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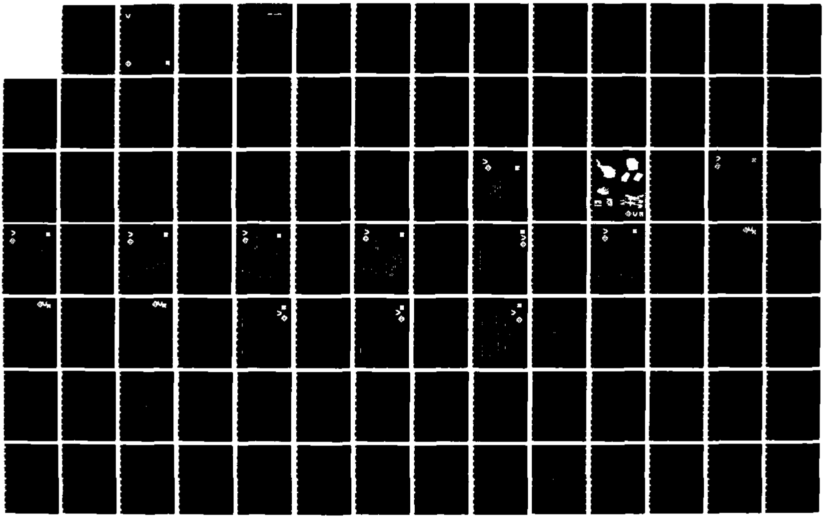

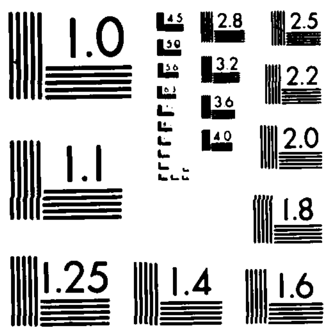

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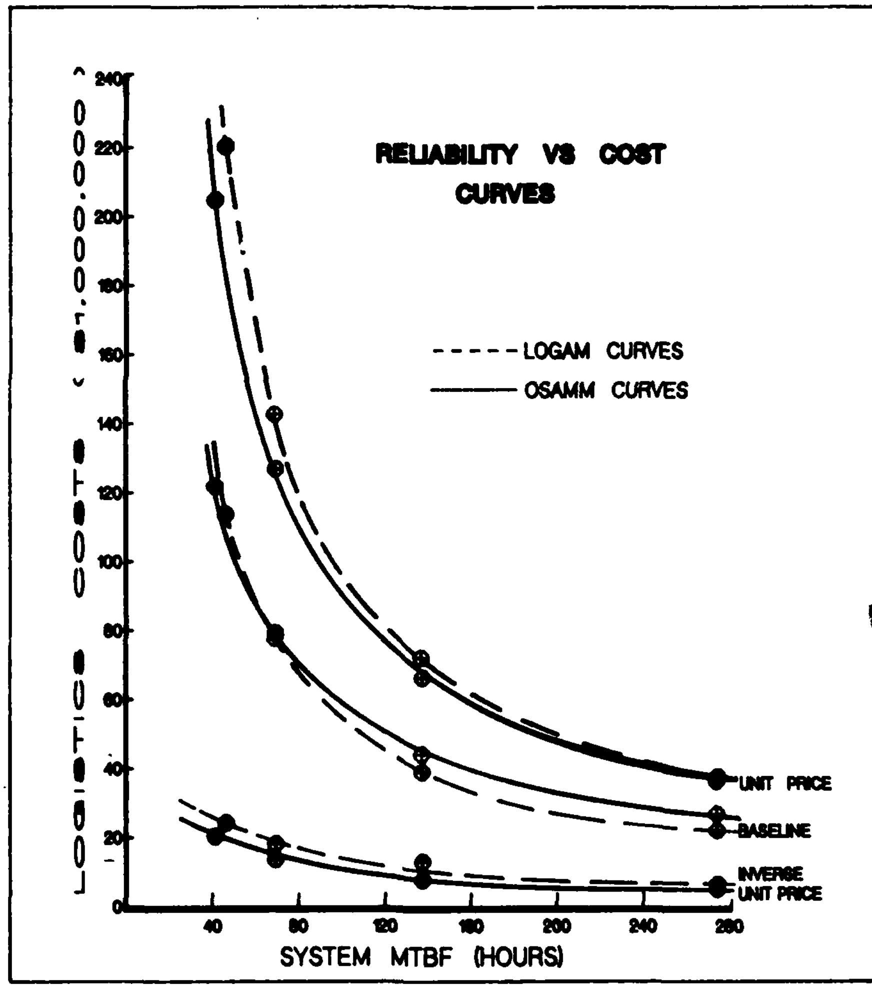
AMC Reliability Versus Cost Task Force

Reliability Versus Cost Using OSAMM and LOGAM



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The Reliability Versus Cost Using OSAMM and LOGAM Study was conducted as part of the AMC Reliability versus Cost Task Force. The report that was generated as a result of the study investigates two viable computer models for performing logistics (maintenance and support) cost versus reliability studies. Also, the report establishes and recommends guidelines for performing logistics cost versus reliability trade-offs. There were four main objectives of the study. The first was to determine if the Optimum Supply and Maintenance Model (OSAMM) and the Logistics Analysis Model (LOGAM) can be used to trade-off logistics cost versus reliability. The second was to determine feasible reliability allocation methods to develop the logistics cost versus reliability envelope of curves around the baseline reliability allocation. The third was to determine the impacts that utilizing maintenance and supply support optimization has on the logistics cost versus reliability curves. The fourth objective was to investigate input data required to execute OSAMM and LOGAM in the early life cycle phases. All these objectives were

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19 ABSTRACT cont'd

accomplished using actual data from a weapon system already fielded (M65 Airborne TOW Missile System).

PREFACE

The area of trading-off logistics (maintenance and support) cost versus reliability is being given emphasis not only in recent revision to policy documents such as AR-702-3 but within the command staff as well. This emphasis is most evident by the establishment of the AMC Reliability Versus Cost Task Force.

This report was prepared jointly, as part of the AMC Task Force, by the U.S. Army Missile Command (MICOM) and the USAMC Materiel Readiness Support Activity (MRSA). The study team consisted of Mr. Joe Nordman (MICOM), Mr. Bud Carroll (MICOM), Mr. Les Karenbauer (MRSA), Ms. Betty Clarke, Typist (MRSA), and team leader, Mr. Jim Crabtree (MRSA).

The study team would like especially to thank Mr. Charles Plumeri, U.S. Army Communications and Electronics Command (CECOM) and Mr. Alan Kaplan, U.S. Army Materiel Systems Analysis Activity-Inventory Research Office (AMSAA-IRO) for their efforts/assistance.

This report investigates viable computer models for performing logistics cost versus reliability studies. Also, this report establishes and recommends guidelines for performing logistics cost versus reliability trade-offs.

This report is to be consolidated and incorporated into a final report developed by the task force as a group. The AMC Reliability Versus Cost AMC task force Report is to be submitted to HQ AMC (Oct 86). Thus, the content of this report represents the views, conclusions, and recommendations of the Commanders, MICOM and MRSA and do not necessarily reflect the official views of the Department of the Army or HQ AMC. The examples and data contained in this report are used for illustrative purposes only and should not be used without first consulting MICOM or MRSA.

Comments and/or questions concerning this report may be directed to the Commander, MICOM, ATTN: AMSMI-OR-SA, Redstone Arsenal, Al 35898-5000, AUTOVON 746-3625, commercial (205) 876-3625 or Commander, MRSA, ATTN: AMXMD-EL, Lexington, KY 40511-5101, AUTOVON 745-3985, commercial (606) 293-3985.

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Optimum Supply and Maintenance Model (OSAMM)
and
Logistics Analysis Model (LOGAM)

1.0 PURPOSE/OBJECTIVES. There are four main objectives of this study. The first is to determine if OSAMM and LOGAM can be used to trade-off logistics cost versus reliability. The second is to determine feasible reliability allocation methods to develop the logistics cost versus reliability envelope of curves around the baseline reliability allocation. The third is to determine the impacts that utilizing maintenance and supply support optimization has on the logistics cost versus reliability curves. The fourth objective is to investigate input data required to execute OSAMM and LOGAM in the early life cycle phases. These objectives were to be accomplished using actual data from a weapon system already fielded.

2.0 BACKGROUND. The U.S. Army Materiel Systems Analysis Activity (AMSAA) was tasked by HQ AMC on 3 Dec 84 to assume lead role in establishing an AMC Task Force to develop a methodology and model which will investigate life cycle costs versus reliability trade-offs and establish guidelines and training for the major subordinate commands (MSCs). The task force split this problem into two areas. One area is to relate deployment and operational phase costs to the initial fielded system reliability. The other area is to relate the pre-deployment phase costs (i.e., Research, Development, Test and Evaluation (RDT&E) costs) to achieve an initial fielded system reliability. AMSAA addressed the RDT&E costs versus reliability issue while MRSA and MICOM addressed the deployment and operational phase costs versus reliability issue. The deployment and operational phase costs were narrowed to those costs that are effected by the reliability of a system which are the maintenance and support costs (hence referred to as logistics cost for simplicity). The following paragraphs depict the events and viewpoints made to investigate the logistics cost versus reliability area and thus focus on actions and efforts relative to that area. Some of the meetings outlined below covered the RDT&E costs versus reliability area but that area will be discussed in another part of the consolidated AMC Task Force Report. Therefore, the RDT&E costs versus reliability area is not covered in this report or in the events outlined below.

2.1 The initial meeting (25-28 Feb 85) of the AMC Task Force was more of a round table discussion to establish the task force and discuss the experience of MSC attendees in analyzing/trading-off cost versus reliability. Also, the focus of the task force was discussed. The focus at that time was to develop new methodologies and models to be used in analyzing cost versus reliability trade-offs.

2.2 The second meeting (1-3 May 85) redefined the focus of the tasks force to utilize existing computer model(s) to develop a methodology on cost versus reliability in the time frame allotted by HQ AMC (Jan 85 - Aug 86). The second meeting established the models to be reviewed and a checklist against which a models applicability could be judged.

2.3 The third meeting (26-27 Jun 85) of the AMC Task Force primarily reviewed the models that were evaluated using the checklist established during the second task force meeting. During the third meeting, it was decided that the models to be given closer scrutiny, in regard to logistics cost versus reliability, were the LOGAM, OSAMM, and the AVSCOM Maintenance Operating and Support Cost (AMOS) model. Closer scrutiny of these three models was to be accomplished through case studies using two weapon systems from each MSC, preferably systems that have used one of the models. Each system's data was to be input to each of the three models and evaluated for differences in output results. However, it was found that AMOS was not a documented model and was lacking in support by a proponent. Therefore, it was dropped from further consideration. Also, the MSCs did not provide weapon systems from which case studies could be made and evaluated. Therefore, MRSA was requested by AMSAA, in Nov 85, to pursue the evaluation of OSAMM and LOGAM using fictitious data until actual weapon system data could be provided.

2.4 The fourth meeting of the task force (16-18 Dec 85) centered on the detailed review of OSAMM and LOGAM conducted by MRSA using fictitious data. MRSA's conclusion in the review was that either model (OSAMM or LOGAM) could be used for logistics cost versus reliability trade-offs. The task force felt that since this result was based on fictitious data it should be proven on real world weapon system data. MICOM suggested that they work with MRSA using data on the Tube-Launched Optically-Tracked Wire-Guided (TOW) Missile system to execute each model and plot the logistics cost versus reliability curves which result to confirm the initial MRSA findings. This was agreed to by the group.

2.5 MRSA made two trips to MICOM in support of the efforts initiated during the fourth task force meeting. The first visit to MICOM (26-29 Mar 86) was made to provide MICOM a brief overview of OSAMM and establish an OSAMM data file on the M65 Airborne TOW using the data input into LOGAM. The second visit to MICOM (4-5 Jun 86) was made to correlate findings of the study using the M65 Airborne TOW data. Also, MRSA and MICOM jointly developed a briefing for presentation to the fifth AMC Task Force meeting (see appendix A).

2.6 The fifth meeting of the AMC Task Force (10-12 Jun 86) centered on the results of MRSA's and MICOM's efforts in utilizing OSAMM and LOGAM with M65 Airborne TOW data. The findings confirmed MRSA's initial findings that either model could be used for logistics cost versus reliability trade-off studies. It was requested during this meeting that the study be formally documented. Thus, this report was developed. A preliminary opinion of the task force, as a result of MICOM'S and MRSA's briefing, was that since cost versus reliability trade-offs would be conducted early in the life cycle that it was more advantageous to have maintenance and supply support optimization capability which

OSAMM provides. However, the task force opinion is to be finalized as a result of this report. The task force requested that the report address the effects that utilizing maintenance and supply support optimization has on the logistics cost versus reliability curves. Also, the task force requested that the report address input data required to execute OSAMM and LOGAM in the concept/demonstration life cycle phases.

3.0 **MODEL DESCRIPTIONS**. The two models being analyzed as part of this study are the OSAMM and LOGAM models which are described below.

3.1 **OSAMM**. The proponent for OSAMM is the U.S. Army Communications and Electronics Command (CECOM), AMSEL-PL-SA (Charles Plumeri), Ft. Monmouth, NJ 07703-5004, AUTOVON 992-5170, commercial (201) 532-5170. A proponent is defined as an organization that maintains configuration control of the software program and documentation providing access/copies of that type information upon request and provides technical assistance in the application and use of the model. OSAMM is designed to simultaneously optimize support and maintenance policies for a new equipment while achieving a given operational availability target at least cost. The model can be applied during all phases of a materiel system's life cycle. However, it should be noted that inputs to the model are limited to the types of information that should be available early in development when the maintenance concept is being formulated. OSAMM describes where to remove and replace components (i.e., LRUs) and modules, place test equipment and skilled manpower, and where to stock spare parts and how much. OSAMM uses a mixed integer linear program to optimize and determine the best multiechelon stockage, test equipment, and maintenance policy decisions. Maintenance policies considered in the optimization can be constrained from a group of 25 that are available. All or most can typically be considered in a single execution of the model which includes split level maintenance policies. If the maintenance policy is fixed, the evaluator mode of OSAMM can be used to determine the costs, operational availability, etc. associated with that maintenance policy. When executing the evaluator mode alone the mixed integer linear program optimizer is by-passed. OSAMM computes a steady state cost which is converted to present value and assumes a symmetrical support structure. Selected Essential-Item Stockage for Availability Method (SESAME) algorithms are used in OSAMM to optimize supply which is the AMC approved model for provisioning determination. OSAMM is not designed to replace SESAME. The OSAMM model is designed to be used early in development to help establish a maintenance concept when detailed data on a new equipment is unknown. OSAMM can consider 30 different pieces of test equipment and personnel together. OSAMM looks at four levels of maintenance (organizational, Direct Support (DS), General Support (GS), and Depot) along with a discard option to optimize three levels of hardware indenture within an end item (components, modules and piece parts). Since detailed piece part data is not generally available in early development, the piece parts are considered only in an aggregate manner. OSAMM is based on applications (or failure modes) which lends well to the reliability program. This gives

OSAMM greater flexibility than most models. Commonality within an end item can be considered. The maintenance decisions made by OSAMM are output by application. The model will describe what should be done when the end item fails due to the failure of a certain module in a certain component. The model will also determine which components and modules should be thrown away instead of repaired. This information is ultimately used to develop the maintenance task distributions (MTDs) and replacement task distributions (RTDs) for individual components and modules. Occasionally there are parts or groups of parts that do not fit exactly into the indenture level structure. These parts or groups can be designated as pseudo components or pseudo modules. One example of a pseudo component would be a component that contains no modules and has a washout rate of one (e.g., a cable harness). The difference between a pseudo component and a pseudo module lies more in how repair is accomplished rather than in the actual hardware construction. For example, if an engine is considered a component the spark plugs would be a pseudo module. Because by definition of a module you would have to remove and replace the component before you could remove and replace the module. The pseudo module would allow you to replace the spark plugs (a module) without removing the engine (a component). Execution of OSAMM was accomplished through the CDC commercial time-sharing service since this is the most available source from which to access the model. Efforts are underway to have OSAMM available to government agencies through a government type time-sharing service in addition to the commercial service.

3.2 **LOGAM.** The proponent for LOGAM is the U.S. Army Missile Command (MICOM), AMSMI-OR-SA (Joe Nordman), Redstone Arsenal, AL 35898-5000, AUTOVON 746-3625, commercial (205) 876-3625. LOGAM is a tool used to evaluate alternate logistic postures for systems and equipments on the basis of cost and availability. The model is a deterministic type model and does not directly have an optimization feature like OSAMM. However, optimization can be accomplished by multiple runs of the model and manual comparison of results. Although LOGAM is operating and support cost oriented, acquisition costs including development, production and nonrecurring production costs can be throughput into the model to provide the DA PAM 11-4 formats along with the DCA-P-92(R) Baseline Cost Estimate format. The model can be applied during all phases of a materiel system's life cycle. The logistic and maintenance support system possibilities, which may be considered, comprise 20 basic maintenance policies. Also, the analyst can split maintenance policy and stock locations for LRUs. Four possible levels of maintenance and inventory support can be considered; organization (equipment), DS, GS, and Depot along with a discard possibility. LOGAM assumes a homogeneous (or symmetrical) deployment of the support and supply echelons (i.e., workload is equally distributed between maintenance facilities deployed at a particular echelon and supply parts are equally distributed to the number of supply points located at each echelon). LOGAM assumes a constant deployment such that the operational costs are the same for each year during the operation and support phase. Five types of test equipment, along with five types of manpower, can be modeled per LRU. The five types of test equipment include: Automatic Test Equipment (Field or Depot, Type I); Special Depot Test Equipment (Type II); Calibration Sets in the Field (Type III); Contact Support Teams and Test Sets (Type IV); and Built-in-Test Equipment (Type V). The test equipment is aggregated into these five types. In other words, two pieces of automatic test equipment (Type I) would be lumped together with no distinction between the two (which was the case for this study). LOGAM looks at three levels of hardware indenture within the end item (LRU, modules, and piece parts). LOGAM aggregates the modules and piece parts which precludes a detailed accounting for failures to specific modules. For example, if an LRU has 12 modules they would be lumped together with an average failure rate and average unit price for each module with no other specific distinction between the 12 modules. Execution of LOGAM was accomplished for this study through the use of MICOM's CDC mainframe at Huntsville, Al. However, access can also be obtained through installation of the program on a similar mainframe. It is being considered to have LOGAM on a similar type time-sharing service as OSAMM in order to preclude delays in debugging and installation of LOGAM on other computer systems. This would also allow better configuration control and access to LOGAM.

4.0 WEAPON SYSTEM DESCRIPTION. In order to satisfy the study objectives, data was used from the M65 Airborne TOW Missile system. The TOW was selected due to several reasons: MICOM's performance of other analysis using LOGAM with the TOW; the TOW being a deployed system; the relative simplistic size and configuration of the TOW; and, the information available locally from the MICOM project manager. The briefing contained at Appendix A gives a pictorial view and description of the hardware system along with its support structure. Basically, the TOW is broken down into 8 Line Replaceable Units (LRUs or components) with a total of 47 modules. A hypothetical deployment theater was considered having a total of 230 M65 Airborne TOW's deployed. This was done in order to simplify the study. The system life was taken to be 20 years along with a system MTBF of 137 hours. Since the system is deployed, an attempt was made to match the support structure and maintenance policy presently in use on the TOW (see appendix A for details). Only two pieces of test equipment to maintain the TOW were considered. This was done to simplify the study since the two considered were the main items in use to support test and repair of the TOW LRU's. One piece of test equipment was already in existence at the DS, GS, and Depot levels (so it was considered common at those levels); but at the organizational level it was not available and had to be procured (so it was considered peculiar at that level). The other piece of test equipment was already in existence and used only at the GS and Depot levels (so it was considered common). These two pieces of TMDE were input (lumped) as Type I TE in LOGAM and broken out separately in OSAMM for this study. The maintenance personnel were already in place at all support levels and were being used to support other systems as well as the TOW. Therefore, they were considered as being shared with the TOW at a fraction of the annual cost for personnel. A split level maintenance policy by LRU was modeled due to the policy already being in existence on the TOWs fielded (see appendix A for details). In addition to the fixed maintenance policy for LRU #8 (Sight Unit), there was an additional policy of screening for false no-go's at the DS level. Field information indicated that it was common to have a false no-go rate of 15 percent for all LRUs (i.e., 15 percent of the time a repair was attempted the LRU was good). Since LRU #8 is screened at DS no unfailed modules or LRUs are evacuated to GS or Depot for repair (i.e., the 15 percent false no-go's of LRU #8 are found at the DS level before they are evacuated).

5.0 MODEL SCENARIOS. This paragraph addresses how the models were used in this study: what costs were considered; what costs were omitted; and input and output adjustments which had to be made in order to compare the models and meet all the study objectives.

5.1 LOGISTICS COSTS OMITTED. There were certain cost categories that were considered unnecessary in order to achieve the study objectives and retain consistency and compatibility between the model scenarios. Some costs were also omitted due to: the nature of the system being analyzed; cost areas not actually being incurred against the system; or, the way the system's deployment scenario was being modeled. Therefore, these cost categories were for the most part zeroed out of the models in order to better meet the study objectives.

a. The cost of publications for the TOW was not readily available and was not considered in this study. This did not effect the purpose of the study which was to see if the OSAMM and LOGAM logistics cost versus reliability curves were comparable and compatible. The publications costs could have been included if they had been available.

b. Training costs were not used because the personnel were already available before the system was fielded. Therefore, training was considered a sunk cost. The training costs could have been modeled but due to the small costs involved and for the sake of simplicity of the analysis it was left out.

c. OSAMM does not consider salvage costs and Modification Work Order (MWO) costs. Therefore, they were taken out of LOGAM to have closer correlation in the cost curves. MWO costs would not have a great effect (if any) on this study or trading-off logistics cost versus reliability.

d. Scheduled maintenance costs were not considered due to the nature of the TOW system. The information available for scheduled maintenance was considered to be for the entire helicopter (i.e., approximately 8 hours per week per helicopter) and was not applicable to the TOW portions due to its stand-by static nature. Also, it should be noted that scheduled maintenance could not be directly input into OSAMM and in order to consider scheduled maintenance, adjustments would have been required to the OSAMM input file. If the scheduled maintenance was labor intensive, which in this study it would have been, it could be put into OSAMM as a pseudo component that costs a penny with an MTBF equal to the operating time per week (44 hours per week for this study) with an MTTR equal to the scheduled maintenance time (8 hours per week for this study) and be associated with TMDE used for the scheduled maintenance (there was no TMDE associated with scheduled maintenance for this study).

e. Manpower repair costs were omitted in OSAMM. This was done to force closer TMDE utilization compatibility between OSAMM and LOGAM. The TMDE for the TOW is only used in the testing mode--not in the repair mode. OSAMM uses a Mean Time to Repair (MTTR) factor to compute TMDE requirements. This fact only allows one time (manpower repair time or test time) to be put into OSAMM. Since this was the case and the TMDE was used only for testing, the test time was put into OSAMM's MTTR factor. If repair time would have been added to the MTTR factor in OSAMM, it would have estimated a higher amount of TMDE than was done by LOGAM without this adjustment. This drawback in OSAMM is being corrected in a new release scheduled for later this year. The manpower repair costs were left in LOGAM to see what the cost difference in manpower would be. This difference ended up to be $1.8 million more cost in LOGAM's results at the baseline MTBF of 137 hours. Upon closer scrutiny of the way OSAMM and LOGAM handles manpower requirements it was determined that manpower productivity factors or crew sizes input into LOGAM were incorrect for purposes of this study. However, no change was made in LOGAM due to time constraints and because of the discrepancy in OSAMM and LOGAM manpower costs already described above. One LOGAM run was made to determine the impact of putting the correct factors or size crews into LOGAM. Thus, the manpower cost difference noted above would have been reduced to approximately $1 million. Also, LOGAM's TMDE maintenance cost was reduced by approximately $25,000 which made it closer to OSAMM's cost figures. This reduction in LOGAM TMDE maintenance cost was due to a reduction in the fraction of manpower demand added for support of the TE. The LOGAM input variable involved is called "FI." In essence, a fraction of manpower demand cost is added onto the TMDE maintenance support cost. Thus, when manpower costs go down the TMDE maintenance support cost goes down.

5.2 <u>LOGISTICS COSTS CONSIDERED</u>. There were six major categories of logistics costs considered in this study which included: Manpower, Initial Spares, Consumption Spares, Transportation, TMDE, and Miscellaneous. These categories were chosen because of the way the costs are shown on the output reports of both models. It should be noted that the logistics cost category titled, "Miscellaneous" consists of those areas dealing mainly with administrative type costs. This was done to simplify the study and because of the difficulty in correlating some OSAMM cost outputs to LOGAM cost outputs. Table 1 contains a summary of the OSAMM and LOGAM output report cost titles related to each of the six major categories of costs outlined above.

LOGISTICS COST CATEGORY	OSAMM OUTPUT REPORT TITLES	LOGAM OUTPUT REPORT TITLES
MANPOWER	REPAIR COST*	MAINTENANCE MANPOWER**
INITIAL SPARES	INITIAL SPARES COST	TOTAL PROVISION (SUPPLY MATERIEL - SUPPLIES)
CONSUMPTION SPARES	CONSUMPTION SPARES COST	SUPPLIES
TRANSPORTATION	TRANSPORTATION COST	SHIPPING
TMDE	TOTAL TEST EQUIPMENT/ REPAIRMAN COST***	TEST EQUIPMENT TEST EQUIPMENT SPACE
MISCELLANEOUS	INVENTORY HOLDING COST REQUISITIONING COST CATALOGING COST BIN COST BACKORDER COST	INVENTORY MANAGEMENT REORDERING MATERIEL STORAGE COST TO ENTER NSNs INTO INVENTORY (SUPPLY ADMINISTRATION-INVENTORY MANAGEMENT)****

* OSAMM's Repair Cost in this study is only the test manpower costs.

** LOGAM's Maintenance Manpower in this study is both test and repair manpower costs.

*** OSAMM's Total Test Equipment/ Repairman Cost is somewhat misleading. The repairman cost in the title is for special repairmen. In this study there were no special repairmen. Therefore, the cost shown in OSAMM's output report is attributed to TMDE. The only manpower cost on OSAMM's output report for this study is in the element titled Repair Cost.

**** LOGAM's Cost to Enter NSNs Into Inventory is obtained by taking the Inventory Management cost and subtracting it from the Supply Administration cost.

TABLE 1. OSAMM and LOGAM Output Report Correlation.

5.3 **ADJUSTMENTS.** There were several adjustments that needed to be made or that were made to OSAMM and LOGAM input and output data that are worth noting. These adjustments are described in this paragraph. The adjustments described below are only intended to reflect adjustments which were needed or made in order to have consistency of model scenarios. If an adjustment is descriptive to a particular model it only implies that it was simpler to adjust that particular model and does not mean that a similar adjustment could not be made to the other model. It should be noted that the adjustments which could not be reflected in the study results will be reflected in the Comparative Analysis Report, MRSA COMA 86-01, to be completed in Nov 86 that will address the use of OSAMM versus LOGAM in conducting Level of Repair Analysis (LORA) studies.

5.3.1 The most important adjustment made was to present LOGAM's logistics cost categories in the same present value terms as OSAMM. The adjustment done by hand made it possible to compare OSAMM and LOGAM by the cost categories listed in Table 1. OSAMM discounts recurring costs on mid-year tables at a fixed rate of 10 percent as described in DODI 7041.3, Economic Analysis and Program Evaluation for Resource Management, Oct 72. This means that OSAMM assumes uniform spending of money throughout the year. LOGAM discounts recurring costs using end-of-year tables but an arbitrary discount (or inflation) rate can be input. However, the LOGAM discounting is only reflected in the end total logistics costs and not by the categories listed above. The use of end-of-year tables means that LOGAM assumes spending of money at the end-of-the year. Therefore, discounting to present value of LOGAM's logistics cost categories was accomplished externally (i.e., by hand) from the LOGAM model. This was done by entering a zero into LOGAM's input variable titled, "FINT" which is the discounting or inflation rate. Then the recurring costs that LOGAM outputs is divided by 20 years since that was used as the system life. The division was done because the figures LOGAM outputs are accumulated recurring costs for the 20 years and the division gives the annual recurring cost. Next, from a table of mid-year present value factors 8.933 was obtained for a 10 percent discount rate and a 20 year life cycle. Finally, the annual recurring cost was then multiplied by the 8.933 to bring LOGAM's recurring cost to the present value method that OSAMM uses. The specific costs that were adjusted are titled on LOGAM's output report as follows: Inventory Management, Materiel Storage, Reordering, Maintenance Manpower, Test Equipment (TE) Space, TE Maintenance, Shipping, and Supplies. The cost that did not undergo this adjustment (because they are already in terms of present value by the nature of the cost area) included: TE Procurement Cost (i.e., Test Equipment minus TE Maintenance), Total Provision, and Cost to Enter NSN's Into the Inventory (i.e., Supply Administration minus Inventory Management). Example 1 shows how the logistics cost category titled "Miscellaneous" were obtained and adjusted for LOGAM.

LOGAM MISCELLANEOUS CATEGORY	UNADJUSTED VALUE (UV)	YEARS ADJUSTMENT (YA) (UV/20 YEARS)	PRESENT VALUE FACTOR ADJUSTMENT (YA * 8.933)	PRESENT VALUE
Inventory Mgmt	$2,450,000	$122,500	$1,094,000	$1,094,000
Reordering	$98,000	$4,900	$44,000	$44,000
Mtl Storage	$231,000	$11,550	$103,000	$103,000
Cost Enter NSNs (Supply Admin.- Inventory Mgmt)	$68,000 ($2,518,000 - $2,450,000)	No Adjustment needed already present value.		$68,000
TOTAL				$1,309,000*

*This is the value shown at Table 2 for LOGAM's logistics cost category titled "Miscellaneous".

Example 1. Adjusting LOGAM Output.

5.3.2 An important adjustment made to OSAMM's input data was the requirement to add a psuedo module to handle removal of the false-no-go's for LRU #8 at DS level. This was necessary because in the actual field environment screening takes place at that maintenance level for LRU #8. Presently, this type screening of LRU's cannot be directly modeled in OSAMM so an adjustment was made to OSAMM's input to allow for the above scenario. This adjustment consisted of increasing the MTBF for the modules in LRU #8 by 15 percent which is the false-no-go rate and adding a pseudo module to LRU #8 which costs a penny. The pseudo module also had a restricted maintenance policy which was removal and replacement at DS Level. The failure rate for the psuedo module compensates for the decrease in failure rates of the other modules in LRU #8. Example 2 depicts the method and equation used to determine the failure rate of the pseudo module.

$$X = LRU * [FNG/(1 + FNG)]$$

LRU -- Failure Rate of the LRU before decreasing it for the percentage of false-no-go's (.0000364).

FNG -- False-no-go percentage rate (.15).

X -- Failure rate of the Psuedo Module (.0000048)*.

$\frac{1}{X}$ -- MTBF of the Psuedo Module (208,333 hours).

$$X = .0000364 * [.15/(1 + .15)]$$

* This is the value used in this study for the psuedo module failure rate included in LRU #8.

EXAMPLE 2. Method for Pseudo Module Development.

If this adjustment to OSAMM had not been made there would have been a slight impact on the logistics cost output. However, the adjustment did allow the TOW system and logistics support to be modeled correctly. This type adjustment will not be necessary in the future since the new release of OSAMM allows for screening of false-no-go's.

5.3.3 The second adjustment to OSAMM was insertion of the input variable titled, "Inventory Holding Cost Percentage" which was a matter of inputting the correct percentage rate to coincide with LOGAM's percentage rate of Materiel Storage to Total Provision. In preliminary execution of LOGAM this percentage was approximately two percent. Thus, two percent was used in OSAMM for the variable titled, "Inventory Holding Cost Percentage". Upon closer scrutiny of the way both models calculate holding cost and refinements in the LOGAM supply support pipelines it was revealed that the percentage rate should have been less than one percent. This finding was primarily due to the diverse methods used by the models to calculate inventory holding cost. OSAMM's Inventory Holding Cost (Materiel Storage in LOGAM) category is estimated by a percentage rate of the initial spares cost. The Inventory Holding Cost Percentage input into OSAMM includes three factors obsolescence, loss, and storage of the spares. The percentages for these three factors used in OSAMM are based on historical information from the Commodity Command Standard System Materiel Management Decision File. In contrast, LOGAM uses the quantity of spares stocked and their volume in cubic feet times a cost per cubic foot for storage space to calculate Materiel Storage cost. Also, LOGAM does not calculate obsolescence and loss as part of

Materiel Storage Cost. In this study LOGAM's cost per cubic foot for storage space was too low or OSAMM's holding cost percentage had to be adjusted to compensate for the above factors. No change was made in either of these figures due to time constraints and the diverse way holding costs are considered in the models. However, one OSAMM run was made to determine the impact of putting one percent instead of two percent. The one percent would have reduced the OSAMM Inventory Holding Cost category by $1.8 million and thus been closer to the cost obtained in LOGAM for the category titled, "Materiel Storage."

5.3.4 The third adjustment to OSAMM was insertion of the input called TE work space cost. Since OSAMM does not provide for a direct input for TE work space costs (like LOGAM) it was necessary to include it either in the OSAMM input variable titled "ETC" (Other One Time Initial Costs of TE) or "CF" (TE Annual Maintenance Cost Factor). The TE work space cost (input into LOGAM) was input into the OSAMM variable titled, "ETC" in order to keep visibility between the TE annual maintenance costs and TE work space costs. In preliminary execution of LOGAM the TE work space cost was $30,000. Thus, since 10 pieces of TE were required for the system in OSAMM, $3,000 was input into OSAMM. Later it was discovered that the $30,000 needed to be converted to OSAMM's present value terms before it was input into OSAMM. This was necessary since "ETC" is input into OSAMM as a one time cost and the LOGAM cost was an annual cost. Also, refinements in LOGAM input data reduced the TE work space cost to $24,000. Adjusting the $24,000 to present value, as shown earlier, and dividing by the TE requirement computed in OSAMM yields $1,072 which should have been input into OSAMM instead of $3,000. No adjustment to OSAMM was made due to the very small contribution that this had to the overall logistics cost and because it does not effect the accomplishment of the study objectives. However, one OSAMM run was made using $1,072 which reduced OSAMM cost for TMDE work space by $20,750. Thus, making OSAMM TMDE costs more compatible to LOGAM TMDE costs.

5.3.5 The fourth adjustment to OSAMM that will be discussed has to deal with insertion of the input called, "TE Annual Maintenance Cost Factor" (CF). This adjustment was a matter of inputting the correct percentage rate of TE procurement cost that should be used to calculate the TE annual maintenance cost. The annual cost for support of TE is an input to LOGAM as the variable titled, "CRI." In preliminary execution of LOGAM the percentage rate for TE maintenance cost was one percent of the TE procurement cost. Thus, one percent was used in OSAMM for the variable titled, "CF." Upon closer scrutiny of the way both models calculate TE annual maintenance cost and refinements in the LOGAM input data it was revealed that the percentage rate should have been two and a half or three percent. No change was made in the OSAMM input due to time constraints and the very small contribution that this cost had on the overall logistics cost. However, one OSAMM run was made to determine the impact of putting three percent instead of one percent. The three percent would have increased the OSAMM TE maintenance costs by $65,000 and thus been very close to the cost obtained in LOGAM.

6.0 RELIABILITY ALLOCATION SCENARIOS. One of the more important study objectives was to evaluate and determine the reliability allocation methods that would yield a wide logistics cost versus reliability envelope. This envelope provides a high and low cost bound (about a baseline cost) that could be incurred by realloca- tion of the LRU failure rates while still achieving the same sys- tem MTBF. This study objective was accomplished through the investigation of four different failure rate allocation methods: Baseline Proration; Unit Price Proration; ARINC Proration; and, Inverse Unit Price Proration. The first three allocation methods were agreed to at the fourth AMC Task Force meeting held in Dec 85. It was determined from the initial study efforts that another method was needed to provide the lower logistics cost versus reliability curve. This led MRSA to develop and suggest the Inverse Unit Price Proration method. Each of the four prora- tion methods are described in this paragraph.

