ANALYSIS OF THUNDER COMBAT SIMULATION MODEL

THESIS

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THESIS

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Abstract

TAC THUNDER, or THUNDER, is a two-sided large scale computer simulation model that simulates air and ground combat, logistics, and limited airlift at the theater level. It is in use by several allied nations, major defense contractors, and various Department of Defense (DoD) analysis agencies.

The objectives of this thesis effort were to examine the overall model variability, examine the model output for possible interrelationships, and examine the model sensitivity to input parameters. A univariate and multivariate analysis was performed to examine the first two objectives. The univariate analysis consisted of an analysis of the confidence intervals and replication requirements for specific measures of outcome (MOOs). The multivariate analysis consisted of a principal components analysis (PCA) and factor analysis (FA). The third objective consisted of three analysis methodologies. These three methodologies were used to analyze the significance of specific input variables to specific output variables. These three methodologies were then examined for consistency.

ANALYSIS OF THUNDER COMBAT SIMULATION MODEL

I. Introduction

1.1 Background. (U.S. AF/SA, 1992:1-1 to 7-8)

THUNDER is a two-sided, large scale computer simulation model that simulates air and ground combat, logistics, and limited airlift at the theater level. THUNDER was developed by the Air Force Assistant Chief of Staff for Studies and Analyses (AF/SA) and is the Air Force's premier theater level model in use today. Furthermore, it is in use by several allied nations, major defense contractors, and various Department of Defense (DoD) analysis agencies. It was developed to reduce the shortcomings of the TAC WARRIOR model, which was previously used for approximately 13 years. The purpose of THUNDER is to provide detailed comparative analyses of tactical warfare. This thesis effort focuses on an analysis of the input and output characteristics of THUNDER.

Although THUNDER primarily simulates air combat, it also simulates ground combat attrition based on the Army's FORCEM model which models the battlefield as a series of parallel pistons, i.e., the forward line of troops (FLOT) is continuous in that there are no pockets of the opposing forces behind the FLOT (Figure 1.0). It accounts for the impact of the air campaign on the ground battle. THUNDER is a data driven model, meaning the model inputs (e.g., scenario, force structure, terrain, and weapons systems) are described in the data and are separate from the actual computer model. This design, i.e., the data is separate from the model, allows any scenario to be simulated for which the data exists. The data is stored in a data base with the user or analyst serving as the interface between it and the model (Figure 1.1). This model capability allows the analyst

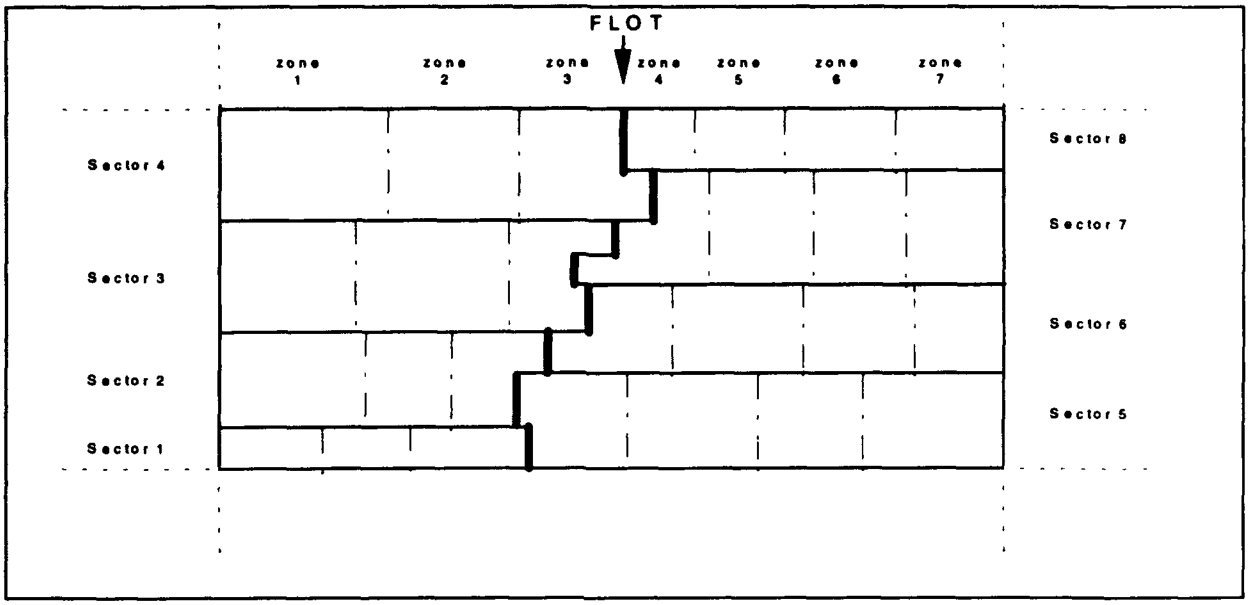

Figure 1.0 Battlefield Area

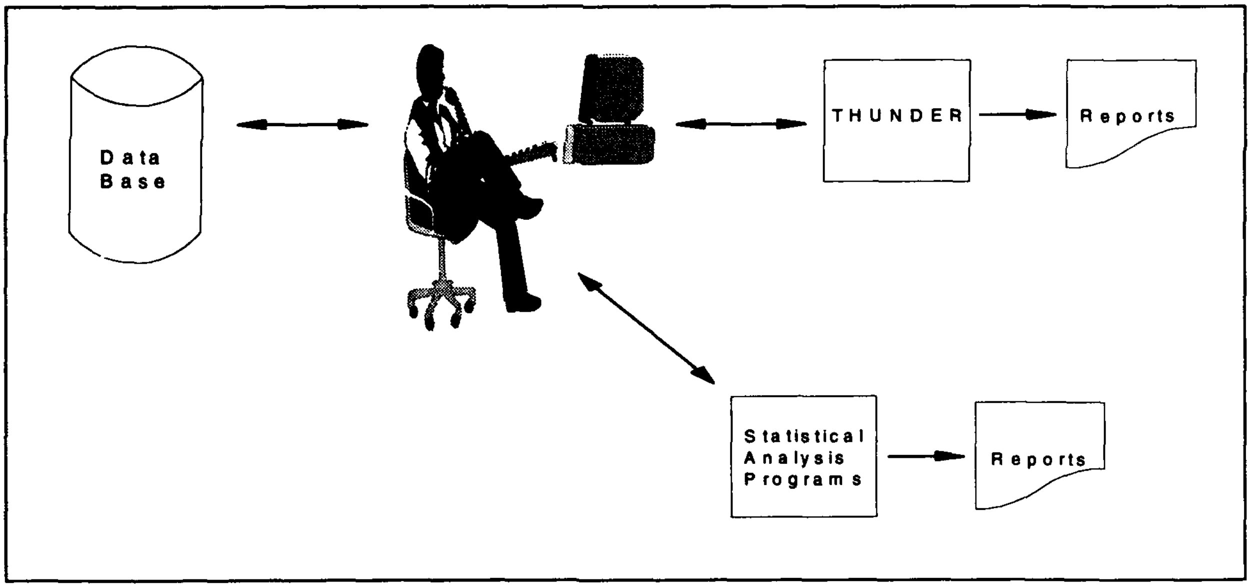

Figure 1.1 Model Interface

to study the effects of changes in plans, tactics, force structures, and weapon systems at the theater-level by simply changing the data in the data base. The users can modify existing data base files or create entirely new ones; however, they should be aware that the model will probably behave differently for dissimilar input data files.

1.2 The Problem.

Aeronautical Systems Center, Campaign Analysis Branch (ASC/XREC) is currently using THUNDER in support of acquisition efforts, e.g., comparing alternative weapon systems. They perform analysis to support customers such as major commands and system program offices (SPOs), e.g., Air Mobility Command and F-15 SPO. They are relatively new users of THUNDER and therefore are unaware of some of the model's sensitivity and variability to input and output parameters. ASC/XREC uses different output parameters or measures of outcome (MOO) (e.g., aircraft inventory, FLOT movement or surface-to-air missile (SAM) kills) for ranking alternatives in their analysis (McCormick, 1993). Therefore, determining output variability is an essential part of this ranking. They realize they cannot base this ranking on only a single simulation run or even the average, i.e., point estimate of the mean, because neither accounts for the uncertainty in the output variability. Law and Kelton provide an example (example 9.20) of average system behavior resulting in misleading conclusions (1991: 540-41). A method that accounts for this variability is the use of a confidence interval about the mean. A confidence interval accounts for this variablity by calculating the accuracy of the estimated parameter of interest, or MOO, by using the variance (or standard error) of the estimated parameter (Banks and Carson, 1984: 406). This confidence interval should include enough computer simulation runs to provide ASC/XREC with a desired accuracy, i.e., relative accuracy of 0.01. By performing a statistical analysis on the output parameters of interest (or MOOs), we can determine the number of observations required to achieve this desired accuracy for each MOO. Therefore, ASC/XREC can have greater confidence in their rankings by knowing they are using a certain accuracy in their calculations, e.g., the use of two different weapon systems produce results that are statistically different.

1.3 Objectives.

This thesis effort has three major objectives:

1) Examine the overall model variability.

2) Examine the model sensitivity to input parameters.

3) Examine the model output for possible interrelationships.

These objectives are accomplished by taking the following steps:

Objective 1

a. Perform 30 replications of the THUNDER Analytical Model.

b. Compute 85% and 90% confidence intervals on 5, 10, 15, 20, 25 and 30 replications for each MOO of interest.

c. Determine the significance for each MOO, e.g., the number of replications required to get a certain accuracy.

Objective 2

a. Determine a designed experiment on the input parameters of interest.

b. Perform the required runs from the above designed experiment.

c. Determine the significant input parameters for each MOO of interest.

   1. Three methodologies are used to determine the significant input parameters.

   2. The models produced by these methodologies are then compared against each other to determine which is the best estimator.

Objective 3

a. Perform a multivariate analysis (a principal components analysis, PCA, or factor analysis, FA) of the output from the designed experiment from Objective 2.

b. Determine if the number of output variables from Objective 2 can be reduced to a linear combination of the original output variables.

c. If the number of variables can be reduced explain the meaning of these new output variables.

1.4 Scope and Limitations.

THUNDER has two modes -- analytical and war game. This thesis will concentrate on the air and ground combat portions of theTHUNDER Analytical Model and will not address the war game mode. The unclassified Middle East (ME) scenario provided with THUNDER will be used when running the model. This scenario is used with the assumption that the model will be exercised in the same manner as with a classified scenario, i.e., the same general sorts of conclusions can be inferred.

ASC/XRECT receives much of their scenario data (or input files) from other organizations, typically Air Force Studies and Analysis (AF/SA), and develops other scenario data files internally. These data files are then consolidated for input to the THUNDER Analytical Model as a specific scenario. THUNDER currently contains over 60 input data files, each containing numerous input variables, so it would be infeasible to test the sensitivity of all these input variables within a thesis project. Only the input variables or factors that significantly affect the MOOs of interest need to be identified; therefore a screening experiment is deemed appropriate. ASC/XREC has identified key parameters in the following input files to be examined (see Appendix A for a complete definition):

(1) **Air Rules (airrules.dat)**

(2) **Air-to-Air Probability of Kill (airairpk.dat)**

(3) **Probability of Detection (detect.dat)**

(4) **Air Defense to Air Probability of Kill or Damage (advsac.dat)**

(5) **Air-to-Ground Air Munitions vs. Target (airgrdpk.dat)**

(6) **Fighter/Bomber Squadron (squadron.dat)**

(7) **Air Planning (airplan.dat)**

THUNDER currently produces a multitude of possible output reports with each containing several different output variables; therefore, it would be infeasible to test the sensitivity of all these variables within a thesis project. THUNDER currently supports three types of output: (1) Situational Map (TTSM), (2) Graphical (TTgraph), and (3) Reports. All of these output reports can be customized to the particular study being performed to include what variables will be incorporated on each map, graph, or report. This allows the user or analyst to determine what output is needed, select the desired format (e.g., situation map, line graph, bar graph, etc.), and have THUNDER produce those reports required. In their analyses, ASC/XREC mainly uses the TTgraph option, which produces different types of graphical output. The following output variables, identified by ASC/XREC, are to be examined:

Output Variables (MOO):

Blue Inventory/Red Inventory

Blue Sorties Flown/Red Sorties Flown

Blue Strength/Red Strength (percent authorized)

Blue Losses/Red Losses by Mission

Air-to-Ground
Air-to-Air
Defense Suppression

Blue Aircraft/Red Aircraft Losses

Surface-to-Air Missile
Air-to-Air

Cumulative FLOT Movement (km)

The analysis will focus on only the above identified data files and MOOs.

1.5 Thesis Overview.

Chapter II is a review of the literature concerning input/output analysis of computer simulation models and provides some justification for this analysis on the THUNDER Analytical Model. The methodology used to perform this analysis is provided in Chapter III. Chapter IV provides the analysis results and Chapter V gives any conclusions and recommendations.

II. Literature Review

The purpose of this chapter is to review the relevant literature concerning the analysis of a computer simulation model and highlight the objectives as mentioned above. The specific topics to be covered are:

1) The need for computer simulation.
2) The need for data analysis.
3) The need for experimental design.
4) Significance to THUNDER.
5) Multivariate Analysis.

2.1 Computer Simulation Models.

"The purpose of most simulations is to develop an understanding of system behavior, with the goal of using that understanding to make decisions involving the system" (Seila, 1992:190). A system is modeled using computer simulation for several reasons; for example, the actual system is too expensive to alter or the actual system does not truly exist, i.e., a future weapon system. THUNDER, as stated above, allows the analyst to make changes and compare alternatives of tactical warfare without actually having a conflict -- this would not be possible without the use of a computer simulation model. "The use of large scale computer models for guidance in real world decisions is now commonplace in the Department of Defense, other government agencies, and private industry" (Thomas, 1974: I-1). If a model is properly designed and accurately represents system behavior, the decisionmaker can have confidence in the outputs and gain meaningful insights about the underlying system. Since computer models "are used to justify important national defense and other policy decisions, the need to establish a basis for accepting the results of such models is clear" (Fossett et al.,1991:722). However, model results are easily distorted, extended, and misrepresented especially in the acquisition process. "They [computer simulation models] will easily lead an unsuspecting decisionmaker down the garden path" (GAO, 1980:3).

2.2 Data Analysis.

Comparing alternative system designs, e.g., changes in force structure or weapon systems, is an important use of computer simulation models (Banks and Carson, 1984:450). A computer simulation model can be examined to determine the sensitive input parameters for each MOO. Knowing what these sensitivities are can contribute directly to an understanding of a model's behavior and hopefully to the underlying system's behavior (Fossett et al., 1991:719). Other organizations have used THUNDER, or TAC THUNDER, for several years but no documented sensitivity analysis exists according to AF/SA, the Office of Primary Responsibility (OPR) for THUNDER (Lumm, 1993). For example, a formal analysis approach to determine the number of replications required for a given analsysis effort does not exist. It appears that organizations using THUNDER, at least AF/SA and ASC/XREC, use corporate memory or experience in their analysis; that is, they use the knowledge they have attained from using the model to determine or make assumptions about the sensitivity and variability of input and output parameters.

2.2.1 Input.

It is imperative that THUNDER's sensitivity be estimated accurately; otherwise, "the validity of the model is questionable" (Kleijen, 1987: 145). The more sensitive the model is to a particular input parameter the more confident ASC/XREC needs to be in the parameter's accuracy. For example, if SAM kills are extremely sensitive to the probability of kill (P_k) of the missile, we would like to have accurate estimate or a high degree of confidence in the P_k for these missiles otherwise the results would be meaningless.

> Even if the [computer] model structure is valid, if the input data are inaccurately collected, inappropriately analyzed, or not representative of the environment, the simulation output data will be misleading and possibly damaging or costly when used for policy or decision making (Banks and Carson, 1984: 333-34).

Therefore, ASC/XREC needs to know if any of the MOOs are sensitive to any of the input parameters. This will help ensure that they have good estimates of the variables that most affect the MOO of interest within a study.

2.2.2 Output.

"Proper output analysis is one of the most important aspects of any simulation study" (Goldsman, 1992: 102). Both univariate and multivariate output analysis is performed in this thesis effort. Univariate and multivariate analysis methods differ in that univariate analysis examines a single output at a time, while multivariate examines multiple outputs at the same time.

2.2.2.1 Univariate Analysis.

"Since the observations of the response variable [or model output] contain random variation, statistical analysis is needed to determine whether any observed differences are due to differences in design or merely to the random fluctuation in the models" (Banks and Carson, 1984:450). A single run is just one possible realization of the random variables within a model. Therefore, an analyst could make "erroneous inferences" about the system by basing his conclusions on only a single run (Law and Kelton, 1991:522-23). A more accurate comparison or inference can be concluded by using a confidence interval approach (Law and Kelton, 1991:287). In creating these confidence intervals, the analyst should recall that the number of observations used in the calculation influences the reliability or accuracy. In general, the more observations used in the calculation, the smaller the corresponding confidence interval will be (Kleijnen, 1974: 83). With smaller confidence intervals, the difference between alternative systems will be easier to detect; whereas, with the larger confidence intervals it would be difficult to detect a significant difference between the alternative systems. However, a tradeoff should be made between the number of runs and the accuracy -- the time available to perform the analysis and the cost per simulation run should be considered. If there is unlimited time to perform the analysis and it is relatively inexpensive to run the simulation model, then an analyst can determine the best alternatives with extremely accurate results; however, this is usually not the case.

2.2.2.2 Multivariate Analysis.

Principal components analysis (PCA) and factor analysis (FA) are multivariate analysis techniques that are used to examine model output. PCA and FA produce components and factors, respectively.

> Principal components analysis (PCA) and factor analysis (FA) are statistical techniques that may be applied to a group of variables in which none has been specified as [dependent variable] DV or [independent variable] IV. PCA and FA differ from other multivariate techniques in that intercorrelations among variables in a single set, as opposed to external criteria (e.g., group membership, score on one or more DVs), are analyzed. Further, there are many solutions from which to choose. PCA and FA also differ in that they may reveal relationships between observed and hypothetical variables, while other techniques are concerned primarily with relationships among observed variables (Fidell and Tabachnick, 1983:372).

This analysis determines what groups of these output variables are independent (or nearly independent) of other groups (Fidell and Tabachnick, 1983:372). "... [T]he essential purpose of *factor analysis* is to describe the variation among many variables in terms of a few underlying but unobservable random variables called factors" (Jobson, 1992:388). Once these groups or factors are identified, the analyst can create linear combinations of the variables that make up these groups or factors and create new unobservable variables (less than the original number) that explain most of the variation among the original variables or MOOs. The goal of this procedure is to develop a reduced number of variables that accounts for most of the variation among the original variables and also makes sense to the analyst and user. For example, in THUNDER several of the Blue MOOs may be combined to create a new variable - Blue Index - that gives a measure of how well the Blue Forces are doing in the battle. The advantage in doing this is that now instead of tracking four or five of the original variables or MOOs, there is only one (e.g., Blue Index) that gives an overview of the original MOOs. "PCA is the solution of choice for the researcher who is primarily interested in reducing a large number of variables down to a smaller number. PCA is also recommended as the first step toward a more detailed FA (Fidell and Tabachnick, 1983:397). The best way to determine the value of a PCA or FA is to decide if it makes sense; if it does then the PCA or FA is good or useful, if not, then perhaps a PCA or FA is not useful and another approach should be considered (Fidell and Tabachnick, 1983:373).

Principal components analysis attempts to focus on the linear combinations of variables or MOOs that contain the most variation and have the following special properties:

- The eigenvectors are orthogonal, so the principal components represent jointly perpendicular directions through the space of the original variables.
- The principal component scores are jointly uncorrelated. Note that this property is quite distinct from the previous one.

- The first principal component has the largest variance of any unit-length linear combination of the observed variables. The jth principal component has the largest variance of any unit-length linear combination orthogonal to the first j-1 principal components. The last principal component has the smallest variance of any linear combination of the original variables.

- The scores on the first j principal components have the highest possible generalized variance of any set of unit-length linear combinations of the original variables.

- The first j principal components give a least-squares solution to the model

$$\mathbf{Y} = \mathbf{X} \cdot \mathbf{B} + \mathbf{E} \quad (3\text{-}8)$$

where **Y** is an nXp matrix of the centered observed variables; **X** is the nXj matrix of scores on the first j principal components; **B** is the jXp matrix of eigenvectors; **E** is an nXp matrix of residuals; and you want to minimize trace(**E′E**), the sum of all the squared elements in **E**. In other words, the first j principal components are the best linear predictors of the original variables among all possible sets of j variables, although any nonsingular linear transformation of the first j principal components would provide equally good prediction. The same result is obtained if you want to minimize the determinant or the Euclidean (Schur, Frobenious) norm of **E′E** rather than the trace.

- In geometric terms, the j-dimensional linear subspace spanned by the first j principal components gives the best possible fit to the data points as measured by the sum of the squared perpendicular distances from each data point to the subspace. (SAS/STAT User's Guide, 1988:752)

The two major uses of FA are confirmatory and exploratory; where confirmatory tests "hypotheses about the structure of underlying processes" and exploratory "seeks to summarize data by grouping together variables that are intercorrelated" (Fidell and Tabachnick, 1983:372). In this thesis effort the focus is on exploratory FA since no previous hypotheses exist concerning the THUNDER model.

> Mathematically, PCA and FA produce several linear combinations of observed variables called components or factors. When the scores on components or factors for each individual are properly weighted and summed, the individual's scores on observed variables may be closely approximated or reproduced. The number of factors or components required to approximate observed scores, m, is

> usually fewer than the number of observed variables, p, producing considerable parsimony in summarizing a set of results. Scores on components or factors may, in addition, be more stable than scores on the observed variables from which they were obtained (Fidell and Tabachnick, 1983:374).

Once the number of factors or components has been decided, the analyst can begin to interpret what these factors mean. In doing this, the loadings matrix or factor pattern can be examined for high correlations between the MOOs and the factors. The loadings matrix can either be the unrotated or rotated; sometimes it is easier to interpret the rotated matrix rather than the unrotated. Orthogonal rotations are used in this thesis effort. There are also oblique rotations - not discussed in the thesis effort but can be found in any multivariate statistics reference - in which the factor pattern or loadings matrix is not as easily interpretable as either the unrotated or orthogonally rotated matrix, i.e., the terms in the matrix are no longer correlations.

> As a rule of thumb, loadings in excess of .30 are eligible for interpretation, whereas lower ones are not, because a factor loading of .30 indicates as least a 9% overlap in variance between the variable and the factor. The greater the overlap between a variable and a factor, the more that variable is a pure measure of the factor. Comrey (1973) suggests that loadings in excess of .71 (50% variance) are considered excellent, .63 (40%) very good, .55 (30%) good, .45 (20%) fair, and .32 (10% of variance) poor. Choice of the cutoff of size of loading to be interpreted is a matter of researcher preference (Fidell and Tabachnick,1983:411).

Both PCA and FA are similar in how they identify their components and factors, respectively. The difference in the two, however, is that PCA examines all the variance among the MOOs while FA only uses the common variance or variance shared with other variables. In addition, "[a] frequent source of confusion in the field of factor analysis is the term *factor*. It sometimes refers to a hypothetical, unobservable variable, as in the phrase *common factor*. In this sense, *factor analysis* must be distinguished from component analysis since a component is an observable linear combination" (SAS/STAT User's Guide, 1988:450).

2.3 Experimental Design.

Design of experiments is a statistical methodology "used to obtain more and better information from a sensitivity analysis of a model...", especially with large models that have interrelated parts and may have interacting effects (Thomas, 1974: V-6). "In sensitivity analysis we change the input systematically instead of randomly" (Kleijnen, 1987: 145). In a typical designed experiment, one in which the actual knobs are turned or measurements are taken, it is necessary to randomize the order in which the runs are made to account for measurement error. This is not necessary, however, for a designed computer simulation model experiment.

> In computer models, randomization of the order of runs is not necessary since the same answer will be obtained regardless of order (assuming the same random number seed is used). Since it is not necessary to randomize the order in which computer runs are made, it is advantageous to minimize the number of factor [or input parameter] level changes and also to minimize the number of changes to factor levels that are most difficult to change (Thomas, 1974: IV-1).

Although the setting or input parameter changes for this thesis effort are similar in difficulty, in a large computer simulation study this may not be the case. These input parameters are changed in the most efficient and effective manner by using a statistical technique called experimental design (Kleijnen, 1987: 259). "The statistical design of experiments is a set of principals for designing and evaluating experiments so as to maximize the information gained from the experiment" (Banks and Carson, 1984: 472).

> By the statistical design of experiments, we refer to the process of planning the experiment so that appropriate data will be collected , which may be analyzed by statistical methods resulting in valid and objective conclusions. The statistical approach to experimental design is necessary if we wish to draw meaningful conclusions from the data (Montgomery, 1976: 2).

"The pitfalls of lack of statistical design in a simulation experiment include: invalid inferences; valid inference at substantially increased costs; and inability to complete the study" (Dudewicz, 1981: 3). Now, restating the purpose of statistical design as determining the affect of various input parameters on the MOOs (Banks and Carson, 1984: 472), we can determine the significant input parameters for each MOO. As stated in Chapter 1, we are identifying the important input parameters or factors, i.e., performing a screening experiment.

> Factor screening is the process of determining the subset of factors in a simulation model which exert the greatest impact on the set of response variables. Mauro and Smith (1984) stated the following goals of factor screening: 1) to classify as important as many of the truly important factors as possible, 2) to avoid declaring unimportant factors as important, 3) to accomplish these objectives using the smallest number of simulation runs possible" (Cook,1992: 174-75).

A screening experiment uses two levels of each factor, i.e., a high and low. By analyzing the output from our experimental design, we can identify the significant factors or factor combinations and use these to develop a linear effects model that explains what is going on. At this point, we are only trying to reduce the number of input factors that need to be examined further.

Replication and randomization are two basic principals of experimental design (Montgomery, 1976: 2-3). However, in a computer simulation model we only need to be concerned about the principle of replication and not randomization for the reason given above.

Observations from different runs or replications of a simulation model (using different random numbers seeds) are independently and identically distributed (IID) (Law and Kelton, 1991: 524). Since we have independent observations we can use classical analysis techniques in analyzing the output.

2.4 Significance to THUNDER.

The use of experimental design leads to a "better understanding of model sensitivity to specific factors and combination of factors (Thomas, 1974: V-6). THUNDER is a large computer simulation model that allows a comparison between alternative system designs within a campaign or theater level conflict. There are hundreds of input and output variables or factors that can be examined. Important decisions, such as force structure changes and weapon systems procurement, are based in part on the output from this model. The importance of understanding the sensitivities of this computer simulation model should be evident. Without sensitivity analysis on THUNDER, organization such as ASC/XREC may make unnecessary runs or even worse not enough runs to keep from making "erroneous inferences" that can affect major decisions within the Department of Defense. Therefore, a study to perform sensitivity analysis on input and output variables is essential.

III. Methodology

3.1 Model Variability (Univariate Analysis).

ASC/XREC's interest in THUNDER's variability stems from their desire to know approximately how many simulation runs are required to estimate THUNDER's outputs or MOOs to within some prespecified accuracy. Estimator precision depends on the population variance for each MOO; that is, the number of replications required for a specified precision increases as the variance of a MOO increases. The two methods for determining the number of runs or replications are (1) a fixed-sample-size approach and (2) a sequential approach. In the fixed-sample-size approach, the total number of required runs is calculated to realize a desired accuracy after a fixed number, i.e., 5 runs, have already been completed. Whereas, the sequential approach adds new runs or replications one at a time until the desired half-width or precision is reached.

Both the fixed-sample-size approach and the sequential approach have disadvantages. One of the disadvantages with the fixed-sample-size approach is that the user has no control over the confidence interval half-width. However, if the assumption can be made that the estimates of both the population mean and variance will not change (appreciably) as the number of replications are increased, then the approximate number of total runs can be calculated (Law and Kelton, 1991: 536-37). The major disadvantage with using a sequential approach is that in some cases the variability may be so large that an unacceptable number of runs is required to achieve the desired accuracy; thus, the user would be unaware of this predicament while the sequential approach is performing its calculations. Therefore, unless results are periodically produced, the analyst would not know that a large number of runs are required to get the desired accuracy until the calculations are completed. The fixed-sample-size approach, however, in calculating the number of runs required, would quickly indicate the total number of runs required and allow the user the opportunity to try a different analysis approach, i.e., the use of an alternative MOO, if an excessive number of model runs is indicated.

3.1.2 Fixed-Sample Size Approach.

As stated above, the analyst does not have control over confidence interval half-width (or precision) when using a fixed-sample-size approach. However, using this approach in an iterative manner, the user can get an approximate number of replications required to achieve the desired accuracy. Two ways to measure this precision or accuracy are (Law and Kelton, 1991: 536):

(1) Absolute error. If the estimate of the mean response for each MOO is such that:

$$|\overline{X} - \mu| = \beta, \tag{3-1}$$

then the mean response has an absolute error of β.

(2) [Absolute] relative error. If the estimate of the mean response for each MOO is such that:

$$\frac{|\overline{X} - \mu|}{|\mu|} = \gamma \tag{3-2}$$

then the mean response has a relative error of γ or a $100 \cdot \gamma$ percent error.

Where μ is the population mean in Equation (3-1) and Equation (3-2). However, since ASC/XREC utilizes several different MOOs in their analysis, by using the relative error as the measurement criteria, they do not need to be concerned with the magnitudes of the mean response estimates for each MOO; that is, they can make use of the same relative error, i.e., $\gamma = .10$, for all MOOs used in the analysis. Whereas, using the absolute error, β, as the criteria, ASC/XREC could have as many different values of β as there are MOOs to examine. In practice, using the absolute error criteria, ASC/XREC would still have to develop some way of determining the value of β for each MOO, which would probably translate into essentially the same criteria as using the absolute error. Therefore, the absolute error is used as the measurement criteria. The following equation given by Law and Kelton gives an approximate expression for the number of replications, $n_r^*(\gamma)$, required (under the assumption given above concerning the estimates of the population mean and variance) is (1991: 538):

$$n_r^*(\gamma) = \min\{i \geq n: \frac{t_{i-1,1-\alpha/2}\sqrt{S^2(n)/i}}{|\bar{X}(n)|} \leq \gamma'\} \tag{3-3}$$

where $X(n)$ and $S^2(n)$ are the estimates of the population mean and variance after n replications have been completed, "i" is the minimum whole number in which the above equation is true, and γ' is the "adjusted" relative error needed to get an actual relative error of γ and is given by:

$$\gamma' = \frac{\gamma}{(1-\gamma)}. \tag{3-4}$$

By using the above equation, ASC/XREC can get the approximate number of replications required to estimate the mean response for each MOO within an absolute error of γ.

3.2 Experimental Design.

Ideally, the analyst or user identifies the significant factors in a screening design with the fewest number of runs possible. The objective of this experimental design is the development of a linear model with emphasis placed on identifying the active main effects and two-factor interactions. Therefore, an experimental design of at least resolution III should be used. A resolution III design is a design in which the main effects or factors are not confounded or aliased with other main effects but are confounded with two factor interactions and two factor interactions are confounded with other two factor interactions. Plackett-Burman designs are resolution III with the additional attribute of requiring the fewest number of runs of any classical design type, but do not allow the estimation of interactions between factors (RS/Discover Reference Manual, 1992:3-10). Although Plackett-Burman designs do not allow the estimation of factor interactions, it does have the advantage of parceling out the two factor interactions over many of the main effects which will limit the amount of bias of any main effect due to the possibility that a two factor interaction is actually significant (RS/Discover Reference Manual, 1992:XV). The coded design used for this analysis is given below in Table 3.0 and the uncoded settings are given in Table 3.1.

A	B	C	D	E	F	G	H	I	J	K	L	M
1	-1	1	1	-1	-1	-1	-1	1	-1	1	-1	1
1	1	-1	1	1	-1	-1	-1	-1	1	-1	1	-1
-1	1	1	-1	1	1	-1	-1	-1	-1	1	-1	1
-1	-1	1	1	-1	1	1	-1	-1	-1	-1	1	-1
1	-1	-1	1	1	-1	1	1	-1	-1	-1	-1	1
1	1	-1	-1	1	1	-1	1	1	-1	-1	-1	-1
1	1	1	-1	-1	1	1	-1	1	1	-1	-1	-1
1	1	1	1	-1	-1	1	1	-1	1	1	-1	-1
-1	1	1	1	1	-1	-1	1	1	-1	1	1	-1
1	-1	1	1	1	1	-1	-1	1	1	-1	1	1
-1	1	-1	1	1	1	1	-1	-1	1	1	-1	1
1	-1	1	-1	1	1	1	1	-1	-1	1	1	-1
-1	1	-1	1	-1	1	1	1	1	-1	-1	1	1
-1	-1	1	-1	1	-1	1	1	1	1	-1	-1	1
-1	-1	-1	1	-1	1	-1	1	1	1	1	-1	-1
-1	-1	-1	-1	1	-1	1	-1	1	1	1	1	-1
1	-1	-1	-1	-1	1	-1	1	-1	1	1	1	1
1	1	-1	-1	-1	-1	1	-1	1	-1	1	1	1
-1	1	1	-1	-1	-1	-1	1	-1	1	-1	1	1
-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1

Table 3.0 Twenty Run Plackett-Burman Screening Design (Coded Values)

FILE	CODE	SIDE	LOW	BASE SETTINGS	HIGH
advsac.dat	A -	Blue	0.75	1.0	1.25
	B -	Red	0.75	1.0	1.25
airairpk.dat	C -	Blue	0.9	1.0	1.1
	D -	Red	0.9	1.0	1.1
airgrdpk.dat	E -	Blue	0.9	1.0	1.1
	F -	Red	0.9	1.0	1.1
detect.dat	G -	Both	0.75	1.0	1.25
airplan.dat	H -	Blue	2=failure	3=equal	1=success
(CAS/BAI factors)	I -	Red	2=failure	3=equal	1=success
airrules.dat	J -	Blue(High)	90,000	120,000	150,000
(GCI Ranges)		Blue(Low)	22,500	30,000	37,500
	K -	Red(High)	60,000	80,000	100,000
		Red(Low)	15,000	20,000	25,000
squadron.dat	L -	Blue	-.25	no change	+.25
	M -	Red	-.25	no change	+.25

Table 3.1 Uncoded Factor Settings

For a complete definition of the files in Table 3.1 see Appendix A. Note that these input files are the ones selected by ASC/XREC. Although the Plackett-Burman design does not allow estimation of interactions between factors, it can identify the significant main factors that make up the possibly significant interactions. Further analysis of the important main factors allows the analyst to identify and estimate the significant interaction terms. Therefore, the use of screening design is appropriate for this thesis effort.

