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AN EVALUATION OF THE SUITABILITY OF LCOM
FOR MODELING
THE BASE-LEVEL MUNITIONS PRODUCTION PROCESS

THESIS

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Michael H. Gilchrist
Major USAF

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THESIS

Presented to the faculty of the School of Engineering
of the Air Force Institute of Technology
Air University
in Partial Fulfillment of the
Requirements for the Degree of Master of Science

by

Michael H. Gilchrist
Major USAF

May, 1981

Approved for public release; distribution unlimited



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PREFACE

The model developed in this paper was designed to demonstrate the applicability of the Logistics Composite Model (LCOM) in simulating the base-level munitions production process. The paper was written in support of a project sponsored by the Air Force Logistics Management Center. In this project, several simulation models were to be evaluated to determine which would be most suitable for use throughout the Air Force to determine support resource requirements for munitions production. As a demonstration, the resource quantities derived as a result of this research do not reflect actual requirements. Rather, they illustrate how achieved sortie rate can be used to measure the sortie support capability of a given set of manpower spaces, transportation equipment and storage area capacities. By conducting iterative simulations with decreasing resource quantities, the minimum requirements can be determined that will support a given flying scenario. A similar methodology using the LCOM is currently employed by the Tactical Air Forces to determine the aircraft maintenance manpower requirements for their major weapons systems. As demonstrated by the simulation results presented in this paper, the inherent flexibility and scope of the LCOM allow it to be expanded to encompass the logistics support resources pertinent to the munitions production process.

My experience in LCOM simulation was acquired while working as a manpower analyst at Headquarters, Tactical Air Command; my knowledge of munitions processing was developed during this duty in the manpower field and also as a result of the research conducted as part of this project. For their expert assistance, I wish to acknowledge the contribution and cooperation of the munitions personnel at HQ TAC/LGW for providing insights into the world of munitions processing. Secondly, the inputs of Captain Mark Greenly, AFLMC, deserve special mention. His previous experience as a munitions officer was a valuable source of critique for the control functions and production routines incorporated in this munitions model. In addition, the editorial comments and analytical expertise of my advisor, Lt Col Charles Mitchell, AFLMC, helped polish and refine the final drafts of this paper. Last, but by no means least, I wish to thank my wife, Sandra, whose patience and support throughout this research effort were instrumental in its completion.

As well as satisfying one of the requirements of the AFLMC project, this manuscript has been submitted to Lt Col Charles McNichols and the faculty of the School of Engineering, Air Force Institute of Technology, in partial fulfillment of the requirements for the degree of Master of Science in Operations Research. Hopefully, the capabilities of the munitions model, as demonstrated by this research, will support the adoption of the LCOM by munitions planners as a viable tool with which to determine accurate and defensible munitions support resource requirements.

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ABSTRACT

The availability of adequate munitions is a key factor in the combat effectiveness of Air Force weapons systems. To insure that availability, it is necessary to determine accurate logistics resources that support the base-level munitions production function. Current methods do not provide a systems approach to determine those requirements. The simulation model developed in this thesis demonstrates how the Logistics Composite Model (LCOM) can be used to provide this systems analysis. Using three general categories of munitions, the model captures the impact of varying quantities of munitions manpower, transportation equipment, and storage capacity on achieved sortie rate. The model was designed for maximum analytical flexibility, and procedures are described that allow users to easily change the key variables in the model. Results from test simulations are analyzed to show the wide range of available output products and the procedures for using these displays.

A detailed description is provided for the model data base, which is appended to the report. Samples of simulation results are included along with an example of the input data used to construct the buildup networks. The report concludes with a discussion of the support structure for the LCOM that enhances its selection as an analytical tool to assist munitions planners.

AN EVALUATION OF THE SUITABILITY OF LCOM
FOR MODELING
THE BASE-LEVEL MUNITIONS PRODUCTION PROCESS

I. The Research Problem

Introduction

The increased emphasis within the Air Force to insure the readiness of its combat forces requires management tools that can accurately determine the logistics resources required to support planned wartime scenarios. One such tool, the Logistics Composite Model (LCOM), has been used by the Tactical Air Forces since 1971 to determine the maintenance manpower requirements for their major weapons systems. (1:1) As the manpower community has been the principal user of the model, the majority of improvements in LCOM software design and analytical applications have been made to enhance that manpower determination process. So narrow a focus, however, has not taken full advantage of the powerful analytical capabilities inherent in the model. The Rand Corporation, in their original design of the LCOM, included features capable of modeling not only the manpower resource but also the other main logistics factors (equipment and spare parts) required to support aircraft sortie generation at the base level. For the wartime scenario, munitions production is a critical leg of that logistics support. There has been relatively little

effort, however, to study the resources required to support munitions production, particularly from a systems analysis perspective. The basic purpose of this research is to correct this deficiency by building a generalized LCOM model of the munitions production environment. This model will demonstrate the capability of the LCOM methodology to analyze munitions support resource requirements.

This first chapter will discuss several aspects of the research problem. Included is a description of the project as defined by the Air Force Logistics Management Center (AFLMC), which is sponsoring this effort, and a brief look at munitions support analyses to date, including a synopsis of previous LCOM efforts. A detailed definition of the research problem will then be presented, to include a description of the intended users and uses of the munitions model. The concluding section of this chapter outlines the criteria that will be used to evaluate the suitability of the demonstration model.

Chapter II will discuss in detail the environment that was simulated in the research effort. The base level munitions "system" will first be described using a generalized conceptual model. Each stage of this general model will be expanded to describe the pertinent features that must be included in any analysis if a complete and accurate determination of munitions support resources is to be accomplished. The expansion will include a definition of specific resources that impact munitions buildup and their relationship to the work processes of generating munitions. The present methods of actuating munitions

buildup, controlling inventory levels, and distributing finished ordnance will also be discussed.

Chapter III will describe how the information detailed in Chapter II was translated into a computer simulation model. A basic discussion of the LCOM will be presented to enable the reader to interpret the network data base contained in Appendix A. A description of several of the output products available in the LCOM system will give the reader an appreciation for the wide range of analytical uses for the model and will help in

understanding the trial simulation data shown in Appendix B. The intention is not to give a complete description of the LCOM nor to make the reader an expert in its use. Rather, it is intended to give a sufficient background with which to judge the model's application in analyzing the conventional munitions environment. Following this introduction, a detailed description of the model as applied to the munitions production is given. Complete details of the munitions generation and consumption routines, buildup trigger mechanisms and other aspects of the model are discussed, including a summation of the major assumptions used during model development. User procedures for changing various parameter values within the model are also described. The effect of these parameter changes are demonstrated in the next chapter.

Chapter IV presents the results of the simulations run using the munitions model. Because the purpose of this research is to demonstrate the universal suitability of LCOM, the simulations were based on a hypothetical scenario rather than a specific

scenario drawn from actual operational plans. Using a representative squadron size and target sortie rate, an initial simulation was made with unconstrained resources to establish a baseline sortie rate and initial resource demands. Subsequent simulation results are then presented that show the impact of constrained resources on sortie generation and how iterative runs of this nature can be used to determine a given mix of resource requirements. Following this discussion of simulation results, details pertinent to evaluating the model other than those explicitly contained within the model are discussed. Such details include computer run time, core usage, available compiler compatibility and representative simulation execution time. The final section outlines the data requirements that must be satisfied before the model can be used operationally within the Air Force to determine realistic resource requirements.

The final chapter discusses the conclusions and recommendations reached during the course of the research effort. The first section evaluates the model according to the criteria established in Chapter I, concluding with an overall assessment of the suitability of LCOM for modeling munitions production. The last section presents recommendations in two areas. The first area is that concerned with the continuing development and exploration of the demonstration model should LCOM be chosen as the modeling methodology. The second area deals with the LCOM software itself and suggests several enhancements to improve the utility and flexibility the LCOM as a general analytical tool.

Given this outline of the research effort, we can now address the specifics of the munitions modeling project by discussing the background and original definition of the problem.

Background

The author originally encountered the problem of determining munitions support resource requirements while working as a manpower analyst at Tactical Air Command Headquarters in 1976. At that time, AFR 66-1 was the governing regulation for the organization and policies covering aircraft maintenance. This regulation designated a separate Munitions Maintenance Squadron (MMS) to control all munitions functions and support assets. (2: 2-9). Because of this organizational separation, the manpower resource requirements for the MMS were not determined using the LCOM as were the majority of manpower requirements for the other three squadrons more directly involved in aircraft maintenance. Preliminary attempts to extend the LCOM to cover the Weapons Loading function were made during the A-10 and F-4E LCOM studies completed in the summer of 1976. The results of these attempts, however, proved unreliable and were not forwarded to Hq USAF as valid requirements. Thus, manpower requirements continued to be determined by the conventional manpower methods specified in AFR 25-5. In essence, these methods gather historical data from base level, peacetime operations, then reduce that data via standard statistical regression techniques to a program estimating equation. (3:1-1) The wartime requirements are then extrapolated from these equations. Upon approval by HQ USAF, this equation becomes a manpower standard

and is entered in AFR 26-3. The current equations for the conventional munitions maintenance work centers for a wing maintenance organization are functions of the number of Primary Authorized Aircraft to be supported (4:2).

The shortfalls of this conventional method are obvious. First, the extrapolation to wartime conditions is difficult to justify, given the dissimilarity of the two environments. Munitions functions in peacetime are largely concerned with the processing of dummy ordnance, inspection of live munitions in storage, and personnel training. These functions support peacetime training missions which for economic, safety and training reasons, seldom carry live ordnance and rarely operate at sortie rates as high as those specified in wartime scenarios. Wartime munitions processing, on the other hand, is concerned primarily with the assembly, delivery and upload of live ordnance in support of missions whose sole objective is to "put bombs on target." Thus the wartime munitions operation differs significantly from the peacetime in the tasks performed, the type and quantity of munitions processed and the objective to be supported. Extrapolating wartime requirements solely from an equation derived from peacetime operations is a questionable practice at best.

The second shortfall of the conventional method lies in the nature of the program estimating equation itself. Based primarily on the quantity of aircraft to be supported, the equation does not account for the type of aircraft nor for the various sortie rates that each type is tasked to fly. Thus, an A-10, F-111A or an F-15 squadron of 24 aircraft each earns the same munitions manpower,

even though each weapon system carries different types of munitions, has different probabilities of expending these munitions and is tasked to fly a different sortie rate.

From this brief description, it is evident that a more rigorous and defensible methodology is needed to determine wartime munitions manpower requirements. The same need exists regarding the determination of other munitions support requirements such as transportation equipment (trucks and trailers), handling equipment (fork lifts and production stands) and facilities (storage, holding and buildup areas). Requirements in these first two areas are currently contained in the Table of Allowances (TA) for the various weapons systems, specified by aircraft type and PAA per unit. The quantities contained in the TAs are questionable for reasons similar to those regarding manpower requirements. The TA authorizations are determined through a negotiating process that combines the estimates of experienced munitions personnel with a qualitative assessment of the operational environment. This method makes it difficult to provide quantitative evidence that the requirements can actually support the wartime operations of a given weapons system and is largely unresponsive to periodic changes in that scenario.

Thus, there exists a need for a methodology that provides a systems view of the munitions processing function and that can be used to determine support requirements for any given wartime scenario. This need has been articulated throughout the Air Force and is the primary motivation for this research effort.

Current Modeling Efforts

There are at present two main avenues being pursued within the Air Force to provide the needed methodology. The first is the analytical efforts of the logistics and plans directorates at HQ TAC and PACAF. At HQ TAC, the major revision of the aircraft maintenance organization directed by AFR 66-5 provided the impetus to broaden the scope of the LCOM to include munitions maintenance manpower. Under AFR 66-5, the old MMS was disbanded and its various functional entities incorporated in either the Aircraft Generation Squadron (AGS) or the Equipment Maintenance Squadron (EMS). (5:1-1) As the munitions functions were made an integral part of the aircraft maintenance complex, it was logical to try to determine the manpower requirements using the same analytical method. The procedures for this analysis are contained in a technical paper written at HQ TAC in the fall of 1980. (6) Although these procedures have been used in several subsequent LCOM studies, they were developed to fill a gap in the manpower determination process and thus focus primarily on the munitions manpower resources alluded to earlier. With certain modifications, these same procedures have been used by HQ TAC/LGX in a study of the sortie generation capability of deployment packages in support of the Rapid Deployment Force. (7:17) HQ PACAF has also pursued independent efforts to model munitions functions. One effort parallels that of the Manpower Plans Division of HQ TAC/XP, in that it extends the scope of the LCOM.

The second avenue being pursued to develop an analytical tool is that taken by the Operations Analysis Directorate at HQ PACAF.

This organization is developing a new simulation model utilizing the GASP simulation language. Although only in the development stage, the model offers an alternative to LCOM. Its applicability to the munitions environment is being examined by project officers at the Logistics Management Center (LMC) located at Gunter AFS, AL.

Each of these analytical efforts was undertaken to satisfy the operational requirements of the parent organization. As such, they focus on the specific area of responsibility of that organization and often incorporate situations unique to the individual command. This lack of generality and the incomplete system perspective were the main reasons the Logistics Management Center became involved in the munitions analysis effort. During the course of Mission Area Analysis in support of the Air Force Planning Guide, HQ USAF/LEYWC identified the deficiencies in the munitions capabilities analysis that have been outlined above. They contacted the LMC and recommended the initiation of a project to correct this problem. (8) After preliminary research, the LMC had narrowed and defined the problem sufficiently to establish Project #781040 (Appendix D). The objective of this project, as stated in the project plan, is to:

"Develop a methodology to determine the effect of changes in munitions support resources on sortie generation. Any methodology developed must be able to:

- a. Determine the alternative mixes of resources . . . capable of supporting a given sortie rate.
- b. Determine the effects on sortie support of changes in one or more resource levels.
- c. Identify production bottlenecks caused by insufficient resources." (See page D1)

In addition to this broad objective statement, the LMC also concluded that computer simulation was the best approach to pursue because of the complexity of the munitions support environment. Subsequent investigation of work being done in the field narrowed the candidates for investigation to the LCOM and the HQ PACAF GASP model. The project officer also left open the option of developing an entirely new model should the LCOM or GASP models prove inadequate to the analysis effort. After initial familiarization with the language of the two alternative models, the LMC proceeded to define the specific criteria to be met by the simulation model and by which the two competing candidates would be judged. It is at this point in the progress of the project that this researcher became involved.

Based on my past experience with the LCOM and on the requirement for a munitions analysis tool, this research effort is aimed at producing and evaluating a demonstration LCOM model that the LMC can use pursuant to recommending a methodology capable of being used Air Force wide to study the munitions environment. As the LMC is the focal point in the Air Force to promulgate universal methodologies of this nature, the research effort was shaped to fit into the construct of their Project Plan. The limitations and direction provided by this plan are outlined below under the details of the problem statement.

PROBLEM STATEMENT

From the information provided above, the objective of the research is straightforward: to construct an LCOM simulation model of the munitions environment and exercise that model to

demonstrate its applicability as an analytical methodology useful to munitions managers and planners. Limitations imposed both by the LMC Project Plan and by available resources narrowed the scope of the research from that implied by this objective statement.

The first limitations discussed will be those imposed by the Project Plan. A complete picture of the munitions environment would begin with procurement from industrial sources and carry through to the delivery to the using weapon system. The LMC chose to narrow the system to be studied to that which occurs at the local base where the using weapon system is deployed. Thus, the overall process to be modeled will encompass the arrival of munitions at the base, up to and including loading the munitions on an aircraft. Furthermore, during this phase of the project, the plan has directed that modeling efforts be concentrated on the munitions buildup process within the base level munitions organization. This direction, however, is really more a degree of concentration than an exclusion of the other facets of the base processes, because additional criteria require that any model be capable of easy expansion to include the munitions processes other than buildup. Thus, the project plan has limited the scope of the model to a base level munitions system which concentrates on the buildup portion of the entire process.

Within these limitations, further constraints have been imposed on the modeling effort, partly because of the requirement to demonstrate the universal applicability of the model and partly because of the author's personal time constraints. The first of these constraints concerns the type of munitions treated

in the model. If one looks at the complete range of various weapons carried by a particular aircraft, then sums these weapons over the number of different aircraft in the current operating inventory of the Air Force, the array of munitions is not only impressive but quite large. This array can be substantially reduced, however, if the munitions are grouped according to common buildup characteristics. To this end, the model utilizes only three major groups of munitions, illustrated in the networks by a specific munition type selected from each category.

Limiting the model in this way does not degrade the overall research effort because the techniques for capturing the support resource relationships are adequately demonstrated using these three categories. All that need be done, if and when the model is used to study a specific weapon system, is to insert the details pertinent to that system in the framework established by this generalized model. Details of the characteristics of the three munitions categories and of the munitions types selected from each category are contained in the next chapter.

The second of the constraints concerns the accuracy of the data used for various parameters throughout the model. These parameters deal primarily with the reliability and maintainability values of support equipment and the process times for various tasks within the model. To some degree, valid data is available for these parameters, derived primarily from previous efforts by this researcher while at HQ TAC and by members of the LMC during preliminary work on the project. Where such data is usable, it will be incorporated in the model.

It is beyond the scope of this research effort, however, to supply accurate parameter data where it does not already exist. In those instances, hypothetical values will be used. Limiting the model in this way is a natural consequence of the purpose for which it is being built; i.e., to demonstrate the LCOM capability.

Thus, the emphasis in treating various parameters is not on their numerical value but rather on the terms in which they are expressed. For example, the frequency with which a fork lift malfunctions is not as important in the context of this research as is the way it fails in relation to its use within the munitions buildup process. That is, can the relationship among the various support resources best be captured by expressing failure as a function of number of operating hours, by calendar days, or number of munitions processed, etc.? The value of the parameter is subject to change; indeed, the function of the model is to capture the impact of that change. The terms in which the parameters are expressed, however, are not subject to change. They should be expressed in terms that best capture their relationship to the overall process. Specific details regarding parameter terms are contained in Chapter III and some general observations regarding data collection and validation are discussed in the final portions of Chapter IV.

To summarize, then, the modeling efforts contained in this research are directed toward the base level munitions process with particular emphasis placed on the buildup section of that process. Data values within the model's networks are represen-

tative in nature; their quantitative validity being of less importance than the terms in which they are expressed.

Intended Users

Given the scope and limitations of the model just described, a few comments regarding its intended use will assist the reader in understanding the approach that was taken in representing the real world of munitions processing in a simulation model. The first of these comments regards the organizational level at which the model can most practically be employed. The LCOM Main Module object deck is a sophisticated and complex software package and requires a relatively large amount of Central Processing Unit (CPU) storage space. When the core requirements for the simulation model are added to this requirement, the result is such that only computer resources available at Major Command level or higher can process an LCOM simulation. In addition, the simulation execution time, while dependent on the size of the specific model, will generally be greater than that available to any one office or organization below MAJCOM level. For these two reasons, (core and execution time requirements), the model will not be of much practical use below MAJCOM level.

The second comment regarding intended use concerns the question of whether the model is to be designed to determine future resource requirements in support of a planned scenario or to assess current operational capabilities given current, on-hand assets. At first the distinction may appear so slight as to be purely academic. One need only investigate the present

discrepancies between authorized assets and on-hand balances and the creative management techniques that exist throughout the Air Force to deal with these differences to realize that the distinction is not academic. The munitions model in this research paper was developed for the determination process. Certain assumptions were made regarding equipment usage, production processing and inventory control that are not always valid in the real world because of the shortages mentioned above. Where possible, these assumptions were associated with particular model parameters that can be changed by the user so that some assessment of the effect of the assumptions can be made. In other cases, the assumptions are hard wired in the logic of the model and, as such, limit its applicability in the operational assessment role.

With this understanding of the scope of the model to be developed and its intended uses, the concluding section provides the criteria against which the final model will be evaluated.

Evaluation Criteria

From the basic objectives of the LMC Project Plan stated earlier, it is obvious that the focus of the model is on the resources involved in munitions production. The following criteria are generated primarily from this focus.

Criterion 1: The model must capture the utilization and interaction of all pertinent resources involved in the munitions production process. It must address operations where any or all of these resources are limited in quantity, whether from

externally imposed initial constraints or from internal resource utilization during simulation.

Criterion 2: The model must show, either directly from simulation results or indirectly through subsequent calculations using simulation results, the impact of limited resources on sortie generation. Simulation results should show where bottlenecks occur in the production process and what resources are responsible for them.

Criterion 3: The model must be capable of handling the simultaneous production of several munition types, each competing for the use of the same resource.

Criterion 4: The modeling methodology must be capable of simulating the range of production processes used for the current inventory of munitions in the Air Force.

Criterion 5: To be a useful management tool, the parameters and variables in the model must be easily changed by the user to reflect different operations scenarios and munitions management policies.

Criterion 6: Although the scope of this research does not encompass munitions receipt/storage or aircraft loading, the model must be capable of expansion to include these areas and of relating this complete munitions processing system to sortie generation.

Criterion 7: The data used in the model should be that which is currently available to the user or that which could reasonably be obtained from current Air Force data collection systems.

Criterion 8: The computer requirements and supporting software packages required by the model should be compatible with computer hardware currently available at MAJCOM level or higher.

The above eight criteria, although general in nature, provide a framework of design for a model which will be useful to the MAJCOMs concerned with munitions production resources. Prototype models submitted to the LMC for evaluation can be compared using these basic criteria as an initial selection screen. With that initial screening, systems analysts and munitions managers will be able to expand the criteria to provide more detailed guidelines for further model development and evaluation.

In summary, the material contained in this chapter was intended to lay a foundation for the remainder of the research effort and to channel the reader's expectations regarding the munitions model that is its output. The following chapter will continue to build on that foundation by describing the munitions environment that is represented by this model.

II. Simulation Environment

Conceptual Model

Chapter I established the scope of the modeling effort and explained the emphasis on the munitions buildup process. Before presenting the details of this process, however, it is necessary to discuss how buildup relates to the remaining functions in the base level munitions systems. The conceptual model in Figure 1 diagrams that system in adequate detail to show these inter-relationships.

One of the first things to note in the model is that the processes, shown in blocks, are tied together by the consumption and generation of specific end items. That is, the storage process generates the bits and pieces that are consumed by the buildup function, which in turn assembles these parts and generates a complete munition. These complete rounds are then loaded on the aircraft for eventual "consumption" during a sortie. Obviously, any slow down or outright stoppage of production in one function will have certain effects on the production rate for a subsequent functions. The LCOM is particularly well suited to simulate a system linked by sequential production because a major part of its software is devoted to tracking and accounting for parts that are generated and/or consumed. This compatibility was one of the initial reasons that suggested LCOM as a useful methodology to simulate the munitions environment.

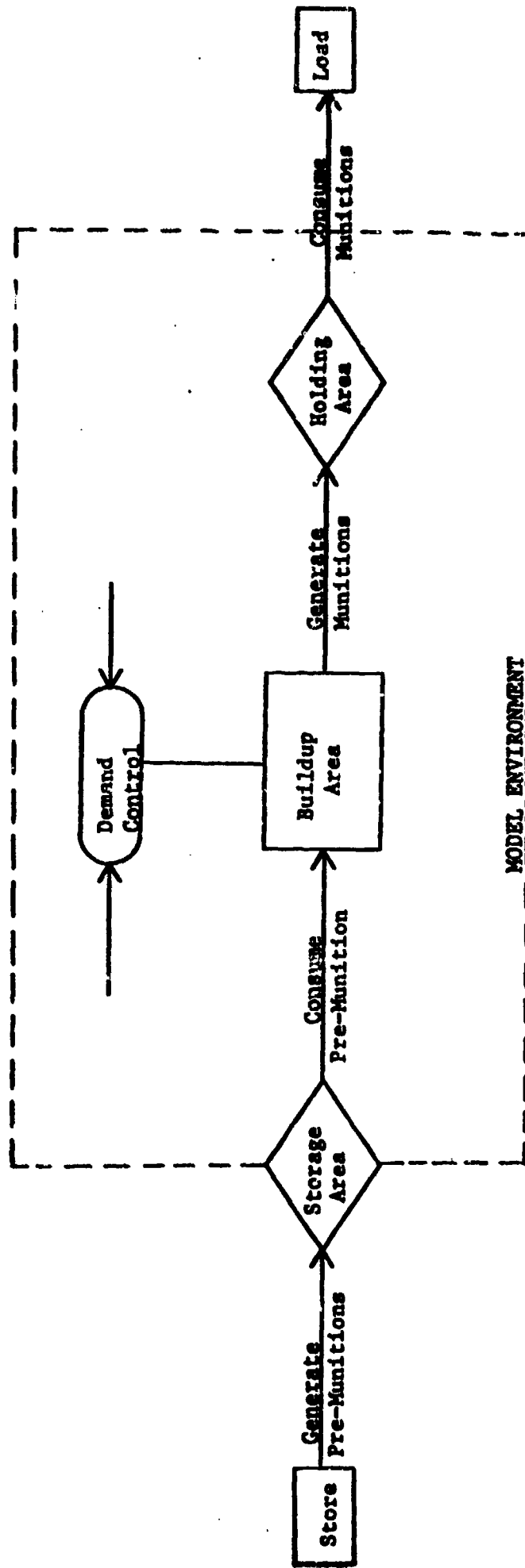


Figure 1. Conceptual Model

A second feature to note in the conceptual model is the final consumption of munitions by loading on an aircraft. In this function lies the key parameter that reflects overall system performance and which is, therefore, the best independent variable to measure the adequacy of various levels of munitions support resources. Certainly it is possible to select an intermediate measurement parameter that would reflect system performance at selected points throughout the process. One such parameter, for instance, might be a buildup production rate, expressed in number of bombs produced per hour. Yet any such intermediate measure would then have to be related to the overall goal of the munitions system, which is to provide the required munitions for wartime sorties. To avoid the problems posed by intermediate measures of performance, any simulation should be capable of modeling a detailed wartime scenario and must directly link aircraft processing in that scenario to munitions production. The LCOM has both of these features, the latter through the consumption logic previously mentioned. The details of reproducing a specific scenario are beyond this research effort, whose purpose is to build a general model. However, the procedures for building the scenario are well established. AFR 25-8 has a detailed questionnaire for gathering scenario data (9:4) and the procedures for translating that data into computer language are contained in a HQ TAC/XPM technical paper. (10) The fact that such procedures are established and are being used, however, is one of the primary reasons for using LCOM to study munitions production. This feature will allow the analyst to use

sortie generation as a direct measure of the adequacy of support resource requirements. This capability produces credible and defensible requirements and is the main feature supporting the use of LCOM for this analysis.

The third and final characteristic of the munitions system illustrated by the conceptual model is the block labeled Demand Control. This block represents the inputs that are used in the field to arrive at the decision to start munitions buildup and to determine the quantity to be built. As shown, the system operates by responding to demands from the final consumer -- the aircraft loading function. In supply terminology, the system runs under a "pull" demand rather than a "push" supply philosophy. This is accomplished by looking at the projected flying schedule and ordering munitions production based on that plan. The period of projection and subsequent buildup is a function of several variables which are discussed in detail later in the chapter. The "pull" nature of the system is modified to some extent by the input of actual sortie consumption to the demand control process. This is essentially a feedback loop which allows the munitions managers to weigh scheduled sortie munitions requirements against actual consumption. Discrepancies between the two may cause changes in the production order. Thus, any simulation model must be able to look ahead at the scheduled scenario and account for actual consumption and must use this information in an internal feedback loop to dynamically change production start-up during the simulation. The techniques used in this LCOM model to satisfy these requirements are described in Chapter III.

To summarize, the conceptual model highlights several general system characteristics which should be captured by a representative simulation model. The first of these is a production process that is triggered by sortie demand, with each step of the process dependent upon the output of the previous step. The second is that sortie generation is the most direct and valid parameter with which to measure the adequacy of munitions support resources. Any analytical model must, as a minimum, capture these two elements of the munitions system. Within these general guidelines, it is now possible to describe the more specific details of the buildup sub-function.

Munitions Buildup.

Because of the emphasis of this paper on the buildup function, the specifics of how unassembled munitions are ordered and arrive at the base and how they are inspected and placed in the storage area will not be presented. The process that will be modeled starts with the withdrawal of a certain quantity of these munitions parts from the storage area for delivery to the buildup function. The stored parts are broken out of their containers or pallets and loaded on transport vehicles for delivery to buildup in multiples of common storage lot sizes. For certain munitions, the common lot sizes for the various components may not all be of the same quantity. For instance, the number of tail fins in a standard storage container is usually greater than the number of bombs on a storage pallet. Thus, delivery to the buildup area may not always be in a one-to-one ratio for all parts required for final assembly. The transportation and accounting of

mismatched storage lot sizes will be described in Chapter III.

One major limitation exists that restricts the quantity of any munition that may be placed in a single location. Each munition is assigned a value in explosive weight based on its explosive potential. To satisfy safety precautions, any physical location is rated as to the total or Net Explosive Weight (NEW) that can be positioned there at any one time. Before unassembled munitions can be delivered to a buildup area, a check is made of available NEW in the area. Insufficient NEW capacity may delay the delivery of parts from the storage area.

When all the required parts are assembled, the actual buildup can begin. Depending on the specific munition type, this may involve any one or all of the following tasks: parts or whole round inspection, guidance control checkout, fuse assembly, and buildup or linking on ammunition belts. When the required tasks are completed, a finished munition is loaded on the appropriate transportation vehicle, ready for delivery to the holding area. Again, the holding areas are rated by NEW and a sufficient capacity must exist there before the buildup area can be cleared of assembled munitions. From the holding area, the required munitions are transported on demand to the flight line for upload on the aircraft. Certain operational requirements or physical limitations may cause deviations from the process just described. For example, combat quick turn procedures have been developed in which aircraft are taxied to a munitions holding area. This eliminates the need to transport munitions from a holding area to individual aircraft revetments. In another case, munitions are

delivered directly from the buildup area to aircraft parking areas, thus eliminating the need for an intermediate holding area. The simulation model should be flexible enough to represent these different situations.

As already mentioned, the rate of production is controlled to some extent by the available NEW at various physical locations. In reality, this is not a critical limitation because, in contingencies, almost any open area on a base can be designated for weapons deposit. Thus, total NEW can usually be expanded to match the system requirements. The primary production control is exercised by the munitions staff organization and is based on scenario requirements. Normally, the flying schedule is published 24 hours in advance. The aggregate munitions requirements are determined from this document and appropriate buildup orders are placed. To handle deviations from the planned schedule, a certain stock level of assembled munitions is also maintained. This level must be great enough to permit operational flexibility to change sortie munition loads but is practically restricted by holding-area NEW and vehicle resources. Thus, buildup decisions are made after considering the planned consumption, current inventory level, desired safety stock level, holding area limitations and equipment availability. The interplay among these factors is complex and should be reflected in any simulation of the munitions environment.

Munitions Buildup Categories

The preceding paragraphs have explained the flow of munitions from the storage area to the aircraft and have outlined

the considerations that control that flow. This framework is common to most all the various munitions in the current inventory. The only major difference occurs in the actual buildup procedures and in the support resources required to process each munition type. To describe the buildup procedures for all munitions types is not the purpose of this research. The applicability of the model can be maintained, however, by grouping munitions by common buildup procedures and including a representative munition from each category in the model data base. To this end the author has derived the following three categories: 1) assembled munitions, 2) all-up rounds and 3) ammunition. By modeling a munition from each category, the research demonstrates the procedures that can be used to simulate any of the various munition types that may be called for by a particular wartime scenario. The following sections explain each category and indicate the munition type contained in the model.

Assembled Munitions. This category includes all those munitions that are produced by assembling various component parts at the deployed location. The buildup starts with delivery of the required components to a central assembly location, where they are inspected, then put together to produce the completed round. Munitions in this category generally have the more extensive assembly procedures and are often produced using an assembly line operation. The majority of conventional weapons fall into this group, which includes the MK82, 83, and 84 General Purpose Bombs, the AIM-9 Sidewinder air-to-air missile and the AGM-65 Shrike air-to-ground missile. The MK82 bomb was

included in the simulation model for several reasons. First, it gives a good representation of the complex assembly procedures common to this category. Second, the general purpose bomb is a common munition specified in scenarios for aircraft with an air-to-ground mission. Last, reasonably accurate data has been collected by the LMC for the MK82. The MK82 buildup flow diagram and corresponding resource requirements, as gathered by the LMC, are contained in Appendix C. Reference to this data will be made in the next chapter and also in Chapter IV in the data discussion section.

All-up Round. This category represents a recent advance in munitions production that was introduced to simplify and reduce the munitions support requirements at base level. Essentially, the assembly has been accomplished prior to munitions delivery to the base. The base process, therefore, is primarily that of inspection of the round in its container and delivery to the using aircraft. Munitions in this category include certain air-to-air missiles like the AIM-7 and cluster munitions such as the MK20 antitank weapon. The AIM-9 was chosen for inclusion in the model. One reason for its selection was the opportunity to study the impact of a munition that is available both as an all-up round and as an assembled munition. The capability to make such a comparison suggests one of the various uses for the simulation model.

Ammunition. This category encompasses all rounds that are fired from the variety of guns installed on Air Force aircraft. It includes such munitions as the 20mm and 30mm machine gun

ammunition and the 105mm cannon rounds. The buildup procedure consists, in general, of round inspection, linking rounds in a carrying belt and loading the belt in an aircraft loading device. The 20mm round was simulated as it is the round carried by the majority of active inventory aircraft. The data for the buildup networks was collected by the LMC.