6.1 BASELINE PRORATION METHOD. The Baseline Proration method simply uses the historical LRU failure rates to determine the logistics cost involved. Example 3 contains some actual failure rate data input into the two models.

LRU#	Mod	FR*	MTBF (1/FR*)	MTBF* (MTBF * Mod)
LRU #1	12	.00259	386	4,633
LRU #2	2	.00041	2,439	4,878

LRU#	-	Line Replaceable Unit (LRU) Number.
Mod	-	Number of modules in the particular LRU.
FR*	-	Historical failure rate for the particular LRU used in LOGAM.
MTBF	-	Mean Time Between failure (MTBF) in hours for a particular LUR.
MTBF*	-	Mean Time Between Failure (MTBF) in hours for a particular module in the particular LRU used in OSAMM.

EXAMPLE 3. Baseline Proration Method.

Note that in Example 3 FR* is the actual failure rate value input into LOGAM (variable "E") for the LRU shown. OSAMM uses the MTBF* which is to the module (or application) level (variable "FAIL(I)"). The approach used in OSAMM (i.e., multiplying MTBF by Mod) to find MTBF* means that the system is in series con- figuration which implies that if a module fails then the LRU fails. Thus, each of the 12 modules in LRU #1 has an MTBF* of 4,633 hours input into OSAMM. Likewise, each of the two modules in LRU#2 has an MTBF* of 4,878 hours input into OSAMM. These values are reflected on the input files at Appendix B for OSAMM and Appendix D for LOGAM.

6.2 UNIT PRICE PRORATION METHOD. The Unit Price Proration method takes the percentage rate contribution of the LRU unit prices to the end item unit price and uses those percentages as the percentage rate contribution per LRU to the system failure rate which was 1/137 hours or .007288. Contained at Example 4 is this method in equation form.

FR* = (UP/UPs)* FRs

LRU#	Mod	UP	Per (UP/UPs)	FR* (Per * FRs)	MTBF (1/FR*)	MTBF* (Mod * MTBF)
LRU#1	12	$110,628	.198	.001443	693	8,316
LRU#2	2	$ 25,298	.045	.0003279	3,050	6,100

LRU#	-	Line Replaceable Unit (LRU) Number.
Mod	-	Number of modules in the particular LRU.
UP	-	Unit Price of a particular LRU.
Per	-	Percentage rate contribution of a particular LRU's unit price to the system unit price.
FR*	-	Failure Rate for the particular LRU (input into LOGAM) for this method.
MTBF	-	Mean Time Between Failure (MTBF) in hours for a particular LRU.
MTBF*	-	Mean Time Between Failure (MTBF) in hours for a particular module in the particular LRU (input into OSAMM) for this method.
UPs	-	Unit Price of the end item or system ($558,541).
FRs	-	Failure rate of the end item or system (.007288).

Note that the values shown reflect the system being used in this study.

EXAMPLE 4. Unit Price Proration Method.

6.3 **ARINC PRORATION METHOD.** The ARINC Proration method takes the percentage rate contribution of each LRU's failure rate to the system failure rate and multiples it by the system Required Operational Capability (ROC) failure rate which was 1/200 hours or .005. Contained at Example 5 is this method in equation form.

FR* = (FR/FRs) * FRr

LRU#	Mod	FR	Per (FR/FRs)	FR* (Per * FRr)	MTBF (1/FR*)	MTBF* (Mod * MTBF)
LRU#1	12	.00259	.356	.00178	562	6,744
LRU#2	2	.00041	.056	.00028	3,571	7,142

LRU#	-	Line Replaceable Unit (LRU) Number.
Mod	-	Number of modules in the particular LRU.
FR	-	Historical failure rate for the particular LRU.
Per	-	Percentage rate contribution of a particular LRU's historical failure rate to the historical failure rate of the system.
FR*	-	Failure rate for the particular LRU (input into LOGAM) for this method.
FRs	-	Historical failure rate for the system (.007288).
FRr	- -	Failure rate specified in the Required Operational Capability (ROC) for the system (.005).
MTBF	-	Mean Time Between Failure (MTBF) in hours for a particular LRU.
MTBF*	-	Mean Time Between Failure (MTBF) in hours for a particular module in the particular LRU (input into OSAMM) for this method.

Note that the values shown reflect the system being used in this study.

EXAMPLE 5. ARINC Proration Method.

6.4 **INVERSE UNIT PRICE PRORATION METHOD.** The Inverse Unit Price Proration method takes the percentage rate contribution of each LRU's unit price to the end item unit price and then ranks the LRU's by this percentage rate from high to low. Next the percentages are inversed in ranking while the LRU nomenclatures are held as is. Thus, the LRU that had the highest percentage contribution to unit price now has the lowest percentage contribution to the system failure rate. The percentages are then multiplied by the system failure rate. Contained at Example 6 is an example of this method.

LRU#	UP	Per (UP/UPs)
LRU# 1	$110,628	.198
LRU# 4	$ 2,773	.005
LRU# 7	$ 4,000	.007
LRU# 8	$314,863	.564

LRU#	Mod	Perr (ranked Per High to Low)	IPER (Inverse Perr Order)	FR* (IPER * FRs)	MTBF (1/FR*)	MTBF* (Mod * MTBF)
LRU#8	13	.564	.005	.0000364	27,472	357,143
LRU#1	12	.198	.007	.000051	19,608	235,294
LRU#7	1	.007	.198	.001443	693	693
LRU#4	1	.005	.564	.0041104	243	243

LRU#	-	Line Replaceable Unit (LRU) Number.
UP	-	Unit price of a particular LRU.
UPs	-	Unit price of the end item or system ($558,541).
Per	-	Percentage rate contribution of a particular LRU's unit price to the system unit price.
Mod	-	Number of modules in the particular LRU.
Perr	-	This is the same as Per. However, the percentages are ranked in order from high to low.
IPER	-	This is the inverse rank of Perr holding the LRU# numbers the same.
FR*	-	Failure rate for the particular LRU (input into LOGAM) for this method.
FRs	-	Failure rate for the end item or system (.007288).
MTBF	-	Mean Time Between Failure (MTBF) in hours for a particular LRU.
MTBF*	-	Mean Time Between Failure (MTBF) in hours for a particular module in the particular LRU (input into OSAMM) for this method.

Note that the values shown reflect the system being used in this study. However, the MTBF* for LRU#8 had a further adjustment made to it before it was input into OSAMM. See paragraph 5.3.2 for a discussion of the adjustment.

EXAMPLE 6. Inverse Unit Price Proration Method.

6.5 Using each of the above four allocation methods shown, a sensitivity analysis was performed (varying the system MTBF or failure rate) in order to obtain enough data points to plot out a curve for each allocation method. Four different data points were generated for each failure rate allocation method using the sensitivity analysis features of the models.

7.0 **STUDY RESULTS.** This paragraph addresses the findings on the two main objectives of this study. The first objective was to determine if OSAMM and/or LOGAM can be used to trade-off logistics cost versus reliability. The second objective was to determine feasible reliability allocation methods that would develop a wide logistics cost versus reliability envelope around the baseline reliability allocation.

7.1 The final results from the OSAMM and LOGAM analysis were very similar. However, sources contributing to differences between the two models were identified on the sample problem studied and are discussed below. The logistics cost versus reliability curves derived as a result of executing OSAMM and LOGAM using M65 Airborne TOW data is contained at Figure 1. The input data files and the output files for each model are contained at Appendix B through Appendix E. It is impractical to show the input and output files for each curve along with files for each data point on a curve. Therefore, Appendixes B-E contain only the input and output files for the baseline curve at the data point of 137 hours system mean time between failure (MTBF). This point was chosen because 137 hours were taken as the baseline MTBF. It should be noted that the LOGAM output files contained at Appendix E were manually adjusted to get the same present value that OSAMM provides. Therefore, the output file costs shown at Appendix E for LOGAM are not identical to the cost plotted on Figure 1. The adjustment process for LOGAM output is discussed in paragraph 5.3.1. The ARINC Proration curves are not shown on Figure 1 because in theory they should be exactly the same as the Baseline Proration curves when plotted as a function of MTBF. The study results indicate this to be the case. However, due to round-off errors and graphical accuracy the ARINC Proration curves were not exactly identical to the Baseline Proration curves (they are extremely close). Thus, the ARINC Proration method is not a viable method to use in order to achieve a wide logistics cost versus reliability envelope. However, it is a viable proration method for determining the Baseline proration curve. Also, the ARINC Proration method provided a chéck to ensure accuracy of the model's computations. The ARINC Proration curves for OSAMM and LOGAM are shown at Appendix A.

7.2 The percentage cost difference between the OSAMM and LOGAM Baseline Proration curves ranges from approximately 2 to 17 percent with approximately 11 percent at the baseline MTBF of 137 hours. This percentage range would have been even smaller if the corrections noted earlier in paragraphs 5.1 and 5.3 could have been implemented before the study had been completed. The indication is that at 137 hours MTBF the percentage difference would have been less than 9 percent. In studying the curves it becomes apparent that some points are above or below the curve line drawn especially on the LOGAM curves. The reason the points do not make an exact smooth line is because the rounding methodology for stockage locations for LOGAM, at a given MTBF, could result in more or fewer spares procured and distributed. Thus, the point could jump above or below the curve because of spares stockage round-off. The next few paragraphs describe the reasons behind four anomalies that are apparent on Figure 1.

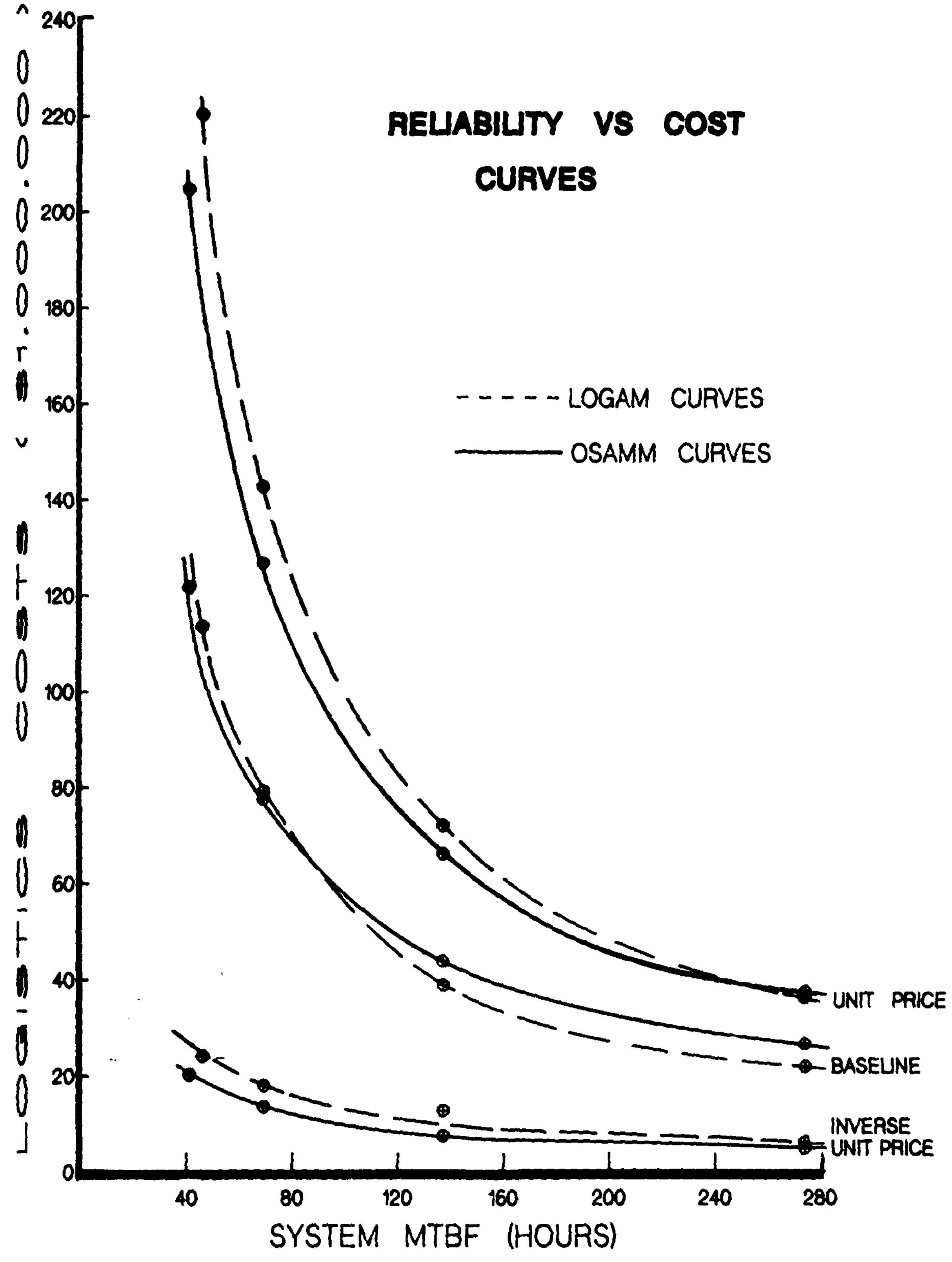


FIGURE 1. OSAMM and LOGAM Curves Comparison.

7.2.1 **ANOMALY A.** LOGAM's Unit Price, Baseline, ARINC, and Inverse Unit Price curves slope upward at a steeper rate than OSAMM's curves. The reasons are:

a. LOGAM recycles improperly repaired items for depot rework (for a lower system MTBF more items ar. recycled and a steeper curve results for LOGAM).

b. OSAMM washes-out parts at the level where repair occurs. Thus, no transportation cost is incurred to evacuate the washed-out parts. In LOGAM washout was designated to occur at the depot for this study which means transportation costs were incurred. At lower system MTBF's the LOGAM curve slopes up more steeply because there is more wash-outs and thus more transportation costs than OSAMM would have.

c. OSAMM repairs a small percentage of false no-go's and LOGAM does not. At a large system MTBF the quantity of false no-go's repaired is less, therefore, a less steep curve results for OSAMM.

7.2.2 **ANOMALY B.** LOGAM's Unit Price curve is higher than OSAMM's Unit Price curve, but not higher for the Baseline and ARINC curves. This is almost entirely due to initial provisioning differences brought about by the recycling of improperly repaired items at the depot which becomes more prevalent on the Unit Price curve since more failures of the high dollar items occur on this curve thus more cost is incurred because of the recycling.

7.2.3 **ANOMALY C.** OSAMM's Baseline curve (over most of the MTBF range) and ARINC curve is higher than LOGAM's. The reason for this is:

a. OSAMM washes-out and repairs a small percentage of false no-go's resulting in higher costs for consumption spares and manpower.

b. OSAMM's Inventory Holding Cost (Materiel Storage in LOGAM) category is estimated by a percentage rate of initial spares cost and includes percentages for storage but also obsolescence and loss costs. In contrast LOGAM uses stockage volume times the cost per cubic foot for storage space to calculate materiel storage cost and does not consider obsolescence and loss. Thus this diverse way to calculate inventory holding cost contributed to OSAMM's higher curves.

c. The differences in initial provisioning among the models contributed to this anomaly. The differences in initial provisioning calculations had to do with a lack of LOGAM having the Standard Initial Provisioning (SIP) retail stockage criteria. LOGAM drove to the availability target without regard to the regulatory minimum stockage criteria which OSAMM incorporates. In this study the requirement to add stockage (i.e., optimize stockage above SIP) was not necessary since the operational availability (Ao) achieved with SIP requirements was well above the target Ao. Thus, OSAMM's stockage optimization feature was not utilized. It must be noted that SIP is the lowest stockage allowed by Army regulation. The SIP criteria can be found in DARCOM-P 700-18 and the regulation which requires SIP usage is AR 700-18. LOGAM achieved the Ao target with less stockage than OSAMM which achieved slightly above the Ao target using SIP. Thus, this contributed to LOGAM's Baseline and ARINC curves being below the OSAMM Baseline and ARINC curves.

7.2.4 ANOMALY D. LOGAM's Inverse Unit Price curve is higher than OSAMM's. The reasons for this are:

a. OSAMM generates lower back order costs since this is a curve whose high dollar items has a low failure rate.

b. Repair time omitted in OSAMM to force closer test equipment compatibility (giving lower manpower costs).

7.3 The effects of the anomalies are considered minor when performing logistics cost versus reliability studies, since all the curves reach their point of diminishing returns at about the same MTBF which was, for this study, approximately 240 hours system MTBF.

7.4 It must be pointed out that the curves derived using the Unit Price and Inverse Unit Price Proration methods are not the maximum and minimum logistics cost versus reliability curves that can be obtained. However, they do appear to provide a wide bound (i.e., heuristic bound). In other words the methods provide a means for guiding reductions in logistics cost through improvements in reliability during system design. The key to whether these curves are realistic and bound the Baseline Proration curve is the accuracy of the data used to develop the curves. If data is uncertain, then sensitivity analysis on that data should be conducted using the models before any logistics cost versus reliability curves are constructed. The area of input data is further discussed at paragraph 9.0.

7.5 This report does not include all the cost figures by individual logistics cost category derived for each point on the curves shown at Figure 1. However, Table 2 shows the set of costs derived from the Baseline Proration curve at a system MTBF of 137 hours. Table 2 also contains remarks which explain the major reasons for the cost differences shown between OSAMM and LOGAM for a given logistics cost category. It should be pointed out that the LOGAM costs shown on Table 2 have been adjusted to present value using the method outlined earlier. Another point which must be made is that time constraints did not permit adjustments noted in paragraphs 5.1 and 5.3 which would have reduced the cost differences between the models and permitted closer correlation of the costs indicated on Table 2. The logistics cost categories which would have been effected by these adjustments are shown with a * on Table 2.

LOGISTICS COST CATEGORY	OSAMM COSTS	LOGAM COSTS	REMARKS
Manpower	$ 644,000	$ 2,468,000 *	Repair time omitted in OSAMM to force TMDE compat-ability.
Initial Spares	$20,997,000	$19,379,000	OSAMM used the SIP which was the minimum stockage allowed by regulation to meet the Ao. However, LOGAM drove to Ao which allowed less stockage than SIP allows.
Consumption Spares	$16,918,000	$15,118,000	OSAMM washes-out false no-go's which consumes more spares. Thus OSAMM has a slightly higher cost.
Transportation	$ 176,000	$ 291,000	LOGAM charges for distribution of initial spares. Transportation cost for washouts not calculated in OSAMM since they are disposed of at the field site.
TMDE	$ 429,000 *	$ 509,000 *	Charges input for TMDE Maintenance Support and Work Space Cost were not exactly consistant. LOGAM also procured one more TE set due to differences in TE Ao. The recycling of depot rework in LOGAM generated more TE requirements.
MISCELLANEOUS	$ 4,832,000 *	$ 1,309,000	The difference is due to inventory holding costs. OSAMM uses a percentage of the initial provisioning cost. LOGAM uses stockage volume times a cost factor. The OSAMM percentage includes obsolescence and loss.
TOTAL	$43,996,000	$39,074,000	

TABLE 2. OSAMM and LOGAM Costs Comparison.

8.0 MAINTENANCE AND SUPPLY SUPPORT OPTIMIZATION. This paragraph addresses the study objective of determining the impacts that utilizing maintenance and supply support optimization has on the logistics cost versus reliability curves.

8.1 One complaint in the past with utilization of logistics cost versus reliability curves has been that there is no consideration that a given design alternative may permit (or demand) a different supply or support environment. The advent of maintenance and supply support optimization has relieved this complaint. However, it should be noted that the greatest benefit of maintenance and supply support optimization can be realized in the early acquisition phases of a weapon system when it is possible to influence design and support structure development. In order to satisfy the study objectives and to illustrate the potential benefits of maintenance and supply support optimization OSAMM was executed on the M65 Airborne TOW data with its optimization feature active. OSAMM was chosen (over LOGAM) due to its built-in optimization feature. LOGAM could have been used; however, the optimization would have required a manual manipulation and comparison of numerous computer runs in order to determine the optimum maintenance and supply support structure for a given system MTBF. Thus, for purposes of this study OSAMM was the least time consuming of the two models when it came to optimization.

8.2 The OSAMM optimization analysis was accomplished using 12 feasible maintenance policies chosen from the 25 available in OSAMM. The 12 policies were based on the maintenance concept for the M65 Airborne TOW of having no GS repair (only screening at GS for LRU#8), no end item repair above DS, no discarding of the end item, and no module repair below depot. Thus, the optimizer was executed with these 12 policies to choose from along with the possibility of split level maintenance policies and possible discard of LRUs and modules. No other changes were made from the basic data base used to derive the OSAMM curves at Figure 1. Shown at Figure 2 are the logistics cost versus reliability curves derived as a result of executing OSAMM using the optimizer to select a maintenance policy versus using the fixed maintenance policy originally used in Figure 1. The maintenance policies derived by the OSAMM optimizer for each of the points on the three curves along with other details are contained at Appendix F. It is important to notice in Figure 2 the large drop in logistics cost (i.e., $19 million) at 137 hours system MTBF for the Baseline Proration curves when using an optimized versus fixed maintenance policy. The largest contribution to this decrease in logistics cost was the reduction in initial spares costs and in inventory holding cost. However, there was a very slight increase in repair costs. For each of the four points on each of the three curves a different maintenance policy was selected by the OSAMM optimizer. This was expected since the system MTBF was changed and proration of the MTBF among the LRUs was changed in order to develop the three proration curves. Thus, variations in MTBF and proration methods required a variation in the maintenance policy to yield the least logistics cost at the availability required. The most predominant maintenance policy selected by the OSAMM optimizer (for this study) was repair of the end item and components at DS; module repair at the Depot; and no split level maintenance. This maintenance policy was selected over most of the MTBF range. However, the maintenance policy selection tended toward repair of the end item and component at Organizational level; module repair at the Depot; and no split level maintenance at a system MTBF of 41 hours. These optimum maintenance policies are in sharp contrast to the fixed policy which was utilized in this study to compare OSAMM and LOGAM.

8.3 The above analysis was only a demonstration of the OSAMM optimizer to dramatize the effects on logistics cost when an optimized maintenance policy is considered versus utilizing a fixed predetermined maintenance policy. The above analysis was limited in scope. Thus, the optimum maintenance policy decisions derived by OSAMM, as a result of this study, should not be used to restructure the present M65 Airborne TOW maintenance and supply support structure. In the case of TOW there are sunk costs that were not considered in this analysis and non-economic considerations that would eliminate the economic benefits of changing the maintenance and supply support structure that already exists. A much more detailed effort would be required in order to consider all the implications of changing the established TOW maintenance and supply support structure.

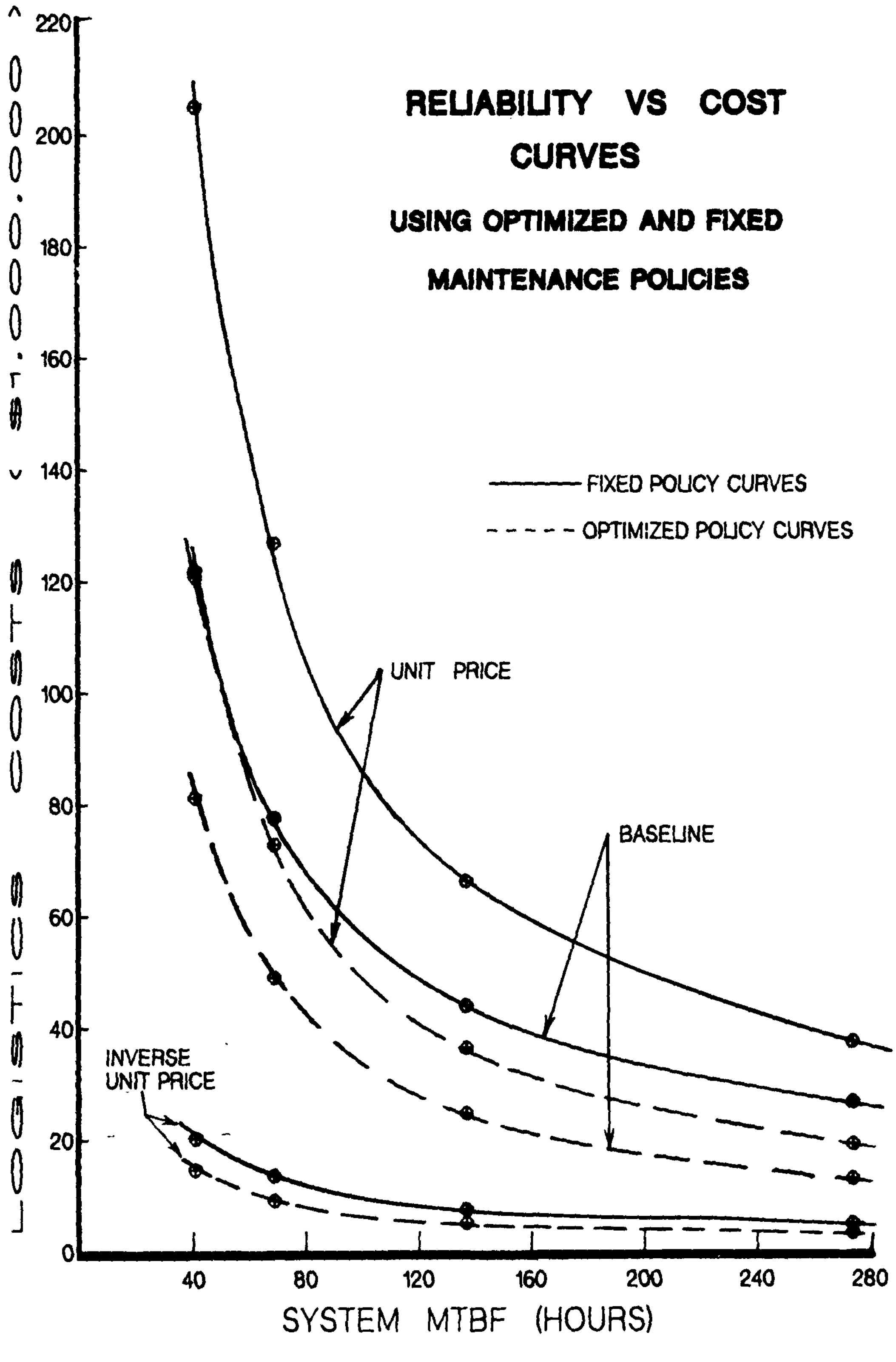


FIGURE 2. OSAMM Optimized Cost Vs Reliability Curves.

8.4 In general, the use of the OSAMM optimization feature does allow the analyst to quantify (i.e., cost-out) the decision to diverge from the optimum (i.e., the least cost solution to achieve an availability requirement) maintenance and supply support structure. Thus, the optimization feature provides a good measure to allow the decision maker to make a more informed and intelligent decision when it is necessary to diverge from the optimum support structure.

9.0 **CONCEPT/DEVELOPMENT PHASE INPUT DATA**. This paragraph discusses the last study objective which was to address the input data required to execute OSAMM and LOGAM in the early life cycle phases.

9.1 The collection and validation of data to be used in execution of models is the single most labor intensive task in conducting an analysis. Thus, it is appropriate that the data requirements of OSAMM and LOGAM be addressed in this study. A list of input data elements along with descriptions is contained at Appendix G for OSAMM and Appendix H for LOGAM. In an attempt to compare OSAMM and LOGAM input data requirements Appendix I is provided by the data categories described below. Also included at Appendix I is a one for one comparision of OSAMM and LOGAM inputs. It must be noted that the OSAMM mnemonics and input data elements provided at the appendixes are for the current version of OSAMM used in this study. The OSAMM mnemonics will be markedly changed from what is shown when the new release of OSAMM is available later this year.

9.2 There are five different categories of input data that the models utilize: Common Data (government and contractor furnished); System Peculiar Data (government and contractor furnished); and Program Control Data (analyst furnished). Each of these data categories is described below:

a. Category 1 - Common Data (government responsibility). This category consists of those data elements which are generally considered government furnished information (GFI) and for which standard data is available or can be developed and is not peculiar to the weapon system under analysis.

b. Category 2 - Common Data (contractor responsibility). These are data elements which are generally considered contractor furnished information (CFI) and which are considered specific to the system under analysis. There are standard reference values for data elements in this category. For instance, training costs will depend on the contractor's proposed training plan, however, data is available on current MOS training costs. This data might be used as a baseline if no other information is available.

c. Category 3 - System Peculiar Data (government responsibility). These are data elements which are considered GFI but for which there are no standard data available. This category includes data which is peculiar to the operation and deployment of the system under analysis.

d. Category 4 - System Peculiar Data (contractor responsibility). These are data elements which are considered CFI but for which there is no standard data. This category includes data, such as, unit price of hardware, reliability values, maintainability values, etc., peculiar to the system under analysis.

e. Category 5 - Program Control Data (analyst responsibility). These variables are used to control outputs and program run modes of the models themselves. These are left (for the most part) to the analyst to decide and input.

9.3 In Concept phase a more macro approach must be taken in utilizing the models both from a standpoint of data inputs and weapon system hardware breakdown. In other words, it is necessary to utilize estimates or common data values for inputs and the hardware breakdown will usually be to the LRU or black box level. Thus, values available for the Category 1 and 2 data inputs should be utilized. The Category 1 values are available from the Logistic Parameters Library developed by MRSA for the purpose of providing validated input data to support logistic modeling. The MRSA Logistic Parameters Library currently contains data elements for input to both OSAMM and LOGAM. The Parameters Library is computerized and is organized by the mnemonics of the models. Thus, if a value is needed for a Category 1 input to OSAMM it can be retrieved from the library by typing in the OSAMM mnemonic. It should be noted that validated sources for the data values are also contained in the Parameters Library. The computerized Parameters Library is contained on MRSA's HP 3000 and may be accessed by government personnel only. Data obtained from the library may be released to a contractor only after screening and approval by the appropriate program manager. It is anticipated that additional models will be added to the library along with Category 2 type data. More detailed information on the Logistic Parameters Library can be obtained from the USAMC Materiel Readiness Support Activity, ATTN: AMXMD-EL, Lexington, KY 40511-5101, AUTOVON 745-3985 or commercial (606) 293-3986. Also, values are available for the Category 1 and 2 type data from the proponents of OSAMM and LOGAM. These values provided by CECOM and MICOM are contained at Appendix G and H, however, these values are not fully validated with sources for their origin. The categories of data that are most important in concept/development phases are the Category 3 and 4 data. However, even estimates for many of these two categories can be utilized. The data which is critical to an analysis in Concept or in any life cycle phase include: the unit price of items, failure rates or MTBF of items, TMDE utilization time and prices, operating life of the system, deployment quantity, operating time per day, availability target, and to a less extent MTTR of items, and the overall maintenance concept. If uncertainty exists in any of these data elements a sensitivity analysis can quantify and assist in determining the benefit of designing for more reliability versus the potential effects on logistics cost. Refinements in inputs to the models can be made as design progresses and more information and details are available. OSAMM and LOGAM both allow this type approach.

10.0 LESSONS LEARNED.

10.1 In this study there were a few input data areas that were difficult to input due to the nature of this study which was to utilize OSAMM and LOGAM with the same inputs and scenarios. These categories include: calibration manpower (or test manpower); contact team manpower (or repair manpower); scheduled maintenance; and initial spares pipelines. Initially, these categories created large differences in the outputs of the two models for the M65 Airborne TOW data. Upon closer review, those categories that could not be easily or directly input into OSAMM for evaluation were eliminated from both models or not considered in OSAMM. Also, inaccurate or overlooked LOGAM input variables or output results were adjusted as required. Those data categories eliminated, not considered, or adjusted are explained in paragraphs 5.1 and 5.3. It should be noted that a prime difficulty was the interpretation of initial spares pipelines. This area was given particular attention to ensure these pipelines were compatible in both models.

10.2 The most important lesson learned is that a skilled analyst who is a logistician should be available for review and consultation on LOGAM or OSAMM studies. It is very easy, even for the skilled analyst, to improperly interpret inputs and outputs.

11.0 CONCLUSIONS/RECOMMENDATIONS.

11.1 OSAMM and LOGAM produce very similar logistics cost versus reliability envelopes. The models give reasonably close logistics cost (2-17 percent difference) for a range of reliability values over various failure rate proration methods (i.e., Unit Price, Baseline, ARINC, and Inverse Unit Price Prorations). This comparability was demonstrated using the M65 Airborne TOW on a fixed set of maintenance policies for both models. Thus, it is concluded that OSAMM and LOGAM will produce similar results for logistics cost versus reliability trade-offs, when exercised without optimizing maintenance policies. Either model is acceptable for use when maintenance policy optimization is not required.

11.2 OSAMM is a more preferred model than LOGAM because of OSAMM's optimization features. Supply and maintenance policy optimization is a significant attribute in early Concept and Demonstration phase studies. It is envisioned that the cost versus reliability studies would be conducted in the Concept and Demonstration phases. OSAMM with the optimization feature can automatically consider a large set of potential solutions for stockage quantities; maintenance policy selection; and placement and purchase of TMDE to achieve a system availability target at a reduced cost. Also, stockage quantities are determined by SESAME algorithms which are AMC approved.

11.3 LOGAM does have some advantages in given situations because more detailed data inputs are required for the logistics structure and because every input can vary by LRU. The model can estimate total Operation and Support Costs with DA PAM 11-4 and

DCA P-92(R) formats and can manipulate individual LRU target availabilities to reduce initial spares cost. Also, LOGAM can vary any input for sensitivity analysis. It appears that LOGAM concentrates more on details of the logistics system than on the actual hardware system and test requirements details. In contrast, it appears OSAMM concentrates more on details of the actual hardware system and its test requirements with a slightly less amount of detail on the logistics system than LOGAM.

11.4 It is obvious from the logistics cost versus reliability envelopes generated in this study that logistics cost are sensitive to the method used to allocate reliability. Also, maximum improvement in logistics cost is attributed to reducing the failure rate of high unit cost items. The Inverse Unit Price Proration method shows a large improvement in logistics cost by reducing the failure rate of high unit price items.

11.5 The Unit Price Proration and Inverse Unit Price Proration methods produce a very good (i.e., wide) logistics cost versus reliability envelope around the Baseline Proration method. The ARINC Proration method is not adequate to provide a good (i.e., wide) logistics cost versus reliability envelope. It must be pointed out that the Inverse Unit Price Proration method has a drawback. This drawback is that if LRU unit prices are uniform (i.e., each LRU percentage contribution to system unit price is relatively equal) then the cost versus reliability envelope would be a very narrow band around the Baseline Proration curve. However, having uniform unit prices for LRUs is highly unlikely. Another point which must be stated is that the proration methods do not address the issue of whether the reallocated failure rates for a particular LRU are realistic or feasible. This is something that a skilled analyst must determine when conducting the cost versus reliability study. Also, these methods do not give the maximum and minimum logistics cost versus reliability curves. These methods do provide a wide bound around the baseline curve given the input data is realistic and feasible.

11.6 Using the Unit Price Proration and Inverse Unit Price Proration methods early in the life cycle will bound the logistics cost for a given predicted system reliability. In other words, even if you do not know the actual baseline reliability allocation, it can be realistically concluded that the Baseline Proration Curve will fall between the other two curves.

11.7 Important to note is that each of the logistics cost versus reliability proration curves in this study reaches its point of diminishing returns at about the same system MTBF. In other words, at a certain point, no matter how much you increase the reliability of the system, it will not significantly reduce logistics cost. For this study that point was approximately 240 hours system MTBF.

11.8 There have been discussions as to the feasibility of requiring the use of both OSAMM and LOGAM in conducting logistics cost versus reliability studies. It is impractical and costly to execute both models to conduct a logistics cost versus reliability study since either model is adequate to accomplish the requirement and both models provide comparable results. The use of either model is recommended but not both on one weapon system study. If both models were used, as in this study, adjustments to both OSAMM and LOGAM input data and output would be required to ensure compatibility of the models results. This would be costly if contracted out and create needless work since either model produces compatible results.

