt (by customer signature, auto-receipt, etc)								
25	OM signals FM of receipt verification and FM expenses/liquidates funds								
26	OM closes customer order upon completion of all child orders								
USMC USE CASE: PROVIDE HEALTH SERVICES AT CUSTOMER SITE									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if required								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with HSCM and confirms availability of resources (available to promise [ATP])								
11	OM checks with DCM for availability of distribution to support movement requirements (available to promise [ATP])								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
12	OM assesses capability of HSCM to complete health service and DCM to provide distribution service within the terms and conditions of the customer's request (required delivery date [RDD], Location, etc.) (Capable to promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc)								
14	OM signals FM to commit/obligate funds and funds are committed/obligated (if required)								
15	OM reserves and schedules health services through HSCM. OM sends DCM advance notice								
16	HSCM sorts and groups orders by common characteristics such as priorities, locations, nature of health service requested, etc. for further processing								
17	HSCM reserves and schedules HSPM								
18	HSCM notifies DCM of shipping requirements. DCM and HSCM coordinate pickup to meet delivery requirements. HSCM signals OM. OM manages fulfillment issues by exception.								
18.a	HSCM notifies DCM of shipping requirements.								
18.b	DCM and HSCM coordinate pickup to meet delivery requirements.								
18.c	HSCM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	HSPM routes order to appropriate HSE for fulfillment								
20	DCM reserves and schedules DPM								
21	OM signals customer to stage personnel based on input from HSCM								
22	DPM routes order to appropriate DE for fulfillment								
23	DE delivers HSE (Contact Team/resources) to work site								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
24	DCM (based on input from DPM/DE) signals OM of contact team on site								
25	HSE contact team conducts assessment								
26	HSPM (based on input from HSE) identifies and requests additional resources and supplies to effect health service (if required) and signals HSCM								
27	HSCM determines if customer's ATP/CTP can be met based on need for additional resources and supplies								
28	If necessary, HSCM determines new ATP/CTP with DCM and other xCM based on HSE diagnosis. If necessary, HSCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.								
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated								
30	If necessary, HSCM signals appropriate xCM for additional resources and supplies and reserves additional capacity/capability (as needed) to effect repair.								
31	The HSE contact team performs service								
32	The HSE contact team notifies HSPM of completed services. HSPM notifies HSCM. HSCM signals OM of completed services.								
32.a	The HSE contact team notifies HSPM of completed services.								
32.b	HSPM notifies HSCM.								
32.c	HSCM signals OM of completed services.								
33	If required, OM verifies satisfactory performance with customer								
34	HSCM arranges with DCM for return of HSE contact team as required								
35	OM signals FM of receipt verification and FM expenses/liquidates funds								
36	OM closes customer order upon completion of all child orders								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
USMC USE CASE: ENGINEERING SERVICES USING ORGANIC RESOURCES									
1	Requirement is identified within using unit								
2	Responsible supervisor within using unit validates requirement and prioritizes if necessary								
3	Requirement is routed to RM								
4	RM sources internally or generates request								
5	Designated representative authorizes and prioritizes request								
6	Designated representative assesses funding availability and submits request (Reserve if funded, else submit an un-funded deficiency)								
7	OM receives request								
8	OM processes and validates request								
9	OM transforms request into a customer order								
10	OM checks with ESCM and confirms availability of resources (available to promise [ATP])								
11	OM checks with DCM for availability of distribution to support movement requirements [ATP]								
12	OM assesses capability of ESCM to complete engineering service and DCM to provide distribution within the terms and conditions of the customer's request (Required Delivery Date [RDD], Location, etc.) (Capable to promise [CTP])								
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc)								
14	OM signals FM and FM commits/obligates funds								
15	OM reserves and schedules engineering services through ESCM. OM sends DCM advance notice								
15.a	OM reserves and schedules engineering services through ESCM.								
15.b	OM sends DCM advance notice								
	Alternate Flow - Engineering 1.1-External Source								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
15	If external source, reserve and schedule through external source								
16	ESCM sorts and groups orders								
17	ESCM reserves and schedules ESPM								
18	ESCM notifies DCM of shipping requirements. DCM and ESCM coordinate pickup to meet delivery requirements. ESCM signals OM. OM manages fulfillment issues by exception								
18.a	ESCM notifies DCM of shipping requirements.								
18.b	DCM and ESCM coordinate pickup to meet delivery requirements.								
18.c	ESCM signals OM.								
18.d	OM manages fulfillment issues by exception.								
19	ESPM assigns resources (ESE) to the service order								
20	DCM reserves and schedules DPM								
21	DPM routes order to appropriate DE for fulfillment								
22	DE delivers ESE (Contact Team/resources) to work site								
23	DCM (based on input from DPM/DE) signals OM of contact team on site								
24	ESE conducts site survey								
25	ESE produces detailed engineer estimate and signals ESPM. ESPM signals ESCM. ESCM notifies OM on estimate status								
25.a	ESE produces detailed engineer estimate and signals ESPM.								
25.b	ESPM signals ESCM.								
25.c	ESCM notifies OM on estimate status								
26	ESPM (based on input from ESE) identifies and requests additional resources and parts to effect engineering service (if required) and signals ESCM								
27	ESCM determines if customer's ATP/CTP can be met based on need for additional resources and parts								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
28	If necessary, ESCM determines new ATP/CTP with DCM and other xCM based on ESE diagnosis. If necessary, ESCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer								
29	If required, OM signals FM to commit /obligate additional funds, and funds are committed/obligated								
30	If necessary, ESCM signals appropriate xCM for additional resources and parts and reserves additional capacity/capability (as needed) to effect engineering service								
31	ESCM assembles required resources and notifies ESPM. ESPM signals ESE								
31.a	ESCM assembles required resources and notifies ESPM.								
31.b	ESPM signals ESE								
32	ESE executes engineering service and conducts quality control								
33	ESE signals ESPM engineering service is complete. ESPM signals ESCM. ESCM notifies OM								
33.a	ESE signals ESPM engineering service is complete.								
33.b	ESPM signals ESCM.								
33.c	ESCM notifies OM								
34	OM verifies receipt/satisfactory performance with customer (by customer signature, auto-receipt, etc)								
35	ESCM arranges with DCM for return of contact team and retrograde of resources no longer needed, as required								
36	OM signals FM of receipt verification and FM expenses/liquidates funds								
37	OM closes customer order upon completion of all child orders								
USMC USE CASE: CUSTOMER SERVICE – PROBLEM RELATED TO A CUSTOMER ORDER (Not relevant to this study as per TSPO.)									
1	Customer signals OM of problem								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
2	OM validates customer complaint and identifies that a resolution does not exist within normal fulfillment. OM signals CSE to create a customer service order linked to the open customer order, and provides details around the issue requiring resolution (if available)								
3	CSE creates the customer service order								
4	CSE prioritizes the customer service orders								
5	CSE coordinates with OM to identify the issue (if OM has not already provided this)								
6	CSE determines the Course of Action (COA) and signals to OM								
7	OM confirms and decides COA with customer within the terms and conditions of the customer's request (RDD etc.) (Capable to Promise [CTP]). Note: If the order is already closed then the original CTP cannot be met, and the OM or CSE sets new expectations with the customer								
8	OM reconciles order terms and conditions with ATP/CTP and decides on COA with customer								
9	OM signals FM to commit/obligate or de-obligate funds and funds are committed/obligated or de-obligated (if needed)								
10	OM signals CSE to execute approved COA								
11	CSE signals OM after issue has been successfully resolved								
12	OM verifies resolution with customer and signals CSE								
13	OM signals FM to expense/liquidate and FM expenses/liquidates								
14	CSE closes customer service order								
USMC USE CASE: CUSTOMER SERVICE- CUSTOMER INQUIRY (Not Relevant to this study as per TSPO.)									
1	CSE receives the inquiry/customer service order								
2	CSE validates customer inquiry, creates a customer service order, and captures details around the inquiry requiring resolution.								

USE CASE NAME		# Actions/ Frequency	Shortest Time	Most Likely Time	Longest Time	Reasons for Long Delays	RESOURCES		
Step #	Step Description						Skill Sets	Transportation Vehicles	Equipment (MHE)
3	CSE prioritizes the customer service orders and categorizes them (these are not related to a customer order)								
4	CSE coordinates further with the customer to identify the issue								
5	CSE determines the Course of Action (COA) to answer inquiry								
6	CSE confirms COA with customer, sets expectations with the customer around resolution date/time								
7	CSE executes COA								
8	CSE signals OM after inquiry has been successfully answered								
9	CSE verifies resolution with customer								
10	CSE closes customer service order								

APPENDIX D: TIME CRITERIA LOGISTICS MODEL USE CASE INPUT

The Time Criteria Logistics Model Use Cases, detailed in this appendix, show only the steps required for each of the logistics processes considered in development of the time criteria logistics model. Assumptions made in the model development from these annotated use cases are included for information. All times listed are in hours. These tables provide the basis for the analyses, conclusions, and recommendations presented in this report.

- **List of Tables**

Table 1. Product Order Fulfillment for a Stocked Item – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request	0.1	0.5	2	100%	0%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
9	OM transforms request into a customer order	0.05	0.1	0.25	0%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
10	OM checks with ICM to determine availability of product [Available to Promise (ATP)]	0.05	0.1	0.25	0%	100%	100%	0%	0%				0%	0%	0%				0%	0%	0%							
ALT FLOW	Alternate Flow – Normally stocked item out of stock (i.e., not on shelf at designated storage locations) – follows flow for procurement unless waiting on backorder (next step)												0%	0%	0%				0%	0%	0%							
ALT FLOW	If the requested item is out of stock, OM makes determination on waiting (back order) or buying (Procurement/Source) that item. If item is not stocked, go to procurement flow.	0.25	0.5	48									0%	0%	0%				0%	0%	0%							
11	OM checks with DCM and confirms availability of distribution to support movement requirements	0.1	0.25	0.5	0%	100%	0%	100%	0%				0%	0%	0%				0%	0%	0%							
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	0.1	0.25	0.5	0%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
13	OM reconciles customer (RM) terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.)	0.1	0.5	2	100%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
20	DCM and ICM coordinate pickup to meet delivery requirements	0.1	0.25	0.5	0%	0%	100%	100%	0%				0%	0%	0%				0%	0%	0%							
26	DPM routes order to appropriate DE for fulfillment	0.1	0.5	2	0%	0%	0%	0%	0%				0%	100%	0%				0%	0%	0%							

Table 1. Product Order Fulfillment for a Stocked Item – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
28	IE picks, packs and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)	0.5	2	4	0%	0%	0%	0%	0%				0%	0%	0%				100%	0%	0%				0%	0%	0%	0%
29	DE receives the item from the IE	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				100%	100%	0%				0%	0%	0%	0%
29.1	DE loads the item onto distribution mode	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%
29.2	DE transports item to designated node	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%
29.3	DE fulfills distribution service order (item is unloaded, sorted, received by RM and staged at designated node)	0.25	0.5	1	100%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%
29.4	DE fulfills distribution service order (item is unloaded, sorted, received by using unit - point of consumption)	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				0%	0%	0%	0%
30	Item is installed, if required	0.5	1	2	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				0%	0%	0%	0%

Assumptions in Product Order Fulfillment for a Stocked Item Process:

- Steps 29.3 and 29.4 are distinct steps in this process.
- Step 29.3 describes the Request Manager receiving the item. Therefore, it is assumed that the Request Manager is required for the duration of the step. In the model, all resources by definition are required for the duration of the step.
- The percentage of the time that the installation Step 30 is required was assessed separately as 70% for model purposes. Currently, the model is adding the time for this step to the total time required of the Distribution Executor resource.