Buildup Resource Requirements

Once the reader is familiar with the LCOM procedures and with the model data base at Appendix A, he will be able to determine the exact resources for any particular task in the buildup process of a specific munition. Some general comments regarding the various resources will aid in that learning process.

Manpower. The manhours and resultant manpower requirements that can be derived from simulation results reflect only direct productive labor. No attempt was made to model supervisory or management positions, primarily because these requirements are not a direct function of the sorties to be supported. The majority of direct production work in the munitions function is performed by personnel with the 461XX Air Force Speciality Code (AFSC). Various personnel within this AFSC are assigned to specific work centers within the munitions complex. In the model, only two major distinctions were made in the 461XX resource. The first was between those personnel assigned to store and deliver unassembled munitions and those assigned to buildup and deliver munitions to the flightline. This division

represents two distinct pools of manpower, and cross-utilization between them does not occur in the model. Within each category, a further breakdown was made between qualified and assistant resources. This was done as it is common to supplement the munitions buildup personnel with minimally trained augmentees during contingency operations. The qualified personnel were allowed to substitute for the augmentees but not the reverse. This technique will allow planners to assess the degree of augmentation required to support any specific scenario.

Facilities. In researching the constraints that physical sites (holding, storage and buildup areas) place on munitions production, the author discovered that rarely are physical dimensions a limiting factor in positioning munitions. Rather, it is the total explosive potential that can be co-located in an area that establishes such limits. Thus, the capacity of a facility is expressed in Net Explosive Weight units so that the impact of limited facilities on sortie production can be analyzed.

Equipment. The various pieces of equipment contained in the model reflect the specific requirements of the three munitions types selected. As such, they do not comprise a comprehensive list of all the equipment associated with munitions processing. Where acceptable according to regulation or common practice, substitution was allowed between comparable pieces of equipment; the 4000, 6000 and 10,000 pound fork lifts were all made interchangeable. Availability of the various equipment is restricted by sending them through repair and maintenance networks.

These networks represent both scheduled and unscheduled maintenance and were included to illustrate how equipment reliability and maintainability is treated in the simulation.

Summary

The content of this chapter was designed to familiarize the reader with the system being simulated. It detailed the sequential flow through the various munitions functions, discussed the buildup control function and highlighted the emphasis that will be placed on sortie generation as the prime measurement of support resource capability. The description of munitions buildup categories and preliminary discussion of resource characteristics were included to aid the reader in understanding the following model description in the next chapter.

III. Model Development

LCOM Background

The Logistics Composite Model was designed by the Rand Corporation in response to a request from the Air Force Logistics Command (AFLC) for a methodology with which to study base level logistics functions. Subsequently, the Human Resources Laboratory at Wright-Patterson AFB began exploring the capabilities of the model as a tool to determine maintenance manpower resources for new aircraft weapons systems. This organization was responsible for the first comprehensive use and documentation of LCOM as an analytical methodology. In 1971 the Tactical Air Command tested the LCOM as an alternative to determine manpower requirements for its operational aircraft. (1:1-1) The pilot study at TAC modeled wartime operations of the F-4E. A field validation at Seymour-Johnson AFB (11:A-1) proved the validity of LCOM results and the Air Staff authorized use of the model as the primary method of determining maintenance manpower resources.

LCOM Infrastructure

Since that validation, the model has found widespread use throughout the Air Force and has generated its own extensive

support structure. The manpower planning organizations at HQ TAC, PACAF, USAFE and, more recently, MAC and SAC have an established LCOM capability. In addition, the Air Force Test and Evaluation Center has used the model in logistics support analyses of new weapons systems. The Aerospace Systems Division at Wright-Patterson AFB has also used the LCOM in support of research and development projects. This growing community of users has generated two important spin-offs.

First, these organizations have produced a cadre of trained personnel, expert in the use of the LCOM and familiar with its analytical capabilities. Second, a central support organization, the Air Force Maintenance and Supply Management Engineering Team (AFMSMET), serves as a focal point for maintenance of the model. The AFMSMET has developed and continually updates the software and user documentation for the LCOM. They disseminate improved versions of the model and, through the LCOM Steering Group, collect user inputs for future enhancements. The Steering Group meetings provide an excellent forum where new applications can be surfaced and where users can exchange technical ideas and analytical procedures. In addition, the AFMSMET also maintains the LCOM Student Training Text. (12) This document is invaluable in introducing the basic principles of constructing an LCOM model and, together with the User's Guide, provides the information necessary to train new personnel in the LCOM methodology.

The AFMSMET also serves as an approval agency for LCOM studies, providing guidance in report standardization and quality control. This diverse range of users and support organizations

is a major indicator of the accepted analytical utility of LCOM in the Air Force. Starting with personnel training and continuing through model enhancement, this structure adds an important dimension to be considered when comparing LCOM to other simulation models.

General LCOM Description

Looking now at the actual model, the LCOM software can be viewed as an interconnected system of four basis modules. These modules work together as a complete unit to simulate base level logistics functions. The brief descriptions of these modules that follow are essentially summaries of the detailed descriptions contained in AFMSMET Report 78-5.1. (1:2-17 - 2-20) The reader who is interested in a more complete description of the LCOM software and simulation techniques than is contained in this chapter is strongly urged to consult the referenced document. It is a comprehensive user's guide to the LCOM. With that direction in mind, the following discussion will provide an introductory familiarization with the LCOM and its functions, beginning with the Input Module.

Input Module. The Input Module is essentially a translation device. It allows the reader to enter data pertinent to the system being modeled via a series of easily understood forms. The Input Module translates that data into a binary computer format for processing by the Main Module. A comprehensive error and diagnostic message routine are also included in the Input Module. These allow the user to debug the data base prior to

attempting actual simulation, thus economizing on valuable computer time and usage. When all error checks have been passed, the Input Module produces a file called an initialization. The initialization is referenced by the Main Module during actual simulation. A second function of the Input Module is to produce the file of exogenous events that trigger activities to be processed through the data structure contained in the initialization. This exogenous file specifies the type of resource that will enter the data base and schedules the time and place of entry during the simulation. It is this feature of the LCOM that has made it so successful in simulating the details of a wartime scenario.

Main Module. As suggested in the preceding section, the Main Module conducts the actual simulation processing. Essentially, the initialized data base is a series of tasks connected in a representation of the flowpath of an entity through the environment being simulated. Each segment specifies the time and resources, by type and quantity, that are required to accomplish the task. When indicated by the exogenous file, the Main Module draws the specified entering resource from an internal pool. It then enters that resource at the appropriate point in the data base and begins the network processing. At each task, the Main Module checks the pools of required resources for availability and, when all specified resources are available, draws them from the pool for the length of the task. At the end of the task, all resources are returned to their proper pools and the entering resource is passed to the next task. All tasks are

processed in a similar fashion until the end of the network is reached. At this time, the entering resource is released back into the proper pool for subsequent processing. Simultaneous processing of a virtually unlimited number of resources is possible, and simulation continues until all exogenous events are processed or simulation stop time is reached, whichever occurs first. Provision is also made for the generation and/or consumption of resources throughout the simulation. During the simulation, statistics are fed to a separate file which is passed to the next module for use in a variety of processing reports, as selected by the user. In addition to these optional displays, the Main Module produces a standard summary of simulation results in an output called a Performance Summary Report (PSR). The PSR is separated into six categories of reports and offers summary statistics of simulation events. At the user's option, intermediate (level 1) reports can be produced for a subset of total simulation run time with an aggregate (level 2) report produced summarizing the complete simulation. For instance, if the simulation were run for 120 days, a level 1 PSR could be produced every day, and a final, level 2, PSR would present simulation results for the complete 120 days. The six categories in the PSR are: Operations, Aircraft, Personnel, Shop Repair, Supply, and Equipment. Within each category, the user defines the specific headings for which statistics will be displayed. There are a total of 76 statistical displays in the six PSR categories. The information in these displays can be seen in the simulation results at Appendix B. The display labels are self-explanatory.

In addition to the PSR reports, the user can select snapshot reports at any desired point in simulation time. These snapshots give the status of various aspects of the simulation at the requested time. From this brief description, it should be apparent that LCOM is capable of producing a full range of simulation output statistics. As the amount of detail is controlled by the user, the analyst can tailor these reports to any particular problem. For complete details on PSR output, the reader is encouraged to consult the AFMSMET Report referenced earlier.

Post Processor Module. This module produces additional displays of simulation results. The Matrix, Parts, Supply and Mission Post Processors are aggregate displays that show the utilization and processing of particular resources for the entire simulation period. The Graph Post Processor enables the user to produce graphical displays of selected statistics. The Display Post Processor traces an aircraft resource through all the various tasks it processed during a selected interval of simulation time. Its primary use is for debugging and validating the logic of the networks in the data base.

Restart Module. This model allows the user to stop the simulation and dump all statistics to a save tape to be used for restarting the simulation at a later date. It was not used for this project and has limited use throughout the LCOM community.

Summary. The preceding paragraphs have outlined the basic construction and function of the LCOM and have described the interface between the four modules that make up the complete model. Several of the output products described above for the

LOCM II SYSTEM

LOCM II SIMULATION SOFTWARE		
INPUT MODULE	MAIN MODULE	POST PROCESSOR MODULE
Includes: Data Verification Initialization (INIT) Process Scenario (EXOG) Generation Process Data Display Data Summarization	Includes: Simulation Process Simulation Reports Transaction Outputs	Includes: Transaction Decoder Matrix Post Processor Graph Post Processor Parts Post Processor Display Post Processor Mission Post Processor Support Equipment PP Realized Flying Schedule
	RESTART MODULE	
	Includes: Main Module Restart (HIS only)	

Figure 2. LOCM II SYSTEM STRUCTURE (1:2-2)

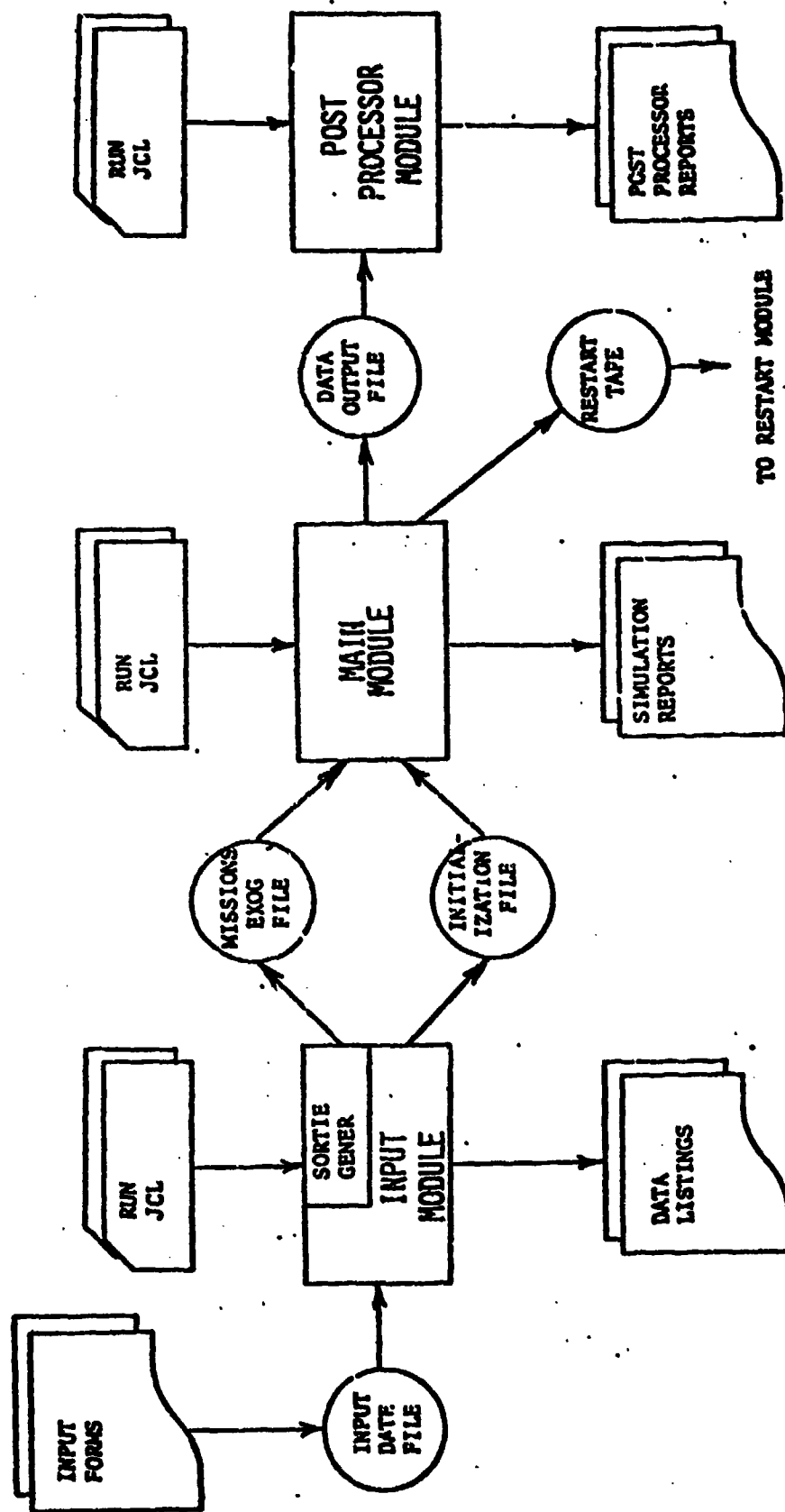


Figure 3. BASIC LCOM II SIMULATION SOFTWARE MODULE INTERFACES (1:2-3)

munitions model simulation are illustrated in Appendix B. Fig. 2 and Fig. 3 provide a summary of the above information. The next section will give a detailed description of the Munitions Model constructed for this research.

The Munitions Model

During the explanation of the Munitions Model, extensive reference will be made to the data base contained in Appendix A by keying various descriptions to the appropriate line numbers in that data base. The general scheme of explanation will use the network flow logic contained in the Form 11s which run from line number 466 to line number 842. For the information not contained in the Form 11, the reader will be referred to the appropriate line number in the remaining forms that comprise the rest of the data base. Before beginning, a brief explanation of the content of each Form will assist the reader in following the model explanation. The forms will be described in the same order in which they appear in Appendix A. The form number appears in columns 2 and 3 on each line of the individual forms.

Form 10 - contains the labels for the headings that appear in the PSR.

Form 13 - lists the various resources used in the model, segregated by the following codes: I for aircraft, M for manpower, P for parts and A for equipment. This form also contains the name and value of the failure clocks that control entry to the equipment repair networks and that control iterative generate tasks.

Form 12 - contains the name of each task in the network and defines the task time and resources required for the task. The consumption and generation of resources are also indicated on this form.

Form 11 - lays out the flow of entities as they are processed by the model. Format consists of a prior node name, the task performed when reaching that node and the name of the next node referenced when task processing is complete. The trace of information in this form is the basis of the model explanation.

Form 14 - contains the failure clocks, the tasks that cause each clock to be decremented to simulate equipment failure and the decrementing value that each clock will have subtracted from it when the specified task is performed.

Form 16 - specifies the shift lengths that the manpower resources will work and the initial quantity of manpower on each shift.

Form 17 - designates the entry point in the Form 11 for each of the exogenous events in the exogenous data. The form also defines the resource that will be processed through the networks.

This form definition should prove useful in understanding the following model explanation, which starts at the beginning of the Form 11s.

Main Flight Line Network. (line number 466 through 473)

The six tasks in this section are representative of those that most aircraft must process during the course of a mission. This section is vitally important because it contains the consumption of munitions by loading on the aircraft. If for some reason (inadequate support resources or insufficient facilities), a munition is not in the available pool, aircraft processing will be delayed awaiting munitions production, and a corresponding degradation in sortie rate will result. It is this section that allows the analyst to directly relate support resource capability to sortie generation. The mechanics are as follows. Line 468 contains the task COMUN. This is not an actual task, but is the name of a next node that the aircraft must go to. In LCOM terminology, this is a "called" node. It is a unique feature in LCOM and means that the aircraft must go to the specified node and complete all tasks or networks connected to that node before returning to the main networks to continue flight line processing. The actual consumption mechanics will be described in the next section. Two other items are of interest in the flight line networks. The first is the task labeled R at line 469. The R task is a mechanical device which allows the connected network to be processed but prevents the aircraft from being delayed during that processing. This is accomplished by placing an "*" in column 29 of the Form 12 defining the R task. See line 137.

In this case, the network following the R task is the munitions buildup network. This R task, which stops the aircraft from processing the connected network but triggers the munitions

buildup, is the munitions consumption feedback loop described in Chapter II. Thus, each time a sortie consumes or attempts to consume a given set of munitions, the control network to start munitions buildup is activated. If buildup decision criteria are met, munitions generation will commence. Notice also that the R task has the same prior node as the CQMUN task. The parallel noding allows buildup to occur when the munitions stock is depleted and the aircraft is awaiting subsequent munitions production. If the buildup trigger were referenced sequentially after the consumption call section and, if munitions had been reduced to zero, the aircraft would be delayed at the consume call task and would have to wait for buildup to be started by the next day's frag order before it could load and continue flight line processing. This is an unacceptable delay and would not reflect real world operations.

The second item of note in the flight line network is the continuous loop nature of the flowpath. That is, at the completion of the last network task (REFUEL), the aircraft is sent back to the beginning and immediately starts processing again. This is an artificial network devised solely for this demonstration model. Normally, a detailed wartime scenario would be contained in the exogenous file, defining a number of different types of sorties, each carrying a different munition load. In such a case, each mission would have a separate entry point to a unique flight line and munitions loading network. As was explained earlier, this research does not attempt to model a specific scenario. Thus, for demonstration purposes, the

aircraft are processed by an activity which enters this closed network and continues to loop through it until simulation stop time is reached. By varying the length of the sortie task, any desired sortie rate can be modeled without having to build a new exogenous file or re-initialize the data base. User procedures for changing this task time are discussed in the last section of this chapter. The above technique facilitates the analysis of the munitions buildup process, yet still incorporates the munitions consumption logic. This consumption logic will impact accomplished sortie rate exactly as it would if a wartime scenario were being used to initiate aircraft processing. This activity processing technique does require special interpretation of the output statistics to determine sortie rate, but the procedure is straightforward and will be explained in Chapter IV.

Munitions Consumption Networks. (lines 474 to 528) As mentioned in the preceding section, this series of networks is reached by processing a call task in the main flight line network. Notice that the consumption for all three munition types is attached to the CQMUN node: The MK82 at line 474, the 20MM at 679, and AIM9 at line 758. This logic simulates the simultaneous delivery of all three munitions to the loading area and requires all three munitions to be consumed before the call section is completed and the aircraft is returned to the flight line network. In the interest of brevity, only the MK82 consumption and buildup logic will be described from this point on. The other munitions networks are similar in nature, differing only in the number of tasks and specific resources for

each task. The connecting network logic and consume and generate routines are the same for all munitions.

The MK82 consumption network starts at line 474. Notice that there are three sets of prior nodes labeled CQMK82 (lines 475 to 479; lines 487 to 491, and lines 499 to 503), with each set containing five CQMK82 nodes. In effect, this scheme is checking each of five holding areas for the MK82 munition, which may be loaded on any one of three types of delivery trailers. The software logic that allows this search is triggered by the R selection mode, indicated by the R in column 26. For each task on an R selection mode, the model looks at all the required resources and, if all are available, processes that and only that task. If any of the resources are not available, the model moves to the next task and repeats the search. This process continues until a task is selected or until the list of tasks attached to the common node is exhausted. In the latter case, the model moves back to the first task searched and back-orders the resources. A task name convention was employed that gives the reader an indication of what set of resources are being searched on each task. The convention keys on the last two characters in the task name. The penultimate character indicates the holding area (A-E). The last character indicates the type of trailer carrying the munition, where 1 equals a MHU12, a "2" a MHU85, and a "3" a MHU11. Thus, the task QM82A1 indicates the task that will consume a load of MK82 General Purpose bombs loaded on a MHU-12M trailer which is stored in holding area A. It must be emphasized that the task name is strictly a convention

for the user's convenience. The actual resources required for the task are listed on the Form 12. Referring to lines 142 to 144, the reader can confirm that the implied set of resources are in fact listed for this example.

Several other vital pieces of information are contained on the Form 12's. This information will be described using the same QM82A1 task as an example. The data will be described as it is encountered on the Form 12, reading from left to right.

Immediately following the task name, are the numbers 2, indicating task type, and 1, indicating task priority. The task type is not important in this model. The priority is used by the model to assign resources to tasks which occur simultaneously or to arrange tasks in a back-order queue. The next field contains the task time, variance and distribution. In this case, the time (.3 hours) represents the travel time from the holding area to the loading area. This task has a lognormal distribution with a .1 hour variance. The model draws a unique task time from this defined distribution each time the task is referenced. This gives the model its stochastic properties. The next set of characters are the resources required to perform the task.

The first resource encountered is the M82A1, as suggested by the task name. Notice that the resource is followed by a "C" and the number 2. This tells the model to reduce the pool of M82A1 resources by two units. The MK82 resource, which is also consumed, is an information trigger whose use will be explained later. The last resource listed is a 461CQ in a quantity of 1. This indicates a manpower resource with a 461XX AFSC, who works in

the buildup and/or holding area (461CX), and who is fully qualified (461CQ) to accomplish the task. The next line on the Form 12 is merely a continuation of the required resources for the QM82A1 task. The first resource listed here is a 461CS. This manpower resource is the same as the 461CQ except it indicates minimally trained or augmentee resource. These categories of resources were explained in Chapter II. Notice that the 461CS resource is followed by an X. This indicates that an acceptable substitute has been specified for this resource on the Form 13 record. On line 22 in the Form 13s, one can see that a 461CQ can substitute for a 461CS. Thus, the preferred manpower combination is one qualified and one augmentee. An acceptable substitute, if no augmentee is available, would be two qualified personnel. This Form 12A (line 144) indicates this second resource combination and labels it RCS-1 to eliminate repetitive definition should it be used for a different task.

Returning to the Form 11s at line 480, the discussion of the consumption routine can be completed. Having processed one of the R selection mode tasks, the aircraft consumes one of the required munitions. This action also releases the holding area capacity. The CHOLDA call section (511) generates the proper quantity of the resource HOLDA, depending on the quantity of munitions consumed in the preceding task. The munitions are then loaded on the aircraft (LDMK82), which in turn releases the trailer resource. The CMHU12 call section (521) generates the proper quantity of the resource MHU12 in the same manner as the CHOLDA call section. This last generation completes the called

munition consumption section and releases the aircraft to continue its flightline processing.

Munitions Buildup Control. (lines 529 to 531) Recall that this section of network was reached by processing the R task in the flight line network, and that the aircraft was prevented from processing through that R task. The buildup decision logic is again constructed using the R selection mode feature. The first task encountered on the R modes in TMK81A. Referring to the Form 12 definition on line 197, this task requires 24 MK82 resources. If that quantity is available, the network ends. If 24 MK82's are not available, the parallel task (ENTER) is queried. Because this task requires no resources, it will always be processed if it is reached. In short, the control function says: if there are less than 24 MK82 assets on hand, send an order to the buildup function to begin production. The quantity of MK82's specified on the first R mode task is the safety stock level discussed in Chapter II. Recall that one MK82 was consumed when the aircraft was loaded. Thus one LCOM MK82 represents one full load. If the simulation is processing 24 aircraft, each flying one sortie per day, the safety stock level of 24 is one day's worth of MK82 munitions. This control logic is queried as a result of either actual sortie consumption or daily frag order scheduled on the exogenous file. Thus, the prime objective of the munitions control in this model is to maintain a pre-determined safety stock level.

Assuming that this buildup check is passed, the model then checks to see if the required NEW capacity is available in any

one of the five buildup areas (lines 532 to 536). This is accomplished by a series of tasks (TBLDA1-5), all on R selection modes. This check requires that a major assumption be made. That is, if a check of required NEW is to be made, one must know the quantity of munitions that is going to be processed. The assumption is that, if the decision is made to build up, it will be for a quantity that can be economically transported from storage. In the MK82 example, this means that the decision to build is also a decision to build 48 MK82's. Forty-eight MK82's will just fill a 25 foot flatbed trailer and is, therefore, an economical buildup lot size. From this assumption, the required NEW at the buildup area can be calculated and entered on the Form 12s as the required quantity on the TBLD tasks mentioned above.

If the required NEW is available, the model then checks the storage area for the proper quantity of munition parts (lines 537 to 541). For the MK82, it checks for tail fins, boosters, fuses and the main body of the bomb. As indicated in Chapter II, each of these components may not be stored in the same quantities. From the LMC data on the MK82, the boosters are packaged in quantities of 200 per container. Thus for every lot of 48 bombs, only .240 lots of boosters are required ($48/200 = .240$). This is simulated by requiring the consumption of boosters only 24 percent of the time that a lot of 48 MK82's is produced. Similar logic is used for the remaining components, as reflected on lines 558, 560 and 562 in the Form 11s.

When this last component check is passed, two events occur. First, parts are delivered to the buildup area and production

begins. Second, at line 547, four MK82 resources are generated. A check is then again made of the safety stock level and, if it is less than 24, production is started for another lot. This re-check feature allows the simultaneous buildup of more than one lot of bombs without having to wait until each lot is actually produced. Of course, any buildup order will be delayed if the NEW and component check cannot be passed. In this model, the components in storage are unlimited because of the emphasis on the buildup function. The component check, however, will allow the model to be easily expanded to include the storage function, which can be modeled to produce specific quantities of these component parts.

Component Delivery Network. (line 574 to 653) The delivery section is contained in the call section referenced by task CDMK82 at line 573. The call section requires all components to be delivered to the buildup area before production can begin. Again, in the interest of brevity, only the delivery of the bomb body will be explained. Similar logic is used for the other components. The first choice in delivering components is to select the combination of tow and trailer vehicles that is available. The LMC data shows that any combination of a 5 ton or 10 ton tractor and a 25 or 40 foot flatbed trailer is acceptable. A series of four R selection mode tasks were set up to model the four possible combination of these resources. (lines 575 to 578) Depending on which is available, the proper set is consumed, to be generated again after delivery is complete. Fork lifts are required at both the storage and holding area. Because these

resources are only required on one of the three tasks in the delivery process, the general substitution feature described earlier was used for the 4, 6 and 10 thousand pound fork lift. A distinction was made between fork lifts in the storage area (4FORKS) vice the holding area (4FORKC), as it is not common practice to shuttle this equipment between the two areas. Again the tasks in this section (MK8201-C1) have a name convention similar to that in the consumption logic. Examination of the Form 12 records for these tasks will make the meaning of the convention clear. When the component is delivered and off-loaded at the buildup area, (MK8204), the proper set of transportation resources is regenerated. Equipment identity is maintained by having independent networks branching from the R mode task. Each of these networks processes the same intermediate tasks but terminates at a unique node that generates the proper resources, depending upon the R-mode path taken. When all components are delivered and resources regenerated, the buildup network can be entered.

Buildup Network. (lines 654 to 678) The buildup network is relatively simple, consisting of two tasks, MK8218 and 19. These tasks have standard resource definitions on the Form 12. Note here the various acceptable combinations of qualified and augmentation manpower resources as listed on the Form 12A. At the end of the buildup tasks, the finished munition generation network is entered (line 656 to 681). Here the question is just the mirror image of that asked during flight line consumption.

That is, first a check is made as to what trailer (MHU11,85 or 12) is available and then which holding area has the required NEW capacity. Depending upon which combination is available, the proper trailer and holding area are consumed and the associated munition resource is generated. Because only 6 bombs can be loaded on a trailer, this generate network is reiterated eight times to match the buildup lot size of 48 MK82s. The completion of this generation marks the end of a buildup cycle and the replenishment of holding area munitions. The number of simultaneous buildup processes that can occur is limited only by the quantity of resources available. The interaction of these resources and the resultant impact on achievable sortie rate will be explored in the next chapter.

Equipment Repair Networks. (line 805 to 842) Each of the equipment resources has an associated repair network, represented by a single task. Entry to that repair task is controlled by individual failure clocks. The clock values are expressed in mean time between failures. A timing mechanism is set up (line 805 to 806) that has a task occurring every half hour throughout the simulation. Each time the task occurs, the equipment clocks are decremented by 1 and a check is made to see if a clock has been decremented to zero. If so, the particular resource is removed from the available pool for the length of the repair time. A variety of failure rates and distributions were used for the clock values to demonstrate the flexibility in the model to capture a variety of maintainability information.

This completes the model description section. The following paragraphs summarize the main assumptions of the model.

Model Assumptions

The major assumption in the this model is that munitions are produced in discrete lots. This assumption is the basis for the munitions accounting that takes place and is key to the quantity normalization that economizes on computer run time. Production of munitions in variable lot sizes would require construction of a different model, necessitating a different method of accounting for munitions quantities.

A second assumption is that there is no returned ordnance, either because of a malfunction during pre-load checks or because of unexpended munitions during the sortie. Although past experience indicates such occurrences to be insignificant in terms of resource requirements, they may, under certain scenarios (peacetime, for example), place a demand on munitions resources in addition to those currently modeled. The present network structure, however, can accomodate such scenarios. In essence, these returned munitions would represent another source of production. At the appropriate point in the main flight line network, the repair or return networks could be activated and, if the munitions could be repaired or were still serviceable, the on-hand balance would be increased accordingly. If the munition were condemned, resources would be utilized in disposal activities, but no change would be made in on-hand balances.

Finally, there is an implicit assumption that no sortie is loaded with a partial complement of munitions. For instance,

unless there are two MK82XX resources on hand, a sortie will not be loaded, even though there may be one lot of six bombs in the holding area. This assumption stems from the intended use of the model as a requirements determination tool. The object is to provide sufficient resources to insure that a full complement of munitions is available to meet the sortie demand. Allowing partial loading would lead to an understatement of requirements and is more properly the function of a capability assesment model.

The above discussion of assumptions completes the explanation of the model development. The concluding section will explain the procedures for changing many of the variables and resource quantities that were described above. With this knowledge, the reader will better understand the intent and results of the simulation runs summarized in Chapter IV.

Parameter Changes

One of the main design features of the LCOM is the capability to change various parameter values at any time during the simulation. These changes are accomplished by placing selected change cards in the job control listing (JCL) before executing the actual simulation. The current version of the LCOM has 88 possible change cards from which to choose. (1:7-4) Many of these cards control features of the model other than variable values. The discussion that follows deals primarily with the cards that were used in the test simulations to demonstrate the use of the model as a resource requirements tool.

Resource Quantities. The SAUTH and AUTH change cards are used to establish the authorized quantity of Form 13 resources. The SAUTH controls manpower quantities; the AUTH controls all other resources. In constructing the data base, the Form 13 format requires that all resources be assigned an initial authorized quantity. These initial values were made arbitrarily high (999) to simulate unconstrained asset levels. Debug simulations were run with these initial resource levels to check the internal validity of the munitions model. Once that validity was established, iterative simulations were run with decreasing quantity levels, monitoring the achieved sortie rate on each run. The final resource levels were the minimum values to which each resource could be reduced with an acceptable degradation in achieved sortie rate. Recalling the model description in the preceding section, the following categories of resources can be controlled via the SAUTH and AUTH change cards: manpower, transportation vehicles, buildup and storage area NEW capacities, and munitions quantities. Chapter IV contains the calculations used to establish the various change card values as well as a discussion of the simulation results using these changed values.

Reliability and Maintainability Parameters. These parameters consist of the task times and failure clock values contained in the model. The former are changed via a TKCNG change card; the latter via a CKCNG change card. Because many of these values are hypothetical, no conclusive results were to be achieved by running simulations against different values for these parameters. The capability to make such changes, however, has

several potential applications. One such application would be to establish the sensitivity of the sortie rate and resource quantities to variations in munitions processing times. This knowledge could be used to establish the degree of accuracy necessary in any subsequent data collection effort. A second use would be to investigate the impact of certain external factors, such as the chemical or nuclear environment, on resource requirements. Both of these circumstances are likely to change normal processing task times. This change could be simulated via the use of the TKCNG cards.

BUILDUP CONTROL. A central feature in the munitions model is the control mechanism for triggering the start of munitions buildup. Recall that this was accomplished by using the TMK81A task on a R selection mode, which queried the on-hand balance of each munition type, both after loading a sortie and once a day as a function of the planned frag. This query was simulated by specifying the desired inventory level in the required resource column on the trigger tasks as specified in the Form 12s. Unfortunately, there is no provision in the LCOM to change this specified quantity via change cards. An alternate procedure using the task substitution (TSUB) change card overcomes this limitation to some degree. The TSUB card allows the user to substitute any defined task in the Form 12s for the task originally specified between nodes in the Form 11s. To take advantage of this feature, five different tasks, each with a different required resource quantity, were defined in the Form 12s for each munition type. Thus, within the limits of these

five task quantities, the on-hand trigger quantity can be varied by using the TSUB change card. Of course, different values can be set by changing the values specified on the Form 12s, but this would require re-initializing the model. Regardless of how the trigger quantity is changed, investigating the impact of such changes could provide valuable insight into munitions inventory control policies. For example, it would be useful to know to what level the safety stock could be reduced without degrading sortie generation. The lower the stock level, the lower would be the requirements for holding area capacity and munitions trailers. Reduction in the safety stock level, on the other hand, places a premium on munitions production capacity. Thus there would be a tradeoff between storage trailers and holding area capacity versus production manpower and buildup area capacity. Investigations of this type should prove of value to munitions planners.