12.0 SUMMARY. In summary, for performing logistics (maintenance and support) cost versus reliability studies the following conclusions are:

a. Either OSAMM or LOGAM is acceptable.

b. OSAMM is preferred, if maintenance policy optimization is required, but LOGAM will suffice for analysis of a small number of maintenance policies.

APPENDIX A

APPENDIX A
STUDY BRIEFING

AS PART OF THE AMC RELIABILITY VERSUS COST TASK FORCE MRSA AND MICOM JOINTLY CONDUCTED A STUDY OF THE OPTIMUM SUPPLY AND MAINTENANCE MODEL (OSAMM) AND THE LOGISTICS ANALYSIS MODEL (LOGAM) USING THE M65 AIRBORNE-TUBE LAUNCHED OPTICALLY TRACKED WIRE-GUIDED (TOW) MISSILE SYSTEM. THE MAIN OBJECTIVE OF THE STUDY WAS TO INVESTIGATE THE POTENTIAL OF THE MODELS TO CONDUCT LOGISTICS COST VERSUS RELIABILITY TRADE-OFFS. THE FOLLOWING BRIEFING IS A SUMMARY OF MRSA'S AND MICOM'S EFFORTS AND RESULTS.

AMC RELIABILITY VERSUS COST TASK FORCE

RELIABILITY VERSUS COST
USING
OSAMM AND LOGAM
WITH
M65 AIRBORNE TOW DATA

BY

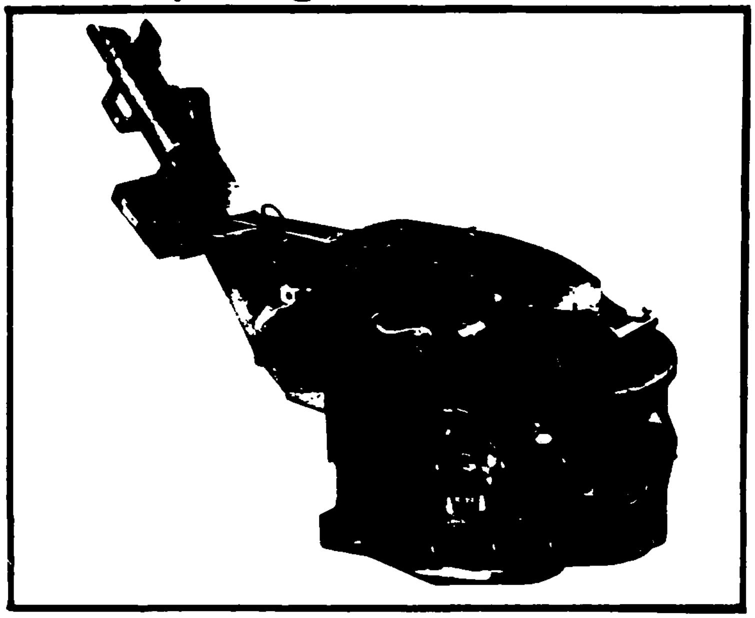
JOE NORDMAN

&

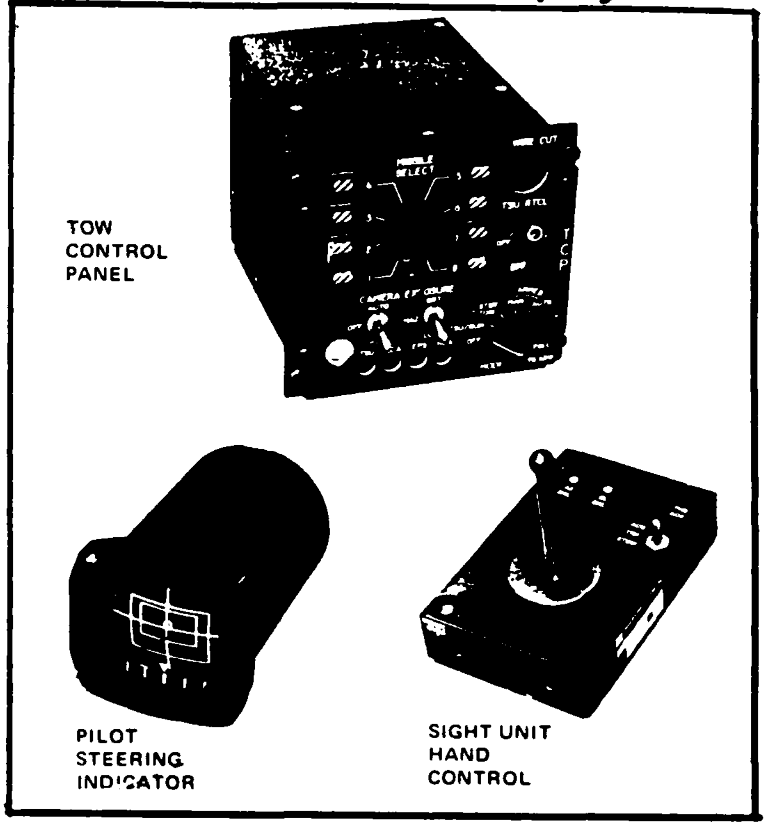
JIM CRABTREE

THIS SLIDE GIVES YOU A PICTORIAL VIEW OF THE M65 AIRBORNE TOW'S EIGHT LINE REPLACEABLE UNITS WHICH WERE THE FOCUS OF THE STUDY.

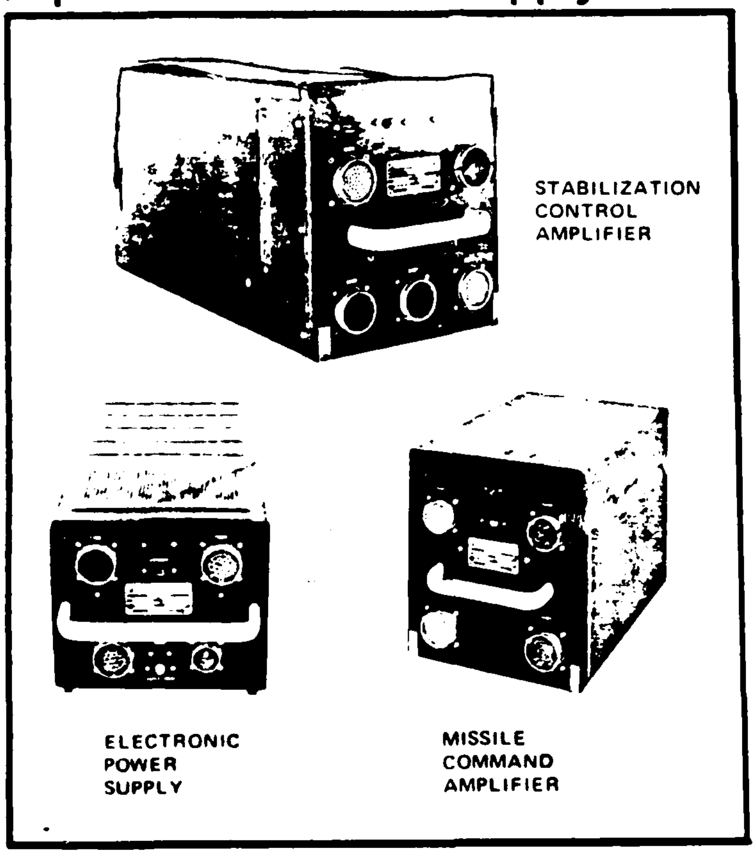
Telescopic Sight Unit



Aircrew Controls and Displays



Amplifiers and Power Supply



TOW Missile Launcher

THIS SLIDE SHOWS THE EIGHT LRU'S AND ALSO GIVES YOU THE NUMBER OF MODULES WHICH MAKE UP THE LRU'S OF THE M65 AIRBORNE TOW.

M65 AIRBORNE TOW

PROBLEM DESCRIPTION :

LRU	NOMENCLATURE	NO. MODULES
1	COMMAND AMPLIFIER	12
2	CONTROL UNIT	2
3	SYSTEM AMPLIFIER	9
4	SIGHT CONTROL	1
5	POWER SUPPLY	8
6	LAUNCH UNIT	1
7	STEERING UNIT	1
8	SIGHT UNIT	13

A HYPOTHETICAL DEPLOYMENT THEATER WAS CONSIDERED HAVING A TOTAL OF 230 M65 AIRBORNE TOW'S DEPLOYED. THIS WAS DONE IN ORDER TO SIMPLIFY THE STUDY. THE SYSTEM LIFE WAS TAKEN TO BE 20 YEARS. SINCE THE SYSTEM IS DEPLOYED WE TRIED TO MATCH THE SUPPORT STRUCTURE AND MAINTENANCE POLICY PRESENTLY IN USE ON THE TOW. THIS SLIDE SHOWS THE NUMBER OF SUPPORT UNITS PER SUPPORT LEVEL, TEST EQUIPMENT AND MANPOWER AT EACH LEVEL. WE CONSIDERED TWO PIECES OF TEST EQUIPMENT TO MAINTAIN THE TOW. THIS WAS DONE TO SIMPLIFY THE STUDY SINCE THE TWO CONSIDERED WERE THE MAIN ITEMS IN USE TO SUPPORT TEST AND REPAIR OF THE TOW LRU'S. ONE PIECE OF TEST EQUIPMENT WAS ALREADY IN EXISTENCE AT THE DS, GS, AND DEPOT LEVELS (SO IT WAS CONSIDERED COMMON AT THOSE LEVELS BUT AT THE ORGANIZATION LEVEL IT WAS NOT AVAILABLE AND HAD TO BE PROCURED (SO IT WAS CONSIDERED PECULIAR AT THAT LEVEL). THE OTHER PIECE OF TEST EQUIPMENT WAS ALREADY IN EXISTENCE AND USED ONLY AT THE GS AND DEPOT LEVELS (SO IT WAS CONSIDERED COMMON). THE MAINTENANCE PERSONNEL WERE ALREADY IN PLACE AT ALL SUPPORT LEVELS AND WERE BEING USED TO SUPPORT OTHER SYSTEMS AS WELL AS THE TOW. THEREFORE, THEY WERE CONSIDERED AS BEING SHARED WITH THE TOW AT A FRACTION OF THE ANNUAL COST FOR PERSONNEL.

PROBLEM DESCRIPTION (CONT'D) :

- HYPOTHETICAL DEPLOYMENT : 230 SYSTEMS
- SYSTEM LIFE : 20 YEARS
- LOGISTICS SUPPORT STRUCTURE :

SUPPORT LEVEL	NO. SUPPORT UNITS	TMDE	MANPOWER
ORG	10	PECULIAR	SHARED
DS	2	COMMON	SHARED
GS	1	COMMON	SHARED
DEPOT	1	COMMON	SHARED

SINCE THE TOW WAS FIELDED THE MAINTENANCE POLICY WAS FIXED FOR THIS STUDY. THIS SLIDE DEPICTS THE SPLIT LEVEL MAINTENANCE POLICY BY LRU. IN ADDITION, TO THE FIXED REPAIR POLICY FOR LRU #8 THERE WAS AN ADDITIONAL POLICY OF SCREENING FOR FALSE NO-GO'S AT THE DS LEVEL. FIELD INFORMATION INDICATED THAT IT WAS COMMON TO HAVE A FALSE NO-GO RATE OF 15 PERCENT FOR ALL LRU'S (THIS MEANS THAT 15 PERCENT OF THE TIME A REPAIR WAS ATTEMPTED THE LRU WAS GOOD). SINCE LRU #8 IS SCREENED AT DS NO UNFAILED MODULES OR LRUS ARE EVACUATED TO GS OR DEPOT FOR REPAIR (I.E. THE 15 PERCENT FALSE NO-GO'S ARE FOUND AT THE DS LEVEL BEFORE THEY ARE EVACUATED).

PROBLEM DESCRIPTION (CONT'D) :

- FIXED MAINTENANCE POLICY :

LRU	PERCENT	POLICY	
		LRU REPAIR	MODULE REPAIR
1 – 7	25%	ORG	DEPOT
1 – 7	65%	DS	DEPOT
1 – 7	10%	DEPOT	DEPOT
8	25%	DS*	DEPOT
8	65%	GS	GS
8	10%	DEPOT	DEPOT

* INCLUDES SCREENING OF ALL LRU #8's AT DS FOR FALSE-NO-GO's.

- ALL LRU REPAIR INCLUDES 15% DETECTION FOR FALSE-NO-GO'S UNLESS PRECEEDED BY CHECK-OUT AT DS.

There were certain cost categories that we considered not necessary in order to achieve the study objectives and retain consistency and compatibility between model scenarios. Some costs were also omitted due to: The nature of the system being analyzed; cost areas not actually being incurred against the system; or, the way the system's deployment scenario was being modeled.

The cost of publications for the TOW was not readily available and was not considered in this study. It was felt this would not effect the purpose of the study which was to see if the OSAMM and LOGAM reliability versus cost curves were comparable and compatible. The publications costs could have been included if they had been available.

Training costs were not used because the personnel were already available before the system was fielded. Therefore, training was considered a sunk cost. The training costs could have been modeled but due to the small costs involved and for the sake of simplicity of the analysis it was left out.

OSAMM does not consider salvage costs and MWO costs, and it was felt better to take them out of LOGAM to have closer correlation in the cost curves. It was also felt that MWO costs would not have a great effect (if any) on this study or trading-off reliability versus logistics cost.

Scheduled maintenance costs were not considered due to the nature of the TOW system. It was felt that the information available for scheduled maintenance was for the entire helicopter (i.e. approximately 8 hours per week per helicopter) and was not applicable to the TOW portion due to its stand-by static nature.

Manpower repair costs were omitted in OSAMM. This was done to force closer TMDE utilization compatibility between OSAMM and LOGAM. The TMDE is only used in the testing mode not in the repair mode. OSAMM uses a MTTR factor to compute TMDE requirements and would only allow one manpower repair or test time. Since this was the case and the TMDE was used for testing only, we put only test time into OSAMM's MTTR factor. This drawback in OSAMM is being corrected in a new release scheduled for later this year. The manpower repair costs were left in LOGAM to see what the cost difference in manpower would be.

COMPARISON ANALYSIS

COSTS OMITTED :

COST CATEGORY	COMPUTER MODEL OSAMM	COMPUTER MODEL LOGAM
PUBLICATIONS	X	X
TRAINING	X	X
SALVAGE	X	X
SCHEDULED MAINTENANCE	X	X
MWO	X	X
* MANPOWER REPAIR	X	

* REPAIR TIME WAS OMITTED IN OSAMM TO FORCE CLOSER TMDE UTILIZATION COMPATIBILITY.

THIS SLIDE SHOWS THE LOGISTICS COST CATEGORIES THAT WERE CONSIDERED IN THE STUDY. AN ACTUAL COST COMPARISON BETWEEN OSAMM AND LOGAM IS SHOWN ON THE NEXT SLIDE. IT SHOULD BE NOTED THAT THE LOGISTICS CATEGORY TITLED 'MISCELLANEOUS" WAS DONE TO SIMPLIFY THE STUDY AND BECAUSE OF THE DIFFICULTY IN CORRELATING SOME OSAMM COSTS TO LOGAM COSTS. THE MISCELLANEOUS CATEGORY IN OSAMM IS MADEUP OF THE FOLLOWING COSTS: INVENTORY HOLDING, REQUISITIONING, CATALOGING, BIN, AND BACKORDER. THE MISCELLANEOUS CATEGORY IN LOGAM IS MADEUP OF THE FOLLOWING COSTS: INVENTORY MANAGEMENT, REORDERING, MATERIEL STORAGE, AND COST TO ENTER NSNS INTO THE INVENTORY.

THE BOTTOM LINE SHOWN ON THIS SLIDE IS THAT THE COST VARIANCE BETWEEN OSAMM AND LOGAM WAS ONLY 11 PERCENT.

COMPARISON ANALYSIS

COSTS CONSIDERED :

LOGISTICS CATEGORY	COMPUTER MODEL OSAMM	COMPUTER MODEL LOGAM
MANPOWER	X	X
INITIAL SPARES	X	X
CONSUMPTION SPARES	X	X
TRANSPORTATION	X	X
TMDE	X	X
MISCELLANEOUS (SUPPLY ADMIN., REORDERING, REQUISITIONING, STORAGE, ETC.)	X	X

BOTTOM LINE : DIFFERENCE IN BASELINE COSTS OBTAINED = APPROXIMATELY 11%.

THIS SLIDE SHOWS THE ACTUAL COSTS DERIVED FROM BOTH MODELS FOR THE BASE-LINE ALLOCATION METHOD AT A SYSTEM MTBF OF 137 HOURS.

IT SHOULD BE NOTED THAT IN ORDER TO GET THIS LOGISTICS COST CATEGORY COMPARISON, LOGAM'S COST FIGURES HAD TO BE HAND ADJUSTED TO GET PRESENT VALUE THAT OSAMM OUTPUTS. LOGAM DISCOUNTS RECURRING COSTS USING END OF YEAR TABLES. THE ADJUSTED COSTS ARE SHOWN BY A *. OSAMM DISCOUNTS RECURRING COSTS ON MID-YEAR TABLES.

ALSO, INCLUDED ON THIS SLIDE ARE REMARKS WHICH EXPLAIN THE MAJOR REASONS COSTS ARE DIFFERENT BETWEEN OSAMM AND LOGAM IN A GIVEN LOGISTICS COST CATEGORY.

BEYOND THE ADJUSTMENT NOTED ABOVE, ADJUSTMENTS WERE NEEDED TO THE OSAMM COST CATEGORIES TITLED TMDE AND MISCELLANEOUS AND LOGAM COST CATEGORY TITLED MANPOWER AND TMDE. HOWEVER, THESE ADJUSTMENTS WERE NOT MADE DUE TO TIME CONSTRAINTS. THE ADJUSTMENTS INVOLVED INPUT VARIABLES OF THE MODELS. THESE PARTICULAR INPUT VARIABLES NOT BEING ADJUSTED AFFECTED THE OUTPUT COSTS SHOWN FOR MANPOWER, TMDE, AND MISCELLANEOUS CATEGORIES. IF THESE ADJUSTMENTS HAD BEEN MADE, THE PERCENTAGE DIFFERENCE BETWEEN OSAMM AND LOGAM WOULD HAVE BEEN REDUCED FROM 11 PERCENT TO 9 PERCENT.

COMPARISON ANALYSIS

LOGISTICS COST CATEGORY	OSAMM COSTS	LOGAM COSTS	REMARKS
MANPOWER	$ 644,000	$ 2,468,000*	REPAIR TIME OMITTED IN OSAMM TO FORCE TMDE COMPATABILITY.
INITIAL SPARES	$20,997,000	$19,379,000	OSAMM USED SIP WHICH WAS THE MINIMUM STOCKAGE ALLOWED BY REGULATION TO MET THE Ao. HOWEVER, LOGAM DROVE TO Ao WHICH ALLOWED LESS STOCKAGE THAN SIP ALLOWS.
CONSUMPTION SPARES	$16,918,000	$15,118,000*	OSAMM WASHES- OUT FALSE NO-GO's WHICH CONSUMES MORE SPARES. THUS OSAMM HAS A SLIGHTLY HIGHER COST.
TRANSPORTATION	$ 176,000	$ 291,000*	LOGAM CHARGES FOR DISTRIBUTION OF INITIAL SPARES. TRANSPORTATION COST FOR WASHOUTS NOT CALCULATED IN OSAMM SINCE THEY ARE DISPOSED OF AT THE FIELD SITE.
TMDE	$ 429,000	$ 509,000*	CHARGES INPUT FOR TMDE MAINTENANCE SUPPORT AND WORK SPACE COST WERE NOT EXACTLY CONSISTANT. LOGAM ALSO PROCURED ONE MORE TE SET DUE TO DIFFERENCES IN TE Ao's. THE RECYCLING OF DEPOT REWORK IN LOGAM GENERATED MORE TE REQ'MTS.
MISCELLANEOUS	$ 4,832,000	$ 1,309,000*	THE DIFFERENCE IS DUE TO INVENTORY HOLDING COSTS. OSAMM USES A PERCENTAGE OF THE INITIAL PROVISIONING COST. LOGAM USES STOCKAGE VOLUME TIMES A COST FACTOR. THE OSAMM PERCENTAGE INCLUDES OBSOLECENCE AND LOSS LOGAM DOESNOT.
TOTAL	$43,996,000	$39,074,000*	

THIS SLIDE STARTS THE MAIN TWO POINTS OF THE STUDY. ONE MAIN POINT WAS TO DETERMINE IF OSAMM AND LOGAM GIVE COMPARABLE AND COMPATIBLE RESULTS WHEN LOOKING AT MAINTENANCE AND SUPPLY SUPPORT COSTS AS A FUNCTION OF RELIABILITY. THE OTHER POINT WAS TO DETERMINE DIFFERENT RELIABILITY ALLOCATION METHODS THAT WOULD YIELD A COST VERSUS RELIABILITY ENVELOPE THAT REPRESENTS THE MAXIMUM AND MINUMUM COSTS THAT COULD BE INCURRED BY REALLOCATION OF THE LRU FAILURE RATES IN THE SYSTEM TO ACHIEVE THE SAME SYSTEM MTBF.

THE STUDY CENTERED ON THE FOUR ALLOCATION METHODS SHOWN ON THIS SLIDE. THE BASELINE SYSTEM FAILURE RATE (λ) WAS .007288 OR 137 HOURS MTBF. THE ROC SYSTEM FAILURE RATE USED IN THE ARINC PRORATION METHOD WAS .005 OR 200 HOURS MTBF. THE INVERSE UNIT PRICE PRORATION METHOD WHICH WAS A NEW ALLOCATION METHOD WHICH CAME FROM MRSA (MR. JIM CRABTREE). THE OTHER THREE METHODS INVESTIGATED CAME FROM DISCUSSIONS DURING THE FOURTH AMC RELIABILITY VS COST TASK FORCE MEETING (16-18 DEC 85).

RELIABILITY VERSUS LOGISTICS COST CURVES

METHODOLOGIES USED :

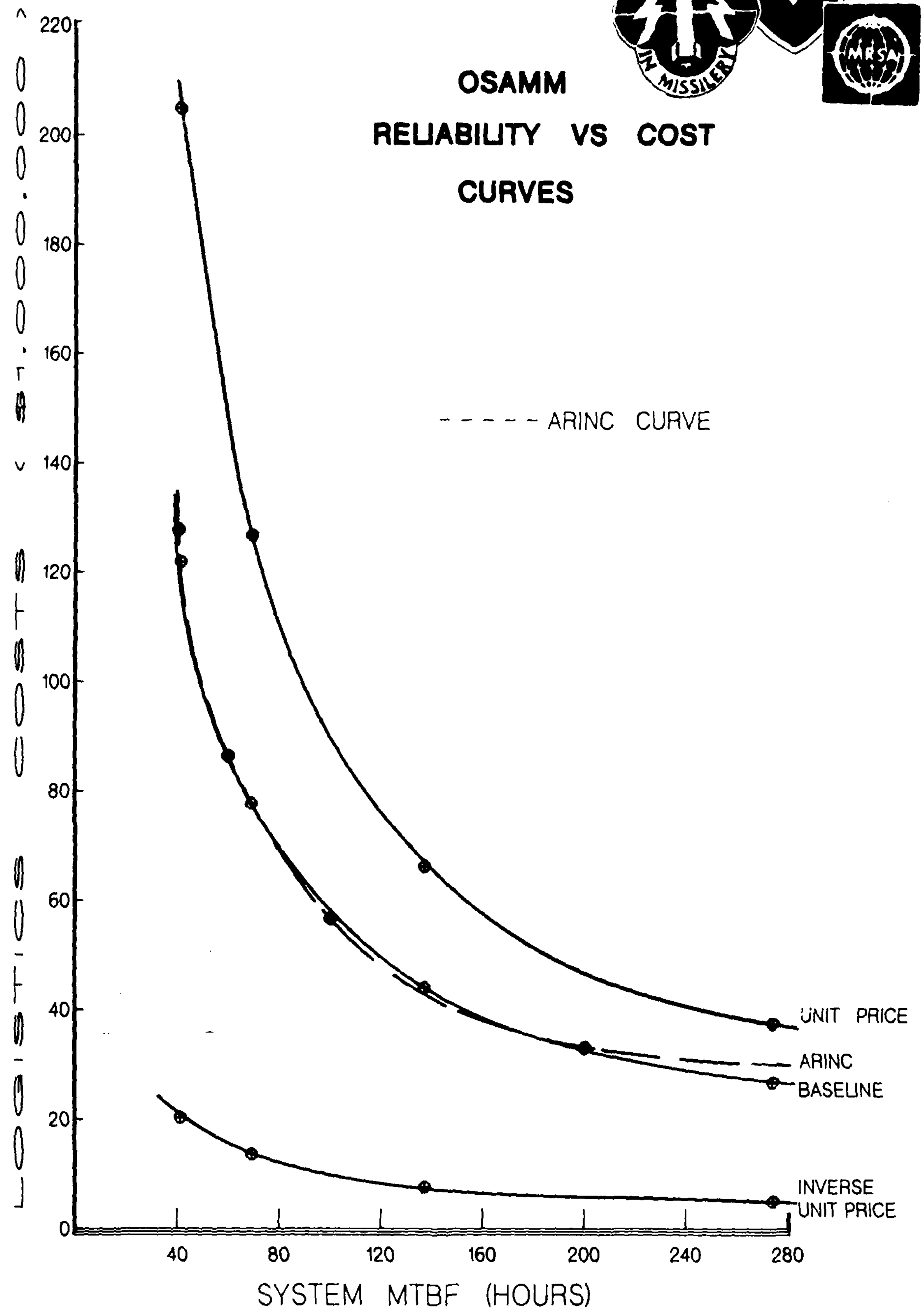
METHODOLOGY NAME	FAILURE RATE ALLOCATION SCHEME
• BASELINE PRORATION	HISTORICAL FAILURE RATES λ_i
• UNIT PRICE (UP) PRORATION	$\overset{*}{\lambda}_i = (UP_i / \Sigma UP_i) * \text{SYSTEM } \lambda$
• ARINC PRORATION	$\overset{*}{\lambda}_i = (\lambda_i / \Sigma \lambda_i) * \text{SYSTEM ROC } \lambda$
• INVERSE UNIT PRICE PRORATION	INVERSE ORDER UNIT PRICE PRORATIONS SWITCHING HIGHEST TO LOWEST

EXAMPLE :

	RANKED $UP_i / \Sigma UP_i$	INVERSE ORDER	$\overset{*}{\lambda}_i$
LRU3	60%	15%	.15 * SYSTEM
LRU1	25%	25%	.25 * SYSTEM
LRU2	15%	60%	.60 * SYSTEM

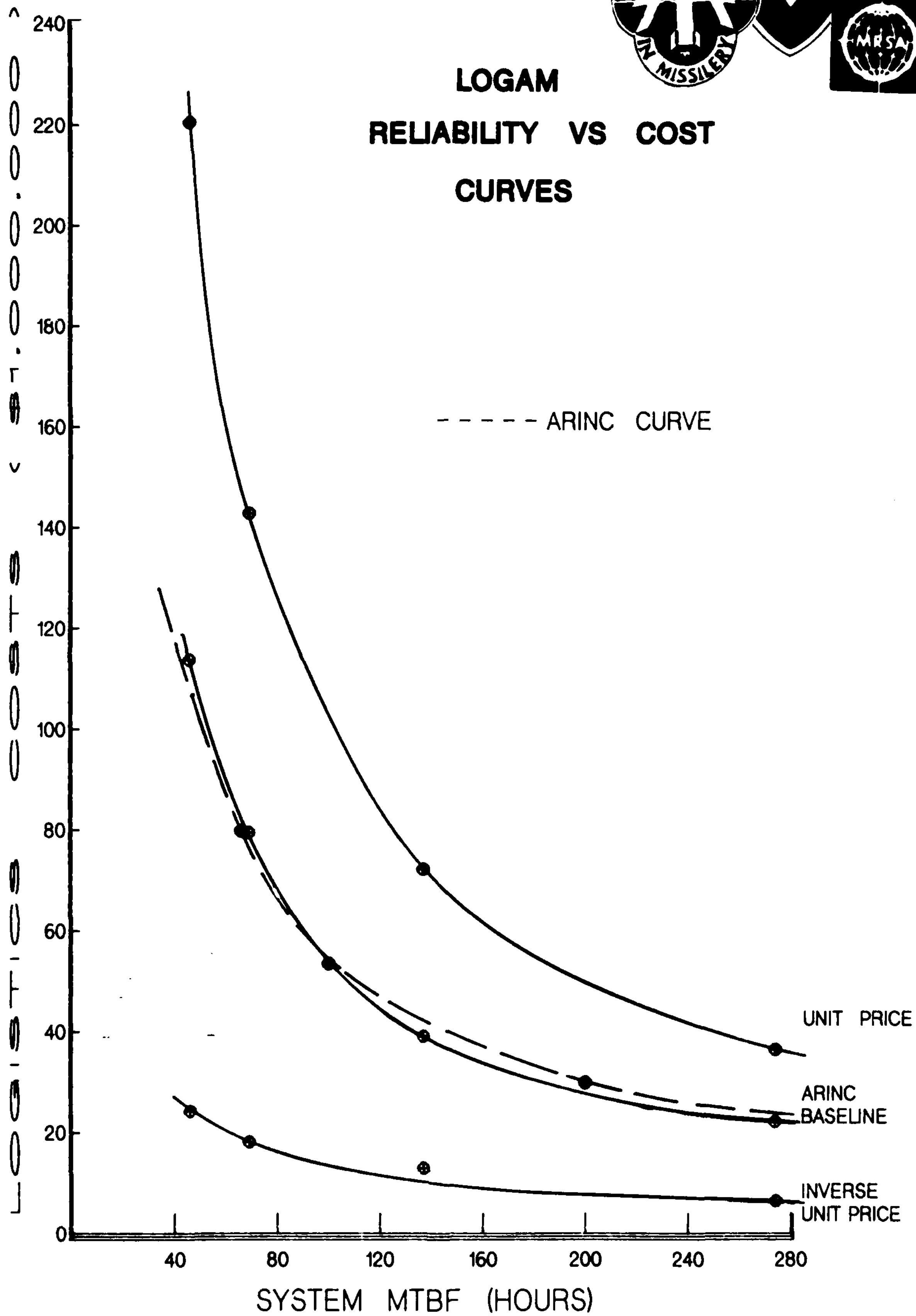
THIS SLIDE SHOWS THE LOGISTICS COST VERSUS RELIABILITY CURVES DERIVED USING THE OSAMM MODEL ALONG WITH THE FOUR FAILURE RATE ALLOCATION METHODS SHOWN ON THE LAST SLIDE. FOR EACH OF THE FOUR ALLOCATION METHODS SHOWN WE CONDUCTED A SENSITIVITY ANALYSIS BY VARYING THE SYSTEM MTBF AND OBTAINING THE DERIVED MAINTENANCE AND SUPPORT COSTS (I.E. LOGISTICS COST) FROM THE MODEL (IN THIS CASE OSAMM). WE PRODUCED FOUR DIFFERENT DATA POINTS FOR EACH FAILURE RATE ALLOCATION METHODS, BY USING THE SENSITIVITY ANALYSIS (FEATURE) IN ORDER TO DRAW THE FOUR CURVES SHOWN. NOTICE THAT THE ARINC PRORATION CURVE IS EXTREMELY CLOSE TO THE BASELINE PRORATION CURVE AND THUS THE ARINC CURVE IS NOT A VIABLE METHOD TO USE IN ORDER TO YIELD A WIDE COST VERSUS RELIABILITY ENVELOPE ABOUT THE BASELINE CURVE.

OSAMM
RELIABILITY VS COST
CURVES



THIS SLIDE SHOWS THE CURVES DERIVED USING THE LOGAM MODEL ALONG WITH THE FOUR FAILURE RATE ALLOCATION METHODS. THESE CURVES WERE DERIVED THE SAME WAY AS THOSE DERIVED USING OSAMM.

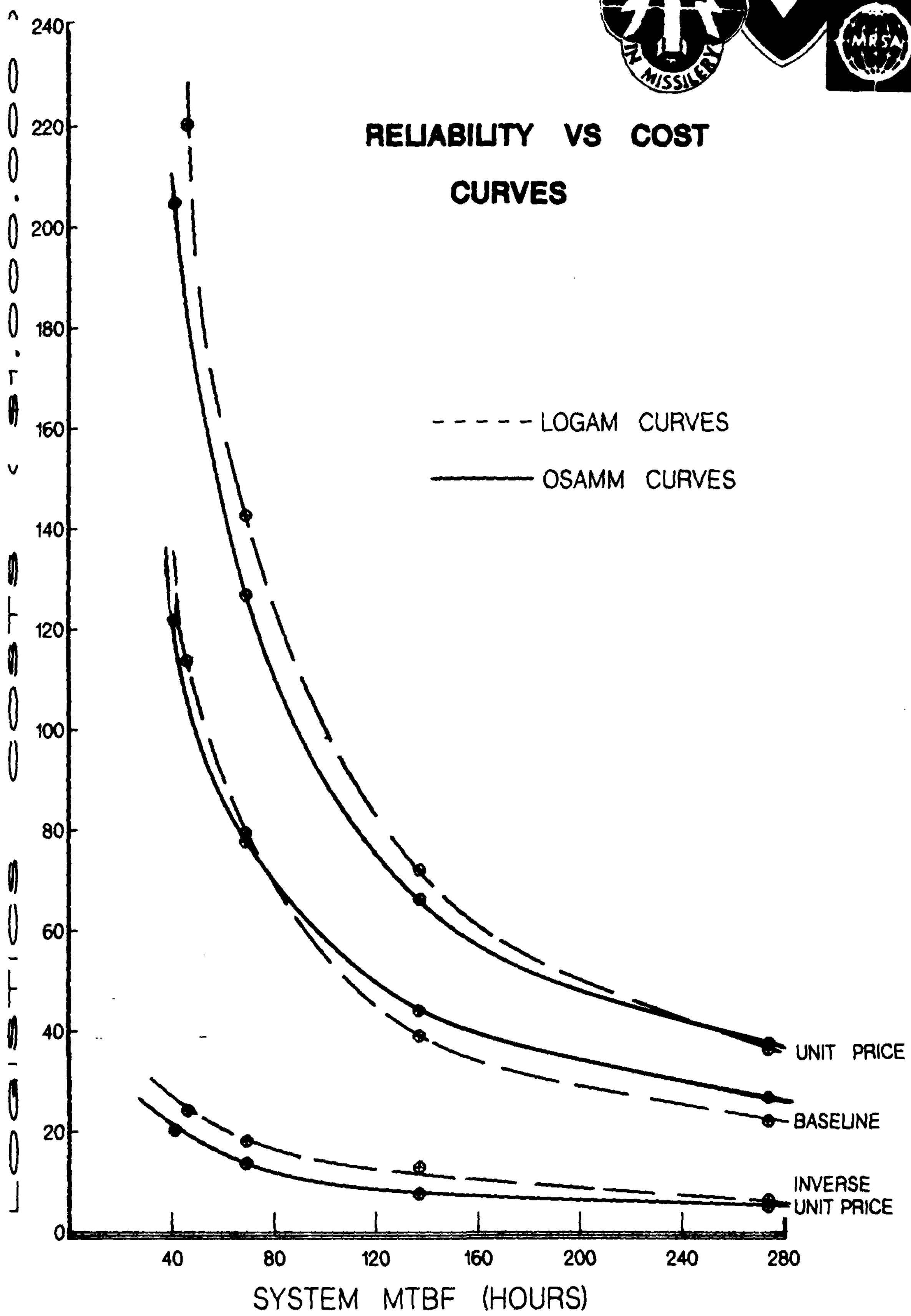
NOTICE AGAIN THE ARINC PRORATION CURVE IS EXTREMELY CLOSE, EVEN MORE THAN FOR OSAMM, TO THE BASELINE PRORATION CURVE. THUS, THE ARINC PRORATION METHOD IS NOT A VIABLE METHOD TO USE IN ORDER TO YIELD THE COST VERSUS RELIABILITY ENVELOPE.