Table 2. Procurement for Out-of Stock, Non-stocked, Not-stocked – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
10	OM checks with ICM and confirms that item is not stocked.	0.05	0.1	0.25	0%	100%	100%	0%	0%				0%	0%	0%				0%	0%	0%							
11	ICM checks with PCM for ability/availability to acquire product.	0.05	0.1	0.25	0%	0%	100%	0%	100%				0%	0%	0%				0%	0%	0%							
12	ICM provides OM updated information on ability/availability to acquire product.	0.05	0.1	0.25	0%	100%	100%	0%	0%				0%	0%	0%				0%	0%	0%							
13	OM checks with DCM and confirms availability of distribution to support movement requirements.	0.1	0.25	0.5	0%	100%	0%	100%	0%				0%	0%	0%				0%	0%	0%							
14	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc).	0.1	0.25	0.5	0%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
15	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc).	0.1	0.5	2	100%	100%	0%	0%	0%				0%	0%	0%				0%	0%	0%							
23	PPM routes order to appropriate PE for fulfillment.	0.1	0.5	2	0%	0%	0%	0%	0%				0%	0%	100%				0%	0%	0%							
24	PE reviews provider options.	0.5	1	1.5	0%	0%	0%	0%	0%				0%	0%	0%				0%	0%	100%							
25	PE evaluates source options (availability and capacity). [PE assesses organic and external capability to deliver to the customer - PE reviews options for delivery of product within the terms and conditions of the customer's request and selects appropriate option.	24	48	72	0%	0%	0%	0%	0%				0%	0%	0%				0%	0%	100%							

Table 2. Procurement for Out-of Stock, Non-stocked, Not-stocked – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
25.5.	PE negotiates with suppliers to deliver product(s)/service(s) within the terms and conditions of the customer's request and selects provider.	1	1.5	4	0%	0%	0%	0%	0%				0%	0%	0%				0%	0%	100%							
28	PE creates sourcing order and releases to source/provider.	0.05	0.1	0.25	0%	0%	0%	0%	0%				0%	0%	0%				0%	0%	100%							
29	PCM (based on input from PPM/PE) signals ICM and items are ordered.	0.05	0.1	0.25	0%	0%	0%	0%	100%				0%	0%	100%				0%	0%	100%							
33	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%				0%	0%	0%				0%	100%	0%				0%	0%	0%	0%
37	IE receives the product order and prepares to receive item(s) or coordinates its direct delivery to customer by external source/capability.	0.1	0.25	0.5	0%	0%	0%	0%	0%				0%	0%	0%				100%	0%	0%				0%	0%	0%	0%
ALT FLOW	Alt. Time - step 38 if not MSR, step 3b.b if MSR.																											
38	IE receives items ordered from external source and notifies IPM.	0.1	0.25	0.5	0%	0%	0%	0%	0%				0%	0%	0%				100%	0%	0%				0%	0%	0%	0%
38b.	Same step as above but expected to be longer if MSR.	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				100%	0%	0%				0%	0%	0%	0%
43	DPM routes order to appropriate DE for fulfillment.	0.1	0.5	2	0%	0%	0%	0%	0%				0%	100%	0%				0%	100%	0%				0%	0%	0%	0%
45	IE picks, packs, and stages order and generates shipping documents (e.g. shipping manifests, packing lists, etc)	0.5	2	4	0%	0%	0%	0%	0%				0%	0%	0%				100%	0%	0%				0%	0%	0%	0%
46	DE receives the item from the IE.	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				100%	100%	0%				0%	0%	0%	0%
47	DE loads the item on distribution mode.	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%
48	DE transports item to designated node.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%

Table 2. Procurement for Out-of Stock, Non-stocked, Not-stocked – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
49	DE fulfills distribution service order (item is unloaded, sorted, received by RM and staged at designated node).	0.25	0.5	1	100%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				100%	0%	0%	0%
50	DE fulfills distribution service order (item is unloaded, sorted, received by using unit).	0.25	0.5	1	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				0%	0%	0%	0%
51	Item is installed, if required.	0.5	1	2	0%	0%	0%	0%	0%				0%	0%	0%				0%	100%	0%				0%	0%	0%	0%

Assumptions in Procurement for Non-stocked or Not-in-stock Items Process:

- In Step 25, the data from the assessment assume that the minimum time is 24 hours, the most likely time is 48 hours, and the maximum time is 72 hours. These are totaled as the number of resource hours required. For example, 24 hours is considered 24 resource hours, not one day, or ten work hours. Also, if the time exceeds 24 hours, we assume that multiple Procurement Executors are available to complete the task within the simulated logistical day.
- Steps 49 and 50 are distinct steps in this process.
- Step 49 describes the Request Manager receiving the item. Therefore, it is assumed that the Request Manager is required for the duration of the step.
- The percentage of the time that the installation Step 51 is required was assessed separately as 70% for model purposes. Currently, the model is only adding the time for this step to the total time required of the Distribution Executor resource.

Table 3. Maintenance Request at Intermediate Maintenance Activity – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%							
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%							
10	OM checks with MCM and confirms availability of maintenance resources (available to promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%	100%			0%	0%	0%	0%			0%	0%	0%							
11	OM checks with DCM and confirms availability to support movement requirements [ATP].	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%							
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (Required Delivery Date (RDD), Location, etc.) (Capable to promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%							
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.).	0.1	0.5	2	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%							
18.b	DCM and MCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%							
19	MPM assigns resources (ME) to the order.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%				0%	0%	0%	0%
21	DPM routes order to appropriate DE for fulfillment.	0.75	2	6	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%				0%	0%	0%	0%
23	DE retrogrades item requiring repair to maintenance site.	Refer to Look Up Table(s) - 2 way journey	Refer to Look Up Table(s) - 2 way journey	Refer to Look Up Table(s) - 2 way journey	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%
25	ME receives item.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%

Table 3. Maintenance Request at Intermediate Maintenance Activity – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip	Special Tools
27	ME performs disassembly (if required), inspection, and diagnosis and captures the cause of failure for possible Quality Deficiency Report (QDR) submission and trend analysis.	0.2	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
30	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	0.1	0.25	0.5	0%	100%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
33	ME performs repair and conducts quality control.	0.25	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
35	ME stages repaired item for return to customer.	0.5	2	4	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
37.b	DCM and MCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
39	DPM routes to appropriate DE for fulfillment (if required).	0.75	2	6	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
40	DE fulfills delivery of repaired item (if necessary).	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%
41	Repaired item is installed (if necessary). Note: ME will perform installation.	0.5	1	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%

Assumptions in Maintenance Request at Intermediate Maintenance Activity Process:

- Step 30, 39, and 40 are described as "if necessary." During the seminar, no assessment of a probability for these steps being necessary was made. For model purposes it is assumed they will always be required.
- In Step 41, the item is installed if required and is assumed to occur at the same rate as in Tables 1 and 2, (70%).
- In other processes, there are specific steps for loading and unloading items, with an average duration of 30 minutes.

Table 4. Maintenance Request Performed at Customer – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into an order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with MCM and confirms availability of maintenance resources (available to promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM checks DCM availability to support movement requirements (ATP).	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM assesses capability of MCM to complete repair and DCM to provide distribution services within the terms and conditions of the customer's request (request delivery date (RDD, Location, etc.) (Capable to promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.).	0.1	0.5	2	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
18b	DCM and MCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
19	MPM assigns resources (ME) to the service order.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%
21	DPM routes order to appropriate DE for fulfillment.	0.75	2	6	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
23	DE delivers ME (Contact Team/resources) to work site.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	100%			100%	0%	0%	0%
25	ME performs disassembly (if required), inspection, and diagnosis and captures the cause of failure for possible QDR submission and trend analysis.	0.2	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%

Table 4. Maintenance Request Performed at Customer – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
26	MPM (based on input from ME) identifies and requests additional resources and parts to effect repair (if required) and signals MCM.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	100%			0%	0%	0%	0%
28	If necessary, MCM determines new ATP/CTP with DCM and other xCM based on ME diagnosis. If necessary, MCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	0.1	0.25	0.5	0%	100%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
31	ME performs repair and conducts quality control.	0.25	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%

Assumptions in Maintenance Request Performed at Customer:

- In Step 26, when additional requests are required, the simulation repeats the process from the beginning. Thus, Step 28 may be unnecessary because it is modeled by repeating Steps 4-26. Currently, Step 28 is included in the time duration and resource accounting.
- In other processes, there are specific steps for loading and unloading items, with an average duration of 30 minutes.

Table 5. Engineering Services Request – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
10	OM checks with ESCM and confirms availability of resources (available to promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%	100%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
11	OM checks with DCM for availability of distribution to support movement requirements.	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
12	OM assesses capability of ESCM to complete engineering service and DCM to provide distribution within the terms and conditions of the customer's request (Required Delivery Date [RDD], Location, etc.) (Capable to promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc).	0.1	0.5	2	100%	100%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%					
18.b	DCM and ESCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%	0%	100%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%
19	ESPM assigns resources (ESE) to the service order.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	100%		0%	0%	0%	0%	0%		0%	0%	0%	0%
21	DPM routes order to appropriate DE for fulfillment.	0.75	2	6	0%	0%	0%	0%	0%	0%	0%		0%	100%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%
22	DE delivers ESE (Contact Team/resources) to work site.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	100%	0%	0%	100%		100%	0%	0%	0%
24	ESE conducts site survey.	0.2	0.5	1	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	100%		0%	0%	0%	0%
25.a	ESE produces detailed engineer estimate and signals ESPM.	0.2	0.75	2	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	100%		0%	0%	0%	0%

Table 5. Engineering Services Request – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
26	ESPM (based on input from ESE) identifies and requests additional resources and parts to effect engineering service (if required) and signals ESCM.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	100%		0%	0%	0%	0%	100%		0%	0%	0%	0%
28	If necessary, ESCM determines new ATP/CTP with DCM and other xCM based on ESE diagnosis. If necessary, ESCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer .	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%	100%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%
31.a	ESCM assembles required resources and notifies ESPM.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%	100%		0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%
32	ESE executes engineering service and conducts quality control.	0.25	0.75	2	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%	0%	0%		0%	0%	0%	0%	100%		0%	0%	0%	0%

Assumptions in Engineering Service Request:

- Similar to the previous process, if in Step 26 additional requests are required, the simulation repeats the process from the beginning. Thus, Step 28 may be unnecessary. Currently, Step 28 is included in the time duration and resource accounting.
- In other processes, there are specific steps for loading and unloading items, with an average duration of 30 minutes.

Table 6. Return of Excess Item to Stock – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with ICM and determines disposition.	0.05	0.1	0.25	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP]).	0.05	0.1	0.25	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM checks with DCM and confirms availability of distribution to pick up from customer and to deliver (Available to Promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
13	OM assesses capability of DCM to deliver product and ICM to receive product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc).	0.1	0.25	0.5	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
19.b	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
22	DPM routes order to appropriate DE for fulfillment.	0.5	1	3	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
24	Transportation and any required personnel and/or material are dispatched to using unit site designated for pick-up of excess item for return.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
25	Excess item for return is loaded onto transportation mode at using unit site.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%

Table 6. Return of Excess Item to Stock – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
26	Excess item for return transported from using unit site to designated node.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
27	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for return).	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
29	IE receives return product.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
30	IE verifies items received, records and reports discrepancies and signals IPM.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
31	IE puts item away.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%

Assumptions in Return of Excess Item to Stock Request:

- No assumptions were identified for Table 6.

Table 7. Return Material Release Order Product to Stock – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with MCM and confirms availability of maintenance resources (Available to Promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM checks with ICM and confirms availability to receive product [ATP].	0.05	0.1	0.25	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM checks with DCM and confirms availability of distribution to support movement requirements.	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
13	OM assesses capability of MCM to complete repair, ICM to receive product and DCM to deliver product within the terms and conditions to complete customer's request for pickup (RDD, Location, etc) (Capable to Promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc.).	0.1	0.5	2	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
19.b	DCM and MCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
20	MPM assigns resources (ME) to the service order.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%			0%	0%	0%	0%
22	DPM routes order to appropriate DE for fulfillment.	0.75	2	6	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
24.a	DE retrogrades item requiring repair to maintenance facility and notifies DCM (through DPM).	Refer to Look Up Table(s) - 2-way journey	Refer to Look Up Table(s) - 2-way journey	Refer to Look Up Table(s) - 2 way journey	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
26	ME performs inspection and diagnosis.	0.2	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%

Table 7. Return Material Release Order Product to Stock – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
29	ME performs repair and conducts quality control.	0.25	0.75	2	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%
30	ME stages repaired item for return.	0.5	2	4	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	100%			0%	0%	0%	0%
32.b	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
35	DPM routes order to appropriate DE for fulfillment.	0.5	1	3	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
36	DE picks up return product and delivers to designated IPM/IE.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
38	IE receives return product.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
39.a	IE verifies items received, records and reports discrepancies and signals IPM.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
40	IE puts item away.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%

Assumptions in Return of Material Release Order Product to Stock Request:

- In other processes, there are specific steps for loading and unloading items, with an average duration of 30 minutes.

Table 8. Return of Defective Item to Source – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with ICM and determines disposition.	0.05	0.1	0.25	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM checks with ICM and confirms availability to receive product (Available to Promise [ATP]).	0.05	0.1	0.25	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM checks with DCM and confirms availability of distribution to support movement requirements.	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
13	OM assesses capability of ICM and DCM to complete return within the terms and conditions to complete customer's request (RDD, Location, etc) (Capable to Promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
14	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Pick up Date, Time Window, Actual Pick up Location, etc).	0.1	0.25	0.5	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
19.b	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%				0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
22	DPM routes order to appropriate DE for fulfillment.	0.5	1	3	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
24	Transportation and any required personnel and/or material are dispatched to using unit site designated for pick-up of defective item for return.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
25	Defective item for return is loaded onto transportation mode at using unit site.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
26	Defective item for return transported from using unit site to designated node.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%

Table 8. Return of Defective Item to Source – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
27	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for return).	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
29	IE receives return product.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
30.a	IE verifies items received, records and reports discrepancies and signals IPM.	0.05	0.1	0.25	0%	0%	100%	100%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%
30.b	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
32	DPM routes order to appropriate DE for fulfillment.	0.5	1	3	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
33	DE receives the item from IE.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%
34	DE loads the item on distribution mode.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
35	DE transports/delivers defective item to designated source.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%

Assumptions in Return of Defective Item to Source Request:

- The Logistics Operational Architecture considers the steps from the pick up of an item through return of the item to the designated source for the return of a defective item. Because the model is concerned with resource requirements in a time critical situation, only those times required to return the item to the node are provided in Table 8. It is assumed that the item will be returned to its designated source at a time when there are no other impacts on resources.
- In Table 6, when the Inventory Executor receives the return of an excess item, the time to re-stow the item is calculated.