3.3 Analysis Methodologies.

Three methodologies are used to identify the significant or active factors in analyzing the results of the experiment described in the previous section. The first is an approach developed by Box and Meyer (Bayesian approach), the next is an approach developed by Hamada and Wu (Iterative approach), and the last is a typical response surface methodology (RSM) approach.

The Bayesian and Iterative approaches are both based on the concept that of "the many potentially important variables, it is often the case that only a few are truly important" (Box and Meyer, 1993: 94). This condition is known as the Pareto Principle or factor (or effect) sparsity. Furthermore, the Iterative approach assumes "that when a two-factor interaction is significant, at least one of the corresponding factor main effects is also significant" (Hamada and Wu, 1992: 132). This is known as effect heredity. For example, if the AB interaction term is significant then either factor A or factor B is also significant (or possibly both).

Given these different approaches, it is apparent that different significant factors or models can be identified, especially with the complex aliasing of the Plackett-Burman design used for this experiment. Therefore, an attempt to ascertain a true model for one of the MOOs of interest is to be performed using Resolution V design. This true model can be used as a comparison for these different analysis methods. These three methodologies are described in more detail in the following subsections.

3.3.1 Bayesian Approach.

This methodology, developed by Box and Meyer, improves the likelihood of identifying significant factors that might be overlooked when using typical or conventional methods of analysis, such as an RSM approach. "This is particularly true of Plackett-Burman designs where the number of runs is not a power of two (Box and Meyer, 94:1993). This model examines the possible hypotheses and identifies those that best fit the data. For example, if there are three factors (A, B, and C) then the various hypotheses considered are that a single factor is responsible, that two factors are responsible, and that all three factors are responsible for what is going on. In the single factor hypotheses, only single factors are included in the model. In the hypotheses that two and three factors are responsible, the models considered include the main factors along with all possible interactions, e.g., under the hypothesis that A, B, and C are active, only the subset of these main factors with interactions AB, AC, BC, and ABC are considered. However, this methodology allows the analyst to assume, for example, that three-factor interactions are negligible and thus the models considered would contain at most two-factor interactions.

> "A Bayesian framework is used to assign an appropriate measure of fit to each model considered (posterior probabilities) that can be accumulated in various ways (marginal posterior probability)" (Box and Meyer, 1993: 95). "It is analogous to all-subsets regression in that all possible models are evaluated" (Box and Meyer, 1993: 95).
>
> The Bayesian approach to model identification is as follows (see, e.g., Box and Tiao (1968)). We consider the set of all possible models labeled $M_0, \ldots, M_m$. Each model M_i has an associated vector of parameters θ_i so that the sampling distribution of data **y** [or output responses], given the model M_i, is described by the probability density $f(\mathbf{y}|M_i, \theta_i)$. The prior probability of the model M_i is $p(M_i)$, and the prior probability density of θ_i is $f(\theta_i|M_i)$. The predictive density of **y**, given model M_i, is written $f(\mathbf{y}|M_i)$, and is given by the expression
>
> $$f(y|M_i) = \int_{R_i} f(y|M_i,\theta_i)d\theta_i \tag{3-5}$$
>
> where $\mathbf{R}_i$ is the set of possible values of θ_i. The posterior probability of the model M_i, given the data **y**, is then
>
> $$p(M_i|y) = \frac{p(M_i)f(y|M_i)}{\sum_{h=0}^{m} p(M_h)f(y|M_h)}. \tag{3-6}$$

The posterior probabilities $p(M_i|y)$ provide a basis for model identification. Tentatively plausible models are identified by their large posterior probability. Computationally one calculates $p(M_i)f(y|M_i)$ for each model M_i (the numerator in the above expression) and then scales these quantities to sum to one. The probabilities $p(M_i|y)$ can be accumulated to compute the marginal posterior probability P_j that factor j is active as

$$P_j = \sum_{M_i:\ \text{factor } j \text{ active}} p(M_i|y). \tag{3-7}$$

The probability P_j is just the sum of the posterior probabilities of all the distinct models in which the factor j is active. The probabilities $\{P_j\}$ are thus calculated by direct enumeration over the 2^k [where k is the number of factors] possible models M_i (Box and Meyer, 1993: 95-96).

Large values of P_j indicate that factor j is significant while small values indicate that factor j is not significant. For a more in depth explanation of this method see Box and Meyer, 1992. Box and Meyer developed a software program called MBJQT92 that performs the calculations described in their article and above . By using this program, the analyst does not have to do the calculations manually and is provided with output that indicates which factors are active. An example of this output is provided below (Figure 3.0). In analyzing the results of the MBJQT92 program, it is up to the analyst to determine what signifies a large posterior probability. "In practice there is no harm in interpreting the posterior probabilities liberally" (Box and Meyer, 1993: 102). For example, from Figure 3.0, the analyst might conclude that factors 3, 5, 7, and 8 are active. Further analysis on these factors can produce a model that contains these main effects along with any significant interactions.

3.3.2 Iterative Approach.

This method "works well when effect sparsity and effect heredity hold and the correlations between aliased effects (i.e., aliasing coefficients) are small to moderate" (Hamada and Wu, 1992: 132). Hamada and Wu specifically state that this methodology

```
                Posterior
Factor          Probabilities
None            0.001  +                    +
   1            0.136  +**                  +
   2            0.143  +**                  +
   3            0.573  +**************      +
   4            0.245  +*****               +
   5            0.513  +**********          +
   6            0.272  +******              +
   7            0.894  +******************  +
   8            0.704  +**************      +
   9            0.095  +*                   +
  10            0.276  +*****               +
  11            0.229  +****                +
  12            0.053  +*                   +
  13            0.248  +****                +
```

Figure 3.0 Example Output from MBJQT92

is useful in analyzing the result of a Plackett-Burman design by taking the complex aliasing pattern of a PB design and turning it into an advantage. In analyzing the results of a screening design to identify the significant factors the following steps should be performed (Hamada and Wu, 1992: 132).

Step 1: Entertain all the main effects and interactions that are orthogonal to the main effects. Use standard analysis methods such as analysis of variance or half-normal plots to select significant effects. Go to Step 2

Step 2: Using effect heredity, entertain (i) the effects identified in the previous step and (ii) the two-factor interactions that have at least one component factor appearing among the main effects in (i). Also, consider (iii) interactions suggested by the experimenter. Use a forward selection regression procedure to identify significant effects among the effects in (i)-(iii). Go to Step 3.

Step 3: Use a forward selection regression procedure to identify significant effects among the effects identified in the previous step as well as all the main effects. Go to Step 2.

Iterate between Steps 2 and 3 until the selected model stops changing. (Effect sparsity suggests that only a few iterations will be required.)

The proposed method, however, does have a limitation. Significant main effects can be overlooked when several significant interactions are aliased with a nonsignificant main effect and cause it to appear significant (Hamada and Wu, 1992: 135). To overcome this problem, Hamada and Wu offer two extensions to the above steps (136):

(1) Relax the criterion for significance in Step 1 so more main effects are included.

(2) Replace Step 1 with Step 1' below.

Step 1': For each factor X, entertain X and all its interactions XY with other factors. Use a forward selection regression procedure to identify significant effects from the candidate variables and denote the model by M_X. Repeat this for each of the factors and then choose the best model from all the M_X's. Go to Step 3.

Then iterate between Steps 3 and 2 as before.

By using this approach, it is possible to identify significant effects (either main or two-factor interaction) that explains most of the variance.

For a more detailed explanation and example of its use see Hamada and Wu, 1992. This thesis effort makes use of the second extension provided above (Step 1') in analyzing the results of the screening design. This method should produce better results than the standard analysis techniques normally performed. "Note that the standard analysis of PB [Plackett-Burman] designs ends at Step 1" (Hamada and Wu, 1992: 132). This standard analysis is the final method used in analyzing the results of the screening design experiment, which in this thesis effort will be termed response surface methodology (RSM) approach, explained in more detail in the next subsection.

3.3.3 RSM Approach.

This method uses the standard analysis methods found in any experimental design reference or response surface methodology reference. These standard analysis methods include: (1) examining the effects of the main factors and identifying which are large compared to the others, (2) examining the analysis of variance (ANOVA) tables, (3) using normal probability plots, or (4) the use of Pareto charts (a chart consisting of bars whose length is proportional to the absolute value of the estimated effects). In this thesis effort, all of these are used to identify significant factors from the results of the screening experiment.

The approach used to determine the significant effects is an iterative one. That is, the first step is to identify the significant main effects using standard analysis methods as discussed above and then examining the interactions between these significant main factors, if enough degrees of freedom are left for such an analysis, to determine if any of these are significant. A step-wise regression approach is used to identify the final model, containing the identified significant main factors and any significant two-factor interactions.

3.4 Multivariate Output Analysis.

In doing a principal components analysis (PCA) or factor analysis (FA) on the output from the experiment described in Section 3.2, the following steps are performed: "preparing the correlation matrix, determining the number of components or factors to be considered, extracting a set of components or factors from the correlation matrix, (probably) rotating the components or factors to increase interpretability, and, finally, interpreting the results" (Fidell and Tabachnick, 1983:373).

3.4.1 Principal Components Analysis.

The method used in this thesis effort extracts the principal components from the sample covariance matrix, C, or the sample correlation matrix, R, since the population covariance matrix, Σ, is not known. The components are extracted from C or R by determining the eigenvalues and associated eigenvectors from the matrix. Once the eigenvalues and eigenvectors have been calculated the vector of principal components can be determined by normalizing the eigenvectors and multiplying them by the data matrix **X** (Bauer,1994:22). The principal component that explains most of the variance of the original data is associated with the largest eigenvalue, the component that explains most of the remaining variance is associated with the next largest eigenvalue, and so on, until the component explaining the least variance of the original data is associated with the smallest eigenvalue.

The methodology here is to retain enough of the principal components developed above that explains an acceptable amount of the variation in the original data and is interpretable to the user or analyst. The number of new variables should be less than the original. Note that the new variables are uncorrelated and orthogonal. The new variables are made up of linear combinations of the original data. Now, instead of tracking the original data, the user can track these new variables that are contained in fewer dimensions which should allow the analyst to track the progress of the original variables with less effort and confusion.

3.4.2 Factor Analysis.

The FA technique that is used for this thesis effort is the principal factor method. The method of maximum likelihood is another technique that might have been used, however, according to the SAS/STAT User's Guide (456), this technique cannot be used when the correlation matrix being examined is singular. The correlation matrix produced from the output data of the Plackett-Burman experiment is singular (or nearly singular). The cause of this singular or nearly singular matrix is that there are a few MOOs, e.g., Blue and Red Ending Strength (BSTREN and RSTREN), that vary little across runs. However, according to the SAS/STAT User's Guide (453), even though the correlation matrix is singular, a principal factor analysis can still be performed by using the priors=max option with the proc factor procedure and method=principal.

Factor analysis is similar to principal components analysis except that FA takes the data matrix **X** and separates its variance into a common variance or communality and a specific variance or uniqueness. The common variance only is used in the FA calculations; for example, the diagonal elements of R are replaced by the communality estimates or common variance, and then the analysis is continued just as in a PCA.

IV. Results

4.1 Model Variability.

The initial input data scenario, provided with version 5.9 of THUNDER, might not produce adequate results for analyzing the variability inherent in THUNDER. The input data files heavily favored the Blue Forces; therefore, they are able to attain their objectives quickly without much resistance from the Red Forces. One of the variability analysis assumptions is that the results are based on the output after 30 days. However, in this scenario, the model is stopping significantly before this time period because all of the military objectives are being met, e.g., enemy forces falling below a pre-specified strength (percent of authorized). This scenario might not have thoroughly exercised the THUNDER Model and therefore is modified with the assistance of ASC/XREC to more evenly oppose the Blue and Red Forces. The following data files from the original input scenario are modified:

(1) **Advsac.dat**: air defense vs. aircraft pks are reduced for Blue Forces and increased for Red Forces to ensure model is exercised.

(2) **Airalloc.dat**: aircraft are assigned to a different mission allocation.

(3) **Command.dat**: objectives are increased for Red Forces and Red Forces deployment times are changed to ensure Red Forces are present at start of conflict.

(4) **Squadron.dat**: sortie rate increased for some missions for Blue and Red Forces.

(5) **Typeac.dat**: max sorties per day changed so squadron.dat changes are allowed.

(6) **Units.dat**: number Blue units decreased and Red units deployment times changed.

The changes more evenly match the air defense probability of kills and conflicting forces and allows both Blue and Red Forces to fly more sorties. See Appendix B to examine the modified input data files. This helps confirm the earlier statement that in the acquisition process, the output from a simulation model is easily manipulated to signify whatever the analyst or user wants it to; that is, the input data files can be set up or modified to ensure certain conclusions are drawn, e.g., the input scenario can be constructed so that a particular weapon system performs very well under certain conditions.

Once the above input data files are changed, thirty runs of the THUNDER Analytical Model are to be made (results provided in Table 4.0). Where the output variables in Table 4.0 are defined as:

BDSUP/RDSUP: Blue/Red Losses by Mission (Defense Suppression)

FLTMVMT: Blue Cumulative Flot Movement (km)

BSTREN/RSTREN: Blue/Red Ending Strength (% Authorized)

BSORT/RSORT: Blue/Red Sorties Flown (Total)

BINV/RINV: Blue/Red Inventory

BA-G/RA-G: Blue/Red Losses by Mission (Air-to-Ground)

BACAA/RACAA: Blue/Red Aircraft Losses from Air-to-Air

BACSA/RACSA: Blue/Red Aircraft Losses from Surface-to-Air

BA-A/RA-A: Blue/Red Losses by Mission (Air-to-Air)

Where BA-G/RA-G and BACSA/RACSA differ in that the former accounts for losses from aircraft flying air-to-ground missions, e.g., close air support, and the latter accounts for aircraft losses from the ground, e.g., surface to air missiles and BA-A/RA-A and BACAA/RACAA differ in that the former accounts for losses from aircraft flying air-to-air missions, e.g., air superiority, and the latter accounts for aircraft losses from the air, e.g. air-to-air missiles. Using the output data provided in Table 4.0, eighty-five and ninety percent confidence intervals (CIs) are calculated for all seventeen MOOs (Appendix C). However, the eighty-five and ninety percent CIs for Blue Strength

run	BDSUP	RDSUP	FLTMVMT	BSTREN	RSTREN	BSORT	RSORT	BINV
1	4	12	-12	89	80	9364	3632	284
2	4	12	-13	89	81	9546	3660	286
3	3	9	-15	86	81	9926	3446	290
4	4	6	-12	87	81	9610	3352	278
5	1	7	-13	91	80	9655	3514	291
6	1	8	-14	83	80	10176	3754	291
7	4	8	-13	91	80	9512	3406	280
8	3	9	-12	90	80	9823	2544	303
9	2	11	-16	90	81	9743	3250	288
10	1	5	-14	92	80	9918	3276	293
11	3	7	-12	90	79	9696	3296	297
12	3	9	-14	90	81	9355	3490	286
13	6	12	-14	89	81	9577	3624	287
14	8	7	-15	88	81	9619	3446	268
15	3	16	-16	88	80	10182	3038	297
16	0	4	-13	90	80	9412	3288	289
17	6	10	-16	88	80	9936	3514	290
18	7	6	-15	91	80	9626	2688	285
19	4	3	-17	89	80	9516	3302	284
20	3	6	-16	89	80	9896	3598	291
21	2	10	-14	91	80	9884	3280	293
22	8	12	-16	86	80	9827	3300	292
23	3	5	-6	91	79	9643	3384	279
24	2	15	-14	90	81	9263	3206	290
25	2	12	-14	91	80	9770	3278	286
26	5	11	-17	88	80	9638	3656	275
27	5	6	-13	90	81	9883	3308	280
28	3	10	-14	89	79	9433	3330	294
29	1	7	-13	88	80	9985	3150	290
30	5	8	-13	90	80	9844	3502	300

Table 4.0 Baseline Output from Thirty Runs of THUNDER

(Table 4.0 Continued on Next Page)

(% Authorized) and Blue Losses by Mission (DSUP) are given in Figures 4.0 through 4.3 to provide representative CIs for an MOO that converges quickly and a MOO that does not converge adequately within the thirty runs. The actual numbers (i.e., the lower confidence limit, mean, and upper confidence limit) used to produce the confidence intervals for all the MOOs are provided in Appendix D. Most of the MOO's CIs appear to converge quickly enough that by the tenth replication the CI or half-width is sufficiently small (that is, not much is gained by making additional replications);

run	RINV	BA-G	RA-G	BACAA	RACAA	BACSA	RACSA	BA-A	RA-A
1	191	20	67	35	136	17	30	23	87
2	186	20	70	35	137	15	26	19	81
3	167	19	80	29	129	17	38	18	78
4	188	23	72	38	122	20	28	23	72
5	170	24	86	22	119	23	48	14	74
6	182	14	74	31	126	14	33	27	77
7	177	25	75	35	136	21	38	21	91
8	182	8	72	24	118	9	29	18	66
9	194	19	78	32	115	16	39	22	65
10	188	21	75	28	115	15	44	16	79
11	182	19	68	20	128	19	31	13	84
12	174	22	72	27	121	23	41	20	81
13	176	21	71	29	142	20	31	16	90
14	168	24	82	47	158	21	39	32	108
15	190	20	72	23	111	16	36	13	59
16	211	21	77	26	104	21	41	18	64
17	176	17	83	34	129	12	41	20	77
18	146	15	96	36	140	15	43	24	81
19	159	17	87	35	142	17	48	25	100
20	168	15	93	27	119	18	48	20	68
21	191	20	72	31	120	12	36	19	74
22	183	20	80	25	135	19	37	10	80
23	197	22	95	33	116	24	52	27	68
24	199	16	79	34	126	12	37	23	69
25	185	19	80	32	110	18	44	26	62
26	175	29	67	40	129	21	35	24	86
27	196	21	61	32	111	22	26	22	70
28	161	28	89	25	159	17	40	10	100
29	181	22	88	30	124	16	48	18	77
30	190	10	72	22	105	14	30	16	55

Table 4.0 (Concluded) Baseline Output from Thirty Runs of the THUNDER

however, a small number of the MOO's CIs are not converging adequately by the thirtieth replication.

The last area of concern in the area of model variability is the significance of each MOO, e.g., the number of replications required to be within a certain accuracy. Note that these calculations are made under the assumption that the estimated population mean and

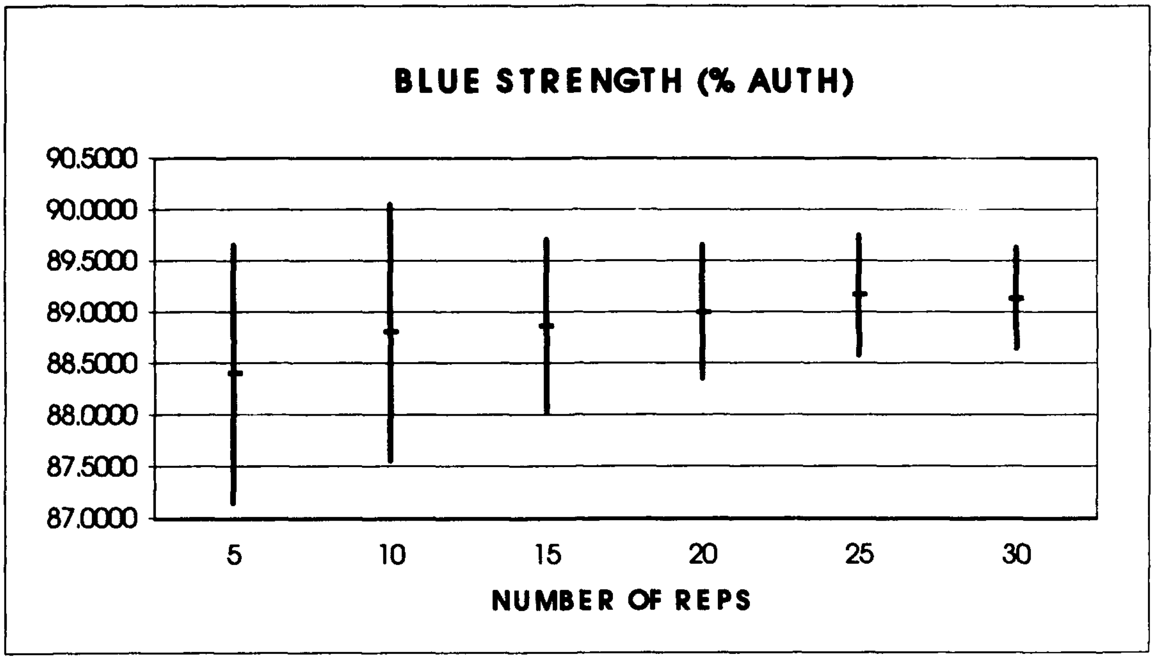

Figure 4.0 85% Confidence Intervals (BSTREN)

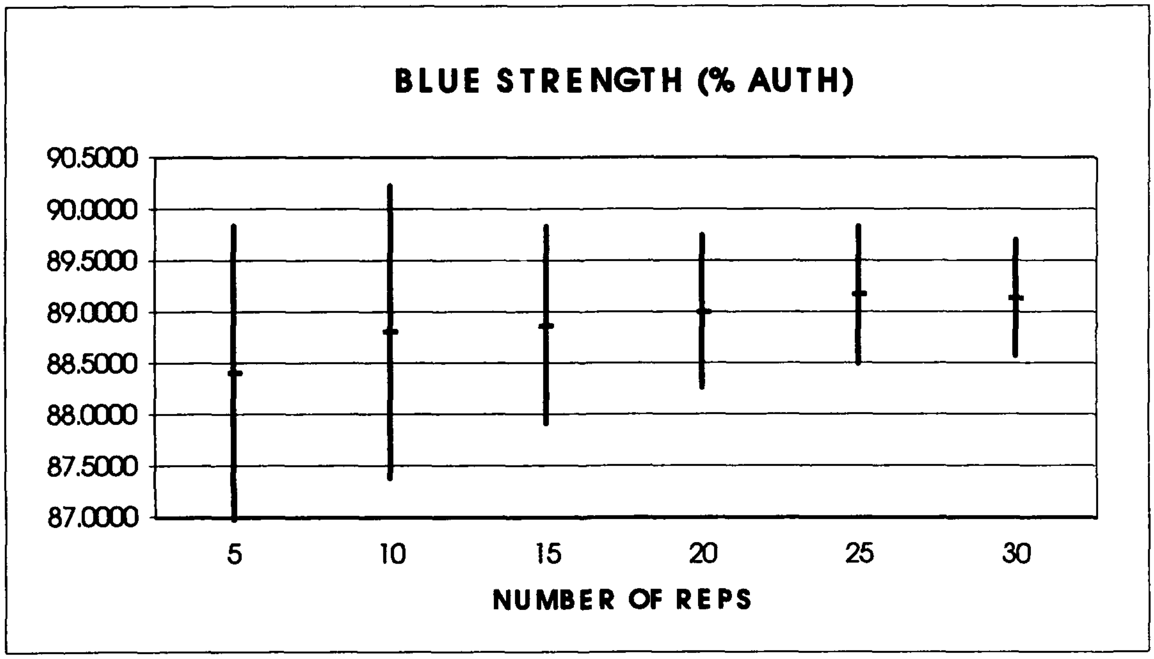

Figure 4.1 90% Confidence Intervals (BSTREN)

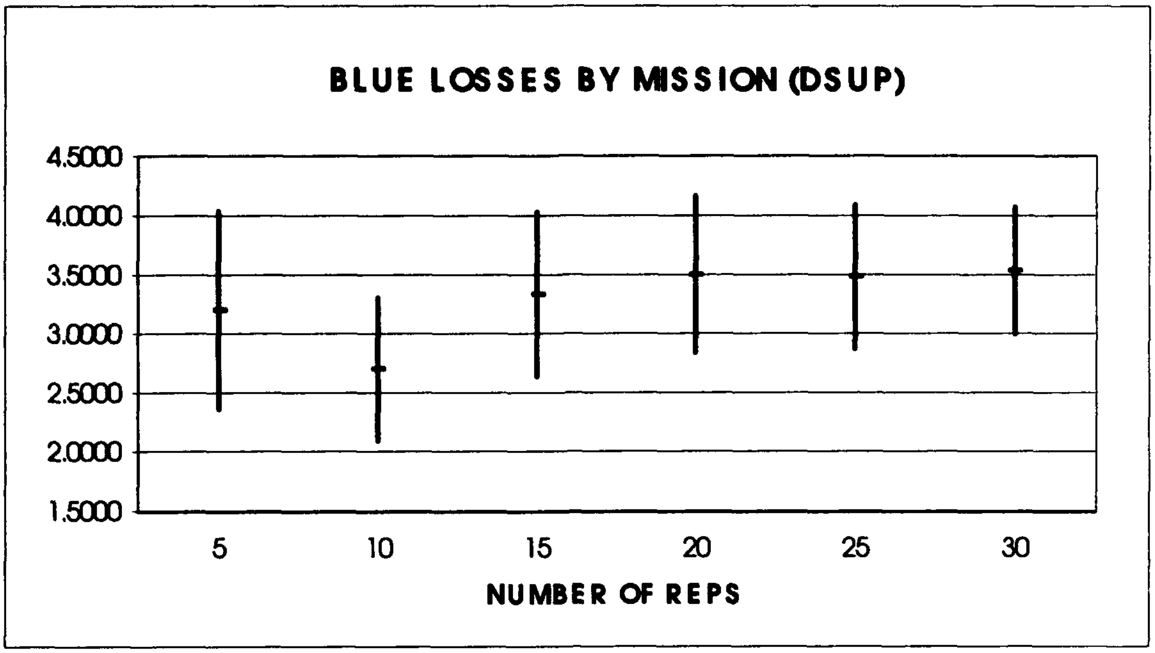

Figure 4.2 85% Confidence Intervals (BDSUP)

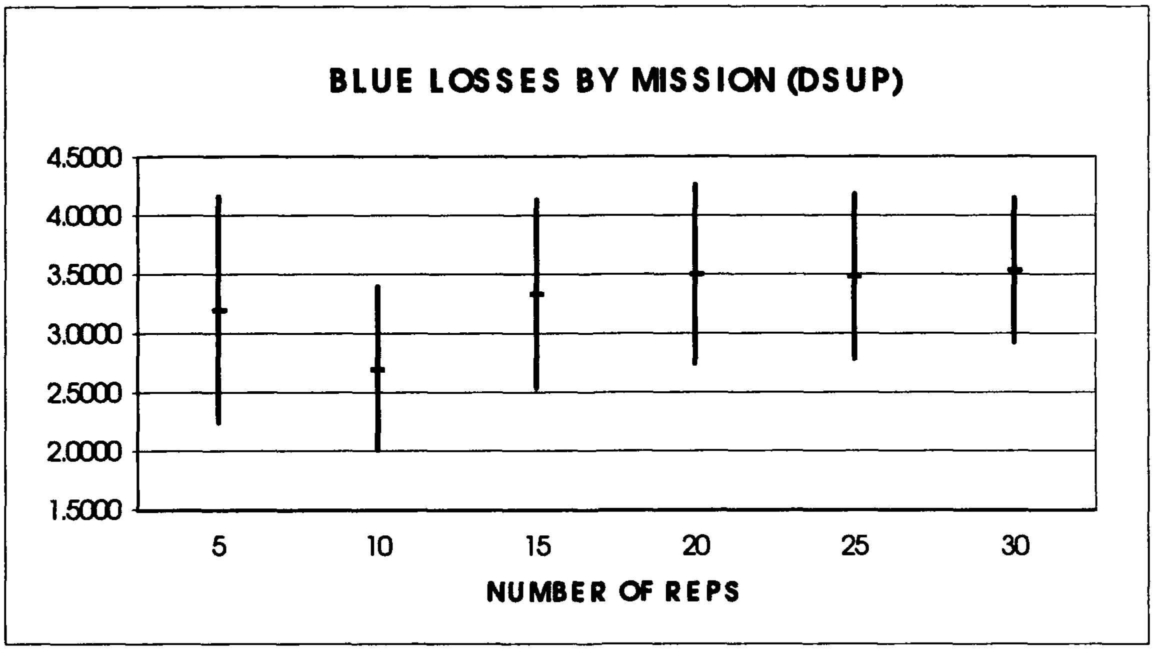

Figure 4.3 90% Confidence Intervals (BDSUP)

variance do not change significantly with the addition of more replications. With the many different MOOs and the number of possibly different weapon systems that can be examined, the desired accuracy of any MOO can vary depending on the objectives of a particular study. Therefore, in this thesis effort, an accuracy of 10% ($\gamma = .10$) is used; that is, the number of runs required for the expected value of each MOO to be within 10% of the mean. The significance level of the t-statistic used in these calculations is $\alpha = .15$ and .10. Table 4.1 below lists the additional number of replications required (the calculations

		number of replications completed					
		5	10	15	20	25	30
Blue Losses by	alpha=.15	39	54	67	69	70	56
Mission(DSUP)	alpha=.10	52	73	91	96	99	82
Red Losses by	alpha=.15	20	11	12	18	13	4
Mission(DSUP)	alpha=.10	27	17	20	29	24	15
Blue Flot Movement	alpha=.15	0	0	0	0	0	0
(KM)	alpha=.10	0	0	0	0	0	0
Blue End Strength	alpha=.15	0	0	0	0	0	0
(% Authorized)	alpha=.10	0	0	0	0	0	0
Red End Strength	alpha=.15	0	0	0	0	0	0
(% Authorized)	alpha=.10	0	0	0	0	0	0
Blue Sorties	alpha=.15	0	0	0	0	0	0
(Total)	alpha=.10	0	0	0	0	0	0
Red Sorties	alpha=.15	0	0	0	0	0	0
(Total)	alpha=.10	0	0	0	0	0	0
Blue Inventory	alpha=.15	0	0	0	0	0	0
(End)	alpha=.10	0	0	0	0	0	0
Red Inventory	alpha=.15	0	0	0	0	0	0
(End)	alpha=.10	0	0	0	0	0	0

Table 4.1 Additional Replications Required for the Expected Value of each MOO to be within 10% of Mean

		number of replications completed					
		5	10	15	20	25	30
Blue Losses by	alpha=.15	0	9	0	0	0	0
Mission (A-to-G)	alpha=.10	1	15	2	0	0	0
Red Losses by	alpha=.15	0	0	0	0	0	0
Mission (A-to-G)	alpha=.10	1	0	0	0	0	0
Blue Losses by	alpha=.15	7	0	1	0	0	0
Mision (A-to-A)	alpha=.10	11	2	5	0	0	0
Red Losses by	alpha=.15	0	0	0	0	0	0
Mission (A-to-A)	alpha=.10	0	0	0	0	0	0
Blue Aircraft	alpha=.15	4	6	0	0	0	0
Losses (S-to-A)	alpha=.10	7	11	2	0	0	0
Red Aircraft	alpha=.15	15	3	0	0	0	0
Losses (S-to-A)	alpha=.10	21	6	0	0	0	0
Blue Aircraft	alpha=.15	7	1	5	0	0	0
Losses (A-to-A)	alpha=.10	10	4	11	1	0	0
Red Aircraft	alpha=.15	0	0	0	0	0	0
Losses (A-to-A)	alpha=.10	0	0	0	0	0	0

Table 4.1 (Concluded) Additional Replications Required for the Expected Value of each MOO to be within 10% of Mean

are made at the following intervals 5, 10, 15, 20, 25, and 30 run). The number reported at each interval is the number of **additional** replications required for the expected value of each MOO to be within 10% of the mean. Note the number of additional replications required for Blue and Red Losses by Mission (DSUP), the first two MOOs in Table 4.1, are significantly different than the others; that is, the others are considerably more stable and converge rather quickly within the thirty replications allocated in this thesis effort. This problem is caused by the fact that the estimate of the population variance is approximately the same size or magnitude as the estimate of the population mean (Table

4.2). Table 4.3 is provided to give a comparision for the results in Table 4.2 with two MOOs that require no additional replications.