LOGAM
RELIABILITY VS COST
CURVES
- - - - - ARINC CURVE
UNIT PRICE
ARINC
BASELINE
INVERSE
UNIT PRICE
0
20
40
60
80
100
120
140
160
180
200
220
240
40
80
120
160
200
240
280
SYSTEM MTBF (HOURS)

THIS SLIDE COMBINES THE PREVIOUS TWO SLIDES TO MAKE AN EASIER COMPARISON BETWEEN THE TWO SETS OF CURVES. SINCE THE ARINC PRORATION CURVES WERE NOT CONSIDERED VIABLE AND FOR THE SAKE OF CLARITY WE DID NOT PUT THEM ON THIS CHART.

I WILL NOW DISCUSS SOME OF THE ANOMALIES THAT ARE APPARENT ON THE CURVES THEMSELVES ALONG WITH ANOMALIES OF THE OSAMM CURVES COMPARED TO THE LOGAM CURVES. FIRST, I WANT TO POINT OUT WHY SOME OF THE CURVES ARE NOT EXACTLY SMOOTH WELL FITTING CURVES (I.E., WHY SOME OF THE POINTS ARE ABOVE OR BELOW THE CURVE LINE DRAWN) FOR LOGAM. THE PRIMARY REASON THAT SOME POINTS ARE NOT EXACTLY ON THE CURVE DRAWN IS BECAUSE THE ROUNDING METHODOLOGY FOR STOCKAGE LOCATIONS, IN LOGAM, *AT A GIVEN* MTBF *COULD RESULT IN MORE OR FEWER* SPARES PROCURED AND DISTRIBUTED. THUS, THE POINT COULD JUMP UP ABOVE OR BELOW THE CURVE BECAUSE OF SPARES STOCKAGE ROUND-OFF.

THE NEXT SET OF ANOMALIES I WANT TO DISCUSS IS WHY THE LOGAM CURVES SLOPE UPWARD AT A STEEPER RATE THAM OSAMM'S CURVES. A PRIMARY REASON FOR THESE ANOMALIES IS THAT LOGAM RECYCLES IMPROPERLY REPAIRED ITEMS FOR DEPOT REWORK. THUS, AT HIGHER FAILURE RATES LOGAM COST CURVES SLOPE UPWARD AT A STEEPER RATE. THERE ARE OTHER REASONS FOR THE ANAMOLIES WHICH I DO NOT WISH TO GO INTO BECAUSE THE ANAMOLIES EFFECTS ARE CONSIDERED MINOR WHEN PERFORMING COST VERSUS RELIABILITY STUDIES, SINCE ALL THE CURVES REACH THEIR POINT OF DIMINISHING RETURNS AT ABOUT THE SAME MTBF.


RELIABILITY VS COST
CURVES
LOGAM CURVES
OSAMM CURVES
UNIT PRICE
BASELINE
INVERSE
UNIT PRICE
240
220
200
180
160
140
120
100
80
60
40
20
0
40
80
120
160
200
240
280
SYSTEM MTBF (HOURS)

THIS SLIDE IS JUST A SUMMARY OF DATA POINTS USED TO PLOT THE COST VERSUS RELIABILITY CURVES SHOWN EARLIER USING OSAMM.

SUMMARY OF DATA USED FOR OSAMM CURVES

MTBF (HRS)	PRORATION METHOD		
	UNIT PRICE	BASELINE	INVERSE UNIT PRICE
41	$204,767,359	$121,829,357	$20,275,874
69	$126,785,695	$ 77,644,581	$13,592,972
137	$ 66,233,603	$ 43,995,825	$ 7,565,074
274	$ 37,540,185	$ 26,724,067	$ 4,977,046

MTBF (HRS)	PRORATION METHOD
	ARINC
40	$127,720,802
60	$ 86,363,696
100	$ 56,645,996
200	$ 33,067,950
400	$ 20,828,016

THIS SLIDE IS JUST A SUMMARY OF DATA POINTS USED TO PLOT THE COST VERSUS RELIABILITY CURVES SHOWN EARLIER USING LOGAM.

SUMMARY OF DATA USED FOR LOGAM CURVES

MTBF (HRS)	PRORATION METHOD		
	UNIT PRICE	BASELINE	INVERSE UNIT PRICE
46	$220,335,000	$113,690,000	$24,170,000
69	$142,807,000	$ 79,429,000	$18,046,000
137	$ 72,208,000	$ 39,074,000	$12,867,000
274	$ 36,399,000	$ 22,103,000	$ 6,340,000

MTBF (HRS)	PRORATION METHOD
	ARINC
66	$79,806,000
100	$53,475,000
200	$29,871,000
400	$16,933,000

IN CONCLUSION, IT IS FELT THAT LOGISTICS COSTS ARE SENSITIVE TO THE METHOD USED TO ALLOCATE RELIABILITY AND THAT MAXIMUM IMPROVEMENT IN LOGISTICS COST IS ATTRIBUTED TO REDUCING THE FAILURE RATE OF HIGH UNIT COST ITEMS. THUS, THE UNIT PRICE AND INVERSE UNIT PRICE PRORATION METHODS PRODUCE A VERY GOOD COST VERSUS RELIABILITY ENVELOPE AROUND THE BASELINE PRORATION. ALSO, EACH ALLOCATION CURVE REACHES ITS POINT OF DIMINISHING RETURNS AT ABOUT THE SAME SYSTEM MTBF.

A FINAL CONCLUSION IS THAT OSAMM AND LOGAM PRODUCE VERY SIMILIAR RESULTS WHEN COMPARING MAINTENANCE AND SUPPLY SUPPORT COSTS AS A FUNCTION OF RELIABILITY.

AMC RELIABILITY VERSUS COST TASK FORCE

CONCLUSIONS :

- INVERSE UNIT PRICE PRORATION SHOWS MAXIMUM IMPROVEMENT IN LOGISTICS COST DUE TO REDUCING FAILURE RATE OF HIGH UNIT COST ITEMS.

- OSAMM AND LOGAM PRODUCE COMPATIBLE RESULTS WHEN COMPARING MAINTENANCE AND SUPPLY SUPPORT COST AS A FUNCTION OF RELIABILITY.

APPENDIX B

APPENDIX B
OSAMM INPUT FILES

```
1114 0.2500
1124 0.6500
1144 0.1000
2114 0.2500
2124 0.6500
2144 0.1000
3114 0.2500
3124 0.6500
3144 0.1000
4114 0.2500
4124 0.6500
4144 0.1000
5114 0.2500
5124 0.6500
5144 0.1000
6114 0.2500
6124 0.6500
6144 0.1000
7114 0.2500
7124 0.6500
7144 0.1000
8114 0.2500
8124 0.6500
8144 0.1000
9114 0.2500
9124 0.6500
9144 0.1000
10114 0.2500
10124 0.6500
10144 0.1000
11114 0.2500
11124 0.6500
11144 0.1000
12114 0.2500
12124 0.6500
12144 0.1000
13114 0.2500
13124 0.6500
13144 0.1000
14114 0.2500
14124 0.6500
14144 0.1000
15114 0.2500
15124 0.6500
15144 0.1000
16114 0.2500
16124 0.6500
16144 0.1000
17114 0.2500
17124 0.6500
```

17144	0.1000
18114	0.2500
18124	0.6500
18144	0.1000
19114	0.2500
19124	0.6500
19144	0.1000
20114	0.2500
20124	0.6500
20144	0.1000
21114	0.2500
21124	0.6500
21144	0.1000
22114	0.2500
22124	0.6500
22144	0.1000
23114	0.2500
23124	0.6500
23144	0.1000
24114	0.2500
24124	0.6500
24144	0.1000
25114	0.2500
25124	0.6500
25144	0.1000
26114	0.2500
26124	0.6500
26144	0.1000
27114	0.2500
27124	0.6500
27144	0.1000
28114	0.2500
28124	0.6500
28144	0.1000
29114	0.2500
29124	0.6500
29144	0.1000
30114	0.2500
30124	0.6500
30144	0.1000
31114	0.2500
31124	0.6500
31144	0.1000
32114	0.2500
32124	0.6500
32144	0.1000
33114	0.2500
33124	0.6500
33144	0.1000
34114	0.2500

34124	0.6500
34144	0.1000
35124	0.2500
35133	0.6500
35144	0.1000
36124	0.2500
36133	0.6500
36144	0.1000
37124	0.2500
37133	0.6500
37144	0.1000
38124	0.2500
38133	0.6500
38144	0.1000
39124	0.2500
39133	0.6500
39144	0.1000
40124	0.2500
40133	0.6500
40144	0.1000
41124	0.2500
41133	0.6500
41144	0.1000
42124	0.2500
42133	0.6500
42144	0.1000
43124	0.2500
43133	0.6500
43144	0.1000
44124	0.2500
44133	0.6500
44144	0.1000
45124	0.2500
45133	0.6500
45144	0.1000
46124	0.2500
46133	0.6500
46144	0.1000
47124	0.2500
47133	0.6500
47144	0.1000
48135	1.0000

```
TOW COBR      558541  20      300     2000    330    950     15     0    10
3D  10    2    1    230  6. 15. 55. 77.  4.     5   30  30
1111111111111111111111111
11111108  4 4 4 5  944 944 9443261        6     50  3800 .01     .0012  .0001
              615.   375.              02        01     01      01
01      34800  20    01      3000    92 11
05        .01  20    01         0    99 22
99
99
01   CMD AMPLIF110628.   58. 1 .001 2.90   00 1 0
01
02   CNTL UNIT  25298.   17. 1 .001  .75   00 1 0
01
03   SYS AMPLIF 24428.   42. 1 .001 2.30   00 1 0
01
04   SIGHT CTL   2773.   14. 1 .001  .75   00 1 0
01
05   POW SUPPLY 45551.   49. 1 .001 1.35   00 1 0
01
06   LAUNCH UNI 31000. 156. 1 .0011.425   00 1 0
01
07   STEER UNIT  4000.    7. 1 .001  .74   00 1 0
01
08   SIGHT UNIT314863. 414. 1 .001 2.20   00 2 0
0105
9999
9999
01   1           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
02   2           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
03   3           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
04   4           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
05   5           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
06   6           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
07   7           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
08   8           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
09   9           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
10  10           11062.    2. 1 .08  3.00   00 00   1 18  0 24    1265500
11  11           11062.    2. 1 .08  3.00   00 00   1 18  0 24    0265500
12  12           11062.    2. 1 .08  3.00   00 00   1 18  0 24    0265500
13  13           15178.    2. 1  08   .75   00 00   1 18  0 24    21518
14  14           15178.    2. 1  08   .75   00 00   1 18  0 24    21518
15  15            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
16  16            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
17  17            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
18  18            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
19  19            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
20  20            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
21  21            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
22  22            3257.    2. 1  08  1.25   00 00   1 18  0 24    1 734
23  23            3257.    2. 1  08  1.25   00 00   1 18  0 24    0 734
```

```
24  24       521.   2. 1  08   .75   00 00   1 18     0 24   6 111
25  25      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
26  26      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
27  27      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
28  28      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
29  29      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
30  30      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
31  31      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
32  32      6832.   2. 1  08  1.5    00 00   1 18     0 24   11367
33  33      2000.   1. 1  08   .8    00 00   1 18     0 24   8 930
34  34       750.   1. 1  08   .75   00 00   1 18     0 24   4 240
35  35     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
36  36     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
37  37     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
38  38     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
39  39     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
40  40     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
41  41     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
42  42     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
43  43     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
44  44     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
45  45     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
46  46     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
47  47     26988.  15. 1  08  3.5    00 00   2 18 44157      15689
9999
MAKEUP08          .01   .010    1    0
9999
01  01        4633  1  4  0 10 0
01  02        4633  1  4  0 10 0
01  03        4633  1  4  0 10 0
01  04        4633  1  4  0 10 0
01  05        4633  1  4  0 10 0
01  06        4633  1  4  0 10 0
01  07        4633  1  4  0 10 0
01  08        4633  1  4  0 10 0
01  09        4633  1  4  0 10 0
01  10        4633  1  4  0 10 0
01  11        4633  1  4  0 10 0
01  12        4633  1  4  0 10 0
02  13        4878  1  4  0 10 0
02  14        4878  1  4  0 10 0
03  15        8042  1  4  0 10 0
03  16        8042  1  4  0 10 0
03  17        8042  1  4  0 10 0
03  18        8042  1  4  0 10 0
03  19        8042  1  4  0 10 0
03  20        8042  1  4  0 10 0
03  21        8042  1  4  0 10 0
03  22        8042  1  4  0 10 0
03  23        8042  1  4  0 10 0
04  24        5882  1  4  0 10 0
```

```
05  25         7079  1  4    0 10 0
05  26         7079  1  4    0 10 0
05  27         7079  1  4    0 10 0
05  28         7079  1  4    0 10 0
05  29         7079  1  4    0 10 0
05  30         7079  1  4    0 10 0
05  31         7079  1  4    0 10 0
05  32         7079  1  4    0 10 0
06  33         4000  1  4    0 10 0
07  34        16666  1  4    0 10 0
08  35         9589  2  4  30127  0
08  36         9589  2  4  30127  0
08  37         9589  2  4  30127  0
08  38         9589  2  4  30127  0
08  39         9589  2  4  30127  0
08  40         9589  2  4  30127  0
08  41         9589  2  4  30127  0
08  42         9589  2  4  30127  0
08  43         9589  2  4  30127  0
08  44         9589  2  4  30127  0
08  45         9589  2  4  30127  0
08  46         9589  2  4  30127  0
08  47         9589  2  4  30127  0
08  MAKE      4919.  1  2    3  4 0
9999
```

APPENDIX C

APPENDIX C

OSAMM OUTPUT FILES

```
O P T I M U M   S U P P L Y   A N D   M A I N T E N A N C E   M O D E L   P R E P R O C E S S O R
                        V E R S I O N   D A T E   84/06/28
                           R U N   D A T E   86/05/28.

END ITEM      UNIT COST      LIFE     OPERATING      MTBF       MTR      FALSE    AVAILABILITY
                           (YEARS)      HOURS                            REMOVAL      GOAL
TOW COBR       558541.       20.0       300.0        200.0      3.30       .15        .950

           CLMNTS            DENSITY            OST            PLT    CTDEL         OPSL            IVSYS    RSC
    10.      2.        1.      230.      6.0    15.0    55.0   77.0    4.0    5. 30. 30.  0.         D        3

     AVERAGE OUPS
  23.0  115.0  230.0

POLICIES ALLOWED
         1
         2
         3
         4
         5
         6
         7
         8
         9
        10
        11
        12
        13
        14
        15
        16
        17
        18
        19
        20
        21
        22
        23
        24
        25
```

	ORG	DSU	GSU	DEPOT
WAGE RATE (LOADED)	15.88	15.88	13.69	47.28
SHIFT HOURS	11.	11.	11.	8.
DAYS/WEEK	4.	4.	4.	5.
SHIFT RATIO	1.000	1.000	1.000	.909

TRANSPORTATION COST PER POUND

ORG-DSU	DSU-GSU	GSU-DEPOT
.06	.06	.38

OTHER COSTS (PRESENT VALUE)

COST PER NEW NSN	3609.26
BIN COST	315.74
HOLDING COST PERCENT	.02
COST PER REQUISITION	212.59
TECH DOC PER PAGE	.01

SPECIAL TEST EQUIPMENT DATA

NUMBER	PRICE	USEFUL LIFE	MAINT COST FACTOR	ONE-TIME COST	PRESENT VALUE	AVAIL	COMMON ABOVE	NOT ALLOWED BELOW
1	34800.	20.0	.01	3000.	40911.	.92	1	1
5	0.	20.0	.01	0.	0.	.99	2	2

SPECIAL REPAIRMEN

NUMBER	AVAIL	COMMON ABOVE	NOT ALLOWED BELOW	ORG	DSU	GSU	DEPOT

COMPONENT INFORMATION

REF	ID	NAME	PRICE	WGT	ESS	WASH	EQUIP COUNT	PAGE	NSN	LABOR TIME (HOURS)
1	01	CMD AMPLIF	110628.00	58.00	1	.001	1	0.	0	2.90
2	02	CNTL UNIT	25298.00	17.00	1	.001	1	0.	0	.75
3	03	SYS AMPLIF	24428.00	42.00	1	.001	1	0.	0	2.30
4	04	SIGHT CTL	2773.00	14.00	1	.001	1	0.	0	.75
5	05	POW SUPPLY	45551.00	49.00	1	.001	1	0.	0	1.35
6	06	LAUNCH UNI	31000.00	156.00	1	.001	1	0.	0	1.43
7	07	STEER UNIT	4000.00	7.00	1	.001	1	0.	0	.74
8	08	SIGHT UNIT	314863.00	414.00	1	.001	2	0.	0	2.20

NUMBER OF COMPONENTS= 8

MODULE INFORMATION

REF	MOD NUM	ID	NAME	PRICE	WGT	ESS	WASH	ORG	ARR-SHELF DSU	GSU	DEP	NEW PARTS	PARTS PRICE PER REPAIR	EQUIP COUNT	PAGE	NSN	LABOR TIME (HOURS)
9	1	01	1	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
10	2	02	2	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
11	3	03	3	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
12	4	04	4	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
13	5	05	5	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
14	6	06	6	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
15	7	07	7	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
16	8	08	8	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
17	9	09	9	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
18	10	10	10	11062.00	2.00	1	.080	1.	18.	0.	24.	1.	2655.00	0	0.	0	3.00
19	11	11	11	11062.00	2.00	1	.080	1.	18.	0.	24.	0.	2655.00	0	0.	0	3.00
20	12	12	12	11062.00	2.00	1	.080	1.	18.	0.	24.	0.	2655.00	0	0.	0	3.00
21	13	13	13	15178.00	2.00	1	.080	1.	18.	0.	24.	2.	1518.00	0	0.	0	.75
22	14	14	14	15178.00	2.00	1	.080	1.	18.	0.	24.	2.	1518.00	0	0.	0	.75
23	15	15	15	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
24	16	16	16	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
25	17	17	17	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
26	18	18	18	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
27	19	19	19	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
28	20	20	20	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
29	21	21	21	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
30	22	22	22	3257.00	2.00	1	.080	1.	18.	0.	24.	1.	734.00	0	0.	0	1.25
31	23	23	23	3257.00	2.00	1	.080	1.	18.	0.	24.	0.	734.00	0	0.	0	1.25
32	24	24	24	521.00	2.00	1	.080	1.	18.	0.	24.	6.	111.00	0	0.	0	.75
33	25	25	25	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
34	26	26	26	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
35	27	27	27	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
36	28	28	28	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
37	29	29	29	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
38	30	30	30	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
39	31	31	31	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
40	32	32	32	6832.00	2.00	1	.080	1.	18.	0.	24.	1.	1367.00	0	0.	0	1.50
41	33	33	33	2000.00	1.00	1	.080	1.	18.	0.	24.	8.	930.00	0	0.	0	.80
42	34	34	34	750.00	1.00	1	.080	1.	18.	0.	24.	4.	240.00	0	0.	0	.75
43	35	35	35	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
44	36	36	36	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
45	37	37	37	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
46	38	38	38	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
47	39	39	39	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
48	40	40	40	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
49	41	41	41	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
50	42	42	42	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
51	43	43	43	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
52	44	44	44	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
53	45	45	45	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
54	46	46	46	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50
55	47	47	47	26988.00	15.00	1	.080	2.	18.	44.	157.	1.	5689.00	0	0.	0	3.50

PSEUDO MODULES

REF	MOD NUM	ID	NAME	AVERAGE PRICE	WGT	ESS	TOTAL PARTS	NEW PARTS
56	48	MAKE	UP08	.01	.01	0	1.	0.

NUMBER OF MODULES= 48

APPLICATION INFORMATION

REF	APP NUM	COMP ID	MOD ID	FAILURES PER YEAR	ORG	ARR-SHELF DSU	ARR-SHELF GSU	DEP
57	1	01	01	.648E-01	1.	4.	0.	10.
58	2	01	02	.648E-01	1.	4.	0.	10.
59	3	01	03	.648E-01	1.	4.	0.	10.
60	4	01	04	.648E-01	1.	4.	0.	10.
61	5	01	05	.648E-01	1.	4.	0.	10.
62	6	01	06	.648E-01	1.	4.	0.	10.
63	7	01	07	.648E-01	1.	4.	0.	10.
64	8	01	08	.648E-01	1.	4.	0.	10.
65	9	01	09	.648E-01	1.	4.	0.	10.
66	10	01	10	.648E-01	1.	4.	0.	10.
67	11	01	11	.648E-01	1.	4.	0.	10.
68	12	01	12	.648E-01	1.	4.	0.	10.
69	13	02	13	.615E-01	1.	4.	0.	10.
70	14	02	14	.615E-01	1.	4.	0.	10.
71	15	03	15	.373E-01	1.	4.	0.	10.
72	16	03	16	.373E-01	1.	4.	0.	10.
73	17	03	17	.373E-01	1.	4.	0.	10.
74	18	03	18	.373E-01	1.	4.	0.	10.
75	19	03	19	.373E-01	1.	4.	0.	10.
76	20	03	20	.373E-01	1.	4.	0.	10.
77	21	03	21	.373E-01	1.	4.	0.	10.
78	22	03	22	.373E-01	1.	4.	0.	10.
79	23	03	23	.373E-01	1.	4.	0.	10.
80	24	04	24	.510E-01	1.	4.	0.	10.
81	25	05	25	.424E-01	1.	4.	0.	10.
82	26	05	26	.424E-01	1.	4.	0.	10.
83	27	05	27	.424E-01	1.	4.	0.	10.
84	28	05	28	.424E-01	1.	4.	0.	10.
85	29	05	29	.424E-01	1.	4.	0.	10.
86	30	05	30	.424E-01	1.	4.	0.	10.
87	31	05	31	.424E-01	1.	4.	0.	10.
88	32	05	32	.424E-01	1.	4.	0.	10.
89	33	06	33	.750E-01	1.	4.	0.	10.
90	34	07	34	.180E-01	1.	4.	0.	10.
91	35	08	35	.313E-01	2.	4.	30.	127.
92	36	08	36	.313E-01	2.	4.	30.	127.
93	37	08	37	.313E-01	2.	4.	30.	127.
94	38	08	38	.313E-01	2.	4.	30.	127.

95	39	08	39	.313E-01	2.	4.	30.	127.
96	40	08	40	.313E-01	2.	4.	30.	127.
97	41	08	41	.313E-01	2.	4.	30.	127.
98	42	08	42	.313E-01	2.	4.	30.	127.
99	43	08	43	.313E-01	2.	4.	30.	127.
100	44	08	44	.313E-01	2.	4.	30.	127.
101	45	08	45	.313E-01	2.	4.	30.	127.
102	46	08	46	.313E-01	2.	4.	30.	127.
103	47	08	47	.313E-01	2.	4.	30.	127.
104	48	08	MAKE	.610E-01	1.	2.	3.	4.

NUMBER OF APPLICATIONS= 48

THE RE ARE 2.19 END ITEM FAILURES PER YEAR
THE DERIVED MTBF IS 137. HOURS
THE INPUT MTBF IS 200. HOURS

EQUIPMENT STACK

COM/MOD/APP	EQUIPMENT INFORMATION
57	1.001378
58	1.001378
59	1.001378
60	1.001378
61	1.001378
62	1.001378
63	1.001378
64	1.001378
65	1.001378
66	1.001378
67	1.001378
68	1.001378
69	1.000356
70	1.000356
71	1.001093
72	1.001093
73	1.001093
74	1.001093
75	1.001093
76	1.001093
77	1.001093
78	1.001093
79	1.001093
80	1.000356
81	1.000641
82	1.000641
83	1.000641
84	1.000641
85	1.000641
86	1.000641

87	1.000641	
88	1.000641	
89	1.000677	
90	1.000352	
91	1.001045	5.000971
92	1.001045	5.000971
93	1.001045	5.000971
94	1.001045	5.000971
95	1.001045	5.000971
96	1.001045	5.000971
97	1.001045	5.000971
98	1.001045	5.000971
99	1.001045	5.000971
100	1.001045	5.000971
101	1.001045	5.000971
102	1.001045	5.000971
103	1.001045	5.000971
104	1.001045	5.000971

MAINTENANCE POLICIES BY APPLICATION

APP NUM	COMPONENT NAME	MODULE NAME	REPAIR LEVEL EI	COMP	MOD	PERCENT	MODULE PROMOTED
1	CMD AMPLIF	1	ORG	ORG	DEP	.250	
1	CMD AMPLIF	1	ORG	DSU	DEP	.650	
1	CMD AMPLIF	1	ORG	DEP	DEP	.100	
2	CMD AMPLIF	2	ORG	ORG	DEP	.250	
2	CMD AMPLIF	2	ORG	DSU	DEP	.650	
2	CMD AMPLIF	2	ORG	DEP	DEP	.100	
3	CMD AMPLIF	3	ORG	ORG	DEP	.250	
3	CMD AMPLIF	3	ORG	DSU	DEP	.650	
3	CMD AMPLIF	3	ORG	DEP	DEP	.100	
4	CMD AMPLIF	4	ORG	ORG	DEP	.250	
4	CMD AMPLIF	4	ORG	DSU	DEP	.650	
4	CMD AMPLIF	4	ORG	DEP	DEP	.100	
5	CMD AMPLIF	5	ORG	ORG	DEP	.250	
5	CMD AMPLIF	5	ORG	DSU	DEP	.650	
5	CMD AMPLIF	5	ORG	DEP	DEP	.100	
6	CMD AMPLIF	6	ORG	ORG	DEP	.250	
6	CMD AMPLIF	6	ORG	DSU	DEP	.650	
6	CMD AMPLIF	6	ORG	DEP	DEP	.100	
7	CMD AMPLIF	7	ORG	ORG	DEP	.250	
7	CMD AMPLIF	7	ORG	DSU	DEP	.650	
7	CMD AMPLIF	7	ORG	DEP	DEP	.100	
8	CMD AMPLIF	8	ORG	ORG	DEP	.250	
8	CMD AMPLIF	8	ORG	DSU	DEP	.650	
8	CMD AMPLIF	8	ORG	DEP	DEP	.100	
9	CMD AMPLIF	9	ORG	ORG	DEP	.250	
9	CMD AMPLIF	9	ORG	DSU	DEP	.650	
9	CMD AMPLIF	9	ORG	DEP	DEP	.100	
10	CMD AMPLIF	10	ORG	ORG	DEP	.250	
10	CMD AMPLIF	10	ORG	DSU	DEP	.650	

10	CMD AMPLIF	10	ORG	DEP	DEP	.100
11	CMD AMPLIF	11	ORG	ORG	DEP	.250
11	CMD AMPLIF	11	ORG	DSU	DEP	.650
11	CMD AMPLIF	11	ORG	DEP	DEP	.100
12	CMD AMPLIF	12	ORG	ORG	DEP	.250
12	CMD AMPLIF	12	ORG	DSU	DEP	.650
12	CMD AMPLIF	12	ORG	DEP	DEP	.100
13	CNTL UNIT	13	ORG	ORG	DEP	.250
13	CNTL UNIT	13	ORG	DSU	DEP	.650
13	CNTL UNIT	13	ORG	DEP	DEP	.100
14	CNTL UNIT	14	ORG	ORG	DEP	.250
14	CNTL UNIT	14	ORG	DSU	DEP	.650
14	CNTL UNIT	14	ORG	DEP	DEP	.100
15	SYS AMPLIF	15	ORG	ORG	DEP	.250
15	SYS AMPLIF	15	ORG	DSU	DEP	.650
15	SYS AMPLIF	15	ORG	DEP	DEP	.100
16	SYS AMPLIF	16	ORG	ORG	DEP	.250
16	SYS AMPLIF	16	ORG	DSU	DEP	.650
16	SYS AMPLIF	16	ORG	DEP	DEP	.100
17	SYS AMPLIF	17	ORG	ORG	DEP	.250
17	SYS AMPLIF	17	ORG	DSU	DEP	.650
17	SYS AMPLIF	17	ORG	DEP	DEP	.100
18	SYS AMPLIF	18	ORG	ORG	DEP	.250
18	SYS AMPLIF	18	ORG	DSU	DEP	.650
18	SYS AMPLIF	18	ORG	DEP	DEP	.100
19	SYS AMPLIF	19	ORG	ORG	DEP	.250
19	SYS AMPLIF	19	ORG	DSU	DEP	.650
19	SYS AMPLIF	19	ORG	DEP	DEP	.100
20	SYS AMPLIF	20	ORG	ORG	DEP	.250
20	SYS AMPLIF	20	ORG	DSU	DEP	.650
20	SYS AMPLIF	20	ORG	DEP	DEP	.100
21	SYS AMPLIF	21	ORG	ORG	DEP	.250
21	SYS AMPLIF	21	ORG	DSU	DEP	.650
21	SYS AMPLIF	21	ORG	DEP	DEP	.100
22	SYS AMPLIF	22	ORG	ORG	DEP	.250
22	SYS AMPLIF	22	ORG	DSU	DEP	.650
22	SYS AMPLIF	22	ORG	DEP	DEP	.100
23	SYS AMPLIF	23	ORG	ORG	DEP	.250
23	SYS AMPLIF	23	ORG	DSU	DEP	.650
23	SYS AMPLIF	23	ORG	DEP	DEP	.100
24	SIGHT CTL	24	ORG	ORG	DEP	.250
24	SIGHT CTL	24	ORG	DSU	DEP	.650
24	SIGHT CTL	24	ORG	DEP	DEP	.100
25	POW SUPPLY	25	ORG	ORG	DEP	.250
25	POW SUPPLY	25	ORG	DSU	DEP	.650
25	POW SUPPLY	25	ORG	DEP	DEP	.100
26	POW SUPPLY	26	ORG	ORG	DEP	.250
26	POW SUPPLY	26	ORG	DSU	DEP	.650
26	POW SUPPLY	26	ORG	DEP	DEP	.100
27	POW SUPPLY	27	ORG	ORG	DEP	.250
27	POW SUPPLY	27	ORG	DSU	DEP	.650
27	POW SUPPLY	27	ORG	DEP	DEP	.100

28	POW SUPPLY	28	ORG	ORG	DEP	.250
28	POW SUPPLY	28	ORG	DSU	DEP	.650
28	POW SUPPLY	28	ORG	DEP	DEP	.100
29	POW SUPPLY	29	ORG	ORG	DEP	.250
29	POW SUPPLY	29	ORG	DSU	DEP	.650
29	POW SUPPLY	29	ORG	DEP	DEP	.100
30	POW SUPPLY	30	ORG	ORG	DEP	.250
30	POW SUPPLY	30	ORG	DSU	DEP	.650
30	POW SUPPLY	30	ORG	DEP	DEP	.100
31	POW SUPPLY	31	ORG	ORG	DEP	.250
31	POW SUPPLY	31	ORG	DSU	DEP	.650
31	POW SUPPLY	31	ORG	DEP	DEP	.100
32	POW SUPPLY	32	ORG	ORG	DEP	.250
32	POW SUPPLY	32	ORG	DSU	DEP	.650
32	POW SUPPLY	32	ORG	DEP	DEP	.100
33	LAUNCH UNI	33	ORG	ORG	DEP	.250
33	LAUNCH UNI	33	ORG	DSU	DEP	.650
33	LAUNCH UNI	33	ORG	DEP	DEP	.100
34	STEER UNIT	34	ORG	ORG	DEP	.250
34	STEER UNIT	34	ORG	DSU	DEP	.650
34	STEER UNIT	34	ORG	DEP	DEP	.100
35	SIGHT UNIT	35	ORG	DSU	DEP	.250
35	SIGHT UNIT	35	ORG	GSU	GSU	.650
35	SIGHT UNIT	35	ORG	DEP	DEP	.100
36	SIGHT UNIT	36	ORG	DSU	DEP	.250
36	SIGHT UNIT	36	ORG	GSU	GSU	.650
36	SIGHT UNIT	36	ORG	DEP	DEP	.100
37	SIGHT UNIT	37	ORG	DSU	DEP	.250
37	SIGHT UNIT	37	ORG	GSU	GSU	.650
37	SIGHT UNIT	37	ORG	DEP	DEP	.100
38	SIGHT UNIT	38	ORG	DSU	DEP	.250
38	SIGHT UNIT	38	ORG	GSU	GSU	.650
38	SIGHT UNIT	38	ORG	DEP	DEP	.100
39	SIGHT UNIT	39	ORG	DSU	DEP	.250
39	SIGHT UNIT	39	ORG	GSU	GSU	.650
39	SIGHT UNIT	39	ORG	DEP	DEP	.100
40	SIGHT UNIT	40	ORG	DSU	DEP	.250
40	SIGHT UNIT	40	ORG	GSU	GSU	.650
40	SIGHT UNIT	40	ORG	DEP	DEP	.100
41	SIGHT UNIT	41	ORG	DSU	DEP	.250
41	SIGHT UNIT	41	ORG	GSU	GSU	.650
41	SIGHT UNIT	41	ORG	DEP	DEP	.100
42	SIGHT UNIT	42	ORG	DSU	DEP	.250
42	SIGHT UNIT	42	ORG	GSU	GSU	.650
42	SIGHT UNIT	42	ORG	DEP	DEP	.100
43	SIGHT UNIT	43	ORG	DSU	DEP	.250
43	SIGHT UNIT	43	ORG	GSU	GSU	.650
43	SIGHT UNIT	43	ORG	DEP	DEP	.100
44	SIGHT UNIT	44	ORG	DSU	DEP	.250
44	SIGHT UNIT	44	ORG	GSU	GSU	.650
44	SIGHT UNIT	44	ORG	DEP	DEP	.100
45	SIGHT UNIT	45	ORG	DSU	DEP	.250

45	SIGHT UNIT	45	ORG	GSU	GSU	.650
45	SIGHT UNIT	45	ORG	DEP	DEP	.100
46	SIGHT UNIT	46	ORG	DSU	DEP	.250
46	SIGHT UNIT	46	ORG	GSU	GSU	.650
46	SIGHT UNIT	46	ORG	DEP	DEP	.100
47	SIGHT UNIT	47	ORG	DSU	DEP	.250
47	SIGHT UNIT	47	ORG	GSU	GSU	.650
47	SIGHT UNIT	47	ORG	DEP	DEP	.100
48	SIGHT UNIT	UP08	ORG	GSU	TOSS	1.000

MTD AND RTD

COMPONENT NUMBER	COMPONENT NAME	WASH	MTD ORG	MTD DSU	MTD GSU	MTD DEP	RTD ORG	RTD DSU	RTD GSU	RTD DEP
1	CMD AMPLIF	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
2	CNTL UNIT	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
3	SYS AMPLIF	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
4	SIGHT CTL	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
5	POW SUPPLY	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
6	LAUNCH UNI	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
7	STEER UNIT	.001	0.000	.866	0.000	.133	1.000	0.000	0.000	0.000
8	SIGHT UNIT	.001	0.000	.217	.695	.087	1.000	0.000	0.000	0.000

MODULE NUMBER	MODULE NAME	WASH	MTD ORG	MTD DSU	MTD GSU	MTD DEP	RTD ORG	RTD DSU	RTD GSU	RTD DEP
1	1	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
2	2	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
3	3	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
4	4	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
5	5	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
6	6	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
7	7	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
8	8	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
9	9	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
10	10	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
11	11	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
12	12	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
13	13	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
14	14	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
15	15	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
16	16	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
17	17	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
18	18	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
19	19	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
20	20	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
21	21	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
22	22	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
23	23	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
24	24	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100

25	25	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
26	26	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
27	27	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
28	28	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
29	29	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
30	30	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
31	31	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
32	32	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
33	33	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
34	34	.080	0.000	0.000	0.000	.920	.250	.650	0.000	.100
35	35	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
36	36	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
37	37	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
38	38	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
39	39	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
40	40	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
41	41	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
42	42	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
43	43	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
44	44	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
45	45	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
46	46	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
47	47	.080	0.000	0.000	.598	.322	0.000	.250	.650	.100
48	UP08	1.000	0.000	0.000	0.000	0.000	0.000	0.000	1.000	0.000

SPECIAL TEST EQUIPMENT/REPAIRMAN REQUIREMENTS

PECULIAR EQUIPMENT/REPAIRMAN

EQUIPMENT/REPAIRMAN NUMBER 1

ECHELON	QUANTITY PER SHOP	TOTAL COST (P.V.)
ORG	1	409110.