Table 9. Return of Hazardous Material for Disposal – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with ICM and determines special handling requirements and availability to receive product.	0.1	0.25	0.5	0%	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM checks with DCM and confirms availability of qualified distribution to support movement requirements (Available to Promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM assesses capability of DCM to deliver return product and ICM to receive product and dispose product within the terms and conditions of the customer's request OM (Time, Location, etc) (Capable to Promise [CTP]).	0.1	0.25	0.5	0%	100%	0%		0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery Location, etc).	0.1	0.25	0.5	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
19	DCM and ICM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
22	IPM (Disposal) routes order to appropriate IE (Disposal) for fulfillment.	0.5	1	3	0%	0%	0%	0%	0%	0%			100%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
24	DPM routes order to appropriate DE for fulfillment.	Incl. in Step 22	Incl. in Step 22	Incl. in Step 22																								
26	DE sends transportation and required personnel/materiel to using unit site designated for pick-up of item.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
27	Item is loaded on to transportation mode at using unit site .	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%

Table 9. Return of Hazardous Material for Disposal – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
28	DE transports item from using unit site to designated node for return of hazardous material.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
29	DE fulfills distribution service order (item is unloaded, sorted, received, and staged for disposal at designated node).	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
31	IE (Disposal) receives return product.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%

Assumptions in Return of Hazardous Material for Disposal Request:

- No assumptions were identified for Table 9.

Table 10. One -Way Personnel and Equipment Move – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
10	OM checks with DCM and confirms availability of distribution to deliver from location to final destination (Available to Promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
11	OM assesses capability of DCM to complete service within the terms and conditions of the customer's request (Required delivery date [RDD], location, etc; capable to promise [CTP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
12	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual pick-up/delivery date, time window, actual pick-up/delivery locations, etc).	0.1	0.5	2	100%	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%						
18	DPM builds load plan for PAX and equipment and signals DCM. DCM notifies OM.	0.1	0.25	0.5	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%						
20	DPM rates and routes shipment.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%						
21	DPM evaluates carrier capability, availability, and cost and selects/schedules carrier and signals DCM. DCM notifies OM.	0.05	0.1	0.25	0%	0%	0%	0%	0%	0%			0%	100%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%
26	DE loads the load.	0.25	0.5	1	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%
28	DE delivers shipment.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	100%	0%	0%			100%	0%	0%	0%

Assumptions in One Way Personnel and Equipment Move Request:

- No assumptions were identified for Table 10.

Table 11. Patient Movement – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
10	OM checks with HSCM and confirms availability of health resources to provide services (Available to Promise [ATP]).	0.05	0.1	0.25	0%	100%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%			0%				
11	OM checks with DCM and confirms availability of distribution to support movement requirements.	0.1	0.25	0.5	0%	100%	0%	100%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
12	OM assesses capability of HSCM to provide health services and DCM to provide distribution services within the terms and conditions of the customer's request (required delivery date [RDD], location, etc.) (Capable to Promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc.).	0.1	0.25	2	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
18b	DCM and HSCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	100%	100%	0%			100%	0%	0%	0%			0%	0%	0%	0%			0%				
19	HSPM assigns resources (HSE) to the service order.	0.05	0.1	0.25	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%	0%
22	DE sends transportation and required personnel/materiel to using unit site designated for pickup of patient.	Refer to Look Up Table	Refer to Look Up Table	Refer to Look Up Table	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	100%	0%			100%	100%	0%	0%	0%
23	Patient is loaded on to transportation mode at using unit site.	0.1	0.25	0.5	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	100%	0%			0%	100%	0%	0%	0%
24	DE moves patient requiring treatment from using unit to next level of care.	Refer to Look Up Table	Refer to Look Up Table	Refer to Look Up Table	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	100%	0%			0%	100%	0%	0%	0%

Table 11. Patient Movement – Times are in Hours																												
LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
25	DE fulfills distribution service order (patient is unloaded, sorted, received, and staged for treatment at designated node).	0.25	0.5	1	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	100%	0%			0%	100%	0%	0%	0%

Assumptions in Patient Movement Request:

- No assumptions were identified for Table 11.

Table 12. Provide Health Services at Customer Site – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
4	RM sources internally or generates request.	0.1	0.5	2	100%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
9	OM transforms request into a customer order.	0.05	0.1	0.25	0%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
10	OM checks with HSCM and confirms availability of resources (available to promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%			0%				
11	OM checks with DCM for availability of distribution to support movement requirements (available to promise [ATP]).	0.1	0.25	0.5	0%	100%	0%	100%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
12	OM assesses capability of HSCM to complete health service and DCM to provide distribution service within the terms and conditions of the customer's request (required delivery date [RDD], Location, etc.) (Capable to promise).	0.1	0.25	0.5	0%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
13	OM reconciles customer terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Actual Delivery Location, etc).	0.1	0.5	2	100%	100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			0%				
18.b	DCM and HSCM coordinate pickup to meet delivery requirements.	0.1	0.25	0.5	0%	0%	0%	100%	0%			100%	0%	0%	0%			0%	0%	0%	0%			0%				
22	DPM routes order to appropriate DE for fulfillment.	0.75	2	6	0%	0%	0%	0%	0%			0%	0%	100%	0%			0%	0%	0%	0%			0%	0%	0%	0%	0%
23	DE delivers HSE (Contact Team/resources) to work site.	Refer to Look Up Table(s)	Refer to Look Up Table(s)	Refer to Look Up Table(s)	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	100%	0%			100%	100%	0%	0%	0%
25	HSE contact team conducts assessment.	0.2	0.75	2	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%	0%
26	HSPM (based on input from HSE) identifies and requests additional resources and supplies to effect health service (if required) and signals HSCM.	0.1	0.25	0.5	0%	0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%	0%

Table 12. Provide Health Services at Customer Site – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM	HSPM	IE	DE	PE	ME	ESE	HSE	Trans-portation	MHE	Special Equip.	Special Tools
28	If necessary, HSCM determines new ATP/CTP with DCM and other xCM based on HSE diagnosis. If necessary, HSCM notifies OM of new ATP/CTP and OM reconciles ATP/CTP with customer.	0.1	0.25	0.5	0%	0%	0%	0%	0%			100%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%	0%
31	The HSE contact team performs service.	0.25	0.75	2	0%	0%	0%	0%	0%			0%	0%	0%	0%			0%	0%	0%	0%			100%	0%	0%	0%	0%

Assumptions in Provide Health Services at Customer Site Request:

- No assumptions were identified for Table 12.

APPENDIX E: TI ME CRITERIA LOGISTICS MODEL USER'S MANUAL

The Time Criteria Logistics Model is a Microsoft Excel© based application developed to assist Marine Corps logistics planning. It is based on the use cases found in Appendix 05 of the Logistics Operational Architecture. This appendix contains the User's Manual for the application. The intent of the User's Manual is to guide the user through model runs to achieve necessary logistics information.

TIME CRITERIA
LOGISTICS MODEL USER'S MANUAL

I. BASIC USER.

The Time Criteria Logistics Model is created using Visual Basic Macros in Excel©. In order to run the model, you will need, in addition to the model file:

1) Excel© - program available from Microsoft Corporation, and

2) @Risk© (Professional Version) – add in program available from Palisades Corporation.

When opening files, make sure the @Risk© program is open in Excel© before opening the model file.

The model is set up for the basic user to easily navigate using control buttons. The three major components to navigate are the data entry forms, the various simulation models, and the different model output statistics.

Start Window.

The model opens to the start window, Figure 1, where the user has several options to navigate using control buttons:

Figure 1: Start Window.

1. **Start:** Pressing the start button takes the user to the data entry portion of the model.

2. **Advanced User - Restore Environment:** In order to make the model as user friendly as possible, many aspects of the Excel© environment were removed from the window. Examples include the worksheet tabs in the lower portion of the screen and the horizontal and vertical scrollbars. The advanced user may require these tools to complete advanced applications, so pressing this button restores the traditional Excel© environment.

3. **View Assumptions:** Clicking this button displays a window, depicted in Figure 2, with the basic model assumptions.

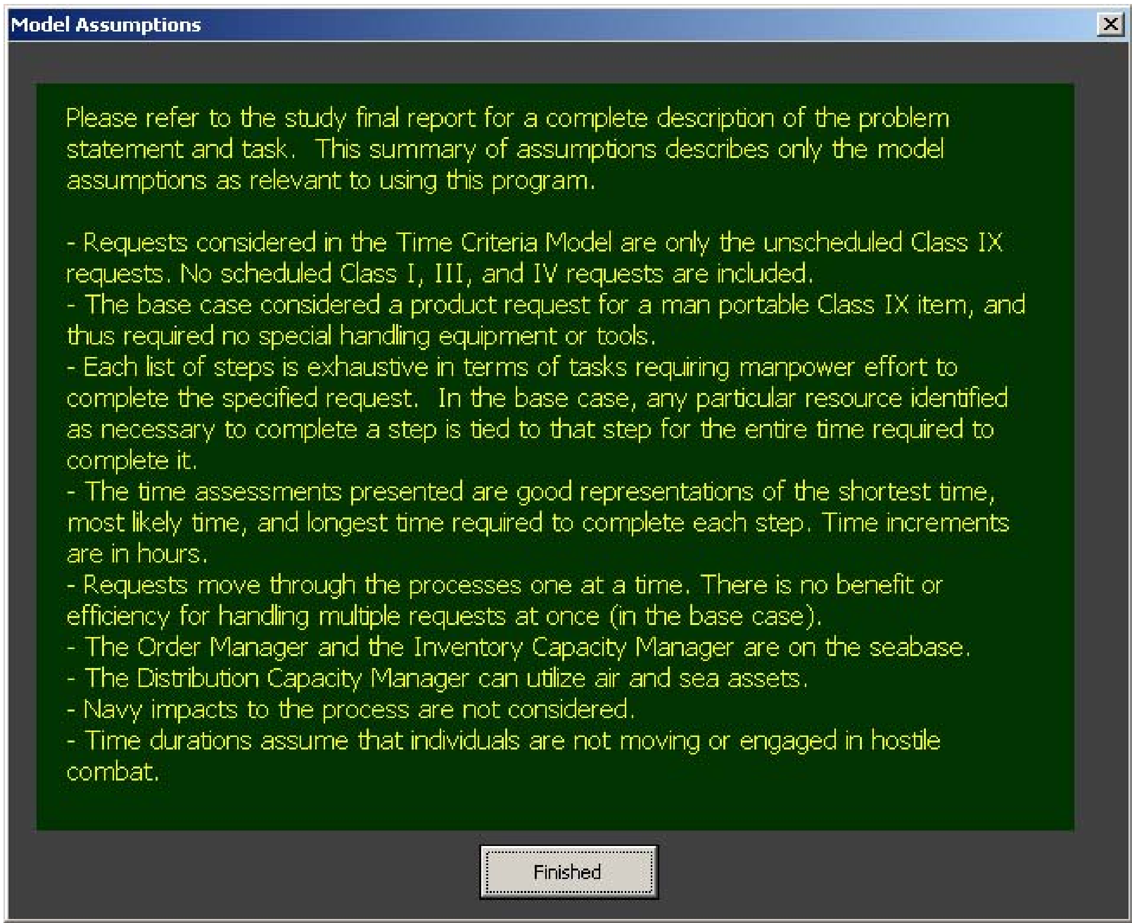

Figure 2: Basic Model Assumption Window.

4. **Quit Application:** Clicking this button exits the user out of the Time Criteria Logistics Model. Before closing the file, the model will prompt the user to save changes. If the user has created a different model scenario based on changes to the base case data, the user will want to save the changes under a new file name. Otherwise, the next time the user returns to the file, the base case data are used.

5. **View Abbreviations:** By selecting this button, the user brings up the abbreviations window, Figure 3, that provides a list of terms associated to all model abbreviations.