Runs	BDSUP		RDSUP	
5	Mean	= 3.2	Mean	= 9.2
	Variance	= 1.7	Variance	= 7.7
10	Mean	= 2.7	Mean	= 8.7
	Variance	= 1.79	Variance	= 5.79
15	Mean	= 3.33	Mean	= 9.2
	Variance	= 3.52	Variance	= 8.46
20	Mean	= 3.5	Mean	= 8.35
	Variance	= 4.26	Variance	= 10.03
25	Mean	= 3.49	Mean	= 8.84
	Variance	= 4.51	Variance	= 11.22
30	Mean	= 3.53	Mean	= 8.77
	Variance	= 4.19	Variance	= 9.91

Table 4.2 Comparison of Mean and Variance for BDSUP and RDSUP

Runs	FLTMVMT		BSTREN	
5	Mean	= -13	Mean	= 88.4
	Variance	= 1.5	Variance	= 3.8
10	Mean	= -13.4	Mean	= 88.8
	Variance	= 1.82	Variance	= 7.51
15	Mean	= -14.2	Mean	= 88.87
	Variance	= 1.95	Variance	= 5.12
20	Mean	= -14.1	Mean	= 89
	Variance	= 2.52	Variance	= 4.11
25	Mean	= -13.84	Mean	= 89.16
	Variance	= 4.81	Variance	= 4.14
30	Mean	= -13.87	Mean	= 89.13
	Variance	= 4.4	Variance	= 3.57

Table 4.3 Comparison of Mean and Variance for FLTMVMT and BSTREN

4.2 Analysis Methodologies.

The output from the THUNDER model is analyzed using the three methodologies described in Section 3.3. The first step of the analysis produced notably different significant factors for each method (Appendix E provides these significant factors), especially when comparing the Iterative method with the RSM and Bayesian methods. The reason for this difference is that at the first step of this analyses, the two-factor interactions are not taken into account for both the RSM and Bayesian methodologies. This helps explain why they, the RSM and Bayesian techniques, produced similar significant effects when compared against the Iterative method. Initially, the analysis stopped after only this first step and the differences in models are initially thought to be from the complex aliasing structure of the Plackett-Burman design. The aliasing matrix and structure of this Plackett-Burman (PB) design are provided at Appendix F. However, the complex aliasing pattern did not provide the explanation needed. The aliasing structure of this PB design has all main effects confounded with all two-factor interactions not containing that particular main effect. Therefore, the interpretation of these confounding relationships did not help in this particular situation because of the number of confounded elements or factors.

The next step in this analysis is to account for the two-factor interactions within the RSM and Bayesian techniques. The results from this second step produced similar models for each MOO; that is, they are significantly more consistent in identifying the significant factors across all three methodologies. However, there are a few exceptions; of these exceptions, the MOO that provided the best opportunity for further analysis is Blue Aircraft Losses from Surface-to-Air. This particular MOO produced slightly different models (or identified slightly different significant factors) for the Bayesian method (Equation 4.0) compared against the Iterative and RSM methods (Equation 4.1).

The Bayesian method concluded that the following factors are significant (at an $\alpha = .10$): A, B, J, L, AB, and AI; which produced the following model:

$$\hat{Y} = 13.95 - 1.65 \cdot A + 4.436 \cdot B - 2.291 \cdot J + 1.818 \cdot L - 2.228 \cdot AB - 2.432 \cdot AI \qquad (4\text{-}0)$$

The Iterative and RSM methods concluded that the following factors are significant (at an $\alpha = .10$): B, AB, AL, BG, CE, and EF; which produced the following model:

$$\hat{Y} = 13.95 + 4.454 \cdot B - 2.294 \cdot AB - 2.44 \cdot AL - 2.118 \cdot BG + 4.37 \cdot CE - 0.59 \cdot EF \qquad (4\text{-}1)$$

In order to determine which of these models best predicts or estimates the actual MOO, a number of runs needs to be completed to provide a criteria to compare the accuracy of these different models. The measurement criterion decided on for determining the accuracy of each model is the mean absolute percent error (MAPE); which is defined by the following equation:

$$MAPE = \frac{100}{n} \cdot \sum_{i=1}^{n} \frac{|e_i|}{|X_i|} \qquad (4\text{-}2)$$

where X_i = (the actual observation), $Xhat_i$ = (the estimate of X_i using Equations 4.0 and 4.1 for each model), and e_i = (the difference between X_i and $Xhat_i$), and n = (the number of runs). A resolution V design is needed in the validation of the above equations to ensure that the two-factor interactions are not confounded with main effects or other two-factor interactions which would might confuse the results of the validation dataset. Main effects and two-factor interactions are needed since the above three methodologies created models containing only these. For the Blue Aircraft Losses from Surface-to-Air

MOO, five of the original main effects or factors can be dropped since they are not included in either model as either a main effect or interaction. Therefore, eight main factors are left which allows a resolution V design with sixty-four runs (2^{8-2}_{V} fractional factorial).

When the sixty-four run validation dataset is completed, the better methodology can be decided by examining each model (Equations 4.0 and 4.1) against this dataset. The measurement criterion for the Iterative & RSM methodologies is:

$$MAPE_{IR} = 43.778$$

and for the Bayesian methodology is:

$$MAPE_{B} = 31.393.$$

Both of these MAPE values appear to be very large; however, to put them in perspective the MAPE for the model produced from the resolution V design (Equation 4.3) is used as

$$\hat{Y} = 13.95 + 4.43 \cdot B - 0.02 \cdot G - 2.74 \cdot J + 2.04 \cdot L - 2.09 \cdot AB - 2.38 \cdot AI - 0.90 \cdot BI + 0.52 \cdot BL \qquad (4\text{-}3)$$

a comparison assuming that the best MAPE value possible is obtained from the model produced from the resolution V design. Equation 4-3 produces the following MAPE value:

$$MAPE_{ResV} = 28.452.$$

Comparing the other models' MAPEs with this one, it is apparent that the Bayesian methodology is almost as proficient at esimating as the model produced from the actual validation dataset. For this particular instance, as stated earlier in the model variability subsection, this is not a guarantee that the Bayesian methodology is always a better method for analyzing the results of the THUNDER model. For example, in some cases the Bayesian methodology produced the same model or identified the same significant factors as the RSM methodology, e.g., Blue Inventory.

4.3 Multivariate Analysis.

The results provided for this analysis are the number of components or factors retained by each analysis and an interpretation of these components or factors. The component scores and factor scores are examined for any possible explanation of what is happening within the simulation model, e.g., perhaps some insight can be gained by examining these scores.

In order to select the correct number of components or factors to retain for each analysis, two methods are used: 1) Kaiser's criterion (Bauer, 1994:39) and 2) Cattell's scree test (Jobson, 1992:395-96). The first is a rule of thumb that states to retain those components or factors associated with eigenvalues greater than one; since an eigenvalue less than one would explain less variance than one of the original variables. The second method (scree test) is a graphical approach modeled after the rubble that falls to the bottom of a cliff -- the analyst should retain those components or factors that are above the "rubble" (Bauer, 1994: 39-40).

4.3.1 Principal Components Analysis.

In performing the principal components analysis using the SAS proc factor command with priors=one, which does a principal components analysis, the following results are obtained and provided in Table 4.4 (Eigenvalues) and Figure 4.4 (Scree Plot).

```
Factor Analysis of THUNDER Output
Initial Factor Method: Principal Components
Prior Communality Estimates: ONE
Eigenvalues of the Correlation Matrix:  Total = 17  Average = 1
```

	1	2	3	4	5	6	7	8	9
Eigenvalue	5.0140	3.9338	2.8774	1.7449	1.1310	0.9695	0.5039	0.3392	0.1492
Difference	1.0803	1.0564	1.1325	0.6139	0.1615	0.4656	0.1647	0.1900	0.0104
Proportion	0.2949	0.2314	0.1693	0.1026	0.0665	0.0570	0.0296	0.0200	0.0088
Cumulative	0.2949	0.5263	0.6956	0.7982	0.8648	0.9218	0.9514	0.9714	0.9802

	10	11	12	13	14	15	16	17
Eigenvalue	0.1388	0.0981	0.0495	0.0326	0.0172	0.0010	0.0000	0.0000
Difference	0.0407	0.0486	0.0168	0.0155	0.0161	0.0010	0.0000	
Proportion	0.0082	0.0058	0.0029	0.0019	0.0010	0.0001	0.0000	0.0000
Cumulative	0.9883	0.9941	0.9970	0.9989	0.9999	1.0000	1.0000	1.0000

Table 4.4 SAS Output - Eigenvalues

By examining Table 4.4 and Figure 4.4, the number of components retained for this PCA is either five or six. Kaiser's criterion retains only five; however, the sixth component is close to the cutoff. In an attempt to make the components easier to interpret, the SAS varimax rotation is performed on the first five and six components. Examining both of these, it is determined that six components provide the best interpretation. The output from the varimax rotation with six components is provided at Table 4.5.

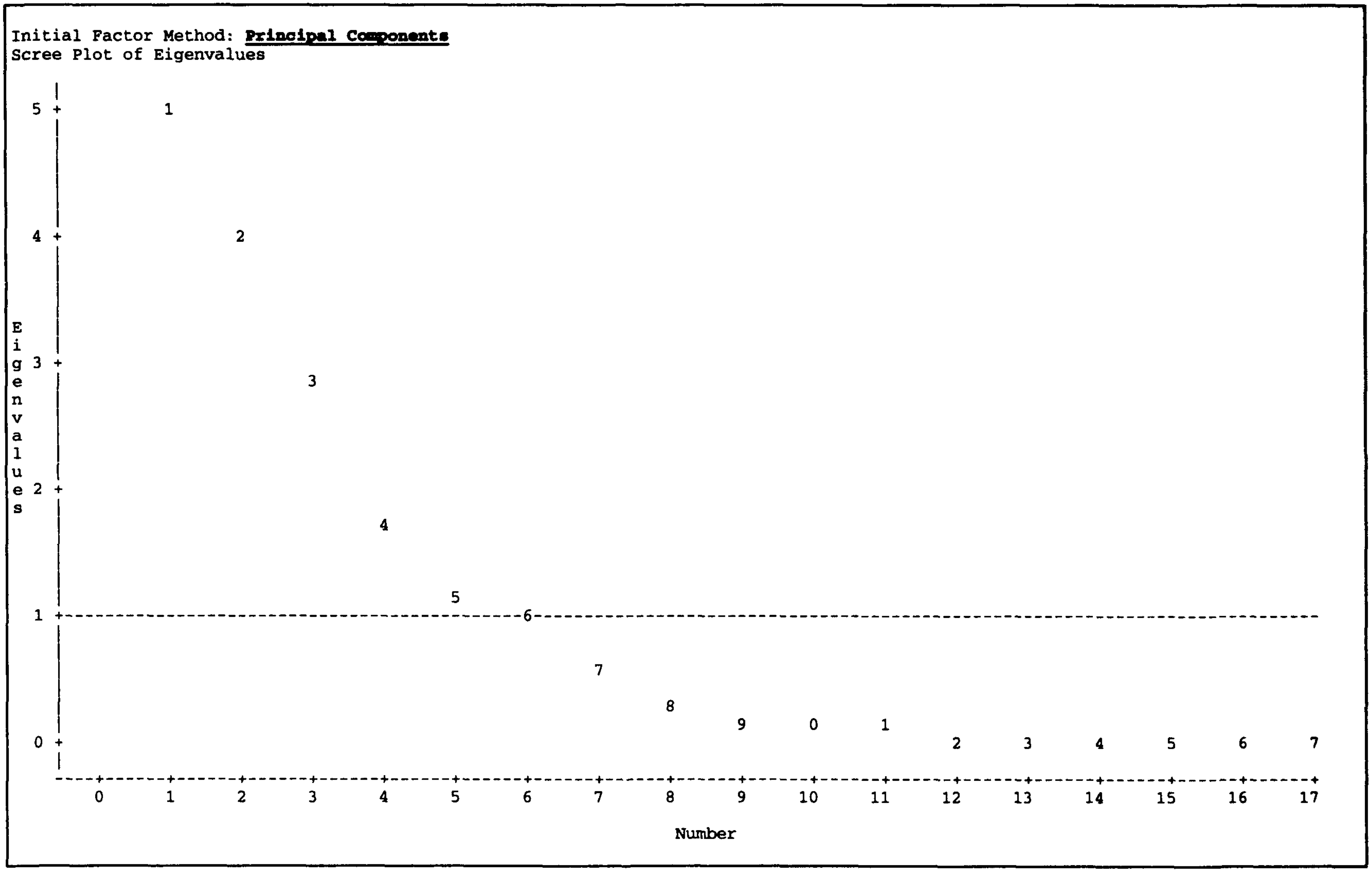

Figure 4.4 Scree Plot for Principal Components Analysis

Principle Components Analysis of THUNDER Output

Capt Tim Webb

Rotation Method: Varimax

Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
BAG	93 *	6	15	-14	15	-12
BACSA	88 *	-9	-2	-37	2	-2
BFLT	72 *	-44 *	-20	-7	6	-26
BDSUP	70 *	32	27	36	18	3
BINV	-83 *	-8	-11	6	-54 *	2
RAG	-4	98 *	8	0	-2	-9
RSORT	1	97 *	-2	13	4	0
RACSA	-13	95 *	-5	-16	1	-1
BSTRE	-48 *	-75 *	-3	-19	-19	-19
RACAA	11	7	97 *	-9	2	-3
RAA	2	-1	95 *	-22	8	-11
RINV	-9	-9	-28	88 *	5	-12
BSORT	20	-13	15	-86 *	-4	-33
BAA	11	-4	-5	-4	97 *	-3
BACAA	42 *	20	19	25	78 *	-1
RSTRE	-27	4	-30	34	-3	78 *
RDSUP	5	-13	58 *	-32	-7	62 *

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer.
Values greater than 0.39196 have been flagged by an '*'.

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4	FACTOR5	FACTOR6
3.897648	3.783401	2.573717	2.219935	1.945885	1.249980

Final Communality Estimates: Total = 15.670566

BDSUP	RDSUP	BFLT	BSTRE	RSTRE	BSORT	RSORT	BINV	RINV
0.832428	0.841164	0.823018	0.898146	0.893394	0.923954	0.966773	0.995079	0.876442

BAG	RAG	BACAA	RACAA	BACSA	RACSA	BAA	RAA
0.936240	0.976004	0.931924	0.975819	0.921063	0.952286	0.953804	0.973026

Table 4.5 Varimax Rotation of PCA

The interpretation is simplified somewhat by rotating the factor pattern. That is, the correlations between the original variables and the factors or components have been cleared up somewhat. Now, it is more evident which variables are correlated with which factors. Factor 1 is formed from a linear combination of BAG, BACSA, BFLT, BDSUP, and BINV. Factor 2 is formed from a linear combination of RAG, RSORT, RACSA, and BSTRE. Factor 3 is formed from a linear combination of RACAA and RAA. Factor 4 is formed from a linear combination of RINV and BSORT. Factor 5 is formed from a linear combination of BAA and BACAA. Factor 6 is formed from a linear combination of RSTRE and RDSUP.

These factors can be thought of as measuring the following:

Factor 1: an overall Blue index.

Factor 2: a Red index contrasted with Blue Ending Strength.

Factor 3: a Red Air-to-Air index.

Factor 4: a contrast of Red Inventory and Blue Sorties.

Factor 5: a Blue Air-to-Air index.

Factor 6: a measure of Red defenses.

Bringing these factors back into terms from the THUNDER model, they are interpreted in the following manner:

Factor 1: This factor is contrasting Blue Inventory with specific Blue aircraft losses and gives a means to measure the inventory vs. losses with one variable. A measure of how well the Blue Air Forces are helping in the war overall.

Factor 2: This factor compares specific Red aircraft losses and number of Red sorties flown with Blue Ending Strength.

Factor 3: This factor gives a measure for the Red aircraft losses from flying air-to-air missions and Red aircraft losses from the air, e.g., air-to-air missiles. Somewhat of a measure of how well Red Forces are doing in the air war.

Factor 4: This factor contrasts Red Inventory with the number of Blue sorties flown. A measure of how well the Blue Forces are doing when they fly a mission.

Factor 5: This factor gives a measure for the Blue aircraft losses from flying air-to-air mission and Blue aircraft losses from the air, e.g., air-to-air missiles. Somewhat of a measure of how well Blue Forces are doing in the air war.

Factor 6: This factor gives a measure somewhat of a measure of how well the Red Forces are holding out during the battle.

4.3.2 Factor Analysis.

In performing the principal factor analysis in this thesis effort, the SAS proc factor command is used once again but with priors=max, which is recommended by SAS when the correlation matrix used in the analysis is singular. Table 4.6 (Eigenvalues from the Reduced Correlation Matrix) and Figure 4.5 (Scree Plot) provide the preliminary output from the SAS calculations. By examining Table 4.6 and Figure 4.5, and keeping in mind

Factor Analysis of THUNDER Output
Initial Factor Method: Principal Factors
Prior Communality Estimates: MAX

BDSUP	RDSUP	BFLT	BSTRE	RSTRE	BSORT	RSORT	BINV	RINV
0.718453	0.537879	0.673126	0.742189	0.625833	0.768609	0.949499	0.880474	0.768609

BAG	RAG	BACAA	RACAA	BACSA	RACSA	BAA	RAA
0.880474	0.949499	0.795560	0.953725	0.838282	0.943277	0.721219	0.953725

Eigenvalues of the Reduced Correlation Matrix: Total = 13.7004313 Average = 0.80590773

	1	2	3	4	5	6	7	8	9
Eigenvalue	4.8310	3.7968	2.6995	1.5603	0.8560	0.6751	0.2030	0.1170	-0.0079
Difference	1.0343	1.0973	1.1392	0.7042	0.1809	0.4721	0.0860	0.1249	0.0322
Proportion	0.3526	0.2771	0.1970	0.1139	0.0625	0.0493	0.0148	0.0085	-0.0006
Cumulative	0.3526	0.6297	0.8268	0.9407	1.0031	1.0524	1.0672	1.0758	1.0752

	10	11	12	13	14	15	16	17
Eigenvalue	-0.0401	-0.0493	-0.0900	-0.1308	-0.1379	-0.1569	-0.1999	-0.2253
Difference	0.0092	0.0406	0.0409	0.0071	0.0190	0.0431	0.0254	
Proportion	-0.0029	-0.0036	-0.0066	-0.0096	-0.0101	-0.0114	-0.0146	-0.0164
Cumulative	1.0723	1.0687	1.0621	1.0526	1.0425	1.0310	1.0164	1.0000

4 factors will be retained by the MINEIGEN criterion.

Table 4.6 SAS Output - Eigenvalues for Reduced Correlation Matrix

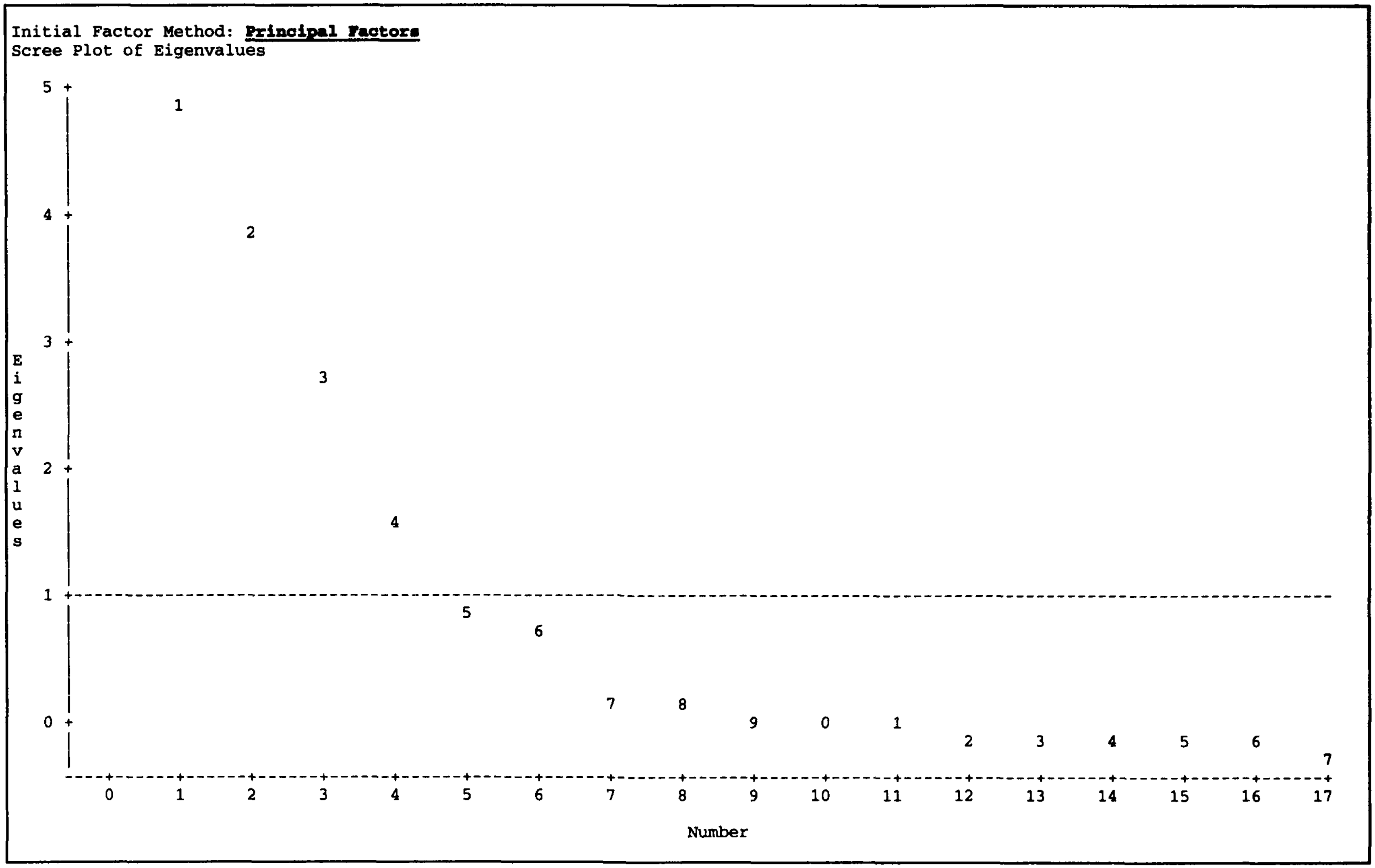

Figure 4.5 Scree Plot for Principal Factor Analysis

Kaiser's criterion and the scree test, only the first four factors are retained. The rotated factor pattern is produced by using the SAS varimax procedure once again (Table 4.6).

Factor Analysis of THUNDER Output
Rotation Method: Varimax
Rotated Factor Pattern

	FACTOR1	FACTOR2	FACTOR3	FACTOR4
BACAA	86 *	14	-12	12
BDSUP	75 *	26	4	10
BAG	73 *	2	59 *	3
BAA	59 *	-8	-7	0
BINV	-91 *	-3	-37	-4
RAG	5	98 *	-1	5
RSORT	15	96 *	-14	-6
RACSA	-8	96 *	3	-2
BSTRE	-56 *	-67 *	2	4
BSORT	-15	-10	84 *	22
BACSA	51 *	-10	73 *	-7
BFLT	45 *	-43	48 *	-26
RSTRE	-12	3	-60 *	-19
RINV	19	-13	-65 *	-41
RAA	9	1	20	95 *
RACAA	18	9	13	94 *
RDSUP	-4	-9	10	59 *

NOTE: Printed values are multiplied by 100 and rounded to the nearest integer.
Values greater than 0.435342 have been flagged by an '*'.

Variance explained by each factor

FACTOR1	FACTOR2	FACTOR3	FACTOR4
3.949305	3.585596	2.866491	2.486120

Final Communality Estimates: Total = 12.887513

BDSUP	RDSUP	BFLT	BSTRE	RSTRE	BSORT	RSORT	BINV	RINV
0.648804	0.364993	0.687959	0.775411	0.416786	0.784920	0.965387	0.968574	0.648042

BAG	RAG	BACAA	RACAA	BACSA	RACSA	BAA	RAA
0.880372	0.963942	0.788464	0.938854	0.813613	0.926966	0.365014	0.949411

Table 4.6 Varimax Rotation for FA

Once again, the rotated factor pattern is easier to interpret than the unrotated factor pattern. However, the factor pattern for the FA is not as easily interpretable as the pattern for the PCA. Part of the reason for this is that there are two less factors in the FA and therefore more of the original variables are present in the linear combination than in the PCA factors. Factor 1 is formed from the linear combination of BACAA, BDSUP, BAG, BAA, and BINV. Factor 2 is formed from the linear combination of RAG, RSORT, RACSA, and BSTRE. Factor 3 is formed from the linear combination of BSORT, BACSA, BFLT, RSTRE, and RINV. Factor 4 is formed from the linear combination of RAA, RACAA, and RDSUP.

These factors can be thought of as measuring the following:

Factor 1: a contrast of Blue Inventory with Blue aircraft losses.

Factor 2: a constrast of Blue Ending Strength with Red aircraft losses form air-to-ground and Red sorties.

Factor 3: a contrast between Red Ending Strength and Inventory with Flot Movement, Blue sorties flown, and Blue aircraft losses form surface-to-air.

Factor 4: a measure of Red air-to-air losses and defense suppression losses.

Bringing these factors back into terms from the THUNDER model, they are interpreted in the following manner:

Factor 1: This factor is contrasting Blue Inventory with specific Blue aircraft losses and gives a means to measure the inventory vs. losses with one variable. A measure of how well the Blue Air Forces are helping in the ground war.

Factor 2: This factor compares specific Red aircraft losses and number of Red sorties flown with Blue Ending Strength. A measure of how Red aircraft losses flying air-to-ground missions and aircraft losses from surface-to-air are affected by Blue Strength.

Factor 3: This factor compares overall Red power (strength and inventory) with flot movement and the number of Blue sorties flown and Blue aircraft losses from surface-to-air. A measure of how well Red Forces are doing in the war.

Factor 4: This factor gives a measure for Red aircraft air-to-air losses and defense suppression losses. More of an overall how Red aircraft are doing in the air war.

V. Conclusions and Recommendations

5.1 Model Variability.

In examining each MOO of interest separately, the overall model variability can be shown to be minimal for several of the MOOs. For example, examining Figures 4.0 and 4.1 (CIs for Blue Strength (% Authorized)), the confidence interval half-width continues to diminish after each confidence interval calculation, which means that the mean and variance are remaining reasonably or moderately constant. However, for a few, the variability is significant; for example, examining Figures 4.2 and 4.3 (CIs for Blue Losses by Mission (DSUP)), the confidence interval half-width is reduced from the calculation at the fifth replication to the tenth replication; but, after the tenth replication the half-width is remaining almost constant, the cause of which is more than likely an increasing variance estimate or an unstable mean estimate. This same conclusion can be drawn from the calculation of the approximate number of replications required to be within 10% of the mean. The reason for the similarity in the CI and approximate number of replications calculations is that both are using the same estimates for the population mean and variance. Examining Table 4.1, it is apparent which MOOs are more variable than the others.

In this effort, the MOOs that appear to be significantly more variable (requiring additional runs beyond the thirty completed) than any of the others are:

(1) Blue Losses by Mission (DSUP).

(2) Red Losses by Mission (DSUP).

The following MOOs are not as variable as the above; however, they are considerably more variable (all requiring approximately 15 to 20 replications) than the remaining MOOs:

(3) Blue Losses by Mission (Air-to-Ground).

(4) Blue Losses by Mission (Air-to-Air).

(5) Blue Aircraft Losses (Surface-to-Air).

(6) Red Aircraft Losses (Surface-to-Air).

(7) Blue Aircraft Losses (Air-to-Air).

The remaining MOOs all require approximately five (or less) replications to be within 10% of the mean:

(8) Blue Flot Movement (km).

(9) Blue End Strength (% Authorized).

(10) Red End Strength (% Authorized).

(11) Blue Sorties (Total).

(12) Red Sorties (Total).

(13) Blue Inventory (End).

(14) Red Inventory (End).

(15) Red Losses by Mission (Air-to-Ground).

(16) Red Losses by Mission (Air-to-Air).

(17) Red Aircraft Losses by Mission (Air-to-Air).

By examining the above results and taking into account how changing the input data can influence the output, it is apparent that these results are based only on this particular scenario. Given this conclusion, an analyst should examine any MOO of interest when conducting a study and it is recommended that a minimum of five replications be performed in any study. Another recommendation for any study is that the approximate number of replications should be calculated (using Equation 3.3) for any MOO of interest used in the study. Once the approximate number of additional replications is known, the analyst can determine if time is available to actually perform these replications or not; if not, the analyst is at least aware of the possible problems, e.g., not able to determine a difference in weapon system performance.

Examining Table 4.1 again, the additional replications for certain MOOs can be explained by the fact that the assumptions, i.e., concerning the estimates of the population mean and variance, do not hold. For example, the variance (or the mean) has not stabilized or is not constant from calculation to calculation.

5.2 Analysis Methodologies.

The three analysis methodologies used in this thesis effort eventually converged to similar models or identified significant factors in most cases; however, in a few instances, such as Blue Losses by Mission (DSUP), the models did not converge for all three methodologies. In this instance, the validation set of sixty-four runs (Resolution V design) is used to compare these different models produced; these models are for Blue Losses by Mission (DSUP) from Iterative & RSM methodologies, which produced the same model, and the Bayesian methodology.

The measurement criteria for the accuracy of each model is the mean absolute percent error (MAPE); which is defined by the following equation:

$$MAPE = \frac{100}{n} \cdot \sum_{i=1}^{n} \frac{|e_i|}{|X_i|} \qquad (5\text{-}0)$$

where X_i = (the actual observation from the Resolution V design), $Xhat_i$ = (the estimate of X_i using Equations 4.0 and 4.1 for each model), and e_i = (the difference between X_i and $Xhat_i$), and n = (the number of runs) = sixty-four.

The measurement criteria for the Iterative & RSM methodologies is:

$$MAPE_{IR} = 43.778$$

and for the Bayesian methodology is:

$$MAPE_B = 31.393.$$

Both of these MAPE values appear to be very large; however, to put them in perspective the MAPE for the model produced from the Resolution V design is used as a comparison. Using the MAPE value from the model produced from the Resolution V design as approximately the best any model could do; which is:

$$MAPE_{ResV} = 28.452.$$

Comparing the other models' MAPEs with this (Resolution V designed) model's, it is apparent that the Bayesian methodology is almost as proficient at esimating as the model produced from the actual data. For this particular instance, as stated earlier in the model variability subsection, this is not a guarantee that the Bayesian methodology is always a better method for analyzing the results of a designed computer simulation experiment. For example, in some cases the Bayesian methodology produced the same model or identified the same significant factors as the RSM methodology, e.g., Blue Inventory.

However, determining which method might produce better results is not actually an issue, since the purpose of a screening experiment is to reduce the number of factors to be examined in further analyses. Therefore, whatever method used by the analyst works as long as the number of factors to be examined at a later time has decreased. It does not hurt in a screening experiment to be conservative in selecting active factors.

5.3 Multivariate Analysis.

The user or analyst should be aware that any of the results and conclusion of a FA or PCA is one of an infinite number depending on the rotation. By rotating the components or factors, the solution changes, but it does not change the explanatory ability of the components or factors (SAS/STAT User's Guide, 1988:452). Using the varimax rotation option within SAS, it provided a rotated factor pattern for both the PCA and FA that could be interpreted. Therefore, it is possible to reduce the number of variables in tracking the THUNDER outputs or MOOs and possibly make the interpretation of these MOOs more meaningful. In this instance, if all seventeen MOOs needed to be tracked, the user or analyst would only need to track the six components identified for the PCA or the four factors identified for the FA as indicators of what is happening with the original seventeen MOOs. However, the output from the PCA is more useful since the interpretation of its components are more meaningful.

5.4 Further Research Areas.

There are several areas still left untouched within this thesis effort. Only a small part of the THUNDER model is examined in this thesis effort. Given the size of THUNDER, the same kind of effort can be done by examing a different set of input and output variables. This thesis effort examined only a small portion of the available input and output variables. Also, a similar effort can be done using one of the classified data bases or scenarios. It is of interest to ASC/XREC to determine how the results from the thesis effort would compare with the results from a classified scenario. The classified data bases are significantly larger than the unclassified data base.

Another area of concern is the lack of guidance in performing analysis with THUNDER. There is no specific guidance, that can be found, on how the user or analyst would go about comparing two weapon systems. For example, if the Air Force is developing a new radar for all their fighter aircraft, what specific MOOs should be examined in comparing this new radar with the existing radar and how should this comparison be made. *A thesis effort outlining the analysis process using* THUNDER, *even* for a simple example, would be very useful for anyone given the task of comparing weapon systems using THUNDER.

APPENDIX A

Input Files: (U.S. AF/SA, 1992:6-3 to 6-8)

Air Rules (airrules.dat) data includes, for each side, aircraft taxi times, main operating base, divert base and dispersal base takeoff and landing delays, crater repair times, rearming and refueling times, minimum distances from FLOT of certain types of missions, radar detection distances, lethality, loss value, vulnerability, error, perception, target priority factors of various facilities, priority and mutual support factors, length of time a flight will wait for other flights at a join point, over-the-FLOT defensive counter air (ODCA) and fighter sweep (FSWP) orbit time, ODCA minimum threats size, size ratio and probability of detection, and mission supported by ODCA.

Air-to-Air Probability of Kill (airairpk.dat) data includes both killer and target ID, and the PK of the killer ID against the target ID, and, for low resolution for each target, the average percent killed per engagement and the time this kill rate becomes effective.

Probability of Detection (detect.dat) of each aircraft type on each side by each aircraft type on the opposing side.

Air Defense to Air Probability of Kill or Damage (advsac.dat) data includes target aircraft IDs for each type of air defense site on each side and the upper and lower limits for probability of kill and probability of damage to the target by the site, and, for low resolutino by side for each AD site, average percent of enemy target types killed per engagement and the time this kill rate becomes effective.

Air-to-Ground Air Munitions vs. Target (airgrdpk.dat) data includes air munition effectiveness for each air munition on each aircraft against each type component, type strategic target, and type equipment; each anti-radiation missile (ARM) and self-protect weapon (SPW) on each aircraft against each radar type; and each mine munition on each aircraft against each arc construction type.