Another question related to munitions control concerns the feedback of sortie consumption to the buildup control routine. As presently modeled, that feedback occurs at each sortie. Thus, any production order based on the expected flying schedule will probably find the on-hand assets already at safety stock level as a result of sortie feedback initiating munitions production. In fact, it may be more desirable to have production triggered only by the frag order so that production would occur at scheduled times and would produce only the next day's munitions. The on-hand assets would then be drawn down to zero each day, to be replaced by production triggered by the next day's flying

schedule. Another possibility would be to have the sortie feedback mechanism operative only during certain days of the simulation, in response to mass launch requirements or during an initial surge period. The possible control variations are numerous. Simulation of these variations can be implemented using the EPROB change card. In the main flight line networks, the sortie feedback section (lines 469-470) is composed of two tasks in parallel, controlled by an E selection mode. The E selection mode operates such that one, and only one, of the possible paths is processed, based on the mutually exclusive probability values specified for each path. As the path leading to the buildup control routine (line 469) has a value of 1.0, sortie feedback will always occur. The EPROB change card allows the user to change these probability values at any specified time during the simulation. Thus, the user can readily investigate a variety of control schemes. The combination of varying control quantities and degree of sortie feedback will permit investigation of a wide range of control policies.

This concluding section on parameter changes shows the reader the wide range of analytical options, easily implemented, that are available in the munitions model. This control feature, together with the explanation of the network logic and model assumptions contained in the initial sections of the chapter, were designed to provide a working knowledge of the munitions production model. The next chapter will familiarize the reader with the various LCOM output products and explain the validation checks that were made in verifying the munitions model.

IV. Model Verification and Demonstration

Introduction

This chapter is composed of two principal subsections. The first will describe the validation checks made on the munitions model. The format and use of simulation output products will be apparent as various results are compared to insure the internal consistency of the model's logic. These output products are contained in Appendix B and, as in Chapter III, this information will be referenced throughout the following explanation. The second section deals with the use of the model to determine resource requirements. The impact of limited resources on sortie rate will be demonstrated and concluding remarks will discuss the computer utilization and data requirements of the model. Because sortie rate is the global measurement parameter in this model, the first section will begin with a discussion of the scenario used to exercise the model and an explanation of the procedure used to determine achieved sortie rate from the output statistics.

Scenario

For the demonstration purposes of this research, a squadron of 24 aircraft was used to generate demands for munitions. The TFX

aircraft were tasked to fly 1.0 sorties/day and each sortie carried the following munitions: 12 MK82 General Purpose Bombs; 4 AIM9 missiles; and 1500 rounds of 20mm ammunition. All munitions were assumed to be expended on each sortie.

The continuous loop nature of the main flight line network was explained in Chapter III. To determine the length of the SORTIE task so that a 1.0 sortie rate would be achieved, the summation of all flight line tasks was subtracted from the 24 hours available in a day; in essence, the 24 aircraft were either ground processing or flying. The calculations to determine sortie length are shown below. The task times can be found following each task name in the Form 12s in Appendix A.

<u>TASK</u>	<u>TIME (HOURS)</u>
Preflt	1.5
Pstflt	2.5
Refuel	1.0
QM82XX	.3
LDMK82	<u>1.0</u>
Total	6.3 hours

24 hours/day - 6.3 hours = 17.7 hours/sortie

NOTE: The three load tasks (LDMK82, LD20MM and LDAIM9) are done in parallel, and all must be completed before the aircraft can continue processing. Therefore, the longest task (LDMK82) establishes the loading time line and was used in the above calculations.

Thus, to achieve the target sortie rate of 1.0 sorties per day, each aircraft completes a full cycle in 24 hours. Target sortie rate can be changed easily by varying the sortie task length. The equation for computing sortie length is shown below.

$$\text{Sortie Length} = \frac{24 \text{ hours} - \text{Processing time}}{\text{Sortie rate}}$$

$$\text{For a 1.5 sortie rate: } \text{Sortie Length} = \frac{(24 - 6.3)}{1.5}$$

$$= 11.8 \text{ hours}$$

Confirming that the achieved sortie rate is indeed equal to the target is not as readily apparent in the output from the demonstration simulations as it would be if a wartime scenario were being modeled because the sorties are input as aircraft processing activities instead of actual missions. If a wartime scenario were modeled, the sortie rate would be calculated internally by the model and displayed as statistic #23 under the Aircraft section of the PSR. For the demonstration simulation in Appendix B, however, statistic #33 under the Personnel section must be used to determine sortie rate. Looking at the task definition on line 139 of the Form 12s in the data base, one PILOT resource is required every time the aircraft processes the SORTIE task. Thus, the number of demands for the PILOT resource can be used to determine the number of sorties flown, and the manhours used statistic (#29) is the number of flying hours accumulated. For the 30 days shown in the PSR in Appendix B, these statistics are used as follows to calculate achieved sortie rate and average sortie length.

Number of PILOT demands	-	717	
$\frac{717 \text{ sorties}}{30 \text{ days} \times 24 \text{ aircraft}}$	=	.996 sorties/aircraft/day	
Number of manhours used	-	12525	
$\frac{12525 \text{ hours}}{717 \text{ sorties}}$	=	17.4 hours/sortie	

As shown above, the sortie rate and length are easily calculated. As the main purpose of this research is to study the munitions environment and not a specific scenario, this procedure is a small penalty to pay for the convenience of changing the target sortie rate via the task change cards instead of having to create a new exogeneous file. Keeping this sortie rate procedure in mind, the model debug process can now be described.

Validation Simulations

The basic procedure for checking the internal logic or validity of the model is to simulate flight operations with unconstrained resources and compare the outcome with expected results. Before going through this comparison, it is necessary to describe how certain parameter values and initial conditions were established. Detailed explanations will be given for the MK82 networks and calculations. Only the calculations will be shown for the AIM9 and 20MM networks.

Internal Parameters - MK82. Most of the internal parameter values shown below were extracted from the MK82 network data gathered by the LMC. For the reader's reference, this data is contained in Appendix C. The following information was derived both from this data and from the described scenario.

Lot size for buildup (LSB) = 48 bombs. Six bombs are contained on one pallet and 8 pallets will maximize the carrying capacity of a 25 or 40 foot flatbed trailer.

Generation Quantity (GQ) = 6 bombs. Six bombs fill a MHU-12M, MHU-85 or a MHU-110 munitions trailer.

Aircraft Load Quantity (LQ) = 12 bombs. Established by the scenario.

Net Explosive Weight (NEW) = 298 lbs/bomb. (13:4)

To prevent excessive run time, these quantities were normalized to the lowest common denominator as shown below.

	<u>Calculated</u>	<u>LCOM</u>
LSB	48	8
LQ	12	2
GQ	6	1

Using the LCOM column, the database reflects that two M82XX resources are consumed when the QM82XX consumption task is performed and one M82XX resource is generated on the GM82XX task. Also, for each QM82XX task, one MK82 trigger resource, equivalent to 12 bombs, is consumed. When MK82 production begins, four MK82 trigger resources are, in turn, re-generated because one LSB of 48 bombs is equivalent to 4 trigger resources, each of which represents 12 bombs. At the completion of production, a looping mechanism controlled by the halt clock HRMK82 causes the generate task to be repeated 8 times (48 bombs per buildup/6 bombs per generate = 8 iterations).

The calculations for buildup and holding area NEW are more complicated because, unlike each munition unit, the NEW unit must be compatible for all munition types. For this reason, only the actual calculations are shown below; the reduction to LCOM units will be discussed subsequently. For the MK82 buildup and holding area requirements, the calculations are as follows:

$$\begin{aligned}\text{Buildup NEW} &= \text{LSB} \times \text{NEW/bomb} \\ &48 \times 298 = 14304 \text{ lbs}\end{aligned}$$

$$\begin{aligned}\text{Holding NEW} &= \text{GQ} \times \text{NEW/bomb} \\ &6 \times 298 = 1788 \text{ lbs}\end{aligned}$$

This completes the description of the derivation of the MK82 parameter values. The results of similar calculations are shown for the 20MM and AIM9 parameter values.

Internal Parameters - 20MM.

<u>Calculated</u>	<u>LCOM</u>
LSB = 42000 rounds	14
LQ = 1500 rounds	.5
GQ = 3000 rounds	.1
NEW = 1/3 lb per round	
Buildup NEW = 14000 lbs	
Holding NEW = 1000 lbs	

NOTE: Different network logic was required because one trailer from the holding area can service two aircraft. To model this situation, only every other sortie causes a trailer to be drawn from the holding area. Thus the LQ equals .5 LCOM units.

Internal Parameters - AIM9.

<u>Calculated</u>	<u>LCOM</u>
LSB 24	6 missiles
LQ 4	1 missile
CQ 4	1
NEW 125 lbs/missile	
Buildup NEW = 3000 lbs	
Holding NEW = 500 lbs	

NEW Reductions. Summarizing the calculations for the holding area and buildup area NEW requirements for each munition type:

	<u>Buildup NEW</u>	<u>Holding NEW</u>
MK82	14304	1768

20MM	14000	1000
AIM9	3000	500

Comparing the above data, the lowest figure of 500 was selected as the normalizing factor. It was decided to use the same factor for both holding and buildup as this will simplify interpretation of output statistics. Because LCOM can only generate and consume unit quantities, the LCOM units were rounded to the nearest whole number. This round off introduces a slight error in the NEW requirements that are demanded during the simulation. As area capacity in the real world rarely matches the stored munitions requirements exactly, this error was considered acceptable. The normalized LCOM NEW units are shown below.

	<u>Buildup NEW</u>	<u>Holding NEW</u>
MK82	29	4
20MM	28	2
AIM9	6	1

The parameter values detailed above are basic to the internal logic of the munitions model and are hard wired into the data base. If for any reason the user desires to simulate different conditions, re-initializing the data base will be necessary. The demonstrated calculations should make determining the parameter values relatively straightforward. With an understanding of these internal parameter values, the initial conditions for the debug simulations will be covered next.

Initial Conditions. To obtain meaningful results from the validation simulations, certain initial resource quantities had to

be established. For instance, if the trigger resources were left unconstrained, no production orders would pass the munitions control routine and the buildup networks would not be exercised. Likewise, it is impossible to observe the proper operation of the consumption logic and the buildup re-supply of required munitions if the munitions quantities are left unconstrained. For these reasons, the following values were input via change cards at the beginning of the simulation runs. The demand control tasks, shown last, were selected such that production would attempt to maintain one day's worth of each munition in the holding areas. All other munitions quantities were set to zero. Transportation vehicles and manpower resources were left unconstrained. The constrained resources are as follows:

MK82B1 - 12	20MD1 - 12	AIM9E - 6
HOLDB - 951	HOLDD - 975	HOLDE - 993
MK82 - 6	20MM - 12	AIM9 - 6
TMK81A - 24	T20M5A - 12	TAIM91 - 24

The simulations were run for thirty days with these initial conditions. At the 30 day point, all inputs to production were stopped and simulation was continued for ten more days. Sortie feedback was prevented from triggering munitions production through the use of the EPROB change card as discussed in Chapter III. The orders based on the daily flying schedule were stopped by removing any ORDER activities beyond day 30. By allowing sortie demands to continue beyond munitions production, information was generated which shows the model operation as available munitions are depleted. The next section discusses the expected results of the validation simulations and describes how these expectations were confirmed by the output statistics.

Output Analysis

With unconstrained manpower, transportation, and area resources, the sortie rate and average length should be equal to the target values input via the SORTIE task. Inadequate munitions production would cause aircraft delays at the munitions consumption task, consequently degrading the sortie rate. The sortie rate calculations in the preceding Scenario section used data from the validation simulation results. These calculations confirm that the expected sortie rate is being achieved and that munitions production is adequate. The estimates for initial munitions quantities were not sufficient to supply sortie requests until production could start re-supplying the holding areas, as evidenced by the "PCT Demand Not Satisfied" statistic (#61) under the Supply heading in the PSR. Observe that this is .01% and that all unsatisfied demands occurred for initial munitions. The delays for these munitions were not sufficient to cause any appreciable degradation in achieved sortie rate, as evidenced by the .996 sortie rate calculated previously. In conjunction, these two statistics (33 and 61) confirm that the sortie rate mechanism is functioning properly and that munitions production is adequate to support this sortie rate.

Contrast these results with those for days 30 through 35 when munitions production was stopped. For this period, only 53 sorties were flown. Statistic 61 shows that 33% of the MK82 demands, 13% of the 20MD1 demands and 27% of the AIM9E demands were unsatisfied. Thus, inadequate munitions production does, in fact, cause a degradation in sortie rate.

Munitions Consume/Generate Analysis. With confirmation that munitions production is adequate, the next check is to insure that an excessive quantity is not being produced. For this check, an additional report, Resource Data, provides more concise output statistics than the PSR. In this report, the simulation resources are referenced by a coded number. The dictionary that maps resource number to resource name is contained at the back of Appendix B. These same resource numbers are also referenced in the AUTH and SAUTH change cards used to input the initial conditions. Returning to munitions production, the buildup trigger resources provide the best analytical tool to analyze production. Recall from the model description that, when the decision to buildup is made, an equivalent number of trigger resources are generated. Thus, if excessive production is not occurring, the maximum on-hand balance of these trigger resources should be equal to the number produced per buildup cycle plus the safety stock level minus one. This condition should prevail throughout the simulation. The expected maximum on-hand balance for each munition is calculated below. The reference number is shown in parentheses.

<u>MK82 (24)</u>		<u>20MM (36)</u>		<u>AIM9 (44)</u>	
TMK82A	- 24	T20M1A	- 24	TAIM91	- 24
HMK82	- 4	HG20MM	- 14	HGAIM9	- 6
	-1		-1		-1
	<u>27</u>		<u>37</u>		<u>29</u>

Resource Data reports were generated at day 15 and 30. The on-hand balances are circled in Appendix B and all are equal to or less than the expected values shown above. The zero on-hand

balances in the 40 day Resource Data report confirms the effect of sortie consumption on munitions quantities and consequently on sortie rate.

Holding Area Analysis. If the consume and generate routines for the holding area resources are correct, the on-hand balance plus any NEW allocated to munitions in the holding area should be equal to the initial quantity of 999 set for each holding area resource. For the MK82 munition, the Resource Data report provides the following data. For day 15, there were 18 M82A1 assets on hand, each requiring 4 NEW units, for a total of 72 NEW units occupied. There are 927 units of HOLDA on hand. Thus the 927 unoccupied NEW plus the 72 occupied equal the predicted quantity of 999. For the 20MD1 resource, the data shows 991 units of HOLDD and 8 units (4 on-hand 20MD1 assets x 2 NEW/ASSET) which again sums to the expected 999 figure. The same check was performed for the remaining holding areas and each confirmed that the consume/generate logic was functioning properly.

Buildup Area Analysis. The 15 and 30 day Resource Data reports are of little value in confirming the correct operation of the buildup routines because it is difficult to determine how many production lines are still in operation and thus consuming buildup area NEW. The 40 day report does not have this limitation. Because all production was stopped on day 30, the on-hand balances should all equal the authorized quantity of 999. The statistics circled in the 40 day report indeed confirm an on-hand balance of 999 for all buildup areas. Thus, with this

simple check, the buildup consumption/generate logic is seen to be operating properly.

To summarize, validation checks have been successfully met on the sortie rate logic, all munitions consume/generate logic and the holding and buildup area usage. The production control operates as designed and it is possible to shut production down if desired. These validation simulations were run under certain limiting conditions to facilitate the checkout tests. The next section will relax these constraints and investigate the model operation with all resources constrained. The results of these subsequent runs can be analyzed with the confidence that the model's internal validity has been confirmed.

Constrained Simulations

The process of constraining resources to arrive at a final set of quantities that are the minimum required to support the target sortie rate is an iterative process. It involves selecting an initial estimate, observing the resultant sortie rate, determining choke points and/or under-constrained resources, changing these resource levels accordingly and running the simulation again. Because many of the parameter values in the data base are hypothetical, the iterations were not conducted until the minimum resource quantities were reached. The purpose of the following explanation is to show how the various output statistics are used in this constraining process and the impact of the different sets of resource quantities on the munitions system. The statistics used in the following explanations are

underlined in the particular PSRs in Appendix B. The AUTH and SAUTH cards used to modify the quantity levels precede each simulation PSR. The resource numbers on these cards can be translated using the dictionaries contained in the back of Appendix B.

Initial Constraints.

Manpower -- The Matrix Post Processor gives a detailed picture of the utilization of manpower throughout the simulation period. The labels on the statistics printed below the matrix display are self-explanatory. The matrix itself depicts the working day in three, eight-hour shifts and, by half hour increments, shows the number of times specific quantities of each resource were utilized. Initial constraints on manpower are internally determined by the model, based on a user selected utilization rate. That utilization rate is based on the percentage of direct labor for a particular AFSC that is represented in the data base. For instance, if the task times do not include travel time to the job site, or do not include time for assembling tools and necessary technical data, then the manhours expended during the simulation would be less than actual work hours. The percentage was arbitrarily chosen in this demonstration as 75%. Thus, the object is to constrain manpower so as not to exceed the 75% utilization factor and, at the same time, to be sufficient to support the desired sortie rate. Example matrix outputs are included for the 461CQ and 461CS manpower resources. The internal conversions of manhours to

manpower spaces are circled on these printouts. These figures were input via the SAUTH change cards. The same procedure was used for all manpower resources except the 431F1, 462X2 and PILOT. These resources were left unconstrained so that the impact of munitions production manpower could be observed more clearly.

Parts and Equipment -- The initial constraints for parts and equipment were based on the average daily usage. As an initial constraint, this quantity used per day is excessive, but provides the first cut information with which to make a more refined calculation. The procedure will be illustrated using the holding area resources. The calculations are similar for the remaining parts and equipment.

Looking at the 30 day debug simulation data, statistic #57 gives the total demand for each of the holding areas. Observe that only holding areas A, D and E had any demands. This occurred because the quantities were unrestricted and munitions were always able to be stored in the first area searched. Dividing each demand by 30 gives the average daily demand as follows:

$$\text{HOLDA} - \frac{5772}{30} = 192.4$$

$$\text{HOLDD} - \frac{728}{30} = 24.27$$

$$\text{HOLDE} - \frac{727}{30} = 24.23$$

Distributing these quantities across all the possible holding areas for each munition, accounting for the NEW requirements per generation, gives the initial holding area constraints.

	<u>HOLDA</u>	<u>HOLDB</u>	<u>HOLDC</u>	<u>HOLDD</u>	<u>HOLDE</u>
MK82	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>	<u>36</u>
20MM	--	12	--	12	--
AIM9	--	--	12	--	12
Total	36	48	48	48	48

The remaining initial constraints are shown in the change card files preceding the first constrained simulation results.

First Constrained Run. For this first simulation, statistic #33 under the Personnel heading shows a demand for 712 pilots for 30 days which, using the procedures described earlier, equals a sortie rate of .989. One or more resources are causing a bottleneck, as evidenced by the degradation in sortie rate from the .996 achieved with unconstrained resources.

Manpower -- Looking first at the demands unsatisfied statistic (#38), the 461SQ and 461SS resources show a significant number of demands which could not be satisfied, 15.93% and 17.91%, respectively. The back-order manpower matrix for each resource gives a display of the number of requirements in excess of on-hand balance. This information indicates that a majority of these back-orders could be eliminated if 2 additional 461SQs were added per shift and 2 additional 461SS spaces were added on the first and third shift and 4 on the second shift. These new quantities are reflected in the change card file for the next simulation run.

Parts and Equipment -- Looking next at the parts information, statistic #61 shows that the MK82A1, the BLDA1, the 20MD1 and the BLDB1 resources account for all of the unsatisfied

demands. Since both the BLD resources are the first buildup areas searched when initiating production for these munitions types, it appears that the initial constraints on these buildup areas were excessive. Because all the MK82 buildup areas show some demands, it can be deduced that as many as five production lines were in use at one time during the simulation. This is evidently not sufficient, so BLDA1 and A2 were increased to allow the simultaneous buildup of two LSBs of MK82 resources in these areas. The increase of these quantities from 35 to 58 can be seen in the CNGFILE2 printout preceding the second simulation results in Appendix B. As the lack of buildup area for the 20MM munition caused only 4 unsatisfied demands in 712 sorties, the BLDB1 resource was not changed. This situation is an optimum constrained condition; i.e., there are some unsatisfied demands, but not of a sufficient quantity or duration to degrade sortie rate excessively.

The changes just discussed should open the slight bottle-necks that presently are reducing sortie rate. The remaining resources, however, have not been sufficiently constrained. For example, the holding areas show demands only for the first two areas searched for the MK82 and only for the first area searched for the 20MM and AIM9 munitions. If these holding areas had been more tightly constrained, all of the holding areas should have been utilized, and possibly back-ordered to some degree. The same under-constrained condition exists for the equipment, as evidenced by the very low total number of back-order days (#74) and the correspondingly high PCT UNUSED statistic (#73).

To further constrain the parts and equipment, the information under the CUTIL. FACTOR heading of the Resource Report will be used. In essence, this factor is an expression of the amount of time that parts were available on the shelf. For example, part #66 (3/4TON) had an authorized quantity of 13 and no demands in 30 days. It therefore accumulated 390 days of shelf life, (30 x 13 = 390). The difference between the reported and maximum possible shelf life is a measure of the idle time of a particular part. By treating this residual shelf life as a constant, and by having it represent a target percentage of the maximum shelf life available, an equation can be derived with which to calculate a new resource quantity. That derivation is shown below.

$$\text{Equation: } \frac{(30 \text{ days})X - (\text{Max Cutil} - \text{Avail Cutil})}{(30 \text{ days})X} = \%$$

Where: X = Resource Quantity

$$\text{Or: } X = \frac{(\text{Max Cutil} - \text{Avail Cutil})}{30(1 - \%)}$$

Assuming: Desired % = .50

$$\text{Then: } X = \frac{(\text{Max Cutil} - \text{Avail Cutil})}{15}$$

Application: For the MB4, 5TON and 10TON resources, which are interchangeable, the Resource Report shows the following data.

	<u>Auth #</u>	<u>MAX Cutil</u>	<u>Cutil</u>
MB4	17	510	479.3
5TON	38	1140	1101.4
10TON	38	1140	1095.4
Total		2790	2676.1

$$\text{Thus: } \frac{(2790 - 2676.1)}{15} = 7.59 \text{ or 7 units}$$

Note: This percentage is arbitrarily chosen and can be adjusted as more information is gained from subsequent simulations

These seven units were distributed as evenly as possible among the three types of equipment, as seen in the change card file. The quantities for the buildup and holding areas were derived using the above formula but were adjusted to match the multiple unit demands (see page 59) for each munitions type so as to most efficiently use these area resources. The results for the simulation run with these new resource levels are discussed in the next section.

Second Constrained Run. The 707 PILOT demands during this run indicate a .982 achieved sortie rate. The decrease from the previous run again indicates that one or more bottlenecks have been created by the new constraints placed on the resource quantities.

Manpower -- The additional manpower added to the 461SQ and the 461SS resources significantly reduced the percentage of demands not satisfied, eliminating it entirely for the 461SQ. The price paid, however, was a large decrease in the percent of utilization for these two resources. Recall that optimum utilization would be 75% with an acceptable sortie rate. If further simulations were run, some of the added manpower should be taken back out, possibly leaving the increases in the most heavily worked shift, as indicated in the MATRIX displays. This iterative process is characteristic of the constraining procedure.

Parts and Equipment -- The increase in buildup area resources reduced the back-order observed in the previous run, and, because all five BLDA areas are in use, simultaneous produc-

tion is still occurring. The increase in the percentage of demands not satisfied for the MK82A1, however, indicates that the bottleneck in production has shifted to another resource. There is one caution in relating this percentage to the number of demands. Because the holding areas quantities were reduced, the MK82 assets are now being stored in all areas except HOLDE. However, because of the nature of the R selection mode, back-orders for any of the MK82 will be counted against the MK82A1 resource because it was the first one searched in the list of R tasks. This back-order accounting will apply for all resources on tasks having an R selection mode. Observe also that the 20MM and AIM9 are still only being stored in the first holding area searched. Specific reduction in the HOLDD and HOLDE resources may force this distribution, if so desired. Caution should be exercised, however, as the MK82 is also competing for these holding area resources. Various simulations would have to be run to see if it is more economical to dedicate particular holding areas to specific munitions or to consolidate all holding areas into one pool.

Looking at the equipment resources, the constraining formula evenly distributed the back-orders; that is, there is no one particular piece of equipment with high back-order days that would indicate a bottleneck. The next step would be to assume a lower unused shelf life percentage and re-calculate the quantities. As may be expected, the closer the resource quantities get to the minimum figure desired, the more difficult it becomes to single out the choke points. This even

distribution of back-order days is a good indication of proper constraining techniques, and the slight reduction in sortie rate indicates that the resource quantities are close to an acceptable set of requirements. This set, however, is only one of the many that may support the desired sortie rate. The tradeoff between various resources is governed by external policy decisions and, as such, is not within the scope of this research.

Summary. From the two iterations discussed above, it can be seen that each step further refines the resource quantities toward the desired minimum level. Further iterations were not presented because no additional information regarding the techniques for constraining resources would have been gained. The bias of the LCOM as a manpower tool is evident in the MATRIX display, with the wealth of information it gives on manpower utilization in the model. The Version 4.0 LCOM release will have revised Equipment and Parts Post Processors that should provide more information concerning parts and equipment utilization. Several other possibilities for enhancing other aspects of the LCOM are contained in the final chapter of this report.

COMPUTER UTILIZATION

In addition to the simulation results discussed above, the computer resources required to exercise the model will have a bearing when comparing this LCOM model to other competing designs. For that reason, the computer utilization observed during the simulation runs are presented below.

The core requirements and central processing time are important factors to consider in comparing simulation models.

A model that captures the pertinent features of a system, but which requires excessive computer support, loses its utility for operational use. To aid in comparing this LCOM model to competing designs, the computer requirements observed during the simulations conducted on the Honeywell 6000 computer are tabulated below.

	<u>Storage Space (LLinks)</u>	<u>Core</u>	<u>Run Time (CPU Hours)</u>
Input module	162	40K	.008
Main Module	245	43K	.38
Decoder Module	41	18K	.087
Matrix Post Processor	82	35K	.101
Exogenous File	6	NA	NA
Data Base	44	NA	NA

These figures, particularly the core and run time requirements, are dependent upon the specific conditions of the validation simulations. The length of the simulation (30 days) is important to consider because any increase will cause all the above figures to increase except the data base requirements. The data base requirements are, of course, dependent upon the number of munitions modeled. Keeping these qualifying conditions in mind, the above figures should give a basis for comparison with other models.

A second consideration in evaluating simulation models is the different types of computers that can process the model. This number is dependent upon the existence of a suitable compiler for the language in which a particular model is written.

Creating new compilers is usually an expensive and time consuming process. Thus, the more compilers that exist for a particular language, the more useful will be the model. The LCOM is written in the Simscript II language. Compilers exist for this language on the Honeywell 6000, the CDC and IBM computer systems in use in the Air Force.

The considerations outlined above offer several elements for comparison that, although of lesser importance than the actual simulation results, must still be considered in a complete evaluation of any munitions model. The concluding section discusses several features of the data elements used in the model that are of interest in future data collection efforts.

Data Requirements

The critical nature of buildup task times was illustrated during the first simulation by the MK82 production time line and its impact on production rate. Data on the manpower crew sizes and buildup equipment must be carefully gathered as it can have a significant impact on resource requirements. Regarding crew sizes, only the minimum number of personnel required to accomplish a task should be entered on each task segment. While it may be customary to work a production line with a crew of ten, if the task in the network can be started with less than the desired team, the lower number should be used as the crew size. Parallel task networking will allow the model to determine if the time line can be extended without degrading achieved sortie rate. Inflated crew sizes produce low manpower utilization factors and corresponding excess manpower requirements.

Although equipment failure and repair were included in the model, the arbitrary failure rates were not great enough to cause much effect. If failure rates are expressed in mean time between failures, these figures must be adjusted for the increased utilization that occurs in accelerated wartime munitions production. If possible, failure rates would be best expressed in terms that directly relate to utilization, such as mean failures per bomb loaded or per delivery. This would eliminate the need to adjust peacetime utilization rates by estimated wartime factors.

In conclusion, the above discussion of simulation results were designed to acquaint the reader with the output statistics available through LCOM and how this information can be used in conjunction with the parameter control features to analyze support resource capabilities and thus determine resource requirements. These results, together with the computer utilization figures and data requirements, will be used in the next chapter to evaluate the suitability of LCOM model in simulating the munitions production process.

V. Conclusions and Recommendations

Introduction

The preceding chapters have explained the logic of the munitions model and demonstrated its use in determining support resource requirements. This use is but one of the many ways that the model could be used to assist munitions planners. Other uses have been suggested in this text and more will arise if the model is exercised in the field. The simulations run using the model have been sufficient to generate the data with which to evaluate the suitability of LCOM but, due to time constraints, do not represent an exhaustive validation of the model. As Emshoff and Sisson have described, the construction of a simulation model is an iterative process, as shown in Figure 4. (14:50) As it exists at the completion of this research, the model is in one of the early iterations of this process. Further validation simulations will reveal more information about the inter-relationships captured by the model and should lead to further modification and improvements. Interface with munitions planners should also generate additional improvements to tailor the model to their needs. The first step in providing the needed analytical tool, however, is the selection of a single methodology so that further development efforts can be effectively concentrated.

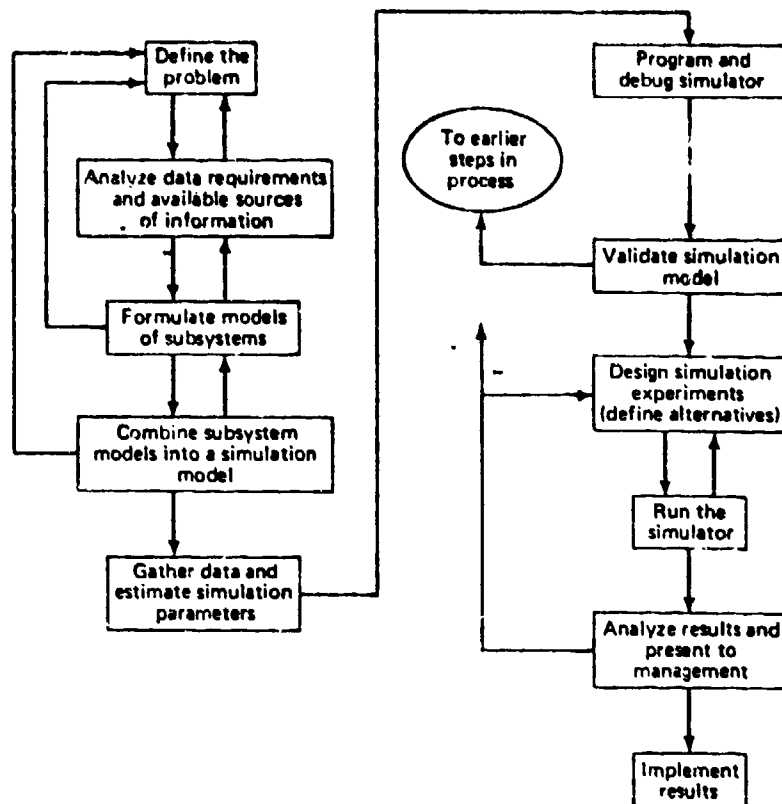


Figure 4. Iterative Process of Model Construction (15:50)

To aid in that selection, this concluding chapter offers an evaluation of the munitions model based on the criteria established in Chapter I. This evaluation cannot support the recommendation of LCOM as the single methodology to be used because not other alternative designs were evaluated. It will, however, point out the strengths and weaknesses of the LCOM approach, and this information should be of value in any future comparison with competing models.

Model Evaluation

The following discussion will evaluate the model against the eight criteria in the same order that they were listed in Chapter I. The reader is urged to review these criteria as they will be referenced below only by number.

Criterion 1: As the LCOM was designed to model resource utilization, the munitions model, overall, satisfies this criterion very well. From the model description, each task segment can have associated with it a virtually unlimited number of resources. The software logic automatically handles task resource demands, drawing and releasing resources from a common pool for each resource type according to task length. Backorders demands and the rescheduling of delayed tasks are also handled automatically. A full range of statistics describing resource utilization are available on demand. Using the change card procedure, the user can easily vary resource quantities throughout the simulation, and the failure and repair logic accurately simulates resource limitations based on utilization during the simulation. However, the method of relating a munition type to a holding area and/or transportation vehicle is cumbersome, as it necessitates splitting one resource into several distinct entities. The method contained in the model handles the problem adequately but does so at the expense of main model core usage. With this exception, however, the model satisfactorily simulates resource utilization and interaction.

Criterion 2: One of the strongest assests of the LCOM is its excellent fulfillment of this criterion. As scen from the

analysis of simulation results, the output produces a direct measure of sortie generation and all analyses of resource capability, munitions management policy and data sensitivity can be directly measured through the sortie rate statistic. Sortie rate can, however, be misleading because resource requirements are more often determined by sortie timing than by the aggregate number of sorties scheduled. Although not utilized in this research in the interest of generality, as already discussed, there are well established procedures for incorporating any given flying scenario into the exogenous file that drives resource utilization during the simulation. Regardless of how these exogenous events are scheduled, the LCOM relates all resource capabilities to sortie generation and thus provides quantified and fully supported resource requirements.