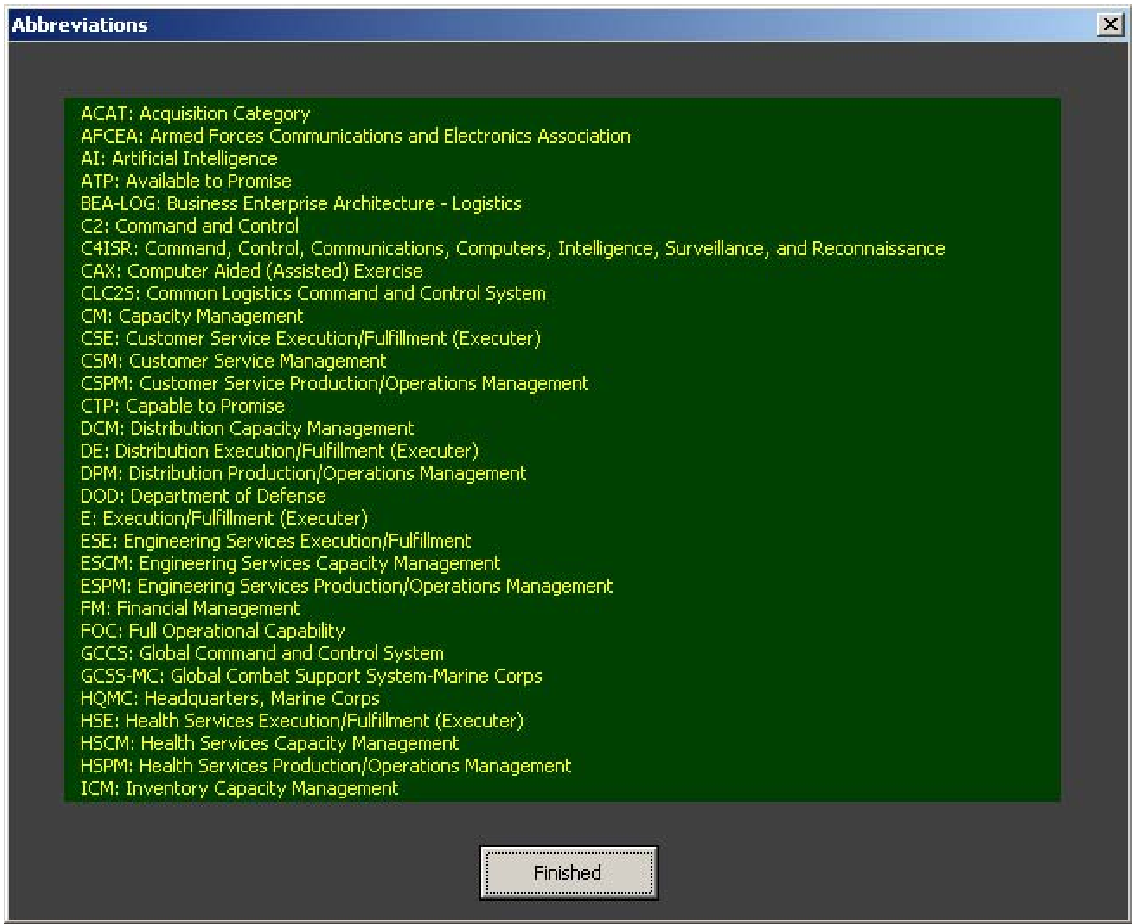

Figure 3: Abbreviations Window.

Data Entry.

There are several input model parameters to consider. Initially, each is set to a base case value, but the user can adjust the parameters to reflect different values before running the simulation. Pressing the start button takes the user to the data entry page depicted in Figure 4. Four control buttons are used to open the appropriate data entry form:

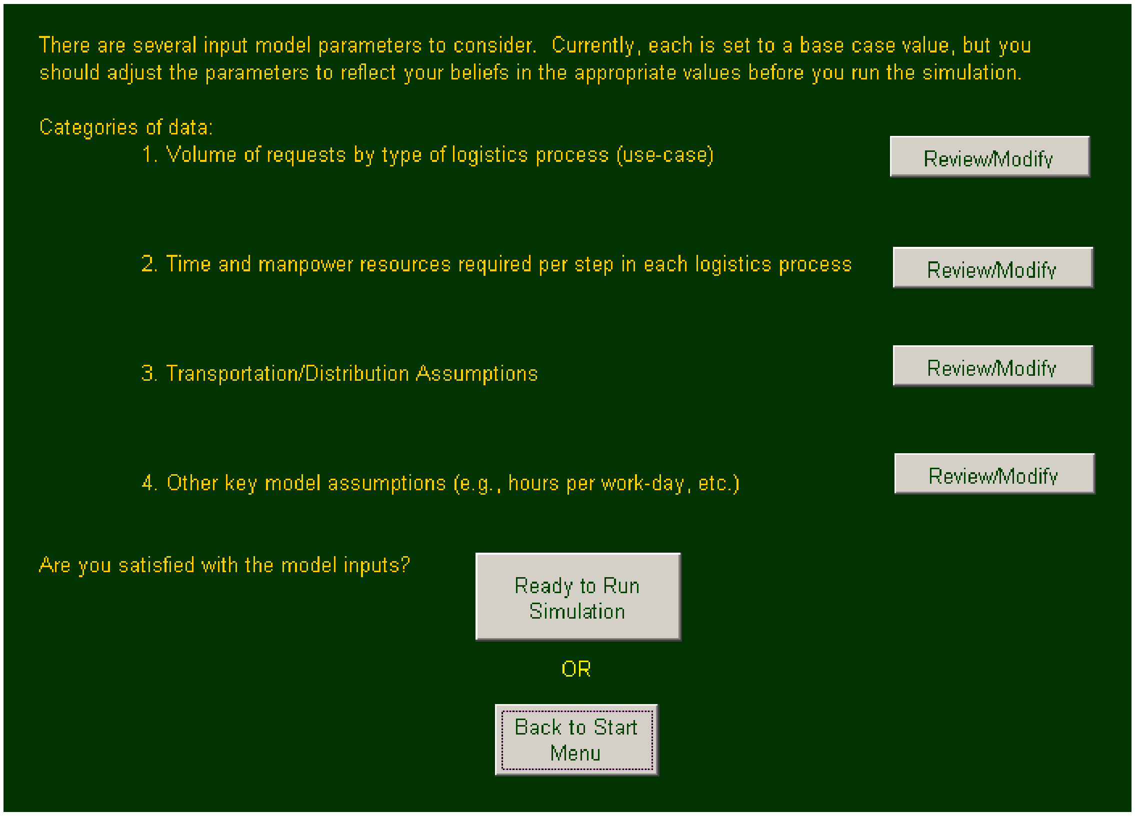

Figure 4: Input Parameters Window.

1. Volume of Requests by Type of Logistics Process (Use Case): The expected number of occurrences of each logistics process is an important input in the model. The data entry form, shown in Figure 5, has two buttons in the upper left corner to switch between the low tempo case and the high tempo case. From the model's perspective, there is no difference between low tempo and high tempo (i.e., if the user entered the same data for both cases, the results would be identical). Distinguishing between low tempo and high tempo is only to provide a convenient way for the user to examine and track two different scenarios at one time.

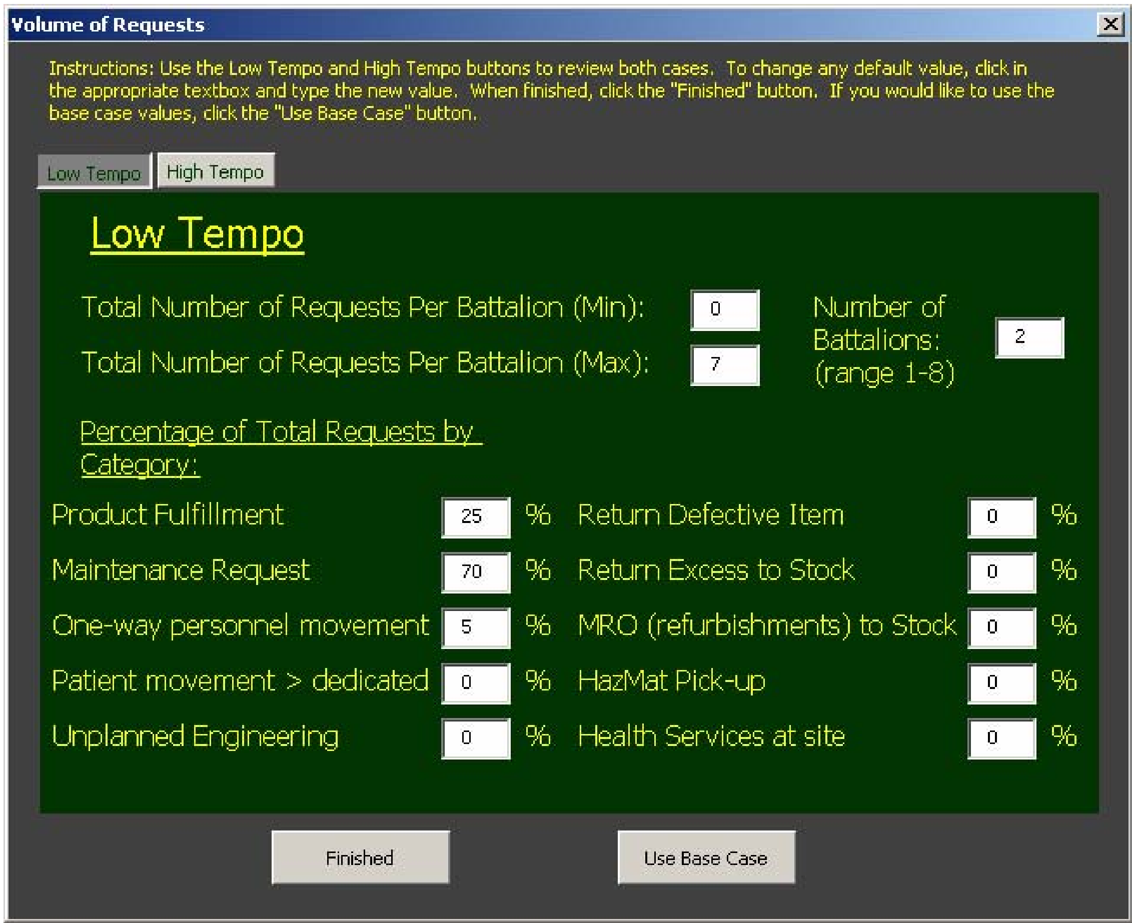

Figure 5: Volume of Requests Data Entry Form.

If changes to the baseline data are required, the form requires the user to enter:

- The minimum number of total unscheduled requests per day per battalion,
- The maximum number of total unscheduled requests per day per battalion,
- The total number of battalions (a maximum of 8 is permitted by the model), and,
- The percentage of these total requests that are expected to be of each type of logistics process.

The model will do an error check to make sure that the minimum value is less than the maximum value and that the total of the percentages sum to 100%.

The model assumes a uniform distribution between the minimum and maximum number of requests. This assumption cannot be changed by the basic user. Also, the number of requests per process is determined by rounding. A conservative assumption was made to always round values greater than or equal to 0.5 up to the next whole integer.

2. **Time and Manpower Resources Required Per Step in Each Logistics Process:** From the workshops held during the model development, a set of base case values were agreed upon for the shortest, most likely, and longest times for each step in each process. Also, for each step, the resources required, including personnel, special handling equipment, and transportation resources were identified.

   Selecting the button associated with time and manpower resources from Figure 4 opens the menu form, Figure 6, that allows the user to select which process's data the user desires to edit.

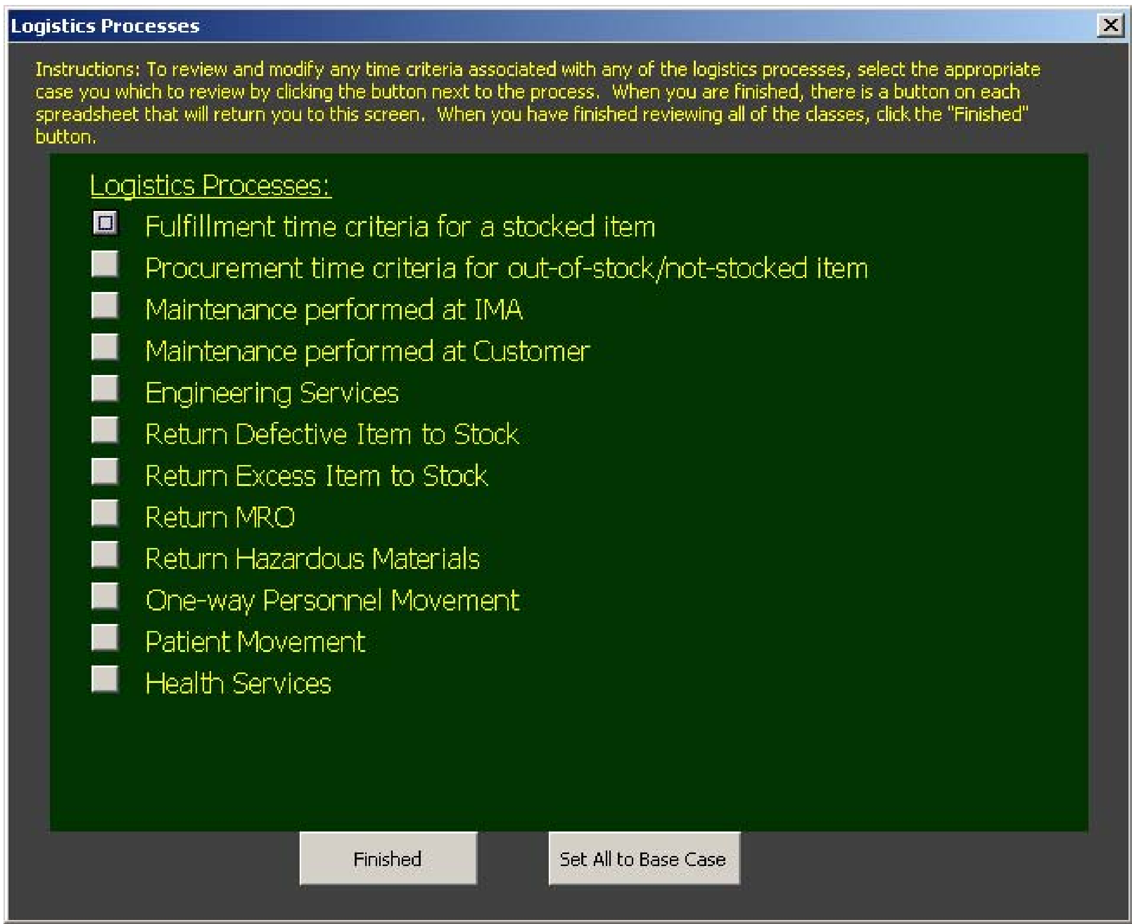

Figure 6: Logistics Processes Menu Form.