Fighter/Bomber Squadron (squadron.dat) data includes mission class names; ID and name of each squadron on each side, its owning command, main operating base and dispersal base, mission class, quantity and type of aircraft owned, the squadron's relative effectiveness for each mission, and squadron orders.

Air Planning (airplan.dat) data includes side preplanned air tasking order (ATO) support flags and flags that indicate, by side, whether a given autoplanned mission will be supported by escorts. Air planning factors are also contained in this file and are determined by the air planning command and by time. Different air planning factors include squadron planning factors (escort to primary mission aircraft ratios and time over target spacing); battlefield air interdiction (BAI) planning factors (target type priorities); barrier combat air patrol (BARCAP) planning factors (value of assets to be protected); close air support (CAS) planning factors (CAS support planning rule); suppression of enemy air defenses (SEAD) planning factors (depth, planned effectiveness, and desired target drawdown percentage); suppression and support jammer planning factors (planned setback distances and support depths); interdiction planning factors (planned per-sortie effectiveness and desired target drawdowns for each type of interdiction target and depth factor curves); and offensive counter air (OCA) planning factors (planned effectiveness and desired target drawdown percentages).

APPENDIX B

This appendix contains the modified input data files described in Section 4.1.

ADVSAC.DAT

```
AD.VS.AC.206

 BLUE.MULTI.FACTOR   1.00       RED.MULTI.FACTOR   1.00

  PRIMARY
    BLUE
              200    210
      1001  .0150  .0500
      1002  .0210  .0600
    RED
              100    110
      2001  .0100  .0200
      2002  .0200  .0300
      2003  .0050  .0100
      2004  .0010  .0020

  END.PRIMARY.HIGH.RES.AD.PK.DATA

  SECONDARY
    BLUE
              200    210
       101  .0070  .0090
    RED
              100    110
       201  .0050  .0050
  END.SECONDARY.HIGH.RES.AD.PK.DATA

  START.LOW.RES.PERCENT

    BLUE
           AREA
           200      1.0  20   END
           210      1.0  25   END
           TERMINAL
           200      1.0  20   END
           210      1.0  25   END
```

```
    RED
            AREA
            100        1.0    1    END
            110        1.0    1    END
            TERMINAL
            100        1.0    1    END
            110        1.0    1    END

  END.LOW.RES.PERCENT

  START.LOW.RES.JAMMER.PK.MULTIPLIER
      BLUE
            0        0.10
        10000        0.05
        30000        0.02
       100000        0.01
      END.CURVE
      RED
            0        0.10
        10000        0.05
        30000        0.02
       100000        0.01
      END.CURVE
  END.LOW.RES.JAMMER.PK.MULTIPLIER

  START.LOW.RES.SUPPRESSOR.PK.MULTIPLIER
      BLUE
            0        0.15
        10000        0.07
        30000        0.03
       100000        0.01
      END.CURVE
      RED
            0        0.15
        10000        0.07
        30000        0.03
       100000        0.01
      END.CURVE
  END.LOW.RES.SUPPRESSOR.PK.MULTIPLIER


END.AD.VS.AC
```

AIRALLOC.DAT

```
AIR.ALLOCATION.601
  ALLOCATION.CYCLES   1.001 12.00   1.001 12.00
  ALLOCATIONS.MUST.TOTAL.100   YES
  PLANNING.COMMANDS
     1102   1013  1009
          1.000
            AIR.SUPERIORITY
               25  ODCA
               25  BARCAP
               25  AIRESC
               25  FSWP
            END.MISSION.CLASS
            DEEP.STRIKE
               20  STI
               30  INT
               50  OCA
            END.MISSION.CLASS
            GROUND.SUPPORT
               80  CAS
               20  BAI
            END.MISSION.CLASS
            JAMMER
               60  SJAM
               10  CJAM
               30  ESCJAM
            END.MISSION.CLASS
            MULTI.ROLE
              25  DCA
              15  ODCA
              10  BARCAP
              20  INT
              15  SSUP
              15  ESCSUP
            END.MISSION.CLASS
        END.TIMES
     1103   1015  1014
          1.000
            AIR.SUPERIORITY
               30  DCA
               30  BARCAP
               25  AIRESC
               15  FSWP
            END.MISSION.CLASS
            DEEP.STRIKE
              100  OCA
            END.MISSION.CLASS
```

```
        JAMMER
           60   SJAM
           10   CJAM
           30   ESCJAM
        END.MISSION.CLASS
        MULTI.ROLE
          55   DCA
          15   SSUP
          15   CSUP
          15   ESCSUP
        END.MISSION.CLASS
    END.TIMES
1104    1010  1012
      1.000
        AIR.SUPERIORITY
           20   DCA
           35   BARCAP
           25   AIRESC
           20   FSWP
        END.MISSION.CLASS
        DEEP.STRIKE
           10   STI
           40   INT
           50   OCA
        END.MISSION.CLASS
        GROUND.SUPPORT
           70   CAS
           30   BAI
        END.MISSION.CLASS
        JAMMER
           60   SJAM
           10   CJAM
           30   ESCJAM
        END.MISSION.CLASS
        MULTI.ROLE
          50   DCA
          20   BARCAP
          10   INT
          20   OCA
        END.MISSION.CLASS
        RECCE
          100   RECCE
        END.MISSION.CLASS
        WEASEL
           10   DSEAD
           50   SSUP
           10   CSUP
           30   ESCSUP
        END.MISSION.CLASS
    END.TIMES
```

```
     2101   2009  2017
          1.000
            AIR.SUPERIORITY
              20  DCA
              20  BARCAP
            20  FSWP
            20  AIRESC
              20  ODCA
            END.MISSION.CLASS
            GROUND.SUPPORT
              90  CAS
              10  BAI
            END.MISSION.CLASS
            MULTI.ROLE
              10  DCA
              10  STI
              25  INT
              10  AIRESC
               5  ESCSUP
            25  CAS
            05  FSWP
              10  BARCAP
            END.MISSION.CLASS
        END.TIMES
    END.PLANNING.COMMANDS
END.AIR.ALLOCATION
```

COMMAND.DAT

```
COMMANDS.511

AIR/GRD.INFO:.1-AIR;.2-GROUND
STATUS.INFO:..1-ON.LINE;.3-HOLDING.AREA;.4-IN.POSITION;.5-NOT.IN.THEATER

NUMBER.OF.COMMANDS:   33

 1001 "UNEF HQ"
  SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
    1     900      0      2                0         1000000       1000
  WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
   1000       25000       1400000        3      4    0           0
  C3.FACILITIES...ID...QTY
                    2    5
  AD.SITES...ID...QTY
            1001     1
            1002     1
  ORDERS
  END.ORDERS

 1006 "PG CMD"
  SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
    1     900    1001     2                0         1000000       1000
  WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
   1000      380000       380000         3      4    0           0
  C3.FACILITIES...ID...QTY
  AD.SITES...ID...QTY
  ORDERS
  END.ORDERS

 1007 "3RD ARMY"
  SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
    1     700    1001     2                0         100000        1000
  WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
   1000      495000       495000         3      4    0           0
  C3.FACILITIES...ID...QTY
                    2    3
  AD.SITES...ID...QTY
            1001     1
            1002     1
  ORDERS
  END.ORDERS

 1005 "DESERT CMD"
  SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
    1     900    1001     2                0         1000000       1000
  WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
   1000      525000       525000         3      4    0           0
  C3.FACILITIES...ID...QTY
  AD.SITES...ID...QTY
```

```
 ORDERS
 END.ORDERS

1013 "PERSIAN GULF SOUTH"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    900    1006       2                 0          1000000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       190000       190000        2     1   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1008 "PERSIAN GULF NORTH"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    900    1006       2              1013          1000000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       190000       190000        2     1   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1009 "MARINES"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1007       2              1008          300000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       100000       100000        2     1   0            0
 C3.FACILITIES...ID...QTY
                   2    2
 AD.SITES...ID...QTY
          1001     1
          1002     1
 ORDERS
 END.ORDERS

1010 "ARAB CORPS"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1007       2              1009          400000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000        80000        80000        2     1       0            0
 C3.FACILITIES...ID...QTY
                   2    2
 AD.SITES...ID...QTY
          1001     1
          1002     1
 ORDERS
 END.ORDERS
```

```
1020 "VII CORPS"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1007       2            1010         200000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      120000       120000        2     1        0           0
 C3.FACILITIES...ID...QTY
                  2    2
 AD.SITES...ID...QTY
           1001     1
           1002     1
 ORDERS
 END.ORDERS

1021 "XVIII AIRBORNE CORPS"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1007       2            1020         250000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      195000       195000        2     1        0           0
 C3.FACILITIES...ID...QTY
                  2    2
 AD.SITES...ID...QTY
           1001     1
           1002     1
 ORDERS
 END.ORDERS

1012 "DESERT FORCE E"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1005       2            1021           500000        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      175000       175000        2     1   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1014 "DESERT FORCE C"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1005       2            1012         500000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      175000       175000        2     1   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1015 "DESERT FORCE W"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1    600    1005       2            1014           500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      175000       175000        2     1   0            0
 C3.FACILITIES...ID...QTY
```

```
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1102 "USN AIR EAST"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1     900    1001       1               1007              0        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       25000       1400000         3      4    0            0
 C3.FACILITIES...ID...QTY
                      2    3
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1104 "UNEF AF"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1     900    1001       1               1007              0        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       25000       1400000         3      4    0            0
 C3.FACILITIES...ID...QTY
                      2    3
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

1103 "USN AIR WEST"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   1     900    1001       1               1007              0        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       25000       1400000         3      4    0            0
 C3.FACILITIES...ID...QTY
                      2    3
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2001 "IRAQI GENERAL STAFF"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2     900       0       2                   0         500000          1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       10000      1400000         5      4    0            0
 C3.FACILITIES...ID...QTY
                  10002    5
 AD.SITES...ID...QTY
             2001     1
             2002     1
 ORDERS
 END.ORDERS
```

```
2006 "PG CMD"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    600     2001      2                  0          1000000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      380000       380000        4     4   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2107 "IRAQI GRD HQ"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    600   2001       2                 0             0       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      100000       100000        4     4   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2207 "IRAQI GRD HQ"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    600     2001      2                  0            0        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       80000        80000        4     4   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2307 "IRAQI GRD HQ"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    600     2001      2                  0           0          1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      120000       120000        4     4   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2005 "BAGHDAD CMD"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2   600     2001      2                  0        1000000       1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      150000       150000        4     4   0            0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS
```

```
2008 "DESERT CMD"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2   600      2001      2                    0        1000000      1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       570000       570000        4     4   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2009 "PERSIAN GULF SOUTH"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2     600     2006      2                   0         1000000        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       190000       190000        3     1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2010 "PERSIAN GULF NORTH"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2     600     2006      2               2009         1000000        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       190000       190000        3     1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2011 "1 IRAQI ARMY"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2     700     2107      2               2010        1000000      1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       100000       100000        3     1   0           0
 C3.FACILITIES...ID...QTY
                  10002    2
 AD.SITES...ID...QTY
              2001     1
              2002     1
 ORDERS
 END.ORDERS

2012 "2 IRAQI ARMY"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2     700     2207      2                  2011      500000      1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       80000       80000          3     1   0           0
 C3.FACILITIES...ID...QTY
                  10002    2
```

```
 AD.SITES...ID...QTY
           2001    1
           2002    1
 ORDERS
 END.ORDERS


2013 "3 IRAQI ARMY"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    700    2307      2                    2012      500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      120000        120000       3      1   0           0
 C3.FACILITIES...ID...QTY
                 10002    2
 AD.SITES...ID...QTY
           2001    1
           2002    1
 ORDERS
 END.ORDERS

 2014 "DESERT FORCE EAST"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    000    2008      2                    2016      500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      195000        195000       3      1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

 2015 "DESERT FORCE CENTER"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    000    2008      2                    2014      500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      185000        185000       3      1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

 2017 "DESERT FORCE WEST"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    000    2008      2                    2015      500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      190000        190000       3      1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS
```

```
2016 "BAGHDAD FORCE"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    000    2005       2                  2013     500000     1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000      150000        150000        3     1   0           0
 C3.FACILITIES...ID...QTY
 AD.SITES...ID...QTY
 ORDERS
 END.ORDERS

2101 "IRAQI AIR FORCE"
 SIDE..ICON..SUP.CMD..AIR/GRD..CO.LOCATE/ADJ.CMD..OBJECTIVE..AD.RADIUS
   2    900    2001       1             2001                0        1000
 WEIGHT..MIN.WIDTH(M)..OP.WIDTH(M)..ZONE..STATUS...LATITUDE...LONGITUDE
  1000       10000        140000        4     4   0           0
 C3.FACILITIES...ID...QTY
                10002    3
 AD.SITES...ID...QTY
           2001    1
           2002    1
 ORDERS
 END.ORDERS

END.COMMANDS
```

SQUADRON.DAT

```
SQUADRONS.305

NUMBER.OF.MISSION.CLASSES:    7
 AIR.SUPERIORITY
 DEEP.STRIKE
 GROUND.SUPPORT
 JAMMER
 MULTI.ROLE
 RECCE
 WEASEL

NUMBER.OF.SORTIE.PROFILES: 14
 1001 "A-10"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              3.00              4.00
       6.00       2.00          3.00
  END.PROFILE
 1002 "F-16"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              2.60              3.50
       6.00              2.00              3.00
  END.PROFILE
 1003 "RF-4"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              2.50              3.00
       6.00              1.50              2.00
  END.PROFILE
 1004 "F-111"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              2.00              2.50
       6.00              1.20              1.50
  END.PROFILE
 1005 "F-15"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              2.50              3.00
       6.00              2.20              2.50
  END.PROFILE
 1006 "AV-8B"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              3.00              4.00
       6.00       2.00          3.00
  END.PROFILE
 1007 "F/A-18"
  DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
       1.00              3.00              4.00
       6.00              2.50              3.50
  END.PROFILE
```

```
1008 "A-6"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              2.00              2.50
      6.00              1.20              1.50
 END.PROFILE
1009 "F-14"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              3.00              3.50
      6.00              2.20              2.50
 END.PROFILE
2001 "MIG-23"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              3.00              3.00
      6.00              1.20              1.20
 END.PROFILE
2002 "MIRAGE F-1"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              3.50              4.00
      6.00              2.70              2.70
 END.PROFILE
2003 "MIG-21"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              3.00              3.00
      6.00              1.20              1.20
 END.PROFILE
2004 "MIG-29"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              3.00              4.00
      6.00              2.50              2.70
 END.PROFILE
2005 "SU-25"
 DAY.IN.THEATER..AUTH.QTY.SORT/DAY..AC.MAX.SORT/DAY
      1.00              2.20              2.20
      6.00               .80               .80
 END.PROFILE

NUMBER.OF.SQUADRONS:     58

11401 "F14 USN 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102       1009       10          1009         1009
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1013      1002      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
10601 "A6E USN 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1008       12          1008         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1013      1002      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11801 "FA18 USN 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1007       10          1007         1007
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1013      1002      MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

19601 "EA6B USN 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1008       6           1099        1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1013      1002      JAMMER
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0   100   100   100     0     0     0     0   100
  ORDERS
  END.ORDERS

11402 "F14 USN 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1009       10          1009         1009
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1014      1002      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
10602 "A6E USN 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102          1008       12           1008         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1014      1002      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11802 "FA18 USN 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102          1007       10           1007         1007
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1014      1002      MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

19602 "EA6B USN 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102          1008        6          1099         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1014      1002      JAMMER
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0   100   100   100     0     0     0     0   100
  ORDERS
  END.ORDERS

11403 "F14 USN 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1103          1009       10           1009         1009
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1015      1002      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
10603 "A6E USN 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1103          1008        12           1008         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1015      1002       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  8.00 ARRIVE
  END.ORDERS

11803 "FA18 USN 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1103          1007        10           1007         1007
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1015      1002       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  8.00 ARRIVE
  END.ORDERS

19603 "EA6B USN 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1103          1008         6          1099         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1015      1002       JAMMER
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0   100   100   100     0     0     0     0   100
  ORDERS
  8.00 ARRIVE
  END.ORDERS

10604 "A6E USMC 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102          1008        12           1008         1008
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1002      1017       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11804 "FA18 USMC 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1007        10           1007          1007
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1002      1017       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100    100    100    100    100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100    100    100    100      0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

10804 "AV8B USMC 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1102         1006        12           1006          1006
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1002      1017       GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0      0      0      0      0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100      0      0      0      0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11001 "A10 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1001        12           1001          1001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1010      1022       GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0      0      0      0      0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100      0      0      0      0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11002 "A10 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1001        12           1001          1001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1025      1022       GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0      0      0      0      0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100      0      0      0      0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11003 "A10 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1       1104          1001        12            1001          1001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1022        1010        GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  10.00 ARRIVE
  END.ORDERS

11601 "F16 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1       1104          1002        12            1002          1002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1026        1022        MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100    50    50   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

11602 "F16 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1       1104          1002        12            1002          1002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1022        1026        MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

11603 "F16 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1       1104          1002        12            1002          1002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1005        1026        MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100    10    10   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  10.00 ARRIVE
  END.ORDERS
```

```
11604 "WEASEL 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1002        12           1002         1002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1026      1022       WEASEL
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

10401 "RF4 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1003        12           1003         1003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1023      1022       RECCE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0   100     0     0   100
  ORDERS
  END.ORDERS

11101 "F111 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004        6           1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1029      1027       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100    10   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11102 "F111 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004        6           1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1027      1029       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100    10   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11103 "F15E 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004       6          1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1039      1007      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100    10   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11104 "F117 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004       6          1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1007      1004      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100     0     0   100    50
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11105 "TORN IDS 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004       6          1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1016      1018      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11106 "TORN IDS 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1004       6          1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1018      1016      DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11107 "TORN IDS 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104          1004        2            1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
   1021      1016       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11108 "TORN IDS 4"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104          1004        2            1004         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
   1016      1018       DEEP.STRIKE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     0     0     0     0     0     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    50     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

11109 "EF111 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104          1004        6            1099         1004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
   1004      1007       JAMMER
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     0     0     0     0     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     0     0     0     0   100   100   100     0     0     0     0   100
  ORDERS
  END.ORDERS

11501 "F15 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104          1005        6            1005         1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
   1021      1023       AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
   100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11502 "F15 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104         1005       6           1005         1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1023      1021      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

11503 "F15 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104         1005       6           1005         1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1016      1022      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  5.00 ARRIVE
  END.ORDERS

11504 "F15 4"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104         1005       12          1005         1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1022      1016      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  10.00 ARRIVE
  END.ORDERS

11505 "F15 5"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
   1      1104         1005       6           1005         1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1029      1030      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
11506 "F15 6"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1005       2           1005        1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1030      1029      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  15.00 ARRIVE
  END.ORDERS

11507 "TORN ADV 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1005       4           1005        1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1018      1024      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

11508 "TORN ADV 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    1      1104         1005       4           1005        1005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    1024      1018      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100     0     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22901 "MIG29 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101         2004      25           2004        2004
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2010      2013      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
22101 "MIG21 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2013      2010      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0     0    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22102 "MIG21 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2029      2032      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0     0    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22103 "MIG21 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2032      2029      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0     0    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22104 "MIG21 4"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2004      2009      AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0   100    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
22105 "MIG21 5"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2       2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2019       2020       AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0     0    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22106 "MIG21 6"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2       2101          2003        25          2003          2003
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2020       2019       AIR.SUPERIORITY
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100     0     0    30    30     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

20101 "MIRAGE F1 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY .SERVE.KIT.ID..SORT.PROF.ID
    2       2101          2002        25          2002          2002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2023       2022       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0    10     0     0    10    10
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100    10     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

20102 "MIRAGE F1 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2       2101          2002        25          2002          2002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2019       2010       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0    10    30     0    10    10
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100    10     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS
```

```
20103 "MIRAGE F1 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2002        25          2002          2002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2007       2006       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0     0    10     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

20104 "MIRAGE F1 4"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2002        25          2002          2002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2006       2008       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

20105 "MIRAGE F1 5"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2002        25          2002          2002
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2008       2007       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0    50   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0     0     0     0     0   100
  ORDERS
  END.ORDERS

22501 "SU25 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101          2005        25          2005          2005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2001       2005       GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0   100   100     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0     0
  ORDERS
  END.ORDERS
```

```
22502 "SU25 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101         2005        25          2005         2005
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2005       2001       GROUND.SUPPORT
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0     0   100   100     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0     0
  ORDERS
  END.ORDERS

22301 "MIG23 1"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101         2001        25          2001         2001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2003       2004       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

22302 "MIG23 2"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101         2001        25          2001         2001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2011       2012       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100   100   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

22303 "MIG23 3"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2      2101         2001        25          2001         2001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2018       2025       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS
```

```
22304 "MIG23 4"
  SIDE..SUP.CMD.ID..TYPE.AC.ID..AUTH.QTY..SERVE.KIT.ID..SORT.PROF.ID
    2       2101          2001        25          2001         2001
  MOB.ID..DISP.AB.ID..MISSION.CLASS
    2021       2024       MULTI.ROLE
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    100   100     0   100   100     0   100   100   100   100   100
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    100   100   100   100     0     0     0   100     0     0     0   100
  ORDERS
  END.ORDERS

END.SQUADRONS
```