Criterion 3: The model used three different munitions types, and simultaneous production occurred throughout the simulation. The only limitation in the capability of LCOM to satisfy this criterion is in computer core limitations. A portion of that limitation is driven by the munitions splitting scheme discussed under the first criterion.

Criterion 4: The three categories of munitions were specifically designed to illustrate the flexibility of the LCOM to simulate a variety of production processes. Given the flexibility and adaptability demonstrated in this model, the only limitation in simulating a unique production process is the analyst's imagination and knowledge of LCOM.

Criterion 5: Given the 88 change card options in LCOM, the user has a wide range of easily changed parameters and variables with which to explore munitions production. The use of these change cards was illustrated during the constraining process and several other suggestions for their use were offered in Chapter III under the "Parameter Changes" section. Other than the basic network logic, the only parameters which cannot be readily changed are the individual task resources. Even these parameters can be changed by re-initializing the data base, which is relatively simple given a basic working knowledge of LCOM. In aggregate, the ability to easily change model parameters is the second strongest asset of the LCOM.

Criterion 6: The expansion to include these areas has already been incorporated in the model. In fact, the consumption of munitions during aircraft loading is the key to relating munitions production, and thus munitions support resources, to sortie generation. The model thus contains the skeletal framework for simulating the complete munitions production system. Only the buildup section was fleshed out in this model due to the scope of the research effort.

Criterion 7: Air Force Management Engineering regulations and procedures are well established for gathering task time and resource requirements for most all functional areas within the Air Force. Expanding the coverage to munitions production poses no problem except that it is difficult to find operational situations to observe where live ordnance production occurs in the magnitude likely during a wartime scenario. Various Air

Force exercises such as Red Flag could provide fruitful areas for such data collection. Equipment failure rates is another matter. The method presented in this model is unsatisfactory as it represents failures as a function of calendar time. Thus, regardless of utilization within the model, the equipment always fails at the same rate. Efforts should be expended to gather failure data based on equipment utilization similar to the mean sorties per failure commonly used for aircraft equipment. Improvement is required in this data area, but the LCOM failure routines are flexible enough to utilize data gathered from the field in most any format, as long as it relates failure rates to equipment utilization.

Criterion 8: As a methodology widely used in the Air Force manpower community and research, test and development agencies, the LCOM is highly compatible with most computer systems currently used in the Air Force. Secondary support programs are continually being developed by the various users and disseminated via the LCOM infrastructure discussed earlier. This compatibility of LCOM to Air Force systems and the organizational support structure that exists behind LCOM is its third strongest asset supporting its recommendation as a munitions modeling methodology.

Conclusions

The model developed in this research demonstrates how the LCOM can capture the complex interrelationships of munitions support resources and, most importantly, how each of these resources contributes to sortie generation. The model was

designed so that the user can easily change most of the important parameters and can explore the impact of various control policies on resource requirements and sortie generation capability. In fact the model's three strongest features are its ability to directly relate resource capability to sortie generation, the ease with which key parameters can be changed and the existing infrastructure that supports LCOM in general. In short, the LCOM has a great deal of potential as a munitions simulation tool.

The project that generated this research effort will hopefully be the first step in providing munitions planners with a much needed tool to use in a systems analysis of munitions production. An adequate munitions supply is crucial to the combat readiness of the Air Force, and adequate logistics support is a key factor in insuring that supply. To aid future efforts in the search for this tool, the following recommendations are offered, first in the area of further exploration of the munitions model developed in the study and second in suggested enhancements to the LCOM software.

Recommendations

Suggested efforts in exercising the model further should include: longer simulation periods to disclose any inconsistent long run trends; variations in the demand control parameters to more fully explore the logic of this routine; and continuing development of the resource constraining procedure. An invaluable aid in this validation effort would be the inputs and suggestions of munitions planners. They are most familiar with

the system modeled and should prove a knowledgeable source of "what if" ideas to test the functioning of the model.

The second suggestion would be to exercise the model using a typical scenario, so that actual missions are scheduled in the exogenous file instead of activities. A relatively simple way to accomplish this would be to use the networks and exogenous file already developed by one of the using LCOM agencies. The information this generates concerning computer utilization would give a better appreciation for these requirements if the model is placed in the field. Another approach would be to explore using the realized flying schedule from an LCOM aircraft maintenance manpower model to provide the exogenous events which trigger munitions production. This latter method may prove valuable in tying both the munitions production and aircraft maintenance systems together without having to pay too high a price in either core or run time.

Third, efforts should be directed toward collecting data on task times, equipment reliability and repair. This data development must be done regardless of which simulation model is ultimately chosen. The MK82 network in Appendix C provides a good starting structure for gathering this data. The simulation model offered by this research could be used to determine the sensitivity of the parameters in this data and thus focus data gathering efforts on the key elements.

Finally, the enhanced versions of the Parts and Support Equipment Post Processors should be run when they are released by AFMSMET. These output products should provide additional insight

into resource utilization and assist in the constraining process. The LCOM version 4.0 is scheduled for release by AFMSMET sometime in the summer of 1981.

Suggested LCOM Enhancements

In working with this munitions model and analyzing the simulation results, two improvements to the LCOM surfaced that would improve its use in studying the munitions production process and other analogous systems. The first concerns the generation routine in the LCOM. As it now stands, only one part can be added to the available pool each time a generate task is performed. In contrast, the consume routine allows the user to specify up to 99 resources to be consumed per task. The same capability on the generate tasks would alleviate the rather cumbersome technique of loop networking controlled halt clocks. In addition, the comparatively large quantities of resources dealt with in the munitions world suggest that the quantity field be increased to at least three digits. This enhancement would prove most valuable in modeling a variable buildup lot size, where individual round accounting may be necessary.

The second suggestion concerns the Graph Post Processor. This useful routine is seldom exercised because it can display only the statistics listed under the TOTAL column in the PSRs. This gives little information concerning individual resource utilization. If modified to display the same statistics but on an individual item basis, the Graph Post Processor could prove

as powerful a tool as the Matrix Post Processor. In the munitions model, for example, it would have been interesting to compare the time sequenced graphs for the demands and generations of a particular munition. Just the graph of the demands alone would provide valuable information on the maximum and minimum utilization for the resource, which would improve and perhaps shorten the constraining process.

These suggestions and recommendations offer areas for further exploration that the researcher feels would be of the most value in continuing the development of the munitions model and in improving the capability of the LCOM software. As it now stands, the model adequately demonstrates how the LCOM can successfully simulate and be used to analyze the munitions production environment. Continuing effort is required, however, to produce a model that is suitable for use in the operational world of the Air Force munitions planner.

BIBLIOGRAPHY

1. Air Force Maintenance and Supply Management Engineering Team. LCOM II Simulation Software Users Reference Guide (AFMSMET Report 78-5.1). AFMSMET/MENT, Wright-Patterson AFB, OH 25 August 1979.
2. Air Force Regulation 60-1. Maintenance Management Policy. Vol. 1, Washington: Department of the Air Force, 2 January 1980.
3. Air Force Regulation 25-5. Air Force Management Engineering Program (MEP). Vol. II, Washington: Department of the Air Force, 4 November 1977.
4. Air Force Manpower Standard. Munitions Maintenance and Storage. Washington: Department of the Air Force, 25 September 1979.
5. Air Force Regulation 66-5. Production Oriented Maintenance Organization. Washington: Department of the Air Force, 15 July 1979.
6. Gilchrist, Michael H., Maj, USAF. "Modeling Procedures for Munitions Storage/Handling and Buildup". Unpublished technical paper, HQ TAC/XPM(LCOM), 1 May 1980.
7. Air Force Maintenance and Supply Management Engineering Team Minutes of the LCOM Steering Group Conference (21-23 October 1980). Prepared by AFMSMET, Wright-Patterson AFB, OH, 20 November 1980
9. Air Force Logistics Management Center. "Trip Report for Project 781040 - Munitions Model for MAA". AFLMC/LGY, Gunter AFS, AL, 20 February 1979.
10. Air Force Regulation 25-8. Logistics Composite Model (LCOM). Washington: Department of the Air Force, 3 November 1978.
11. Rice, Thomas E., MSgt. USAF. "Create Form 20 (Pre20) Version 2.75 with Mass Launches". Unpublished Technical report, HQ TAC/XPM(LCOM), 1 June 1979.

11. USAF, Tactical Air Command, Deputy Chiefs of Staff Plans and Logistics. LCOM Field Test Final Report - F-4E, 15 January to 9 March 1976. Langley AFB, VA.: HQ TAC, April 1976.
12. Air Force Maintenance and Supply Management Engineering Team. LCOM Student Training Text. Unpublished draft. AFMSMET, Wright-Patterson AFB, OH, 15 March 1981.
13. Air Force Technical Order 11A1-1-46. Complete Round and Fire Fight Time. Washington: Department of the Air Force, 22 August 1977.
14. Emshoff, J. R. and R. L. Sisson. Design and Use of Computer Simulation Models. New York: MacMillan Publishing Company, Inc., 1970.