Selecting a process from the menu places the user in a spreadsheet, Figure 7, that contains the current data for that process. Data is changed directly in the spreadsheet. Care must be taken by the user not to alter spreadsheet cells that have been shaded. These cells are either not applicable to the model or contain formulas critical to the model's functioning.

Finished - Save & Return to Menu

Use Base Case

Product Order Fulfillment for a Stocked Item – Times are in Hours

LogOA Reference Step Number	Step Description	Shortest Time	Most Likely Time	Longest Time	RM	OM	ICM	DCM	PCM	MCM	ESCM	HSCM	IPM	DPM	PPM	MPM	ESPM
4	RM sources internally or generates request	0.1	0.5	2	100%	0%	0%	0%	0%				0%	0%	0%		
9	OM transforms request into a customer order	0.05	0.1	0.25	0%	100%	0%	0%	0%				0%	0%	0%		
10	OM checks with ICM to determine availability of product [Available to Promise (ATP)]	0.05	0.1	0.25	0%	100%	100%	0%	0%				0%	0%	0%		
ALT FLOW	Alternate Flow – Normally stocked item out of stock (i.e., not on shelf at designated storage locations) – follows flow for procurement unless waiting on backorder												0%	0%	0%		
ALT FLOW	If the requested item is out of stock, OM makes determination on waiting (back order) or buying (Procurement/Source) that item. If item is not stocked, go to procurement flow.	0.25	0.5	48									0%	0%	0%		
11	OM checks with DCM and confirms availability of distribution to support movement requirements	0.1	0.25	0.5	0%	100%	0%	100%	0%				0%	0%	0%		
12	OM assesses capability of ICM and DCM to deliver product within the terms and conditions of the customer's request (RDD, Location, etc) (Capable to Promise [CTP])	0.1	0.25	0.5	0%	100%	0%	0%	0%				0%	0%	0%		
13	OM reconciles customer (RM) terms and conditions with ATP/CTP and obtains customer confirmation (Actual Delivery Date, Time Window, Actual Delivery	0.1	0.5	2	100%	100%	0%	0%	0%				0%	0%	0%		
20	DCM and ICM coordinate pickup to meet delivery requirements	0.1	0.25	0.5	0%	0%	100%	100%	0%				0%	0%	0%		
26	DPM routes order to appropriate DE for fulfillment	0.1	0.5	2	0%	0%	0%	0%	0%				0%	100%	0%		

Figure 7: Sample Current Data Spreadsheet.

Once data has been edited for any process, use the control button to save and return to the menu. If you want this data to be saved when the file is closed, you will need to use the Save command from the File menu in Excel© and save the file under a new file name.

3. **Transportation/Distribution Assumptions:** Selecting the control button associated with the transportation/distribution assumptions from Figure 4 opens a user form (Figure 8) to allow editing of these data. The percentage of the time that air transportation is used can be any value between 0% and 100%. The surface transportation option will automatically update to be 100% minus the percentage allocated to air transportation.

4. **Other Key Model Assumptions (e.g., Hours Per Workday):** In developing the model, several other key assumptions were required. Selecting the fourth Review/Modify button on Figure 3 takes the user to the other key model assumptions. The model provides a user form (Figure 9) to adjust all these values. Percentages should be entered as values between 0% and 100%.

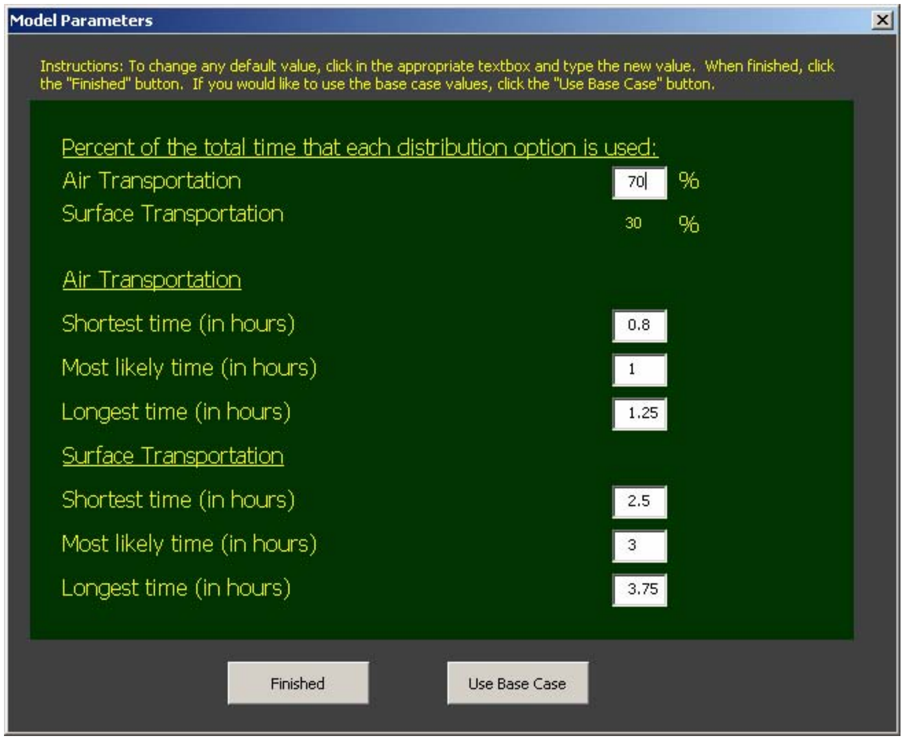

Figure 8: Transportation/Distribution Assumptions User Form.

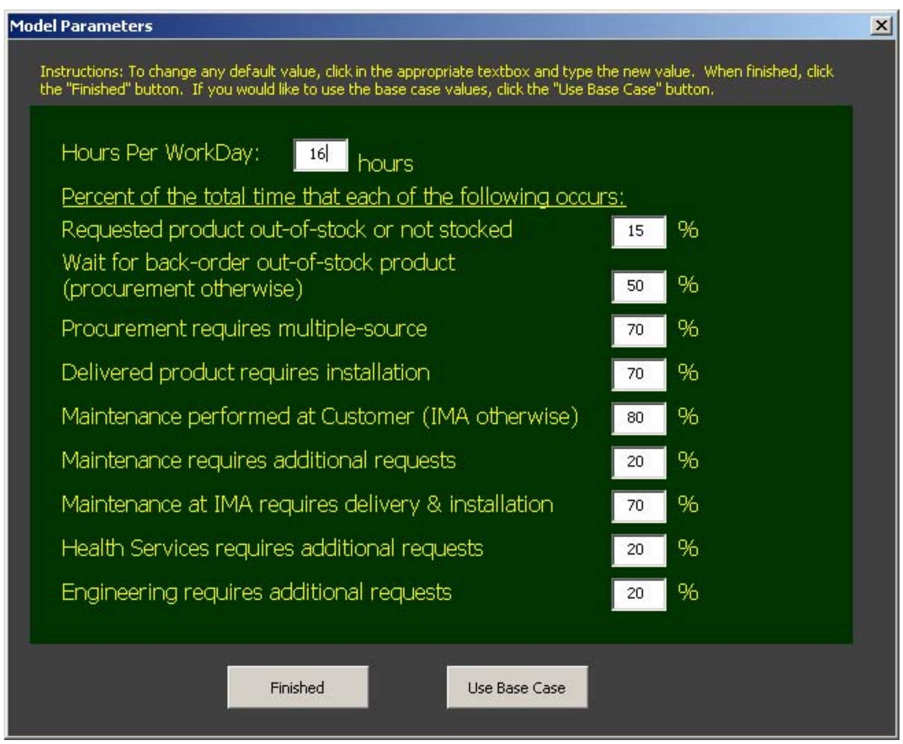

Figure 9: Other Key Model Assumptions User Form.

Running Simulations And Viewing Output.

When data entry is complete, the user should select the "Ready to Run Simulation" button depicted in Figure 4. The model run page depicted in Figure 10 will then display.

There are two primary components to the simulation model. Because the simulations can be time intensive (between 10 minutes and several hours), components are set up to run separately.

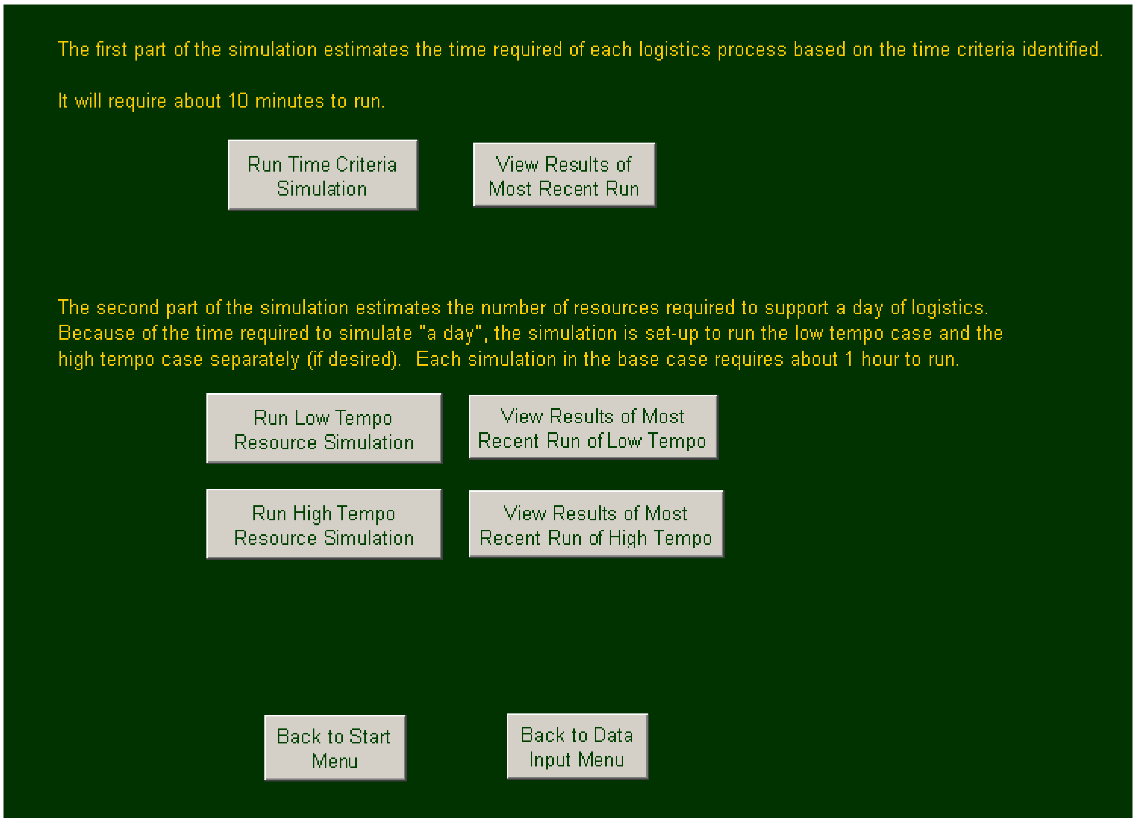

Figure 10: Running Simulations.

The first component of the simulation estimates the time required of each logistics process based on the time criteria identified. The user can either select the button to run the simulation, or can select the button to view the results from the prior run. Running the simulation will overwrite the values from the previous run.

The simulation will use the @Risk© program to generate random variables for the time required for each step according to the Beta distribution associated with the parameters defined for the minimum, most likely, and maximum times. The basic user does not have the option to select a distribution other than Beta. The simulation is run for 1,000 iterations. The basic user does not have the capability to change the number of iterations.

Based on the simulation, an output table summarizes the simulated times for each process, and an output graph displays the times for a relative perspective, as shown in Figure 11.