TYPEAC.DAT

```
TYPE.AIR.CRAFT.302

NUMBER.OF.AIRCRAFT.TYPES     14

 1001  "A-10"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
    1       1         2     "FIGHTER"         110         1             2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                  0
    PROB.ENEMY.INT.LAUNCH(0-100)   25
    AD.PROB.ENGAGE                 30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID        0
    RADAR.ID            1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                    30              300
      LOW.PENETRATE               30              300
      HIGH.DASH                 5000              355
      HIGH.PENETRATE            5000              355
      HIGH.CRUISE               5000              355
      CAP.ENEMY                   30              355
      CAP.FRIENDLY                30              355
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  6.5000
    TAKEOFF.LENGTH(METERS)...MISSION   900  DISPERSAL   496
    LANDING.LENGTH(METERS)...MISSION   896  WEATHER  1500  NIGHT   900
    DAMAGED.RWY.FACTOR(METERS)    100
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  4  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE    1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1        1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0    10    90    50    10     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0    50
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     2     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
      1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"             100        400      10000
      "UNIT        "             100        400      10000
      "C3 FACILITY "             100        400      10000
      "SUPPLY TRAIN"             100        400      10000
```

```
    "CKP ARC     "           100        400      10000
    "AIRBASE     "           100        400      10000
    "AD.COMPLEX  "           100        400      10000
    "TRANSSHIP PT"           100        400      10000
    "COMMAND     "           100        400      10000
    "STRATEGIC TARGET"       100        400      10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    23590
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     344   LOW.PENETRATE     344
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    476   CAP.FRIENDLY      476
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                107      2          10            -3.0
                110      4          25             0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    23590
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     344   LOW.PENETRATE     344
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    476   CAP.FRIENDLY      476
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  25  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                105      1          25             0.0
                103      2           0             0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      3
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    23590
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     344   LOW.PENETRATE     344
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    476   CAP.FRIENDLY      476
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
```

```
        MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  106     4         5            0.0
      ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

 1002  "F-16"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   1       1        1      "FIGHTER"        100         1              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                  0
    PROB.ENEMY.INT.LAUNCH(0-100)   25
    AD.PROB.ENGAGE                  30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      101
    RADAR.ID            1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                    61             475
      LOW.PENETRATE               61             475
      HIGH.DASH                10600             550
      HIGH.PENETRATE           10600             550
      HIGH.CRUISE              10600             550
      CAP.ENEMY                   30             550
      CAP.FRIENDLY                30             550
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  3.3000
    TAKEOFF.LENGTH(METERS)...MISSION  1000  DISPERSAL   400
    LANDING.LENGTH(METERS)...MISSION   650  WEATHER  2500  NIGHT   700
    DAMAGED.RWY.FACTOR(METERS)   200
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  4  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1         1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     60    10    60    25    10     0    50    10    50    50    10
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     50    50    50    50     0     0     0    20     0     0     0    20
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     1     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
      1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"             100         400      10000
      "UNIT        "             100         400     150000
```

```
    "C3 FACILITY "              100         400         10000
    "SUPPLY TRAIN"              100         400         10000
    "CKP ARC     "              100         400         10000
    "AIRBASE     "              100         400         10000
    "AD.COMPLEX  "              100         400         10000
    "TRANSSHIP PT"              100         400         10000
    "COMMAND     "              100         400         10000
    "STRATEGIC TARGET"          100         400         10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    15371
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     331    LOW.PENETRATE    331
      HIGH.DASH    265    HIGH.PENETRATE   265    HIGH.CRUISE    265
      CAP.ENEMY    441    CAP.FRIENDLY     441
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  75
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  50  SUP   0  JAM   0  AIRESC  50
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                103      4          0              0.0
                104      2          0              0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    15371
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     331    LOW.PENETRATE    331
      HIGH.DASH    265    HIGH.PENETRATE   265    HIGH.CRUISE    265
      CAP.ENEMY    441    CAP.FRIENDLY     441
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  10  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                108      2         5               0.0
                105      1        20               0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      3
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    15371
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     331    LOW.PENETRATE    331
      HIGH.DASH    265    HIGH.PENETRATE   265    HIGH.CRUISE    265
      CAP.ENEMY    441    CAP.FRIENDLY     441
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
```

```
        BARCAP    0   SUP    0   JAM    0   AIRESC    0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  108       2          5              0.0
                  109       2         25              0.0
      ECM...ID....NUMBER
    CONFIGURATION.NUMBER      4
      DELTA.RCS(SQ.MTRS)     0.0
      FUEL.CAPACITY(LBS)    25000
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     331    LOW.PENETRATE     331
        HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
        CAP.ENEMY    441    CAP.FRIENDLY      441
      LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)   50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP    0   SUP   50   JAM    0   AIRESC    0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  105       1         20              0.0
                  107       2         10              0.0
                  108       2          5              0.0
      ECM...ID....NUMBER
    CONFIGURATION.NUMBER      5
      DELTA.RCS(SQ.MTRS)     0.0
      FUEL.CAPACITY(LBS)    15371
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     331    LOW.PENETRATE     331
        HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
        CAP.ENEMY    441    CAP.FRIENDLY      441
      LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)   50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP    0   SUP    0   JAM    0   AIRESC    0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  110       2         20              0.0
                  105       1         20              0.0
      ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

 1003   "RF-4"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   1       1         2       "RECCE"          100          1             2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)               0
```

```
  PROB.ENEMY.INT.LAUNCH(0-100)  10
  AD.PROB.ENGAGE                30
ONBOARD.EQUIPMENT
  RECCE.SENSOR.ID      102
  RADAR.ID            1003
PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
    LOW.DASH                   100              600
    LOW.PENETRATE              100              600
    HIGH.DASH                10600              447
    HIGH.PENETRATE           10600              447
    HIGH.CRUISE              10600              447
    CAP.ENEMY                  100              447
    CAP.FRIENDLY               100              447
  RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  5.5000
  TAKEOFF.LENGTH(METERS)...MISSION  1200  DISPERSAL   700
  LANDING.LENGTH(METERS)...MISSION   850  WEATHER  2300  NIGHT  1300
  DAMAGED.RWY.FACTOR(METERS)   200
SORTIE.GENERATION.DATA
  FLYING.PERIODS...DAY  4  NIGHT  0
MISSION.DATA
  MIN.FLT.SIZE 1  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
  MAX.TARGETS.PER.SORTIE   1
  DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
  ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                 1       1          1
  MISSION.EFFECTIVENESS.DATA(0-100)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    0     0     0     0     0     0     0     0     0     0     0
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    0     0     0     0     0     0     0     0   100     0     0     0
  MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    2     2     2     2     2     2     1     1     1     1     1
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
    1     1     1     1     1     1     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"              100        400       10000
    "UNIT        "              100        400       10000
    "C3 FACILITY "              100        400       10000
    "SUPPLY TRAIN"              100        400       10000
    "CKP ARC     "              100        400       10000
    "AIRBASE     "              100        400       10000
    "AD.COMPLEX  "              100        400       10000
    "TRANSSHIP PT"              100        400       10000
    "COMMAND     "              100        400       10000
    "STRATEGIC TARGET"          100        400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)    36455
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE    330
```

```
        HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
        CAP.ENEMY    440    CAP.FRIENDLY      440
      LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP   0  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
      ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

 1004  "F-111"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
    1       1         1     "FTR-BOMB"       100         1             2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                  0
    PROB.ENEMY.INT.LAUNCH(0-100)  25
    AD.PROB.ENGAGE                  30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      101
    RADAR.ID            1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                  80              476
      LOW.PENETRATE             80              476
      HIGH.DASH              15600              512
      HIGH.PENETRATE         15600              512
      HIGH.CRUISE            15600              512
      CAP.ENEMY                100              512
      CAP.FRIENDLY             100              512
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  3.7000
    TAKEOFF.LENGTH(METERS)...MISSION  1300  DISPERSAL   750
    LANDING.LENGTH(METERS)...MISSION   950  WEATHER  2300  NIGHT  1300
    DAMAGED.RWY.FACTOR(METERS)   300
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  2  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1      1        1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     0     0     0     0     0     0    75    30    50    75    75
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    25     0     0     0    75    75    75     0     0     0     0    20
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     2     2     2     2     2     2     1     1     1     1     1
```

```
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
   1     1     1     1     2     2     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"            100         400       10000
    "UNIT        "            100         400       10000
    "C3 FACILITY "            100         400       10000
    "SUPPLY TRAIN"            100         400       10000
    "CKP ARC     "            100         400       10000
    "AIRBASE     "            100         400       10000
    "AD.COMPLEX  "            100         400       10000
    "TRANSSHIP PT"            100         400       10000
    "COMMAND     "            100         400       10000
    "STRATEGIC TARGET"        100         400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    80500
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     440   LOW.PENETRATE     440
      HIGH.DASH    256   HIGH.PENETRATE    256   HIGH.CRUISE    256
      CAP.ENEMY    550   CAP.FRIENDLY      550
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM  50  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        120000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
    ECM...ID....NUMBER
         1002       2
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    80500
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     550   LOW.PENETRATE     550
      HIGH.DASH    275   HIGH.PENETRATE    275   HIGH.CRUISE    275
      CAP.ENEMY    660   CAP.FRIENDLY      660
    LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  10  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                105       2         20            0.0
                108       2          5            0.0
    ECM...ID....NUMBER
         1001       2
  CONFIGURATION.NUMBER      3
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    80500
    FUEL.BURN.RATES(LBS/MINUTE)
```

```
      LOW.DASH     550    LOW.PENETRATE     550
      HIGH.DASH    275    HIGH.PENETRATE    275    HIGH.CRUISE    275
      CAP.ENEMY    660    CAP.FRIENDLY      660
    LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                105       2         20             0.0
                109       2         20             0.0
    ECM...ID....NUMBER
         1001       2
  CONFIGURATION.NUMBER      4
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    80500
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     550    LOW.PENETRATE     550
      HIGH.DASH    275    HIGH.PENETRATE    275    HIGH.CRUISE    275
      CAP.ENEMY    660    CAP.FRIENDLY      660
    LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                110       4         20             0.0
    ECM...ID....NUMBER
         1001       2
  END.CONFIGURATIONS
END.AIRCRAFT

 1005  "F-15"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
    1       1         1       "FIGHTER"        100          1              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                  0
    PROB.ENEMY.INT.LAUNCH(0-100)    25
    AD.PROB.ENGAGE                  30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      101
    RADAR.ID            1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                    80               476
      LOW.PENETRATE               80               476
      HIGH.DASH                12600               557
      HIGH.PENETRATE           12600               557
      HIGH.CRUISE              12600               557
      CAP.ENEMY                  100               557
```

```
    CAP.FRIENDLY                100              557
  RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  6.5000
  TAKEOFF.LENGTH(METERS)...MISSION  1300  DISPERSAL   550
  LANDING.LENGTH(METERS)...MISSION   950  WEATHER  2000  NIGHT  1025
  DAMAGED.RWY.FACTOR(METERS)   250
SORTIE.GENERATION.DATA
  FLYING.PERIODS...DAY  3  NIGHT  2
MISSION.DATA
  MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
  MAX.TARGETS.PER.SORTIE   1
  DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
  ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                  1       1          1
  MISSION.EFFECTIVENESS.DATA(0-100)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
   50    75    50    60    75     0     0     0     0     0     0
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    0     0     0     0     0     0     0    75     0     0     0     0
  MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    2     2     2     2     2     2     1     1     1     1     1
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
    1     1     1     1     1     1     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"             100         400       10000
    "UNIT         "            100         400       10000
    "C3 FACILITY "             100         400       10000
    "SUPPLY TRAIN"             100         400       10000
    "CKP ARC      "            100         400       10000
    "AIRBASE      "            100         400       10000
    "AD.COMPLEX  "             100         400       10000
    "TRANSSHIP PT"             100         400       10000
    "COMMAND      "            100         400       10000
    "STRATEGIC TARGET"         100         400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    38660
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     385   LOW.PENETRATE     385
      HIGH.DASH    220   HIGH.PENETRATE    220   HIGH.CRUISE    220
      CAP.ENEMY    550   CAP.FRIENDLY      550
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  90
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  75  SUP   0  JAM   0  AIRESC  75
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                102       1          0              0.0
                103       1          0              0.0
                102       1          0              0.0
```

```
                  103      1          0            0.0
                  102      1          0            0.0
                  103      1          0            0.0
                  102      1          0            0.0
                  103      1          0            0.0
                  104      2          0            0.0
      ECM...ID....NUMBER
    END.CONFIGURATIONS
  END.AIRCRAFT

   1006  "AV-8B"

  SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
     1      1        2     "FIGHTER"       110          1              2
    RPV.DATA(0.FOR.NON.RPV)
      RPV.TYPE(0,1,2)                0
      PROB.ENEMY.INT.LAUNCH(0-100)  25
      AD.PROB.ENGAGE                30
    ONBOARD.EQUIPMENT
      RECCE.SENSOR.ID       0
      RADAR.ID           1003
    PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
        LOW.DASH                  30             420
        LOW.PENETRATE             30             420
        HIGH.DASH               5000             550
        HIGH.PENETRATE          5000             550
        HIGH.CRUISE             5000             550
        CAP.ENEMY                 30             550
        CAP.FRIENDLY              30             550
      RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  4.0000
      TAKEOFF.LENGTH(METERS)...MISSION   100  DISPERSAL   100
      LANDING.LENGTH(METERS)...MISSION    50  WEATHER   100  NIGHT   100
      DAMAGED.RWY.FACTOR(METERS)   100
    SORTIE.GENERATION.DATA
      FLYING.PERIODS...DAY  4  NIGHT  2
    MISSION.DATA
      MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
      MAX.TARGETS.PER.SORTIE   1
      DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
      ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                      1      1        1
      MISSION.EFFECTIVENESS.DATA(0-100)
    ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
       0     0     0     0     0     0    10    90    50    10     0
    .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
       0     0     0     0     0     0     0     0     0     0     0    50
      MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
    ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
       2     2     2     2     2     2     1     1     1     1     1
    .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
       1     1     1     1     1     1     1     1     1     2     2
      TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
```

```
      "LOG FACILITY"            100        400      10000
      "UNIT        "            100        400      10000
      "C3 FACILITY "            100        400      10000
      "SUPPLY TRAIN"            100        400      10000
      "CKP ARC     "            100        400      10000
      "AIRBASE     "            100        400      10000
      "AD.COMPLEX  "            100        400      10000
      "TRANSSHIP PT"            100        400      10000
      "COMMAND     "            100        400      10000
      "STRATEGIC TARGET"        100        400      10000
  CONFIGURATION.DATA
    CONFIGURATION.NUMBER      1
      DELTA.RCS(SQ.MTRS)     0.0
      FUEL.CAPACITY(LBS)   23590
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     344   LOW.PENETRATE     344
        HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE    265
        CAP.ENEMY    476   CAP.FRIENDLY      476
      LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP  10  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  105      1          25             0.0
      ECM...ID....NUMBER
    CONFIGURATION.NUMBER      2
      DELTA.RCS(SQ.MTRS)     0.0
      FUEL.CAPACITY(LBS)   23590
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     344   LOW.PENETRATE     344
        HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE    265
        CAP.ENEMY    476   CAP.FRIENDLY      476
      LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP   0  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  106      4          5              0.0
      ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

 1007  "F/A-18"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   1       1        1      "FIGHTER"        100         1           2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)              0
```

```
  PROB.ENEMY.INT.LAUNCH(0-100)  25
  AD.PROB.ENGAGE                30
ONBOARD.EQUIPMENT
  RECCE.SENSOR.ID     101
  RADAR.ID           1003
PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
    LOW.DASH                 61            475
    LOW.PENETRATE            61            475
    HIGH.DASH             10600            550
    HIGH.PENETRATE        10600            550
    HIGH.CRUISE           10600            550
    CAP.ENEMY                30            550
    CAP.FRIENDLY             30            550
  RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  3.3000
  TAKEOFF.LENGTH(METERS)...MISSION  1000  DISPERSAL   400
  LANDING.LENGTH(METERS)...MISSION   650  WEATHER  2500  NIGHT   700
  DAMAGED.RWY.FACTOR(METERS)   200
SORTIE.GENERATION.DATA
  FLYING.PERIODS...DAY  3  NIGHT  2
MISSION.DATA
  MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
  MAX.TARGETS.PER.SORTIE   1
  DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
  ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                 1       1          1
  MISSION.EFFECTIVENESS.DATA(0-100)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
  60    10    60    25    10     0    50    10    50    50    10
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
  50    50    50    50     0     0     0    25     0     0     0    20
  MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
   2     2     2     2     1     2     1     1     1     1     1
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
   1     1     1     1     1     1     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"            100        400      10000
    "UNIT         "           100        400     150000
    "C3 FACILITY "            100        400      10000
    "SUPPLY TRAIN"            100        400      10000
    "CKP ARC      "           100        400      10000
    "AIRBASE      "           100        400      10000
    "AD.COMPLEX  "            100        400      10000
    "TRANSSHIP PT"            100        400      10000
    "COMMAND      "           100        400      10000
    "STRATEGIC TARGET"        100        400      10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)   35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     331   LOW.PENETRATE    331
```

```
    HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
    CAP.ENEMY    380    CAP.FRIENDLY      380
  LAUNCHES/AIR.ENGAGEMENT   2   DEGREE.COMMAND&CONTROL(0-100)   50
  CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
    BARCAP  50  SUP    0  JAM    0  AIRESC  50
    MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
    MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
    MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
  MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
              101       1          0            0.0
              103       1          0            0.0
              101       1          0            0.0
              103       1          0            0.0
              104       2          0            0.0
  ECM...ID....NUMBER
CONFIGURATION.NUMBER      2
  DELTA.RCS(SQ.MTRS)     0.0
  FUEL.CAPACITY(LBS)    35000
  FUEL.BURN.RATES(LBS/MINUTE)
    LOW.DASH     331    LOW.PENETRATE     331
    HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
    CAP.ENEMY    380    CAP.FRIENDLY      380
  LAUNCHES/AIR.ENGAGEMENT   1   DEGREE.COMMAND&CONTROL(0-100)   75
  CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
    BARCAP   0  SUP   50  JAM    0  AIRESC   0
    MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
    MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
    MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
  MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
              103       2         0             0.0
              104       2         0             0.0
              107       4        10             0.0
  ECM...ID....NUMBER
CONFIGURATION.NUMBER      3
  DELTA.RCS(SQ.MTRS)     0.0
  FUEL.CAPACITY(LBS)    35000
  FUEL.BURN.RATES(LBS/MINUTE)
    LOW.DASH     331    LOW.PENETRATE     331
    HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
    CAP.ENEMY    380    CAP.FRIENDLY      380
  LAUNCHES/AIR.ENGAGEMENT   1   DEGREE.COMMAND&CONTROL(0-100)   50
  CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
    BARCAP   0  SUP    0  JAM    0  AIRESC   0
    MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
    MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
    MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
  MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
              103       2         0             0.0
              104       2         0             0.0
              106       4         5             0.0
  ECM...ID....NUMBER
CONFIGURATION.NUMBER      4
```

```
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)   35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     331   LOW.PENETRATE     331
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    380   CAP.FRIENDLY      380
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  10  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                103      2         0              0.0
                104      2         0              0.0
                105      1        20              0.0
    ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

 1008  "A-6"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   1       1        1      "FTR-BOMB"       110          1              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)              0
    PROB.ENEMY.INT.LAUNCH(0-100)  25
    AD.PROB.ENGAGE               30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      101
    RADAR.ID           1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                  80             420
      LOW.PENETRATE             80             420
      HIGH.DASH              15600             512
      HIGH.PENETRATE         15600             512
      HIGH.CRUISE            15600             512
      CAP.ENEMY                100             512
      CAP.FRIENDLY             100             512
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  6.7000
    TAKEOFF.LENGTH(METERS)...MISSION  1300  DISPERSAL   750
    LANDING.LENGTH(METERS)...MISSION   950  WEATHER  2300  NIGHT  1300
    DAMAGED.RWY.FACTOR(METERS)   300
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  3  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1          1
    MISSION.EFFECTIVENESS.DATA(0-100)
```

```
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
   0     0     0     0     0     0    75    30    50    75    75
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
  25     0     0     0    75    75    75     0     0     0     0    20
  MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
   2     2     2     2     2     2     1     1     1     1     1
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
   1     1     1     1     2     2     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"             100         400       10000
    "UNIT        "             100         400       10000
    "C3 FACILITY "             100         400       10000
    "SUPPLY TRAIN"             100         400       10000
    "CKP ARC     "             100         400       10000
    "AIRBASE     "             100         400       10000
    "AD.COMPLEX  "             100         400       10000
    "TRANSSHIP PT"             100         400       10000
    "COMMAND     "             100         400       10000
    "STRATEGIC TARGET"         100         400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)   70500
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     440   LOW.PENETRATE    440
      HIGH.DASH    256   HIGH.PENETRATE   256   HIGH.CRUISE   256
      CAP.ENEMY    550   CAP.FRIENDLY     550
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM  50  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST      5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH       120000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
    ECM...ID....NUMBER
         1002       2
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)   70500
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     550   LOW.PENETRATE    550
      HIGH.DASH    275   HIGH.PENETRATE   275   HIGH.CRUISE   275
      CAP.ENEMY    660   CAP.FRIENDLY     660
    LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  10  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST      5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
               105       2          20              0.0
```

```
      ECM...ID....NUMBER
           1001       1
    CONFIGURATION.NUMBER     3
      DELTA.RCS(SQ.MTRS)    0.0
      FUEL.CAPACITY(LBS)   70500
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.D^SH     550   LOW.PENETRATE    550
        HIGH.DASH    275   HIGH.PENETRATE   275   HIGH.CRUISE   275
        CAP.ENEMY    660   CAP.FRIENDLY     660
      LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP   0  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  105      1         20             0.0
                  109      2         20             0.0
      ECM...ID....NUMBER
           1001       1
    CONFIGURATION.NUMBER     4
      DELTA.RCS(SQ.MTRS)    0.0
      FUEL.CAPACITY(LBS)   70500
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     550   LOW.PENETRATE    550
        HIGH.DASH    275   HIGH.PENETRATE   275   HIGH.CRUISE   275
        CAP.ENEMY    660   CAP.FRIENDLY     660
      LAUNCHES/AIR.ENGAGEMENT  0  DEGREE.COMMAND&CONTROL(0-100)  50
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP   0  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  110      4         20             0.0
      ECM...ID....NUMBER
           1001       1
  END.CONFIGURATIONS
END.AIRCRAFT

 1009  "F-14"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   1       1        1      "FIGHTER"        100          1             2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)               0
    PROB.ENEMY.INT.LAUNCH(0-100)  25
    AD.PROB.ENGAGE                30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      101
    RADAR.ID            1003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
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      LOW.DASH                  80              476
      LOW.PENETRATE             80              476
      HIGH.DASH              12600              557
      HIGH.PENETRATE         12600              557
      HIGH.CRUISE            12600              557
      CAP.ENEMY                100              557
      CAP.FRIENDLY             100              557
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  6.5000
    TAKEOFF.LENGTH(METERS)...MISSION  1300  DISPERSAL   550
    LANDING.LENGTH(METERS)...MISSION   950  WEATHER  2000  NIGHT  1025
    DAMAGED.RWY.FACTOR(METERS)   250
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  3  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  180
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1          1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     50    75    50    60    75     0     0     0     0     0     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0    75     0     0     0     0
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     2     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
      1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"            100        400      10000
      "UNIT        "            100        400      10000
      "C3 FACILITY "            100        400      10000
      "SUPPLY TRAIN"            100        400      10000
      "CKP ARC     "            100        400      10000
      "AIRBASE     "            100        400      10000
      "AD.COMPLEX  "            100        400      10000
      "TRANSSHIP PT"            100        400      10000
      "COMMAND     "            100        400      10000
      "STRATEGIC TARGET"        100        400      10000
  CONFIGURATION.DATA
    CONFIGURATION.NUMBER      1
      DELTA.RCS(SQ.MTRS)     0.0
      FUEL.CAPACITY(LBS)   50000
      FUEL.BURN.RATES(LBS/MINUTE)
        LOW.DASH     385   LOW.PENETRATE     385
        HIGH.DASH    220   HIGH.PENETRATE    220   HIGH.CRUISE    220
        CAP.ENEMY    400   CAP.FRIENDLY      400
      LAUNCHES/AIR.ENGAGEMENT  3  DEGREE.COMMAND&CONTROL(0-100)  90
      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP  75  SUP   0  JAM   0  AIRESC  75
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
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        MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  102      1          0            0.0
                  103      1          0            0.0
                  102      1          0            0.0
                  103      1          0            0.0
                  102      1          0            0.0
                  103      1          0            0.0
                  102      1          0            0.0
                  103      1          0            0.0
                  104      2          0            0.0
      ECM...ID....NUMBER
    END.CONFIGURATIONS
  END.AIRCRAFT

   2001  "MIG-23"

  SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
     2       2         1      "FIGHTER"         200          2             2
    RPV.DATA(0.FOR.NON.RPV)
      RPV.TYPE(0,1,2)               0
      PROB.ENEMY.INT.LAUNCH(0-100) 100
      AD.PROB.ENGAGE                30
    ONBOARD.EQUIPMENT
      RECCE.SENSOR.ID      201
      RADAR.ID            2003
    PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
        LOW.DASH                   100              470
        LOW.PENETRATE              100              470
        HIGH.DASH                10000              440
        HIGH.PENETRATE           10000              440
        HIGH.CRUISE              10000              440
        CAP.ENEMY                  100              440
        CAP.FRIENDLY               100              440
      RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  5.5000
      TAKEOFF.LENGTH(METERS)...MISSION  1100  DISPERSAL   750
      LANDING.LENGTH(METERS)...MISSION   950  WEATHER  1500  NIGHT  1225
      DAMAGED.RWY.FACTOR(METERS)   150
    SORTIE.GENERATION.DATA
      FLYING.PERIODS...DAY  3  NIGHT  1
    MISSION.DATA
      MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
      MAX.TARGETS.PER.SORTIE    1
      DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  240
      ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                       1       1          1
      MISSION.EFFECTIVENESS.DATA(0-100)
    ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
       60    50    60    50    25     0    20    10    50    20    10
    .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
        0     0     0    20     0     0     0    20     0     0     0    20
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```
  MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    2     2     2     2     2     2     1     1     1     1     1
.DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
    1     1     1     1     1     1     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"            100        400       10000
    "UNIT        "            100        400       10000
    "C3 FACILITY "            100        400       10000
    "SUPPLY TRAIN"            100        400       10000
    "CKP ARC     "            100        400       10000
    "AIRBASE     "            100        400       10000
    "AD.COMPLEX  "            100        400       10000
    "TRANSSHIP PT"            100        400       10000
    "COMMAND     "            100        400       10000
    "STRATEGIC TARGET"        100        400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    11618
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE     330
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  20
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  30  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                204      1          25             0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    11618
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE     330
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE   265
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  20
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  40  SUP   0  JAM   0  AIRESC  30
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                201      1          0              0.0
                202      1          0              0.0
                201      1          0              0.0
                202      1          0              0.0
    ECM...ID....NUMBER
```

```
  END.CONFIGURATIONS
END.AIRCRAFT

 2002  "MIRAGE F-1"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   2       2         1      "FIGHTER"         200           4              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                  0
    PROB.ENEMY.INT.LAUNCH(0-100) 100
    AD.PROB.ENGAGE                  30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      201
    RADAR.ID            2003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                  100              475
      LOW.PENETRATE             100              475
      HIGH.DASH                9950              553
      HIGH.PENETRATE           9950              553
      HIGH.CRUISE              9950              553
      CAP.ENEMY                 100              553
      CAP.FRIENDLY              100              553
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  4.4000
    TAKEOFF.LENGTH(METERS)...MISSION   900  DISPERSAL   650
    LANDING.LENGTH(METERS)...MISSION   950  WEATHER  1000  NIGHT   925
    DAMAGED.RWY.FACTOR(METERS)   150
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  3  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  240
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1          1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     40    60    40    40    50     0    20     5    10    20    30
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
     40     0     0    50     0     0     0    30     0     0     0    20
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     2     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
      1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"             100          400       10000
      "UNIT        "             100          400       10000
      "C3 FACILITY "             100          400       10000
      "SUPPLY TRAIN"             100          400       10000
      "CKP ARC     "             100          400       10000
      "AIRBASE     "             100          400       10000
      "AD.COMPLEX  "             100          400       10000
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    "TRANSSHIP PT"            100        400       10000
    "COMMAND     "            100        400       10000
    "STRATEGIC TARGET"        100        400       10000
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330    LOW.PENETRATE     330
      HIGH.DASH    265    HIGH.PENETRATE    265    HIGH.CRUISE    265
      CAP.ENEMY    340    CAP.FRIENDLY      340
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  25
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  50  SUP   0  JAM   0  AIRESC  40
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                203      1          0            0.0
                202      1          0            0.0
                203      1          0            0.0
                202      1          0            0.0
                208      2          0            0.0
    ECM...ID....NUMBER
         2001       1
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     352    LOW.PENETRATE     352
      HIGH.DASH    287    HIGH.PENETRATE    287    HIGH.CRUISE    287
      CAP.ENEMY    440    CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  25
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  50  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                206      2         15            0.0
                207      2         10            0.0
                208      2          0            0.0
    ECM...ID....NUMBER
         2001       1
  CONFIGURATION.NUMBER      3
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    42000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     352    LOW.PENETRATE     352
      HIGH.DASH    287    HIGH.PENETRATE    287    HIGH.CRUISE    287
      CAP.ENEMY    440    CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  25
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      CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
        BARCAP   0  SUP  50  JAM   0  AIRESC   0
        MAX.SEAD.ORBIT.TO.WPN.REL.DIST        5000
        MAX.SEAD.ORBIT.PT.PEN.DEPTH          80000
        MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)    25
      MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                  204      1        20            0.0
                  208      2         0            0.0
      ECM...ID....NUMBER
           2001      1
  END.CONFIGURATIONS
END.AIRCRAFT

 2003  "MIG-21"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
    2       2          1      "FIGHTER"        200          1              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                0
    PROB.ENEMY.INT.LAUNCH(0-100) 100
    AD.PROB.ENGAGE                30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      201
    RADAR.ID            2003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                  100             470
      LOW.PENETRATE             100             470
      HIGH.DASH               10000             500
      HIGH.PENETRATE          10000             500
      HIGH.CRUISE             10000             500
      CAP.ENEMY                 100             500
      CAP.FRIENDLY              100             500
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  5.5000
    TAKEOFF.LENGTH(METERS)...MISSION  1100  DISPERSAL   750
    LANDING.LENGTH(METERS)...MISSION   950  WEATHER  1500  NIGHT  1225
    DAMAGED.RWY.FACTOR(METERS)   150
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  4  NIGHT  0
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE    1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  240
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1      1          1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     60    50    60    50    25     0    20    10    50    20    10
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0    20     0     0     0    20     0     0     0    20
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     2     2     1     1     1     1     1
```

```
 .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
    1     1     1     1     1     1     1     1     1     2     2
  TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
    "LOG FACILITY"          100        400      10000
    "UNIT        "          100        400      10000
    "C3 FACILITY "          100        400      10000
    "SUPPLY TRAIN"          100        400      10000
    "CKP ARC     "          100        400      10000
    "AIRBASE     "          100        400      10000
    "AD.COMPLEX  "          100        400      10000
    "TRANSSHIP PT"          100        400      10000
    "COMMAND     "          100        400      10000
    "STRATEGIC TARGET"      100        400      10000
 CONFIGURATION.DATA
  CONFIGURATION.NUMBER     1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    11618
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE     330
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE    265
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  20
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  30  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                204       1         30             0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER     2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)    11618
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE     330
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE    265
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  20
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  40  SUP   0  JAM   0  AIRESC  30
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH         80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                201       1          0             0.0
                202       1          0             0.0
                201       1          0             0.0
                202       1          0             0.0
    ECM...ID....NUMBER
 END.CONFIGURATIONS
END.AIRCRAFT
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2004  "MIG-29"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   2       2          1      "FIGHTER"        200          8             2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                0
    PROB.ENEMY.INT.LAUNCH(0-100) 100
    AD.PROB.ENGAGE                30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID      201
    RADAR.ID            2003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                   50              475
      LOW.PENETRATE              50              475
      HIGH.DASH                9950              553
      HIGH.PENETRATE           9950              553
      HIGH.CRUISE              9950              553
      CAP.ENEMY                 100              553
      CAP.FRIENDLY              100              553
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  4.4000
    TAKEOFF.LENGTH(METERS)...MISSION    900  DISPERSAL   650
    LANDING.LENGTH(METERS)...MISSION    950  WEATHER  1000  NIGHT   925
    DAMAGED.RWY.FACTOR(METERS)   150
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  3  NIGHT  2
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  240
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1          1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
    40    60    40    40    50     0    20     5    10    20    30
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
    40     0     0    50     0     0     0    30     0     0     0    20
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
     2     2     2     2     2     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
     1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"           100         400       10000
      "UNIT        "           100         400       10000
      "C3 FACILITY "           100         400       10000
      "SUPPLY TRAIN"           100         400       10000
      "CKP ARC     "           100         400       10000
      "AIRBASE     "           100         400       10000
      "AD.COMPLEX  "           100         400       10000
      "TRANSSHIP PT"           100         400       10000
      "COMMAND     "           100         400       10000
      "STRATEGIC TARGET"       100         400       10000
```

```
CONFIGURATION.DATA
  CONFIGURATION.NUMBER      1
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)   35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE     330
      HIGH.DASH    265   HIGH.PENETRATE    265   HIGH.CRUISE    265
      CAP.ENEMY    340   CAP.FRIENDLY      340
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  25
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP  50  SUP   0  JAM   0  AIRESC  40
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                203       1          0            0.0
                202       1          0            0.0
                203       1          0            0.0
                202       1          0            0.0
                208       2          0            0.0
    ECM...ID....NUMBER
  CONFIGURATION.NUMBER      2
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)   35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     352   LOW.PENETRATE     352
      HIGH.DASH    287   HIGH.PENETRATE    287   HIGH.CRUISE    287
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  25
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  50  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                206       2         15            0.0
                207       2         10            0.0
    ECM...ID....NUMBER
         2001      1
  CONFIGURATION.NUMBER      3
    DELTA.RCS(SQ.MTRS)     0.0
    FUEL.CAPACITY(LBS)   35000
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     352   LOW.PENETRATE     352
      HIGH.DASH    287   HIGH.PENETRATE    287   HIGH.CRUISE    287
      CAP.ENEMY    440   CAP.FRIENDLY      440
    LAUNCHES/AIR.ENGAGEMENT  1  DEGREE.COMMAND&CONTROL(0-100)  25
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP  50  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST       5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
```

```
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
                204      1         20            0.0
                202      2          0            0.0
    ECM...ID....NUMBER
         2001       1
  END.CONFIGURATIONS
END.AIRCRAFT

 2005  "SU-25"

SIDE...WX.CAP...NUC.CAP...TGT.CLASS...TGT.INDEX...OCA.TGT.PRIORITY..GRAPH
   2       1        2      "FIGHTER"        210          2              2
  RPV.DATA(0.FOR.NON.RPV)
    RPV.TYPE(0,1,2)                 0
    PROB.ENEMY.INT.LAUNCH(0-100) 100
    AD.PROB.ENGAGE                 30
  ONBOARD.EQUIPMENT
    RECCE.SENSOR.ID       0
    RADAR.ID          2003
  PERFORMANCE.DATA.....ALTITUDE(METERS)...SPEED(KNOTS)
      LOW.DASH                     60           300
      LOW.PENETRATE                60           300
      HIGH.DASH                  5000           355
      HIGH.PENETRATE             5000           355
      HIGH.CRUISE                5000           355
      CAP.ENEMY                   100           355
      CAP.FRIENDLY                100           355
    RADAR.CROSS.SECT(DEC.SQ.METERS)...EW.FREQ  6.5000
    TAKEOFF.LENGTH(METERS)...MISSION  1300  DISPERSAL   750
    LANDING.LENGTH(METERS)...MISSION  1150  WEATHER  1500  NIGHT  1625
    DAMAGED.RWY.FACTOR(METERS)   150
  SORTIE.GENERATION.DATA
    FLYING.PERIODS...DAY  3  NIGHT  0
  MISSION.DATA
    MIN.FLT.SIZE 2  ORBIT.WIDTH(MTRS)  40000  ORBIT.DEPTH(MTRS)  50000
    MAX.TARGETS.PER.SORTIE   1
    DURATION.OF.ALERT.WITHOUT.LAUNCH(MINUTES)  108
    ESCORT.WITH....AIR...JAMMER...SUPPRESSOR...(1=YES,2=NO)
                    1       1         1
    MISSION.EFFECTIVENESS.DATA(0-100)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      0     0     0     0     0     0    10    90    50    10     0
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC..RESV
      0     0     0     0     0     0     0     0     0     0     0    50
    MISSION.ALTITUDE.DATA(1=LOW,2=HIGH)
  ..DCA..ODCA..BDEF..BARC..FSWP...RCA...STI...CAS...BAI...INT...OCA
      2     2     2     2     2     2     1     1     1     1     1
  .DSED..SSUP..CSUP..ESUP..SJAM..CJAM..EJAM..EAIR..RECC...AEW..SREC
      1     1     1     1     1     1     1     1     1     2     2
    TGT.DETECT.DATA(METERS)...MIN.CEIL...MIN.VIS...MAX.DIST
      "LOG FACILITY"             100        400      10000
      "UNIT        "             100        400      10000
```

```
    "C3 FACILITY "          100       400      10000
    "SUPPLY TRAIN"          100       400      10000
    "CKP ARC     "          100       400      10000
    "AIRBASE     "          100       400      10000
    "AD.COMPLEX  "          100       400      10000
    "TRANSSHIP PT"          100       400      10000
    "COMMAND     "          100       400      10000
    "STRATEGIC TARGET"      100       400      10000
  CONFIGURATION.DATA
   CONFIGURATION.NUMBER     1
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)   34250
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE    330
      HIGH.DASH    265   HIGH.PENETRATE   265   HIGH.CRUISE   265
      CAP.ENEMY    440   CAP.FRIENDLY     440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST      5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
              204      1         25             0.0
    ECM...ID....NUMBER
   CONFIGURATION.NUMBER     2
    DELTA.RCS(SQ.MTRS)    0.0
    FUEL.CAPACITY(LBS)   34250
    FUEL.BURN.RATES(LBS/MINUTE)
      LOW.DASH     330   LOW.PENETRATE    330
      HIGH.DASH    265   HIGH.PENETRATE   265   HIGH.CRUISE   265
      CAP.ENEMY    440   CAP.FRIENDLY     440
    LAUNCHES/AIR.ENGAGEMENT  2  DEGREE.COMMAND&CONTROL(0-100)  50
    CONFIGURATION.MISSION.EFFECTIVENESS(0-100)
      BARCAP   0  SUP   0  JAM   0  AIRESC   0
      MAX.SEAD.ORBIT.TO.WPN.REL.DIST      5000
      MAX.SEAD.ORBIT.PT.PEN.DEPTH        80000
      MAX.CLOSE.IN.ORBIT.TIME...(MINUTES)   25
    MUNITIONS...ID....NUMBER...CEP(METERS)...DELTA.RCS(SQ.MTRS)
              205      4         10             0.0
    ECM...ID....NUMBER
  END.CONFIGURATIONS
END.AIRCRAFT

END.TYPE.AIRCRAFT
```

UNITS.DAT

```
UNITS.533

POSTURE.INFO:.1-PURSUIT;.2-ATK.VS.DELAY;.3-ATK.VS.DEFEND;.4-STATIC;
              5-DEFEND;.6-DELAY;.7-WITHDRAW
STATUS.INFO:..1-ON.LINE;.2-SECOND.ECHELON;.3-HOLDING.AREA;
              5-NOT.IN.THEATER;.8-SUPPORT

....INITIAL.POSTURE...DAYS.AMMO...DAYS.DRY.BULK...DAYS.POL...DAYS.WATER
BLUE         3             10          10             10         10
RED          5             10          10             10         10

NUMBER.OF.UNITS:    74

 1101 "1 SAUDI DIV"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1002   1     1009          1          1   0            0
  ORDERS
  END.ORDERS

 1102 "1 MARINE EF"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1007   1     1009          1          1   0            0
  ORDERS
  END.ORDERS

 1103 "2 MARINE EF"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1007   1     1009          1          1   0            0
  ORDERS
  END.ORDERS

 1201 "3RD EGYPTIAN MECH DIV"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1002   1     1010          1          1   0            0
  ORDERS
  END.ORDERS

@ 1202 "4TH EGYPTIAN ARM DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1001   1     1010          1          1   0            0
@  ORDERS
@  END.ORDERS

 1203 "9TH SYRIAN ARM DIV"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1001   1     1010          1          1   0            0
  ORDERS
  END.ORDERS
```

```
@ 1301 "1 UK ARM DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1006   1     1020          1          1   0            0
@  ORDERS
@  END.ORDERS

@ 1302 "1 US ARM DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1006   1     1020          1          1   0            0
@  ORDERS
@  END.ORDERS

 1303 "2 US CAV RGT"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1003   1     1020          1          1   0            0
  ORDERS
  END.ORDERS

 1304 "3 US ARM DIV"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1001   1     1020          1          1   0            0
  ORDERS
  END.ORDERS

@ 1305 "1 US INF DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1002   1     1020          1          1   0            0
@  ORDERS
@  END.ORDERS

 1306 "11 US AVTN BGD"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1009   1     1020          2          8   0            0
  ORDERS
  END.ORDERS

 1307 "VII CORPS ARTY"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1006   1     1020          1          8   0            0
  ORDERS
  END.ORDERS

 1308 "VII CORPS AD BN"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    1   1010   1     1020          2          8   0            0
  ORDERS
  END.ORDERS
```

```
@ 1401 "24 US MECH DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1002   1     1021          1          1   0           0
@  ORDERS
@  END.ORDERS

@ 1402 "1ST US CAV DIV"
@  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
@    1   1001   1     1021          1          1   0           0
@  ORDERS
@  END.ORDERS

  1403 "3RD US CAV RGT"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1006   1     1021          1          1   0           0
   ORDERS
   END.ORDERS

  1404 "101ST US AIRBORNE DIV"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1008   1     1021          1          1   0           0
   ORDERS
   END.ORDERS

  1405 "82ND US AIRBORNE DIV"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1008   1     1021          1          1   0           0
   ORDERS
   END.ORDERS

  1406 "6TH FR LIGHT ARM DIV"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1006   1     1021          1          1   0           0
   ORDERS
   END.ORDERS

  1407 "XVIII CORPS ARTY"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1006   1     1021          1          8   0           0
   ORDERS
   END.ORDERS

  1408 "XVIII CORPS AD BN"
   SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
     1   1010   1     1021          2          8   0           0
   ORDERS
   END.ORDERS
```

```
1031 "PG"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1013          1           1   0            0
 ORDERS
 END.ORDERS

1032 "PG"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1013          1           1   0            0
 ORDERS
 END.ORDERS

1033 "PG"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1008          1           1   0            0
 ORDERS
 END.ORDERS

1034 "PG"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1008          1           1   0            0
 ORDERS
 END.ORDERS

1043 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1012          1           1   0            0
 ORDERS
 END.ORDERS

1044 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1014          1           1   0            0
 ORDERS
 END.ORDERS

1045 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   1   1006   1     1015          1           1   0            0
 ORDERS
 END.ORDERS

2101 "1 1 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1           1   0            0
 ORDERS
 END.ORDERS
```

```
2102 "1 2 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          1   0            0
 ORDERS
 END.ORDERS

2103 "1 3 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          1   0            0
 ORDERS
 END.ORDERS

2104 "1 4 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          1   0            0
 ORDERS
 END.ORDERS

2105 "1 5 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          1   0            0
 ORDERS
 END.ORDERS

2106 "1 6 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   2     2011          1          2   0            0
 ORDERS
 END.ORDERS

2107 "1 7 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   2     2011          1          2   0            0
 ORDERS
 END.ORDERS

2108 "1 8 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          3   29D18.0M-N   47D45.3M-E
 ORDERS
 END.ORDERS

2109 "1 9 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          3   29D16.7M-N   47D57.4M-E
 ORDERS
 END.ORDERS
```

```
2110 "1 10 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          3   29D07.1M-N   48D05.7M-E
 ORDERS
 END.ORDERS

2111 "1 11 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          3   29D07.7M-N   47D54.3M-E
 ORDERS
 END.ORDERS

2112 "1 12 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2011          1          3   28D59.9M-N   48D00.7M-E
 ORDERS
 END.ORDERS

2201 "2 1 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2012          1          1   0            0
 ORDERS
 END.ORDERS

2202 "2 2 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2012          1          1   0            0
 ORDERS
 END.ORDERS

2203 "2 3 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2012          1          1   0            0
 ORDERS
 END.ORDERS

2204 "2 4 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   1     2012          1          1   0            0
 ORDERS
 END.ORDERS

2205 "2 5 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003   2     2012          1          2   0            0
 ORDERS
 END.ORDERS
```

```
2206 "2 6 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003    1      2012          1          3   29D45.2M-N   47D58.9M-E
 ORDERS
 END.ORDERS

2207 "2 7 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003    1      2012          1          3   30D03.7M-N   48D02.3M-E
 ORDERS
 END.ORDERS

2208 "2 8 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003    2      2012          1          3   30D22.6M-N   48D02.7M-E
 ORDERS
 END.ORDERS

2209 "2 9 MD"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2002    2      2012          1          3   29D38.6M-N   47D38.8M-E
 ORDERS
 END.ORDERS

2210 "2 10 AD"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2001    2      2012          1          3   29D46.0M-N   47D25.7M-E
 ORDERS
 END.ORDERS

2211 "2 11 MD"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2002    2      2012          1          3   29D29.9M-N   47D23.1M-E
 ORDERS
@    AT 36 DEPLOY
 END.ORDERS

2212 "2 12 MD"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2002    2      2012          1          3   29D54.4M-N   47D43.0M-E
 ORDERS
 END.ORDERS

2301 "3 1 ID"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2003    1      2013          1          1   0            0
 ORDERS
 END.ORDERS
```

```
 2302 "3 2 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          1   0            0
  ORDERS
  END.ORDERS

 2303 "3 3 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          1   0            0
  ORDERS
  END.ORDERS

 2304 "3 4 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   2     2013          1          2   0            0
  ORDERS
  END.ORDERS

 2305 "3 5 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   2     2013          1          2   0            0
  ORDERS
  END.ORDERS

 2306 "3 6 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   29D28.5M-N   46D32.2M-E
  ORDERS
@     AT 36 DEPLOY
  END.ORDERS

 2307 "3 7 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   30D39.0M-N   46D56.2M-E
  ORDERS
  END.ORDERS

 2308 "3 8 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   30D35.4M-N   47D09.7M-E
  ORDERS
  END.ORDERS

 2309 "3 9 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   30D29.0M-N   46D19.8M-E
  ORDERS
  END.ORDERS
```

```
 2313 "3 13 AD"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2001   1     2013          1          3   30D04.0M-N   47D32.7M-E
  ORDERS
  END.ORDERS

 2314 "3 14 MD"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2002   1     2013          1          3   30D03.1M-N   47D08.2M-E
  ORDERS
  END.ORDERS

 2315 "3 15 AD"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2001   1     2013          1          3   29D50.3M-N   46D59.2M-E
  ORDERS
@    AT 36 DEPLOY
  END.ORDERS

 2316 "3 16 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   29D38.5M-N   46D47.2M-E
  ORDERS
  END.ORDERS

 2317 "3 17 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2013          1          3   29D50.5M-N   46D45.8M-E
  ORDERS
  END.ORDERS

 2401 "4 1 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2003   1     2016          1          3   30D51.6M-N   45D56.6M-E
  ORDERS
@    AT 54 DEPLOY
  END.ORDERS

 2402 "4 2 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2001   1     2016          1          1   30D04.9M-N   45D33.6M-E
  ORDERS
@   AT 32 DEPLOY
  END.ORDERS

 2403 "4 3 ID"
  SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
    2   2001   1     2016          1          1   30D22.3M-N   44D14.1M-E
  ORDERS
@    AT 30 DEPLOY
  END.ORDERS
```

```
2034 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2014          1          1   0            0
 ORDERS
 END.ORDERS

2035 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2014          1          1   0            0
 ORDERS
 END.ORDERS

2036 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2015          1          1   0            0
 ORDERS
 END.ORDERS

2037 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2017          1          1   0            0
 ORDERS
 END.ORDERS

2039 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2016          1          1   0            0
 ORDERS
 END.ORDERS

2040 "DESERT FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2016          1          1   0            0
 ORDERS
 END.ORDERS

2044 "PG FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2010          1          1   0            0
 ORDERS
 END.ORDERS

2045 "PG FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2    2007   1     2010          1          1   0            0
 ORDERS
 END.ORDERS
```

```
2046 "PG FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2007   1      2009          1           1    0            0
 ORDERS
 END.ORDERS

2047 "PG FORCE"
 SIDE..TYPE..ECH..COMMAND..DPLYMNT.ZONE..STATUS...LATITUDE...LONGITUDE
   2   2007   1      2009          1           1    0            0
 ORDERS
 END.ORDERS

END.UNITS
```