TOTAL QUANTITY OF THIS EQUIPMENT/REPAIRMAN NEEDED WHERE PECULIAR = 10

EQUIPMENT/REPAIRMAN NUMBER 5

ECHELON	QUANTITY PER SHOP	TOTAL COST (P.V.)
DSU	1	0.

TOTAL QUANTITY OF THIS EQUIPMENT/REPAIRMAN NEEDED WHERE PECULIAR = 2

TOTAL PRESENT VALUE OF PECULIAR SPECIAL TEST EQUIPMENT/REPAIRMEN = 409110.

SPECIAL TEST EQUIPMENT/REPAIRMEN COMMON AT HIGHER ECHELONS

EQUIPMENT/REPAIRMAN NUMBER 1

ECHELON	REQUIREMENT PER SHOP	TOTAL COST (P.V.)
DSU	.17	13628.
GSU	.09	3679.
DEP	.06	2618.

TOTAL QUANTITY OF THIS EQUIPMENT/REPAIRMAN REQUIRED WHERE COMMON = .49

EQUIPMENT/REPAIRMAN NUMBER 5

ECHELON	REQUIREMENT PER SHOP	TOTAL COST (P.V.)
GSU	.08	0.
DEP	.01	0.

TOTAL QUANTITY OF THIS EQUIPMENT/REPAIRMAN REQUIRED WHERE COMMON = .10

TOTAL PRESENT VALUE OF EQUIPMENT/REPAIRMEN WHERE COMMON = 19925.

TOTAL PRESENT VALUE OF SPECIAL TEST EQUIPMENT/REPAIRMEN REQUIRED = 429035.

LOGISTICS COSTS

LOGISTICS COSTS FOR COMPONENTS

SPARES

NUMBER	COMPONENT NAME	ALLOWANCES PER CLAIMANT ORG	DSU	GSU	DEPOT	INITIAL SPARES COST (TOTAL)	CONSUMPTION SPARES (PRESENT VALUE)
1	CMD AMPLIF	1.	4.	0.	6.	2655072.	152431.
2	CNTL UNIT	0.	1.	0.	2.	101192.	5518.
3	SYS AMPLIF	1.	2.	0.	3.	415276.	14542.
4	SIGHT CTL	0.	1.	0.	1.	8319.	251.
5	POW SUPPLY	1.	2.	0.	3.	774367.	27386.
6	LAUNCH UNI	0.	1.	0.	1.	93000.	4123.
7	STEER UNIT	0.	0.	0.	1.	4000.	128.
8	SIGHT UNIT	1.	3.	14.	7.	11649929.	348234.

OTHER LOGISTICS COSTS FOR COMPONENTS IN TERMS OF PRESENT VALUE

NUMBER	COMPONENT NAME	HOLDING	TRANSPORTATION	REQUISITION	CATALOGING	BIN	REPAIR
1	CMD AMPLIF	474687.	18421.	29908.	3609.	4105.	101247.
2	CNTL UNIT	18092.	855.	5883.	3609.	947.	4145.
3	SYS AMPLIF	74245.	5763.	16057.	3609.	4105.	34693.
4	SIGHT CTL	1487.	292.	2439.	3609.	947.	1719.
5	POW SUPPLY	138445.	6791.	16217.	3609.	4105.	20566.
6	LAUNCH UNI	16627.	4783.	3587.	3609.	947.	4802.
7	STEER UNIT	715.	52.	861.	3609.	316.	598.
8	SIGHT UNIT	2082833.	129001.	32924.	3609.	4420.	41531.

LOGISTICS COSTS FOR MODULES

SPARES

MOD NUM	MODULE NAME	ALLOWANCES PER CLAIM. ORG	DSU	GSU	DEPOT	INITIAL SPARES COST(TOTAL)	CONSUMPTION COST(P.V.)	INITIAL PARTS COST	CONSUMPTION PARTS(P.V.)
1	1	0.	3.	0.	6.	132744.	135349.	13275.	373580.
2	2	0.	3.	0.	6.	132744.	135349.	13275.	373580.
3	3	0.	3.	0.	6.	132744.	135349.	13275.	373580.
4	4	0.	3.	0.	6.	132744.	135349.	13275.	373580.
5	5	0.	3.	0.	6.	132744.	135349.	13275.	373580.
6	6	0.	3.	0.	6.	132744.	135349.	13275.	373580.
7	7	0.	3.	0.	6.	132744.	135349.	13275.	373580.
8	8	0.	3.	0.	6.	132744.	135349.	13275.	373580.
9	9	0.	3.	0.	6.	132744.	135349.	13275.	373580.
10	10	0.	3.	0.	6.	132744.	135349.	13275.	373580.
11	11	0.	3.	0.	6.	132744.	135349.	13275.	373580.
12	12	0.	3.	0.	6.	132744.	135349.	13275.	373580.
13	13	0.	2.	0.	5.	136602.	176389.	9108.	202875.
14	14	0.	2.	0.	5.	136602.	176389.	9108.	202875.
16	16	0.	2.	0.	4.	26056.	22957.	2202.	59496.
17	17	0.	2.	0.	4.	26056.	22957.	2202.	59496.
18	18	0.	2.	0.	4.	26056.	22957.	2202.	59496.
19	19	0.	2.	0.	4.	26056.	22957.	2202.	59496.
20	20	0.	2.	0.	4.	26056.	22957.	2202.	59496.
21	21	0.	2.	0.	4.	26056.	22957.	2202.	59496.
22	22	0.	2.	0.	4.	26056.	22957.	2202.	59496.
23	23	0.	2.	0.	4.	26056.	22957.	2202.	59496.
24	24	0.	2.	0.	4.	4168.	5021.	666.	12302.
25	25	0.	2.	0.	4.	54656.	54713.	5468.	125895.
26	26	0.	2.	0.	4.	54656.	54713.	5468.	125895.
27	27	0.	2.	0.	4.	54656.	54713.	5468.	125895.
28	28	0.	2.	0.	4.	54656.	54713.	5468.	125895.
29	29	0.	2.	0.	4.	54656.	54713.	5468.	125895.

30	30	0.	2.	0.	4.	54656.	54713.	5468.	125895.
31	31	0.	2.	0.	4.	54656.	54713.	5468.	125895.
32	32	0.	2.	0.	4.	54656.	54713.	5468.	125895.
33	33	0.	3.	0.	7.	26000.	28345.	7440.	151574.
34	34	0.	1.	0.	2.	3000.	2551.	960.	9388.
35	35	0.	1.	1.	3.	161928.	159573.	28445.	386831.
36	36	0.	1.	1.	3.	161928.	159573.	28445.	386831.
37	37	0.	1.	1.	3.	161928.	159573.	28445.	386831.
38	38	0.	1.	1.	3.	161928.	159573.	28445.	386831.
39	39	0.	1.	1.	3.	161928.	159573.	28445.	386831.
40	40	0.	1.	1.	3.	161928.	159573.	28445.	386831.
41	41	0.	1.	1.	3.	161928.	159573.	28445.	386831.
42	42	0.	1.	1.	3.	161928.	159573.	28445.	386831.
43	43	0.	1.	1.	3.	161928.	159573.	28445.	386831.
44	44	0.	1.	1.	3.	161928.	159573.	28445.	386831.
45	45	0.	1.	1.	3.	161928.	159573.	28445.	386831.
46	46	0.	1.	1.	3.	161928.	159573.	28445.	386831.
47	47	0.	1.	1.	3.	161928.	159573.	28445.	386831.
48	UP08	0.	0.	3.	4.	0.	1.	0.	0.

OTHER LOGISTICS COSTS FOR MODULES IN TERMS OF PRESENT VALUE

MOD NUM	MODULE NAME	HOLD	TRANS	REQ	CATL	BIN	REPAIR	BAKO	PARTS HOLD	PARTS REQ	PARTS BIN	PARTS BAKO
1	1	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
2	2	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
3	3	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
4	4	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
5	5	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
6	6	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
7	7	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
8	8	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
9	9	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
10	10	23733.	235.	4183.	7219.	947.	19960.	10162.	2373.	0.	316.	2644.
11	11	23733.	235.	4183.	3609.	947.	19960.	10162.	2373.	0.	316.	2644.
12	12	23733.	235.	4183.	3609.	947.	19960.	10162.	2373.	0.	316.	2644.
13	13	24422.	223.	3973.	10828.	947.	4740.	3675.	1628.	0.	631.	3767.
14	14	24422.	223.	3973.	10828.	947.	4740.	3675.	1628.	0.	631.	3767.
15	15	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
16	16	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
17	17	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
18	18	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
19	19	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
20	20	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
21	21	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
22	22	4658.	136.	2410.	7219.	947.	4791.	1448.	394.	0.	316.	733.
23	23	4658.	136.	2410.	3609.	947.	4791.	1448.	394.	0.	316.	733.
24	24	745.	185.	3295.	25265.	947.	3930.	309.	119.	0.	1894.	304.
25	25	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.

26	26	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
27	27	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
28	28	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
29	29	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
30	30	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
31	31	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
32	32	9772.	154.	2738.	7219.	947.	6532.	3430.	978.	0.	316.	827.
33	33	4648.	136.	4845.	32483.	947.	6165.	3521.	1330.	0.	2526.	1869.
34	34	536.	33.	1163.	18046.	947.	1387.	185.	172.	0.	1263.	87.
35	35	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
36	36	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
37	37	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
38	38	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
39	39	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
40	40	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
41	41	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
42	42	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
43	43	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
44	44	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
45	45	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
46	46	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
47	47	28950.	288.	970.	7219.	1263.	6056.	4851.	5086.	1051.	631.	2064.
48	UP08	0.	1.	2551.	0.	631.	0.	0.	0.	0.	0.	0.

LOGISTICS TOTALS

INITIAL SPARES COST	20997200.
CONSUMPTION SPARES (PRESENT VALUE)	16917652.
INVENTORY HOLDING COST (PRESENT VALUE)	3753984.
TRANSPORTATION COST (PRESENT VALUE)	175780.
REQUISITION COST (PRESENT VALUE)	247737.
CATALOGING COST (PRESENT VALUE)	418674.
BIN COST (PRESENT VALUE)	93459.
REPAIR COST (PRESENT VALUE)	643885.
BACKORDER COST (PRESENT VALUE)	318419.
TOTAL LOGISTICS COST	43566790.

TOTAL COST FOR THIS MAINTENANCE CONCEPT IN TERMS OF PRESENT VALUE

TOTAL LOGISTICS COST	43566790.
TOTAL TEST EQUIPMENT/REPAIRMAN COST	429035.
TOTAL	43995825.

OPERATIONAL AVAILABILITY ACHIEVED
.9858

APPENDIX D

APPENDIX D
LOGAM INPUT FILES

```
                         OPERATIONAL SYSTEM
                            SAMPLE CASE
                         1 THEATER SCENARIO
                              BASELINE
AMSMI-OR-SA
MAY 1986
THOUSANDS OF DOLLARS                        .001
TOTAL                                                         1        8
COMMAND AMPLIF.
LRU 1
 $L
 ARA=.40, ARAD=.20, AYZP=1.99361, CALMAN=23760, CALPUB=0, CALSET=0,
 CDEO=.06, CDFD=.06, CDIO=.06, CDIST=.06, CDOE=.06, CDOI=.06,
 CEND=0, CFTD=1, CI=0, CII=0, CPE=0, CPI=34800, CPII=0,
 CKMD=.85, CKME=.85, CKMI=.85, CKMO=.85, CKPD=.85, CKPI=.85,
 CLRUPG=0, CMODPG=0, CONTCT=2, CPUBII=0, CPUBV=0, CPV=0, CRI=348, CRII=0,
 CKPO=.85, CKUD=.85, CKUE=.85, CKUI=.85, CKUO=.85,
 CDMAN=23760, CDRMAN=23760, CEMAN=23760, CERMAN=23760,
 CRV=0, CSDEP=1, CSDSU=.25, CSESU=.25, CSGSU=.25, CTCPUB=0,
 CTRA=0, CTRAD=0, CTRCAL=0, CTRI=0, CTRII=0, CTRSPT=0,
 CTRV=0, CUCE=0, CV=0, DAOQL=.95, DTE=14, DTI=0, DTO=14,
 CDPMAN=74610, CDPRMN=74610, CAD=375, CEN=615, CRM=299, CRP=299, CRU=299,
 DD=1, DDS=1, DI=0, DIS=0, OD=2, ODS=2, CCSP=0, CCSPP=0, CCSPR=0,
 EACAL=0, EACSP=0, EREI=1, ETE=0, ETEI=1, ETI=1, ETII=0,
 EVDM=1, EVDR=1, EVDT=1, EVEM=1, EVER=1, EVET=1,
 EVIM=1, EVIR=1, EVIT=1, EVOM=1, EVOR=1, EVOT=1,
 FMD=1, FMI=1, FMO=1, FUD=1, FUE=1, FUI=1, FUO=1,
 CGMAN=23760, CGRMAN=23760, CONMAN=23760,
 FTM=15, FTP=15, FTU=10, HPM=1, HPP=1, HPU=1,
 FE=0, FI=.08, FII=0, FINT=0, FN=0, FSA=160, FTI=150, FTII=150,
 IBG=0, IFLAG=1, IMF=0, INHIB=0, IO=0, IOPER=0, IS=3, NA=1, NB=0, NU=1,
 OL=5,30,30,90, OST=6,15,55,90, TAT=1,4,0,10, SUE=0, SUI=0, SUO=0, SUD=.001,
 PMR=0, PPR=0, PUR=0, QTD=0, QTE=0, QTI=0, QMM=5, QMP=20, QMU=1,
 QTMD=0, QTME=0, QTMI=0, QTMO=0, QTO=0, QTPD=0, QTPI=0, QTPO=0,
 RDD=1.7, REO=1, RF=.9, RID=0, ROI=0, SL=0,15,15,30, JTED=1,
 SPE=0, SPEV=1, SPEVR=1, SVE=0, SVR=0, SVT=0, SVV=0,
 TDRMAN=2, TEMAN=2, TENMAN=2, TEO=0, TERMAN=2, TGMAN=2, TGRMAN=2,
 TDI=15, TDMAN=2, TDPMI=1.4, TDPMII=1.4, TDPRI=1.4, TDPRII=1.4,
 TID=0, TIO=0, TOE=0, TOI=0, TONMAN=2, TUMD=84, TUMI=84, TUMO=84,
 WE=44, WEM=44, WER=44, WI=44, WIM=44, WIR=44, WMR=44, WMT=44,
 WO=44, WOM=44, WOR=44, YAT=0, YD=0, YP=7, YR=20, YZ=0, ZFL=1,
 WD=40, WDM=40, WDR=40, TALMAN=0, TATE=4,
 CUP=110628, CMP=11062, CPP=2655, CUBEU=3.83, CUBEM=.07, CUBEP=.01,
 G(11)=.25, G(14)=.65, G(20)=.10,
 P=12, PP=50, WU=58, WM=2, WP=1,
 SME=0, SMI=0, SMO=0, SMD=.08, SMF=0,
 H=0,1,0,1,
 E=.00259,
 ED=10, EDS=10, EE=23, REPEAT=1, OTF=.0342, STAT=20,
 CDDI=.38, CDID=.38, CCALP=0, ZO=0, ZI=0, FNGF=.2, FNSP=.2,
 CKIT=5773, WTKIT=10, YMWO=.05, TDMW=5.5, TMDD=10,
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```
 TOMW=0, TMOD=0, TIMW=0, TMID=0,
 TC=.5, TE=2, TER=2.5, TF=2, TFR=2.5, TMO=0, TMOR=0,
 TRC=3., TI=2, TIR=2.5, TMI=0, TMIR=0,
 TD=6, TDR=10, TMD=3, TMDR=6,
 YMWO=0.0, YP=0,
 TEO=60, TOE=60,
 TOI=10, TIO=10,
 TID=0, TDI=0,
 RDD=90,
 AYZP=1.988249,
 TUMO=0, TUMI=0, TUMD=120,
 H=1,1,0,1,
  $
CONTROL UNIT
LRU 2
 $L
 CUP=25298, CMP=15178, CPP=1518, CUBEU=1.04, CUBEM=.05, CUBEP=.01,
 P=2, PP=20, WU=17, WM=2, WP=1,
 E=.00041,
 TD=.25, TDR=.5, TMD=.75, TMDR=1.5,
 TC=.5, TE=.25, TER=.75, TF=.25, TFR=.75,
 G(11)=.25, G(14)=.65, G(20)=.10,
 FTM=10, FTP=10, FTU=12, CALSET=0, CCALP=0, QMM=10, QMP=50, QMU=2,
 CKIT=148, WTKIT=1, YMWO=.05, TDMW=1.5, TMDD=1.5,
 TRC=2.75, TI=.25, TIR=.75,
 H=0,1,0,1,
 OTF=.0342, FNGF=.15, EACAL=1, SMF=0,
 YMWO=0.0, YP=0,
 AYZP=1.99361,
 H=1,1,0,1,
  $
SYSTEM AMPLIFIER
LRU 3
 $L
 CUP=24428, CMP=3257, CPP=734, CUBEU=3.27, CUBEM=.08, CUBEP=.01,
 P=9, PP=40, WU=42, WM=2, WP=1,
 E=.001119,
 G(11)=.25, G(14)=.65, G(20)=.10,
 H=0,1,0,1,
 FTM=15, FTP=15, FTU=10, CALSET=0, CCALP=0, OTF=.0342, FNGF=.2,
 CKIT=1716, WTKIT=10, YMWO=.05, TDMW=1.5, TMDD=3, EACAL=1,
 TC=.5, TE=1.8, TER=1.5, TF=1.8, TFR=1.5,
 TD=1.8, TDR=1.5, TMD=1.25, TMDR=3.5,
 QMM=5, QMP=20, QMU=1, SMF=0,
 TRC=2.8, TI=1.8, TIR=1.5,
 YMWO=0.0, YP=0,
 H=1,1,0,1,
  $
SIGHT CONTROL
LRU 4
 $L
 CUP=2773, CMP=521, CPP=111, CUBEU=1.04, CUBEM=.02, CUBEP=.01,
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P=1, PP=30, WU=14, WM=2, WP=1,
E=.00017,
G(11)=.25, G(14)=.65, G(20)=.1,
H=0,1,0,1,
FTM=10, FTP=10, FTU=12, CALSET=0, CCALP=0, OTF=.0342,
QMM=10, QMP=50, QMU=2, FNGF=.05, EACAL=1, SMF=0,
CKIT=148, WTKIT=1, YMWO=.05, TDMW=1.1, TMDD=1,
TC=.5, TE=.25, TER=.75, TF=.25, TFR=.75,
TRC=2.5, TI=.25, TIR=.75,
TD=.25, TDR=.5, TMD=.75, TMDR=1.5,
YMWO=0.0, YP=0,
AYZP=1.999,
H=1,1,0,1,
 $
POWER SUPPLY
LRU 5
 $L
CUP=45551, CMP=6832, CPP=1367, CUBEU=3.88, CUBEM=.30, CUBEP=.02,
P=8, PP=40, WU=49, WM=2, WP=1,
TD=4, TDR=1.5, TMD=1.5, TMDR=4,
E=.00113,
G(11)=.25, G(14)=.65, G(20)=.1,
H=0,1,0,1,
TC=.5, TE=.5, TER=1.5, TF=.5, TFR=1.5,
TRC=3.2, TI=.5, TIR=1.5,
CKIT=1883, WTKIT=10, YMWO=.05, TDMW=.75, TMDD=3,
CALSET=0, CCALP=0, EACAL=1, FNGF=.2, OTF=.0455, SMF=0,
YMWO=0.0, YP=0,
AYZP=1.99361,
H=1,1,0,1,
$
LAUNCH UNIT
LRU 6
 $L
CUP=31000, CMP=2000, CPP=930, CUBEU=19.75, CUBEM=.50, CUBEP=.15,
P=1, PP=40, WU=156, WM=1, WP=.5, REPEAT=1,
TD=.25, TDR=.75, TMD=.8, TMDR=2.5,
E=.00025,
G(11)=.25, G(14)=.65, G(20)=.10,
H=0,1,0,1,
TC=.5, TE=1, TER=1.8, TF=1, TFR=1.8,
TRC=3.5, TI=1.0, TIR=1.8,
CKIT=500, WTKIT=10, YMWO=.05, TDMW=1.1, TMDD=1.75,
CALSET=0, EE=92, EACAL=1, FNGF=.10, OTF=.0342, SMF=0, CCALP=0,
YMWO=0.0, YP=0,
H=1,1,0,1,
 $
STEERING UNIT
LRU 7
 $L
CUP=4000, CMP=750, CPP=240, CUBEU=3.93, CUBEM=.05, CUBEP=.01,
P=1, PP=20, WU=7, WM=1, WP=.5, EE=23,
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```
 E=.00006,
 G(11)=.25, G(14)=.65, G(20)=.1,
 H=0,1,0,1,
 TC=.5, TE=.25, TER=.75, TF=.25, TFR=.75,
 TD=.25, TDR=.5, TMD=.75, TMDR=1.5,
 CKIT=148, WTKIT=1, YMWO=.05, TDMW=.5, TMDD=1.5,
 TRC=2.5, TI=.25, TIR=.75,
 CALSET=0, CCALP=0, EACAL=1, FNGF=.15, OTF=.0342, SMF=0,
 YMWO=0.0, YP=0,
 H=1,1,0,1,
  $
SIGHT UNIT
LRU 8
 $L
 CUP=314863, CMP=26988, CPP=5689, CUBEU=55.64, CUBEM=.5, CUBEP=.05,
 P=13, PP=40, WU=414, WM=15, WP=1,
 TC=.5, TE=1, TER=3.5, TF=1,  TFR=3.5,
 TD=8, TDR=19.5, TMD=3.5, TMDR=12,
 CKIT=7226, WTKIT=30, YMWO=.05, TDMW=0, TMDD=0, TIMW=5.5, TMID=10,
 G(14)=.25, G(15)=.65, G(17)=.10,
 H=0,1,1,1,
 E=.001559,
 TRC=4.4, TI=1.5, TIR=4, TMI=3.5, TMIR=12,
 FTM=15, FTP=15, FTU=10, DI=1, DIS=1, DTI=30, QMM=5, QMP=20, QMU=1,
 CALSET=0, CCALP=0, EACAL=1, ZI=1,
 TAT=2,4,30,127, OST=6,15,45,60, STAT=90, OD=2, ODS=2,
 OTF=.0342, FNGF=.25, SMF=0,
 ETI=1, EVET=0,
 TEO=72, TOE=72,
 TOI=15, TIO=15,
 TID=75, TDI=75,
 RDD=135,
 YMWO=0.0, YP=0,
 REO=0, ROI=10, RID=35,
 SMI=0.052, SMD=0.028,
 TUMO=0, TUMI=240, TUMD=1440,
 H=1,1,1,1,
 IS=1, NU=-3, IO=3,
  $
SENSY ON FAILURE RATE
VALUE 3.0, 2.0, 1.5, 0.66667, 0.5, 0.4
  $L SENSY=1.,6.,4.,91.,3.0,2.0,1.5,0.66667,0.5,0.4,IFLAG=0$
STOP 1
STOP 2
 $L NU=-4,
  $
```

APPENDIX E

APPENDIX E
LOGAM OUTPUT FILES

-1-
OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA DATE - MAY 1986

UNIT - COMMAND AMPLIF.
LRU 1

LOGAM PROVISIONING QUANTITIES

	*************** LRUS ***************			******* MODULES *******		******** PARTS ********		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	9.13	27.13	30.00	.64	10.00	0.00	0.00	10.0	1.
OD..........	1.53	1.53	2.00	9.24	10.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	1.86	1.86	2.00	6.71	7.00	50.05	51.00	1.0	1.
TOTALS......	12.52	30.52	34.00	16.59	27.00	50.05	51.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .988249 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA   DATE - MAY 1986

UNIT - COMMAND AMPLIF.
LRU 1

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS   AVAILABILITY= .990009 INHERENT= .999681

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	23.	12.	385.	1897.	4195.	11947.	0.	0.	30.	10.	81.	661.	19242.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	34.	0.	1.	0.	0.	34.
MODULES...		27.	54.	5.	270.	297.	0.
PARTS.....		51.	45.	75.	3375.	3416.	10.

** TEST EQP AND REPAIR CHANNEL MMH,S ** ** PER HOUR PER MAINTENANCE LOCATION **	***ORGANIZATION**		******DIRECT*****		*****GENERAL*****		*******DEPOT*****	
	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR
EACH LRU CASE	.0022	.0013	.0170	.0164	0.0000	0.0000	.0724	.1380
CUM FOR LRU CASES 1- 1	.0022	.0013	.0170	.0164	0.0000	0.0000	.0724	.1380
CUM FOR ALL LRU CASES	.0022	.0013	.0170	.0164	0.0000	0.0000	.0724	.1380

TYPE I TEST EQP POSTED FOR LRUS 1- 1	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0024	.0013	.0917	.0917	.0481
DIRECT SUPPORT	.0184	.0164	.1406	.1406	.1251
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0782	.1380	.3285	.3285	.5798

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	3319.	221.	0.	221.	3761.	3720.
MODULE	111.	111.	0.	77.	299.	0.
PART		0.	0.	135.	135.	28.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	19242.	19242.	2216.	-0.
EXPECTED VALUE COSTS	19242.	19242.	2216.	-0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - CONTROL UNIT
LRU 2

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK POINTS	H
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED		
ED..........	1.39	.90	10.00	.10	10.00	0.00	0.00	10.0	1.
OD..........	.23	.00	2.00	1.46	2.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	.28	.00	1.00	.84	1.00	5.31	6.00	1.0	1.
TOTALS......	1.90	.90	13.00	2.40	13.00	5.31	6.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

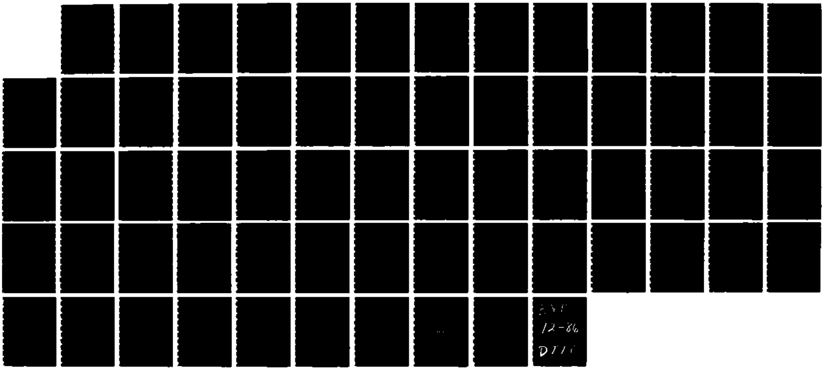
********** MAINTENANCE POLICIES **********

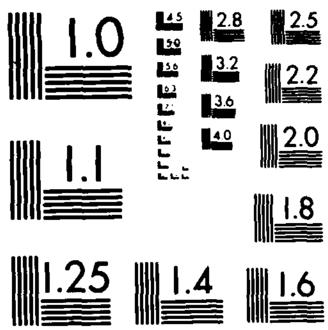
GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

```
                                   OPERATIONAL SYSTEM
                                       SAMPLE CASE
                                   1 THEATER SCENARIO
                                        BASELINE
ANALYSIS - AMSMI-OR-SA                                          DATE - MAY 1986

UNIT - CONTROL UNIT
LRU 2

PRESENT VALUE COST TOTALS IN      THOUSANDS OF DOLLARS            AVAILABILITY=  .991898  INHERENT=  .999956

PRIME    T EQ  TESPACE    FLDMPW    DEPMPW     PROV   RECSUP  FLDTNG   DEPTNG   ORDER  STORE    SHIP    SADM    TOTAL
   0.      1.       0.       23.       67.     535.    1442.      0.       0.      4.     1.      4.    166.    2244.

               *INSTALLED*    *INITIAL**   *REORDER**   *REORDER**   *REORDER**   *CONSUMED*   *RESIDUAL*
                EQUIPMENT     PROVISIONS    ACTIONS       LOTS        QUANITY       STOCK         STOCK
UNITS.....         230.            13.          0.           2.           0.           0.           13.
MODULES...                         13.          4.          10.          40.          47.            6.
PARTS.....                          6.         11.          50.         550.         542.           14.

** TEST EQP AND REPAIR CHANNEL MMH,S **   ***ORGANIZATION**    ******DIRECT*****    *****GENERAL*****    *******DEPOT*****
** PER HOUR PER MAINTENANCE LOCATION **     TEST    REPAIR       TEST    REPAIR       TEST    REPAIR       TEST    REPAIR
               EACH LRU CASE               .0002     .0001      .0009     .0008     0.0000    0.0000      .0026     .0048
               CUM FOR LRU CASES  2- 2     .0002     .0001      .0009     .0008     0.0000    0.0000      .0026     .0048
               CUM FOR ALL LRU CASES       .0024     .0013      .0179     .0172     0.0000    0.0000      .0750     .1428

 TYPE I TEST EQP POSTED FOR LRUS  2- 2    ***TEST HRS***  **REPAIR HRS**  ***TEST EQP***  ***TEST MEN***  **REPAIR MEN**
                        ORGANIZATION               .0002           .0001           .0084           .0084           .0023
                      DIRECT SUPPORT               .0009           .0008           .0071           .0071           .0060
                     GENERAL SUPPORT              0.0000          0.0000          0.0000          0.0000          0.0000
                               DEPOT               .0028           .0048           .0118           .0118           .0202
 COST OF INITIAL PROVISION
          EQPT.        DIRECT       GENERAL        DEPOT         TOTAL       RESIDUAL
UNIT       253.           51.            0.          25.          329.          327.
MODULE     152.           30.            0.          15.          197.           89.
PART                       0.            0.           9.            9.           22.

                         TOTALS        CUM    MANPOWER       DELTA
 PRESENT VALUE COSTS      2244.     21486.         86.         -0.
 EXPECTED VALUE COSTS     2244.     21486.         86.         -0.
```

AD-A173 243 RELIABILITY CERSUS COST USING OSAMM AND LOGAM(U) ARMY MATERIEL READINESS SUPPORT ACTIVITY LEXINGTON KY J W CRABTREE AUG 86 MRSA-REL-86-01 2/2

UNCLASSIFIED F/G 15/5 NL





ICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - SYSTEM AMPLIFIER
LRU 3

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	3.95	9.95	10.00	.28	10.00	0.00	0.00	10.0	1.
OD..........	.66	.66	2.00	3.99	4.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	.80	.80	1.00	2.90	3.00	21.63	22.00	1.0	1.
TOTALS......	5.41	11.41	13.00	7.17	17.00	21.63	22.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA   DATE - MAY 1986

UNIT - SYSTEM AMPLIFIER
LRU 3

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS   AVAILABILITY= .993407 INHERENT= .999871

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	6.	2.	132.	392.	389.	1455.	0.	0.	21.	3.	26.	511.	2938.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	13.	0.	1.	0.	0.	13.
MODULES...		17.	23.	5.	115.	129.	3.
PARTS.....		22.	46.	32.	1472.	1481.	13.

** TEST EQP AND REPAIR CHANNEL MMH,S ** ** PER HOUR PER MAINTENANCE LOCATION **	***ORGANIZATION** TEST	REPAIR	******DIRECT***** TEST	REPAIR	*****GENERAL***** TEST	REPAIR	*******DEPOT***** TEST	REPAIR
EACH LRU CASE	.0009	.0003	.0068	.0043	0.0000	0.0000	.0128	.0309
CUM FOR LRU CASES 3- 3	.0009	.0003	.0068	.0043	0.0000	0.0000	.0128	.0309
CUM FOR ALL LRU CASES	.0033	.0016	.0247	.0214	0.0000	0.0000	.0878	.1738

TYPE I TEST EQP POSTED FOR LRUS 3- 3	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0010	.0003	.0380	.0380	.0125
DIRECT SUPPORT	.0074	.0043	.0562	.0562	.0326
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0138	.0309	.0579	.0579	.1299

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	244.	49.	0.	24.	318.	314.
MODULE	33.	13.	0.	10.	55.	11.
PART		0.	0.	16.	16.	10.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	2938.	24424.	509.	-0.
EXPECTED VALUE COSTS	2938.	24424.	509.	-0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - SIGHT CONTROL
LRU 4

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	.52	1.52	10.00	.04	10.00	0.00	0.00	10.0	1.
OD..........	.09	.09	2.00	.61	2.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	.11	.11	1.00	.35	1.00	2.20	3.00	1.0	1.
TOTALS......	.72	1.72	13.00	1.00	13.00	2.20	3.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .999000 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA   DATE - MAY 1986

UNIT - SIGHT CONTROL
LRU 4

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS   AVAILABILITY= .998562 INHERENT= .999985

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	0.	0.	9.	28.	43.	33.	0.	0.	2.	1.	1.	138.	256.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	13.	0.	2.	0.	0.	13.
MODULES...		13.	1.	10.	10.	20.	3.
PARTS.....		3.	5.	50.	250.	226.	27.

** TEST EQP AND REPAIR CHANNEL MNH,S **	***ORGANIZATION**		******DIRECT*****		*****GENERAL*****		*******DEPOT*****	
** PER HOUR PER MAINTENANCE LOCATION **	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR
EACH LRU CASE	.0001	.0000	.0003	.0003	0.0000	0.0000	.0011	.0020
CUM FOR LRU CASES 4- 4	.0001	.0000	.0003	.0003	0.0000	0.0000	.0011	.0020
CUM FOR ALL LRU CASES	.0034	.0017	.0251	.0218	0.0000	0.0000	.0888	.1758

TYPE I TEST EQP POSTED FOR LRUS 4- 4	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0001	.0000	.0032	.0032	.0010
DIRECT SUPPORT	.0004	.0003	.0028	.0028	.0025
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0012	.0020	.0049	.0049	.0084

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	28.	6.	0.	3.	36.	36.
MODULE	5.	1.	0.	1.	7.	2.
PART		0.	0.	0.	0.	3.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	256.	24680.	36.	-0.
EXPECTED VALUE COSTS	256.	24680.	36.	-0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - POWER SUPPLY
LRU 5

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	5.30	4.27	10.00	.37	10.00	0.00	0.00	10.0	1.
OD..........	.89	.00	2.00	5.36	6.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	1.08	.01	1.00	3.06	4.00	19.46	20.00	1.0	1.
TOTALS......	7.27	4.27	13.00	8.80	20.00	19.46	20.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA DATE - MAY 1986

UNIT - POWER SUPPLY
LRU 5

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS AVAILABILITY= .993154 INHERENT= .999803

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	7.	4.	124.	629.	756.	3827.	0.	0.	17.	4.	40.	466.	5875.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	13.	0.	2.	0.	0.	13.
MODULES...		20.	16.	10.	160.	173.	7.
PARTS.....		20.	40.	50.	2000.	1989.	31.

** TEST EQP AND REPAIR CHANNEL MMH,S ** ** PER HOUR PER MAINTENANCE LOCATION **	***ORGANIZATION** TEST	REPAIR	******DIRECT***** TEST	REPAIR	*****GENERAL***** TEST	REPAIR	*******DEPOT***** TEST	REPAIR
EACH LRU CASE	.0009	.0004	.0042	.0057	0.0000	0.0000	.0227	.0472
CUM FOR LRU CASES 5- 5	.0009	.0004	.0042	.0057	0.0000	0.0000	.0227	.0472
CUM FOR ALL LRU CASES	.0043	.0021	.0293	.0275	0.0000	0.0000	.1115	.2230

TYPE I TEST EQP POSTED FOR LRUS 5- 5	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0009	.0004	.0352	.0352	.0168
DIRECT SUPPORT	.0045	.0057	.0346	.0346	.0437
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0245	.0472	.1029	.1029	.1983

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	456.	91.	0.	46.	592.	582.
MODULE	68.	41.	0.	27.	137.	48.
PART		0.	0.	27.	27.	43.