Back to Simulation Menu

Summary of Time Results (in Hours)

Simulated Task Time in Hours	Minimum	Maximum	Mean	0.05 percentile	0.95 percentile
Stocked Fulfillment with Wait Time for BackOrder	6.5	14.1	9.7	7.6	12.3
Stocked Fulfillment Time without BackOrder wait	6.2	39.0	10.2	7.7	13.6
Not-In-Stock Procurement Time	38.3	87.7	62.3	48.0	77.4
Maintenance at IMA Time	8.3	21.6	14.7	10.4	18.8
Maintenance at Customer Time (first request only)	5.6	14.4	9.2	6.9	11.8
Maintenance at Customer Time with additional requests	5.7	36.9	11.0	7.1	18.8
Engineering Services Time (first request only)	6.3	14.6	10.0	7.7	12.5
Engineering Services Time with additional requests	6.3	40.4	12.4	7.9	21.0
Return of Excess Item Time	5.7	13.2	8.5	6.4	12.0
Return of MRO Time	10.9	25.6	16.3	12.6	22.3
Return of Defective Item Time	7.2	17.1	11.0	8.3	15.2
Return of HazMat Item Time	5.3	13.1	8.3	6.1	11.9
One-Way Personnel/Equipment Movement Time	2.7	7.8	4.7	3.4	6.7
Patient Movement Time	3.8	10.9	6.4	4.5	9.8
Health Services at Customer Time (first request only)	5.1	14.2	8.9	6.7	11.6
Health Services at Customer with additional requests Time	5.3	33.8	10.9	6.9	18.1

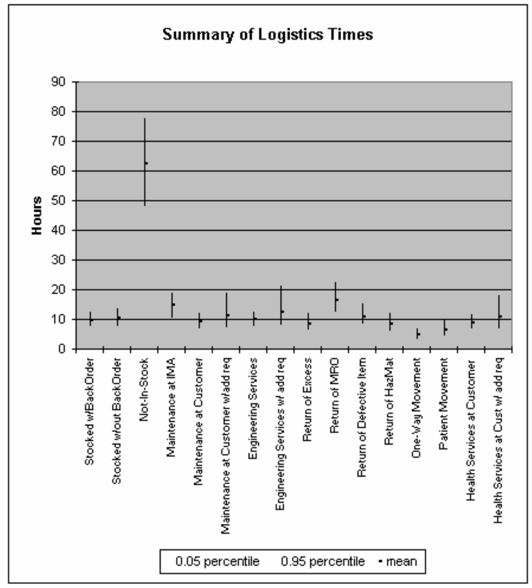

Figure 11: Simulated Times Output Table.

PLEASE NOTE: The following is true for all three components of the simulation model. Sometimes the interface between Excel© and @Risk© does not update properly. If this occurs, the model will stop itself and ask the user to restart it. It generally works when the user does this. If the model continues to ask the user to restart the simulation, check to make sure that @Risk© is loaded and opened properly. If @Risk© is not open, the simulation will not run, and you will continue to get the message to restart the simulation as depicted in Figure 12.

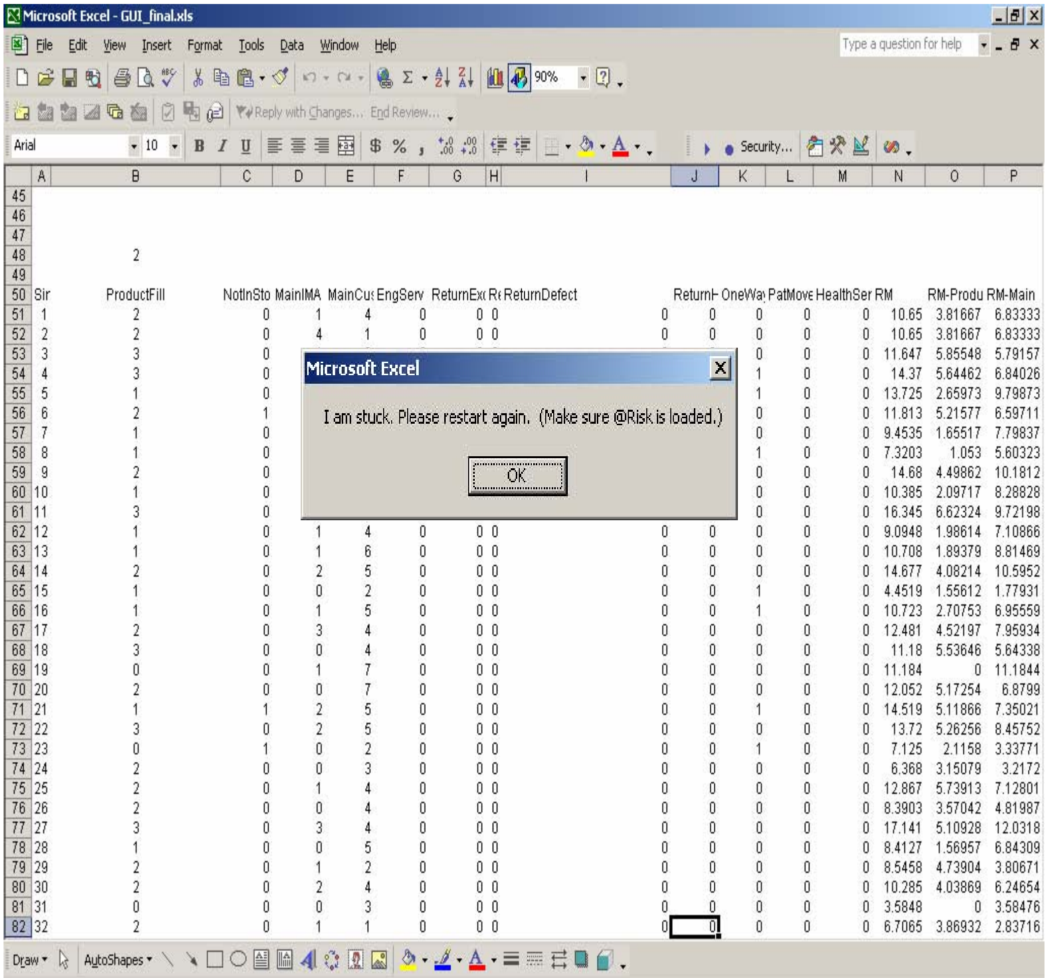

Figure 12: Error Window - Open @Risk© .

The control buttons for the low tempo and high tempo case cause identical operation of the model. Each button runs the simulation for the corresponding scenario in order to determine how many hours of each resource are required given the total number of requests. The simulation is run for 1,000 iterations, and as before, the basic user does not have the capability to change the number of iterations.

The low tempo and high tempo models are identical, and two buttons, Run Low Tempo Resource Simulation and Run High Tempo Resource Simulation, provide the user the flexibility to examine the two scenarios. The time required for each simulation is a direct factor of the total number of requests (more requests, more time to run), but requests in the range of the base case data run in one to two hours.

Results for the number of hours of resources required and the total number of personnel required (based on the hours per day available assumption from the data entry) are available in tabular form (Figure 13). In graphical form, results include the total number of requests per logistics process and the percentage of each resource required by each type of process (See Figure 14).

Summary Statistics in Hours for Resource Requirements per Day

	Min	Max	Mean	0.05 percentile	0.95 percentile
Hours of RM per Day	1.4	20.8	10.2	4.9	15.8
Hours of OM per Day	2.1	23.4	11.9	5.0	18.5
Hours of DCM per Day	0.7	10.6	5.3	2.2	8.5
Hours of ICM per Day	0.0	1.8	0.7	0.3	1.3
Hours of DPM per Day	1.1	34.2	14.4	5.0	24.7
Hours of IE per Day	0.0	11.7	4.6	1.6	8.6
Hours of DE per Day	3.7	39.4	18.0	8.9	28.9
Hours of PCM per Day	0.0	0.6	0.0	0.0	0.2
Hours of PPM per Day	0.0	1.8	0.1	0.0	0.9
Hours of IPM per Day	0.0	0.0	0.0	0.0	0.0
Hours of PE per Day	0.0	115.2	5.7	0.0	51.3
Hours of MCM per Day	0.0	9.6	4.3	1.4	7.5
Hours of MPM per Day	0.0	5.0	2.2	0.6	3.9
Hours of ME per Day	0.0	57.1	21.5	6.5	38.2
Hours of ESCM per Day	0.0	0.0	0.0	0.0	0.0
Hours of ESPM per Day	0.0	0.0	0.0	0.0	0.0
Hours of ESE per Day	0.0	0.0	0.0	0.0	0.0
Hours of HSCM per Day	0.0	0.0	0.0	0.0	0.0
Hours of HSPM per Day	0.0	0.0	0.0	0.0	0.0
Hours of HSE per Day	0.0	0.0	0.0	0.0	0.0
Hours of Air Trans. per Day	0.0	16.2	6.3	2.0	11.3
Hours of Surface Trans. per Day	0.0	23.2	7.2	0.0	15.3
Hours of MHE per Day	0.0	0.0	0.0	0.0	0.0
Hours of Special Equip. per Day	0.0	0.0	0.0	0.0	0.0
Hours of Special Tools per Day	0.0	0.0	0.0	0.0	0.0

Summary Statistics in Resource Individuals Required per Day

	Min	Max	Mean	0.05 percentile	0.95 percentile
Hours of RM per Day	1	2	1	1	1
Hours of OM per Day	1	2	1	1	2
Hours of DCM per Day	1	1	1	1	1
Hours of ICM per Day	0	1	1	1	1
Hours of DPM per Day	1	3	1	1	2
Hours of IE per Day	0	1	1	1	1
Hours of DE per Day	1	3	2	1	2
Hours of PCM per Day	0	1	1	0	1
Hours of PPM per Day	0	1	1	0	1
Hours of IPM per Day	0	0	0	0	0
Hours of PE per Day	0	8	1	0	4
Hours of MCM per Day	0	1	1	1	1
Hours of MPM per Day	0	1	1	1	1
Hours of ME per Day	0	4	2	1	3
Hours of ESCM per Day	0	0	0	0	0
Hours of ESPM per Day	0	0	0	0	0
Hours of ESE per Day	0	0	0	0	0
Hours of HSCM per Day	0	0	0	0	0
Hours of HSPM per Day	0	0	0	0	0
Hours of HSE per Day	0	0	0	0	0

View Graphs of Results

Return to Simulation Controls

Figure 13: Tabular Format of Simulation Information.

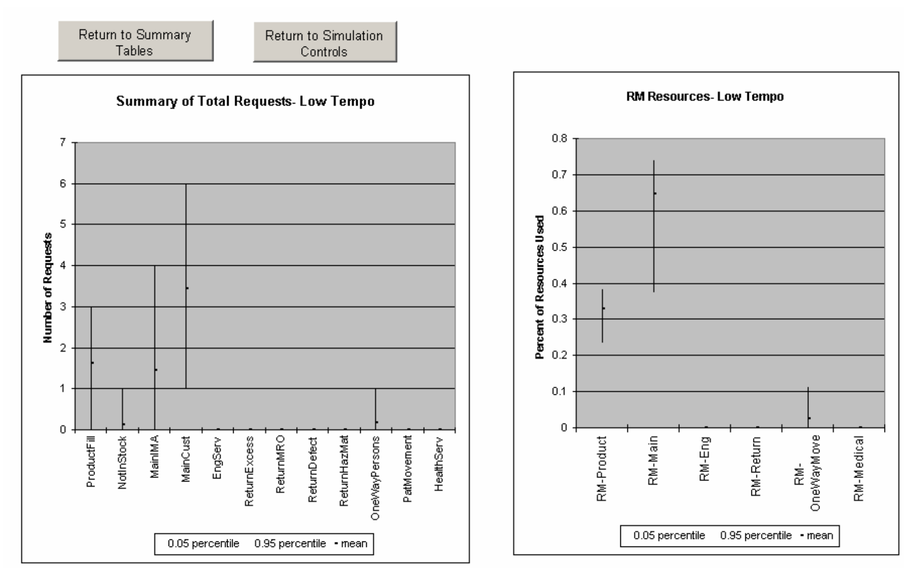

Figure 14: Graphical Format of Simulation Information.

II. ADVANCED USER.

The model is constructed using Visual Basic code to simulate time data in each process and to total resources required across processes. A user who has never used the Visual Basic Editor would not be considered an advanced user.

To open the Visual Basic editor, make sure the Visual Basic Toolbar is displayed (select View -> Toolbars -> Visual Basic from the main menu). Select the Visual Basic editor button (the fourth icon in the toolbar). In Visual Basic, you can see that the model is structured with 34 different worksheets, the ThisWorkbook object, five user forms, and four code modules. Table 1 provides a brief summary of each component. Also included for the advanced user are detailed instructions for completing the mostly likely model tasks.

Table 1: Description of Model Components.