APPENDIX C

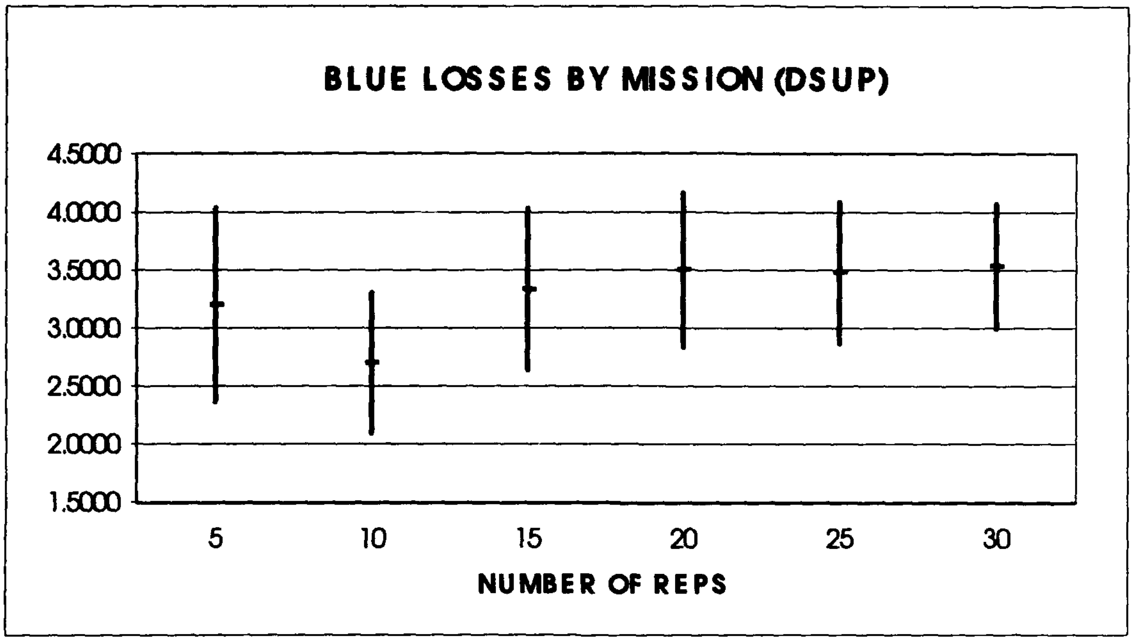

Figure C.0 85% Confidence Intervals (BDSUP)

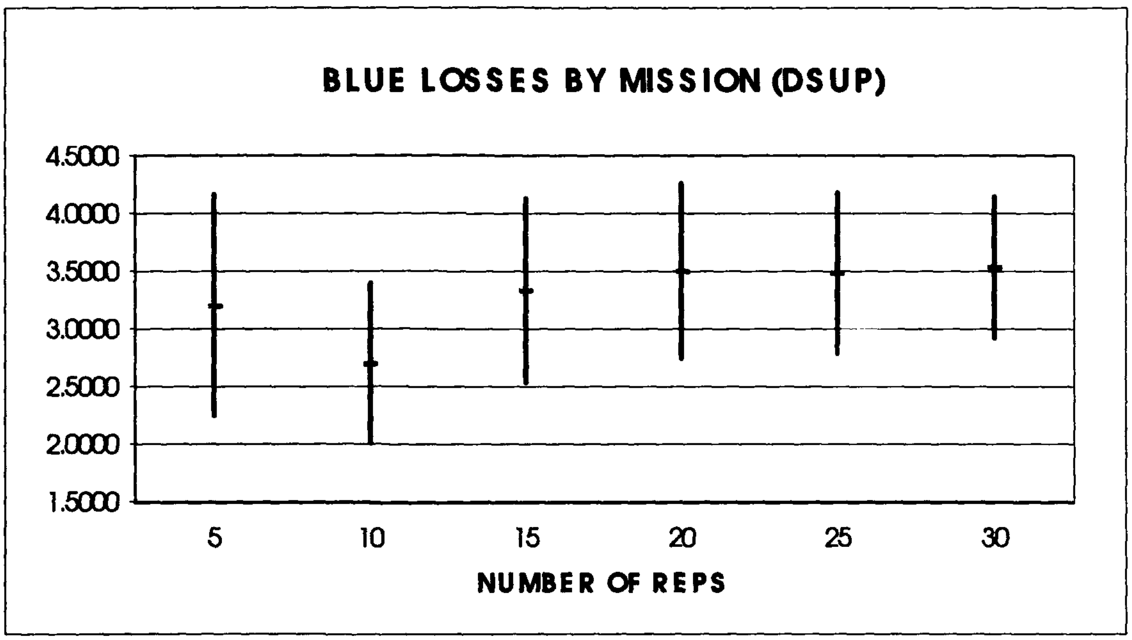

Figure C.1 90% Confidence Intervals (BDSUP)

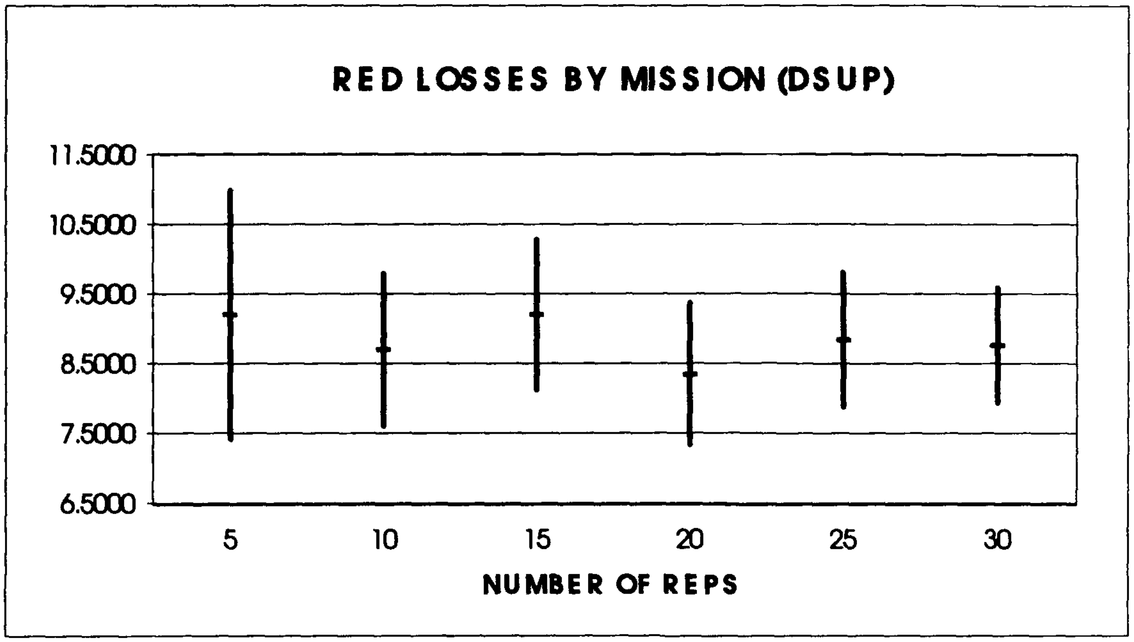

Figure C.2 85% Confidence Intervals (RDSUP)

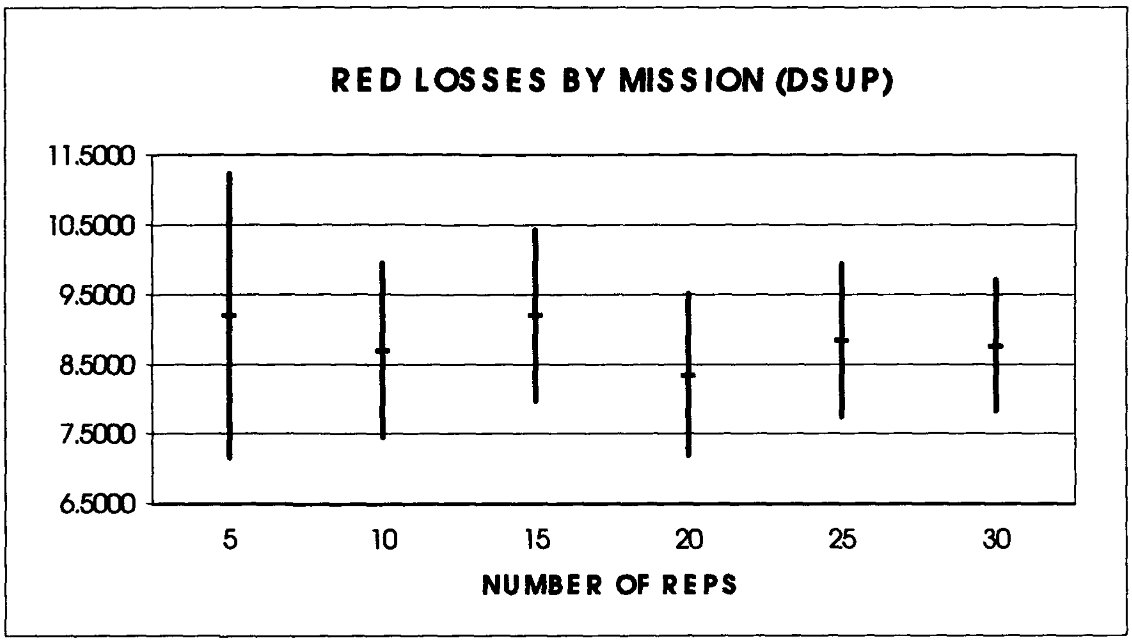

Figure C.3 90% Confidence Intervals (RDSUP)

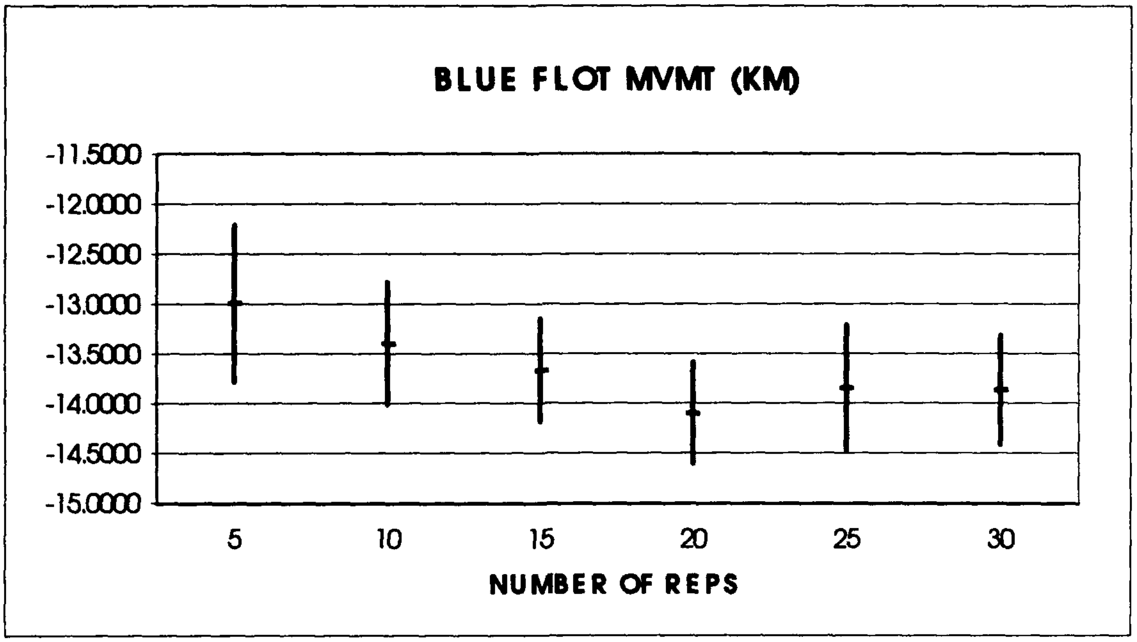

Figure C.4 85% Confidence Intervals (FLTMVMT)

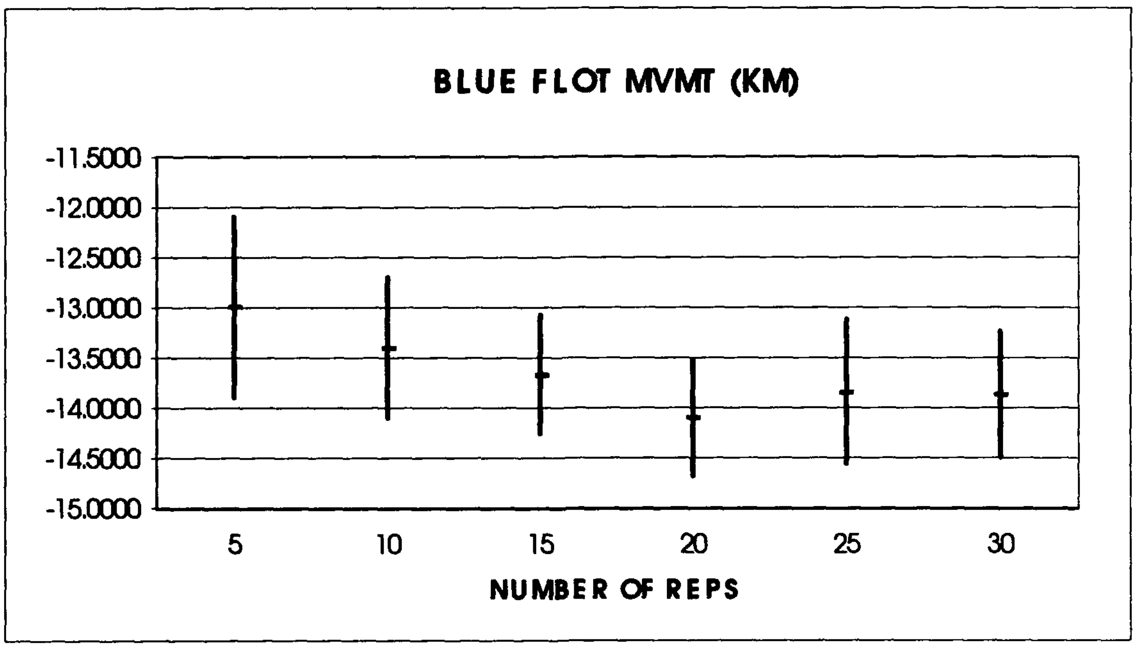

Figure C.5 90% Confidence Intervals (FLTMVMT)

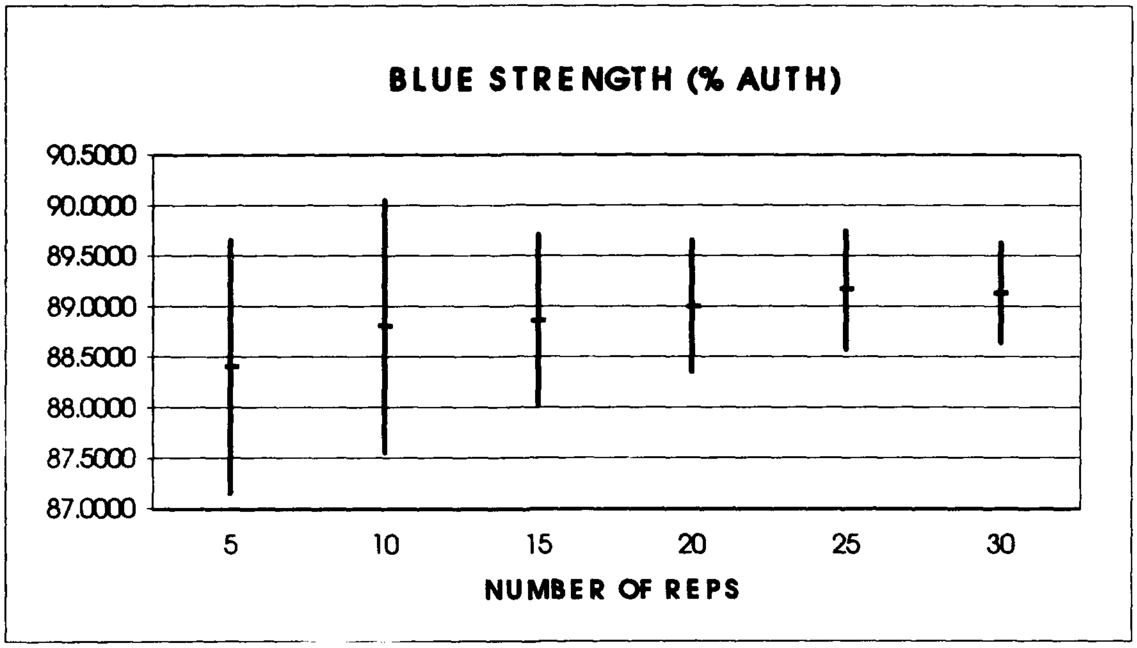

Figure C.6 85% Confidence Intervals (BSTREN)

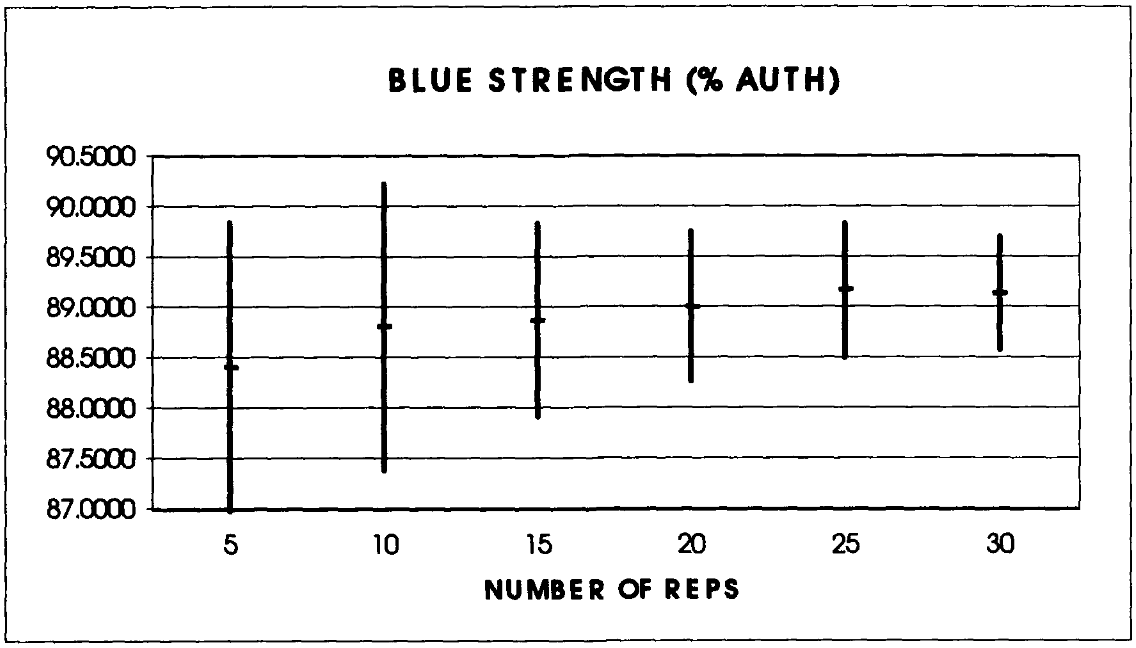

Figure C.7 90% Confidence Intervals (BSTREN)

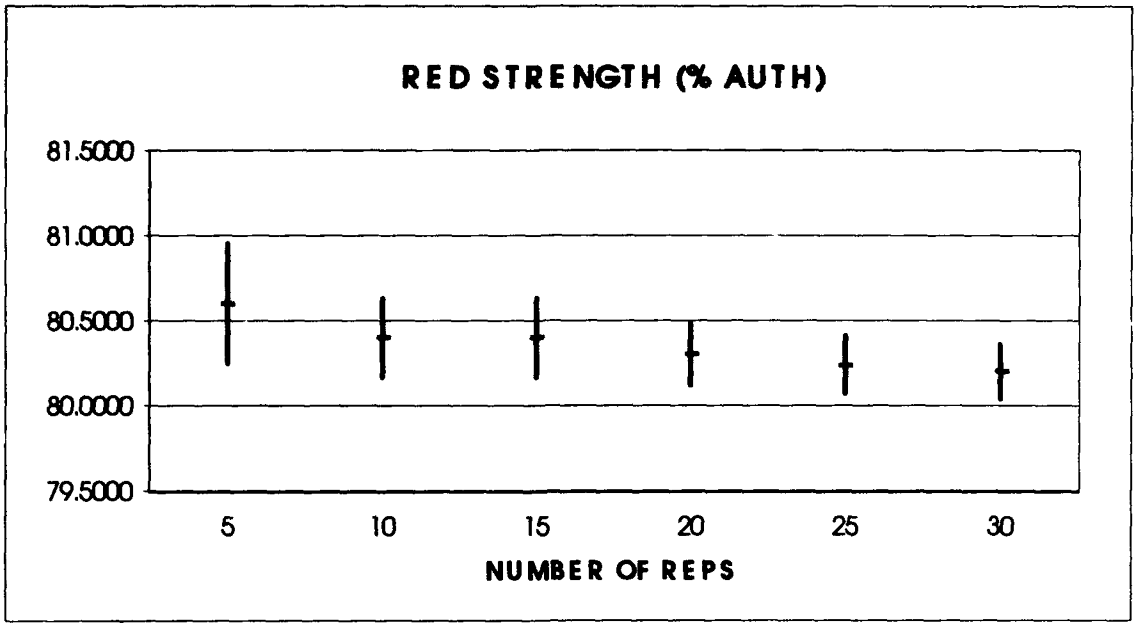

Figure C.8 85% Confidence Intervals (RSTREN)

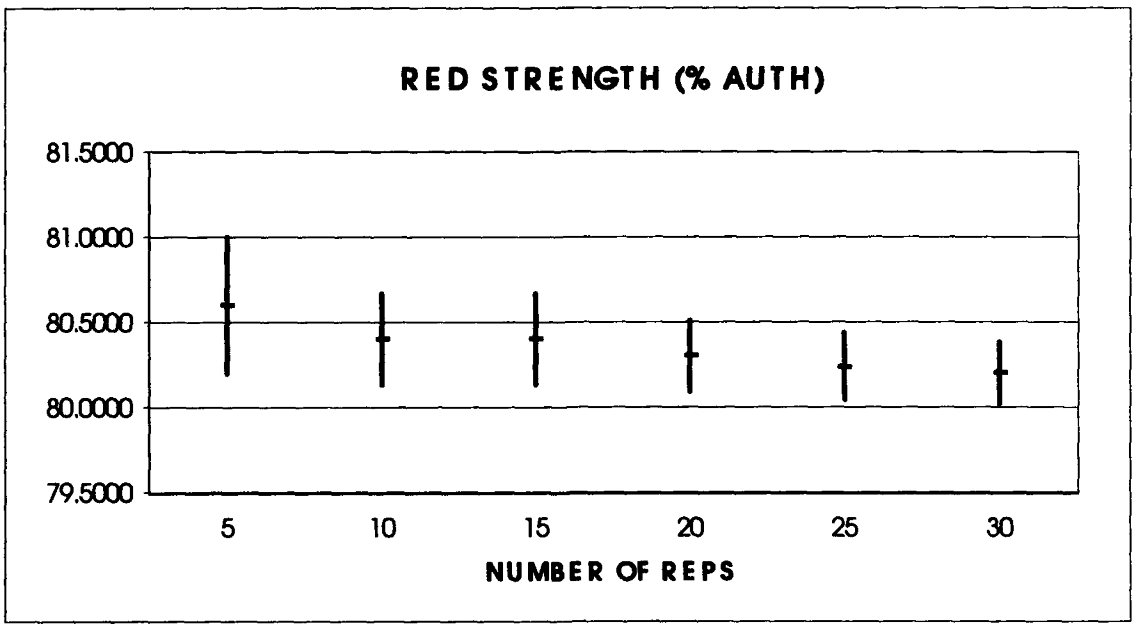

Figure C.9 90% Confidence Intervals (RSTREN)

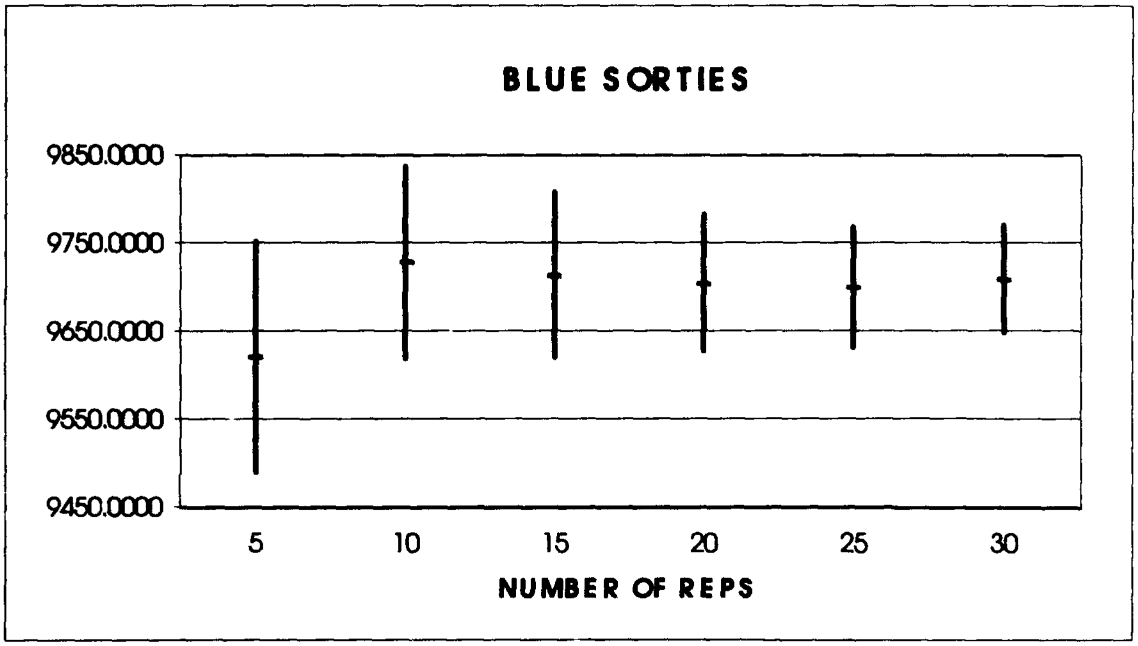

Figure C.10 85% Confidence Intervals (BSORT)

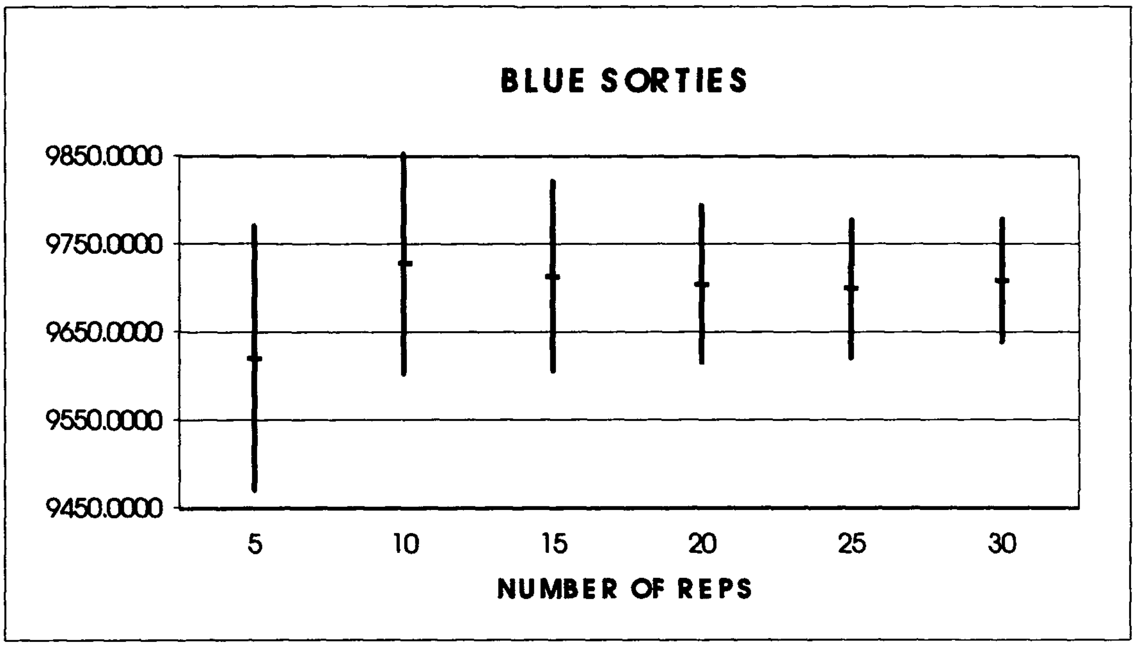

Figure C.11 90% Confidence Intervals (BSORT)

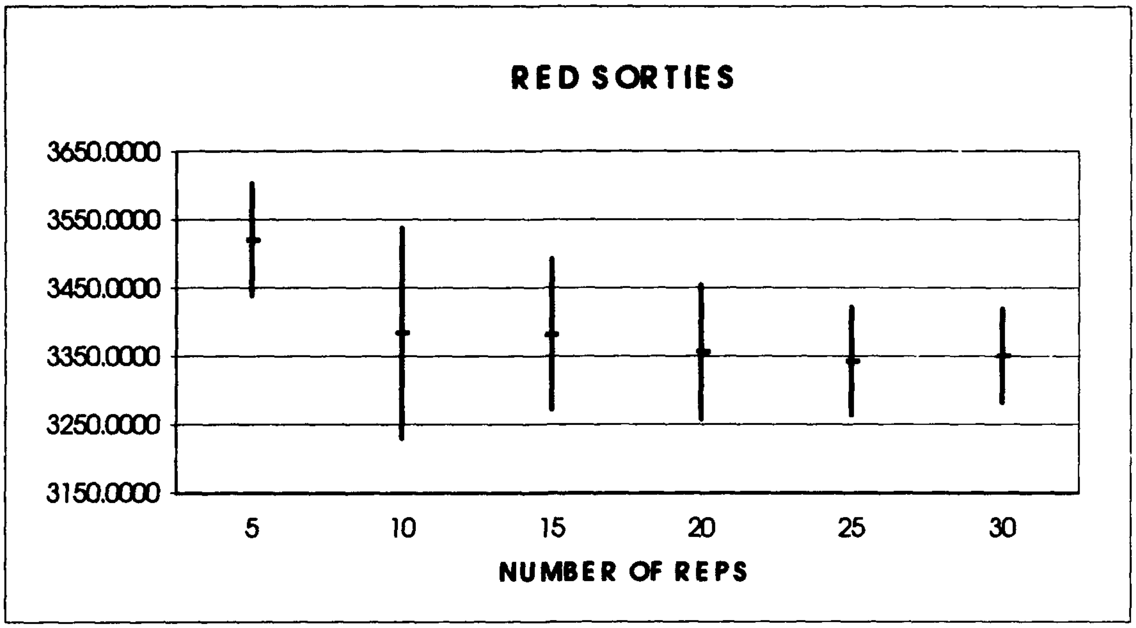

Figure C.12 85% Confidence Intervals (RSORT)