	TOTALS	CUM	MANPOWFR	DELTA
PRESENT VALUE COSTS	5875.	30555.	732.	0.
EXPECTED VALUE COSTS	5875.	30555.	732.	0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - LAUNCH UNIT
LRU 6

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	3.23	.00	0.00	.25	10.00	0.00	0.00	10.0	1.
OD..........	.54	.00	2.00	3.57	4.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	.66	.00	1.00	2.04	3.00	12.95	13.00	1.0	1.
TOTALS......	4.43	.00	3.00	5.85	17.00	12.95	13.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - LAUNCH UNIT
LRU 6

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS

AVAILABILITY= .995894 INHERENT= .999967

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	4.	1.	102.	235.	139.	1456.	0.	0.	11.	8.	73.	124.	2152.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	920.	3.	0.	2.	0.	0.	3.
MODULES...		17.	10.	10.	100.	115.	2.
PARTS.....		13.	27.	50.	1350.	1327.	36.

** TEST EQP AND REPAIR CHANNEL MMH,S **	***ORGANIZATION**		******DIRECT*****		*****GENERAL*****		*******DEPOT*****	
** PER HOUR PER MAINTENANCE LOCATION **	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR
EACH LRU CASE	.0006	.0004	.0039	.0046	0.0000	0.0000	.0067	.0195
CUM FOR LRU CASES 6- 6	.0006	.0004	.0039	.0046	0.0000	0.0000	.0067	.0195
CUM FOR ALL LRU CASES	.0049	.0025	.0332	.0321	0.0000	0.0000	.1182	.2425

TYPE I TEST EQP POSTED FOR LRUS 6- 6	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0007	.0004	.0259	.0259	.0135
DIRECT SUPPORT	.0043	.0046	.0325	.0325	.0350
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0072	.0195	.0304	.0304	.0820

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	0.	62.	0.	31.	93.	89.
MODULE	20.	8.	0.	6.	34.	3.
PART		0.	0.	12.	12.	34.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	2152.	32707.	328.	-0.
EXPECTED VALUE COSTS	2152.	32707.	328.	-0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA | DATE - MAY 1986

UNIT - STEERING UNIT
LRU 7

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	.20	.00	0.00	.01	10.00	0.00	0.00	10.0	1.
OD..........	.03	.00	2.00	.21	2.00	0.00	0.00	2.0	1.
DI..........	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.
DD..........	.04	.00	1.00	.12	1.00	.78	1.00	1.0	1.
TOTALS......	.28	.00	3.00	.35	13.00	.78	1.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10

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OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - STEERING UNIT
LRU 7

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS

AVAILABILITY= .994781 INHERENT= .999994

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	0.	0.	3.	10.	22.	24.	0.	0.	1.	1.	0.	91.	153.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	3.	0.	2.	0.	0.	3.
MODULES...		13.	0.	10.	0.	7.	6.
PARTS.....		1.	2.	50.	100.	80.	21.

** TEST EQP AND REPAIR CHANNEL MMH,S **	***ORGANIZATION**		******DIRECT*****		*****GENERAL*****		*******DEPOT*****	
** PER HOUR PER MAINTENANCE LOCATION **	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR
EACH LRU CASE	.0000	.0000	.0001	.0001	0.0000	0.0000	.0004	.0007
CUM FOR LRU CASES 7- 7	.0000	.0000	.0001	.0001	0.0000	0.0000	.0004	.0007
CUM FOR ALL LRU CASES	.0049	.0025	.0333	.0322	0.0000	0.0000	.1186	.2433

TYPE I TEST EQP POSTED FOR LRUS 7- 7	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0000	.0000	.0012	.0012	.0003
DIRECT SUPPORT	.0001	.0001	.0010	.0010	.0009
GENERAL SUPPORT	0.0000	0.0000	0.0000	0.0000	0.0000
DEPOT	.0004	.0007	.0017	.0017	.0030

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	0.	8.	0.	4.	12.	12.
MODULE	8.	2.	0.	1.	10.	5.
PART		0.	0.	0.	0.	5.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	153.	32860.	13.	0.
EXPECTED VALUE COSTS	153.	32860.	13.	0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

UNIT - SIGHT UNIT
LRU 8

LOGAM PROVISIONING QUANTITIES

	LRUS			MODULES		PARTS		STOCK	
	COMPUTED	REQUIRED	DISTRIBUTED	COMPUTED	DISTRIBUTED	COMPUTED	DISTRIBUTED	POINTS	H
ED..........	7.38	19.38	20.00	0.00	0.00	0.00	0.00	10.0	1.
OD..........	4.59	4.59	6.00	2.32	4.00	0.00	0.00	2.0	1.
DI..........	5.74	5.74	6.00	14.49	15.00	19.94	20.00	1.0	1.
DD..........	6.71	6.71	7.00	7.68	8.00	30.36	31.00	1.0	1.
TOTALS......	24.42	36.42	39.00	24.49	27.00	50.30	51.00		

*** COLUMN 2 ABOVE IS THE QTY OF LRUS REQUIRED TO MEET AN OPER. AVAIL. OF .993610 ***

********** MAINTENANCE POLICIES **********

GA	GB	GC	GD	GE	GF	GG	GH	GI	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	.25	.65	0.00	.10	0.00	0.00	0.00

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA DATE - MAY 1986

UNIT - SIGHT UNIT
LRU 8

PRESENT VALUE COST TOTALS IN THOUSANDS OF DOLLARS AVAILABILITY= .994692 INHERENT= .999707

PRIME	T EQ	TESPACE	FLDMPW	DEPMPW	PROV	RECSUP	FLDTNG	DEPTNG	ORDER	STORE	SHIP	SADM	TOTAL
0.	432.	4.	718.	925.	13298.	13665.	0.	0.	13.	202.	427.	361.	30047.

	INSTALLED EQUIPMENT	*INITIAL** PROVISIONS	*REORDER** ACTIONS	*REORDER** LOTS	*REORDER** QUANITY	*CONSUMED* STOCK	*RESIDUAL* STOCK
UNITS.....	230.	39.	0.	1.	0.	0.	39.
MODULES...		27.	14.	5.	70.	94.	3.
PARTS.....		51.	30.	69.	2070.	2081.	40.

** TEST EQP AND REPAIR CHANNEL MMH,S **	***ORGANIZATION**		******DIRECT*****		*****GENERAL*****		*******DEPOT*****	
** PER HOUR PER MAINTENANCE LOCATION **	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR	TEST	REPAIR
EACH LRU CASE	.0008	0.0000	.0054	.0053	.0422	.1219	.0261	.0772
CUM FOR LRU CASES 8- 8	.0008	0.0000	.0054	.0053	.0422	.1219	.0261	.0772
CUM FOR ALL LRU CASES	.0057	.0025	.0387	.0375	.0422	.1219	.1447	.3205

TYPE I TEST EQP POSTED FOR LRUS 8- 8	***TEST HRS***	**REPAIR HRS**	***TEST EQP***	***TEST MEN***	**REPAIR MEN**
ORGANIZATION	.0008	0.0000	10.0000	.0316	0.0000
DIRECT SUPPORT	.0058	.0053	.0441	.0441	.0408
GENERAL SUPPORT	.0455	.1219	.1739	.1739	.4655
DEPOT	.0282	.0772	.1185	.1185	.3243

COST OF INITIAL PROVISION

	EQPT.	DIRECT	GENERAL	DEPOT	TOTAL	RESIDUAL
UNIT	6297.	1889.	1889.	2204.	12280.	12209.
MODULE	0.	108.	405.	216.	729.	73.
PART		0.	114.	176.	290.	225.

	TOTALS	CUM	MANPOWER	DELTA
PRESENT VALUE COSTS	30047.	62907.	1608.	0.
EXPECTED VALUE COSTS	30047.	62907.	1608.	0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA DATE - MAY 1986

CASE TOTAL

**** TEST AND REPAIR MANPOWER REQUIREMENTS

	MAN-E	EQUIP	DIRECT	GENERAL	DEPOT
HRS PER YR ALL MAINT LOC					
TEST EQUIPMENT	454.620	540.207	732.392	399.186	1370.269
REPAIR	4091.584	216.980	657.709	1068.678	2809.281
NO OF MEN PER ANY TIME UNIT ALL MAINT LOC					
TEST EQUIPMENT	.198	.471	.638	.348	.919
REPAIR	1.782	.189	.573	.931	1.884
HRS PER YR PER MAINT LOC					
TEST EQUIPMENT	45.462	54.021	366.196	399.186	1370.269
REPAIR	409.158	21.698	328.855	1068.678	2809.281
NO OF MEN PER ANY TIME UNIT PER MAINT LOC					
TEST EQUIPMENT	.020	.047	.319	.348	.919
REPAIR	.178	.019	.286	.931	1.884

****SYSTEM/SUBSYSTEM AVAILABILITIES ****

CAYZ= .953354

CAYZI= .998964

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                                          -18-
                                   OPERATIONAL SYSTEM
                                       SAMPLE CASE
                                   1 THEATER SCENARIO
                                        BASELINE

ANALYSIS - AMSMI-OR-SA                                                DATE - MAY 1986

                                            CASE TOTAL
COST TOTALS, COST IN THOUSANDS OF DOLLARS                                         RECURRING COSTS
     INSTALLED EQUIPMENT              0.
     TEST EQUIPMENT                 627.                                   T.E. MAINTENANCE      232.
     TEST EQUIPMENT SPACE            24.                             DEPOT SPACE/UTILITIES        24.
     MAINTENANCE MANPOWER          5527.            FIELD     1445.  DEPOT    4082. TOTAL       5527.
                                           TRAINING FIELD       0.  DEPOT       0. TOTAL          0.
     SUPPLY MATERIAL              53228.                                           SUPPLIES    33849.
     REORDERING                      98.                                         REORDERING       98.
     MATERIAL STORAGE               231.                                   MATERIAL STORAGE      231.
     SUPPLY ADMINISTRATION         2518.                               INVENTORY MANAGEMENT     2450.
     SHIPPING AND HANDLING          653.                                           SHIPPING      653.

     GRAND TOTAL COST             62907.                                    TOTAL RECURRING    43065.


     PRESENT VALUE                                                  COST OF INITIAL PROVISION
     DEVELOPMENT                      0.                                              UNITS    17421.
     ACQUISITION                  19842.                                            MODULES     1467.
     OPERATION AND MAINTENANCE    43065.                                              PARTS      491.
     END LIFE SALVAGE                 0.                                    TOTAL PROVISION    19379.

     GRAND TOTAL                  62907.

EXPECTED VALUE MANPOWER AT EQUIPMENT DIRECT AND GENERAL

     MAINTENANCE MANPOWER          5527.
     GRAND TOTAL COST             62907.
     PRESENT VALUE
     OPERATION AND MAINTENANCE    43065.
     GRAND TOTAL                  62907.        DELTA       -0.         PV DELTA       -0.
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OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA DATE - MAY 1986

CASE TOTAL

SYSTEM MAINTENANCE SUPPORT COSTS

		COST	PERCENTAGE
1.000	RESEARCH AND DEVELOPMENT		
1.010	DEVELOPMENT ENGINEERING	0.00	100.00
TOTAL		0.00	100.00
2.000	INVESTMENT COST		
2.010	NON-RECURRING INVESTMENT	118.53	.60
2.020	PRODUCTION	276.56	1.40
2.050	DATA	0.00	0.00
2.080	TRAINING SERVICES AND EQUIPMENT	0.00	0.00
2.090	INITIAL SPARES AND REPAIR PARTS	19378.66	97.99
2)100	TRANSPORTATION	2.98	.02
TOTAL		19776.73	100.00
3.000	OPERATING AND SUPPORT COST		
3.010	MILITARY PERSONNEL		
3.011	CREW PAY AND ALLOWANCES	0.00	0.00
3.012	MAINTENANCE PAY AND ALLOWANCES	1496.54	3.47
3.013	INDIRECT PAY AND ALLOWANCES	0.00	0.00
3.014	PERMANENT CHANGE OF STATION	0.00	0.00
3.020	CONSUMPTION		
3.021	REPLENISHMENT SPARES	8990.08	20.84
3.022	PETROLEUM, OIL AND LUBRICANTS	0.00	0.00
3.023	UNIT TRAINING AMMUNITION AND MISSILE	0.00	0.00
3.030	DEPOT MAINTENANCE		
3.031	LABOR	4183.43	9.70
3.032	MATERIEL	24938.30	57.82
3.033	TRANSPORTATION	145.81	.34
3.040	MODIFICATIONS MATERIAL	0.00	0.00
3.050	OTHER DIRECT SUPPORT OPERATIONS		
3.051	MAINTENANCE, CIVILIAN LABOR	0.00	0.00
3.052	OTHER DIRECT	2847.52	6.60
3.060	INDIRECT SUPPORT OPERATIONS		
3.061	PERSONNEL REPLACEMENT	0.00	0.00
3.062	TRANSIENTS, PATIENTS AND PRISONERS	0.00	0.00
3.063	QUARTERS, MAINTENANCE AND UTILITIES	0.00	0.00
3.064	MEDICAL SUPPORT	0.00	0.00
3.065	OTHER INDIRECT	528.24	1.22
TOTAL		43129.92	100.00
GRAND TOTAL		62906.64	

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA　　　　DATE - MAY 1986

CASE TOTAL

SYSTEM MAINTENANCE SUPPORT COSTS DCA-P-92(R) FORMAT

		COST	PERCENTAGE
1.0	DEVELOPMENT		
1.011	ENGINEERING	0.00	100.00
TOTAL		0.00	100.00
2.0	PRODUCTION		
2.011	INT PROD FACIL (:PF)	39.51	.20
2.021	MANUFACTURING	276.56	1.43
2.022	RECURRING ENG	79.02	.41
2.04	DATA	0.00	0.00
2.07	INITIAL SPARES	18887.86	97.95
TOTAL		19282.94	100.00
3.0	MILITARY CONSTRUCTION		
TOTAL		0.00	0.00
4.0	FIELDING		
4.01	SYSTEM TEST AND EVAL	0.00	0.00
4.02	TRAIN,SERV AND EQ	0.00	0.00
4.03	TRANSPORTATION	2.98	.60
4.04	INITIAL REPAIR PARTS	490.80	99.40
4.05	SYS SPEC BASE OP SPT	0.00	0.00
4.06	OTH O$M FUND FIELD	0.00	0.00
TOTAL		493.78	100.00
5.0	SUSTAINMENT		
5.01	REPLENISHMENT		
5.011	REPL REPAIR PARTS	7459.55	17.30
5.012	REPL SPARES	1530.53	3.55
5.013	WAR RES REPAIR PARTS	0.00	0.00
5.014	WAR RESERVE SPARES	0.00	0.00
5.02	PETR,OIL,AND LUB (POL)	0.00	0.00
5.03	AMMUNITION		
5.031	TRAINING AMMO/MISL	0.00	0.00
5.032	WAR RES AMMO/MISL	0.00	0.00
5.04	DEPOT MAINTENANCE		

5.041	CIVILIAN LABOR	4183.43	9.70
5.042	MATERIEL (OM)	2493.83	5.78
5.043	MATERIEL (PROC)	22444.47	52.04
5.044	MAINT SUPPORT ACTIV	0.00	0.00
5.05	FIELD MAINT CIV LAB	0.00	0.00
5.06	TRANSPORTATION	650.41	1.51
5.07	SYS SPEC REPL TRAINING		
5.071	AMMO/MSLE/EQUIP	0.00	0.00
5.072	SERVICES	0.00	0.00
5.08	MILITARY PERSONNEL		
5.081	CREW PAY AND ALLOWANCES	0.00	0.00
5.082	MAINT PAY AND ALLOW	1496.54	3.47
5.083	SYS SPEC SUPT P/A	0.00	0.00
5.084	TRAINEE/TRAINER P/A	0.00	0.00
5.085	SYS/PROJ MGMT P/A	0.00	0.00
5.086	PERM CHG OF STA (PCS)	0.00	0.00
5.087	OTH MPA FUND SUST	0.00	0.00
5.09	SYS/PROJ MGMT (CIV)	0.00	0.00
5.10	MODIFICATIONS/KITS	0.00	0.00
5.11	OTHER SUSTAINMENT		
5.111	OTH O/M FUND SUST	23.64	.05
5.112	OTH PROC FUND SUST	2847.52	6.60
TOTAL		43129.92	100.00
	TOTAL LIFE CYCLE COST	62906.64	

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

GRAND TOTAL

COST TOTALS, COST IN THOUSANDS OF DOLLARS				RECURRING COSTS	
INSTALLED EQUIPMENT	0.				
TEST EQUIPMENT	627.			T.E. MAINTENANCE	232.
TEST EQUIPMENT SPACE	24.			DEPOT SPACE/UTILITIES	24.
MAINTENANCE MANPOWER	5527.	FIELD	1445.	DEPOT 4082. TOTAL	5527.
		TRAINING FIELD	0.	DEPOT 0. TOTAL	0.
SUPPLY MATERIAL	53228.			SUPPLIES	33849.
REORDERING	98.			REORDERING	98.
MATERIAL STORAGE	231.			MATERIAL STORAGE	231.
SUPPLY ADMINISTRATION	2518.			INVENTORY MANAGEMENT	2450.
SHIPPING AND HANDLING	653.			SHIPPING	653.
GRAND TOTAL COST	62907.			TOTAL RECURRING	4306[illegible].
PRESENT VALUE				COST OF INITIAL PROVISION	
DEVELOPMENT	0.			UNITS	17421.
ACQUISITION	19842.			MODULES	1467.
OPERATION AND MAINTENANCE	43065.			PARTS	491.
END LIFE SALVAGE	0.			TOTAL PROVISION	19379.
GRAND TOTAL	62907.				

EXPECTED VALUE MANPOWER AT EQUIPMENT DIRECT AND GENERAL

MAINTENANCE MANPOWER	5527.				
GRAND TOTAL COST	62907.				
PRESENT VALUE					
OPERATION AND MAINTENANCE	43065.				
GRAND TOTAL	62907.	DELTA	-0.	PV DELTA	-0.

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA   DATE - MAY 1986

GRAND TOTAL

SYSTEM MAINTENANCE SUPPORT COSTS

		COST	PERCENTAGE
1.000	RESEARCH AND DEVELOPMENT		
1.010	DEVELOPMENT ENGINEERING	0.00	100.00
TOTAL		0.00	100.00
2.000	INVESTMENT COST		
2.010	NON-RECURRING INVESTMENT	118.53	.60
2.020	PRODUCTION	276.56	1.40
2.050	DATA	0.00	0.00
2.080	TRAINING SERVICES AND EQUIPMENT	0.00	0.00
2.090	INITIAL SPARES AND REPAIR PARTS	19378.66	97.99
2)100	TRANSPORTATION	2.98	.02
TOTAL		19776.73	100.00
3.000	OPERATING AND SUPPORT COST		
3.010	MILITARY PERSONNEL		
3.011	CREW PAY AND ALLOWANCES	0.00	0.00
3.012	MAINTENANCE PAY AND ALLOWANCES	1496.54	3.47
3.013	INDIRECT PAY AND ALLOWANCES	0.00	0.00
3.014	PERMANENT CHANGE OF STATION	0.00	0.00
3.020	CONSUMPTION		
3.021	REPLENISHMENT SPARES	8990.08	20.84
3.022	PETROLEUM, OIL AND LUBRICANTS	0.00	0.00
3.023	UNIT TRAINING AMMUNITION AND MISSILE	0.00	0.00
3.030	DEPOT MAINTENANCE		
3.031	LABOR	4183.43	9.70
3.032	MATERIEL	24938.30	57.82
3.033	TRANSPORTATION	145.81	.34
3.040	MODIFICATIONS MATERIAL	0.00	0.00
3.050	OTHER DIRECT SUPPORT OPERATIONS		
3.051	MAINTENANCE, CIVILIAN LABOR	0.00	0.00
3.052	OTHER DIRECT	2847.52	6.60
3.060	INDIRECT SUPPORT OPERATIONS		
3.061	PERSONNEL REPLACEMENT	0.00	0.00
3.062	TRANSIENTS, PATIENTS AND PRISONERS	0.00	0.00
3.063	QUARTERS, MAINTENANCE AND UTILITIES	0.00	0.00
3.064	MEDICAL SUPPORT	0.00	0.00
3.065	OTHER INDIRECT	528.24	1.22
TOTAL		43129.92	100.00
GRAND TOTAL		62906.64	

OPERATIONAL SYSTEM
SAMPLE CASE
1 THEATER SCENARIO
BASELINE

ANALYSIS - AMSMI-OR-SA

DATE - MAY 1986

GRAND TOTAL

SYSTEM MAINTENANCE SUPPORT COSTS DCA-P-92(R) FORMAT

		COST	PERCENTAGE
1.0	DEVELOPMENT		
1.011	ENGINEERING	0.00	100.00
TOTAL		0.00	100.00
2.0	PRODUCTION		
2.011	INT PROD FACIL (IPF)	39.51	.20
2.021	MANUFACTURING	276.56	1.43
2.022	RECURRING ENG	79.02	.41
2.04	DATA	0.00	0.00
2.07	INITIAL SPARES	18887.86	97.95
TOTAL		19282.94	100.00
3.0	MILITARY CONSTRUCTION		
TOTAL		0.00	0.00
4.0	FIELDING		
4.01	SYSTEM TEST AND EVAL	0.00	0.00
4.02	TRAIN,SERV AND EQ	0.00	0.00
4.03	TRANSPORTATION	2.98	.60
4.04	INITIAL REPAIR PARTS	490.80	99.40
4.05	SYS SPEC BASE OP SPT	0.00	0.00
4.06	OTH O$M FUND FIELD	0.00	0.00
TOTAL		493.78	100.00
5.0	SUSTAINMENT		
5.01	REPLENISHMENT		
5.011	REPL REPAIR PARTS	7459.55	17.30
5.012	REPL SPARES	1530.53	3.55
5.013	WAR RES REPAIR PARTS	0.00	0.00
5.014	WAR RESERVE SPARES	0.00	0.00
5.02	PETR,OIL,AND LUB (POL)	0.00	0.00
5.03	AMMUNITION		
5.031	TRAINING AMMO/MISL	0.00	0.00
5.032	WAR RES AMMO/MISL	0.00	0.00
5.04	DEPOT MAINTENANCE		

5.041	CIVILIAN LABOR	4183.43	9.70
5.042	MATERIEL (OM)	2493.83	5.78
5.043	MATERIEL (PROC)	22444.47	52.04
5.044	MAINT SUPPORT ACTIV	0.00	0.00
5.05	FIELD MAINT CIV LAB	0.00	0.00
5.06	TRANSPORTATION	650.41	1.51
5.07	SYS SPEC REPL TRAINING		
5.071	AMMO/MSLE/EQUIP	0.00	0.00
5.072	SERVICES	0.00	0.00
5.08	MILITARY PERSONNEL		
5.081	CREW PAY AND ALLOWANCES	0.00	0.00
5.082	MAINT PAY AND ALLOW	1496.54	3.47
5.083	SYS SPEC SUPT P/A	0.00	0.00
5.084	TRAINEE/TRAINER P/A	0.00	0.00
5.085	SYS/PROJ MGMT P/A	0.00	0.00
5.086	PERM CHG OF STA (PCS)	0.00	0.00
5.087	OTH MPA FUND SUST	0.00	0.00
5.09	SYS/PROJ MGMT (CIV)	0.00	0.00
5.10	MODIFICATIONS/KITS	0.00	0.00
5.11	OTHER SUSTAINMENT		
5.111	OTH O/M FUND SUST	23.64	.05
5.112	OTH PROC FUND SUST	2847.52	6.60
TOTAL		43129.92	100.00
	TOTAL LIFE CYCLE COST	62906.64	

	ARA	ARAD	AYZP	CAD	CALMAN	CALPUB	CALSET	CCAL	CCALP	CCALR	CCSP
1COMMAND AMPLIF.	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
2CONTROL UNIT	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
3SYSTEM AMPLIFIER	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
4SIGHT CONTROL	.40	.20	2.00	375.	23760.	0.	0.00	0.	0.	0.	0.
5POWER SUPPLY	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
6LAUNCH UNIT	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
7STEERING UNIT	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.
8SIGHT UNIT	.40	.20	1.99	375.	23760.	0.	0.00	0.	0.	0.	0.

	CCSPP	CCSPR	CDDI	CDEO	CDFD	CDID	CDIO	CDIST	CDMAN	CDOE	CDOI
1COMMAND AMPLIF.	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
2CONTROL UNIT	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
3SYSTEM AMPLIFIER	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
4SIGHT CONTROL	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
5POWER SUPPLY	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
6LAUNCH UNIT	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
7STEERING UNIT	0.	0.	.38	.06	.06	.38	.06	.06	23760.	.06	.06
8SIGHT UNIT	0.	0.	.38	.06	.06	[illegible]	.06	.06	23760.	.06	.06

	CDPMAN	CDPRMN	CDRMAN	CEMAN	CEN	CEND	CERMAN	CFTD	CGMAN	CGRMAN
1COMMAND AMPLIF.	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
2CONTROL UNIT	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
3SYSTEM AMPLIFIER	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
4SIGHT CONTROL	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
5POWER SUPPLY	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
6LAUNCH UNIT	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
7STEERING UNIT	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.
8SIGHT UNIT	74610.	74610.	23760.	23760.	615.	0.	23760.	1.00	23760.	23760.

	CI	CII	CKIT	CKMD	CKME	CKMI	CKMO	CKPD	CKPI	CKPO	CKUD
1COMMAND AMPLIF.	0.	0.	5773.	.85	.85	.85	.85	.85	.85	.85	.85
2CONTROL UNIT	0.	0.	148.	.85	.85	.85	.85	.85	.85	.85	.85
3SYSTEM AMPLIFIER	0.	0.	1716.	.85	.85	.85	.85	.85	.85	.85	.85
4SIGHT CONTROL	0.	0.	148.	.85	.85	.85	.85	.85	.85	.85	.85
5POWER SUPPLY	0.	0.	1883.	.85	.85	.85	.85	.85	.85	.85	.85
6LAUNCH UNIT	0.	0.	500.	.85	.85	.85	.85	.85	.85	.85	.85
7STEERING UNIT	0.	0.	148.	.85	.85	.85	.85	.85	.85	.85	.85
8SIGHT UNIT	0.	0.	7226.	.85	.85	.85	.85	.85	.85	.85	.85

	CKUE	CKUI	CKUO	CLRUPG	CMODPG	CMP	CONMAN	CONTCT	CPE	CPI	CPII
1COMMAND AMPLIF.	.85	.85	.85	0.	0.	11062.	23760.	2.00	0.	34800.	0.
2CONTROL UNIT	.85	.85	.85	0.	0.	15178.	23760.	2.00	0.	34800.	0.
3SYSTEM AMPLIFIER	.85	.85	.85	0.	0.	3257.	23760.	2.00	0.	34800.	0.
4SIGHT CONTROL	.85	.85	.85	0.	0.	521.	23760.	2.00	0.	34800.	0.
5POWER SUPPLY	.85	.85	.85	0.	0.	6832.	23760.	2.00	0.	34800.	0.
6LAUNCH UNIT	.85	.85	.85	0.	0.	2000.	23760.	2.00	0.	34800.	0.
7STEERING UNIT	.85	.85	.85	0.	0.	750.	23760.	2.00	0.	34800.	0.
8SIGHT UNIT	.85	.85	.85	0.	0.	26988.	23760.	2.00	0.	34800.	0.

	CPP	CPUBII	CPUBV	CPV	CRI	CRII	CRM	CRP	CRU	CRV	CSDEP
1COMMAND AMPLIF.	2655.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
2CONTROL UNIT	1518.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
3SYSTEM AMPLIFIER	734.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
4SIGHT CONTROL	111.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
5POWER SUPPLY	1367.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
6LAUNCH UNIT	930.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
7STEERING UNIT	240.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00
8SIGHT UNIT	5689.	0.	0.	0.	348.	0.	299.	299.	299.	0.	1.00

	CSDSU	CSESU	CSGSU	CTCPUB	CTRA	CTRAD	CTRCAL	CTRI	CTRII	CTRSPT	CTRV
1COMMAND AMPLIF.	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
2CONTROL UNIT	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
3SYSTEM AMPLIFIER	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
4SIGHT CONTROL	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
5POWER SUPPLY	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
6LAUNCH UNIT	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
7STEERING UNIT	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00
8SIGHT UNIT	.25	.25	.25	0.	0.	0.	0.	0.	0.	0.	0.00

	CUBEM	CUBEP	CUBEU	CUCE	CUP	CV	DAOQL	DD	DDS	DI	DIS
1COMMAND AMPLIF.	.070	.010	3.830	0.00	110628.	0.	.95	1.	1.	0.	0.
2CONTROL UNIT	.050	.010	1.040	0.00	25298.	0.	.95	1.	1.	0.	0.
3SYSTEM AMPLIFIER	.080	.010	3.270	0.00	24428.	0.	.95	1.	1.	0.	0.
4SIGHT CONTROL	.020	.010	1.040	0.00	2773.	0.	.95	1.	1.	0.	0.
5POWER SUPPLY	.300	.020	3.880	0.00	45551.	0.	.95	1.	1.	0.	0.
6LAUNCH UNIT	.500	.150	19.750	0.00	31000.	0.	.95	1.	1.	0.	0.
7STEERING UNIT	.050	.010	3.930	0.00	4000.	0.	.95	1.	1.	0.	0.
8SIGHT UNIT	.500	.050	55.640	0.00	314863.	0.	.95	1.	1.	1.	1.

	DTE	DTI	DTO	E	EACAL	EACSP	ED	EDS	EE	EREI	ETE
1COMMAND AMPLIF.	14.	0.	14.	.002590000	0.	0.	10.	10.	23.	1.00	0.00
2CONTROL UNIT	14.	0.	14.	.000410000	1.	0.	10.	10.	23.	1.00	0.00
3SYSTEM AMPLIFIER	14.	0.	14.	.001119000	1.	0.	10.	10.	23.	1.00	0.00
4SIGHT CONTROL	14.	0.	14.	.000170000	1.	0.	10.	10.	23.	1.00	0.00
5POWER SUPPLY	14.	0.	14.	.001130000	1.	0.	10.	10.	23.	1.00	0.00
6LAUNCH UNIT	14.	0.	14.	.000250000	1.	0.	10.	10.	92.	1.00	0.00
7STEERING UNIT	14.	0.	14.	.000060000	1.	0.	10.	10.	23.	1.00	0.00
8SIGHT UNIT	14.	30.	14.	.001559000	1.	0.	10.	10.	23.	1.00	0.00

	ETEI	ETI	ETII	EVDM	EVDR	EVDT	EVEM	EVER	EVET	EVIM	EVIR
1COMMAND AMPLIF.	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
2CONTROL UNIT	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
3SYSTEM AMPLIFIER	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
4SIGHT CONTROL	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
5POWER SUPPLY	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
6LAUNCH UNIT	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
7STEERING UNIT	1.00	1.	0.	1.	1.	1.	1.	1.	1.	1.	1.
8SIGHT UNIT	1.00	1.	0.	1.	1.	1.	1.	1.	0.	1.	1.

	EVIT	EVOM	EVOR	EVOT	FE	FI	FII	FINT	FLM	FMD	FMI	FMO
1COMMAND AMPLIF.	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
2CONTROL UNIT	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
3SYSTEM AMPLIFIER	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
4SIGHT CONTROL	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
5POWER SUPPLY	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
6LAUNCH UNIT	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
7STEERING UNIT	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00
8SIGHT UNIT	1.	1.	1.	1.	0.00	.08	0.00	0.00	0.00	1.00	1.00	1.00

	FN	FNGF	FNSP	FSA	FTI	FTII	FTM	FTP	FTU	FUD	FUE
1COMMAND AMPLIF.	0.	.20	.20	160.00	150.0	150.0	15.	15.	10.	1.00	1.00
2CONTROL UNIT	0.	.15	.20	160.00	150.0	150.0	10.	10.	12.	1.00	1.00
3SYSTEM AMPLIFIER	0.	.20	.20	160.00	150.0	150.0	15.	15.	10.	1.00	1.00
4SIGHT CONTROL	0.	.05	.20	160.00	150.0	150.0	10.	10.	12.	1.00	1.00
5POWER SUPPLY	0.	.20	.20	160.00	150.0	150.0	10.	10.	12.	1.00	1.00
6LAUNCH UNIT	0.	.10	.20	160.00	150.0	150.0	10.	10.	12.	1.00	1.00
7STEERING UNIT	0.	.15	.20	160.00	150.0	150.0	10.	10.	12.	1.00	1.00
8SIGHT UNIT	0.	.25	.20	160.00	150.0	150.0	15.	15.	10.	1.00	1.00

	FUI	FUO	GA	GB	GC	GD	GE	GF	GG	GH	GI
1COMMAND AMPLIF.	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2CONTROL UNIT	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3SYSTEM AMPLIFIER	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4SIGHT CONTROL	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5POWER SUPPLY	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6LAUNCH UNIT	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7STEERING UNIT	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8SIGHT UNIT	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	GJ	GK	GL	GM	GN	GO	GP	GQ	GR	GS	GT
1COMMAND AMPLIF.	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
2CONTROL UNIT	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
3SYSTEM AMPLIFIER	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
4SIGHT CONTROL	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
5POWER SUPPLY	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
6LAUNCH UNIT	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
7STEERING UNIT	0.00	.25	0.00	0.00	.65	0.00	0.00	0.00	0.00	0.00	.10
8SIGHT UNIT	0.00	0.00	0.00	0.00	.25	.65	0.00	.10	0.00	0.00	0.00

	H(1)	H(2)	H(3)	H(4)
1COMMAND AMPLIF.	1.	1.	0.	1.
2CONTROL UNIT	1.	1.	0.	1.
3SYSTEM AMPLIFIER	1.	1.	0.	1.
4SIGHT CONTROL	1.	1.	0.	1.
5POWER SUPPLY	1.	1.	0.	1.
6LAUNCH UNIT	1.	1.	0.	1.
7STEERING UNIT	1.	1.	0.	1.
8SIGHT UNIT	1.	1.	1.	1.

	HPM	HPP	HPU	IBG	IFLAG	IMF	INHIB	IO	IOPER
1COMMAND AMPLIF.	1.	1.	1.	0	1	0	0	0	0
2CONTROL UNIT	1.	1.	1.	0	1	0	0	0	0
3SYSTEM AMPLIFIER	1.	1.	1.	0	1	0	0	0	0
4SIGHT CONTROL	1.	1.	1.	0	1	0	0	0	0
5POWER SUPPLY	1.	1.	1.	0	1	0	0	0	0
6LAUNCH UNIT	1.	1.	1.	0	1	0	0	0	0
7STEERING UNIT	1.	1.	1.	0	1	0	0	0	0
8SIGHT UNIT	1.	1.	1.	0	1	0	0	3	0

	IS	JTED	NA	NB	NU	OD	ODS
1COMMAND AMPLIF.	3	1	1	1	1	2.	2.
2CONTROL UNIT	3	1	1	1	1	2.	2.
3SYSTEM AMPLIFIER	3	1	1	1	1	2.	2.
4SIGHT CONTROL	3	1	1	1	1	2.	2.
5POWER SUPPLY	3	1	1	1	1	2.	2.
6LAUNCH UNIT	3	1	1	1	1	2.	2.
7STEERING UNIT	3	1	1	1	1	2.	2.
8SIGHT UNIT	1	1	1	1	-3	2.	2.