Appendix A

MUNITIONS MODEL DATABASE

DATABASE

AS DF:
04/03/81

```

1 10
2 1001 1D 7
3 1004 CAS TIMER ORDER
4 1005 TFX
5 1007 431F1 462X0 PILOT 461SQ 461SS 461CQ 461CS
6 1009 OTHER M82A1 M82B1 M82C1 M82D1 M82E1 M82A2 M82B2 M82C2 M82D2
7 1009 M82E2 M82A3 M82B3 M82C3 M82D3 M82E3 MK82 BLDA1 BLDA2 BLDA3
8 1009 BLDA4 BLDA5 PMK82 82FIN 82BST 82FUS 20MD1 20MB1 20MM BLDB1
9 1009 BLDB2 BLDB3 BLDB4 P20MM AIM9C AIM9E AIM9 BLDC1 PAIM9 HOLDA
10 1009 HOLDB HOLDC HOLDD HOLDE
11 1011 MB4 5TON 10TON 25FLB 40FLB 4FORKS6FORKS10FDRSH-11 JAMER
12 1011 4FORKC6FORKC10FDRSH-11 2HTON MHU12 MHU35 MHU11 CLOCK TIMER
13 1011 3/4TON
14 13
15 13 TFX I 01 15K
16 13 431F1 M 01 10K 999
17 13 462X0 M 02 10K 999
18 13 PILOT M 03 10K 999
19 13 461SQ M 04 10K 999
20 13 461SS M 05 10K 999 461SQ
21 13 461CQ M 06 10K 999
22 13 461CS M 07 10K 999 461CQ
23 13 M82A1 P 02 20K 999
24 13 M82B1 P 03 20K 999
25 13 M82C1 P 04 20K 999
26 13 M82D1 P 05 20K 999
27 13 M82E1 P 06 20K 999
28 13 M82A2 P 07 20K 999
29 13 M82B2 P 08 20K 999
30 13 M82C2 P 09 20K 999
31 13 M82D2 P 10 20K 999
32 13 M82E2 P 11 20K 999
33 13 M82A3 P 12 20K 999
34 13 M82B3 P 13 20K 999
35 13 M82C3 P 14 20K 999
36 13 M82D3 P 15 20K 999
37 13 M82E3 P 16 20K 999
38 13 MK82 P 17 20K 999
39 13 BLDA1 P 18 19K 999
40 13 BLDA2 P 19 20K 999
41 13 BLDA3 P 20 20K 999
42 13 BLDA4 P 21 20K 999
43 13 BLDA5 P 22 20K 999
44 13 PMK82 P 23 20K 999
45 13 82FIN P 24 20K 999
46 13 82BST P 25 20K 999
47 13 82FUS P 26 20K 999
48 13 20MD1 P 27 20K 999
49 13 20MB1 P 28 20K 999
50 13 20MM P 29 20K 999
51 13 BLDB1 P 30 20K 999
52 13 BLDB2 P 31 20K 999

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DATABASE

AS OF:
04/03/81

53	13	BLDB3	P	32	20K	999		
54	13	BLDB4	P	33	20K	999		
55	13	P20NM	P	34	20K	999		
56	13	AIM9C	P	35	20K	999		
57	13	AIM9E	P	36	20K	999		
58	13	AIM9	P	37	20K	999		
59	13	BLDC1	P	38	20K	999		
60	13	PAIM9	P	39	20K	999		
61	13	HOLDA	P	40	20K	999		
62	13	HOLDB	P	41	20K	999		
63	13	HOLDC	P	42	20K	999		
64	13	HOLDD	P	43	20K	999		
65	13	HOLDE	P	44	20K	999		
66	13	MB4	A	01	20K	999	5TON	10TON
67	13	5TON	A	02	20K	999		
68	13	10TON	A	03	20K	999		
69	13	25FLB	A	04	20K	999		
70	13	40FLB	A	05	20K	999		
71	13	4FORKS	A	06	20K	999	6FORKS	10FORS
72	13	6FORKS	A	07	20K	999	4FORKS	10FORS
73	13	10FORS	A	08	20K	999	4FORKS	6FORKS
74	13	H-11	A	09	20K	999	4FORKC	6FORKC 10FORC
75	13	JAMER	A	10	20K	999		
76	13	4FORKC	A	11	20K	999	6FORKC	10FORC
77	13	6FORKC	A	12	20K	999	4FORKC	10FORC
78	13	10FORC	A	13	20K	999	4FORKC	6FORKC
79	13	1HTON	A	14	20K	999	3/4TON	
80	13	2HTON	A	15	20K	999		
81	13	MMHU12	A	16	29K	999		
82	13	MMHU85	A	17	20K	999		
83	13	MMHU11	A	18	20K	999		
84	13	CLOCK	A	19	20K	999		
85	13	FRA6	A	20	20K	999		
86	13	3/4TON	A	21	20K	999		
87	13	HOLDA	C				8	C
88	13	HOLDB	C				8	C
89	13	HOLDC	C				8	C
90	13	HOLDD	C				8	C
91	13	HOLDE	C				8	C
92	13	MMHU12	C				2	C
93	13	MMHU85	C				2	C
94	13	MMHU11	C				2	C
95	13	MMK82	C				4	C
96	13	HBLDA1	C				29	C
97	13	HBLDA2	C				29	C
98	13	HBLDA3	C				29	C
99	13	HBLDA4	C				29	C
100	13	HBLDA5	C				29	C
101	13	HRMK82	C				8	C
102	13	HLD2D	C				2	C
103	13	HLD2B	C				2	C
104	13	HBLDB1	C				28	C

DATABASE

AS OF:
04/03/81

105	13	HBLDB2	C			28	C		
106	13	HBLDB3	C			28	C		
107	13	HBLDB4	C			28	C		
108	13	HBL2A1	C			28	C		
109	13	HG20MM	C			14	C		
110	13	HR20MM	C			14	C		
111	13	HL2C	C			1	C		
112	13	HL2E	C			1	C		
113	13	HBLDC1	C			6	C		
114	13	HBL2A5	C			6	C		
115	13	HGAIM9	C			6	C		
116	13	HRAIM9	C			6	C		
117	13	FMB4	C			50H	5HN		
118	13	F5TON	C			100H	10HN		
119	13	F10TON	C			75H	8HN		
120	13	F25FLB	C			500H	C		
121	13	F4FORS	C			250H	C		
122	13	F40FLB	C			500H	C		
123	13	F6FORS	C			250H	X		
124	13	F10FRS	C			250H	25HN		
125	13	FH-11	C			50H	5HN		
126	13	FJAMR	C			60H	6HN		
127	13	F4FORC	C			100H	10HN		
128	13	F6FORC	C			100H	10HN		
129	13	F10FRC	C			100H	10HN		
130	13	F1HTON	C			50H	5HN		
131	13	F2HTON	C			100H	10HN		
132	13	FMHU12	C			150H	15HN		
133	13	FMHU85	C			150H	15HN		
134	13	FMHU11	C			150H	15HN		
135	12								
136	12	PREFLT	21	1.5H	.2HL	431F1	1		
137	12	R	21						
138	12	LDMK82	21	1.0H	.1HL	462X0	4		
139	12	SORTIE	21	17.7H	C	PILOT	1		
140	12	PSTFLT	21	2.5H	.3HL	431F1	2		
141	12	REFUEL	21	1.0H	.1HL	431F1	2		
142	12	QM82A1	21	.3H	.1HL	M82A1	C	2MK82	C 1461CQ 1
143	12	QM82A1C				461CS	1MB4	X 1	
144	12	12AQM82A1				RCS-1	1461CQ	2	
145	12	QM82B1	21	.3H	.1HL	M82B1	C	2MK82	C 1461CQ 1
146	12	QM82B1C				461CS	1MB4	X 1	
147	12	12AQM82B1				RCS-1	1		
148	12	QM82C1	21	.3H	.1HL	M82C1	C	2MK82	C 1461CQ 1
149	12	QM82C1C				461CS	1MB4	X 1	
150	12	12AQM82C1				RCS-1	1		
151	12	QM82D1	21	.3H	.1HL	M82D1	C	2MK82	C 1461CQ 1
152	12	QM82D1C				461CS	1MB4	X 1	
153	12	12AQM82D1				RCS-1	1		
154	12	QM82E1	21	.3H	.1HL	M82E1	C	2MK82	C 1461CQ 1
155	12	QM82E1C				461CS	1MB4	X 1	
156	12	12AQM82E1				RCS-1	1		

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157	12	QM82A2	21	.3H	.1HL	M82A2	C	2MK82	C	1461CQ	1
158	12	QM82A2C				461CS		1MB4	X	1	
159	12	12AQM82A2				RCS-1	1				
160	12	QM82B2	21	.3H	.1HL	M82B2	C	2MK82	C	1461CQ	1
161	12	QM82B2C				461CS		1MB4	X	1	
162	12	12AQM82B2				RCS-1	1				
163	12	QM82C2	21	.3H	.1HL	M82C2	C	2MK82	C	1461CQ	1
164	12	QM82C2C				461CS		1MB4	X	1	
165	12	12AQM82C2				RCS-1	1				
166	12	QM82D2	21	.3H	.1HL	M82D2	C	2MK82	C	1461CQ	1
167	12	QM82D2C				461CS		1MB4	X	1	
168	12	12AQM82D2				RCS-1	1				
169	12	QM82E2	21	.3H	.1HL	M82E2	C	2MK82	C	1461CQ	1
170	12	QM82E2C				461CS		1MB4	X	1	
171	12	12AQM82E2				RCS-1	1				
172	12	QM82A3	21	.3H	.1HL	M82A3	C	2MK82	C	1461CQ	1
173	12	QM82A3C				461CS		1MB4	X	1	
174	12	12AQM82A3				RCS-1	1				
175	12	QM82B3	21	.3H	.1HL	M82B3	C	2MK82	C	1461CQ	1
176	12	QM82B3C				461CS		1MB4	X	1	
177	12	12AQM82B3				RCS-1	1				
178	12	QM82C3	21	.3H	.1HL	M82C3	C	2MK82	C	1461CQ	1
179	12	QM82C3C				461CS		1MB4	X	1	
180	12	12AQM82C3				RCS-1	1				
181	12	QM82D3	21	.3H	.1HL	M82D3	C	2MK82	C	1461CQ	1
182	12	QM82D3C				461CS		1MB4	X	1	
183	12	12AQM82D3				RCS-1	1				
184	12	QM82E3	21	.3H	.1HL	M82E3	C	2MK82	C	1461CQ	1
185	12	QM82E3C				461CS		1MB4	X	1	
186	12	12AQM82E3				RCS-1	1				
187	12	GHOLDA	21			◆HOLDA					
188	12	GHOLDB	21			◆HOLDB					
189	12	GHOLDC	21			◆HOLDC					
190	12	GHOLDD	21			◆HOLDD					
191	12	GHOLDE	21			◆HOLDE					
192	12	GMHU12	21			◆MHU12					
193	12	GMHU85	21			◆MHU85					
194	12	GMHU11	21			◆MHU11					
195	12	GMH112	21			◆MHU12					
196	12	GMK82	21			◆MK82					
197	12	TMK81A	21					MK82		24	
198	12	TMK82A	21					MK82		48	
199	12	TMK83A	21					MK82		72	
200	12	TMK84A	21					MK82		96	
201	12	TMK85A	21					MK82		12	
202	12	ENTER	21								
203	12	TBLDA1	21					BLDA1	C29		
204	12	TBLDA2	21					BLDA2	C29		
205	12	TBLDA3	21					BLDA3	C29		
206	12	TBLDA4	21					BLDA4	C29		
207	12	TBLDA5	21					BLDA5	C29		
208	12	QPMK82	21					PMK82	C	1	

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209	12	Q82FIN	21			82FIN	C	1
210	12	Q82BST	21			82BST	C	1
211	12	Q82FUS	21			82FUS	C	1
212	12	GBLDA1	21			◆BLDA1		
213	12	GBLDA2	21			◆BLDA2		
214	12	GBLDA3	21			◆BLDA3		
215	12	GBLDA4	21			◆BLDA4		
216	12	GBLDA5	21			◆BLDA5		
217	12	MK8201	22	1.0H	.1HN	461SQ	1461SS X	25TON C 1
218	12	MK8201C				25FLB C	14FORKSX	1
219	12	AMK8201				RCS-3	1461SQ	2461SS 1
220	12	AMK8201				RCS-4	2461SQ	3
221	12	MK82A1	22	1.0H	.1HN	461SQ	1461SS X	210TON C 1
222	12	MK82A1C				25FLB C	14FORKSX	1
223	12	AMK82A1				RCS-3	1	
224	12	AMK82A1				RCS-4	2	
225	12	MK82B1	22	1.0H	.1HN	461SQ	1461SS X	25TON C 1
226	12	MK82B1C				40FLB C	14FORKSX	1
227	12	AMK82B1				RCS-3	1	
228	12	AMK82B1				RCS-4	2	
229	12	MK82C1	22	1.0H	.1HN	461SQ	1461SS X	210TON C 1
230	12	MK82C1C				40FLB C	14FORKSX	1
231	12	AMK82C1				RCS-3	1	
232	12	AMK82C1				RCS-4	2	
233	12	MK82D1	22	1.0H	.1HN	461SQ	1461SS X	21HTON C 1
234	12	MK82D1C				4FORKSX	1	
235	12	AMK82D1				RCS-3	1	
236	12	AMK82D1				RCS-4	2	
237	12	MK82E1	22	1.0H	.1HN	461SQ	1461SS X	22HTON C 1
238	12	MK82E1C				4FORKSX	1	
239	12	AMK82E1				RCS-3	1	
240	12	AMK82E1				RCS-4	2	
241	12	DELIV1	22	.3H	.1HN	461SQ	1461SS X	1
242	12	ADELIV1	22			RCS-2	1461SQ	2
243	12	MK8203	22	1.0H	.1HN	461SQ	1461SS X	24FORKCX 1
244	12	AMK8203				RCS-3	1	
245	12	AMK8203				RCS-4	2	
246	12	MK8204	22	1.2H	.1HN	461CQ	1461CS X	3H-11 X 1
247	12	AMK8204				RCS-5	1461CQ	2461CS 2
248	12	AMK8204				RCS-6	2461CQ	3461CS 1
249	12	AMK8204				RCS-7	3461CQ	4
250	12	G5TON	21			◆5TON		
251	12	G10TON	21			◆10TON		
252	12	G25FLB	21			◆25FLB		
253	12	G40FLB	21			◆40FLB		
254	12	G2HTON	21			◆2HTON		
255	12	G1HTON	21			◆1HTON		
256	12	MK82D5	22	.75H	.1HN	461SQ	1461SS X	21HTON C 1
257	12	MK82D5C				4FORKSX	1	
258	12	AMK82D5				RCS-3	1	
259	12	AMK82D5				RCS-4	2	
260	12	MK8205	22	.75H	.1HN	461SQ	1461SS X	25TON C 1

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313	12	GM82C2C				461CS	X	1		
314	12	12AGM82C2			RCS-1	1				
315	12	GM82D2	21	.3H	.1HN	◆M82D2	HOLDD	C	4MB4	X 1461CQ 1
316	12	GM82D2C				461CS	X	1		
317	12	12AGM82D2				RCS-1	1			
318	12	GM82E2	21	.3H	.1HN	◆M82E2	HOLDE	C	4MB4	X 1461CQ 1
319	12	GM82E2C				461CS	X	1		
320	12	12AGM82E2				RCS-1	1			
321	12	GMHU11	21			MHU11	C	1		
322	12	GM82A3	21	.3H	.1HN	◆M82A3	HOLDA	C	4MB4	X 1461CQ 1
323	12	GM82A3C				461CS	X	1		
324	12	12AGM82A3				RCS-1	1			
325	12	GM82B3	21	.3H	.1HN	◆M82B3	HOLDB	C	4MB4	X 1461CQ 1
326	12	GM82B3C				461CS	X	1		
327	12	12AGM82B3				RCS-1	1			
328	12	GM82C3	21	.3H	.1HN	◆M82C3	HOLDC	C	4MB4	X 1461CQ 1
329	12	GM82C3C				461CS	X	1		
330	12	12AGM82C3				RCS-1	1			
331	12	GM82D3	21	.3H	.1HN	◆M82D3	HOLDD	C	4MB4	X 1461CQ 1
332	12	GM82D3C				461CS	X	1		
333	12	12AGM82D3				RCS-1	1			
334	12	GM82E3	21	.3H	.1HN	◆M82E3	HOLDE	C	4MB4	X 1461CQ 1
335	12	GM82E3C				461CS	X	1		
336	12	12AGM82E3				RCS-1	1			
337	12	DCMTA	21			◆				
338	12	LD20MM	21	.2H	.1HL		462X0	2		
339	12	Q20MD1	21	.3H	.1HL		20MD1	C	120MM	C 1461CQ 1
340	12	Q20MD1C					461CS	11HTON	X	1
341	12	12AQ20MD1				RCS-1	1			
342	12	Q20MB1	21	.3H	.1HL		20MB1	C	120MM	C 1461CQ 1
343	12	Q20MB1C					461CS	11HTON	X	1
344	12	12AQ20MB1				RCS-1	1			
345	12	GHLD2D	21			◆HOLDD				
346	12	GHLD2B	21			◆HOLDB				
347	12	T20M1A	21				20MM	24		
348	12	T20M2A	21				20MM	48		
349	12	T20M3A	21				20MM	72		
350	12	T20M4A	21				20MM	96		
351	12	T20M5A	21				20MM	12		
352	12	TBLDB1	21				BLDB1	C28		
353	12	TBLDB2	21				BLDB2	C28		
354	12	TBLDB3	21				BLDB3	C28		
355	12	TBLDB4	21				BLDB4	C28		
356	12	TBL2A1	21				BLDA1	C28		
357	12	G20MM	21			◆20MM				
358	12	QP20MM	21				P20MM	C	1	
359	12	GBLDB1	21			◆BLDB1				
360	12	GBLDB2	21			◆BLDB2				
361	12	GBLDB3	21			◆BLDB3				
362	12	GBLDB4	21			◆BLDB4				
363	12	GBL2A1	21			◆BLDA1				
364	12	20MMA1	22	2.3H	.2HN		461SQ	1461SS	X	15TON C 1

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365	12	20MMA1C					25FLB C	14FORKSX	1
366	12	20MMA1				RCS-3	1		
367	12	20MMA1				RCS-4	2		
368	12	20MMB1	22	2.3H	.2HN		461SQ	1461SS X	25TON C 1
369	12	20MMB1C					40FLB C	14FORKSX	1
370	12	20MMB1				RCS-3	1		
371	12	20MMB1				RCS-4	2		
372	12	20MMC1	22	2.3H	.2HN		461SQ	1461SS X	210TON C 1
373	12	20MMC1C					25FLB C	14FORKSX	1
374	12	20MMC1				RCS-3	1		
375	12	20MMC1				RCS-4	2		
376	12	20MMD1	22	2.3H	.2HN		461SQ	1461SS X	210TON C 1
377	12	20MMD1C					40FLB C	14FORKSX	1
378	12	20MMD1				RCS-3	1		
379	12	20MMD1				RCS-4	2		
380	12	20MME1	22	2.3H	.2HN		461SQ	1461SS X	21HTON C 1
381	12	20MME1C					4FORKSX	1	
382	12	20MME1				RCS-3	1		
383	12	20MME1				RCS-4	2		
384	12	20MMF1	22	2.3H	.2HN		461SQ	1461SS X	22HTON C 1
385	12	20MMF1C					4FORKSX	1	
386	12	20MMF1				RCS-3	1		
387	12	20MMF1				RCS-4	2		
388	12	20MM03	22	1.75H	.2HN		461SQ	1461SS X	24FORKCX 1
389	12	20MM03				RCS-2	1		
390	12	20MM05	22	.5H	.1HN		461CQ	1461CS X	24FORKCX 1
391	12	20MM05				RCS-1	1		
392	12	20MM04	22	10.5H	1.0HN		461CQ	1461CS X	24FORKCX 1
393	12	20MM04				RCS-1	1		
394	12	620MD1	21	.3H	.1HN	♦20MD1	HOLD C	21HTON X	1461CQ 1
395	12	620MD1C					461CS X	1	
396	12	620MD1				RCS-1	1		
397	12	620MB1	21	.3H	.1HN	♦20MB1	HOLDB C	21HTON X	1461CQ 1
398	12	620MB1C					461CS X	1	
399	12	620MB1				RCS-1	1		
400	12	DCMTB	21			♦			
401	12	LDIM9	21	.2H	.1HL		462X0	4	
402	12	QAIM9C	21	.3H	.1HL		AIM9C C	1AIM9 C	1461CQ 1
403	12	QAIM9CC					461CS	11HTON X	1
404	12	QAIM9C				RCS-1	1		
405	12	QAIM9E	21	.3H	.1HL		AIM9E C	1AIM9 C	1461CQ 1
406	12	QAIM9E					461CS	11HTON X	1
407	12	QAIM9E				RCS-1	1		
408	12	GHLDC	21			♦HOLDC			
409	12	GHLDE	21			♦HOLDE			
410	12	TAIM91	21				AIM9	24	
411	12	TAIM92	21				AIM9	48	
412	12	TAIM93	21				AIM9	72	
413	12	TAIM94	21				AIM9	96	
414	12	TAIM95	21				AIM9	12	
415	12	TBLDC1	21				BLDC1 C	6	
416	12	TBL2A5	21				BLDA5 C	6	

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417	12	6AIM9	21			♦AIM9				
418	12	6PAIM9	21				PAIM9	C	1	
419	12	6BLDC1	21			♦BLDC1				
420	12	6BL2A5	21			♦BLDAS				
421	12	AIM9A1	22	2.0H	.2HN		461SQ	1461SS X	210TON	C 1
422	12	AIM9A1C					25FLB	C	14FORKSX	1
423	12	AIM9A1				RCS-3	1			
424	12	AIM9A1				RCS-4	2			
425	12	AIM9B1	22	2.0H	.2HN		461SQ	1461SS X	25TON	C 1
426	12	AIM9B1C					25FLB	C	14FORKSX	1
427	12	AIM9B1				RCS-3	1			
428	12	AIM9B1				RCS-4	2			
429	12	AIM9C1	22	2.0H	.2HN		461SQ	1461SS X	21HTON	C 1
430	12	AIM9C1C					4FORKSX	1		
431	12	AIM9C1				RCS-3	1			
432	12	AIM9C1				RCS-4	2			
433	12	AIM903	22	2.0H	.2HN		461SQ	1461SS X	24FORKCX	1
434	12	AIM903				RCS-3	1			
435	12	AIM903				RCS-4	2			
436	12	AIM904	22	1.5H	.2HN		461CQ	1461CS X	3	
437	12	AIM904				RCS-5	1			
438	12	AIM904				RCS-6	2			
439	12	AIM904				RCS-7	2			
440	12	6AIM9C	21	.3H	.1HN	♦AIM9C	HOLDC	C	11HTON X	1461CQ 1
441	12	6AIM9CC					461CS	X	1	
442	12	6AIM9C				RCS-1	1			
443	12	6AIM9E	21	.3H	.1HN	♦AIM9E	HOLDE	C	11HTON X	1461CQ 1
444	12	6AIM9EC					461CS	X	1	
445	12	6AIM9E				RCS-1	1			
446	12	DCMTC	21			♦				
447	12	TIME	21	.5H		♦				
448	12	RMB4	21	1.0H	.2HN		MB4		1	
449	12	R5TON	21	1.0H	.2HN		5TON		1	
450	12	R10TON	21	1.0H	.2HN		10TON		1	
451	12	R25FLB	21	1.0H	.2HN		25FLB		1	
452	12	R40FLB	21	1.0H	.2HN		40FLB		1	
453	12	R4FORS	21	1.0H	.2HN		4FORKS		1	
454	12	R6FORS	21	1.0H	.2HN		6FORKS		1	
455	12	R10FRS	21	1.0H	.2HN		10FORS		1	
456	12	RH-11	21	1.0H	.2HN		H-11		1	
457	12	RJMR	21	1.0H	.2HN		JMR		1	
458	12	R4FORC	21	1.0H	.2HN		4FORKC		1	
459	12	R6FORC	21	1.0H	.2HN		6FORKC		1	
460	12	R10FRC	21	1.0H	.2HN		10FORC		1	
461	12	R1HTON	21	1.0H	.2HN		1HTON		1	
462	12	R2HTON	21	1.0H	.2HN		2HTON		1	
463	12	RMHU12	21	1.0H	.2HN		MHU12		1	
464	12	RMHU11	21	1.0H	.2HN		MHU11		1	
465	12	RMHU85	21	1.0H	.2HN		MHU85		1	
466	11									
467	11	MN0001	FREFLT	MN0002	D					
468	11	MN0002	COMUN	MN0003	C					

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469	11	MN0002	R	BMUN	E	1.000
470	11	MN0002			E	0.000
471	11	MN0003	SORTIE	MN0003	D	
472	11	MN0003	PSTFLT	MN0006	D	
473	11	MN0006	REFUEL	MN0001	D	
474	11	COMUN		COMK82	D	
475	11	COMK82	QM82A1	COMK10	R	
476	11	COMK82	QM82B1	COMK11	R	
477	11	COMK82	QM82C1	COMK12	R	
478	11	COMK82	QM82D1	COMK13	R	
479	11	COMK82	QM82E1	COMK14	R	
480	11	COMK10	CHOLDA	COMK15	C	
481	11	COMK11	CHOLDB	COMK15	C	
482	11	COMK12	CHOLDC	COMK15	C	
483	11	COMK13	CHOLDD	COMK15	C	
484	11	COMK14	CHOLDE	COMK15	C	
485	11	COMK15	LDMK82	COMK16	D	
486	11	COMK16	CMHU12		C	
487	11	COMK82	QM82A2	COMK20	R	
488	11	COMK82	QM82B2	COMK21	R	
489	11	COMK82	QM82C2	COMK22	R	
490	11	COMK82	QM82D2	COMK23	R	
491	11	COMK82	QM82E2	COMK24	R	
492	11	COMK20	CHOLDA	COMK25	C	
493	11	COMK21	CHOLDB	COMK25	C	
494	11	COMK22	CHOLDC	COMK25	C	
495	11	COMK23	CHOLDD	COMK25	C	
496	11	COMK24	CHOLDE	COMK25	C	
497	11	COMK25	LDMK82	COMK26	D	
498	11	COMK26	CMHU65		C	
499	11	COMK82	QM82A3	COMK30	R	
500	11	COMK82	QM82B3	COMK31	R	
501	11	COMK82	QM82C3	COMK32	R	
502	11	COMK82	QM82D3	COMK33	R	
503	11	COMK82	QM82E3	COMK34	R	
504	11	COMK30	CHOLDA	COMK35	C	
505	11	COMK31	CHOLDB	COMK35	C	
506	11	COMK32	CHOLDC	COMK35	C	
507	11	COMK33	CHOLDD	COMK35	C	
508	11	COMK34	CHOLDE	COMK35	C	
509	11	COMK35	LDMK82	COMK36	D	
510	11	COMK36	CMHU11		C	
511	11	CHOLDA	GHOLDA	CHOLD1	D	
512	11	CHOLD1		CHOLDA	HHOLDA	
513	11	CHOLDB	GHOLDB	CHOLD2	D	
514	11	CHOLD2		CHOLDB	HHOLDB	
515	11	CHOLDC	GHOLDC	CHOLD3	D	
516	11	CHOLD3		CHOLDC	HHOLDC	
517	11	CHOLDD	GHOLDD	CHOLD4	D	
518	11	CHOLD4		CHOLDD	HHOLDD	
519	11	CHOLDE	GHOLDE	CHOLD5	D	
520	11	CHOLD5		CHOLDE	HHOLDE	

DATABASE

AS OF:
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521	11	CMHU12	GMH112	CMHU01	D
522	11	CMHU01		CMHU12	HHMHU12
523	11	CMHU85	GMHU85	CMHU02	D
524	11	CMHU02		CMHU85	HHMHU85
525	11	CMHU11	GMHU11	CMHU03	D
526	11	CMHU03		CMHU11	HHMHU11
527	11	CGMK82	GMK82	CGMK80	D
528	11	CGMK80		CGMK82	HHMK82
529	11	BMK82		BMK82	D
530	11	BMK82	TMK81A		R
531	11	BMK82	ENTER	BMK801	R
532	11	BMK801	TBLDA1	BMK802	R
533	11	BMK801	TBLDA2	BMK803	R
534	11	BMK801	TBLDA3	BMK804	R
535	11	BMK801	TBLDA4	BMK805	R
536	11	BMK801	TBLDA5	BMK806	R
537	11	BMK802	CPMK82	BMK807	C
538	11	BMK803	CPMK82	BMK808	C
539	11	BMK804	CPMK82	BMK809	C
540	11	BMK805	CPMK82	BMK810	C
541	11	BMK806	CPMK82	BMK811	C
542	11	BMK807	CGMK82	BMK812	C
543	11	BMK808	CGMK82	BMK813	C
544	11	BMK809	CGMK82	BMK814	C
545	11	BMK810	CGMK82	BMK815	C
546	11	BMK811	CGMK82	BMK816	C
547	11	BMK812	CMK82	BMK82D	C
548	11	BMK812		BMK82	D
549	11	BMK813	CMK82	BMK82E	C
550	11	BMK813		BMK82	D
551	11	BMK814	CMK82	BMK82F	C
552	11	BMK814		BMK82	D
553	11	BMK815	CMK82	BMK82G	C
554	11	BMK815		BMK82	D
555	11	BMK816	CMK82	BMK82H	C
556	11	BMK816		BMK82	D
557	11	CPMK82	QPMK82	PMK801	D
558	11	PMK801	Q82FIN	PMK802	E .565
559	11	PMK801		PMK802	E .435
560	11	PMK802	Q82BST	PMK803	E .240
561	11	PMK802		PMK803	E .760
562	11	PMK803	Q82FUS		A .470
563	11	BMK82D	GBLDA1	BMK001	D
564	11	BMK001		BMK82D	HHBLDA1
565	11	BMK82E	GBLDA2	BMK002	D
566	11	BMK002		BMK82E	HHBLDA2
567	11	BMK82F	GBLDA3	BMK003	D
568	11	BMK003		BMK82F	HHBLDA3
569	11	BMK82G	GBLDA4	BMK004	D
570	11	BMK004		BMK82G	HHBLDA4
571	11	BMK82H	GBLDA5	BMK005	D
572	11	BMK005		BMK82H	HHBLDA5

DATABASE

AS OF:
04/03/81

573	11	CMK82	CDMK82	BMK82A	C
574	11	CDMK82		BMK821	D
575	11	BMK821	MK8201	BMK822	R
576	11	BMK821	MK82A1	BMK823	R
577	11	BMK821	MK82B1	BMK824	R
578	11	BMK821	MK82C1	BMK825	R
579	11	BMK822	DELIV1	BMK826	D
580	11	BMK823	DELIV1	BMK827	D
581	11	BMK824	DELIV1	BMK828	D
582	11	BMK825	DELIV1	BMK829	D
583	11	BMK826	MK8203	BMK830	D
584	11	BMK827	MK8203	BMK831	D
585	11	BMK828	MK8203	BMK832	D
586	11	BMK829	MK8203	BMK833	D
587	11	BMK830	MK8204		D
588	11	BMK830	G5TON	BMK834	D
589	11	BMK834	G25FLB		D
590	11	BMK831	MK8204		D
591	11	BMK831	G10TON	BMK835	D
592	11	BMK835	G25FLB		D
593	11	BMK832	MK8204		D
594	11	BMK832	G5TON	BMK836	D
595	11	BMK836	G40FLB		D
596	11	BMK833	MK8204		D
597	11	BMK833	G10TJN	BMK837	D
598	11	BMK837	G40FLB		D
599	11	CDMK82		BMK840	R
600	11	BMK840	MK82C5	BMK841	R
601	11	BMK840	MK82A5	BMK842	R
602	11	BMK840	MK82B5	BMK843	R
603	11	BMK840	MK8205	BMK844	R
604	11	BMK840	MK82D5	BMK845	R
605	11	BMK840	MK82E5	BMK846	R
606	11	BMK841	DELIV1	BMK847	D
607	11	BMK842	DELIV1	BMK848	D
608	11	BMK843	DELIV1	BMK849	D
609	11	BMK844	DELIV1	BMK850	D
610	11	BMK845	DELIV1	BMK851	D
611	11	BMK846	DELIV1	BMK852	D
612	11	BMK847	MK8203	BMK853	D
613	11	BMK848	MK8203	BMK854	D
614	11	BMK849	MK8203	BMK855	D
615	11	BMK850	MK8203	BMK856	D
616	11	BMK851	MK8203	BMK857	D
617	11	BMK852	MK8203	BMK858	D
618	11	BMK853	G10TON	BMK859	D
619	11	BMK859	G40FLB		D
620	11	BMK854	G10TON	BMK860	D
621	11	BMK860	G25FLB		D
622	11	BMK855	G5TON	BMK861	D
623	11	BMK861	G40FLB		D
624	11	BMK856	G5TON	BMK862	D

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DATABASE

AS OF:
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625	11	BMK862	623FLB	D	
626	11	BMK857	G1HTON	D	
627	11	BMK858	G2HTON	D	
628	11	CDMK82		BMK870	A .240
629	11	BMK870	MK82A5	BMK842	R
630	11	BMK870	MK82B5	BMK843	R
631	11	BMK870	MK82C5	BMK841	R
632	11	BMK870	MK8205	BMK844	R
633	11	BMK870	MK82E5	BMK846	R
634	11	BMK870	MK82D5	BMK845	R
635	11	CDMK82		B82100	A .470
636	11	B82100	MK82B1	B82001	R
637	11	B82100	MK82C1	B82002	R
638	11	B82100	MK82A1	B82003	R
639	11	B82100	MK8201	B82004	R
640	11	B82100	MK82D1	B82005	R
641	11	B82100	MK82E1	B82006	R
642	11	B82001	DELIV1	B82007	D
643	11	B82002	DELIV1	B82008	D
644	11	B82003	DELIV1	B82009	D
645	11	B82004	DELIV1	B82010	D
646	11	B82005	DELIV1	B82011	D
647	11	B82006	DELIV1	B82012	D
648	11	B82007	MK8213	BMK855	D
649	11	B82008	MK8213	BMK853	D
650	11	B82009	MK8213	BMK854	D
651	11	B82010	MK8213	BMK856	D
652	11	B82011	MK8213	BMK851	D
653	11	B82012	MK8213	BMK852	D
654	11	BMK82A	MK8218	B82120	D
655	11	BMK82A	MK8218		D
656	11	B82120	GMH12	B82119	R
657	11	B82119	MK8219	B82121	D
658	11	B82121	GM82A1	B82124	R
659	11	B82121	GM82B1	B82124	R
660	11	B82121	GM82C1	B82124	R
661	11	B82121	GM82D1	B82124	R
662	11	B82121	GM82E1	B82124	R
663	11	B82120	GMH185	B8212A	R
664	11	B8212A	MK8219	B82122	D
665	11	B82122	GM82A2	B82124	R
666	11	B82122	GM82B2	B82124	R
667	11	B82122	GM82C2	B82124	R
668	11	B82122	GM82D2	B82124	R
669	11	B82122	GM82E2	B82124	R
670	11	B82120	GMH11	B8212B	R
671	11	B8212B	MK8219	B82123	D
672	11	B82123	GM82A3	B82124	R
673	11	B82123	GM82B3	B82124	R
674	11	B82123	GM82C3	B82124	R
675	11	B82123	GM82D3	B82124	R
676	11	B82123	GM82E3	B82124	R

DATABASE

AS DF:
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677	11	B82124	DCMTA	B82125	D
678	11	B82125		B82120	HHRMK82
679	11	COMUN		C020MM	D
680	11	C020MM	LD20MM	E	.500
681	11	C020MM		C20M01	E .500
682	11	C20M01	Q20MD1	C20M10	R
683	11	C20M01	Q20MB1	C20M11	R
684	11	C20M10	CHLD2D	C20M15	C
685	11	C20M11	CHLD2B	C20M15	C
686	11	C20M15	LD20MM	C20M16	D
687	11	C20M16	GMU12		D
688	11	CHLD2D	CHLD2D	CHLD21	D
689	11	CHLD21		CHLD2D	HHL2D
690	11	CHLD2B	CHLD2B	CHLD22	D
691	11	CHLD22		CHLD2B	HHL2B
692	11	BMUN		B20M01	D
693	11	B20M01	T20MSA		R
694	11	B20M01	ENTER	B20M02	R
695	11	B20M02	TBLDB1	B20M03	R
696	11	B20M02	TBLDB2	B20M04	R
697	11	B20M02	TBLDB3	B20M05	R
698	11	B20M02	TBLDB4	B20M06	R
699	11	B20M02	TBL2A1	B20M07	R
700	11	B20M03	QP20MM	B20M08	D
701	11	B20M04	QP20MM	B20M09	D
702	11	B20M05	QP20MM	B20M10	D
703	11	B20M06	QP20MM	B20M11	D
704	11	B20M07	QP20MM	B20M12	D
705	11	B20M08	C620MM	B20M13	C
706	11	B20M09	C620MM	B20M14	C
707	11	B20M10	C620MM	B20M15	C
708	11	B20M11	C620MM	B20M16	C
709	11	B20M12	C620MM	B20M17	C
710	11	B20M13	C20MM	B20M18	C
711	11	B20M13		B20M01	D
712	11	B20M14	C20MM	B20M19	C
713	11	B20M14		B20M01	P
714	11	B20M15	C20MM	B20M20	C
715	11	B20M15		B20M01	D
716	11	B20M16	C20MM	B20M21	C
717	11	B20M16		B20M01	D
718	11	B20M17	C20MM	B20M22	C
719	11	B20M17		B20M01	D
720	11	B20M18	6BLDB1	B20M23	D
721	11	B20M23		B20M18	HHLDB1
722	11	B20M19	6BLDB2	B20M24	D
723	11	B20M24		B20M19	HHLDB2
724	11	B20M20	6BLDB3	B20M25	D
725	11	B20M25		B20M20	HHLDB3
726	11	B20M21	6BLDB4	B20M26	D
727	11	B20M26		B20M21	HHLDB4
728	11	B20M22	6BL2A1	B20M27	D

DATABASE

AS' DF:
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729	11	B20M27	B20M22	HWBL2A1
730	11	C620MM	620MM	C620M1 D
731	11	C620M1	C620MM	HW620MM
732	11	C20MM	CD20MM	B20M50 C
733	11	CD20MM	20MMA1	B20M31 R
734	11	CD20MM	20MMB1	B20M32 R
735	11	CD20MM	20MMC1	B20M33 R
736	11	CD20MM	20MMD1	B20M34 R
737	11	CD20MM	20MME1	B20M35 R
738	11	CD20MM	20MMF1	B20M36 R
739	11	B20M31	DELIV1	B20M37 D
740	11	B20M32	DELIV1	B20M38 D
741	11	B20M33	DELIV1	B20M39 D
742	11	B20M34	DELIV1	B20M40 D
743	11	B20M35	DELIV1	B20M41 D
744	11	B20M36	DELIV1	B20M42 D
745	11	B20M37	20MM03	BMK856 D
746	11	B20M38	20MM03	BMK855 D
747	11	B20M39	20MM03	BMK854 D
748	11	B20M40	20MM03	BMK853 D
749	11	B20M41	20MM03	BMK857 D
750	11	B20M42	20MM03	BMK858 D
751	11	B20M50	20MM04	B20M51 D
752	11	B20M51	6MHU12	B20M52 D
753	11	B20M52	20MM05	B20M53 D
754	11	B20M53	620MD1	B20M54 R
755	11	B20M53	620MB1	B20M54 R
756	11	B20M54	DCMTB	B20M55 D
757	11	B20M55		B20M51 HHR20MM
758	11	COMUN		CQAIM9 D
759	11	CQAIM9	QAIM9E	CAM902 R
760	11	CQAIM9	QAIM9C	CAM901 R
761	11	CAM901	CHLD2C	CAM903 C
762	11	CAM902	CHLD2E	CAM903 C
763	11	CAM903	LDAIM9	CAM904 D
764	11	CAM904	6MHU12	D
765	11	CHLD2C	6HLD2C	CHLD31 D
766	11	CHLD31		CHLD2C HHL2C
767	11	CHLD2E	6HLD2E	CHLD32 D
768	11	CHLD32		CHLD2E HHL2E
769	11	BMUN		BAM901 D
770	11	BAM901	TAIM91	R
771	11	BAM901	ENTER	BAM902 R
772	11	BAM902	TBLDC1	BAM903 R
773	11	BAM902	TBL2A5	BAM904 R
774	11	BAM903	QPAIM9	BAM905 D
775	11	BAM904	QPAIM9	BAM906 D
776	11	BAM905	CGAIM9	BAM907 C
777	11	BAM906	CGAIM9	BAM908 C
778	11	BAM907	CAIM9	BAM909 C
779	11	BAM907		BAM901 D
780	11	BAM908	CAIM9	BAM910 C

DATABASE

AS OF:
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781	11	BAM908		BAM901	D
782	11	BAM909	GBLDC1	BAM911	D
783	11	BAM911		BAM909	HMBLDC1
784	11	BAM910	GBL2A5	BAM912	D
785	11	BAM912		BAM910	HMBL2A5
786	11	CGAIM9	GAIM9	CGAM91	D
787	11	CGAM91		CGAIM9	HMGAIM9
788	11	CAIM9	CDAIM9	BAM930	C
789	11	CDAIM9	AIM9A1	BAM920	R
790	11	CDAIM9	AIM9B1	BAM921	R
791	11	CDAIM9	AIM9C1	BAM922	R
792	11	BAM920	DELIV1	BAM923	D
793	11	BAM921	DELIV1	BAM924	D
794	11	BAM922	DELIV1	BAM925	D
795	11	BAM923	AIM903	BMK854	D
796	11	BAM924	AIM903	BMK856	D
797	11	BAM925	AIM903	BMK857	D
798	11	BAM930	GMHU12	BAM931	D
799	11	BAM931	AIM904		D
800	11	BAM931	AIM904	BAM932	D
801	11	BAM932	GAIM9E	BAM933	R
802	11	BAM932	GAIM9C	BAM933	R
803	11	BAM933	DCMTC	BAM934	D
804	11	BAM934		BAM930	HHRAIM9
805	11	TIMER1	TIME	TIMER2	D
806	11	TIMER2		TIMER1	D
807	11	TIMER2		NB4001	FFNB4
808	11	NB4001	RMB4		D
809	11	TIMER2		5TON1	FF5TON
810	11	5TON1	R5TON		D
811	11	TIMER2		10TON1	FF10TON
812	11	10TON1	P10TON		D
813	11	TIMER2		25FLB1	FF25FLB
814	11	25FLB1	R25FLB		D
815	11	TIMER2		40FLB1	FF40FLB
816	11	40FLB1	R40FLB		D
817	11	TIMER2		4FORS1	FF4FORS
818	11	4FORS1	R4FORS		D
819	11	TIMER2		6FORS1	FF6FORS
820	11	6FORS1	R6FORS		D
821	11	TIMER2		10FRS1	FF10FRS
822	11	10FRS1	R10FRS		D
823	11	TIMER2		H-1101	FFH-11
824	11	H-1101	RH-11		D
825	11	TIMER2		JAMR01	FFJAMR
826	11	JAMR01	RJAMP		D
827	11	TIMER2		4FDR1	FF4FDR1
828	11	4FDR1	R4FDR1		D
829	11	TIMER2		6FDR1	FF6FDR1
830	11	6FDR1	R6FDR1		D
831	11	TIMER2		10FRC1	FF10FRC
832	11	10FRC1	R10FRC		D

DATABASE

AS DF:
04/03/81

833	11	TIMER2	1HTON1	FF1HTON	
834	11	1HTON1	R1HTON	D	
835	11	TIMER2	2HTON1	FF2HTON	
836	11	2HTON1	R2HTON	D	
837	11	TIMER2	MHU111	FFMHU11	
838	11	MHU111	RMHU11	D	
839	11	TIMER2	MHU851	FFMHU85	
840	11	MHU851	RMHU85	D	
841	11	TIMER2	MHU121	FFMHU12	
842	11	MHU121	RMHU12	D	
843	14				
844	14	GHOLDA	HOLDA	1.0	
845	14	GHOLDB	HOLDB	1.0	
846	14	GHOLDC	HOLDC	1.0	
847	14	GHOLDD	HOLDD	1.0	
848	14	GHOLDE	HOLDE	1.0	
849	14	GMH112	HMHU12	1.0	
850	14	GMHU85	HMHU85	1.0	
851	14	GMHU11	HMHU11	1.0	
852	14	GBLDA1	HBLDA1	1.0	
853	14	GBLDA2	HBLDA2	1.0	
854	14	GBLDA3	HBLDA3	1.0	
855	14	GBLDA4	HBLDA4	1.0	
856	14	GBLDA5	HBLDA5	1.0	
857	14	GMK82	HMK82	1.0	
858	14	TIME	S FMB4		
859	14		F5TON		
860	14		F10TON		
861	14		F25FLB		
862	14		F40FLB		
863	14		F4FORS		
864	14		F6FORS		
865	14		F10FRS		
866	14		FH-11		
867	14		FJAMR		
868	14		F4FORC		
869	14		F6FORC		
870	14		F10FRC		
871	14		FMHU12		
872	14		FMHU85		
873	14		FMHU11		
874	14		F1HTON		
875	14		F2HTON		
876	14	DCMTA	HRMK82	1.0	
877	14	GHLD2D	HLD2D	1.0	
878	14	GHLD2B	HLD2B	1.0	
879	14	GBLDB1	HBLDB1	1.0	
880	14	GBLDB2	HBLDB2	1.0	
881	14	GBLDB3	HBLDB3	1.0	
882	14	GBLDB4	HBLDB4	1.0	
883	14	GBL2A1	HBL2A1	1.0	
884	14	G20NM	HG20NM	1.0	

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AS OF:
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885	14	DCMTB	HR20MM	1.0
886	14	6HLD2C	HLD2C	1.0
887	14	6HLD2E	HLD2E	1.0
888	14	6BLDC1	HBLDC1	1.0
889	14	6BL2A5	HBL2A5	1.0
890	14	6AIM9	H6AIM9	1.0
891	14	DCMTC	HRAIM9	1.0
892	16			
893	16	♦	8 8 8	
894	16	R		7
895	16	431F1	200 200 200	
896	16	462X0	200 200 200	
897	16	PILOT	200 200 200	
898	16	461SQ	200 200 200	
899	16	461SS	200 200 200	
900	16	461CQ	200 200 200	
901	16	461CS	200 200 200	
902	17			
903	17	CAS	1AMN0001	
904	17	TIMER	2NTIMER1	
905	17	ORDER	3NBMK82	
906	18			
907	1809	1.1		

TFX

Appendix B

SIMULATION RESULTS

Unconstrained Simulation Results

PERFORMANCE SUMMARY

01. NUMBER ALPHA

MISSIONS		TOTAL	OTHER
1	NUMBER OF MISSIONS REQUESTED	0.	0.
2	NUMBER ACCOMPLISHED	0.	0.
3	PERCENT ACCOMPLISHED	0.	0.
4	NUMBER OF SORTIES REQUESTED	0.	0.
5	NUMBER ACCOMPLISHED	0.	0.
6	PERCENT ACCOMPLISHED	0.	0.
7	NUMBER OF WEATHER CANCELS	0.	0.
8	NUMBER OF WEATHER DELAYS	0.	0.