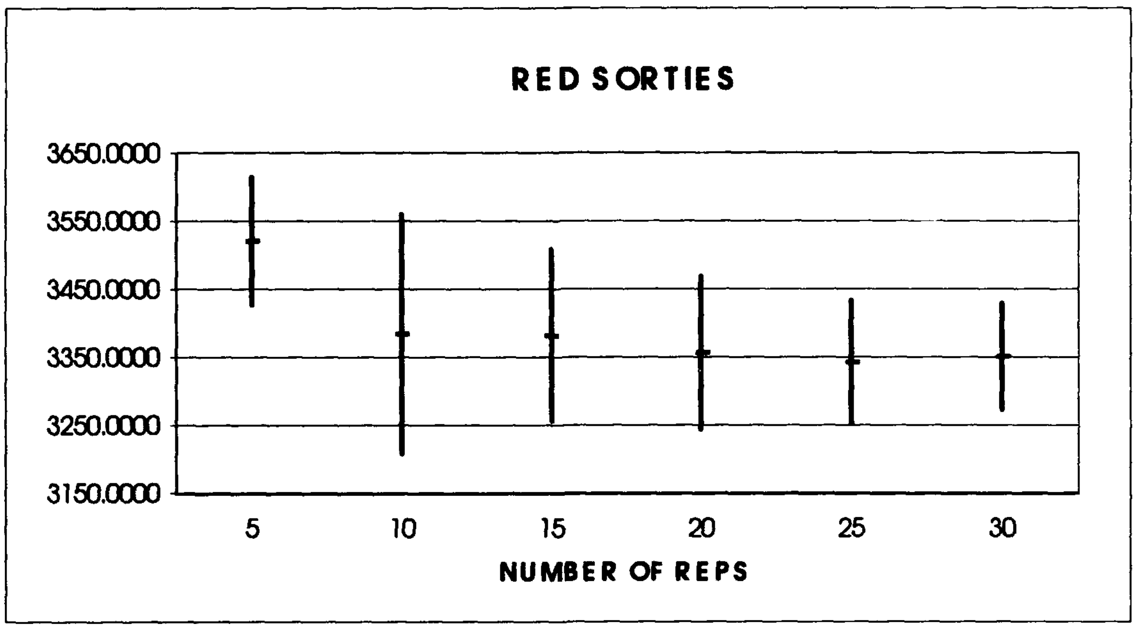

Figure C.13 90% Confidence Intervals (RSORT)

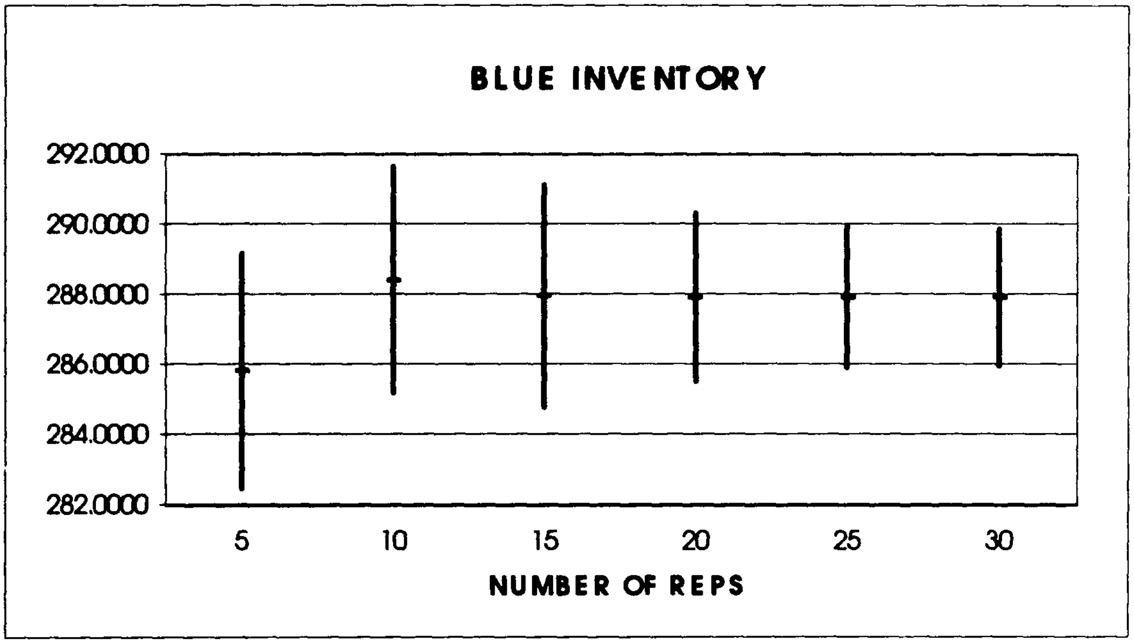

Figure C.14 85% Confidence Intervals (BINV)

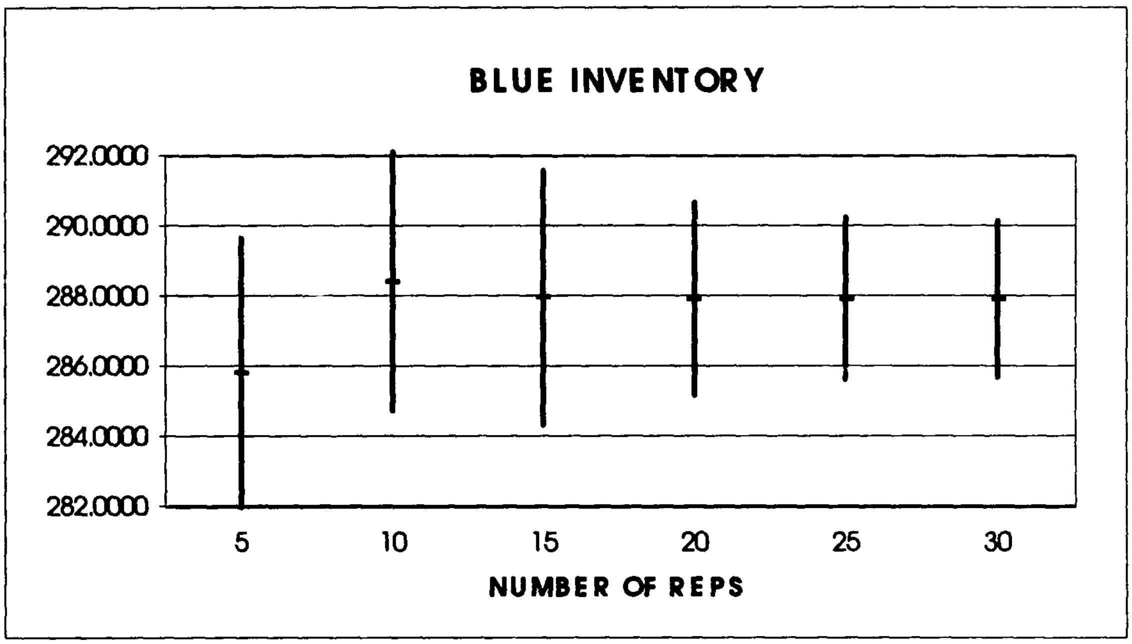

Figure C.15 90% Confidence Intervals (BINV)

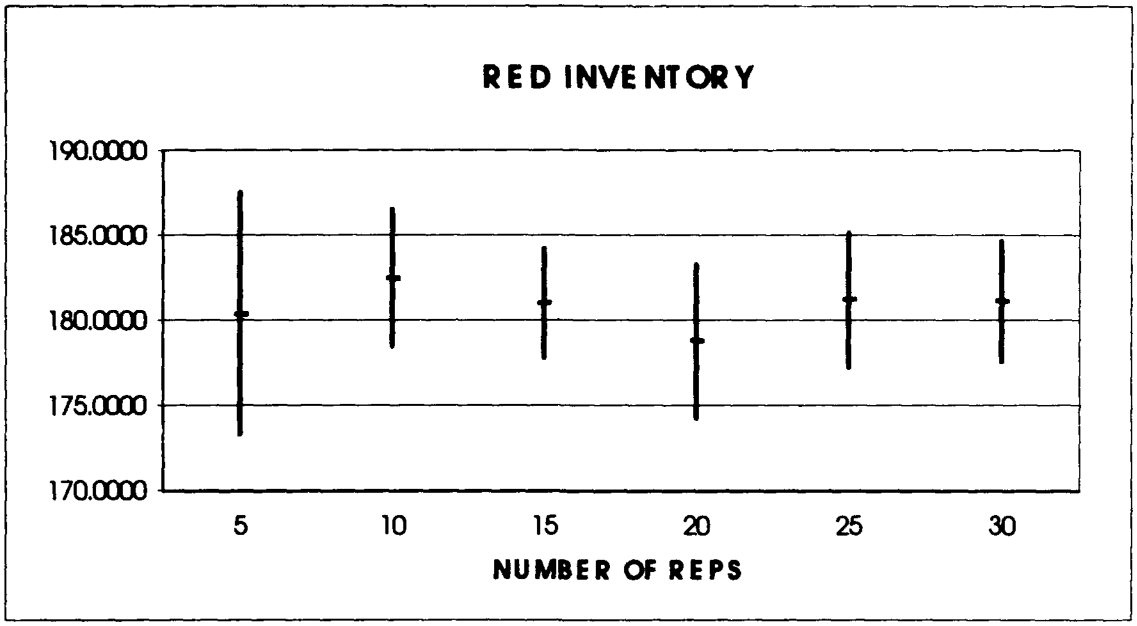

Figure C.16 85% Confidence Intervals (RINV)

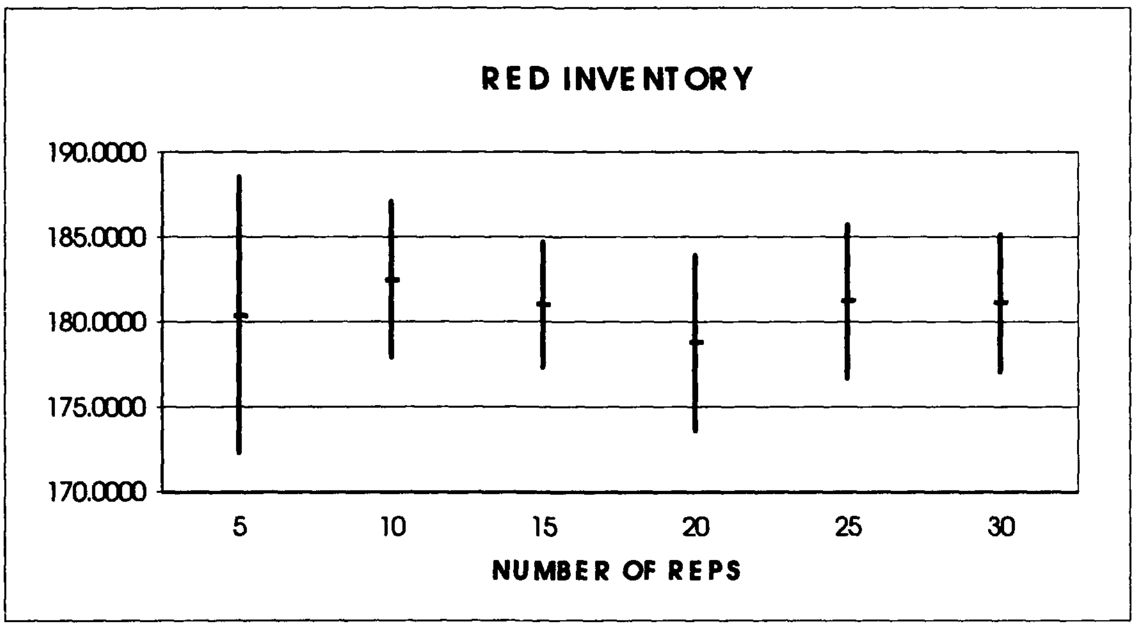

Figure C.17 90% Confidence Intervals (RINV)

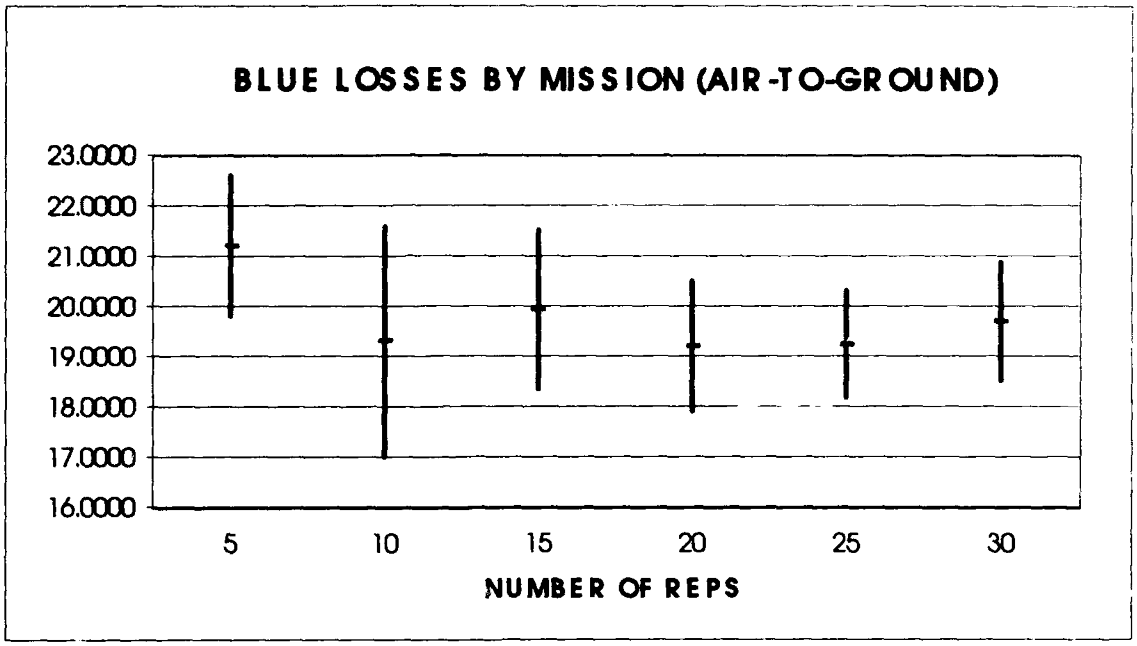

Figure C.18 85% Confidence Intervals (B-AG)

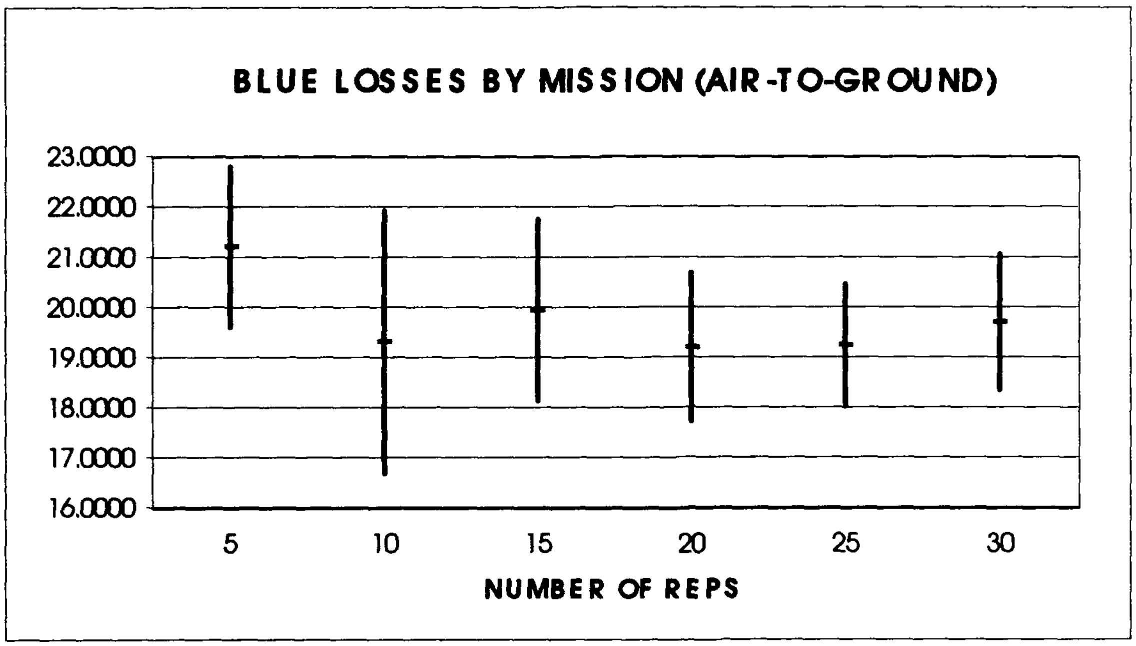

Figure C.19 90% Confidence Intervals (B-AG)

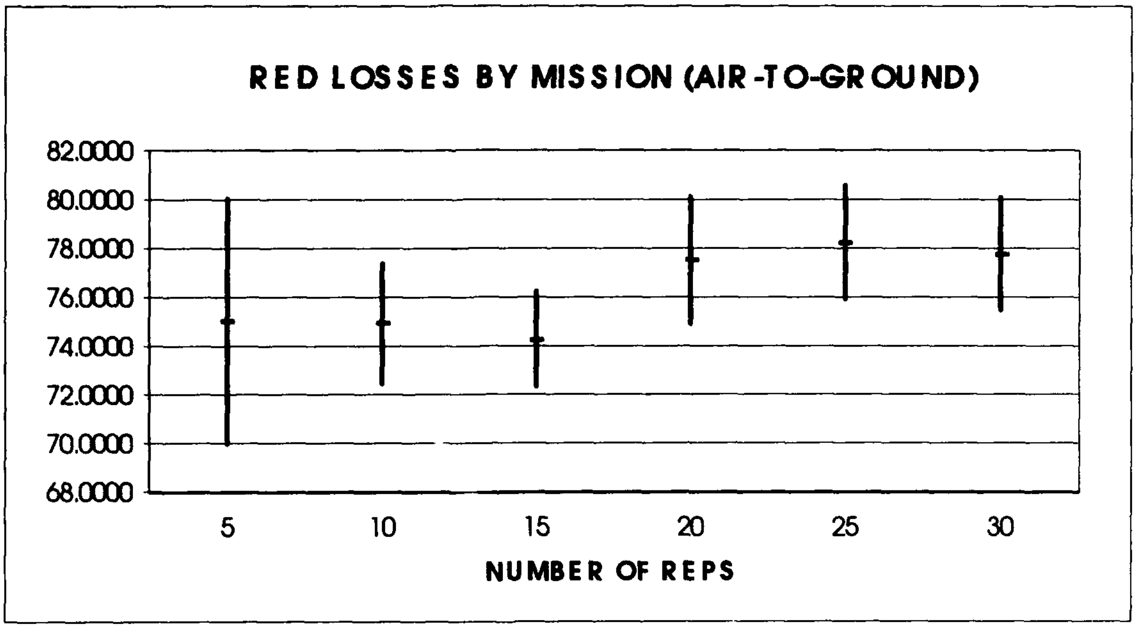

Figure C.20 85% Confidence Intervals (R-AG)

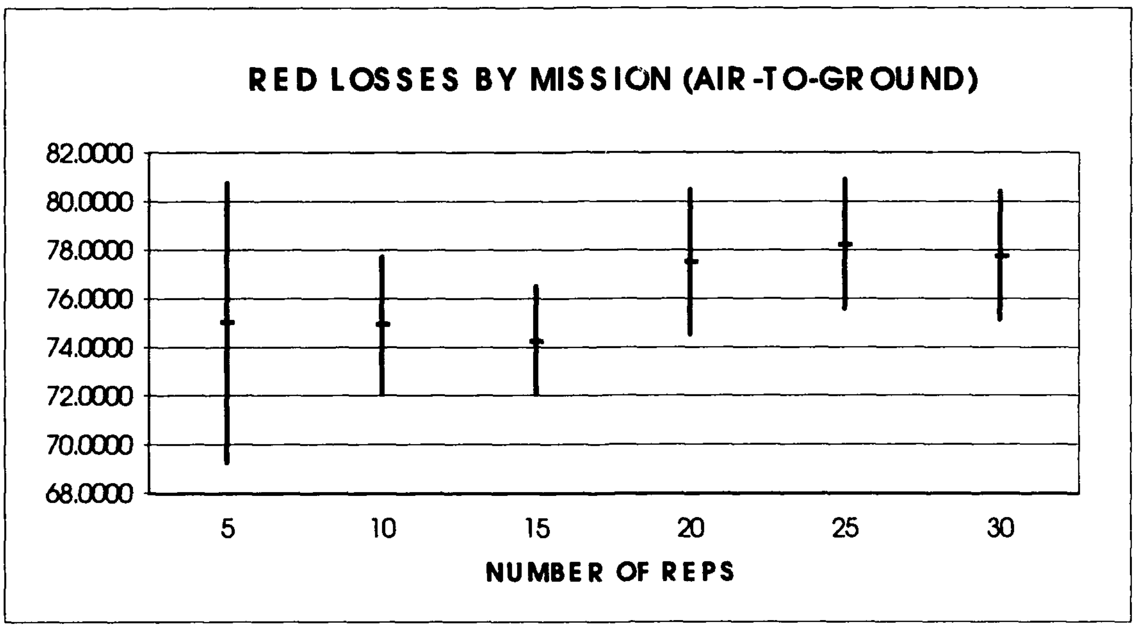

Figure C.21 90% Confidence Intervals (R-AG)

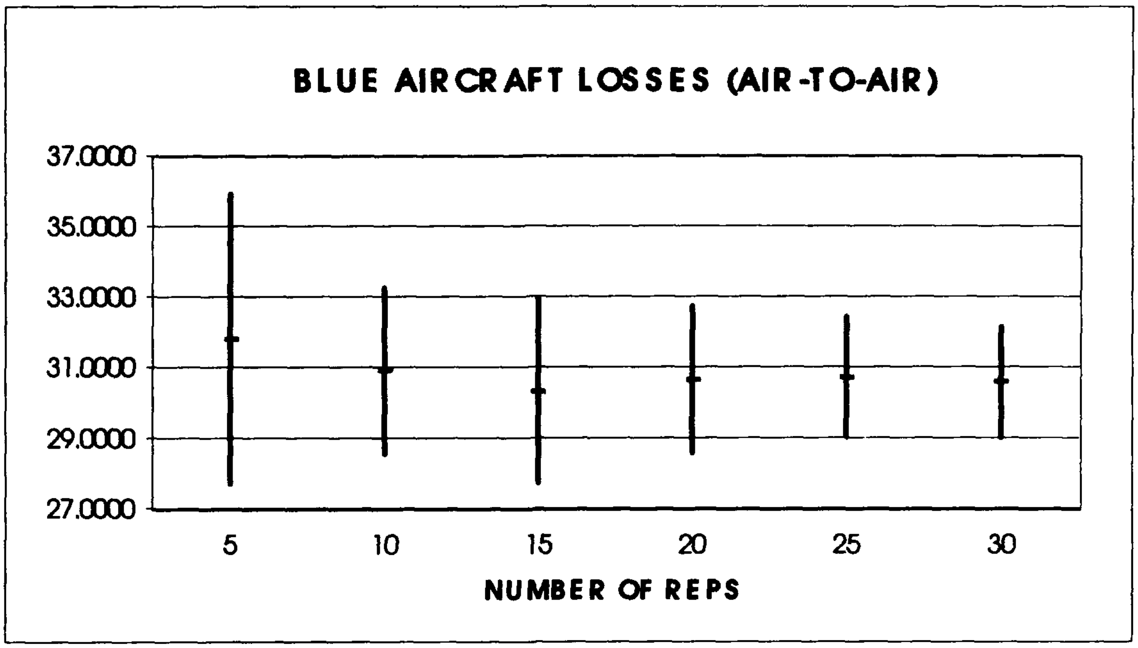

Figure C.22 85% Confidence Intervals (BACAA)

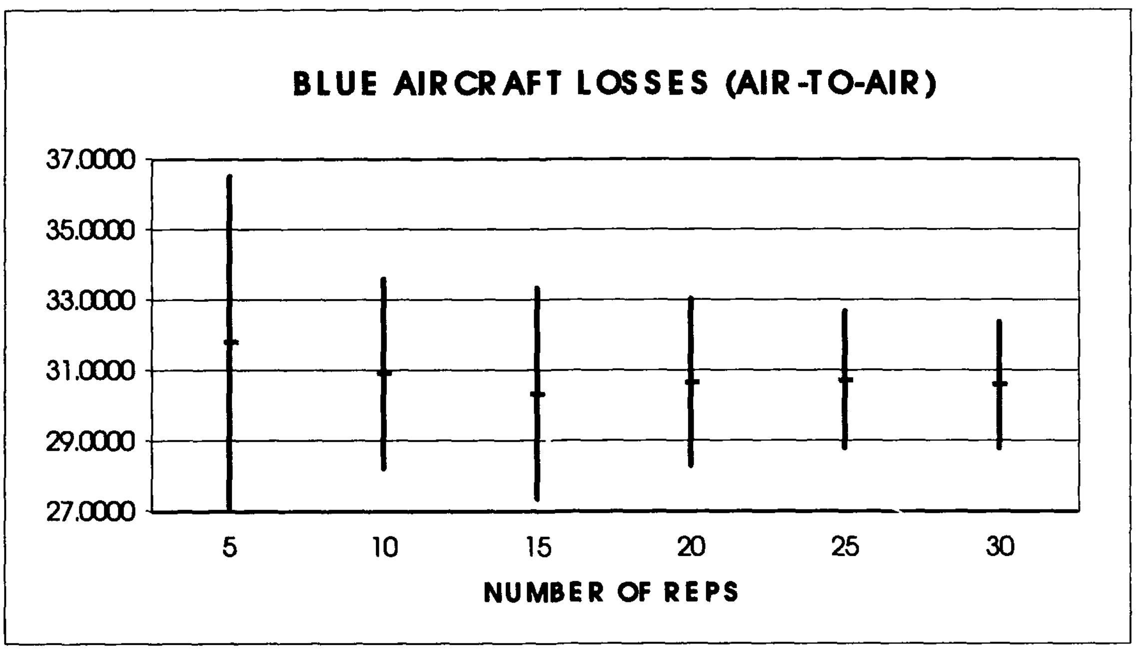

Figure C.23 90% Confidence Intervals (BACAA)

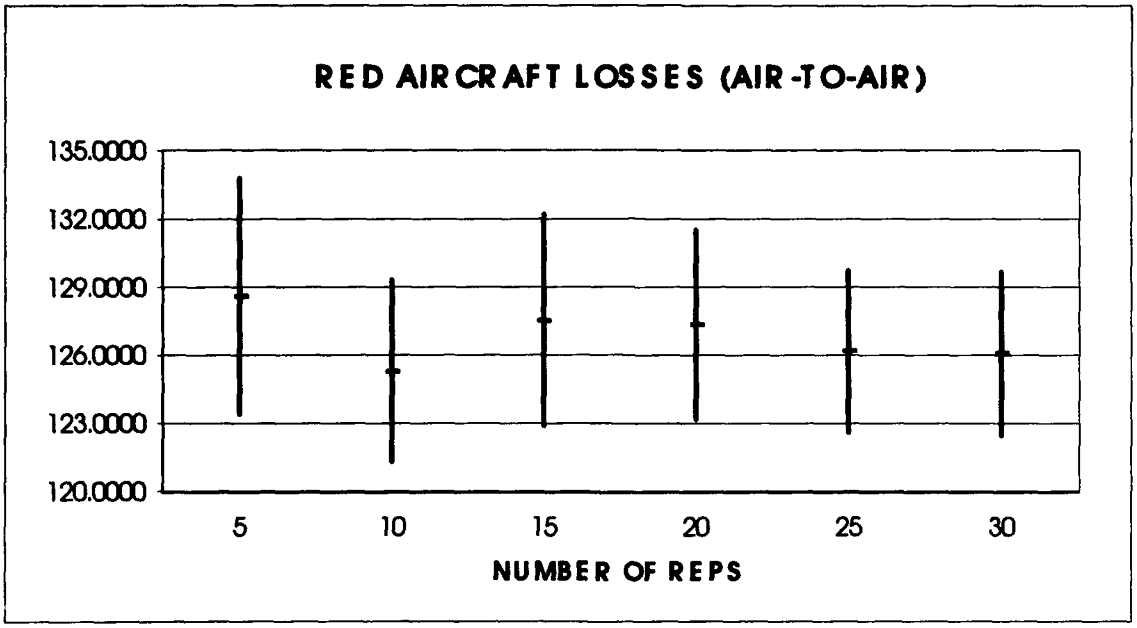

Figure C.24 85% Confidence Intervals (RACAA)

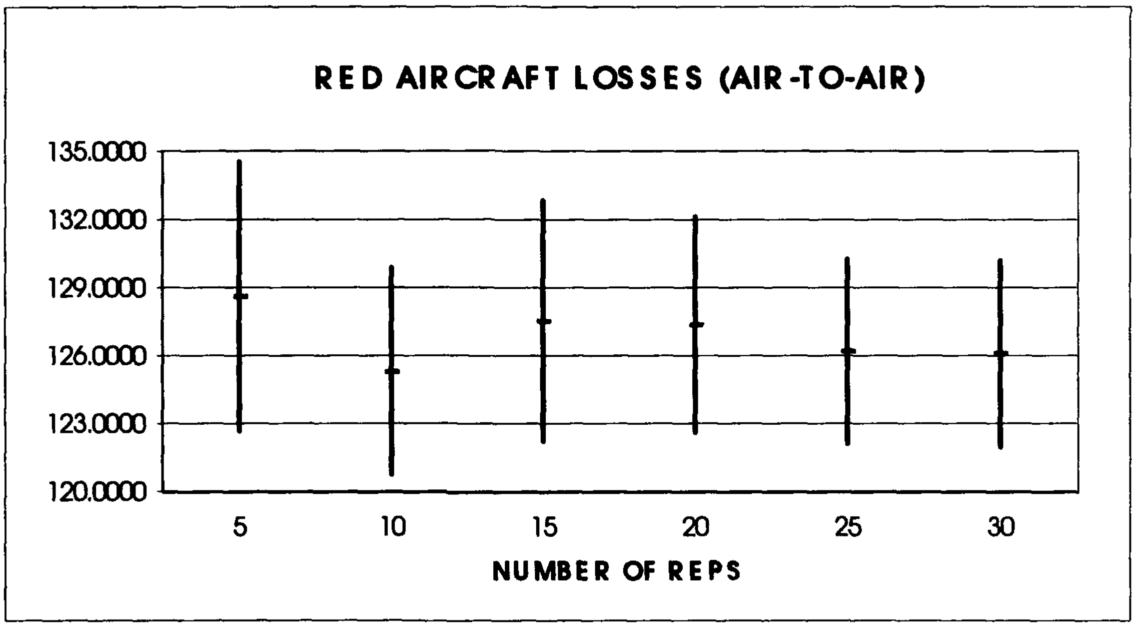

Figure C.25 90% Confidence Intervals (RACAA)

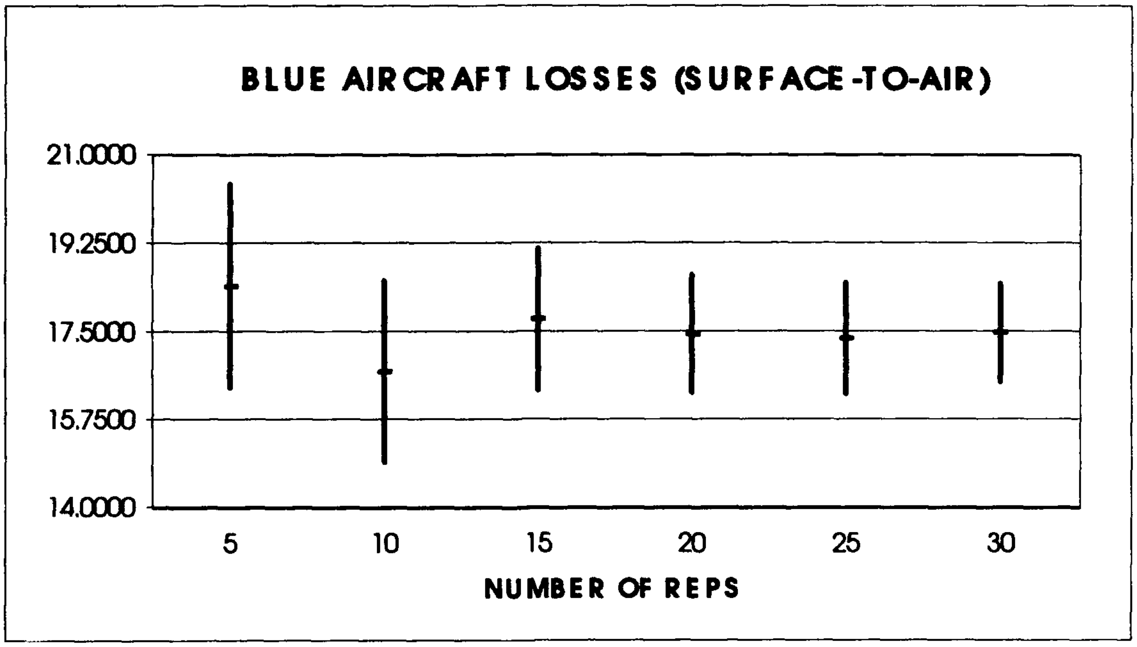

Figure C.26 85% Confidence Intervals (BACSA)