	OL(1)	OL(2)	OL(3)	OL(4)	OST(1)	OST(2)	OST(3)	OST(4)	OTF	P
1COMMAND AMPLIF.	5.	30.	30.	90.	6.	15.	55.	90.	.0342	12.
2CONTROL UNIT	5.	30.	30.	90.	6.	15.	55.	90.	.0342	2.
3SYSTEM AMPLIFIER	5.	30.	30.	90.	6.	15.	55.	90.	.0342	9.
4SIGHT CONTROL	5.	30.	30.	90.	6.	15.	55.	90.	.0342	1.
5POWER SUPPLY	5.	30.	30.	90.	6.	15.	55.	90.	.0455	8.
6LAUNCH UNIT	5.	30.	30.	90.	6.	15.	55.	90.	.0342	1.
7STEERING UNIT	5.	30.	30.	90.	6.	15.	55.	90.	.0342	1.
8SIGHT UNIT	5.	30.	30.	90.	6.	15.	45.	60.	.0342	13.

	PMR	PP	PPR	PUR	QMM	QMP	QMU	QTD	QTE	QTI	QTMD
1COMMAND AMPLIF.	0.	50.	0.	0.	5.	20.	1.	0.	0.	0.	0.
2CONTROL UNIT	0.	20.	0.	0.	10.	50.	2.	0.	0.	0.	0.
3SYSTEM AMPLIFIER	0.	40.	0.	0.	5.	20.	1.	0.	0.	0.	0.
4SIGHT CONTROL	0.	30.	0.	0.	10.	50.	2.	0.	0.	0.	0.
5POWER SUPPLY	0.	40.	0.	0.	10.	50.	2.	0.	0.	0.	0.
6LAUNCH UNIT	0.	40.	0.	0.	10.	50.	2.	0.	0.	0.	0.
7STEERING UNIT	0.	20.	0.	0.	10.	50.	2.	0.	0.	0.	0.
8SIGHT UNIT	0.	40.	0.	0.	5.	20.	1.	0.	0.	0.	0.

	QTME	QTMI	QTMO	QTO	QTPD	QTPI	QTPO	RDD	REO	REPEAT	RF
1COMMAND AMPLIF.	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
2CONTROL UNIT	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
3SYSTEM AMPLIFIER	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
4SIGHT CONTROL	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
5POWER SUPPLY	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
6LAUNCH UNIT	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
7STEERING UNIT	0.	0.	0.	0.	0.	0.	0.	90.	1.	1.	.90
8SIGHT UNIT	0.	0.	0.	0.	0.	0.	0.	135.	0.	1.	.90

	RID	ROI	SL(1)	SL(2)	SL(3)	SL(4)
1COMMAND AMPLIF.	0.	0.	0.	15.	15.	30.
2CONTROL UNIT	0.	0.	0.	15.	15.	30.
3SYSTEM AMPLIFIER	0.	0.	0.	15.	15.	30.
4SIGHT CONTROL	0.	0.	0.	15.	15.	30.
5POWER SUPPLY	0.	0.	0.	15.	15.	30.
6LAUNCH UNIT	0.	0.	0.	15.	15.	30.
7STEERING UNIT	0.	0.	0.	15.	15.	30.
8SIGHT UNIT	35.	10.	0.	15.	15.	30.

	SMD	SME	SMF	SMI	SMO	SPE	SPEV
1COMMAND AMPLIF.	.08	0.00	0.00000000	0.00	0.00	0.	1.
2CONTROL UNIT	.08	0.00	0.00000000	0.00	0.00	0.	1.
3SYSTEM AMPLIFIER	.08	0.00	0.00000000	0.00	0.00	0.	1.
4SIGHT CONTROL	.08	0.00	0.00000000	0.00	0.00	0.	1.
5POWER SUPPLY	.08	0.00	0.00000000	0.00	0.00	0.	1.
6LAUNCH UNIT	.08	0.00	0.00000000	0.00	0.00	0.	1.
7STEERING UNIT	.08	0.00	0.00000000	0.00	0.00	0.	1.
8SIGHT UNIT	.03	0.00	0.00000000	.05	0.00	0.	1.

	SPEVR	STAT	SUD	SUE	SUI	SUO	SVE	SVR	SVT	SVV	TALMAN
1COMMAND AMPLIF.	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
2CONTROL UNIT	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
3SYSTEM AMPLIFIER	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
4SIGHT CONTROL	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
5POWER SUPPLY	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
6LAUNCH UNIT	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
7STEERING UNIT	1.	20.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.
8SIGHT UNIT	1.	90.	.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.

	TAT(1)	TAT(2)	TAT(3)	TAT(4)	TATE
1COMMAND AMPLIF.	1.	4.	0.	10.	4.
2CONTROL UNIT	1.	4.	0.	10.	4.
3SYSTEM AMPLIFIER	1.	4.	0.	10.	4.
4SIGHT CONTROL	1.	4.	0.	10.	4.
5POWER SUPPLY	1.	4.	0.	10.	4.
6LAUNCH UNIT	1.	4.	0.	10.	4.
7STEERING UNIT	1.	4.	0.	10.	4.
8SIGHT UNIT	2.	4.	30.	127.	4.

	TAYZ(1)	TAYZ(2)	TAYZ(3)	TAYZ(4)	TAYZ(5)	TAYZ(6)	TAYZ(7)	TAYZ(8)	TAYZ(9)	TAYZ(10)
1COMMAND AMPLIF.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
2CONTROL UNIT	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
3SYSTEM AMPLIFIER	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
4SIGHT CONTROL	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
5POWER SUPPLY	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
6LAUNCH UNIT	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
7STEERING UNIT	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
8SIGHT UNIT	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.

	TC	TD	TDI	TDMAN	TDMW	TDPMI	TDPMII	TDPRI	TDPRII
1COMMAND AMPLIF.	.50	6.00	0.	2.00	5.50	1.40	1.40	1.40	1.40
2CONTROL UNIT	.50	.25	0.	2.00	1.50	1.40	1.40	1.40	1.40
3SYSTEM AMPLIFIER	.50	1.80	0.	2.00	1.50	1.40	1.40	1.40	1.40
4SIGHT CONTROL	.50	.25	0.	2.00	1.10	1.40	1.40	1.40	1.40
5POWER SUPPLY	.50	4.00	0.	2.00	.75	1.40	1.40	1.40	1.40
6LAUNCH UNIT	.50	.25	0.	2.00	1.10	1.40	1.40	1.40	1.40
7STEERING UNIT	.50	.25	0.	2.00	.50	1.40	1.40	1.40	1.40
8SIGHT UNIT	.50	8.00	75.	2.00	0.00	1.40	1.40	1.40	1.40

	TDR	TDRMAN	TE	TEMAN	TENMAN	TEO	TER	TERMAN	TF	TFR
1COMMAND AMPLIF.	10.00	2.00	2.00	2.00	2.00	60.	2.50	2.00	2.00	2.50
2CONTROL UNIT	.50	2.00	.25	2.00	2.00	60.	.75	2.00	.25	.75
3SYSTEM AMPLIFIER	1.50	2.00	1.80	2.00	2.00	60.	1.50	2.00	1.80	1.50
4SIGHT CONTROL	.50	2.00	.25	2.00	2.00	60.	.75	2.00	.25	.75
5POWER SUPPLY	1.50	2.00	.50	2.00	2.00	60.	1.50	2.00	.50	1.50
6LAUNCH UNIT	.75	2.00	1.00	2.00	2.00	60.	1.80	2.00	1.00	1.80
7STEERING UNIT	.50	2.00	.25	2.00	2.00	60.	.75	2.00	.25	.75
8SIGHT UNIT	19.50	2.00	1.00	2.00	2.00	72.	3.50	2.00	1.00	3.50

	TGMAN	TGRMAN	TI	TID	TIMW	TIO	TIR	TMD	TMDD	TMDR	TMI
1COMMAND AMPLIF.	2.00	2.00	2.00	0.	0.00	10.	2.50	3.00	10.00	6.00	0.00
2CONTROL UNIT	2.00	2.00	.25	0.	0.00	10.	.75	.75	1.50	1.50	0.00
3SYSTEM AMPLIFIER	2.00	2.00	1.80	0.	0.00	10.	1.50	1.25	3.00	3.50	0.00
4SIGHT CONTROL	2.00	2.00	.25	0.	0.00	10.	.75	.75	1.00	1.50	0.00
5POWER SUPPLY	2.00	2.00	.50	0.	0.00	10.	1.50	1.50	3.00	4.00	0.00
6LAUNCH UNIT	2.00	2.00	1.00	0.	0.00	10.	1.80	.80	1.75	2.50	0.00
7STEERING UNIT	2.00	2.00	.25	0.	0.00	10.	.75	.75	1.50	1.50	0.00
8SIGHT UNIT	2.00	2.00	1.50	75.	5.50	15.	4.00	3.50	0.00	12.00	3.50

	TMID	TMIR	TMO	TMOD	TMOR	TOE	TOI	TOMW	TONMAN	TRC	TUMD
1COMMAND AMPLIF.	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	3.00	120.
2CONTROL UNIT	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	2.75	120.
3SYSTEM AMPLIFIER	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	2.80	120.
4SIGHT CONTROL	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	2.50	120.
5POWER SUPPLY	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	3.20	120.
6LAUNCH UNIT	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	3.50	120.
7STEERING UNIT	0.00	0.00	0.00	0.00	0.00	60.	10.	0.00	2.	2.50	120.
8SIGHT UNIT	10.00	12.00	0.00	0.00	0.00	72.	15.	0.00	2.	4.40	1440.

	TUMI	TUMO	WD	WDM	WDR	WE	WEM	WER	WI	WIM	WIR
1COMMAND AMPLIF.	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
2CONTROL UNIT	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
3SYSTEM AMPLIFIER	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
4SIGHT CONTROL	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
5POWER SUPPLY	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
6LAUNCH UNIT	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
7STEERING UNIT	0.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.
8SIGHT UNIT	240.	0.	40.	40.	40.	44.	44.	44.	44.	44.	44.

	WM	WMR	WMT	WO	WOM	WOR	WP	WTKIT	WU	YAT	YD
1COMMAND AMPLIF.	2.00	44.	44.	44.	44.	44.	1.00	10.	58.00	0.0000	0.
2CONTROL UNIT	2.00	44.	44.	44.	44.	44.	1.00	1.	17.00	0.0000	0.
3SYSTEM AMPLIFIER	2.00	44.	44.	44.	44.	44.	1.00	10.	42.00	0.0000	0.
4SIGHT CONTROL	2.00	44.	44.	44.	44.	44.	1.00	1.	14.00	0.0000	0.
5POWER SUPPLY	2.00	44.	44.	44.	44.	44.	1.00	10.	49.00	0.0000	0.
6LAUNCH UNIT	1.00	44.	44.	44.	44.	44.	.50	10.	156.00	0.0000	0.
7STEERING UNIT	1.00	44.	44.	44.	44.	44.	.50	1.	7.00	0.0000	0.
8SIGHT UNIT	15.00	44.	44.	44.	44.	44.	1.00	30.	414.00	0.0000	0.

	YMWO	YP	YR	YZ	ZFL	ZI	ZM(1)	ZM(2)	ZM(3)	ZM(4)
1COMMAND AMPLIF.	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
2CONTROL UNIT	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
3SYSTEM AMPLIFIER	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
4SIGHT CONTROL	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
5POWER SUPPLY	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
6LAUNCH UNIT	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
7STEERING UNIT	0.00	0.	20.	0.	1.00000	0.00	.99999	.99999	.99999	.99999
8SIGHT UNIT	0.00	0.	20.	0.	1.00000	1.00	.99999	.99999	.99999	.99999

	ZO	ZP(1)	ZP(2)	ZP(3)	ZU(1)	ZU(2)	ZU(3)	ZU(4)
1COMMAND AMPLIF.	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
2CONTROL UNIT	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
3SYSTEM AMPLIFIER	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
4SIGHT CONTROL	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
5POWER SUPPLY	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
6LAUNCH UNIT	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
7STEERING UNIT	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999
8SIGHT UNIT	0.00	.99999	.99999	.99999	.99999	.99999	.99999	.99999

APPENDIX F

APPENDIX F

OSAMM FIXED VERSUS OPTIMIZED
MAINTENANCE POLICY DATA

1. Logistics Cost For The Optimized Maintenance Policies.

MTBF (Hrs)	PRORATION METHOD		
	UNIT PRICE	BASELINE	INVERSE UNIT PRICE
41	$120,784,124	$81,220,085	$14,620,471
69	$72,865,515	$49,059,864	$9,163,944
137	$36,485,295	$24,733,255	$5,109,614
274	$19,205,069	$12,978,727	$3,291,415

2. Logistics Cost For The Fixed Maintenance Policy.

MTBF (Hrs)	PRORATION METHOD		
	UNIT PRICE	BASELINE	INVERSE UNIT PRICE
41	$204,767,359	$121,829,357	$20,275,874
69	$126,785,695	$77,644,581	$13,592,972
137	$66,233,603	$43,995,825	$7,565,074
274	$37,540,185	$26,724,067	$4,977,046

3. Maintenance Policies Considered For Optimization.

OSAMM POLICY NUMBER	END ITEM REPAIR	COMPONENT REPAIR	MODULE REPAIR
4	1	1	4
5	1	1	5
8	1	2	4
9	1	2	5
13	1	4	4
14	1	4	5
15	1	5	5
18	2	2	4
19	2	2	5
23	2	4	4
24	2	4	5
25	2	5	5

1 = ORGANIZATIONAL
2 = DIRECT SUPPORT
3 = GENERAL SUPPORT
4 = DEPOT
5 = THROWAWAY (i.e., DISCARD)

4. Optimum Policy Selection By Proration Method.

a. Unit Price Proration Method.

OSAMM POLICY NUMBER	SYSTEM MTBF (HOURS)			
	41	69	137	274
4		1		
5	32	1		
8	2			
9				
13				
14				
15				
18	13	45	45	45
19	1	1	3	1
23				
24				2
25				
Total No. Applications (or modules) in System	48	48	48	48

b. Baseline Proration Method.

OSAMM POLICY NUMBER	SYSTEM MTBF (HOURS)			
	41	69	137	274
4	14			
5				
8				
9				
13				
14				
15				
18	33	47	47	35
19	1	1	1	1
23				12
24				
25				
Total No. Applications (or modules) in System	48	48	48	48

c. Inverse Unit Price Proration Method.

OSAMM POLICY NUMBER	SYSTEM MTBF (HOURS)			
	41	69	137	274
4	31			
5				
8	2			
9				
13				
14				
15				
18	14	47	47	45
19	1	1	1	3
23				
24				
25				
Total No. Applications (or modules) in System	48	48	48	48

5. OSAMM Optimum Maintenance Policy Data Files. The following is an example of how to read the OSAMM policy files. Select two policies from chart 5a titled "Unit Price Proration Method". Using a system MTBF of 41 hours the policies are 1114 1.0000 (Example 1) and 48225 1.0000 (Example 2) which will be used in the example below. Reading the policy from left to right the maintenance policy would be as follows:

	APPLICATION (or Module) NUMBER	END ITEM REPAIR	COMPONENT REPAIR	MODULE REPAIR	PERCENTAGE OF TIME THIS POLICY APPLIES
EXAMPLE 1	1	1 (Org.)	1 (Org.)	4 (Depot)	1.0000 (100%)
EXAMPLE 2	48	2 (DS)	2 (DS)	5 (Discard)	1.0000 (100%)

To further explain Example 1 is put into the following words. If Application or Module #1 fails the end item will be repaired at Organizational level by replacement of the component. The component will be repaired at Organizational level by replacement of the module. The module will be repaired at Depot level by replacement of piece parts. This Application or Module #1 maintenance policy will be in effect for module #1 100% of the time.

a. Unit Price Proration Method.

SYSTEM MTBF (HOURS)							
41		69		137		274	
1114	1.0000	1224	1.0000	1224	1.0000	1224	1.0000
2114	1.0000	2224	1.0000	2224	1.0000	2224	1.0000
3114	1.0000	3224	1.0000	3224	1.0000	3224	1.0000
4114	1.0000	4224	1.0000	4224	1.0000	4224	1.0000
5114	1.0000	5224	1.0000	5224	1.0000	5224	1.0000
6114	1.0000	6224	1.0000	6224	1.0000	6224	1.0000
7114	1.0000	7224	1.0000	7224	1.0000	7224	1.0000
8114	1.0000	8224	1.0000	8224	1.0000	8224	1.0000
9114	1.0000	9224	1.0000	9224	1.0000	9224	1.0000
10114	1.0000	10224	1.0000	10224	1.0000	10224	1.0000
11114	1.0000	11224	1.0000	11224	1.0000	11224	1.0000
12114	1.0000	12224	1.0000	12224	1.0000	12224	1.0000
13124	1.0000	13224	1.0000	13224	1.0000	13224	1.0000
14124	1.0000	14224	1.0000	14224	1.0000	14224	1.0000
15114	1.0000	15224	1.0000	15224	1.0000	15224	1.0000
16114	1.0000	16224	1.0000	16224	1.0000	16224	1.0000
17114	1.0000	17224	1.0000	17224	1.0000	17224	1.0000
18114	1.0000	18224	1.0000	18224	1.0000	18224	1.0000
19114	1.0000	19224	1.0000	19224	1.0000	19224	1.0000
20114	1.0000	20224	1.0000	20224	1.0000	20224	1.0000
21114	1.0000	21224	1.0000	21224	1.0000	21224	1.0000
22114	1.0000	22224	1.0000	22224	1.0000	22224	1.0000
23114	1.0000	23224	1.0000	23224	1.0000	23224	1.0000
24114	1.0000	24115	1.0000	24225	1.0000	24245	1.0000
25114	1.0000	25224	1.0000	25224	1.0000	25224	1.0000
26114	1.0000	26224	1.0000	26224	1.0000	26224	1.0000
27114	1.0000	27224	1.0000	27224	1.0000	27224	1.0000
28114	1.0000	28224	1.0000	28224	1.0000	28224	1.0000
29114	1.0000	29224	1.0000	29224	1.0000	29224	1.0000
30114	1.0000	30224	1.0000	30224	1.0000	30224	1.0000
31114	1.0000	31224	1.0000	31224	1.0000	31224	1.0000
32114	1.0000	32224	1.0000	32224	1.0000	32224	1.0000
33114	1.0000	33224	1.0000	33224	1.0000	33224	1.0000
34114	1.0000	34114	1.0000	34225	1.0000	34245	1.0000
35224	1.0000	35224	1.0000	35224	1.0000	35224	1.0000
36224	1.0000	36224	1.0000	36224	1.0000	36224	1.0000
37224	1.0000	37224	1.0000	37224	1.0000	37224	1.0000
38224	1.0000	38224	1.0000	38224	1.0000	38224	1.0000
39224	1.0000	39224	1.0000	39224	1.0000	39224	1.0000
40224	1.0000	40224	1.0000	40224	1.0000	40224	1.0000
41224	1.0000	41224	1.0000	41224	1.0000	41224	1.0000
42224	1.0000	42224	1.0000	42224	1.0000	42224	1.0000
43224	1.0000	43224	1.0000	43224	1.0000	43224	1.0000
44224	1.0000	44224	1.0000	44224	1.0000	44224	1.0000
45224	1.0000	45224	1.0000	45224	1.0000	45224	1.0000
46224	1.0000	46224	1.0000	46224	1.0000	46224	1.0000
47224	1.0000	47224	1.0000	47224	1.0000	47224	1.0000
48225	1.0000	48225	1.0000	48225	1.0000	48225	1.0000

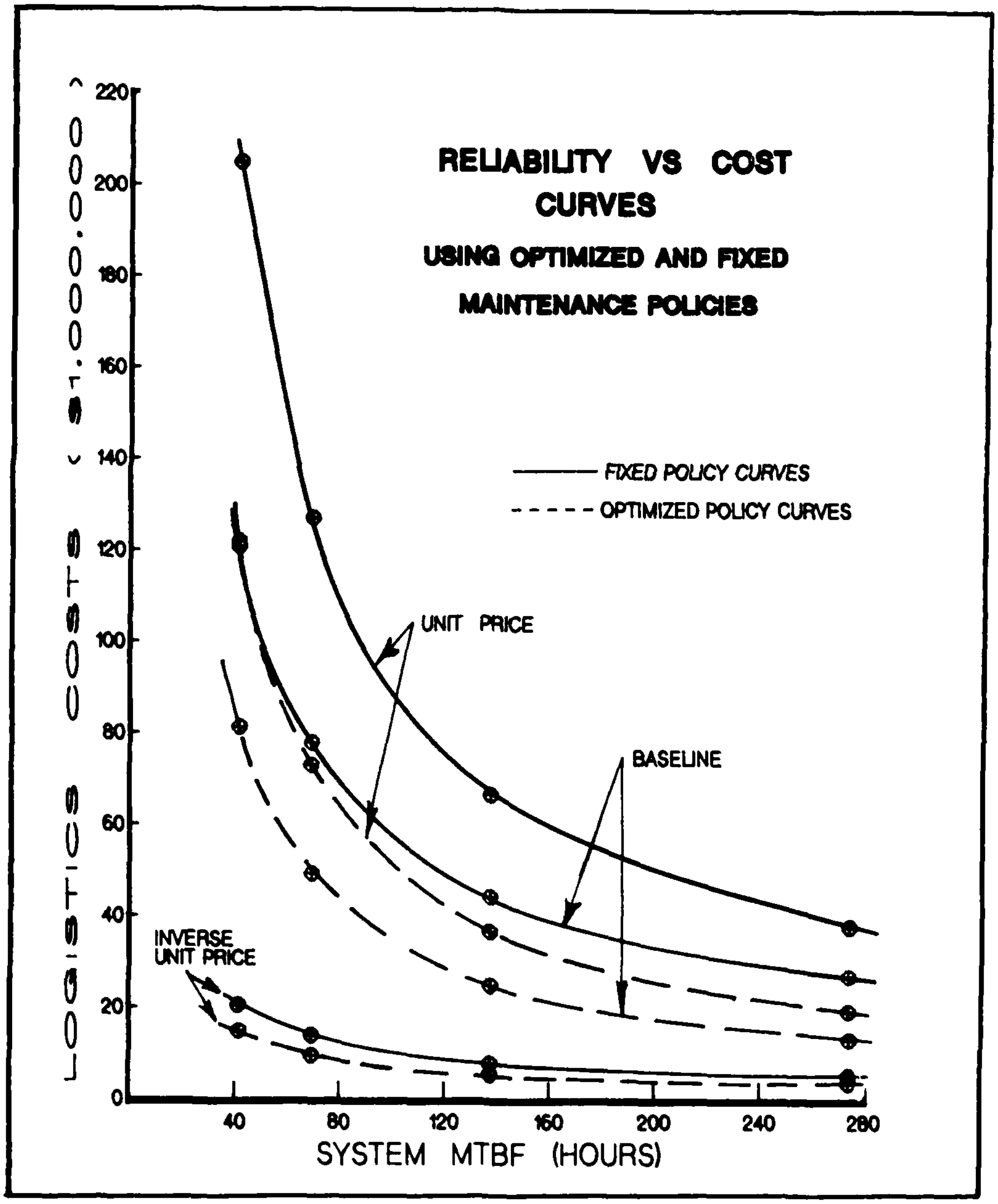
b. Baseline Proration Method.

SYSTEM MTBF (HOURS)							
41		69		137		274	
1114	1.0000	1224	1.0000	1224	1.0000	1224	1.0000
2114	1.0000	2224	1.0000	2224	1.0000	2224	1.0000
3114	1.0000	3224	1.0000	3224	1.0000	3224	1.0000
4114	1.0000	4224	1.0000	4224	1.0000	4224	1.0000
5114	1.0000	5224	1.0000	5224	1.0000	5224	1.0000
6114	1.0000	6224	1.0000	6224	1.0000	6224	1.0000
7114	1.0000	7224	1.0000	7224	1.0000	7224	1.0000
8114	1.0000	8224	1.0000	8224	1.0000	8224	1.0000
9114	1.0000	9224	1.0000	9224	1.0000	9224	1.0000
10114	1.0000	10224	1.0000	10224	1.0000	10224	1.0000
11114	1.0000	11224	1.0000	11224	1.0000	11224	1.0000
12114	1.0000	12224	1.0000	12224	1.0000	12224	1.0000
13124	1.0000	13224	1.0000	13224	1.0000	13224	1.0000
14124	1.0000	14224	1.0000	14224	1.0000	14224	1.0000
15114	1.0000	15224	1.0000	15224	1.0000	15224	1.0000
16114	1.0000	16224	1.0000	16224	1.0000	16224	1.0000
17114	1.0000	17224	1.0000	17224	1.0000	17224	1.0000
18114	1.0000	18224	1.0000	18224	1.0000	18224	1.0000
19114	1.0000	19224	1.0000	19224	1.0000	19224	1.0000
20114	1.0000	20224	1.0000	20224	1.0000	20224	1.0000
21114	1.0000	21224	1.0000	21224	1.0000	21224	1.0000
22114	1.0000	22224	1.0000	22224	1.0000	22224	1.0000
23114	1.0000	23224	1.0000	23224	1.0000	23224	1.0000
24114	1.0000	24224	1.0000	24224	1.0000	24225	1.0000
25114	1.0000	25224	1.0000	25224	1.0000	25224	1.0000
26114	1.0000	26224	1.0000	26224	1.0000	26224	1.0000
27114	1.0000	27224	1.0000	27224	1.0000	27224	1.0000
28114	1.0000	28224	1.0000	28224	1.0000	28224	1.0000
29114	1.0000	29224	1.0000	29224	1.0000	29224	1.0000
30114	1.0000	30224	1.0000	30224	1.0000	30224	1.0000
31114	1.0000	31224	1.0000	31224	1.0000	31224	1.0000
32114	1.0000	32224	1.0000	32224	1.0000	32224	1.0000
33224	1.0000	33224	1.0000	33224	1.0000	33224	1.0000
34114	1.0000	34224	1.0000	34224	1.0000	34225	1.0000
35224	1.0000	35224	1.0000	35224	1.0000	35224	1.0000
36224	1.0000	36224	1.0000	36224	1.0000	36224	1.0000
37224	1.0000	37224	1.0000	37224	1.0000	37224	1.0000
38224	1.0000	38224	1.0000	38224	1.0000	38224	1.0000
39224	1.0000	39224	1.0000	39224	1.0000	39224	1.0000
40224	1.0000	40224	1.0000	40224	1.0000	40224	1.0000
41224	1.0000	41224	1.0000	41224	1.0000	41224	1.0000
42224	1.0000	42224	1.0000	42224	1.0000	42224	1.0000
43224	1.0000	43224	1.0000	43224	1.0000	43224	1.0000
44224	1.0000	44224	1.0000	44224	1.0000	44224	1.0000
45224	1.0000	45224	1.0000	45224	1.0000	45224	1.0000
46224	1.0000	46224	1.0000	46224	1.0000	46224	1.0000
47224	1.0000	47224	1.0000	47224	1.0000	47224	1.0000
48225	1.0000	48225	1.0000	48225	1.0000	48225	1.0000

c. Inverse Unit Price Method.

SYSTEM MTBF (HOURS)							
41		69		137		274	
1114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
3114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
4114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
5114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
6114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
7114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
8114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
9114	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
13224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
14224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
15224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
16224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
17224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
18224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
19224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
20224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
21224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
22224	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
23224	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
24114	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
25224	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
26224	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
27224	1.0000	[illegible]	[illegible]	[illegible]	[illegible]	27224	1.0000
28224	1.0000	28224	[illegible]	[illegible]	[illegible]	28224	1.0000
29224	1.0000	29224	[illegible]	[illegible]	[illegible]	29224	1.0000
30224	1.0000	30224	[illegible]	[illegible]	[illegible]	30224	1.0000
31224	1.0000	31224	1.0000	[illegible]	[illegible]	31224	1.0000
32224	1.0000	32224	1.0000	32224	1.0000	32224	1.0000
33224	1.0000	33224	1.0000	33224	1.0000	33224	1.0000
34114	1.0000	34224	1.0000	34224	1.0000	34224	1.0000
35224	1.0000	35224	1.0000	35224	1.0000	35224	1.0000
36224	1.0000	36224	1.0000	36224	1.0000	36224	1.0000
37224	1.0000	37224	1.0000	37224	1.0000	37224	1.0000
38224	1.0000	38224	1.0000	38224	1.0000	38224	1.0000
39224	1.0000	39224	1.0000	39224	1.0000	39224	1.0000
40224	1.0000	40224	1.0000	40224	1.0000	40224	1.0000
41224	1.0000	41224	1.0000	41224	1.0000	41224	1.0000
42224	1.0000	42224	1.0000	42224	1.0000	42224	1.0000
43224	1.0000	43224	1.0000	43224	1.0000	43224	1.0000
44224	1.0000	44224	1.0000	44224	1.0000	44224	1.0000
45224	1.0000	45224	1.0000	45224	1.0000	45224	1.0000
46224	1.0000	46224	1.0000	46224	1.0000	46224	1.0000
47224	1.0000	47224	1.0000	47224	1.0000	47224	1.0000
48225	1.0000	48225	1.0000	48225	1.0000	48225	1.0000

6. OSAMM Fixed Versus Optimized Maintenance Policy, Cost Versus Reliability Curves Comparison.



APPENDIX G

APPENDIX G
OSAMM
INPUT DATA DESCRIPTIONS

MNEMONIC	VARIABLE NAME	UNITS	DEFAULT VALUE(S)*
AVAIL (J)	Availability of Special Test Equipment or Special Repairman	----	.65/.70
AVTAR	Availability Target	----	-----
CF	Annual Maintenance Cost Factor	----	.27
COSBIN	Annual Cost to Maintain Item in ASL	$/yr	30.00
COSBINI	One Time Cost to Add a Line to ASL	$	187.00
COSHOL	Inventory Holding Cost Percentage	----	.03
COSNSI	First Year Cataloging Cost	$	555.00
COSNSR	Subsequent Years Cataloging Cost	$/yr	138.00
COSREQ	Cost per Requisition	$	20.20
COSTD	Cost of Technical Documentation	$/page	200.00
CPM (J)	Transportation Cost per Pound-Mile (Org-DS, DS-GS, GS-Depot)	$/lb-mi	.01/.00029/.0003
CTDEL	Contact Team Delay Time	days	-----
DIST(J)	Distance Between (Org-DS, DS-GS, GS-Depot)	miles	7/250/3500
DWK(J)	Days in Workweek (Org, DS, GS, Depot)	days	7/5/5/5
EID1,EID2	End Item Identification	----	-----
EQPEC	Highest Echelon at which a TE/ Repairman is Peculiar	----	4
EQPLA	Lowest Echelon at Which a TE/ Repairman Can Be Placed	----	1
ERR	Erroneous Removal Rate	----	.1
ETC	Other One Time Initial Costs of TE	$/TE	0
ETIME(J)	Time Required for TE/Repairman J to Repair the (a) End Item When a Component Fails,(b) Component When a Module Fails	hours	-----
EUP	Unit Price of TE (excluding R&D Costs)	$/TE	-----
FAIL(I)	MTBF for a)Representative Part I in the Pseudo Component/ Psuedo Module, b) Module I in a Component	hours	-----
FL	Salary Loading Factor for Special Repairman (Military, Civilian)	----	.682/.45
ID(I)	Component, Module, Psuedo Component, Psuedo Module Identification	----	-----
IESS(I)	Essentiality Code for Component/ Module/Pseudo Component/Pseudo Module I	----	-----
IPOL(X)	Indicator to Specify Whether Maintenance Policy X of 25 is to be considered (0=No)	----	0

MNEMONIC	VARIABLE NAME	UNITS	DEFAULT VALUE(S)*
IRSC	Retail Stockage Criteria	----	-----
IVSYS	SESAME Support System Indicator (V=Vertical, D=Direct Exchange, N=Nonvertical)	----	-----
MIL	Military/Civilian Indicator for Special Repairman (1=Military, 2=Civilian)	----	1
MTBF	MTBF of the End Item	hours	-----
MTR	Mean Time to Repair the End Item	hours	.5
MULT	Indicates Multiple Cost Cards for Special Repairman (0=one set of costs for all echelons)	----	0
NEQ	Number of special TEs for a Component or Module	----	0
NNSN	New NSN indicator for a Component/Module (1=NSN Exists, 0=No NSN Exists)	----	0
NREP	Number of Special Repairmen for a Component or Module	----	0
NSPEC	Indicator That Special Test Equipment/Repairman is Needed to Repair End Item Associated With Specific Components	----	0
NSTACK(I)	Number of Special TE/Repairmen Associated With an Application	----	0
NSTK1	Number of Special TE/Repairmen to Repair End-Item	----	0
NSTK4(X)	Number of Special TE/Repairmen for Component Repair Associated With Specific Module/Application I	----	0
NSTKT	Identification Number of TE/Repairmen J Needed to Repair the End Item When a Specific Component Fails	----	-----
OH	Operating Hours of the End Item	hours/yr	-----
OLIFE	Operating Life of the End Item	years	-----
OPSL(J)	Operating Safety Level for Stock at a level (Org, DS, GS)	days	-----
OST(J)	Order Ship Time Between levels (Org-DS, DS-GS, GS-Depot)	days	-----
OST(4)	Procurement Lead Time	days	-----
OUPS(J)	Number of Maintenance/Supply Shops at each level (Org, DS, GS)	----	-----
OUPS(4)	Total Number of End Items Fielded (Density)	----	-----
PAGE(I)	Number of Pages of Technical Documentation for Component/Module I	----	-----
PARTSN	Number of Parts in Pseudo Module or Pseudo Component Needing a New NSN	----	-----

MNEMONIC	VARIABLE NAME	UNITS	DEFAULT VALUE(S)*
PARTSP	Average Price of Piece Parts in a Module per Repair Action	$	-----
PARTSR	Number of Piece Parts in a Module Which Need a New NSN	----	-----
PARTST	Total Number of Parts Grouped Together to Form a Pseudo Component/Pseudo Module	----	-----
RATL(X)	Common Repairman Labor Rate at Each Level (Org, DS, GS, Depot)	$/hr/man	6.00/9.00/ 17.25/17.25
RTR	Turnover period for Special Repairmen (Military & Civilian)	yrs/man	2.5/5.0
SAL	Annual Salary of Special Repairmen	$/yr/man	-----
SHOURS(J)	Shift hours at each level (Org, DS, GS, Depot)	hrs/day	16/12/8/8
STK1(J)	Identification Number of Special TE/Repairman J Needed to Repair End Item	----	-----
STK2(J)	Identification Number of Special TE/Repairmen J Needed to Repair Component	----	-----
STK3(J)	Identification Number of Special TE/Repairmen J Needed to Repair Module	----	-----
STK4(J)	Identification Number of Special TE/Repairmen J Needed For Application	----	-----
TAT(I,J)	Average Elapsed Time From Turn-In of a Failed Item I(module or application) at Maintenance Facility J (Org., DS, GS, Depot) Until the Item is Repaired And Ready For Use	days	-----
TBFACT	End Item MTBF Multiplier	----	1
TMTR	Mean Time To Repair Component I or Module I	hours	.25
TRMOS	Training Cost for Special Repairmen	$/man	-----
UL	Useful Life of Special TE	years	OLIFE
UP(I)	Unit Price of a) Component or Module I, b) Parts Consumed per Average Repair Action For Pseudo Component or Pseudo Module I	$	-----
UPEI	End Item Unit Price	$	-----
WASH(I)	Washout Rate for Component or Module I	----	-----
WGT(I)	Weight of a) Component/Module I, b) Parts Consumed per Average Repair Action for Pseudo Component/Pseudo Module I	pounds	-----

*Indicates that the value shown will be used in OSAMM if no value is given by the analyst on the input cards.