9	NUMBER OF ALERT REPLENISHMENT	0.	0.
10	NUMBER OF ATTRITIONS	0.	0.
11	NUMBER OF RAN REPAIRS	0.	0.
12	NUMBER OF AIR ABORTS(TOTAL)	0.	0.
13	AUG. AC POST SORTIE TIME(HRS)	0.	0.
14	NO. OF POST-SORTIES COMPLETED	0.	0.

ACTIVITY		TOTAL	CAS	TIME	ORDER	OTHER
1	NO. OF ACTIVITIES REQUESTED	62.00	31.00	1.00	30.00	0.
2	NO. OF ACTIVITIES STARTED	55.00	24.00	1.00	30.00	0.
3	NO. OF ACTIVITIES CANCELLED	0.	0.	0.	0.	0.
4	AUG. DELAY TO OBTAIN RESCUE	0.00	0.00	0.00	0.00	0.

AIRCRAFT		TOTAL	TFX	OTHER
1	NUMBER OF AIRCRAFT AUTH.(CEOP)	24.00	24.00	0.
2	NUMBER OF AIRCRAFT-DAYS AVAIL	720.00	720.00	0.
3	PCT SORTIES(TOTCL ALERT)	0.	0.	0.
4	PCT UNSCHED MAINTENANCE	98.25	98.25	0.
5	PCT SCHED MAINTENANCE	0.	0.	0.
6	PCT NOBS	0.01	0.01	0.
7	PCT MISSION -AIT STATUS	0.	0.	0.
8	PCT SERVICE -WAITING	0.	0.	0.
9	PCT OPERATIONALLY READY	1.74	1.74	0.
10	AUG. AC POST SORTIE TIME(HRS)	0.	0.	0.
11	AUG. NO. OF SORTIES/ A/C /DAY	0.	0.	0.
12	FLYING HOURS	0.	0.	0.
13	NUMBER OF FCF TASKS FLOWA	0.	0.	0.
14	AUG. AC P-ESORTIE TIME(HRS)	0.	0.	0.

PERFORMANCE SUMMARY

RUN NUMBER ALPHA

P E R S O N N E L

	431F1	462X0	PILOT	461S0	461S1	461C0	461C1	OTHER
27 MANHOURS AVAILABLE (100)	1440.00	1440.00	1440.00	1440.00	1440.00	1440.00	1440.00	0.
28 PERCENT UTILIZATION	4.82	4.13	2.61	1.06	2.00	4.82	10.41	0.
29 MANHOURS USED (100)	485.63	59.44	37.53	15.28	28.80	69.43	149.90	0.
30 PCT UNSCHED MAINT. OF ST	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
31 PCT SCHED MAINT. OF ST	0.	0.	0.	0.	0.	0.	0.	0.
32 PCT PRIME OF STAT 29	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
33 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
34 PCT NUMBER OF MEN DEMANDED	37936.00	3516.00	7210.00	717.00	2895.00	8189.00	1013672.00	0.
35 PCT NUMBER OF MEN DEMANDED POST SCAM	37936.00	3516.00	7210.00	717.00	2895.00	8189.00	1013672.00	0.
36 PCT HUR OF MEN DEMANDED	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
37 PCT AVAIL BY ON. BAL. OF RES	0.	0.	0.	0.	0.	0.	0.	0.
38 PCT AVAIL BY GEN SUBS OF RES	0.	0.	0.	0.	0.	0.	0.	0.
39 PCT AVAIL BY EXPEDITE PROC.	0.	0.	0.	0.	0.	0.	0.	0.
40 PCT AVAIL BY PREEMPTION PRCC.	0.	0.	0.	0.	0.	0.	0.	0.
41 PCT DEMANDS NOT AVAIL FOR RES	0.	0.	0.	0.	0.	0.	0.	0.
42 PCT OVERTIME MANHOURS USED (100)	0.	0.	0.	0.	0.	0.	0.	0.
43 PCT SIMULATED MH PER FLYING HOUR	0.	0.	0.	0.	0.	0.	0.	0.

S U P P L Y

54	TOT DOLLAR INVEST. (1000) (EOP)	418093.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
55	FILL RATE PERCENT	99.99	99.51	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
56	NUMBER OF BACKORDER-DAYS	32	29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
57	NUMBER OF UNITS DEMANDED	62992.00	1430.00	12.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58	PCT OFF-THE-SHELF	99.99	99.51	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
59	PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
60	PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
61	PCT DEMANDS NOT SATIS.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62	NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
63	NO. ITEMS ON BACKORDER (EOP)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S U P P L Y

	OTHER	M82A1	M82B1	M82C1	M82D1	M82E1	M82F1	M82G1	M82H1	M82I1	M82J1	M82K1	M82L1	M82M1	M82N1	M82O1	M82P1	M82Q1	M82R1	M82S1	M82T1	M82U1	M82V1	M82W1	M82X1	M82Y1	M82Z1	OTHER
54 TOT DOLLAR INVEST. (1000) (EOP)	418093.01	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
55 FILL RATE PERCENT	99.99	99.51	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
56 NUMBER OF BACKORDER-DAYS	32	29	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
57 NUMBER OF UNITS DEMANDED	62992.00	1430.00	12.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58 PCT OFF-THE-SHELF	99.99	99.51	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
59 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
60 PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
61 PCT DEMANDS NOT SATIS.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
63 NO. ITEMS ON BACKORDER (EOP)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

PERFORMANCE SUMMARY

RUN NUMBER ALPHA

S U P P L Y

	BLD4	BLD5	BLD6	BLD7	BLD8	BLD9	BLD10	BLD11	BLD12	BLD13	BLD14	BLD15	BLD16	BLD17	BLD18	BLD19	BLD20	BLD21	BLD22	BLD23	BLD24	BLD25	BLD26	BLD27	BLD28	BLD29	BLD30	BLD31	BLD32	BLD33	BLD34	BLD35	BLD36	BLD37	BLD38	BLD39	BLD40	BLD41	BLD42	BLD43	BLD44	BLD45	BLD46	BLD47	BLD48	BLD49	BLD50	BLD51	BLD52	BLD53	BLD54	BLD55	BLD56	BLD57	BLD58	BLD59	BLD60	BLD61	BLD62	BLD63	BLD64	BLD65	BLD66	BLD67	BLD68	BLD69	BLD70	BLD71	BLD72	BLD73	BLD74	BLD75	BLD76	BLD77	BLD78	BLD79	BLD80	BLD81	BLD82	BLD83	BLD84	BLD85	BLD86	BLD87	BLD88	BLD89	BLD90	BLD91	BLD92	BLD93	BLD94	BLD95	BLD96	BLD97	BLD98	BLD99	BLD100	BLD101	BLD102	BLD103	BLD104	BLD105	BLD106	BLD107	BLD108	BLD109	BLD110	BLD111	BLD112	BLD113	BLD114	BLD115	BLD116	BLD117	BLD118	BLD119	BLD120	BLD121	BLD122	BLD123	BLD124	BLD125	BLD126	BLD127	BLD128	BLD129	BLD130	BLD131	BLD132	BLD133	BLD134	BLD135	BLD136	BLD137	BLD138	BLD139	BLD140	BLD141	BLD142	BLD143	BLD144	BLD145	BLD146	BLD147	BLD148	BLD149	BLD150	BLD151	BLD152	BLD153	BLD154	BLD155	BLD156	BLD157	BLD158	BLD159	BLD160	BLD161	BLD162	BLD163	BLD164	BLD165	BLD166	BLD167	BLD168	BLD169	BLD170	BLD171	BLD172	BLD173	BLD174	BLD175	BLD176	BLD177	BLD178	BLD179	BLD180	BLD181	BLD182	BLD183	BLD184	BLD185	BLD186	BLD187	BLD188	BLD189	BLD190	BLD191	BLD192	BLD193	BLD194	BLD195	BLD196	BLD197	BLD198	BLD199	BLD200	BLD201	BLD202	BLD203	BLD204	BLD205	BLD206	BLD207	BLD208	BLD209	BLD210	BLD211	BLD212	BLD213	BLD214	BLD215	BLD216	BLD217	BLD218	BLD219	BLD220	BLD221	BLD222	BLD223	BLD224	BLD225	BLD226	BLD227	BLD228	BLD229	BLD230	BLD231	BLD232	BLD233	BLD234	BLD235	BLD236	BLD237	BLD238	BLD239	BLD240	BLD241	BLD242	BLD243	BLD244	BLD245	BLD246	BLD247	BLD248	BLD249	BLD250	BLD251	BLD252	BLD253	BLD254	BLD255	BLD256	BLD257	BLD258	BLD259	BLD260	BLD261	BLD262	BLD263	BLD264	BLD265	BLD266	BLD267	BLD268	BLD269	BLD270	BLD271	BLD272	BLD273	BLD274	BLD275	BLD276	BLD277	BLD278	BLD279	BLD280	BLD281	BLD282	BLD283	BLD284	BLD285	BLD286	BLD287	BLD288	BLD289	BLD290	BLD291	BLD292	BLD293	BLD294	BLD295	BLD296	BLD297	BLD298	BLD299	BLD300	BLD301	BLD302	BLD303	BLD304	BLD305	BLD306	BLD307	BLD308	BLD309	BLD310	BLD311	BLD312	BLD313	BLD314	BLD315	BLD316	BLD317	BLD318	BLD319	BLD320	BLD321	BLD322	BLD323	BLD324	BLD325	BLD326	BLD327	BLD328	BLD329	BLD330	BLD331	BLD332	BLD333	BLD334	BLD335	BLD336	BLD337	BLD338	BLD339	BLD340	BLD341	BLD342	BLD343	BLD344	BLD345	BLD346	BLD347	BLD348	BLD349	BLD350	BLD351	BLD352	BLD353	BLD354	BLD355	BLD356	BLD357	BLD358	BLD359	BLD360	BLD361	BLD362	BLD363	BLD364	BLD365	BLD366	BLD367	BLD368	BLD369	BLD370	BLD371	BLD372	BLD373	BLD374	BLD375	BLD376	BLD377	BLD378	BLD379	BLD380	BLD381	BLD382	BLD383	BLD384	BLD385	BLD386	BLD387	BLD388	BLD389	BLD390	BLD391	BLD392	BLD393	BLD394	BLD395	BLD396	BLD397	BLD398	BLD399	BLD400	BLD401	BLD402	BLD403	BLD404	BLD405	BLD406	BLD407	BLD408	BLD409	BLD410	BLD411	BLD412	BLD413	BLD414	BLD415	BLD416	BLD417	BLD418	BLD419	BLD420	BLD421	BLD422	BLD423	BLD424	BLD425	BLD426	BLD427	BLD428	BLD429	BLD430	BLD431	BLD432	BLD433	BLD434	BLD435	BLD436	BLD437	BLD438	BLD439	BLD440	BLD441	BLD442	BLD443	BLD444	BLD445	BLD446	BLD447	BLD448	BLD449	BLD450	BLD451	BLD452	BLD453	BLD454	BLD455	BLD456	BLD457	BLD458	BLD459	BLD460	BLD461	BLD462	BLD463	BLD464	BLD465	BLD466	BLD467	BLD468	BLD469	BLD470	BLD471	BLD472	BLD473	BLD474	BLD475	BLD476	BLD477	BLD478	BLD479	BLD480	BLD481	BLD482	BLD483	BLD484	BLD485	BLD486	BLD487	BLD488	BLD489	BLD490	BLD491	BLD492	BLD493	BLD494	BLD495	BLD496	BLD497	BLD498	BLD499	BLD500	BLD501	BLD502	BLD503	BLD504	BLD505	BLD506	BLD507	BLD508	BLD509	BLD510	BLD511	BLD512	BLD513	BLD514	BLD515	BLD516	BLD517	BLD518	BLD519	BLD520	BLD521	BLD522	BLD523	BLD524	BLD525	BLD526	BLD527	BLD528	BLD529	BLD530	BLD531	BLD532	BLD533	BLD534	BLD535	BLD536	BLD537	BLD538	BLD539	BLD540	BLD541	BLD542	BLD543	BLD544	BLD545	BLD546	BLD547	BLD548	BLD549	BLD550	BLD551	BLD552	BLD553	BLD554	BLD555	BLD556	BLD557	BLD558	BLD559	BLD560	BLD561	BLD562	BLD563	BLD564	BLD565	BLD566	BLD567	BLD568	BLD569	BLD570	BLD571	BLD572	BLD573	BLD574	BLD575	BLD576	BLD577	BLD578	BLD579	BLD580	BLD581	BLD582	BLD583	BLD584	BLD585	BLD586	BLD587	BLD588	BLD589	BLD590	BLD591	BLD592	BLD593	BLD594	BLD595	BLD596	BLD597	BLD598	BLD599	BLD600	BLD601	BLD602	BLD603	BLD604	BLD605	BLD606	BLD607	BLD608	BLD609	BLD610	BLD611	BLD612	BLD613	BLD614	BLD615	BLD616	BLD617	BLD618	BLD619	BLD620	BLD621	BLD622	BLD623	BLD624	BLD625	BLD626	BLD627	BLD628	BLD629	BLD630	BLD631	BLD632	BLD633	BLD634	BLD635	BLD636	BLD637	BLD638	BLD639	BLD640	BLD641	BLD642	BLD643	BLD644	BLD645	BLD646	BLD647	BLD648	BLD649	BLD650	BLD651	BLD652	BLD653	BLD654	BLD655	BLD656	BLD657	BLD658	BLD659	BLD660	BLD661	BLD662	BLD663	BLD664	BLD665	BLD666	BLD667	BLD668	BLD669	BLD670	BLD671	BLD672	BLD673	BLD674	BLD675	BLD676	BLD677	BLD678	BLD679	BLD680	BLD681	BLD682	BLD683	BLD684	BLD685	BLD686	BLD687	BLD688	BLD689	BLD690	BLD691	BLD692	BLD693	BLD694	BLD695	BLD696	BLD697	BLD698	BLD699	BLD700	BLD701	BLD702	BLD703	BLD704	BLD705	BLD706	BLD707	BLD708	BLD709	BLD710	BLD711	BLD712	BLD713	BLD714	BLD715	BLD716	BLD717	BLD718	BLD719	BLD720	BLD721	BLD722	BLD723	BLD724	BLD725	BLD726	BLD727	BLD728	BLD729	BLD730	BLD731	BLD732	BLD733	BLD734	BLD735	BLD736	BLD737	BLD738	BLD739	BLD740	BLD741	BLD742	BLD743	BLD744	BLD745	BLD746	BLD747	BLD748	BLD749	BLD750	BLD751	BLD752	BLD753	BLD754	BLD755	BLD756	BLD757	BLD758	BLD759	BLD760	BLD761	BLD762	BLD763	BLD764	BLD765	BLD766	BLD767	BLD768	BLD769	BLD770	BLD771	BLD772	BLD773	BLD774	BLD775	BLD776	BLD777	BLD778	BLD779	BLD780	BLD781	BLD782	BLD783	BLD784	BLD785	BLD786	BLD787	BLD788	BLD789	BLD790	BLD791	BLD792	BLD793	BLD794	BLD795	BLD796	BLD797	BLD798	BLD799	BLD800	BLD801	BLD802	BLD803	BLD804	BLD805	BLD806	BLD807	BLD808	BLD809	BLD810	BLD811	BLD812	BLD813	BLD814	BLD815	BLD816	BLD817	BLD818	BLD819	BLD820	BLD821	BLD822	BLD823	BLD824	BLD825	BLD826	BLD827	BLD828	BLD829	BLD830	BLD831	BLD832	BLD833	BLD834	BLD835	BLD836	BLD837	BLD838	BLD839	BLD840	BLD841	BLD842	BLD843	BLD844	BLD845	BLD846	BLD847	BLD848	BLD849	BLD850	BLD851	BLD852	BLD853	BLD854	BLD855	BLD856	BLD857	BLD858	BLD859	BLD860	BLD861	BLD862	BLD863	BLD864	BLD865	BLD866	BLD867	BLD868	BLD869	BLD870	BLD871	BLD872	BLD873	BLD874	BLD875	BLD876	BLD877	BLD878	BLD879	BLD880	BLD881	BLD882	BLD883	BLD884	BLD885	BLD886	BLD887	BLD888	BLD889	BLD890	BLD891	BLD892	BLD893	BLD894	BLD895	BLD896	BLD897	BLD898	BLD899	BLD900	BLD901	BLD902	BLD903	BLD904	BLD905	BLD906	BLD907	BLD908	BLD909	BLD910	BLD911	BLD912	BLD913	BLD914	BLD915	BLD916	BLD917	BLD918	BLD919	BLD920	BLD921	BLD922	BLD923	BLD924	BLD925	BLD926	BLD927	BLD928	BLD929	BLD930	BLD931	BLD932	BLD933	BLD934	BLD935	BLD936	BLD937	BLD938	BLD939	BLD940	BLD941	BLD942	BLD943	BLD944	BLD945	BLD946	BLD947	BLD948	BLD949	BLD950	BLD951	BLD952	BLD953	BLD954	BLD955	BLD956	BLD957	BLD958	BLD959	BLD960	BLD961	BLD962	BLD963	BLD964	BLD965	BLD966	BLD967	BLD968	BLD969	BLD970	BLD971	BLD972	BLD973	BLD974	BLD975	BLD976	BLD977	BLD978	BLD979	BLD980	BLD981	BLD982	BLD983	BLD984	BLD985	BLD986	BLD987	BLD988	BLD989	BLD990	BLD991	BLD992	BLD993	BLD994	BLD995	BLD996	BLD997	BLD998	BLD999	BLD1000	BLD1001	BLD1002	BLD1003	BLD1004	BLD1005	BLD1006	BLD1007	BLD1008	BLD1009	BLD1010	BLD1011	BLD1012	BLD1013	BLD1014	BLD1015	BLD1016	BLD1017	BLD1018	BLD1019	BLD1020	BLD1021	BLD1022	BLD1023	BLD1024	BLD1025	BLD1026	BLD1027	BLD1028	BLD1029	BLD1030	BLD1031	BLD1032	BLD1033	BLD1034	BLD1035	BLD1036	BLD1037	BLD1038	BLD1039	BLD1040	BLD1041	BLD1042	BLD1043	BLD1044	BLD1045	BLD1046	BLD1047	BLD1048	BLD1049	BLD1050	BLD1051	BLD1052	BLD1053	BLD1054	BLD1055	BLD1056	BLD1057	BLD1058	BLD1059	BLD1060	BLD1061	BLD1062	BLD1063	BLD1064	BLD1065	BLD1066	BLD1067	BLD1068	BLD1069	BLD1070	BLD1071	BLD1072	BLD1073	BLD1074	BLD1075	BLD1076	BLD1077	BLD1078	BLD1079	BLD1080	BLD1081	BLD1082	BLD1083	BLD1084	BLD1085	BLD1086	BLD1087	BLD1088	BLD1089	BLD1090	BLD1091	BLD1092	BLD1093	BLD1094	BLD1095	BLD1096	BLD1097	BLD1098	BLD1099	BLD1100	BLD1101	BLD1102	BLD1103	BLD1104	BLD1105	BLD1106	BLD1107	BLD1108	BLD1109	BLD1110	BLD1111	BLD1112	BLD1113	BLD1114	BLD1115	BLD1116	BLD1117	BLD1118	BLD1119	BLD1120	BLD1121	BLD1122	BLD1123	BLD1124	BLD1125	BLD1126	BLD1127	BLD1128	BLD1129	BLD1130	BLD1131	BLD1132	BLD1133	BLD1134	BLD1135	BLD1136	BLD1137	BLD1138	BLD1139	BLD1140	BLD1141	BLD1142	BLD1143	BLD1144	BLD1145	BLD1146	BLD1147	BLD1148	BLD1149	BLD1150	BLD1151	BLD1152	BLD1153	BLD1154	BLD1155	BLD1156	BLD1157	BLD1158	BLD1159	BLD1160	BLD1161	BLD1162	BLD1163	BLD1164	BLD1165	BLD1166	BLD1167	BLD1168	BLD1169	BLD1170	BLD1171	BLD1172	BLD1173	BLD1174	BLD1175	BLD1176	BLD1177	BLD1178	BLD1179	BLD1180	BLD1181	BLD1182	BLD1183	BLD1184	BLD1185	BLD1186	BLD1187	BLD1188	BLD1189	BLD1190	BLD1191	BLD1192	BLD1193	BLD1194	BLD1195	BLD1196	BLD1197	BLD1198	BLD1199	BLD1200	BLD1201	BLD1202	BLD1203	BLD1204	BLD1205	BLD1206
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FIGURE NUMBER ALPHA

PERFORMANCE

**Y
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S**

DESIGN FROM 30.0 TO 35.0

LEVEL 1

PERSONNEL

	431F1	462X0	PILOT	46150	46159	46158	46158	OTHER
TOTAL	240.00	240.00	240.00	240.00	240.00	240.00	240.00	0.
1680.00	2.00	1.12	6.58	.23	.43	1.42	3.41	0.
27 MANHOURS AVAILABLE (100)	33.58	2.69	11.00	.55	1.04	3.89	8.19	0.
28 PERCENT UTILIZATION	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
29 MANHOURS USED (100)	0.	0.	0.	0.	0.	0.	0.	0.
30 PCT UNSCHED MAINT. OF STAT 29	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
31 PCT SCHED MAINT. OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
32 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
33 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
34 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
35 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
36 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
37 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
38 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
39 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
40 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
41 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
42 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
43 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
44 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
45 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
46 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
47 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
48 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
49 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
50 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
51 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
52 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
53 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
54 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
55 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
56 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
57 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
58 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
59 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
60 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
61 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
62 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
63 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
64 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
65 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
66 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
67 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
68 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
69 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
70 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
71 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
72 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
73 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
74 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
75 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
76 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
77 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
78 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
79 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
80 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
81 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
82 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
83 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
84 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
85 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
86 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
87 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
88 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
89 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
90 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
91 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
92 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
93 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
94 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
95 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
96 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
97 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
98 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
99 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
100 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.

	431F1	462X0	PILOT	46150	46159	46158	46158	OTHER
TOTAL	240.00	240.00	240.00	240.00	240.00	240.00	240.00	0.
1680.00	2.00	1.12	6.58	.23	.43	1.42	3.41	0.
27 MANHOURS AVAILABLE (100)	33.58	2.69	11.00	.55	1.04	3.89	8.19	0.
28 PERCENT UTILIZATION	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
29 MANHOURS USED (100)	0.	0.	0.	0.	0.	0.	0.	0.
30 PCT UNSCHED MAINT. OF STAT 29	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
31 PCT SCHED MAINT. OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
32 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
33 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
34 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
35 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
36 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
37 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
38 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
39 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
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41 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
42 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
43 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
44 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
45 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
46 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
47 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
48 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
49 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
50 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
51 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
52 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
53 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
54 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
55 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
56 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
57 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
58 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
59 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
60 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
61 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
62 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
63 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
64 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
65 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
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73 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
74 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
75 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
76 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
77 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
78 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
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28 PERCENT UTILIZATION	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
29 MANHOURS USED (100)	0.	0.	0.	0.	0.	0.	0.	0.
30 PCT UNSCHED MAINT. OF STAT 29	100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
31 PCT SCHED MAINT. OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
32 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
33 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
34 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
35 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
36 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
37 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
38 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
39 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
40 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
41 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
42 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
43 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
44 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
45 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
46 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.
47 PCT SUBSTITUTE OF STAT 29	0.	0.	0.	0.	0.	0.	0.	0.

PERIOD FROM 30.0 TO 35.0 LEVEL 1

PERFORMANCE SUMMARY

BUN NUMBER ALPHA

S U P P L Y

	TOTAL	BLD41	BLD45	PKB2	82FIN	82FUS	20MD1	20MD3	20MD4	BLRBI
4 TOT DOLLAR INVEST. (1000)(EOP)	418093.01	19980.00	19980.00	19980.00	19980.00	19980.00	240.00	0.	240.00	19980.00
5 FILL RATE PERCENT	95.25	0.	0.	0.	0.	0.	87.18	0.	98.47	100.00
6 NUMBER OF BACKORDER-DAYS	278.61	0.	0.	0.	0.	0.	10.02	0.	10.02	0.
7 NUMBER OF UNITS DEMANDED	2567.00	0.	0.	6.00	4.00	5.00	39.00	0.	327.00	28.00
8 PCT OFF-THE-SHELF	95.25	0.	0.	100.00	100.00	100.00	87.18	0.	98.47	100.00
9 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
10 PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
11 PCT DEMANDS NOT SATIS.	4.75	0.	0.	0.	0.	0.	12.82	0.	1.53	0.
12 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
13 NO. ITEMS ON BACKORDER (EOP)	122.00	0.	0.	0.	0.	0.	5.00	0.	5.00	0.

S U P P L Y

	TOTAL	BLD42	BLD43	BLD44	P20MM	AIM9C	AIM9E	AIM9	BL9C1	PAIR9	HOL9A
14 TOT DOLLAR INVEST. (1000)(EOP)	418093.01	19980.00	19980.00	19980.00	19980.00	0.	120.00	120.00	100.00	100.00	100.00
15 FILL RATE PERCENT	95.25	0.	0.	0.	0.	0.	72.60	96.92	100.00	100.00	100.00
16 NUMBER OF BACKORDER-DAYS	278.61	0.	0.	0.	0.	0.	45.02	45.02	0.	0.	0.
17 NUMBER OF UNITS DEMANDED	2567.00	0.	0.	0.	1.00	0.	73.00	649.00	24.00	4.00	340.00
18 PCT OFF-THE-SHELF	95.25	0.	0.	0.	100.00	0.	72.60	96.92	100.00	100.00	100.00
19 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
20 PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
21 PCT DEMANDS NOT SATIS.	4.75	0.	0.	0.	0.	0.	27.40	3.08	0.	0.	0.
22 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
23 NO. ITEMS ON BACKORDER (EOP)	122.00	0.	0.	0.	0.	0.	20.00	20.00	0.	0.	0.

S U P P L Y

	TOTAL	HOLDB	HOLDC	HOLDD	HOLDE	OTHER
24 TOT DOLLAR INVEST. (1000)(EOP)	418093.01	19020.00	19980.00	19500.00	19860.00	0.
25 FILL RATE PERCENT	95.25	0.	0.	0.	100.00	0.
26 NUMBER OF BACKORDER-DAYS	278.61	0.	0.	0.	0.	0.
27 NUMBER OF UNITS DEMANDED	2567.00	0.	0.	56.00	41.00	0.
28 PCT OFF-THE-SHELF	95.25	0.	0.	100.00	100.00	0.
29 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.
30 PCT PREEMPTION	0.	0.	0.	0.	0.	0.
31 PCT DEMANDS NOT SATIS.	4.75	0.	0.	0.	0.	0.
32 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.
33 NO. ITEMS ON BACKORDER (EOP)	122.00	0.	0.	0.	0.	0.

RUN NUMBER ALPHA

R E S O U R C E D A T A (ITEM)

SIMULATION TIME = 15.000000

RES. NUMBER	REPORT COLUMN	RES. TYPE	NO. OF SUBST.	RES. COST	AUTH. QUAN.	ON HAND BAL.	DUE IN BAL.	DUE OUT BAL.	NO. OF DEMANDS	CUTL. FACTOR	UTIL. OR USMP.	LAST TIME OF UPDATE
1	1	AIRCRAFT	0	15000.0	24	0	31	7	31	-105.0	0.0	13.0
2	1	MAN	0	10000.0	200	191	9	0	0	0.0	0.0	1.0
3	2	MAN	0	10000.0	200	200	0	0	0	0.0	0.0	2.0
4	3	MAN	0	10000.0	200	182	18	0	0	0.0	0.0	3.0
5	4	MAN	0	10000.0	200	199	1	0	0	0.0	0.0	4.0
6	5	MAN	1	10000.0	200	198	2	0	0	0.0	0.0	5.0
7	6	MAN	0	10000.0	200	191	9	0	0	0.0	0.0	6.0
8	7	MAN	1	10000.0	200	184	16	0	0	0.0	0.0	7.0
9	2	PART	0	20000.0	0	0	0	0	204	256.7	0.0	13.0
10	3	PART	0	20000.0	12	0	0	0	12	2.4	0.0	13.0
11	4	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
12	5	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
13	6	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
14	7	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
15	8	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
16	9	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
17	10	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
18	11	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
19	12	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
20	13	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
21	14	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
22	15	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
23	16	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
24	17	PART	0	20000.0	6	0	0	0	9310	377.3	0.0	13.0
25	18	PART	0	18992.0	999	924	0	0	2726	14106.2	0.0	13.0
26	19	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
27	20	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
28	21	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
29	22	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
30	23	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
31	24	PART	0	20000.0	999	905	0	0	94	14245.7	0.0	13.0
32	25	PART	0	20000.0	999	934	0	0	45	14442.9	0.0	13.0
33	26	PART	0	20000.0	999	979	0	0	20	14809.5	0.0	13.0
34	27	PART	0	20000.0	999	955	0	0	44	14639.3	0.0	13.0
35	28	PART	0	20000.0	12	0	0	0	190	118.2	0.0	13.0
36	29	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
37	30	PART	0	20000.0	12	0	0	0	486	282.6	0.0	13.0
38	31	PART	0	20000.0	999	971	0	0	392	14737.8	0.0	13.0
39	32	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
40	33	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
41	34	PART	0	20000.0	999	999	0	0	0	14985.0	0.0	13.0
42	35	PART	0	20000.0	999	985	0	0	14	14872.9	0.0	13.0
43	36	PART	0	20000.0	0	0	0	0	0	0.0	0.0	13.0
44	37	PART	0	20000.0	6	0	2	0	358	196.7	0.0	13.0
45	38	PART	0	20000.0	6	0	0	0	8950	395.4	0.0	13.0
46	39	PART	0	20000.0	999	999	0	0	378	14892.3	0.0	13.0
47	40	PART	0	20000.0	999	936	0	0	63	14489.1	0.0	13.0
48	41	PART	0	20000.0	999	927	0	0	2888	13886.3	0.0	13.0
49	42	PART	0	20000.0	951	999	0	0	0	14974.7	0.0	13.0
					999	999	0	0	0	14985.0	0.0	13.0

50	63	PART	0	20000.0	975	993	0	0	0	364	14739.4	0.	0	15.0
51	64	PART	0	20000.0	993	985	0	0	0	366	14779.1	0.	0	15.0
52	1	AGE	2	20000.0	999	999	0	0	0	1087	14971.2	0.	0	15.0
53	2	AGE	0	20000.0	999	999	0	0	0	156	14970.5	0.	0	15.0
54	3	AGE	0	20000.0	999	999	0	0	0	151	14966.4	0.	0	15.0
55	4	AGE	0	20000.0	999	998	0	0	0	195	14960.2	0.	0	15.0
56	5	AGE	0	20000.0	999	999	0	0	0	106	14976.9	0.	0	15.0
57	6	AGE	2	20000.0	999	999	0	0	0	300	14969.9	0.	0	15.0
58	7	AGE	2	20000.0	999	999	0	0	0	0	14985.0	0.	0	15.0
59	8	AGE	2	20000.0	999	999	0	0	0	1	14985.0	0.	0	15.0
60	9	AGE	3	20000.0	999	996	3	0	0	826	14946.9	0.	0	15.0
61	11	AGE	2	20000.0	999	997	2	0	0	499	14961.1	0.	0	15.0
62	12	AGE	2	20000.0	999	999	0	0	0	4	14984.8	0.	0	15.0
63	13	AGE	2	20000.0	999	999	0	0	0	4	14984.9	0.	0	15.0
64	10	AGE	0	20000.0	999	999	0	0	0	6	14984.7	0.	0	15.0
65	14	AGE	1	20000.0	999	997	2	0	0	1103	14971.0	0.	0	15.0