Worksheets	Purpose
Sheet1 (Inputs)	Stores the basic input parameters for the model (not visible to basic user)
Sheet10 (OneWayPersons)	Spreadsheet visible to basic user for editing data for one way personnel movement process
Sheet11 (PatMovement)	Spreadsheet visible to basic user for editing data for health services/patient movement process
Sheet12 (HealthServices)	Spreadsheet visible to basic user for editing data for health services at customer process
Sheet13 (BaseMaintenanceatIMA)	Stores the base case data for maintenance at IMA process (not visible to basic user)
Sheet14 (BaseMaintenanceatCust)	Stores the base case data for maintenance at customer process (not visible to basic user)
Sheet15 (ResourceUseLow)	Simulation data for Low Tempo case and associated summary tables (tables visible to user, data hidden lower in sheet)
Sheet16 (ResourceUseHigh)	Simulation data for High Tempo case and associated summary tables (tables visible to user, data hidden lower in sheet)
Sheet17 (Start)	Screen visible to user to start model, associated code contains control button functionality
Sheet18 (DataSettings)	Screen visible to user to open data entry forms, associated code contains control button functionality
Sheet19 (ProductFulfillment)	Spreadsheet visible to basic user for editing data for product fulfillment process
Sheet2 (Transportation)	Stores the transportation data parameters for the model (not visible to basic user)
Sheet20 (NotInStock)	Spreadsheet visible to basic user for editing data for procurement process
Sheet21 (BaseProductFulfillment)	Stores the base case data for product fulfillment process (not visible to basic user)
Sheet22 (BaseNotInStock)	Stores the base case data for procurement process (not visible to basic user)
Sheet23 (BaseEngServices)	Stores the base case data for delivering engineering services to field process (not visible to basic user)
Sheet24 (BaseReturnExcess)	Stores the base case data for return of excess item process (not visible to basic user)
Sheet25 (BaseReturnMRO)	Stores the base case data for return of MRO process (not visible to basic user)
Sheet26 (BaseReturnDefect)	Stores the base case data for return of defect item process (not visible to basic user)
Sheet27 (BaseRetHazMat)	Stores the base case data for return of hazardous materials process (not visible to basic user)
Sheet28 (BaseOneWayPersons)	Stores the base case data for one way personnel movement process (not visible to basic user)
Sheet29 (BasePatMovement)	Stores the base case data for health services/patient movement process (not visible to basic user)
Sheet3 (MaintenanceatIMA)	Spreadsheet visible to basic user for editing data for maintenance at IMA process
Sheet30 (BaseHealthServices)	Stores the base case data for health services at customer process (not visible to basic user)
Sheet31 (SimControls)	Screen visible to user to run simulations, associated code contains control button functionality
Sheet32 (OutputTimeCriteria)	Simulation data for Process times and associated summary tables (tables visible to user, data hidden lower in sheet)
Sheet33 (LowGraphs)	Graphs associated with Sheet: ResourceUseLow output (visible to basic user)

Table 1: Description of Model Components.	
Sheet34 (HighGraphs)	Graphs associated with Sheet: ResourceUseHigh output (visible to basic user)
Sheet4 (MaintenanceatCust)	Spreadsheet visible to basic user for editing data for maintenance at customer process
Sheet5 (EngServices)	Spreadsheet visible to basic user for editing data for delivering engineering services to field process
Sheet6 (ReturnExcess)	Spreadsheet visible to basic user for editing data for return of excess item process
Sheet7 (ReturnMRO)	Spreadsheet visible to basic user for editing data for return of MRO process
Sheet8 (ReturnDefect)	Spreadsheet visible to basic user for editing data for return of defect item process
Sheet9 (RetHazMat)	Spreadsheet visible to basic user for editing data for return of hazardous materials process
ThisWorkbook	Code associated with ThisWorkbook automatically runs when file is opened – code sends user to Start sheet
User Forms	**Purpose**
UFAssumptions	User form with the assumptions (Figure 2)
UFParameters	User form for editing miscellaneous assumptions (Figure 9)
UFProcesses	User form with menu for selecting processes to edit (Figure 6)
UFRequests	User form for editing request assumptions for low tempo and high tempo case (Figure 5)
UFTransport	User form for editing transportation assumptions (Figure 8)
Modules	**Purpose**
Module1	Contains the code that runs the simulation and totals the resources required for the Low Tempo case, also contains the definitions for the model's global variables
Module2	Contains the code that runs the simulation and totals the resources required for the High Tempo case
Module3	Contains the code that removes the Excel© environment, that loads the current case into the user forms, and that resets the cases to the base case
Module4	Contains the code that runs the time criteria model simulation

The Most Likely Tasks for the Advanced User.

1. **Change The Number Of Simulation Iterations From 1,000:** This action is not desireable because the output graphs (sheets: Output Time Criteria, Low Graphs, and High Graphs) are based on the 1,000 lines of data in the spreadsheet. Altering the number of iterations will distort the output graphs. The user might want to do it anyway, for instance, in order to run a few quick iterations to see how it works. To change the number of iterations from the default number of 1000, go to the code and select Find from the Edit Menu. Find the three occurrences of the number 1000 in the code for the entire project (in the SimulateLowDay procedure, SimulateHighDay procedure, and TimeCriteriaSim procedure). Once located, you can change the value in the code to the desired value.

2. **Use The More Powerful Capabilities Of @Risk© To Analyze The Time Criteria Output More Deeply Such As The Tornado Diagrams That Were Generated For The Final Report:** From any of the worksheets, you will need to use the @Risk© toolbar to run an @Risk© simulation. The toolbar is shown in Figure 15. Important icons are the fourth, which shows all the inputs and outputs for the model; the sixth, which sets the number of simulation runs and other simulation parameters; and, the eighth, which runs the simulation.

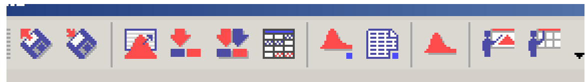

Figure 15: Toolbar for @Risk©.

After an @Risk© simulation is run, powerful output analysis tools are available. Immediately after running a simulation, the results are presented in a Summary Statistics table. If you right-click on any of the output variables, you can create histograms, cumulative distribution graphs, and tornado graphs.

3. **Change The Beta Distribution For The Time Criteria Distributions:** Column "AE" in each of the worksheets associated with a time logistics process contains the @Risk© input cells for the distributions. For example, the formula in the cell would appear something like:

   =RiskPert(C3, D3, E3, RiskName("HealthServ Step 4"))

   To change the distribution to, for example, the triangular distribution, the correct substitution would be:

   =RiskTriang(C3, D3, E3, RiskName("HealthServ Step 4"))

   References in @Risk© can provide the correct notation for other desired distributions.

4. **Change The Distribution Assumed For The Total Number Of Requests To Something Other Than Uniform:** Because the data entry forms accept only two parameters (minimum and maximum) for the distribution for total number of requests, choosing a distribution that is defined by three parameters (e.g., triangular) is a challenge, but not impossible. Locate the "Inputs" Worksheet. Worksheet cells J47:K54 contain the simulated number of requests per battalion. For example, the formula in cell J47 is:

   =RiskUniform(D33, E33, RiskName("Total Requests / Low Tempo (B1)"))

   Alter the formulas in those cells to reflect the new desired distribution. If the desired distribution includes only two parameters, for example, the normal distribution, the user can just treat cell D33 as the mean and cell E33 as the variance. But if more than two parameters are needed, the user will have to bypass the data entry form which stores the values in cells D33 and E33.

APPENDIX F: SUPPLEMENTAL INFORMATION

This appendix contains a list of the abbreviations used in this report and defines terms and processes relative to the Study of Establishing Time Criteria for Logistics Tasks.

LIST OF ABBREVIATIONS

ACAT	Acquisition Category
AFCEA	Armed Forces Communications and Electronics Association
AI	Artificial Intelligence
ATP	Available to Promise
BEA-LOG	Business Enterprise Architecture - Logistics
C2	Command and Control
C4ISR	Command, Control, Communications, Computers, Intelligence, Surveillance, and Reconnaissance
CAX	Computer Aided (Assisted) Exercise
CLC2S	Common Logistics Command and Control System
CM	Capacity Management
CSE	Customer Service Execution/Fulfillment (Executer)
CSM	Customer Service Management
CSPM	Customer Service Production/Operations Management
CTP	Capable to Promise
DCM	Distribution Capacity Management
DE	Distribution Execution/Fulfillment (Executer)
DPM	Distribution Production/Operations Management
DOD	Department of Defense
E	Execution/Fulfillment (Executer)
ESCM	Engineering Services Capacity Management
ESE	Engineering Services Execution/Fulfillment
ESPM	Engineering Services Production/Operations Management
FM	Financial Management
FOC	Full Operational Capability
GCCS	Global Command and Control System
GCSS-MC	Global Combat Support System - Marine Corps
HQMC	Headquarters, Marine Corps
HSE	Health Services Execution/Fulfillment (Executer)
HSCM	Health Services Capacity Management
HSPM	Health Services Production/Operations Management
ICM	Inventory Capacity Management
ICODES	Integrated Computerized Deployment System

IE	Inventory Execution/Fulfillment (Executer)
ILC	Integrated Logistics Capability
ILC OA	Integrated Logistics Capability Operational Architecture – Now known as Logistics Operational Architecture
IMA	Intermediate Maintenance Activity
IOC	Initial Operational Capability
IPM	Inventory Production/Operations Management
ISA	Intermediate Supply Activity
LCM	Logistics Chain Management
LOG OA	Logistics Operational Architecture
MAGTF	Marine Air Ground Task Force
MARCORLOGBASES	Marine Corps Logistics Bases
MARCORSYSCOM	Marine Corps Systems Command
MCM	Maintenance Capacity Management
ME	Maintenance Execution/Fulfillment (Executer)
MHE	Materiel Handling Equipment
MOS	Military Occupational Specialty
MPM	Maintenance Production/Operations Management
MRO	Material Release Order
MSR	Multiple Source Request
NTIS	National Technical Information System
OM	Order Management
O PLAN	Operations Plan
OSD	Office of the Secretary of Defense
PCM	Procurement Capacity Management
PE	Procurement Execution (Executer)
PERT	Program Evaluation and Review Technique
PM	Production/Operations Management
POM	Program Objective Memorandum
PPM	Procurement Production Management
RDD	Required Delivery Date
RM	Request Management
SCM	Service Capacity Management
SCOR	Supply Chain Operations Reference Model
SEAWAY	A Joint Decision Support System for Seabased Logistics Planning and Coordination
SOLE	Society of Logistics Engineers
TSPO	Technical Study Project Officer

TUP	Tactical Unit Prototype
UJTL	Universal Joint Task List
VBA	Visual Basic for Applications
xCM	Other Services Capacity Management
xE	Other Services Execution/Fulfillment (Executer)
xPM	Other Services Production/Operations Management

List of Terms

COMMAND AND CONTROL (C2)	The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Command and control functions are performed through an arrangement of personnel, equipment, communications, facilities, and procedures employed by a commander in planning, directing, coordinating, and controlling forces and operations in the accomplishment of the mission. Command and control is an input to the processes depicted in the operational architecture. Command and control has been depicted at the Marine Air Ground Task Force Headquarters level only.
CAPACITY	The maximum logistics capability per unit of time that a given entity (organization, work center, machine, individual, or supplier) can perform under specified conditions. Capacity may be measured in man hours, machine hours or by a physical measurement such as square footage or inventory quantity.
CAPACITY MANAGEMENT (CM)	An operational element or role that plans, prioritizes, and optimizes capacity within a particular domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within their domain.
CUSTOMER SERVICE EXECUTER/EXECUTION/ FULFILLMENT (CSE)	An operational element or role within Customer Service that executes tasks within that domain to fulfill orders and reports execution status.
DISTRIBUTION CAPACITY MANAGEMENT (DCM)	An operational element or role within Distribution that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.
DISTRIBUTION EXECUTER/EXECUTION/ FULFILLMENT (DE)	An operational element or role within Distribution that executes tasks within that domain to fulfill orders and reports execution status.
DISTRIBUTION PRODUCTION MANAGEMENT (DPM)	An operational element or role within Distribution that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.
ENGINEERING SERVICES CAPACITY MANAGEMENT (ESCM)	An operational element or role within Engineering Service that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.
ENGINEERING SERVICES EXECUTER/EXECUTION/ FULFILLMENT (ESE)	An operational element or role within Engineering Service that executes tasks within that domain to fulfill orders and reports execution status.

ENGINEERING SERVICES PRODUCTION/ OPERATIONS MANAGEMENT (ESPM) An operational element or role within Engineering Service that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

EXECUTER/EXECUTION/ FULFILLMENT (E) An operational element or role that executes tasks within a particular domain to fulfill orders and reports execution status.

FINANCIAL MANAGEMENT (FM) An operational element or role that oversees financial transactions and certain budgetary functions.

HEALTH SERVICE EXECUTER/EXECUTION/ FULFILLMENT (HSE) An operational element or role within distribution that executes tasks within that domain to fulfill orders and reports execution status.

HEALTH SERVICES CAPACITY MANAGEMENT (HSCM) An operational element or role that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.