APPENDIX H

APPENDIX H
LOGAM
INPUT DATA DESCRIPTIONS

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
ARA	Annual Manpower Turnover Fraction	----	.4(0)
ARAD	Annual Manpower Turnover Fraction at Depot	----	.2(0)
AYZP	Control Variable to Specify Method for Initial Provisioning Calculations	----	(1)
CAD	Annual Cost to Retain an Item in Supply System	$/yr	1576(0)
CALMAN	Cost for Calibration Manpower	$/yr/man	25526(0)
CALPUB	Cost of Technical Data for Type III TE	$	(0)
CALSET	Number of Type III Test Sets and Teams	----	(0)
CCAL	Cost to Develop Type III TE	$	(0)
CCALP	Cost to Procure Type III TE	$	(0)
CCALR	Support Cost of Type III TE	$/yr	(0)
CCSP	Cost to Develop Type IV TE	$	(0)
CCSPP	Cost to Procure Type IV TE	$	(0)
CCSPR	Support Cost of Type IV TE	$/yr	(0)
CDDI	Shipping Cost From Depot to GS	$/lb/trip	.3/.21(0)
CDEO	Shipping Cost From Org. to DS	$/lb/trip	.05(0)
CDFD	Shipping Cost From Contractor to Depot	$/lb/trip	.21(0)
CDID	Shipping Cost From GS to Depot	$/lb/trip	.3/.21(0)
CDIO	Shipping Cost From GS to DS	$/lb/trip	.1(0)
CDIST	Shipping Cost to Distribute Initial Provisioning	$/item/lb	(0)
CDMAN	Cost for Test Man at DS	$/yr/man	25526(0)
CDOE	Shipping Cost From DS to Org.	$/lb/trip	.05(0)
CDOI	Shipping Cost From DS to GS	$/lb/trip	.1(0)
CDPMAN	Cost For Test Man at Depot	$/yr/man	61409(0)
CDPRMN	Cost For Repairman at Depot	$/yr/man	61409(0)
CDRMAN	Cost For Repairman at DS	$/yr/man	25526(0)
CEMAN	Cost For Test Man at Org	$/yr/man	(0)
CEN	Cost to Enter Item Into Supply System	$	2585(0)
CEND	Cost to Develop an LRU	$	(0)
CERMAN	Cost For Repairman at Org	$/yr/man	(0)
CFTD	Cost for Floor Space at Depot For TE	$/SqFt/Mo	1.00(0)
CGMAN	Cost For Test Man at GS	$/yr/man	25526(0)
CGRMAN	Cost For Repairman at GS	$/yr/man	25526(0)
CI	Cost to Develop Type I TE	$	(0)
CII	Cost to Develop Type II TE	$	(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
CKIT	Cost For Modification Kit	$	(0)
**CKMD	Safety Stock Coefficient for Module Stock at Depot	----	.85(0)
**CKME	Safety Stock Coefficient for Module Stock at Org	----	(0)
**CKMI	Safety Stock Coefficient for Module Stock at GS	----	.85(0)
**CKMO	Safety Stock Coefficient for Module Stock at DS	----	.85(0)
**CKPD	Safety Stock Coefficient for Part Stock at Depot	----	.85(0)
**CKPI	Safety Stock Coefficient for Part Stock at GS	----	.85(0)
**CKPO	Safety Stock Coefficient for Part Stock at DS	----	.85(0)
**CKUD	Safety Stock Coefficient for LRU Stock at Depot	----	.85(0)
**CKUE	Safety Stock Coefficient for LRU Stock at Org	----	.85(0)
**CKUI	Safety Stock Coefficient for LRU Stock at GS	----	.85(0)
**CKUO	Safety Stock Coefficient for LRU Stock at DS	----	.85(0)
CLRUPG	Cost for Technical Data for Type I TE for LRU Repair	$	(0)
CMODPG	Cost for Technical Data for Type I TE for Module Repair	$	(0)
CMP	Average Cost for Spare or Replacement Module	$	(0)
CONMAN	Cost for Contact Support Team	$/yr/man	25526(0)
CONTCT	Number of Contact Support Sets and Teams	----	(0)
CPE	Nonrecurring Production Cost for An LRU	$	(0)
CPI	Cost to Procure Type I TE	$	(0)
CPII	Cost to Procure Type II TE	$	(0)
CPP	Average Cost for a Spare or Replacement Piece Part	$	(0)
CPUBII	Cost of Technical Data for Type II TE	$	(0)
CPUBV	Cost of Technical Data for Type V TE	$	(0)
CPV	Cost to Procure Type V TE	$	(0)
CRI	Cost to Support Type I TE	$/yr	(0)
CRII	Cost to Support Type II TE	$/yr	(0)
CRM	Cost per Module for Reorder Action	$/Module	1254(0)
CRP	Cost per Piece Part for Reorder Action	$/Part	1254(0)
CRU	Cost per LRU for Reorder Action	$/LRU	1254(0)
CRV	Annual Cost to Set Up Training for Type V TE	$/yr	(0)
CSDEP	Storage Cost at Depot	$/CuFt/Mo/ Item	1.00(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
CSDSU	Storage Cost at DS	$/CuFt/Mo/ Item	.25(0)
CSESU	Storage Cost at Org	$/CuFt/Mo/ Item	.25(0)
CSGSU	Storage Cost at GS	$/CuFt/Mo/ Item	.25(0)
CTCPUB	Cost of Technical Data for Type IV TE	$	(0)
CTRA	Training Cost for Field Maintenance Personnel	$/man	(0)
CTRAD	Training Cost for Depot Maintenance Personnel	$/man	(0)
CTRCAL	Nonrecurring Cost to Set up Training for Type III TE Teams	$	(0)
CTRI	Nonrecurring Cost to Set Up Training for Type I TE	$	(0)
CTRII	Nonrecurring Cost to Set Up Training for Type II TE	$	(0)
CTRSPT	Nonrecurring Cost to Set Up Training for Type IV TE	$	(0)
CTRV	Nonrecurring Cost to Set Up Training for Type V TE	$	(0)
CUBEM	Storage Volume for a Module	Cu.Ft.	(0)
CUPEP	Storage Volume for a Part	Cu.Ft.	(0)
CUBEU	Storage Volume for an LRU	Cu.Ft.	(0)
CUCE	Cost for Org Preventive Maintenance	$/yr	(0)
CUP	Cost for the LRU (Development, Procurement and Provision Cost)	$	(0)
CV	Cost to Develop Type V TE	$	(0)
DAOQL	Fraction of Depot Workload Good When Delivered to Field Stockage Point	----	.95(1)
DD	Number of Depot Level Maintenance Locations	----	(1)
DDS	Number of Depot Level Support Points	----	(1)
DI	Number of GS Maintenance Locations	----	(1)
DIS	Number of GS Supply Locations	----	(1)
DTE	Number of Days Delay Expected for Evacuation of Repairables From Org	days	10(0)
DTI	Number of Days Delay Expected for Evacuation of Repairables From GS	days	30(0)
DTO	Number of Days Delay Expected for Evacuation of Repairables From DS	days	30(0)
E	Failure Rate of LRU	----	(0)
EACAL	Control Variable Posts Out One Time Costs for Type III TE and Manpower	----	(0)
EACSP	Control Variable Posts Out One Time Costs for Type IV TE and Manpower	----	(0)
ED	Number of Deployment Installations	----	(1)
EDS	Number of Org Supply Locations	----	(1)
EE	Number of Systems at a Deployment Installation	----	(1)
EREI	Control Flag to Indicate Dedicated(0) or Shared (1) Org Test and Repair Men	----	(1)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
ETE	Control Variable Posts Accumulated Work Demands for Men and Type V TE	----	(1)
ETEI	Control Flag to Indicate Dedicated (0) or Shared (1) Type V TE at Org	----	(1)
ETI	Control Variable Posts Accumulated Work Demands for Type I TE	----	(1)
ETII	Control Variable Posts Accumulated Work Demands for Type II TE at Depot	----	(1)
EVDM	Control Flag to Indicate Dedicated (0) or Shared (1) Test Manpower at Depot	----	1(1)
EVDR	Control Flag to Indicate Dedicated (0) or Shared (1) Repair Manpower at Depot	----	1(1)
EVDT	Control Flag to Indicate Dedicated (0) or Shared (1) Test Equipment at Depot	----	0(1)
EVEM	Control Flag to Indicate Dedicated (0) or Shared (1) Test Manpower at Org	----	1(1)
EVER	Control Flag to Indicate Dedicated (0) or Shared (1) Repair Manpower at Org	----	1(1)
EVET	Control Flag to Indicate Dedicated (0) or Shared (1) TE at Org	----	0(1)
EVIM	Control Flag to Indicate Dedicated (0) or Shared (1) Test Manpower at GS	----	1(1)
EVIR	Control Flag to Indicate Dedicated (0) or Shared (1) Repair Manpower at GS	----	1(1)
EVIT	Control Flag to Indicate Dedicated (0) or Shared (1) TE at GS	----	0(1)
EVOM	Control Flag to Indicate Dedicated (0) or shared (1) Test Manpower at DS	----	1(1)
EVOR	Control Flag to Indicate Dedicated (0) or Shared (1) Repair Manpower at DS	----	1(1)
EVOT	Control Flag to Indicate Dedicated (0) or Shared (1) TE at DS	----	0(1)
FE	Fraction of Type V TE Manpower Demand Added for Self Support	----	(0)
FI	Fraction of Type I TE Manpower Demand Added for Self Support	----	.08(0)
FII	Fraction of Type II TE Manpower Demand Added for Self Support	----	.08(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
FINT	Yearly Interest Rate to Compute Present Value	----	0(0)
FLM	Fraction of Type IV TE Support Costs That Are for Civilian Labor	----	(1)
FMD	Fraction of Modules Repaired at Depot (Remainder Scrapped)	----	1(1)
FMI	Fraction of Modules Repaired at GS (Remainder Scrapped)	----	1(1)
FMO	Fraction of Modules Repaired at DS (Remainder Scrapped)	----	1(1)
FN	Number of Identical LRUs in System Whose Failure Does not Effect Availability	----	0(0)
FNGF	False-No-Go Factor (Ratio of False to True Failures)	----	.2(0)
FNSP	Fraction of Parts Which are Non-standard thus Having Cost of Supply Administration	----	(1)
FSA	Field Supply Administration Cost	$/yr/item/ supply location	160 (0)
FTI	Type I TE Work Space at Depot	Sq FT	1500(0)
FTII	Type II TE Work Space at Depot	Sq Ft	1500(0)
FTM	Time Required to Reprocure a Module (Factory Start-Up Time Between Placement of Order and Delivery)	Wks	38(0)
FTP	Time Required to Reprocure a Piece Part (Same Definition as FTM)	Wks	20(0)
FTU	Time Required to Reprocure an LRU (Same Definition as FTM)	Wks	64(0)
FUD	Fraction of LRUs Repaired at Depot (Remainder Scrapped)	----	1(1)
FUE	Fraction of LRUs Repaired at Org (Remainder Scrapped)	----	1(1)
FUI	Fraction of LRUs Repaired at GS (Remainder Scrapped)	----	1(1)
FUO	Fraction of LRUs Repaired at DS (Remainder Scrapped)	----	1(1)
G(I)	Maintenance Policies Utilized (20 Different Possible Policies)	----	(0)
H(I)	Control Flag to Authorize Stockage at Org, DS, GS, Depot	----	(1)
HPM	Discretionary Procurement Holding Time for Modules	days	30(0)
HPP	Discretionary Procurement Holding Time for Piece Parts	days	30(0)
HPU	Discretionary Procurement Holding Time for LRUs	days	30(0)
IBG	Control Flag Which Prints Out Values of Internal Variables	----	(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
IFLAG	Control Flag that Sums Up LRU Cases That are Common in TWO or More Theaters	----	(1)
IMF	Control Variable that Reads in Data From the MACRIT Data Tape	----	(0)
INHIB	Control Variable That Allows Individual LRU Output	----	(0)
IO	Control Variable That Prints Out Input Files	----	(0)
IOPER	Control Variable to Allow Adding of TOE Costs to LOGAM Output.	----	(0)
IS	Control Variable for Resetting Various Accumulators	----	(0)
JTED	Control Variable to Designate Type and Location of Test Equipment	----	(1)
NA	Control Variable to Control Number of System Availability Modes Being Tallied	----	(1)
NB	Control Variable to Initialize Default Values	----	(0)
NU	Control Variable That Handles Printout of Various Outputs	----	(0)
OD	Number of DS Maintenance Locations	----	(1)
ODS	Number of DS Supply Points	----	(1)
OL(I)	Operating Level of Supply for Consumables at Org, DS, GS, Depot	days	(0)
OST(I)	Order and Ship Time for Org, DS, GS, and Depot	days	(0)
OTF	Fraction of Real Time That Deployed Equipment Operates	----	(1)
P	Number of Different Modules per LRU	----	(1)
PMR	Production Rate for Modules	----	(0)
PP	Number of Different Piece Parts per LRU	----	(1)
PPR	Production Rate for Piece Parts	----	(0)
PUR	Production Rate for LRUs	----	(0)
**QMM	Minimum Reorder Quantity for Modules	----	(1)
**QMP	Minimum Reorder Quantity for Piece Parts	----	(1)
**QMU	Minimum Reorder Quantity for LRUs	----	(1)
**QTD	Total LRU Stock Quantity for All Depots	----	(0)
**QTE	Total LRU Stock Quantity for All Org	----	(0)
**QTI	Total LRU Stock Quantity for All GS	----	(0)
**QTMD	Total Module Stock Quantity for All Depots	----	(0)
**QTME	Total Module Stock Quantity for All Org	----	(0)
**QTMI	Total Module Stock Quantity for All GS	----	(0)
**QTMO	Total Module Stock Quantity for All DS	----	(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
**QTO	Total LRU Stock Quantity for all DS	----	(0)
**QTPD	Total Piece Part Stock Quantity for All Depot	----	(0)
**QTPI	Total Piece Part Stock Quantity for All GS	----	(0)
**QTPO	Total Piece Part Stock Quantity for All DS	----	(0)
RDD	Delay Time Between Request for an LRU at Depot and Handling Request at Supply Point	days	127(0)
**REO	Difference in Days of Supply Allowed for Condemned Modules and Parts and Days of Supply for Repairable LRUs and Modules at Org	days	5(0)
REPEAT	Number of LRUs in End Item	----	(1)
RF	The Fraction of Org MTTR That is Devoted to LRU Removal and Replacement Excluding Fault Isolate and Retest Time	----	(.9)
**RID	Difference in Days of Supply Allowed for Condemned Modules and Parts and Days of Supply for Repairable LRUs and Modules at GS	days	15(0)
**ROI	Difference in Days of Supply Allowed for Condemned Modules and Parts and Days of Supply for Repairable LRUs and Modules at DS	days	15(0)
SENSY(X)	Used to Conduct Sensitivity Analysis	----	(0)
SL(I)	Safety Level of Supply for Consumables at Org, DS, GS, and Depot	days	(0)
SMD	Module Scrap Fraction at Depot	----	.08(0)
SME	Module Scrap Fraction at Org	----	0(0)
SMF	Scheduled Maintenance Fraction at Org	----	(0)
SMI	Module Scrap Fraction at GS	----	.08(0)
SMO	Module Scrap Fraction at DS	----	.08(0)
SPE	Fraction of End Item Cost That is a Sunk Cost (0 = No Cost, 1 = Full Cost of End Item)	----	(0)
SPEV	Fraction of Initial Provision Cost That is a Sunk Cost	----	(1)
SPEVR	Fraction of Reordered Materiel That is a Sunk Cost	----	(1)
STAT	Shipping Turn-Around Time for an LRU or Module From a Field Maintenance Unit to Depot and Return	days	60/20(0)
SUD	LRU Scrap Fraction at Depot	----	(0)
SUE	LRU Scrap Fraction at Org	----	(0)
SUI	LRU Scrap Fraction at GS	----	(0)
SUO	LRU Scrap Fraction at DS	----	(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
SVE	Salvage Fraction of Cost for LRUs at End of Program Life	----	(0)
SVR	Salvage Fraction of Cost for Consumed Materiel at End of Program Life	----	(0)
SVT	Salvage Fraction of Cost for Test Equipment at End of Program Life	----	(0)
SVV	Salvage Fraction of Cost for Residual Inventory at End of Program Life	----	(0)
T(X)	Table of Organization and Equipment Array	----	(0)
TALMAN	Number of Test Men per Calibration Crew	----	2(0)
TAT(I)	Turn Around Time for Maintenance at Org, DS, GS, and Depot	days	(0)
TATE	Number of Days of Stock at Org	days	(0)
TAYZ(I)	Control Flag That Allows Availabilities to be Collected for Subsystems if They Exist	----	(1)
TC	Mean Test Time to Checkout an LRU for False-No-Go's	hours	(0)
TD	Test Time for LRU Checkout at Depot	hours	(0)
TDI	Number of Days of Supply for Repairable LRUs and Modules at GS	days	15(0)
TDMAN	Manpower Productivity Factor or Number of Men per Test Crew at DS	----	2(0)
TDMW	Mean Time Spent in Test Position at Depot per Test Sequence for MWO's	hours	(0)
TDPMI	Manpower Productivity Factor or Number of Men per Test Equipment Crew at Depot for Type I TE	----	1.4(0)
TDPMII	Manpower Productivity Factor or Number of Men per TE Crew at Depot for Type II TE	----	1.4(0)
TDPRI	Manpower Productivity Factor or Number of Men per Repair Crew at Depot for Type I TE	----	1.4(0)
TDPRII	Manpower Productivity Factor or Number of Men per Repair Crew at Depot for Type II TE	----	1.4(0)
TDR	Repair Time to Repair an LRU	hours	(0)
TDRMAN	Manpower Productivity Factor or Number of Men per Repair at DS	----	2(0)
TE	Test Time for LRU at Org	hours	(0)
TEMAN	Manpower Productivity Factor or Number of Men per Test at Org	----	2(0)
TENMAN	Number of Men Applied to MTTR Effort at Org	----	2(0)
TEO	Pipelength Between Org and DS	hours	7(0)
TER	Repair Time for an LRU at Org	hours	(0)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
TERMAN	Manpower Productivity Factor or Number of Men per Repair at Org	----	2(0)
TF	Mean Time to Test an LRU at DS	hours	(0)
TFR	Repair Time for an LRU at DS	hours	(0)
TGMAN	Manpower Productivity Factor or Number of Men per Test Crew at GS	----	2(0)
TGRMAN	Manpower Productivity Factor or Number of Men per Repair Crew at GS	----	2(0)
TI	Test Time for an LRU at GS	hours	(0)
TID	Number of Days of Supply for Repairable LRUs and Modules at GS	days	15(0)
TIMW	Mean Time Spent in Test Position at GS per Test Sequence for MWO's	hours	(0)
TIO	Number of Days of Supply for Repaired or Condemned LRUs and Repairable Modules at DS	days	15(0)
TIR	Repair Time of an LRU at GS	hours	(0)
TMD	Test Time of a Modules at Depot	hours	(0)
TMDD	Time Required to Install Modification Kit at Depot	hours	(0)
TMDR	Repair Time of a Module at Depot	hours	(0)
TMI	Test Time of a Module at GS	hours	(0)
TMID	Time Required to Install Modification Kit at GS	hours	(0)
TMIR	Repair Time of a Module at GS	hours	(0)
TMO	Test Time of a Module at DS	hours	(0)
TMOD	Time Required to Install Modification Kit at DS	hours	(0)
TMOR	Repair Time of a Module at DS	hours	(0)
TOE	Pipelength Between DS and Org or Expected Time for Obtaining a Spare	hours	7(0)
TOI	Number of Days of Supply for Repaired or Condenmed LRUs and Repairable Modules at DS	days	15(0)
TOMW	Mean Time Spent in Test at DS per Test Sequence for MWO's	hours	(0)
TONMAN	Number of Men per Contact Support Crew for Type IV TE	----	2(0)
TRC	Down-Time (MTTR) per Service Demand at Org	hours	(0)
TUMD	Module Supply Time at Depot to Cover Time Between Removal Until Repaired and Returned	hours	168(0)
TUMI	Module Supply Time at GS to Cover Time Between Removal Until Repaired and Returned	hours	168(0)
TUMO	Module Supply Time at DS to Cover Time Between Removal Until Repaired and Returned	hours	168(0)
WD	Scheduled Work Week for TE at Depot	hours	40(168)

MNEMONIC	DESCRIPTION	UNITS	DEFAULT VALUE(S)*
WDM	Scheduled Work Week for Test Crews at Depot	hours	40(168)
WDR	Scheduled Work Week for Repair Crews at Depot	hours	40(168)
WE	Scheduled Work Week for TE at Org	hours	44(168)
WEM	Scheduled Work Week for Test Crews at Org	hours	44(168)
WER	Scheduled Work Week for Repair Crews at Org	hours	44(168)
WI	Scheduled Work Week for TE at GS	hours	44(168)
WIM	Scheduled Work Week for Test Crews at GS	hours	44(168)
WIR	Scheduled Work Week for Repair Crews at GS	hours	44(168)
WM	Shipping Weight of a Module	pounds	(0)
WMR	Scheduled Work Week for Repair Men at Org	hours	44(48)
WMT	Scheduled Work Week for Type V TE	hours	44(48)
WO	Scheduled Work Week for TE at DS	hours	44(168)
WOM	Scheduled Work Week for Test Crews at DS	hours	44(168)
WOR	Scheduled Work Week for Repair Crews at DS	hours	44(0)
WP	Shipping Weight of a Piece Part	pounds	(0)
WTKIT	Shipping Weight of a Modification Kit	pounds	(0)
WU	Shipping Weight of an LRU	pounds	(0)
YAT	Annual Attrition Fraction for LRUs	----	.001(0)
YD	Length of Development Phase for the System	years	(0)
YMWO	Number of Different MWOs to be Applied	#/yr/LRU	(0)
YP	Length of Production or Acquisition Phase	years	(1)
YR	Length of Operation and Maintenance Phase	years	(10)
YZ	Control Flag to Indicate the Starting Year of Present Value Computation (Can Be Positive or Negative)	years	(0)
ZFL	Round-Off Rule Used in Computing Service Channel Quantities	----	(.9999)
ZI	Fraction of MWOs Installed at GS	----	(0)
ZM(I)	Round-Off Fractions for Modules at Org, DS, GS, and Depot Supply Points	----	(.9999)
ZO	Fraction of MWOs Installed at DS	----	(0)
ZP(I)	Round-Off Fractions for Piece Parts at DS, GS, and Depot Supply Points	----	(.9999)
ZU(I)	Round-Off Fractions for LRU at Org, DS, GS, and Depot Supply Points	----	(.9999)

*Indicates that the values shown are recommended by MICOM. The value in ( ) is what would be used in LOGAM if no value was input by the analyst for that mnemonic.

**Indicates variables that are utilized only when AYZP = 0 which means LOGAM supply rules are to be used to calculate stockage. These variables are very seldom used.

APPENDIX I

APPENDIX I

OSAMM and LOGAM
INPUT DATA COMPARISON

1. Category 1 - Common Data (Government Responsibility).

OSAMM MNEMONICS	
AVAIL (Repairmen)	*FL
*COSBIN	IRSC
*COSBINI	OPSL
*COSHOL	OST
*COSNSI	*RATL
*COSNSR	*RTR
*COSREQ	*SAL
*CPM	SHOURS
*DIST	TAT
DWK	

LOGAM MNEMONICS						
*ARA	*CDRMAN	*CKUD	DTE	RDD	*TDPRI	TUMI
*ARAD	*CEMAN	*CKUE	DTI	REO	*TDPRII	TUMO
*CAD	*CEN	*CKUI	DTO	RID	*TDRMAN	WD
*CALMAN	*CERMAN	*CKUO	*FINT	ROI	*TEMAN	WDM
*CDDI	*CGMAN	*CONMAN	*FSA	SL	*TENMAN	WDR
*CDEO	*CGRMAN	*CRM	FTM	STAT	TEO	WE
*CDID	*CKMD	*CRP	FTP	*TALMAN	*TERMAN	WEM
*CDIO	*CKME	*CRU	FTU	*TAT	*TGMAN	WER
*CDMAN	*CKMI	CSDEP	HPM	TATE	*TGRMAN	WI
*CDOE	*CKMO	CSDSU	HPP	TDI	TID	WIM
*CDOI	*CKPD	CSESU	HPU	*TDMAN	TIO	WIR
*CDPMAN	*CKPI	CSGSU	OL	*TDPMI	TOE	WMR
*CDPRMN	*CKPO	CUCE	OST	*TDPMII	TOI	WMT
					*TONMAN	WO
					TUMD	WOM
						WOR

*Indicates Data for this mnemonic is presently in the MRSA Logistic Parameters Library.

2. CATEGORY 2 - Common Data (Contractor Responsibility).

OSAMM MNEMONICS
COSTD
TRMOS

LOGAM MNEMONICS
*CDFD
CDIST
CFTD
CTRA
CTRAD

3. CATEGORY 3 - System Peculiar Data (Government Responsibility).

OSAMM MNEMONICS
AVAIL(Test Equipment)
AVTAR
CTDEL
EQPLA(TE & Repairman)
IPOL
IVSYS
MIL
OH
OLIFE
OUPS
UL

LOGAM MNEMONICS		
AYZP	ODS	ZP
CALSET	OTF	ZU
CONTCT	SPE	
DD	SPEV	
DDS	SPEVR	
DI	T	
DIS	TAYZ	
ED	YD	
EDS	YP	
EE	YR	
G	YZ	
H	ZFL	
OD	ZM	

*Indicates Data for this mnemonic is presently in the MRSA Logistic Parameters Library.

4. CATEGORY 4 - System Peculiar Data (Contractor Responsibility).

OSAMM MNEMONICS			
CF	MTR	PAGE	TBFACT
EQPEC(TE & Repairmen)	NEQ	PARTSN	TMTR
ERR	NNSN	PARTSP	UP
ETC	NREP	PARTSR	UPEI
ETIME	NSPEC	PARTST	WASH
EUP	NSTACK	STK1	WGT
FAIL	NSTK1	STK2	
ID	NSTK4	STK3	
IESS	NSTKT	STK4	
MTBF			

LOGAM MNEMONICS								
CALBUB	CPP	CUP	EVOR	FUI	QTMI	SUI	TIR	YMWO
CCAL	CPUBII	CV	EVOT	FUO	QTMO	SUO	TMD	ZI
CCALP	CPUBV	DAOQL	FE	JTED	QTO	SVE	TMDD	ZO
CCALR	CPV	E	FI	P	QTPD	SVR	TMDR	
CCSP	CRI	EREI	FII	PMR	QTPI	SVT	TMI	
CCSPP	CRII	ETEI	FLM	PP	QTPO	SVV	TMID	
CCSPR	CRV	EVDM	FMD	PPR	REPEAT	TC	TMIR	
CEND	CTCPUB	EVDR	FMI	PUR	RF	TD	TMO	
CI	CTRCAL	EVDT	FMO	QMM	SENSY	TDMW	TMOD	
CII	CTRI	EVEM	FN	QMP	SMD	TDR	TMOR	
CKIT	CTRII	EVER	FNGF	QMU	SME	TE	TOMW	
CLRUPG	CTRSPT	EVET	FNSP	QTD	SMF	TER	TRC	
CMODPG	CTRV	EVIM	FTI	QTE	SMI	TF	WM	
CMP	CUBEM	EVIR	FTII	QTI	SMO	TFR	WP	
CPE	CUPEP	EVIT	FUD	QTMD	SUD	TI	WTKIT	
CPI	CUBEU	EVOM	FUE	QTME	SUE	TIMW	WU	
CPII							YAT	

5. CATEGORY 5 - Program Control Data (Analyst Responsibility).

OSAMM MNEMONICS
EIDI EID2 MULT

LOGAM MNEMONICS
EACAL EACSP ETE ETI ETII IBG IFLAG IMF INHIB IO IOPER IS NA NB NU

6. OSAMM and LOGAM Mnemonics Comparison. The following paragraphs are an attempt to equate OSAMM and LOGAM inputs on a one for one basis in the same units of measure. Paragraph a contains several expressions for the sole purpose of achieving the same units of measure. It should be noted however, that paragraphs b and c are not directly related in the same units of measure because it was not possible.

a. Directly Related Inputs.

	LOGAM MNEMONIC	OSAMM MNEMONIC
	ARA, ARAD	1/RTR(I)
*	AYZP #1.	AVTAR
	CAD	COSNSR + COSBIN
	CALMAN, CDMAN, CDPMAN, CDPRMN, CDRMAN, CEMAN, CERMAN, CGMAN, CGRMAN, CONMAN	RATL(X)* SHOURS(I)* DWK(I)* FL* 52 wks/yr or SAL(I) * FL #2.
	CALPUB, CLRUPG, CMODPG, CPUBII, CPUBV, CTCPUB	COSTD * PAGE(I)
*	CCALP, CCSPP, CPI, CPII, CPV	EUP(I)
	CCALR, CCSPR, CRI, CRII	CF * EUP(I)

	LOGAM MNEMONIC	OSAMM MNEMONIC
	CDDI, CDID	CPM(3) * DIST(3) #3.
	CDEO, CDOE	CPM(1) * DIST(1) #3.
	CDIO, CDOI	CPM(2) * DIST(2) #3.
	CEN	COSBINI + COSNSI
*	CMP, CUP	UP(I)
	CPP	PARTSP
	CTRA, CTRAD	TRMOS
	DAOQL	1.0
	DD, DDS	1.0
*	DI, DIS	OUPS(3)
*	1/E	FAIL(I) (psuedo component)
*	(1/E)/ P	FAIL(I) (module/ psuedo module)
*	1/ sum of all E's	MTBF
*	ED * EE	OUPS(4)
*	ED, EDS	OUPS(1)
	FINT	0.1
	FNGF	ERR
	FNSP * (PP/P)	PARTSR (modules) PARTSN (psuedo modules)
	FNSP * PP	PARTSN (psuedo components)
	FSA	COSREQ
*	FTM + HPM, FTP + HPP, FTU + HPU	OST(4) / 7 days per wk
*	G(X)	IPOL(X)
*	OD, ODS	OUPS(2)
*	OST(I) (supply flow)	OST(I) (supply flow)

	LOGAM MNEMONIC	OSAMM MNEMONIC
*	OTF	OH / 8766 hrs in a yr
	PP	PARTST(I) (psuedo component)
	PP / P	PARTST(I) (psuedo module)
	SMD or [(1 - FMD) + SMD] SME SMI or [(1 - FMI) + SMI] SMO or [(1 - FMO) + SMO] SUD or [(1 - FUD) + SUD] SUE or [(1 - FUE) + SUE] SUI or [(1 - FUI) + SUI] SUO or [(1 - FUO) + SUO]	WASH(I)
	TALMAN, TDMAN, TDPMI, TDPMII, TDPRI, TDPRII, TDRMAN, TEMAN, TENMAN, TERMAN, TGMAN, TGRMAN, TONMAN	1/ AVAIL(J) (special repairmen)
*	TDR, TER, TFR, TIR, TMDR, TMIR, TMOR	TMTR(I)
*	TAT(I), TATE	TAT(I) + OST(I) (maintenance flow)
*	TC, TD, TE, TF, TI, TMD, TMI, TMO	ETIME(J)
*	[(TEO + TOE) or OL(1)] + SL(1)	OPSL(1)
*	[(TDI + TID) or OL(3)] + SL(3)	OPSL(3)
*	[(TOI + TIO) or OL(2)] + SL(2)	OPSL(2)
	TEO	CTDEL * 24 hrs per day
*	TRC	MTR
	WD, WDM, WDR	DWK(4) * SHOURS(4)
	WE, WEM, WER, WMR	DWK(1) * SHOURS(1)
	WI, WIM, WIR	DWK(3) * SHOURS(3)
	WO, WOM, WOR	DWK(2) * SHOURS(2)
	WM, WP, WU	WGT(I)
*	YR	OLIFE

#1. In LOGAM the product of all the LRU's AYZP is equal to AVTAR in OSAMM. It should be noted that only the fractional part of each LRU's AYZP should be used in the multiplication.

#2. If FL = .9 (which is the OSAMM default value) then the OSAMM expression is equal to the LOGAM mnemonics for the input area of manpower salary.

#3. If DIST = 1 mile then the OSAMM expression is equal to the LOGAM mnemonics for the input area of transportation costs.

b. Indirectly Related Inputs.

	LOGAM MNEMONIC	OSAMM MNEMONIC
	CSDEP, CSDSU, CSESU, CSGSU, CUBEM, CUPEP, CUBEU	COSHOL
*	EREI, ETEI, EVDM, EVDR, EVDT, EVEM, EVER, EVET, EVIM, EVIR, EVIT, EVOM, EVOR, EVOT	EQPEC, EQPLA
*	H(I)	IVSYS

* -- Indicates inputs that are critical in the early life cycle phases.

c. None Related Inputs.

LOGAM MNEMONIC				
CALSET	CRP	FLM	QTI	SVV
CCAL	CRU	FN	QTMD	T(X)
CCSP	CRV	FTI	QTME	TAYZ
CDFD	CTRCAL	FTII	QTMI	TDI
CDIST	CTRI	IBG	QTMO	TDMW
CEND	CTRII	IFLAG	QTO	TIMW
CFTD	CTRSPT	IMF	QTPD	TOMW
CI	CUCE	INHIB	QTPI	TMDD
CII	CV	IO	QTPO	TMID
CKIT	DTE	IOPER	RDD	TMOD
CKMD	DTI	IS	REO	TUMD
CKME	DTO	JTED	REPEAT	TUMI
CKMI	EACAL	NA	RF	TUMO
CKMO	EACSP	NB	RID	WMT
CKPD	EREI	NU	ROI	WTKIT
CKPI	ETE	PMR	SENSY(X)	YAT
CKPO	ETI	PPR	SMF	YD
CKUD	ETII	PUR	SPE	YMWO
CKUE	FE	QMM	SPEV	YP
CKUI	FI	QMP	SPEVR	ZI
CKUO	FII	QMU	STAT	ZO
CONTCT		QTD	SVE	ZM(I)
CPE		QTE	SVR	ZP(I)
CRM			SVT	ZU(I)
				ZFL

OSAMM MNEMONIC	
AVAIL (special test equipment)	NSTACK(I)
EID1	NSTK1
EID2	NSTK4(X)
ETC	NSTKT
ID(I)	STK1(J)
IESS(I)	STK2(J)
IRSC	STK3(J)
MIL	STK4(J)
MULT	TBFACT
NEQ	UL
NNSN	UPEI
NREP	
NSPEC	

A description of the mnemonics can be found at Appendix G for OSAMM and Appendix H for LOGAM.

APPENDIX J

APPENDIX J

ACRONYMS LIST

AMC.	U.S. Army Materiel Command
AMOS	AVSCOM Maintenance Operating and Support Cost Model
AMSAA.	U.S. Army Materiel Systems Analysis Activity
AVSCOM	U.S. Army Aviation Systems Command
BCE.	Baseline Cost Estimate
CDC.	Control Data Corporation
CECOM.	U.S. Army Communications and Electronics Command
DA PAM 11-4. . . .	Operation and Support Cost Guide for Army Materiel Systems, Apr 76
DCA-P-92(R). . . .	Instructions for Reformatting the BCE/ICE, May 84
DODI 7041.3 . .	Economic Analysis and Program Evaluation for Resource Management, Oct 72
DS	Direct Support
GS	General Support
HQ	Headquarters
ICE.	Independent Cost Estimate
LOGAM.	Logistics Analysis Model
LRUs	Line Replaceable Units
MICOM	U.S. Army Missile Command
MRSA	U.S. AMC Materiel Readiness Support Activity
MSCs	Major Subordinate Commands
MTBF	Mean Time Between Failure
MTDs	Maintenance Task Distributions
MTTR	Mean Time To Repair
MWO.	Modification Work Order
M65.	Airborne TOW Missile System
NSN.	National Stock Number
OSAMM.	Optimun Supply and Maintenance Model
RDT&E.	Research, Development, Test and Evaluation
ROC.	Required Operational Capability
RTDs	Replacement Task Distributions
SESAME	Selected Essential-Item Stockage for Availability Method
TE	Test Equipment
TMDE	Test, Measurement, and Diagnostic Equipment
TOW.	Tube-Launched Optically-Tracked Wire-Guided
VS	Versus

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