66	21	AGE	0	20000.0	999	999	0	0	0	0	14985.0	0.	0	15.0
67	15	AGE	0	20000.0	999	999	0	0	0	4	14984.8	0.	0	15.0
68	16	AGE	0	28992.0	999	991	0	0	0	1274	14734.8	0.	0	15.0
69	17	AGE	0	20000.0	999	999	0	0	0	2	14984.9	0.	0	15.0
70	18	AGE	0	20000.0	999	999	0	0	0	2	14984.9	0.	0	15.0
71	19	AGE	0	20000.0	999	999	0	0	0	1	14985.0	0.	0	15.0
72	20	AGE	0	20000.0	999	999	0	0	0	15	14985.0	0.	0	15.0
73	65	OTHER	0	1.0	9999	12337	7	0	0	0	0.	0.	0	0.

SIMULATION TIME = 30.000000

RESOURCE DATA (ITEM)

BUN NUMBER ALPHA

RES. NUMBER	REPORT COLUMN	RES. TYPE	NO. OF SUBST.	RES. COST	AUTH. QUAN	ON HAND	E IN BAL.	BUE QUT. BAL.	NO. OF DEMANDS	CUTL. FACTOR	UTIL. OR USMP.	LAST TIME OF UPDATE
1	1	AIRCRAFT	0	15000.0	24	197	31	0	31	-210.0	0.0	0.0
2	1	MAN	0	10000.0	200	184	16	0	0	0.0	0.0	0.0
3	2	MAN	0	10000.0	200	182	18	0	0	0.0	0.0	0.0
4	3	MAN	0	10000.0	200	197	3	0	0	0.0	0.0	0.0
5	4	MAN	0	10000.0	200	195	5	0	0	0.0	0.0	0.0
6	5	MAN	0	10000.0	200	190	10	0	0	0.0	0.0	0.0
7	6	MAN	0	10000.0	200	180	20	0	0	0.0	0.0	0.0
8	7	MAN	0	10000.0	200	122	11	0	1430	522.0	0.0	0.0
9	2	PART	0	20000.0	12	0	0	0	12	2.4	0.0	0.0
10	3	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
11	4	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
12	5	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
13	6	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
14	7	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
15	8	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
16	9	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
17	10	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
18	11	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
19	12	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
20	13	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
21	14	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
22	15	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
23	16	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
24	17	PART	0	20000.0	0	0	0	0	1875	733.9	0.0	0.0
25	18	PART	0	18992.0	999	912	0	0	5281	28236.8	0.0	0.0
26	19	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
27	20	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
28	21	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
29	22	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
30	23	PART	0	20000.0	999	814	0	0	183	27160.3	0.0	0.0
31	24	PART	0	20000.0	999	879	0	0	120	28073.8	0.0	0.0
32	25	PART	0	20000.0	999	962	0	0	37	29340.2	0.0	0.0
33	26	PART	0	20000.0	999	917	0	0	82	28697.8	0.0	0.0
34	27	PART	0	20000.0	12	0	0	0	370	227.2	0.0	0.0
35	28	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
36	29	PART	0	20000.0	12	0	0	0	9022	551.2	0.0	0.0
37	30	PART	0	20000.0	999	999	0	0	756	29489.5	0.0	0.0
38	31	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
39	32	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
40	33	PART	0	20000.0	999	999	0	0	0	29970.0	0.0	0.0
41	34	PART	0	20000.0	999	972	0	0	27	29558.4	0.0	0.0
42	35	PART	0	20000.0	0	0	0	0	0	0.0	0.0	0.0
43	36	PART	0	20000.0	6	0	1	0	721	403.2	0.0	0.0
44	37	PART	0	20000.0	999	999	0	0	10025	704.7	0.0	0.0
45	38	PART	0	20000.0	999	999	0	0	744	29789.1	0.0	0.0
46	39	PART	0	20000.0	999	875	0	0	126	28077.1	0.0	0.0
47	40	PART	0	20000.0	999	999	0	0	3773	27216.7	0.0	0.0
48	41	PART	0	20000.0	951	999	0	0	0	29959.7	0.0	0.0
49	42	PART	0	20000.0	599	999	0	0	0	29970.0	0.0	0.0

50	63	PART	0	20000.0	975	987	0	0	0	728	29497.1	0.	0	30.0
51	64	PART	0	20000.0	995	987	0	0	0	727	29526.7	0.	0	30.0
52	1	AGE	2	20000.0	999	998	1	0	0	2178	29942.2	0.	0	30.0
53	2	AGE	0	20000.0	999	998	0	0	0	308	29941.6	0.	0	30.0
54	3	AGE	0	20000.0	999	997	0	0	0	290	29934.1	0.	0	30.0
55	4	AGE	0	20000.0	999	997	0	0	0	383	29921.3	0.	0	30.0
56	5	AGE	0	20000.0	999	998	0	0	0	199	29955.0	0.	0	30.0
57	6	AGE	2	20000.0	999	998	1	0	0	583	29940.7	0.	0	30.0
58	7	AGE	2	20000.0	999	999	0	0	0	1	29970.0	0.	0	30.0
59	8	AGE	2	20000.0	999	999	0	0	0	3	29969.9	0.	0	30.0
60	9	AGE	3	20000.0	999	998	1	0	0	1643	29893.8	0.	0	30.0
61	11	AGE	2	20000.0	999	997	2	0	0	977	29923.2	0.	0	30.0
62	12	AGE	2	20000.0	999	999	0	0	0	7	29969.7	0.	0	30.0
63	13	AGE	2	20000.0	999	999	0	0	0	8	29969.7	0.	0	30.0
64	10	AGE	0	20000.0	999	999	0	0	0	13	29969.4	0.	0	30.0
65	14	AGE	1	20000.0	999	998	1	0	0	2197	29942.0	0.	0	30.0
66	21	AGE	0	20000.0	999	999	0	0	0	0	29970.0	0.	0	30.0
67	15	AGE	0	20000.0	999	999	0	0	0	7	29969.7	0.	0	30.0
68	16	AGE	0	28992.0	999	988	0	0	0	2541	29459.9	0.	0	30.0
69	17	AGE	0	20000.0	999	999	0	0	0	5	29969.8	0.	0	30.0
70	18	AGE	0	20000.0	999	999	0	0	0	5	29969.8	0.	0	30.0
71	19	AGE	0	20000.0	999	999	0	0	0	1	29970.0	0.	0	30.0
72	20	AGE	0	20000.0	999	999	0	0	0	30	29970.0	0.	0	30.0
73	65	OTHER	0	1.0	9999	12884	1	0	0	0	0.	0.	0	0.

RUN NUMBER ALPHA

RESOURCE DATA (ITEM)

SIMULATION TIME = 40.000000

RES. NUMBER	REPORT COLUMN	RES. TYPE	NO. OF SUBST.	RES. COST	AUTH. QUAN	ON HAND BAL.	DUE IN BAL.	DUE OUT BAL.	NO. OF DEMANDS	CUTIL. FACTOR	UTIL. OR USMP.	LAST TIME OF UPDATE
1	1	AIRCRAFT	0	15000.0	24	0	31	7	31	-280.0	0.	40.0
2	1	MAN	0	10000.0	200	200	0	0	0	0.	0.	0.
3	2	MAN	0	10000.0	200	200	0	0	0	0.	0.	0.
4	3	MAN	0	10000.0	200	200	0	0	0	0.	0.	0.
5	4	MAN	0	10000.0	200	200	0	0	0	0.	0.	0.
6	5	MAN	1	10000.0	200	200	0	0	0	0.	0.	0.
7	6	MAN	0	10000.0	200	200	0	0	0	0.	0.	0.
8	7	MAN	1	10000.0	200	200	0	0	0	0.	0.	0.
9	2	PART	0	20000.0	0	0	0	49	0	0.	0.	0.
10	3	PART	0	20000.0	12	0	0	48	1574	20.9	0.	40.0
11	4	PART	0	20000.0	0	0	0	0	12	2.4	0.	40.0
12	5	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
13	6	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
14	7	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
15	8	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
16	9	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
17	10	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
18	11	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
19	12	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
20	13	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
21	14	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
22	15	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
23	16	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
24	17	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
25	18	PART	0	18992.0	999	999	0	24	19394	621.0	0.	40.0
26	19	PART	0	20000.0	999	999	0	0	5539	38156.4	0.	40.0
27	20	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
28	21	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
29	22	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
30	23	PART	0	20000.0	999	803	0	0	191	35233.9	0.	40.0
31	24	PART	0	20000.0	999	875	0	0	124	36823.9	0.	40.0
32	25	PART	0	20000.0	999	961	0	0	38	38930.4	0.	40.0
33	26	PART	0	20000.0	999	912	0	0	87	37820.6	0.	40.0
34	27	PART	0	20000.0	12	0	0	3	409	213.5	0.	40.0
35	28	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
36	29	PART	0	20000.0	12	0	0	3	9349	537.3	0.	40.0
37	30	PART	0	20000.0	999	999	0	0	784	39432.4	0.	40.0
38	31	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
39	32	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
40	33	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0
41	34	PART	0	20000.0	999	971	0	0	28	39269.4	0.	40.0
42	35	PART	0	20000.0	0	0	0	0	0	0.	0.	40.0
43	36	PART	0	20000.0	6	0	0	20	794	288.9	0.	40.0
44	37	PART	0	20000.0	6	0	0	20	18674	697.5	0.	40.0
45	38	PART	0	20000.0	999	999	0	0	748	39770.5	0.	40.0
46	39	PART	0	20000.0	999	871	0	0	126	34789.9	0.	40.0
47	40	PART	0	20000.0	999	999	0	0	6112	37577.9	0.	40.0
48	41	PART	0	20000.0	999	999	0	0	0	39949.7	0.	40.0
49	42	PART	0	20000.0	999	999	0	0	0	39900.0	0.	40.0

50	43	PART	0	20000.0	975	999	0	0	0	784	39443.0	0.0	0	40.0
51	44	PART	0	20000.0	993	999	0	0	0	768	39306.7	0.0	0	40.0
52	1	AGE	2	20000.0	999	999	0	24	0	2540	39754.2	0.0	0	40.0
53	2	AGE	0	20000.0	999	999	0	0	0	320	39630.4	0.0	0	40.0
54	3	AGE	0	20000.0	999	999	0	0	0	301	39922.8	0.0	0	40.0
55	4	AGE	0	20000.0	999	999	0	0	0	396	39909.5	0.0	0	40.0
56	5	AGE	0	20000.0	999	999	0	0	0	207	39944.4	0.0	0	40.0
57	6	AGE	2	20000.0	999	999	0	0	0	603	39929.7	0.0	0	40.0
58	7	AGE	2	20000.0	999	999	0	0	0	1	39940.0	0.0	0	40.0
59	8	AGE	2	20000.0	999	999	0	0	0	4	39959.8	0.0	0	40.0
60	9	AGE	3	20000.0	999	999	0	0	0	1239	39879.4	0.0	0	40.0
61	11	AGE	2	20000.0	999	999	0	0	0	1029	39910.8	0.0	0	40.0
62	12	AGE	2	20000.0	999	999	0	0	0	10	39959.6	0.0	0	40.0
63	13	AGE	2	20000.0	939	999	0	0	0	10	39939.7	0.0	0	40.0
64	10	AGE	0	20000.0	999	999	0	0	0	17	39939.2	0.0	0	40.0
65	14	AGE	1	20000.0	999	999	0	25	0	2582	39719.9	0.0	0	40.0
66	21	AGE	0	20000.0	999	999	0	0	0	0	39960.0	0.0	0	40.0
67	15	AGE	0	20000.0	999	999	0	0	0	9	39959.6	0.0	0	40.0
68	16	AGE	0	28992.0	999	1029	0	0	0	2694	39649.3	0.0	0	40.0
69	17	AGE	0	20000.0	999	999	0	0	0	6	39959.7	0.0	0	40.0
70	18	AGE	0	20000.0	999	999	0	0	0	6	39959.7	0.0	0	40.0
71	19	AGE	0	20000.0	999	999	0	0	0	1	39960.0	0.0	0	40.0
72	20	AGE	0	20000.0	999	999	0	0	0	30	39960.0	0.0	0	40.0
73	65	OTHER	C	1.0	9999	13350	1	0	0	0	0.0	0.0	0	0.0

First Constrained Simulation results

CNGFILE1

AS OF:
04/04/81

AUTH	1	24.0
AUTH	9	6.0
AUTH	10	6.0
AUTH	11	6.0
AUTH	12	0.0
AUTH	13	0.0
AUTH	14	0.0
AUTH	15	0.0
AUTH	16	0.0
AUTH	17	0.0
AUTH	18	0.0
AUTH	19	0.0
AUTH	20	0.0
AUTH	21	0.0
AUTH	22	0.0
AUTH	23	0.0
AUTH	24	18.0
AUTH	25	35.0
AUTH	26	35.0
AUTH	27	35.0
AUTH	28	35.0
AUTH	29	35.0
AUTH	34	10.0
AUTH	35	0.0
AUTH	36	10.0
AUTH	37	28.0
AUTH	38	0.0
AUTH	39	0.0
AUTH	40	0.0
AUTH	42	9.0
AUTH	43	9.0
AUTH	44	18.0
AUTH	45	24.0
AUTH	47	36.0
AUTH	48	48.0
AUTH	49	48.0
AUTH	50	48.0
AUTH	51	48.0
AUTH	52	17.0
AUTH	53	38.0
AUTH	54	38.0
AUTH	55	10.0
AUTH	56	10.0
AUTH	57	7.0
AUTH	58	7.0
AUTH	59	6.0
AUTH	60	10.0
AUTH	61	26.0
AUTH	62	26.0
AUTH	63	26.0
AUTH	65	30.0
AUTH	66	13.0

CNGFILE1

AS OF:
04/04/81

AUTH	67	30.0
AUTH	68	28.0
AUTH	69	28.0
AUTH	70	28.0
SAUTH	5	1.0
SAUTH	5	2.0
SAUTH	5	3.0
SAUTH	6	1.0
SAUTH	6	2.0
SAUTH	6	3.0
SAUTH	7	1.0
SAUTH	7	2.0
SAUTH	7	3.0
SAUTH	8	1.0
SAUTH	8	2.0
SAUTH	8	3.0

3
3
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6
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14
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27
27

PIPE RESOURCE REQUIREMENTS IN EXCESS OF ONHAND BALANCE

RES - 1A - CCKBUEZ JITH 66153 AS A PRIME RESOURCE

ALL INFORMATION CONTAINED
HEREIN IS UNCLASSIFIED
DATE 01-21-2001 BY 60322 UCBAW

PRIME RESERVE REQUIREMENTS IN EXCESS OF ONHAND BALANCE[illegible]

TASKS IN BACKLOG WITH 46155 AS A PRIME RESOURCE

[illegible]

NO DATA IN SUBSTITUTE JACKSONEN GRAPH

PERSONNEL
27 MANHOURS AVAILABLE (100)
28 PERCENT UTILIZATION
29 MANHOURS USED (100)
30 PCT UNSCHED MAINT. OF STAT 29
31 PCT SCAGS MAINT. OF STAT 29
32 PCT PRIME OF STAT 29
33 PCT SUBSTITUTE OF STAT 29
34 NUMBER OF MEN DEMANDED
35 NUMBER OF MEN DEMANDED POST SCAN
36 2 AVAIL BY OM. BAL. OF RES
37 2 AVAIL BY GEN SUBS OF RES
38 2 AVAIL BY EXPEDITE PROC.
39 2 AVAIL BY PREEMPTION PRCC.
40 2 DEMANDS NOT AVAIL FOR RES
41 OVERTIME HANNOURS USED (100)
42 SIMULATED AM PER FLYING HOUR

431F1	462X0	PILOT	461S0	461S3	461C0	461C3	OTHER
TOTAL	1440.00	1440.00	21.60	43.20	93.60	201.60	0.
4680.00	1440.00	1440.00	21.60	43.20	93.60	201.60	0.
10.25	4.11	8.66	68.61	64.65	73.76	72.82	0.
479.71	37.27	124.67	14.82	27.93	69.04	146.80	0.
100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
0.	0.	0.	0.	0.	0.	0.	0.
100.00	100.00	100.00	100.00	100.00	100.00	100.00	0.
0.	0.	0.	0.	0.	0.	0.	0.
37383.00	3493.00	7122.00	1049.00	2815.00	8078.00	13474.00	0.
57583.00	3493.00	7122.00	1049.00	2815.00	8078.00	13474.00	0.
95.73	100.00	100.00	84.07	82.81	93.82	97.44	0.
-.07	0.	0.	0.	0.	0.	-.19	0.
-.97	0.	0.	0.	0.	3.51	-.59	0.
-.01	0.	0.	0.	0.	-.02	-.01	0.
3.22	0.	0.	0.	0.	2.64	1.77	0.
-.02	0.	0.	0.	0.	-.02	-.01	0.
0.	0.	0.	0.	0.	0.	0.	0.

S M O P R E P A I R
44 NO. OF REPAIRABLE GENERATIONS
45 PCT BASE REPAIR
46 PCT DEPOT REPAIR
47 AVERAGE BASE REPAIR CYCLE
48 PCT ACTIVE REPAIR
49 PCT WHITE SPACE
50 NO. OF ITEMS IN REPAIR (EOP)
51 NO. OF ITEMS JACKLOGGED (EOP)

OTHER	M82A1	M8231	M82C1	M8201	M82E1	M82A2	M8202	M82C2	M8202
TOTAL	1384.00	47.00	0.	0.	0.	0.	0.	0.	0.
16134.00	1384.00	47.00	0.	0.	0.	0.	0.	0.	0.
100.00	100.00	100.00	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.00	1.00	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S M O P R E P A I R
44 NO. OF REPAIRABLE GENERATIONS
45 PCT BASE REPAIR
46 PCT DEPOT REPAIR
47 AVERAGE BASE REPAIR CYCLE
48 PCT ACTIVE REPAIR
49 PCT WHITE SPACE
50 NO. OF ITEMS IN REPAIR (EOP)
51 NO. OF ITEMS JACKLOGGED (EOP)

M82E2	M82A3	M8203	M82C3	M8203	M82E3	M8202	AL9A1	WL9A2	BL9A3
TOTAL	0.	0.	0.	0.	0.	0.	0.	0.	0.
18134.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S M O P R E P A I R
44 NO. OF REPAIRABLE GENERATIONS
45 PCT BASE REPAIR
46 PCT DEPOT REPAIR
47 AVERAGE BASE REPAIR CYCLE
48 PCT ACTIVE REPAIR
49 PCT WHITE SPACE
50 NO. OF ITEMS IN REPAIR (EOP)
51 NO. OF ITEMS JACKLOGGED (EOP)

BL9A4	WL9A5	PK952	82FIM	82JST	82FUS	20MD1	20MB1	20MM	BL9B1
TOTAL	493.00	87.00	0.	0.	0.	360.00	0.	364.00	700.00
18134.00	493.00	87.00	0.	0.	0.	360.00	0.	364.00	700.00
100.00	100.00	100.00	0.	0.	0.	100.00	0.	100.00	100.00
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.00	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

RUN NUMBER ALPHA

S H O P R E P A I R		P E R F O R M A N C E S U M M A R Y										P E R I O D F R O M 0. TO 30.0		L E V E L 2				
44 NO. OF REPAIRABLE GENERATIONS	45 PCT BASE REPAIR	46 PCT DEPOT REPAIR	47 AVERAGE BASE REPAIR CYCLE	48 PCT ACTIVE REPAIR	49 PCT WHITE SPACE	50 NO. OF ITEMS IN REPAIR (EOP)	51 NO. OF ITEMS BACKLOGGED (EOP)	TOTAL	DLDB2	WLBUS	BLD34	P20MM	AIM9C	AIM9E	AIM9	4L9C1	PAIM9	MOL9A
18134.00	100.00	0.	0.	0.	0.	0.	0.	18134.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	5504.00
100.00	0.	0.	0.	0.	0.	0.	0.	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	100.00
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
100.00	0.	0.	0.	0.	0.	0.	0.	100.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	100.00
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
1.00	0.	0.	0.	0.	0.	0.	0.	1.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S H O P R E P A I R

44 NO. OF REPAIRABLE GENERATIONS	45 PCT BASE REPAIR	46 PCT DEPOT REPAIR	47 AVERAGE BASE REPAIR CYCLE	48 PCT ACTIVE REPAIR	49 PCT WHITE SPACE	50 NO. OF ITEMS IN REPAIR (EOP)	51 NO. OF ITEMS BACKLOGGED (EOP)	TOTAL	HOLDB	HOLDC	HOLDD	HOLDE	OTHER
18134.00	100.00	0.	0.	0.	0.	0.	0.	18134.00	168.00	26.00	722.00	710.00	0.
100.00	0.	0.	0.	0.	0.	0.	0.	100.00	100.00	100.00	100.00	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
100.00	0.	0.	0.	0.	0.	0.	0.	100.00	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	
1.00	0.	0.	0.	0.	0.	0.	0.	1.00	0.	0.	0.	0.	
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	

S U P P L Y

54 TOT DOLLAR INVEST. (1000) (EOP)	55 FILL RATE PERCENT	56 NUMBER OF BACKORDER-DAYS	57 NUMBER OF UNITS DEMANDED	58 PCT OFF-THE-SHELF	59 PCT EXPEDITED REPAIR	60 PCT PREEMPTION	61 PCT DEMANDS NOT SATIS.	62 NUMBER OF CANNIBALIZATIONS	63 NO. ITEMS ON BACKORDER (EOP)	TOTAL	OTHER	M82A1	M8231	M82C1	M82D1	M82E1	M82A2	M82B2	M82C2	M82D2
130604.72	99.51	490.81	62231.00	99.51	0.	0.	0.	0.	0.	130604.72	0.	120.00	120.00	120.00	0.	0.	0.	0.	0.	0.
99.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	99.51	0.	97.24	100.00	100.00	0.	0.	0.	0.	0.	0.
490.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	4.22	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62231.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	1378.00	42.00	6.00	6.00	0.	0.	0.	0.	0.	0.	0.
99.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	97.24	100.00	100.00	100.00	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S U P P L Y

54 TOT DOLLAR INVEST. (1000) (EOP)	55 FILL RATE PERCENT	56 NUMBER OF BACKORDER-DAYS	57 NUMBER OF UNITS DEMANDED	58 PCT OFF-THE-SHELF	59 PCT EXPEDITED REPAIR	60 PCT PREEMPTION	61 PCT DEMANDS NOT SATIS.	62 NUMBER OF CANNIBALIZATIONS	63 NO. ITEMS ON BACKORDER (EOP)	TOTAL	M82E2	M82A3	M82B3	M82C3	M82D3	M82E3	M82A4	M82B4	M82C4	M82D4
130604.72	99.51	490.81	62231.00	99.51	0.	0.	0.	0.	0.	130604.72	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
99.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	99.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
490.81	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62231.00	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
99.51	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

BUY NUMBER ALPHA

PERIOD FROM U. TO 30.0

S U M M A R Y

PERIOD FROM U. TO 30.0

LEVEL 2

S U P P L Y											
	TOTAL	BLDA4	BLDA5	PKB32	82FLW	82OST	82FUS	2UMD1	2OMB1	2OMB1	BL0B1
664 TOT DOLLAR INVEST. (1000) (EOP)	130604.72	700.00	700.00	0019980.00	0019980.00	0019980.00	0019980.00	200.00	0.	2000.00	560.00
555 FILL RATE PERCENT	99.51	100.00	100.00	100.00	100.00	100.00	100.00	98.89	0.	100.00	92.00
660 NUMBER OF BACKORDER-DAYS	490.81	0.	0.	0.	0.	0.	0.	.34	0.	0.	35.12
552 NUMBER OF UNITS DEMANDED	62231.00	493.00	87.00	182.00	107.00	45.00	84.00	361.00	0.	8917.00	700.00
558 PCT OFF-THE-SHELF	99.51	100.00	100.00	100.00	100.00	100.00	100.00	98.89	0.	100.00	92.00
556 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
559 PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
560 PCT DEMANDS NOT SATIS.	.49	0.	0.	0.	0.	0.	0.	1.11	0.	0.	8.00
562 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
563 NO. ITEMS ON BACKORDER (EOP)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S U P P L Y											
54	TOT DOLLAR INVEST. (1000) (EOP)	BLDB2	BLDB3	BLDB4	P20MM	AIM9C	AIM9E	AIM9I	BLDB1	PARM9	MOL9A
55	FILL RATE PERCENT	0.	0.	0.	19980.00	180.00	180.00	360.00	480.00	19930.00	720.00
56	NUMBER OF BACKORDER-DAYS	0.	0.	0.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
57	NUMBER OF UNITS DEMANDED	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
58	PCT OFF-THE-SHELF	0.	0.	0.	26.00	2.00	711.00	1725.00	720.00	120.00	5336.00
59	PCT EXPEDITED REPAIR	0.	0.	0.	100.00	100.00	100.00	100.00	100.00	100.00	100.00
60	PCT PREEMPTION	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
61	PCT DEMANDS NOT SATIS.	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
62	NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
63	NO. ITEMS ON BACKORDER (EOP)	0.	0.	0.	0.	0.	0.	0.	0.	0.	0.

S U P P L Y									
	TOTAL	HOLDB	HOLDBC	HOLDD	HOLDE	OTHER			
54 TOT DOLLAR INVEST. (1000) (EOP)	130606.72	960.00	960.00	960.00	960.00	0.			
55 FILL RATE PERCENT	99.51	100.00	0.	100.00	100.00	0.			
56 NUMBER OF BACKORDER-DAYS	490.81	0.	0.	0.	0.	0.			
57 NUMBER OF UNITS DEMANDED	62231.00	188.00	0.	720.00	710.00	0.			
58 PCT OFF-THE-SHELF	99.51	100.00	0.	100.00	100.00	0.			
59 PCT EXPEDITED REPAIR	0.	0.	0.	0.	0.	0.			
60 PCT PREEMPTION	0.	0.	0.	0.	0.	0.			
61 PCT DEMANDS NOT SATIS.	49	0.	0.	0.	0.	0.			
62 NUMBER OF CANNIBALIZATIONS	0.	0.	0.	0.	0.	0.			
63 NO. ITEMS ON BACKORDER (EOP)	0.	0.	0.	0.	0.	0.			

RUN NUMBER ALPHA	PERFORMANCE	SUMMARY										PERIOD FROM 0. TO 30.0		LEVEL 2
EQUIPMENT														
68	TOT DOLLAR INVEST. (1000) (EOP)	67751.78												JAMES
69	EQUIPMENT HOURS AUTH. (100)	24300.00												
70	EQUIPMENT HOURS AVAIL. (100)	24300.00												
71	PCT USED-UNSCHED MAINT	0.26												
72	PCT USED-SCHED MAINT	0.00												
73	PCT UNUSED	99.74												
74	NUMBER OF BACKORDER-DAYS	1.35												
75	NUMBER OF UNITS DEMANDED	11206.00												
76	PCT AVAILABLE	100.00												
77	PCT PROV. BY EXPEDITE	0.00												
78	PCT PROV. BY PREEMPTION	0.00												
79	PCT DEMANDS NOT SATIS.	0.00												
80	EQUIP HOURS BACKLOG (100) (EOP)	0.00												

RUN NUMBER ALPHA	PERFORMANCE	SUMMARY										PERIOD FROM 0. TO 30.0		LEVEL 2
EQUIPMENT														
68	TOT DOLLAR INVEST. (1000) (EOP)	67751.78												JAMES
69	EQUIPMENT HOURS AUTH. (100)	24300.00												
70	EQUIPMENT HOURS AVAIL. (100)	24300.00												
71	PCT USED-UNSCHED MAINT	0.26												
72	PCT USED-SCHED MAINT	0.00												
73	PCT UNUSED	99.74												
74	NUMBER OF BACKORDER-DAYS	1.35												
75	NUMBER OF UNITS DEMANDED	11206.00												
76	PCT AVAILABLE	100.00												
77	PCT PROV. BY EXPEDITE	0.00												
78	PCT PROV. BY PREEMPTION	0.00												
79	PCT DEMANDS NOT SATIS.	0.00												
80	EQUIP HOURS BACKLOG (100) (EOP)	0.00												

RUN NUMBER ALPHA	PERFORMANCE	SUMMARY										PERIOD FROM 0. TO 30.0		LEVEL 2
EQUIPMENT														
68	TOT DOLLAR INVEST. (1000) (EOP)	67751.78												JAMES
69	EQUIPMENT HOURS AUTH. (100)	24300.00												
70	EQUIPMENT HOURS AVAIL. (100)	24300.00												
71	PCT USED-UNSCHED MAINT	0.26												
72	PCT USED-SCHED MAINT	0.00												
73	PCT UNUSED	99.74												
74	NUMBER OF BACKORDER-DAYS	1.35												
75	NUMBER OF UNITS DEMANDED	11206.00												
76	PCT AVAILABLE	100.00												
77	PCT PROV. BY EXPEDITE	0.00												
78	PCT PROV. BY PREEMPTION	0.00												
79	PCT DEMANDS NOT SATIS.	0.00												
80	EQUIP HOURS BACKLOG (100) (EOP)	0.00												

RES. NUMBER	REPORT COLUMN	RES. TYPE	NO. OF SUGST.	RES. COST	AUTH. QUAN.	ON HAND BAL.	DUE IN SAL.	DUE OUT BAL.	NO. OF DEMANDS	CUTIL. FACTOR	UTIL. OR USHP.	LAST TIME OF UPDATE
1	1	AIRCRAFT	G	15000.0	24	0	31	7	31	-210.0	0.	30.0
2	1	MAN	U	10000.0	200	190	10	0	0	0.	0.	0.
3	2	MAN	U	10000.0	200	200	0	0	0	0.	0.	0.
4	3	MAN	U	10000.0	200	183	17	0	0	0.	0.	0.
5	4	MAN	C	10000.0	3	3	0	0	0	0.	0.	0.
6	5	MAN	U	10000.0	6	6	0	0	0	0.	0.	0.
7	6	MAN	U	10000.0	14	2	12	0	0	0.	0.	0.
8	7	MAN	U	10000.0	50	5	25	0	0	0.	0.	0.
9	2	PART	C	20000.0	6	11	1	0	1578	185.1	0.	30.0
10	3	PART	C	20000.0	6	11	0	0	42	301.4	0.	30.0
11	4	PART	C	20000.0	6	0	0	0	6	2.4	0.	30.0
12	5	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
13	6	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
14	7	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
15	8	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
16	9	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
17	10	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
18	11	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
19	12	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
20	13	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
21	14	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
22	15	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
23	16	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
24	17	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
25	18	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
26	19	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
27	20	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
28	21	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
29	22	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
30	23	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
31	24	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
32	25	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
33	26	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
34	27	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
35	28	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
36	29	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
37	30	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
38	31	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
39	32	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
40	33	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
41	34	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
42	35	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
43	36	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
44	37	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
45	38	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
46	39	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
47	40	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
48	41	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0
49	42	PART	U	20000.0	0	0	0	0	0	0.	0.	30.0

PART	AGE	20000.0	0	20000.0	0	48	50	0	0	720	1526.5	0.0	30.0
43	PART	0	20000.0	0	0	48	50	0	0	720	1526.5	0.0	30.0
44	PART	0	20000.0	0	0	48	50	0	0	710	1500.3	0.0	30.0
51	AGE	2	20000.0	0	2	17	15	0	0	2154	279.3	0.0	30.0
52	AGE	0	20000.0	0	0	38	38	0	0	296	1101.4	0.0	30.0
53	AGE	0	20000.0	0	0	32	32	0	0	283	1093.5	0.0	30.0
54	AGE	0	20000.0	0	0	10	10	0	0	374	238.8	0.0	30.0
55	AGE	0	20000.0	0	0	10	10	0	0	191	278.6	0.0	30.0
56	AGE	2	20000.0	0	0	7	7	0	0	566	160.8	0.0	30.0
57	AGE	2	20000.0	0	0	7	7	0	0	1	210.0	0.0	30.0
58	AGE	2	20000.0	0	0	6	6	0	0	3	179.9	0.0	30.0
59	AGE	3	20000.0	0	0	10	10	0	0	1630	223.8	0.0	30.0
60	AGE	3	20000.0	0	0	26	25	0	0	958	734.1	0.0	30.0
61	AGE	2	20000.0	0	0	26	26	0	0	7	779.7	0.0	30.0
62	AGE	2	20000.0	0	0	26	26	0	0	779.7	779.7	0.0	30.0
63	AGE	2	20000.0	0	0	26	26	0	0	13	29968.5	0.0	30.0
64	AGE	0	20000.0	0	0	999	999	0	0	2158	870.2	0.0	30.0
65	AGE	0	20000.0	0	0	30	29	0	0	0	0	0.0	30.0
21	AGE	0	20000.0	0	0	13	13	0	0	0	0	0.0	30.0
15	AGE	0	20000.0	0	0	30	30	0	0	0	0	0.0	30.0
67	AGE	0	20000.0	0	0	30	30	0	0	0	0	0.0	30.0
68	AGE	0	20000.0	0	0	28	19	0	0	2511	822.8	0.0	30.0
69	AGE	0	20000.0	0	0	28	28	0	0	5	839.8	0.0	30.0
70	AGE	0	20000.0	0	0	28	28	0	0	5	839.8	0.0	30.0
71	AGE	0	20000.0	0	0	999	999	0	0	1	29970.0	0.0	30.0
72	AGE	0	20000.0	0	0	999	999	0	0	30	29970.0	0.0	30.0
73	OTHER	0	1.0	0	7	9999	14664	0	0	0	0.0	0.0	0.0

Second Constrained Simulation Results

CNGFILE2

AS DF:
04/07/81

AUTH	1	24.0
AUTH	9	6.0
AUTH	10	6.0
AUTH	11	6.0
AUTH	12	0.0
AUTH	13	0.0
AUTH	14	0.0
AUTH	15	0.0
AUTH	16	0.0
AUTH	17	0.0
AUTH	18	0.0
AUTH	19	0.0
AUTH	20	0.0
AUTH	21	0.0
AUTH	22	0.0
AUTH	23	0.0
AUTH	24	9.0
AUTH	25	58.0
AUTH	26	58.0
AUTH	27	29.0
AUTH	28	35.0
AUTH	29	35.0
AUTH	34	10.0
AUTH	35	0.0
AUTH	36	10.0
AUTH	37	28.0
AUTH	38	0.0
AUTH	39	0.0
AUTH	40	0.0
AUTH	42	9.0
AUTH	43	9.0
AUTH	44	18.0
AUTH	45	6.0
AUTH	47	8.0
AUTH	48	8.0
AUTH	49	8.0
AUTH	50	34.0
AUTH	51	32.0
AUTH	52	3.0
AUTH	53	2.0
AUTH	54	2.0
AUTH	55	3.0
AUTH	56	2.0
AUTH	57	2.0
AUTH	58	1.0
AUTH	59	1.0
AUTH	60	2.0
AUTH	61	1.0
AUTH	62	1.0
AUTH	63	2.0
AUTH	65	2.0
AUTH	66	1.0

CNGFILE2

AS DF:
04/07/81

AUTH	67	1.0	
AUTH	68	7.0	
AUTH	69	6.0	
AUTH	70	6.0	
SAUTH	5	1.0	5
SAUTH	5	2.0	5
SAUTH	5	3.0	5
SAUTH	6	1.0	8
SAUTH	6	2.0	10
SAUTH	6	3.0	8
SAUTH	7	1.0	14
SAUTH	7	2.0	12
SAUTH	7	3.0	13
SAUTH	8	1.0	30
SAUTH	8	2.0	27
SAUTH	8	3.0	27
TSUB1	32	0.0	33

PERFORMANCE

27 MAJORS AVAILABLE (100)

28 MAJORS UTILIZATION

29 MAJORS USED (100)

30 PCT UNSEEN MAINT. OF STAT 29

31 PCT SCHED MAINT. OF STAT 29

32 PCT PRIME

33 PCT SUBSTITUTE

34 NO. OF GEN DEMANDS

35 NO. OF GEN DEMANDS

36 NO. OF GEN DEMANDS

37 NO. OF GEN DEMANDS

38 NO. OF GEN DEMANDS

39 NO. OF GEN DEMANDS

40 NO. OF GEN DEMANDS

PERFORMANCE

44 NO. OF REPAIRABLE GENERATIONS

45 PCT BASE REPAIR

46 PCT DEPOT REPAIR

47 AVERAGE BASE REPAIR CYCLE

48 PCT ACTIVE REPAIR

49 PCT WHITE SPACE

50 NO. OF ITEMS IN REPAIR (EOP)

51 NO. OF ITEMS JACKLOADED (EOP)

PERFORMANCE

44 NO. OF REPAIRABLE GENERATIONS

45 PCT BASE REPAIR

46 PCT DEPOT REPAIR

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PERFORMANCE

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50 NO. OF ITEMS IN REPAIR (EOP)

51 NO. OF ITEMS JACKLOADED (EOP)

SUMMARY

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600-1000-0000

PERIOD FROM 10 70 30

LEVEL 2

S U P P L Y