HEALTH SERVICES PRODUCTION MANAGEMENT (HSPM) An operational element or role within Health Services that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

INVENTORY CAPACITY MANAGEMENT (ICM) An operational element or role within Inventory that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.

INVENTORY EXECUTER/EXECUTION/ FULFILLMENT (IE) An operational element or role within Inventory that executes tasks within that domain to fulfill orders and reports execution status.

INVENTORY PRODUCTION MANAGEMENT (IPM) An operational element or role within Inventory that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

LOGISTICS CHAIN MANAGEMENT (LCM) A high level planning function that looks both internally and externally from suppliers to end users to make decisions on supplier strategies, customer strategies, and network design.

MAINTENANCE CAPACITY MANAGEMENT (MCM) An operational element or role within Maintenance that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.

MAINTENANCE EXECUTER/EXECUTION/ FULFILLMENT (ME) An operational element or role within Maintenance that executes tasks within that domain to fulfill orders and reports execution status.

MAINTENANCE PRODUCTION/ OPERATIONS MANAGEMENT (MPM) — An operational element or role within Maintenance that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

ORDER MANAGEMENT (OM) — An operational element or role that serves as the supported unit's primary advocate. The primary responsibilities of this role are to manage customer orders from start to completion, to communicate order status externally and order requirements internally, and to coordinate order requirements with capacities and capabilities of other operational elements.

OTHER SERVICES CAPACITY MANAGEMENT (xCM) — An operational element or role within the Other Services domain that plans, prioritizes, and optimizes capacity. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.

OTHER SERVICES EXECUTER/EXECUTION/ FULFILLMENT (xE) — An operational element or role within Other Services that executes tasks within that domain to fulfill orders and report execution status.

OTHER SERVICES PRODUCTION/ OPERATIONS MANAGEMENT (xPM) — An operational element or role within Other Services that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

PROCUREMENT CAPACITY MANAGEMENT (PCM) — An operational element or role within Procurement that plans, prioritizes, and optimizes capacity within that domain. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within that domain.

PROCUREMENT PRODUCTION MANAGEMENT (PPM) — An operational element or role within distribution that plans and controls execution within that domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within that domain.

PRODUCTION/ OPERATIONS MANAGEMENT (PM) — An operational element or role that plans and controls execution within a particular domain. The primary responsibilities of this role are to apply capability and capacity to orders, to maintain visibility of execution status, and to report the status of resources within their domain.

REQUEST MANAGEMENT (RM) — An operational element or role that receives requirements from supported units and translates requirements into a request to be submitted to Order Management.

RESOURCES — Everything necessary to perform a given activity, including people, money, materials, facilities, equipment, tools, energy, utilities, and data.

SERVICE CAPACITY MANAGEMENT (SCM) — An operational element or role within the services area such as maintenance, distribution etc. that plans, prioritizes, and optimizes capacity within those domains. The primary responsibilities of this role are to allocate capacity and capability to orders and to maintain visibility and report status of capacity and capability within those domains.

APPENDIX G: EXECUTIVE LEVEL BRIEF

This appendix contains a PowerPoint© presentation depicting the study effort. It is intended to provide an overarching summary of the study to an executive level audience.

U. S. MARINE CORPS

STUDY OF ESTABLISHING TIME CRITERIA FOR LOGISTICS TASKS

Executive Brief

Decision Engineering Associates, LLC

Contract Number: M00264-01-D-0002

Delivery Order: 0007 Executive Brief 1

This is the title page for the U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks Executive Brief.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Purpose. To establish time criteria for Marine Expeditionary Brigade logistics tasks and demonstrate how the established time criteria supports capacity and resource management

Sponsor. Deputy Commandant, Installations and Logistics Department Headquarters, U.S. Marine Corps

Study Performer. Decision Engineering Associates, LLC

Period of Study. 30 June 2003 – 30 September 2004

Executive Brief 2

The Study of Establishing Time Criteria for Logistics Tasks commenced on 30 June 2003 for the Marine Corps Deputy Commandant, Installation and Logistics Department. The study examined Marine Expeditionary Brigade logistics tasks from a capacity and resource management perspective. Time standards were established for these tasks. Decision Engineering Associates, LLC, of Woodbridge, Virginia, was the study performer.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Study Scope:

- Address Marine Corps Planning Process and processes outlined in the Logistics Operational Architecture.
- Focus of study on Logistics Operational Architecture planning processes.
- Personnel skill sets limited to logistics MOSs.
- Equipment planning factors limited to critical TAMCNs that enable distribution and material handling of cargo and supplies.
- Except for time estimates, logistics data obtained from current Marine Corps Logistics Automated Information Systems.
- Future personnel information and planning tools will be available and feed an integrated environment.
- Time planning factors developed for all logistics processes to support a deployed MEB.

Executive Brief 3

The scope of the study encompassed the areas depicted. It is significant to note that this study was one of the first Marine Corps studies to look at the Marine Corps' Logistics Operational Architecture.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Study Summary

Task One: Research Marine Corps Logistics Planning Processes

Task Two: Recommend Resources to Evaluate

* First Interim Report – Submitted January 8, 2004

Task Three: Time Criteria Methodology

* Second Interim Report – Submitted April 30, 2004

Task Four: Document Data Requirements

* Third Interim Report – Submitted June 10, 2004

Task Five: Demonstrate Time Criteria Methodology

* Draft Final Report – Submitted July 30, 2004
* Final Report – Submitted September 30, 2004

Executive Brief 4

The study effort was divided into the five tasks depicted here. Interim reports were submitted as shown.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Task 1

Research Marine Corps Logistics Planning Processes

- Subtask 1A: Literature Review of Military Sources
- Subtask 1B: Literature Review and Personal Interviews with Academic Sources
- Subtask 1C: Literature Review and Personal Interviews with Commercial and Industrial Sources
- Subtask 1D: Review of General Materials Related to the Logistics Planning Process

Executive Brief 5

Task One, Research the Marine Corps Logistics Planning Processes, was further subdivided into these four subtasks.

Subtask 1A consisted of a military-oriented document review. Among the documents reviewed by the study team were the Logistics Operational Architecture, the Marine Corps Planning Process, the C4ISR Architecture Framework, and the Supply-Chain Operations Reference (SCOR) Model.

In subtasks 1B and 1C, academic and commercial logistics architectural frameworks were reviewed and subject matter experts interviewed. The study team, though, did not find these resources to be particularly valuable to the study goals as they often did not relate to military operations.

Task One provided a detailed look at the Enterprise Architecture background used to develop the Log OA. Of note, the Supply Chain Operations Reference, or SCOR model, depicts the building blocks organizations can use to describe their supply chain. It is organized around five primary management processes and provides information to Level Three, or the Process Element Level. The Marine Corps Log OA is based on the SCOR levels one through three. Level Four, or implementation, though not in the SCOR, provides the functional flows of the Log OA.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Task 2

Recommend Resources to Evaluate

- Subtask 2A: Identify Logistics Operational Architecture Tasks
- Subtask 2B: Identify Resources Needed by Log OA Tasks
    - ➢ Critical Skill Sets
    - ➢ Vehicles
    - ➢ Equipment
- Subtask 2C: Analysis of Resource Impacts

Executive Brief 6

Task Two was divided into these three subtasks. In the first subtask, the study team determined the Log OA S1 node tasks required to fill service and product orders from a seabased MEB. These came from the Use Cases found in Appendix 05 of the Log OA. This list was scrubbed during a Seminar Simulation Exercise workshop held at Decision Engineering headquarters in December 2003. Subject matter experts from the Navy and Marine Corps logistics community participated in the seminar and identified those tasks from the various use cases that specifically require human intervention and therefore have a potential for time measurement and criteria establishment. This process led to refinement of the list from 610 tasks in 17 Use Cases, to 217 tasks in 15 Use Cases. On March 1 and 2, 2004, Phase Two of the Seminar Simulation Exercise was held at Quantico. During Phase Two, an estimated time, based on best case, worst case, and most likely time to meet the identified tasks was determined. The critical skills, vehicles, and equipment were also identified and added to the task lists. The seminar also began to focus on the methodology for time criteria that would be the focus of Task Three.

The study team also made an evaluation of how each critical resource impacts logistics capacity as part of Task Two. Capacity management deals with balancing the competing demands placed upon the logistics system in order to fill the demand for goods and services.

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Task 3

Time Criteria Methodology

- Subtask 3A: Develop Time Criteria Methodology
  - Methodology to Estimate Time Criteria
  - Provide Planning Estimates for Associated Resources
  - Present to Study Sponsor for Approval
- Subtask 3B: Identify and Propose Candidates for Time Criteria
  - Determine Time Criteria for Each Critical Resource

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Task Three details the development of a time criteria methodology. This task was divided into the two subtasks shown. The first step in methodology development involved identification of the steps and processes from the Log OA Use Cases to include in the Time Criteria Logistics Model. Because of duplicative steps found in the use cases, the 15 Use Cases were summarized into three major categories: provide a product; provide a service, and receive a return. The time estimates and resources assigned to the logistics steps during the Task Two, Phase Two Seminar were applied.

The Time Criteria Model developed for study analysis was implemented in Microsoft Excel using both the imbedded Visual Basic for Applications programming language and commercial off-the-shelf @Risk software. The model data was organized in worksheets on Excel and the @Risk software was used to sample from the defined probability distributions, run numerous sampling iterations, and calculate statistical outputs. Excel macros were developed to sum resources across use case processes. Beta distributions were used to fit continuous distributions to the three time parameters.

As the methodology development matured, additional data parameters were addressed. They included the frequency of occurrence for alternative paths in the Use Case flows, transportation assumptions, or the likelihood of air versus surface routing, and the volume of requests per task per day.

With all of the data factors in place, the next step in the methodology was to simulate a time criteria for each Use Case. Table II-4 in the Study Report provides a summary of time results for each Use Case. The table provides a minimum, maximum, and mean time for task accomplishment.

Once the study established the duration of each Use Case process, it was then concerned with how often each process occurs per day and what impact these processes have on resources available. These results are summarized in Tables II-5 and II-6. Results were provided for both low tempo and high tempo operations.

In the process of building the model, completing the analyses, and reviewing the results, many assumptions were made, and these are detailed in the study report.

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Task 4

Document Data Requirements

- Subtask 4A: Identify Data Requirements From Task 3
- Subtask 4B: Documentation of Missing Data Elements
  - GCSS-MC Shared Data Environment
- Subtask 4C: Recommend Corrective Action

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Task Four, Document Data Requirements, was divided into these three subtasks. As a result of meetings with subject matter experts, the data requirements for the Time Criteria Model were modified from those processed during Task Three. Among the key modifications were the generic combat work day extending from ten to 16 hours, the volume of logistics tasks decreasing to reflect a more realistic view of the operational scenario, and the model inputs modified to allow for use of materiel handling and other special equipment to fulfill logistics tasks. Human resource activities were also changed to reflect the percentage of time a particular task actually requires that resource.

The original goal of Task Four was to provide new time criteria inputs to the Global Combat Support System – Marine Corps. Since the GCSS-MC is still in its conceptual stages and has not been implemented, the Time Criteria Logistics Model will be provided to the shared data environment Transformation Task Force to populate the appropriate logistics portions of the GCSS-MC.

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Task 5

Demonstrate Time Criteria Methodology

- Subtask 5A: Demonstration Performance
- Subtask 5B: Draft Final and Final Reports

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Task Five provided for a Proof of Concept demonstration of the Time Criteria methodology and model performance. It also addressed to study's final reports.

Because of the close interaction of the study sponsor and study performer during the development of the Time Criteria Logistics Model, the Proof of Concept demonstration was conducted during a series of meetings held following the Seminar Simulation Exercise, Phase Two. These meetings led to development of the robust Time Criteria Logistics Model which was run to provide the study time criteria results detailed in the study report and provided the proof of concept of the study methodology.

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

Study Conclusions and Recommendations

Conclusion 1. That the Time Criteria Logistics Model provides an additional planning capability to supplement current logistics planning estimate methodologies.

Recommendation 1. That the Time Criteria Logistics Model be utilized to assist in the logistics planning process.

Conclusion 2. That Time Criteria Logistics Model results of various scenarios allows for significant logistics planning analysis of logistics chain performance.

Recommendation 2. That logistics planning analysis derived from the Time Criteria Logistics Model be used to support resource planning, management, and utilization in support of Marine Air-Ground Task Force missions and plans.

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The study effort established its goal of providing time criteria for Marine Expeditionary Brigade logistics tasks. The Time Criteria Logistics Model developed for the study will provide Marine Corps logisticians with a simple, automated system to help plan future operations. In addition to achieving this goal, the study team identified these conclusions and associated recommendations to further simplify logistics planning efforts. The study report provides specific documentation and rationale for each of these conclusions and associated recommendations.

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Questions ?

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This concludes the study brief. Are there any questions?

U.S. Marine Corps Study of Establishing Time Criteria for Logistics Tasks

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This slide depicts the study principals.