		AL004	AL045	AL052	AL057	AL061	AL063	AL065	AL067	AL069	AL071	AL073	AL075	AL077	AL079	AL081	AL083	AL085	AL087	AL089	AL091	AL093	AL095	AL097	AL099	AL101	AL103	AL105	AL107	AL109	AL111	AL113	AL115	AL117	AL119	AL121	AL123	AL125	AL127	AL129	AL131	AL133	AL135	AL137	AL139	AL141	AL143	AL145	AL147	AL149	AL151	AL153	AL155	AL157	AL159	AL161	AL163	AL165	AL167	AL169	AL171	AL173	AL175	AL177	AL179	AL181	AL183	AL185	AL187	AL189	AL191	AL193	AL195	AL197	AL199	AL201	AL203	AL205	AL207	AL209	AL211	AL213	AL215	AL217	AL219	AL221	AL223	AL225	AL227	AL229	AL231	AL233	AL235	AL237	AL239	AL241	AL243	AL245	AL247	AL249	AL251	AL253	AL255	AL257	AL259	AL261	AL263	AL265	AL267	AL269	AL271	AL273	AL275	AL277	AL279	AL281	AL283	AL285	AL287	AL289	AL291	AL293	AL295	AL297	AL299	AL301	AL303	AL305	AL307	AL309	AL311	AL313	AL315	AL317	AL319	AL321	AL323	AL325	AL327	AL329	AL331	AL333	AL335	AL337	AL339	AL341	AL343	AL345	AL347	AL349	AL351	AL353	AL355	AL357	AL359	AL361	AL363	AL365	AL367	AL369	AL371	AL373	AL375	AL377	AL379	AL381	AL383	AL385	AL387	AL389	AL391	AL393	AL395	AL397	AL399	AL401	AL403	AL405	AL407	AL409	AL411	AL413	AL415	AL417	AL419	AL421	AL423	AL425	AL427	AL429	AL431	AL433	AL435	AL437	AL439	AL441	AL443	AL445	AL447	AL449	AL451	AL453	AL455	AL457	AL459	AL461	AL463	AL465	AL467	AL469	AL471	AL473	AL475	AL477	AL479	AL481	AL483	AL485	AL487	AL489	AL491	AL493	AL495	AL497	AL499	AL501	AL503	AL505	AL507	AL509	AL511	AL513	AL515	AL517	AL519	AL521	AL523	AL525	AL527	AL529	AL531	AL533	AL535	AL537	AL539	AL541	AL543	AL545	AL547	AL549	AL551	AL553	AL555	AL557	AL559	AL561	AL563	AL565	AL567	AL569	AL571	AL573	AL575	AL577	AL579	AL581	AL583	AL585	AL587	AL589	AL591	AL593	AL595	AL597	AL599	AL601	AL603	AL605	AL607	AL609	AL611	AL613	AL615	AL617	AL619	AL621	AL623	AL625	AL627	AL629	AL631	AL633	AL635	AL637	AL639	AL641	AL643	AL645	AL647	AL649	AL651	AL653	AL655	AL657	AL659	AL661	AL663	AL665	AL667	AL669	AL671	AL673	AL675	AL677	AL679	AL681	AL683	AL685	AL687	AL689	AL691	AL693	AL695	AL697	AL699	AL701	AL703	AL705	AL707	AL709	AL711	AL713	AL715	AL717	AL719	AL721	AL723	AL725	AL727	AL729	AL731	AL733	AL735	AL737	AL739	AL741	AL743	AL745	AL747	AL749	AL751	AL753	AL755	AL757	AL759	AL761	AL763	AL765	AL767	AL769	AL771	AL773	AL775	AL777	AL779	AL781	AL783	AL785	AL787	AL789	AL791	AL793	AL795	AL797	AL799	AL801	AL803	AL805	AL807	AL809	AL811	AL813	AL815	AL817	AL819	AL821	AL823	AL825	AL827	AL829	AL831	AL833	AL835	AL837	AL839	AL841	AL843	AL845	AL847	AL849	AL851	AL853	AL855	AL857	AL859	AL861	AL863	AL865	AL867	AL869	AL871	AL873	AL875	AL877	AL879	AL881	AL883	AL885	AL887	AL889	AL891	AL893	AL895	AL897	AL899	AL901	AL903	AL905	AL907	AL909	AL911	AL913	AL915	AL917	AL919	AL921	AL923	AL925	AL927	AL929	AL931	AL933	AL935	AL937	AL939	AL941	AL943	AL945	AL947	AL949	AL951	AL953	AL955	AL957	AL959	AL961	AL963	AL965	AL967	AL969	AL971	AL973	AL975	AL977	AL979	AL981	AL983	AL985	AL987	AL989	AL991	AL993	AL995	AL997	AL999	AL1001	AL1003	AL1005	AL1007	AL1009	AL1011	AL1013	AL1015	AL1017	AL1019	AL1021	AL1023	AL1025	AL1027	AL1029	AL1031	AL1033	AL1035	AL1037	AL1039	AL1041	AL1043	AL1045	AL1047	AL1049	AL1051	AL1053	AL1055	AL1057	AL1059	AL1061	AL1063	AL1065	AL1067	AL1069	AL1071	AL1073	AL1075	AL1077	AL1079	AL1081	AL1083	AL1085	AL1087	AL1089	AL1091	AL1093	AL1095	AL1097	AL1099	AL1101	AL1103	AL1105	AL1107	AL1109	AL1111	AL1113	AL1115	AL1117	AL1119	AL1121	AL1123	AL1125	AL1127	AL1129	AL1131	AL1133	AL1135	AL1137	AL1139	AL1141	AL1143	AL1145	AL1147	AL1149	AL1151	AL1153	AL1155	AL1157	AL1159	AL1161	AL1163	AL1165	AL1167	AL1169	AL1171	AL1173	AL1175	AL1177	AL1179	AL1181	AL1183	AL1185	AL1187	AL1189	AL1191	AL1193	AL1195	AL1197	AL1199	AL1201	AL1203	AL1205	AL1207	AL1209	AL1211	AL1213	AL1215	AL1217	AL1219	AL1221	AL1223	AL1225	AL1227	AL1229	AL1231	AL1233	AL1235	AL1237	AL1239	AL1241	AL1243	AL1245	AL1247	AL1249	AL1251	AL1253	AL1255	AL1257	AL1259	AL1261	AL1263	AL1265	AL1267	AL1269	AL1271	AL1273	AL1275	AL1277	AL1279	AL1281	AL1283	AL1285	AL1287	AL1289	AL1291	AL1293	AL1295	AL1297	AL1299	AL1301	AL1303	AL1305	AL1307	AL1309	AL1311	AL1313	AL1315	AL1317	AL1319	AL1321	AL1323	AL1325	AL1327	AL1329	AL1331	AL1333	AL1335	AL1337	AL1339	AL1341	AL1343	AL1345	AL1347	AL1349	AL1351	AL1353	AL1355	AL1357	AL1359	AL1361	AL1363	AL1365	AL1367	AL1369	AL1371	AL1373	AL1375	AL1377	AL1379	AL1381	AL1383	AL1385	AL1387	AL1389	AL1391	AL1393	AL1395	AL1397	AL1399	AL1401	AL1403	AL1405	AL1407	AL1409	AL1411	AL1413	AL1415	AL1417	AL1419	AL1421	AL1423	AL1425	AL1427	AL1429	AL1431	AL1433	AL1435	AL1437	AL1439	AL1441	AL1443	AL1445	AL1447	AL1449	AL1451	AL1453	AL1455	AL1457	AL1459	AL1461	AL1463	AL1465	AL1467	AL1469	AL1471	AL1473	AL1475	AL1477	AL1479	AL1481	AL1483	AL1485	AL1487	AL1489	AL1491	AL1493	AL1495	AL1497	AL1499	AL1501	AL1503	AL1505	AL1507	AL1509	AL1511	AL1513	AL1515	AL1517	AL1519	AL1521	AL1523	AL1525	AL1527	AL1529	AL1531	AL1533	AL1535	AL1537	AL1539	AL1541	AL1543	AL1545	AL1547	AL1549	AL1551	AL1553	AL1555	AL1557	AL1559	AL1561	AL1563	AL1565	AL1567	AL1569	AL1571	AL1573	AL1575	AL1577	AL1579	AL1581	AL1583	AL1585	AL1587	AL1589	AL1591	AL1593	AL1595	AL1597	AL1599	AL1601	AL1603	AL1605	AL1607	AL1609	AL1611	AL1613	AL1615	AL1617	AL1619	AL1621	AL1623	AL1625	AL1627	AL1629	AL1631	AL1633	AL1635	AL1637	AL1639	AL1641	AL1643	AL1645	AL1647	AL1649	AL1651	AL1653	AL1655	AL1657	AL1659	AL1661	AL1663	AL1665	AL1667	AL1669	AL1671	AL1673	AL1675	AL1677	AL1679	AL1681	AL1683	AL1685	AL1687	AL1689	AL1691	AL1693	AL1695	AL1697	AL1699	AL1701	AL1703	AL1705	AL1707	AL1709	AL1711	AL1713	AL1715	AL1717	AL1719	AL1721	AL1723	AL1725	AL1727	AL1729	AL1731	AL1733	AL1735	AL1737	AL1739	AL1741	AL1743	AL1745	AL1747	AL1749	AL1751	AL1753	AL1755	AL1757	AL1759	AL1761	AL1763	AL1765	AL1767	AL1769	AL1771	AL1773	AL1775	AL1777	AL1779	AL1781	AL1783	AL1785	AL1787	AL1789	AL1791	AL1793	AL1795	AL1797	AL1799	AL1801	AL1803	AL1805	AL1807	AL1809	AL1811	AL1813	AL1815	AL1817	AL1819	AL1821	AL1823	AL1825	AL1827	AL1829	AL1831	AL1833	AL1835	AL1837	AL1839	AL1841	AL1843	AL1845	AL1847	AL1849	AL1851	AL1853	AL1855	AL1857	AL1859	AL1861	AL1863	AL1865	AL1867	AL1869	AL1871	AL1873	AL1875	AL1877	AL1879	AL1881	AL1883	AL1885	AL1887	AL1889	AL1891	AL1893	AL1895	AL1897	AL1899	AL1901	AL1903	AL1905	AL1907	AL1909	AL1911	AL1913	AL1915	AL1917	AL1919	AL1921	AL1923	AL1925	AL1927	AL1929	AL1931	AL1933	AL1935	AL1937	AL1939	AL1941	AL1943	AL1945	AL1947	AL1949	AL1951	AL1953	AL1955	AL1957	AL1959	AL1961	AL1963	AL1965	AL1967	AL1969	AL1971	AL1973	AL1975	AL1977	AL1979	AL1981	AL1983	AL1985	AL1987	AL1989	AL1991	AL1993	AL1995	AL1997	AL1999	AL2001	AL2003	AL2005	AL2007	AL2009	AL2011	AL2013	AL2015	AL2017	AL2019	AL2021	AL2023	AL2025	AL2027	AL2029	AL2031	AL2033	AL2035	AL2037	AL2039	AL2041	AL2043	AL2045	AL2047	AL2049	AL2051	AL2053	AL2055	AL2057	AL2059	AL2061	AL2063	AL2065	AL2067	AL2069	AL2071	AL2073	AL2075	AL2077	AL2079	AL2081	AL2083	AL2085	AL2087	AL2089	AL2091	AL2093	AL2095	AL2097	AL2099	AL2101	AL2103	AL2105	AL2107	AL2109	AL2111	AL2113	AL2115	AL2117	AL2119	AL2121	AL2123	AL2125	AL2127	AL2129	AL2131	AL2133	AL2135	AL2137	AL2139	AL2141	AL2143	AL2145	AL2147	AL2149	AL2151	AL2153	AL2155	AL2157	AL2159	AL2161	AL2163	AL2165	AL2167	AL2169	AL2171	AL2173	AL2175	AL2177	AL2179	AL2181	AL2183	AL2185	AL2187	AL2189	AL2191	AL2193	AL2195	AL2197	AL2199	AL2201	AL2203	AL2205	AL2207	AL2209	AL2211	AL2213	AL2215	AL2217	AL2219	AL2221	AL2223	AL2225	AL2227	AL2229	AL2231	AL2233	AL2235	AL2237	AL2239	AL2241	AL2243	AL2245	AL2247	AL2249	AL2251	AL2253	AL2255	AL2257	AL2259	AL2261	AL2263	AL2265	AL2267	AL2269	AL2271	AL2273	AL2275	AL2277	AL2279	AL2281	AL2283	AL2285	AL2287	AL2289	AL2291	AL2293	AL2295	AL2297	AL2299	AL2301	AL2303	AL2305	AL2307	AL2309	AL2311	AL2313	AL2315	AL2317	AL2319	AL2321	AL2323	AL2325	AL2327	AL2329	AL2331	AL2333	AL2335	AL2337	AL2339	AL2341	AL2343	AL2345	AL2347	AL2349	AL2351	AL2353	AL2355	AL2357	AL2359	AL2361	AL2363	AL2365	AL2367	AL2369	AL2371	AL2373	AL2375	AL2377	AL2379	AL2381	AL2383	AL2385	AL2387	AL2389	AL2391	AL2393	AL2395	AL2397	AL2399	AL2401	AL2403	AL2405	AL2407	AL2409	AL2411	AL2413	AL2415	AL2417	AL2419	AL2421	AL2423	AL2425	AL2427	AL2429	AL2431	AL2433	AL2435	AL2437	AL2439	AL2441	AL2443	AL2445	AL2447	AL2449	AL2451	AL2453	AL2455	AL2457	AL2459	AL2461	AL2463	AL2465	AL2467	AL2469	AL2471	AL2473	AL2475	AL2477	AL2479	AL2481	AL2483	AL2485	AL2487	AL2489	AL2491	AL2493	AL2495	AL2497	AL2499	AL2501	AL2503	AL2505	AL2507	AL2509	AL2511	AL2513	AL2515	AL2517	AL2519	AL2521	AL2523	AL2525	AL2527	AL2529	AL2531	AL2533	AL2535	AL2537	AL2539	AL2541	AL2543	AL2545	AL2547	AL2549	AL2551	AL2553	AL2555	AL2557	AL2559	AL2561	AL2563	AL2565	AL2567	AL2569	AL2571	AL2573	AL2575	AL2577	AL2579
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PERFORMANCE SUMMARY

PERIOD FROM 0. TO 50.0

EQUIPMENT

	TOTAL	MD4	STON	TOTON	25FLB	COFLB	4FORKS	6FORKS	10FORKS	M-11	JAMER
66 101 BULLAB INVEST (1000) (600)	6002.04	60.00	40.00	40.00	40.00	40.00	40.00	40.00	20.00	40.00	40.00
67 EQUIPMENT HOURS AUTH. (100)	21902.40	21.60	14.40	14.40	21.60	14.40	14.40	7.20	7.20	14.40	7192.80
68 EQUIPMENT HOURS AUTH. (100)	21902.40	21.60	14.40	14.40	21.60	14.40	14.40	7.20	7.20	14.40	7192.80
69 EQUIPMENT HOURS AUTH. (100)	21902.40	21.60	14.40	14.40	21.60	14.40	14.40	7.20	7.20	14.40	7192.80
70 PCT USED-UNSCHEM PAINT	.29	30.19	22.52	24.56	23.27	11.28	37.07	14.63	4.88	77.67	0.00
71 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72 PCT USED-UNSCHEM PAINT	99.71	69.81	77.48	75.42	76.73	36.72	62.93	85.37	95.12	22.33	100.00
73 PCT USED-UNSCHEM PAINT	29.00	2.11	5.06	4.97	4.92	1.15	6.03	0.00	0.00	1.07	0.00
74 NUMBER OF UNITS DEPARTED	11089.00	2142.00	200.00	261.00	306.00	189.00	560.00	1.00	3.00	1617.00	13.00
75 PCT USED-UNSCHEM PAINT	99.71	69.81	77.48	75.42	76.73	36.72	62.93	85.37	95.12	22.33	100.00
76 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
77 PCT USED-UNSCHEM PAINT	10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
78 PCT USED-UNSCHEM PAINT	5.35	0.65	19.44	22.00	10.60	1.59	5.00	0.00	0.00	3.96	0.00
79 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

EQUIPMENT

	TOTAL	4FORK	6FORK	10FORK	INTON	2HTON	MU12	MU85	MU11	CLOCK	TIMER
66 101 BULLAB INVEST (1000) (600)	6002.04	20.00	20.00	40.00	40.00	20.00	20.00	20.00	20.00	20.00	20.00
67 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	7.20	14.40	14.40	7.20	50.40	43.20	43.20	7192.80	7192.80
68 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	7.20	14.40	14.40	7.20	50.40	43.20	43.20	7192.80	7192.80
69 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	7.20	14.40	14.40	7.20	50.40	43.20	43.20	7192.80	7192.80
70 PCT USED-UNSCHEM PAINT	.29	80.95	72.27	46.49	38.25	1.54	.10	.12	.11	0.00	0.00
71 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72 PCT USED-UNSCHEM PAINT	99.71	19.05	27.73	53.51	61.73	98.40	99.90	99.88	99.89	100.00	100.00
73 PCT USED-UNSCHEM PAINT	25.60	3.30	0.00	0.00	3.76	0.00	.20	.21	0.00	0.00	0.00
74 NUMBER OF UNITS DEPARTED	11089.00	940.00	7.00	8.30	2140.00	10.00	2460.00	21.00	12.00	1.00	30.00
75 PCT USED-UNSCHEM PAINT	64.12	62.22	42.46	53.30	62.24	100.00	99.72	95.24	100.00	100.00	100.00
76 PCT USED-UNSCHEM PAINT	.10	.11	0.00	12.50	.05	0.00	0.00	0.00	0.00	0.00	0.00
77 PCT USED-UNSCHEM PAINT	.23	.52	52.14	32.50	.05	0.00	0.00	0.00	0.00	0.00	0.00
78 PCT USED-UNSCHEM PAINT	5.35	16.60	0.00	0.00	7.62	0.00	.28	4.76	0.00	0.00	0.00
79 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

EQUIPMENT

	TOTAL	3/4TON	UTHER
66 101 BULLAB INVEST (1000) (600)	6002.04	20.00	0.00
67 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	0.00
68 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	0.00
69 EQUIPMENT HOURS AUTH. (100)	21902.40	7.20	0.00
70 PCT USED-UNSCHEM PAINT	.29	14.52	0.00
71 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00
72 PCT USED-UNSCHEM PAINT	99.71	65.48	0.00
73 PCT USED-UNSCHEM PAINT	29.00	0.00	0.00
74 NUMBER OF UNITS DEPARTED	11089.00	0.00	0.00
75 PCT USED-UNSCHEM PAINT	56.32	0.00	0.00
76 PCT USED-UNSCHEM PAINT	.10	0.00	0.00
77 PCT USED-UNSCHEM PAINT	.23	0.00	0.00
78 PCT USED-UNSCHEM PAINT	5.35	0.00	0.00
79 PCT USED-UNSCHEM PAINT	0.00	0.00	0.00

Initialization Dictionaries

RESOURCES

WITH NAME, MAXIMUM AND MAX. USU. LIFE, AND A FLAG THAT = '0' IF MAXIMUM IS LESS THAN MAXUSE

NO.	NAME	MAXIMUM	MAXUSE	FLAG	NAME	MAXUSE	FLAG	NAME	MAXUSE	FLAG
1	1F2	0	0	0	26 - HLOA2	999	29	51 - HLOE	999	4
2	431F1	200	200	0	27 - HLOA3	999	29	52 - HLE	999	1
3	462E3	200	200	0	28 - HLOA4	999	29	53 - STON	999	1
4	PILOT	200	200	1	29 - HLOA5	999	29	54 - TON	999	1
5	461S2	200	200	0	30 - HLOA6	999	29	55 - 25FL3	999	1
6	461S5	200	200	0	31 - HLOA7	999	29	56 - 46FL4	999	1
7	461E3	200	200	0	32 - HLOA8	999	29	57 - 46FL5	999	1
8	461E5	200	200	0	33 - HLOA9	999	29	58 - 46FL6	999	1
9	462E1	999	999	0	34 - HLOA1	999	29	59 - 10FORS	999	1
10	462E1	999	999	0	35 - HLOA2	999	29	60 - H-11	999	1
11	462E1	999	999	0	36 - HLOA3	999	29	61 - 4FORK	999	1
12	462E1	999	999	0	37 - HLOA4	999	29	62 - 4FORK	999	1
13	462E1	999	999	0	38 - HLOA5	999	29	63 - 10FORK	999	1
14	462E2	999	999	0	39 - HLOA6	999	29	64 - JAGER	999	1
15	462E2	999	999	0	40 - HLOA7	999	29	65 - TON	999	1
16	462E2	999	999	0	41 - HLOA8	999	29	66 - 32JIN	999	0
17	462E2	999	999	0	42 - HLOA9	999	29	67 - 2TON	999	1
18	462E2	999	999	0	43 - HLOA1	999	29	68 - HLOA2	999	1
19	462E2	999	999	0	44 - HLOA2	999	29	69 - HLOA3	999	1
20	462E3	999	999	0	45 - HLOA3	999	29	70 - HLOA4	999	1
21	462E3	999	999	0	46 - HLOA4	999	29	71 - CLOCK	999	0
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25	462E3	999	999	0	50 - HLOA8	999	29			

TASKS

1 - PREFLT	2 - H	3 - LOK482	4 - SONTIE	5 - PSTELT	6 - REFUEL
7 - QMB2AT	8 - JMS201	9 - JMB201	10 - QMB201	11 - QMB2E1	12 - QMB2A2
13 - JMS202	14 - JMS202	15 - JMS202	16 - JMS2E2	17 - QMB2A3	18 - QMB2B3
19 - JMS203	20 - JMS203	21 - JMS203	22 - GHOLOA	23 - GHOLOA	24 - GHOLOA
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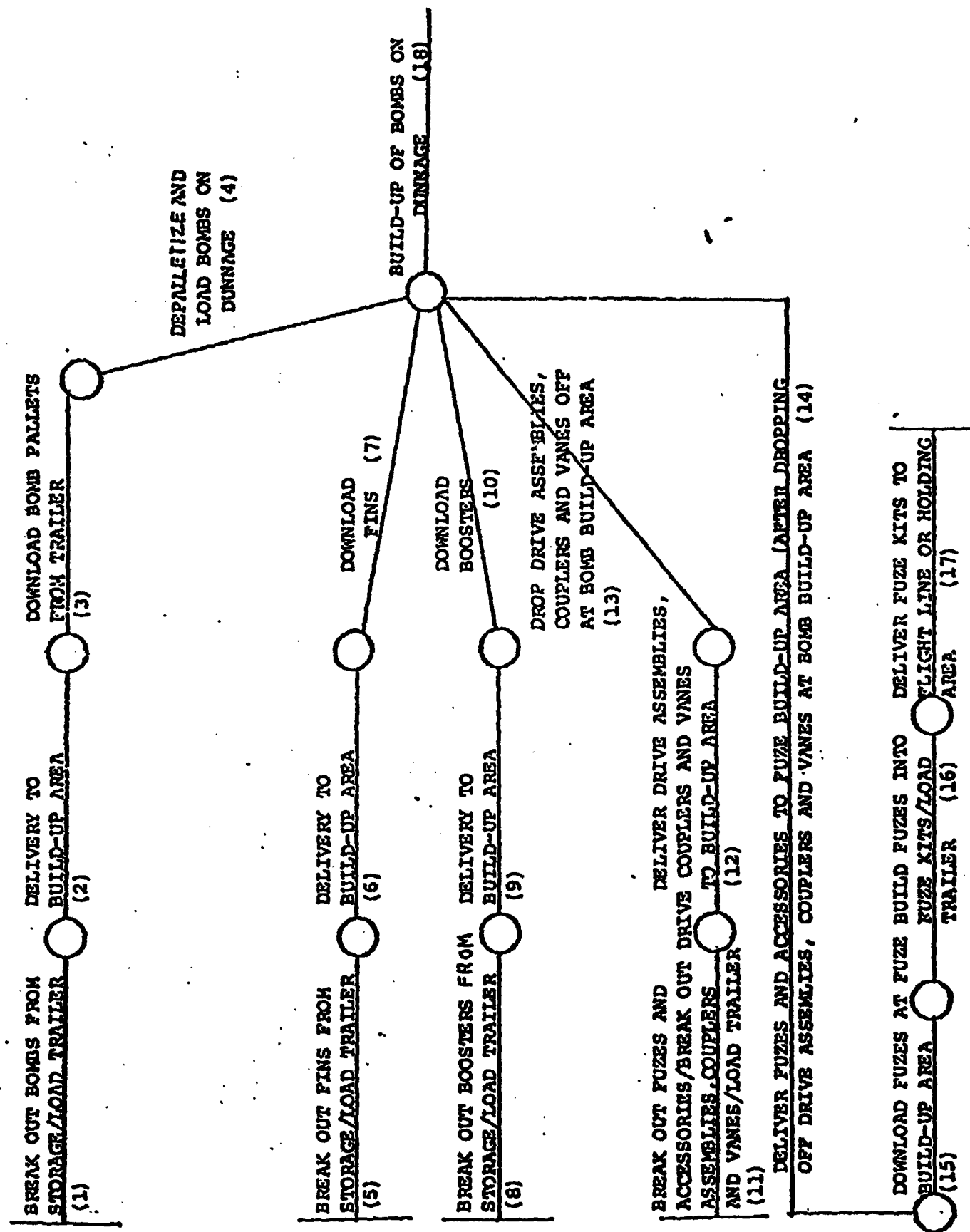
FAILURE CLOCKS

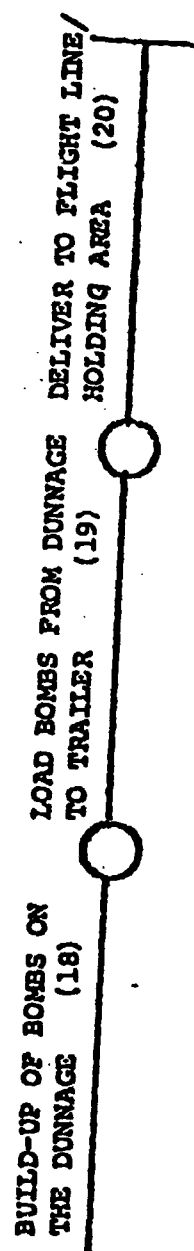
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7 - H0L0G	8 - H0L0H	9 - H0L0I	10 - H0L0J	11 - H0L0K	12 - H0L0L
13 - H0L0M	14 - H0L0N	15 - H0L0O	16 - H0L0P	17 - H0L0Q	18 - H0L0R
19 - H0L0S	20 - H0L0T	21 - H0L0U	22 - H0L0V	23 - H0L0W	24 - H0L0X
25 - H0L0Y	26 - H0L0Z	27 - H0L0A	28 - H0L0B	29 - H0L0C	30 - H0L0D
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37 - H0L0K	38 - H0L0L	39 - H0L0M	40 - H0L0N	41 - H0L0O	42 - H0L0P
43 - H0L0Q	44 - H0L0R	45 - H0L0S	46 - H0L0T	47 - H0L0U	48 - H0L0V

Appendix C

MK82 INPUT DATA

MARK-82 NETWORK





TASK:	(1) Break out bombs from storage & load trailer
NARRATIVE/DESCRIPTION:	Task starts when frag order is given and ends when trailer or truck is loaded and ready for delivery.
RESOURCES NEEDED:	1) 5 or 10 ton tractor 2) 25' or 40' flatbed trailer 3) 4,6 or 10 thousand pound forklift 4) crew of 3x461's
TIME:	1 hour to load 8 pallets on 25' flatbed or 10 pallets on 40' flatbed
COMMENTS:	

TASK:	(2) Delivery to Build-up Area
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	1) tractor from previous task
	2) flatbed from previous task
	3) 2x 461's
TIME:	depends on speed of vehicle and distance traveled
COMMENTS:	

TASK:

(3) Download bomb pallets from trailer

NARRATIVE/DESCRIPTION:

RESOURCES NEEDED:

1) tractor from previous task

2) flatbed from previous task

3) 4,6 or 10 thousand pound forklift

4) 3x 461.0

TIME:

20 minutes

COMMENTS:

TASK:	(4) Depalletize and load bombs on dunnage
NARRATIVE/DESCRIPTION:	This task includes cleanup
RESOURCES NEEDED:	1) H-11 crane, janner or forklift (4.6 or 10,000 lb.) 2) 4x461.0
TIME:	9 minutes / pallet
COMMENTS:	

TASK:	(5) Break out fins from storage & load trailer
NARRATIVE/DESCRIPTION:	Task starts when frag order is given and ends when trailer or truck is loaded and ready for delivery.
RESOURCES NEEDED:	1) 1 1/2 ton truck, 2 1/2 ton truck, 25' or 40' flatbed with 5 or 10 ton tractor 2) 4,6 or 10,000 pound forklift 3) 3x461's
TIME:	45 minutes
COMMENTS:	70 to 100 fins can be loaded on the various vehicles depending on size.

TASK:

(6) Delivery to Build-up Area

NARRATIVE/DESCRIPTION:

RESOURCES NEEDED:

1) vehicle from previous task

2) 2x461's

TIME:

depends on speed of vehicle and distance traveled.

COMMENTS:

TASK:	(7) Download rings at bomb build-up area
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	1) Vehicle from previous task
	2) 4,6 or 10,000 lb. forklift
	3) 3x 462's
TIME:	20 minutes
COMMENTS:	

TASK:	(8) Break out boosters from storage / load trailer
NARRATIVE/DESCRIPTION:	Task starts when order is given to perform task and ends when truck or trailer is loaded and ready for delivery. Task assumed 904 and 905 fuses.
RESOURCES NEEDED:	1) 1 1/2 ton truck, 2 1/2 ton truck, 25' or 40' flatbed with 5 or 10 ton tractor 2) 4,6 or 10,000 lb. forklift 3) 3x 461's
TIME:	45 minutes to load 200 boosters on truck or trailer
COMMENTS:	One load consists of approx. 200 boosters

TASK:	(9) Delivery to Build-up Area
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	
	1) vehicle from previous task
	2) 2x 461's
TIME:	depends on speed of vehicle and distance traveled
COMMENTS:	

TASK:	(10) Download Boosters at bomb building area
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	
	1) vehicles from previous task
	2) 4,6 or 10,000 lb. forklift
	3) 3x 461's
TIME:	20 minutes
COMMENTS:	

TASK:

(11) Break-out fuzes & accessories/break-out drive assemblies, couplers & vanos
NARRATIVE/DESCRIPTION: / load trailer

These two sets of bomb components are frequently stored close to each other and the truck/trailer will stop at each location. The same equipment will be used at each storage location. 904 and 905 fuzes are assumed.

RESOURCES NEEDED:

- 1) 1 1/2 ton, 2 1/2 ton truck, 25' or 40' flatbed (with 5 or 10 ton tractor)
- 2) 4,6 or 10,000 lb. Forklift
- 3) 3x 462'g

TIME:

1 hour for 17 pallets (102 bombs)

COMMENTS:

TASK:	(12) Deliver drive assemblies, couplers and vanes to build-up area
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	1) vehicle from previous task
	2) 2x 461's
TIME:	depends on distance traveled from storage area to build-up area, and speed
COMMENTS:	of vehicle.

TASK:	(13) Drop drive assemblies, couplers and vanes off at bomb build-up area
NARRATIVE/DESCRIPTION:	Downloading of drive assemblies, couplers and vanes at bomb build-up area.
	Fuzes and accessories remain on truck/trailer for delivery to fuse build-up area.
area.	
RESOURCES NEEDED:	1) vehicle from prior task
	2) forklift (4,6 or 10,000 lb.)
	3) 3 x 461's
TIME:	10 minutes (to download enough for 102 bombs)
COMMENTS:	

TASK:

(14) Deliver fuzes and accessories to fuze build-up area

NARRATIVE/DESCRIPTION:

RESOURCES NEEDED:

1) vehicle from prior task

2) 2 x 461's

TIME:

depends on distance traveled and speed of vehicle

COMMENTS:

TASK:	(15.) Download fuzes at fuze build-up area
NARRATIVE/DESCRIPTION:	Enough fuzes and accessories will be downloaded for 102 bombs.
RESOURCES NEEDED:	1) vehicle from prior task 2) 4,6 or 10,000 pound forklift 3) 2 x 461's
TIME:	30 minutes
COMMENTS:	

TASK:	(16) Build fuze into fuze kits/ load trailer
NARRATIVE/DESCRIPTION:	The trailer is loaded as the kits are assembled. Enough kits are assembled for 102 bombs. 34 boxes of fuze kits will need to be put together and loaded on the MHU-12M for 102 bombs.
RESOURCES NEEDED:	1) 4 x 461's 2) MHU-12M trailer
TIME:	5 hours
COMMENTS:	

TASK:

(17) Deliver fuse kits to Flightline

NARRATIVE/DESCRIPTION:

RESOURCES NEEDED:

1) MHU-12H trailer loaded with fuse kits

2) 3/4 ton 6 passenger truck, farm tractor, 1 1/2 ton truck (or any
prime mover available with towing capability- preferably not
the heavier tugs)

3) 2 x 461'0

TIME:

depends on distance from fuse build-up area to flightline and speed of vehicle

COMMENTS:

(18) Build-up of bombs on dunnage

NARRATIVE/DESCRIPTION:

Includes installing boosters in bombs, installing drive assemblies,

couplers and vanes to tail fins, installing tail fins on bombs, and clean-up.

Process numbers 904 and 905 fused.

RESOURCES NEEDED:

1) 4x 46L's working in pairs in production line fashion

! 2411

4 minutes / bomb (or 8 min. if only 2 x 461's are available)

COMMENT: ST. NICHOLAS

TASK:	
(19) Load bombs from dunnage onto trailer	
NARRATIVE/DESCRIPTION:	
RESOURCES NEEDED:	
1) H-11, Janner or forklift (4,6 or 10,000 lb.)	
2) MHU-12K, MHU-85 or MHU-110 trailer	
3) 3 x 461's	
TIME: 8 minutes to load one trailer	
COMMENTS:	

TASK:

(20) Deliver to flightline

NARRATIVE/DESCRIPTION:

Deliver from bomb build-up area to flightline. Each prime

MOVOR MAY pull 2 trailers at a time.

RESOURCES NEEDED:

- 1) trailers loaded with bombs
- 2) MB-4 Coleman tug, 5 or 10 ton tractor with pinale hook
- 3) 2 x 461's

TIME:

depends on distance traveled and speed of vehicle

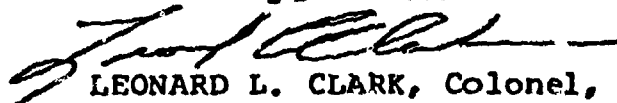
COMMENTS:

Appendix D

AFLMC PROJECT PLAN #781040

PROJECT PLAN
SIMULATION MODEL OF CONVENTIONAL MUNITIONS BUILDUP
FOR
ANALYZING RESOURCE REQUIREMENTS
PROJECT NUMBER: 781040

APPROVED: 22 AUG 1960


LEONARD L. CLARK, Colonel, USAF
Commander

AIR FORCE LOGISTICS MANAGEMENT CENTER
GUNTER AIR FORCE STATION, ALABAMA 36114

SIMULATION MODEL OF CONVENTIONAL MUNITIONS BUILDUP

FOR "

ANALYZING RESOURCE REQUIREMENTS

PROJECT PLAN

1. **PROJECT NUMBER:** 781040
2. **PROJECT MANAGER:** Capt Mark Greenly, AFLMC/LGM
3. **TEAM MEMBERS:** Lt Karen Daniels, AFLMC/LGY
4. **OBJECTIVE:** Develop a methodology to determine the effect of changes in munitions support resources on sortie generation. Any methodology developed must be able to do at least the following:
 - a. Determine alternative mixes of resources (manpower, vehicles, trailers, etc.) capable of supporting a given sortie rate.
 - b. Determine the effects on sortie support of changes in one or more resource levels.
 - c. Identify production bottlenecks caused by insufficient resources.
5. **BACKGROUND:**
 - a. Serious deficiencies have been identified in the process of creating munitions area inputs for Mission Area Analysis. The AFLMC was tasked to develop: (1) a model for allocating munitions based on sortie needs; and (2) a methodology to determine the effect of changes in munitions support resources (manpower, munitions handling equipment, test equipment, vehicles, etc.) on sortie generation. The original proposal was submitted by Col Ryan of HQ USAF/LEYW.
 - b. The AFLMC concluded, in their preliminary analysis, that suitable models for allocating munitions to sorties were already available. Therefore, project 781040 was established to pursue the objective in paragraph 4 above. Further, only conventional munitions are addressed in this study.
6. **SCOPE:**
 - a. The model produced by this project will be able to simulate base-level conventional munitions production activities for a wide range of munitions, weapon systems, and sortie levels for all major commands.

b. Organizations involved.

1. PACAF/OA - Developers of a model, Munitions Production Simulation, possibly suitable for Air Force-wide use.
2. LCOM Users - Organizations conducting related studies using the Logistics Composite Model (LCOM).
3. AFMSMET/MEMT - Office which maintains LCOM as a system.
4. Potential users: Primarily, munitions and logistics planners at MAJCOM level.
5. Air Staff OPR: Major Peterson, HQ USAF/LEYWC.

7. METHODOLOGY AND DATA SOURCES:

a. Due to the complex nature of munitions support processes, development of a computer simulation model has been selected as the best approach to the problem. This methodology implies two project phases: (1) selection of modeling alternative and (2) development and testing. A detailed plan for phase two will not be written until the conclusion of phase one. The last activity in this plan is the writing of a follow-on plan to construct the actual model.

b. Activities A-D involve experimentation and familiarization with the current version of LCOM. They have been completed. The munitions networks constructed in Activity D may serve as a basis of comparison for munitions activities at other bases.

c. The purpose of Activity E is to gather specific information necessary to evaluate the alternative courses of action in model development. The bulk of this information will come from the ultimate model users. The information to be gathered will need to include such areas as:

- (1) Specific munitions task sequences peculiar to each MAJCOM.
- (2) Accuracy and availability of input data.
- (3) Computer resources and expertise available to users. This information will be analyzed, and the results will be used to develop a list of needed model characteristics to determine the amount of flexibility and detail needed.

e. Four modeling alternatives will be examined:

1. Use of the PACAF/OA munitions model (as is or with modification). Since this model is still being tested, analysis will progress as data is received from PACAF/OA. (Activity F)

2. Use of LCOM II Version 3.5.4 (to be released in Fall 1980). This will be accomplished through discussions with knowledgeable LCOM users at the October 1980 LCOM Steering Group. (Activity G)

3. Design of a new model by AFLMC or by contractors (Activity H)

The investigation of each alternative will consist of judging its suitability according to the criteria established in Activity E. The costs and benefits will be analyzed. The results will be reported in a working paper at the end of each activity.

f. After the options in Activities F, G, and H have been initially evaluated, a working group will convene at the AFLMC to review the progress on development of model requirements and characteristics, and the AFLMC views on each option (Activity J). This group will include MAJCOM representatives (potential users), project team members, and other interested parties.

g. After the meeting, an interim report will be written to summarize meeting results and recommend what type of model to develop (or modify). This report represents a decision point regarding which, if any, of the options to pursue through development and testing.

8. ASSUMPTIONS AND CONSTRAINTS: Any munitions simulation developed needs to be; (a) understandable to users; (b) flexible enough to model many bases and munitions types; (c) detailed enough to keep track of individual munitions components and vehicles; (d) small enough and quick enough (in terms of computer resources) to run on the computer systems available to users; and (e) rigorously tested to insure a high level of confidence in model outputs.

Since any simulation model must reflect the users' environment and situations, this entire project will require accurate and timely user inputs and cooperation in all project phases.

9. RESOURCES REQUIRED: Manpower support will be from AFLMC/LGM and AFLMC/LGY. Computer support will be required for model development but cannot be determined until the follow-on plan (phase two) is written. Information on the required manpower and TDY trips is provided in the attachments.

10. MILESTONES:

<u>Milestones</u>	<u>Expected Completion Dates</u>
LCOM II Version 3.5E Familiarization	Completed
Evaluation of LCOM II Version 3.5E	Completed
Gather Available Info for LCOM Study	Completed
Build LCOM Networks	Completed
Develop Model Requirements	15 Oct 80
Evaluate LCOM II	15 Nov 80
Evaluate PACAF/OA Munitions Simulation	30 Nov 80
Assess In-House or Contracting Capabilities	21 Feb 81
Working Group	24 Mar 81
Interim Report	30 Jun 81

VITA

Michael Hanks Gilchrist was born on 19 June 1945 in San Louis Obispo, California. He graduated from high school in Oxen Hill, Maryland in 1963. He was appointed to the United States Air Force Academy in 1964 and graduated from that institution in June 1968 with a Bachelor of Science in Electrical Engineering. Following graduation from pilot training at Webb Air Force Base, Texas in 1969, he served a tour in Vietnam as a Forward Air Controller in the O-2A. His next assignment was to Fairchild Air Force Base, where he served as a KC-135 aircraft commander and instructor pilot from 1971 to 1975. Completing an assignment to the School of Engineering, Air Force Institute of Technology in 1976, he was assigned as a Manpower Plans Staff Officer at the Directorate of Manpower Plans, Headquarters Tactical Air Command. He completed that tour in May 1980 and is currently enrolled as a student in the Air Command and Staff College, Maxwell Air Force Base, Alabama.