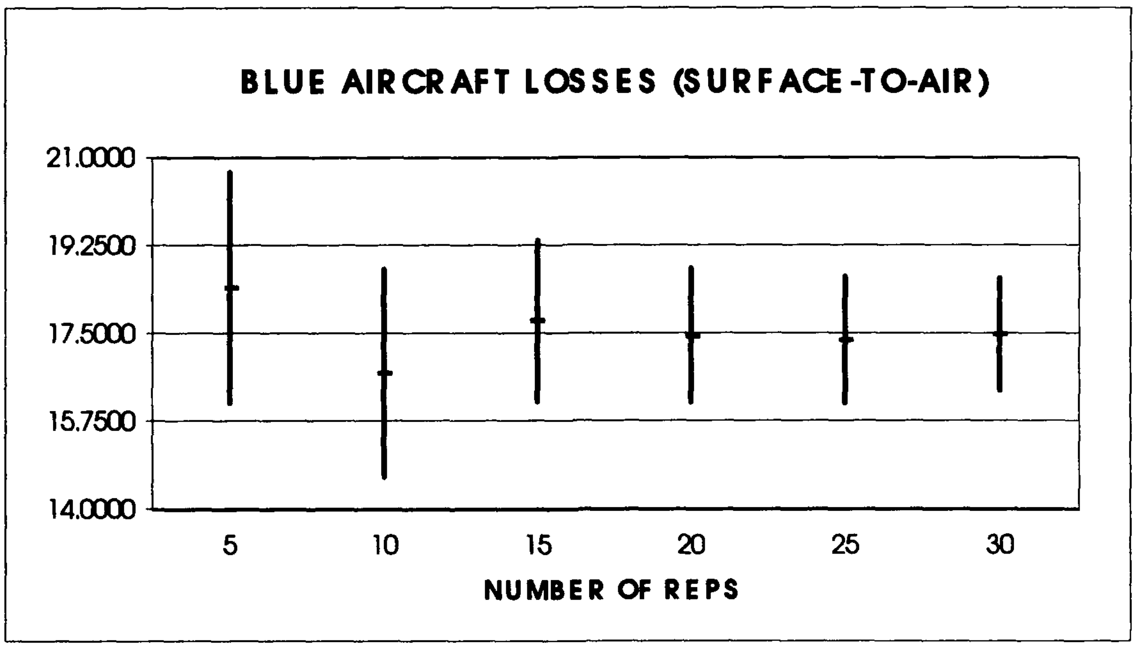

Figure C.27 90% Confidence Intervals (BACSA)

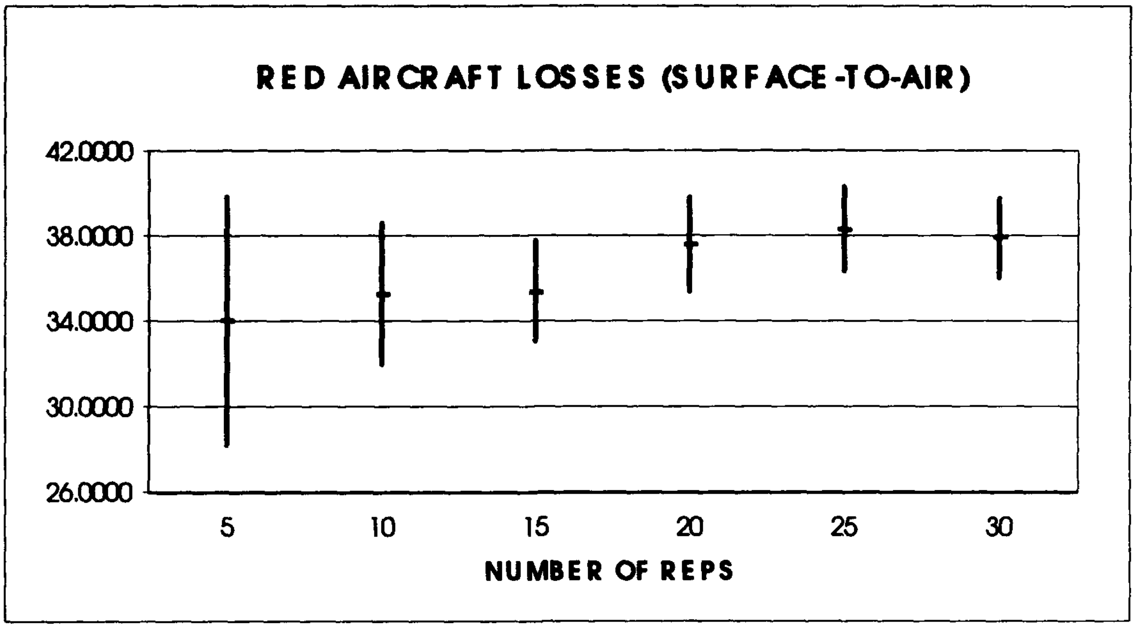

Figure C.28 85% Confidence Intervals (RACSA)

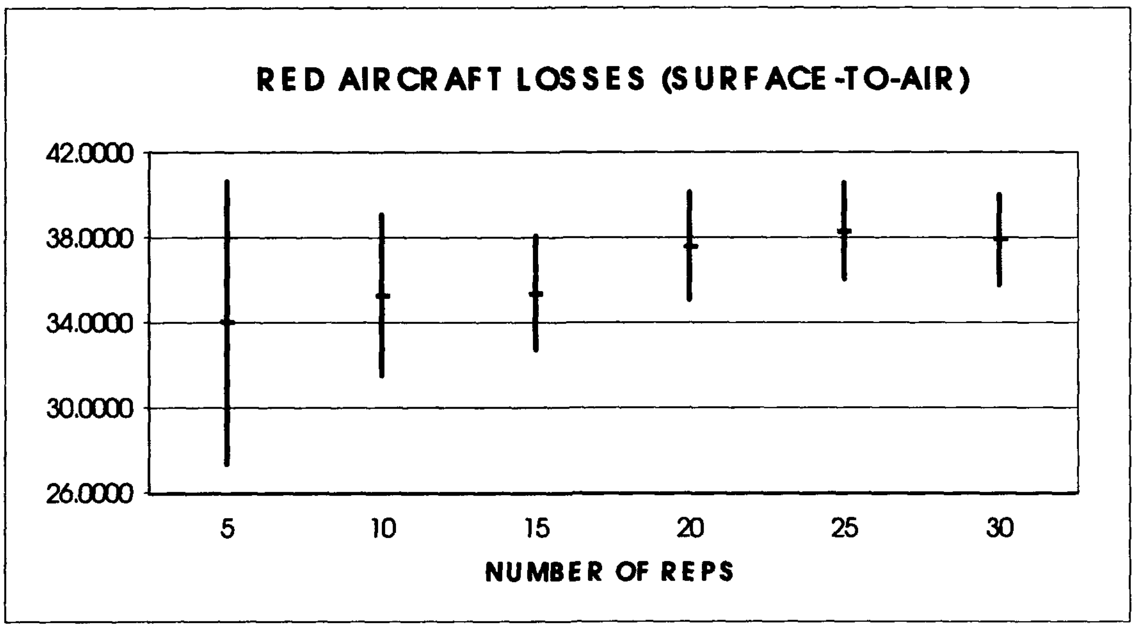

Figure C.29 90% Confidence Intervals (RACSA)

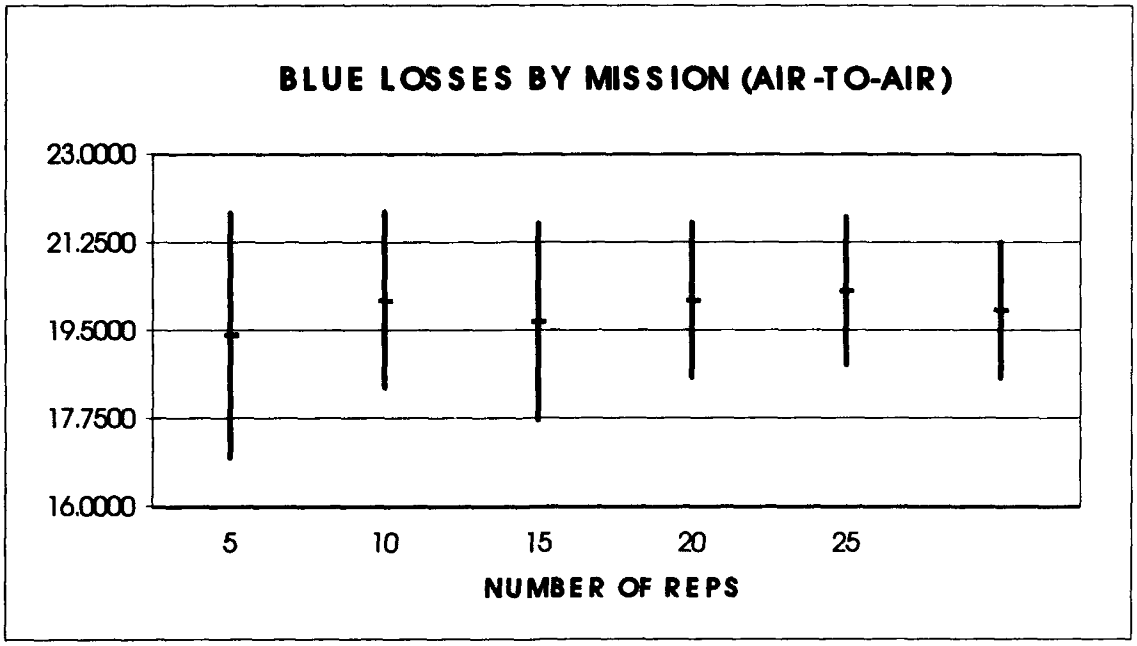

Figure C.30 85% Confidence Intervals (B-AA)

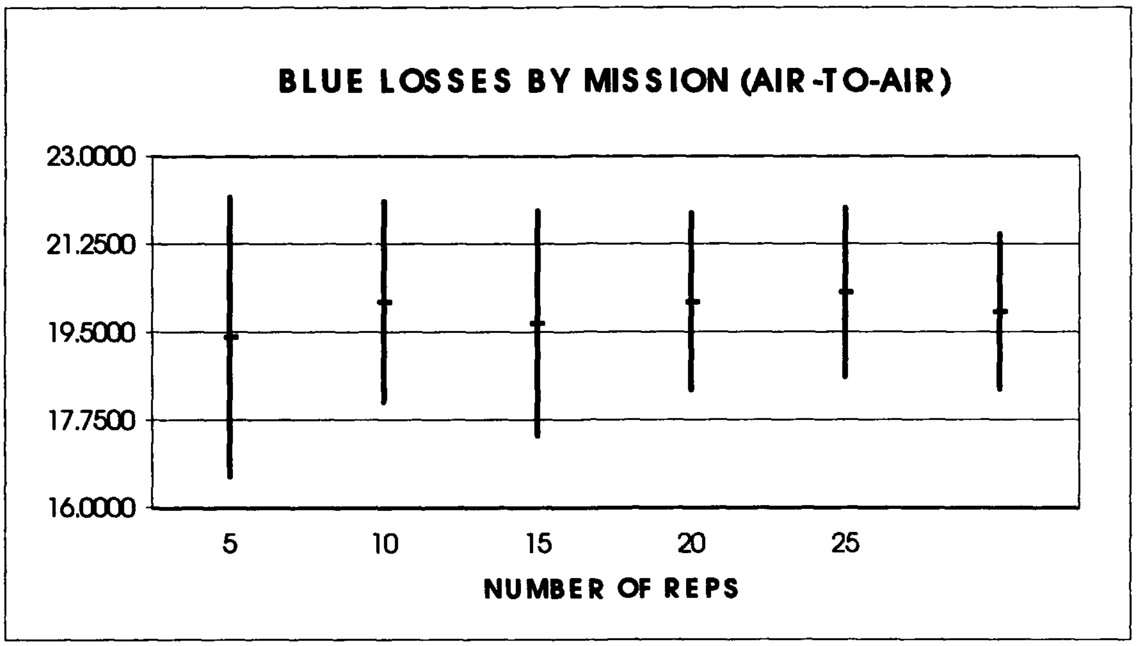

Figure C.31 90% Confidence Intervals (B-AA)

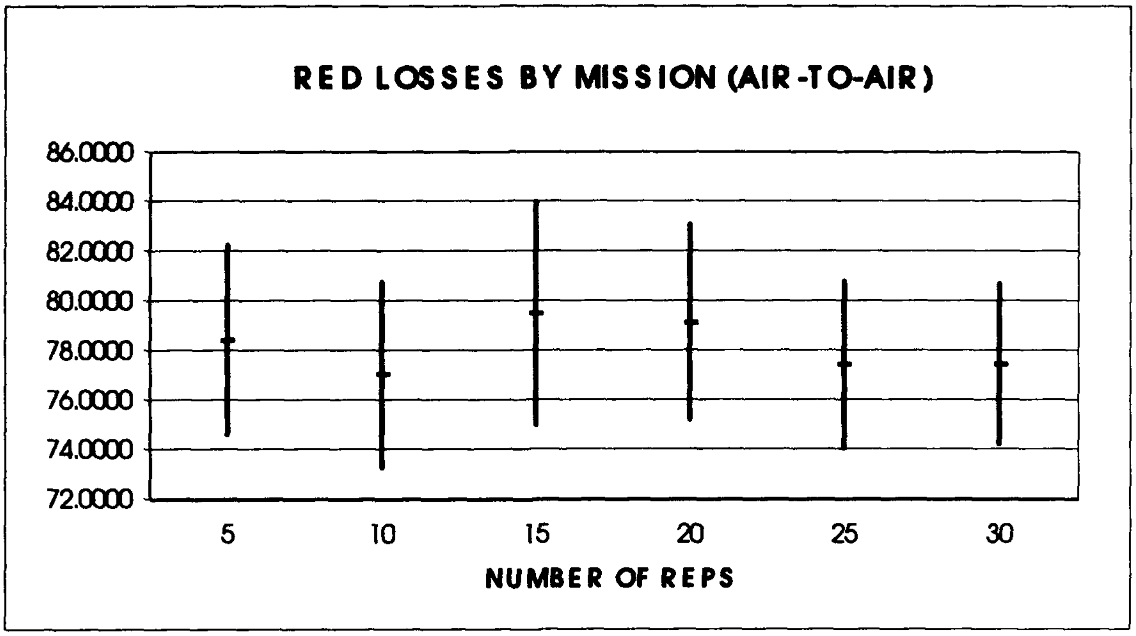

Figure C.32 85% Confidence Intervals (R-AA)

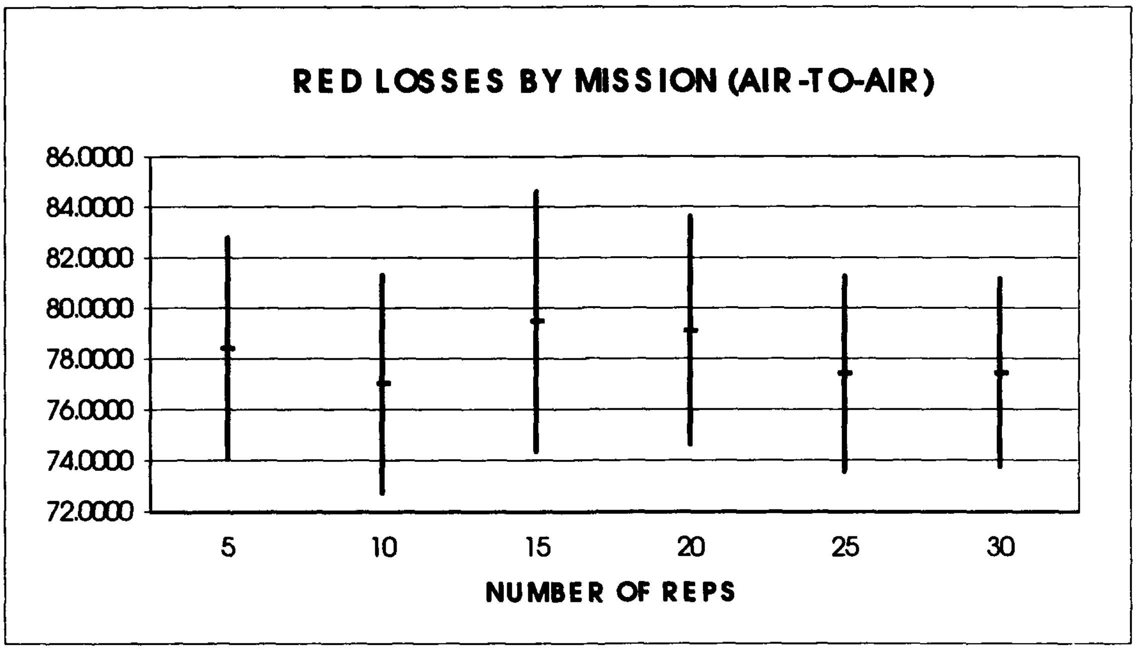

Figure C.33 90% Confidence Intervals (R-AA)

APPENDIX D

Where BDSUP and RDSUP are blue and red aircraft losses from flying defense suppression missions, BSTREN and RSTREN are blue and red strength (percent) at the end of thirty days, BSORT and RSORT are blue and red sorties (total) flown in thirty days, BINV and RINV are blue and red aircraft inventory at the end of thirty days, FLT MVMT is blue cumulative flot movement in kilometers (km), BA-G and RA-G are blue and red aircraft losses from flying air-to-ground missions, BACAA and RACAA are blue and red aircraft losses from air-to-air, BACSA and RACSA are blue and red aircraft losses from surface-to-air, and BA-A and RA-A are blue and red aircraft losses from flying air-to-air missions.

85% CONFIDENCE INTERVALS

BLUE LOSSES BY MISSION (DSUP)

N	LOWER CI	MEAN	UPPER CI
5	2.360617	3.2	4.039383
10	2.0911471	2.7	3.3088529
15	2.6356131	3.333333	4.0310536
20	2.835383	3.5	4.164617
25	2.8685809	3.48	4.0914191
30	2.9954481	3.533333	4.0712186

RED LOSSES BY MISSION (DSUP)

N	LOWER CI	MEAN	UPPER CI
5	7.4135902	9.2	10.98641
10	7.6047372	8.7	9.7952628
15	8.1190965	9.2	10.280904
20	7.3306263	8.35	9.3693737
25	7.8754791	8.84	9.8045209
30	7.9393357	8.766667	9.5939977

CUM. FLOT MVMT (KM)

N	LOWER CI	MEAN	UPPER CI
5	-13.78846	-13	-12.21154
10	-14.0145	-13.4	-12.7855
15	-14.18601	-13.6667	-13.14732
20	-14.61056	-14.1	-13.58944
25	-14.47121	-13.84	-13.20879
30	-14.41768	-13.8667	-13.31566

BLUE STRENGTH (% AUTH)

N	LOWER CI	MEAN	UPPER CI
5	87.145047	88.4	89.654953
10	87.552407	88.8	90.047593
15	88.025327	88.86667	89.708007
20	88.347807	89	89.652193
25	88.574198	89.16	89.745802
30	88.6369	89.13333	89.629767

RED STRENGTH (% AUTH)

N	LOWER CI	MEAN	UPPER CI
5	80.247389	80.6	80.952611
10	80.164926	80.4	80.635074
15	80.164926	80.4	80.635074
20	80.116124	80.3	80.483876
25	80.068058	80.24	80.411942
30	80.039612	80.2	80.360388

BLUE SORTIES

N	LOWER CI	MEAN	UPPER CI
5	9489.0633	9620.2	9751.3367
10	9618.218	9727.3	9836.382
15	9619.512	9713.467	9807.4213
20	9626.4828	9704.4	9782.3172
25	9630.3953	9699	9767.6047
30	9647.4257	9708.6	9769.7743

RED SORTIES

N	LOWER CI	MEAN	UPPER CI
5	3438.1825	3520.8	3603.4175
10	3229.2479	3383.4	3537.5521
15	3271.6015	3381.867	3492.1318
20	3257.3919	3355.9	3454.4081
25	3263.5036	3342.64	3421.7764
30	3281.8382	3350.4	3418.9618

BLUE INVENTORY

N	LOWER CI	MEAN	UPPER CI
5	282.44247	285.8	289.15753
10	285.16541	288.4	291.63459
15	284.75621	287.9333	291.11046
20	285.4937	287.9	290.3063
25	285.89113	287.92	289.94887
30	285.94251	287.9	289.85749

RED INVENTORY

N	LOWER CI	MEAN	UPPER CI
5	173.28051	180.4	187.51949
10	178.47246	182.5	186.52754
15	177.77805	181	184.22195
20	174.22559	178.75	183.27441
25	177.2341	181.2	185.1659
30	177.54807	181.1	184.65193

BLUE LOSSES BY MISSION (AIR-TO-GROUND)

N	LOWER CI	MEAN	UPPER CI
5	19.804324	21.2	22.595676
10	17.008277	19.3	21.591723
15	18.347256	19.93333	21.519411
20	17.897287	19.2	20.502713
25	18.171511	19.24	20.308489
30	18.512231	19.7	20.887769

RED LOSSES BY MISSION (AIR-TO-GROUND)

N	LOWER CI	MEAN	UPPER CI
5	69.971938	75	80.028062
10	72.439662	74.9	77.360338
15	72.312646	74.26667	76.220687
20	74.892273	77.5	80.107727
25	75.900627	78.24	80.579373
30	75.450956	77.76667	80.082377

BLUE AIRCRAFT LOSSES (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	27.692922	31.8	35.907078
10	28.544854	30.9	33.255146
15	27.713898	30.33333	32.952768
20	28.573683	30.65	[illegible]726317
25	29.015671	30.72	[illegible].424329
30	28.994758	30.56667	32.138575

RED AIRCRAFT LOSSES (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	123.39774	128.6	133.80226
10	121.29654	125.3	129.30346
15	122.8743	127.5333	132.19237
20	123.17749	127.35	131.52251
25	122.58459	126.16	129.73541
30	122.45715	126.0667	129.67619

BLUE AIRCRAFT LOSSES (SURFACE-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	16.384658	18.4	20.415342
10	14.891175	16.7	18.508825
15	16.325222	17.73333	19.141445
20	16.280171	17.45	18.619829
25	16.251531	17.36	18.468469
30	16.486353	17.46667	18.44698

RED AIRCRAFT LOSSES (SURFACE-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	28.170348	34	39.829652
10	31.982134	35.3	38.617866
15	33.045902	35.4	37.754098
20	35.381167	37.6	39.818833
25	36.334492	38.32	40.305508
30	36.032178	37.9	39.767822

BLUE LOSSES BY MISSION (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	16.965534	19.4	21.834466
10	18.350709	20.1	21.849291
15	17.706595	19.66667	21.626738
20	18.558397	20.1	21.641603
25	18.806045	20.28	21.753955
30	18.545111	19.9	21.254889

RED LOSSES BY MISSION (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	74.575074	78.4	82.224926
10	73.233918	77	80.766082
15	74.975872	79.46667	83.957461
20	75.16336	79.1	83.03664
25	74.016849	77.4	80.783151
30	74.175695	77.43333	80.690971

95% CONFIDENCE INTERVALS

BLUE LOSSES BY MISSION (DSUP)

N	LOWER CI	MEAN	UPPER CI
5	2.2408941	3.2	4.1591059
10	2.0043052	2.7	3.3956948
15	2.5360959	3.333333	4.1305708
20	2.7405874	3.5	4.2594126
25	2.781373	3.48	4.178627
30	2.9187284	3.533333	4.1479382

RED LOSSES BY MISSION (DSUP)

N	LOWER CI	MEAN	UPPER CI
5	7.1587911	9.2	11.241209
10	7.4485177	8.7	9.9514823
15	7.9649251	9.2	10.435075
20	7.1852311	8.35	9.5147689
25	7.7379076	8.84	9.9420924
30	7.8213318	8.766667	9.7120015

CUM. FLOT MVMT (KM)

N	LOWER CI	MEAN	UPPER CI
5	-13.90092	-13	-12.09908
10	-14.10215	-13.4	-12.69785
15	-14.26009	-13.6667	-13.07324
20	-14.68338	-14.1	-13.51662
25	-14.56124	-13.84	-13.11876
30	-14.49627	-13.8667	-13.23707

BLUE STRENGTH (% AUTH)

N	LOWER CI	MEAN	UPPER CI
5	86.96605	88.4	89.83395
10	87.374461	88.8	90.225539
15	87.905325	88.86667	89.828009
20	88.254783	89	89.745217
25	88.490644	89.16	89.829356
30	88.566092	89.13333	89.700574

RED STRENGTH (% AUTH)

N	LOWER CI	MEAN	UPPER CI
5	80.197095	80.6	81.002905
10	80.131397	80.4	80.668603
15	80.131397	80.4	80.668603
20	80.089898	80.3	80.510102
25	80.043534	80.24	80.436466
30	80.016735	80.2	80.383265

BLUE SORTIES

N	LOWER CI	MEAN	UPPER CI
5	9470.359	9620.2	9770.041
10	9602.6594	9727.3	9851.9406
15	9606.1111	9713.467	9820.8222
20	9615.3693	9704.4	9793.4307
25	9620.61	9699	9777.39
30	9638.7002	9708.6	9778.4998

RED SORTIES

N	LOWER CI	MEAN	UPPER CI
5	3426.3986	3520.8	3615.2014
10	3207.2609	3383.4	3559.5391
15	3255.8742	3381.867	3507.8591
20	3243.3415	3355.9	3468.4585
25	3252.2162	3342.64	3433.0638
30	3272.0591	3350.4	3428.7409

BLUE INVENTORY

N	LOWER CI	MEAN	UPPER CI
5	281.96358	285.8	289.63642
10	284.70406	288.4	292.09594
15	284.30305	287.9333	291.56362
20	285.15048	287.9	290.64952
25	285.60175	287.92	290.23825
30	285.66331	287.9	290.13669

RED INVENTORY

N	LOWER CI	MEAN	UPPER CI
5	172.26504	180.4	188.53496
10	177.898	182.5	187.102
15	177.3185	181	184.6815
20	173.58027	178.75	183.91973
25	176.66844	181.2	185.73156
30	177.04146	181.1	185.15854

BLUE LOSSES BY MISSION (AIR-TO-GROUND)

N	LOWER CI	MEAN	UPPER CI
5	19.605256	21.2	22.794744
10	16.681404	19.3	21.918596
15	18.121031	19.93333	21.745636
20	17.711479	19.2	20.688521
25	18.01911	19.24	20.46089
30	18.342817	19.7	21.057183

RED LOSSES BY MISSION (AIR-TO-GROUND)

N	LOWER CI	MEAN	UPPER CI
5	69.254775	75	80.745225
10	72.088739	74.9	77.711261
15	72.03394	74.26667	76.499393
20	74.520328	77.5	80.479672
25	75.566958	78.24	80.913042
30	75.120662	77.76667	80.412671

BLUE AIRCRAFT LOSSES (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	27.107122	31.8	36.492878
10	28.208935	30.9	33.591065
15	27.340283	30.33333	33.326383
20	28.277534	30.65	33.022466
25	28.772579	30.72	32.667421
30	28.770554	30.56667	32.362779

RED AIRCRAFT LOSSES (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	122.65573	128.6	134.54427
10	120.72552	125.3	129.87448
15	122.20977	127.5333	132.8569
20	122.58235	127.35	132.11765
25	122.07462	126.16	130.24538
30	121.94231	126.0667	130.19102

BLUE AIRCRAFT LOSSES (SURFACE-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	16.097206	18.4	20.702794
10	14.633179	16.7	18.766821
15	16.12438	17.73333	19.342287
20	16.113316	17.45	18.786684
25	16.093428	17.36	18.626572
30	16.346529	17.46667	18.586804

RED AIRCRAFT LOSSES (SURFACE-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	27.338853	34	40.661147
10	31.5089	35.3	39.0911
15	32.710132	35.4	38.089868
20	35.06469	37.6	40.13531
25	36.051295	38.32	40.588705
30	35.765767	37.9	40.034233

BLUE LOSSES BY MISSION (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	16.618301	19.4	22.181699
10	18.101205	20.1	22.098795
15	17.427027	19.66667	21.906307
20	18.338515	20.1	21.861485
25	18.595812	20.28	21.964188
30	18.35186	19.9	21.44814

RED LOSSES BY MISSION (AIR-TO-AIR)

N	LOWER CI	MEAN	UPPER CI
5	74.029517	78.4	82.770483
10	72.696754	77	81.303246
15	74.335341	79.46667	84.597992
20	74.60187	79.1	83.59813
25	73.534304	77.4	81.265696
30	73.711052	77.43333	81.155615

APPENDIX E

The following table lists the identified significant factors for the first iteration of all three methodologies (Iterative, RSM, and Bayesian).

	Iterative	RSM	Bayesian
BDSUP	A	A	A
	D	C	C
	F	D	F
	I	F	J
	J	J	K
	AK	M	
	CF		
	CK		
	CL		
	FH		

	Iterative	RSM	Bayesian
RDSUP	E	G	B
	L		E
	AF		F
	BE		G
	CK		H
	CL		L
	DJ		
	EH		
	EI		
	FL		
	JL		
	KL		

	Iterative	RSM	Bayesian
FLTMVMT	I	I	D
			K
			L

	Iterative	RSM	Bayesian
BSTREN	F	B	I
	AB	D	J
	AF	I	L
	BK	J	M
	BL	L	
	BM	M	
	DE		
	DF		
	DG		
	DH		
	DJ		
	DK		
	EJ		
	GL		
	HL		
	IJ		
	KL		

	Iterative	RSM	Bayesian
RSTREN	A	H	H
	H	E	
	AJ		
	CI		
	DM		
	EH		
	EM		
	HJ		

	Iterative	RSM	Bayesian
BSORT	B	D	H
	C	H	L
	H	I	
	L	J	
	AM	L	
	BH		
	BL		
	CG		
	CM		
	DE		
	DL		
	DM		
	EH		
	EJ		
	HK		
	IL		
	IM		
	LM		

	Iterative	RSM	Bayesian
RSORT	I	A	I
	L	C	L
	M	I	M
	AL	J	
	AM	L	
	DM	M	
	FM		
	HI		
	IL		
	KL		

	Iterative	RSM	Bayesian
BINV	C	D	B
	D	J	D
	I	J	L
	J		
	BC		
	BD		
	BH		
	BJ		
	CF		
	DJ		
	EG		
	EM		
	FH		
	FI		
	GH		
	HJ		
	KL		

	Iterative	RSM	Bayesian
RINV	H	E	E
	K	G	K
	H	H	
	AC	I	
	AH	J	
	AI	L	
	AK		
	AL		
	BL		
	CE		
	CH		
	DI		
	EH		
	EL		
	EK		
	FK		
	GL		
	HK		

	Iterative	RSM	Bayesian
B-AG	A	A	B
	E	B	H
	J	E	J
	AD	H	L
	AE	J	
	AG		
	AH		
	AJ		
	AK		
	DJ		
	EH		
	FJ		
	GJ		
	HJ		
	IJ		
	JK		
	JL		

	Iterative	RSM	Bayesian
R-AG	B	I	I
	I	L	M
	L	M	
	AD		
	AI		
	AL		
	BD		
	BJ		
	CL		
	DE		
	DJ		
	DK		
	EL		
	FJ		
	JM		
	KL		

	Iterative	RSM	Bayesian
BACAA	BC	B	B
	BE	D	D
	CF	J	J
	CM		
	DH		
	DI		
	EH		
	FK		
	FL		
	GI		
	HI		
	IK		
	IL		
	KM		
	LM		

	Iterative	RSM	Bayesian
RACAA	B	G	F
	D	H	G
	G	M	K
	L		
	AF		
	AK		
	BG		
	BK		
	CJ		
	EH		
	EL		
	FG		
	GH		
	GK		
	GL		
	HL		
	JK		

	Iterative	RSM	Bayesian
BACSA	B	A	A
	L	B	B
	M	C	J
	AB	E	L
	AI	H	
	AL	J	
	BF	L	
	BG	M	
	BI		
	CE		
	CF		
	CG		
	EF		
	EJ		
	FL		
	LM		

	Iterative	RSM	Bayesian
RACSA	C	A	C
	I	C	I
	AB	I	
	AE	L	
	AG	M	
	AH		
	BM		
	CE		
	CI		
	DI		
	EK		
	FM		
	HK		
	HM		
	IK		
	IL		
	JM		

	Iterative	RSM	Bayesian
B-AA	E	D	B
	I		D
	L		
	AL		
	BI		
	CD		
	DJ		
	DM		
	EM		
	FL		
	FM		
	GI		
	HI		
	IJ		
	IL		
	LM		

	Iterative	RSM	Bayesian
R-AA	A	G	B
	G	H	D
	H		J
	AC		
	AF		
	AG		
	AL		
	BD		
	BE		
	CG		
	CM		
	DJ		
	FG		
	FJ		
	FK		
	GH		
	GI		
	HM		

APPENDIX F

This appendix contains the alias matrix and structure for the Plackett-Burman design used for the analysis of the THUNDER Analytical Model.

ALIAS MATRIX

	Main Factors													
	A	B	C	D	E	F	G	H	I	J	K	L	M	
AB:	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	0.2	-0.2	-0.2	-0.6	:AB
AC:	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	0.2	0.2	0.2	-0.2	-0.2	:AC
AD:	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	-0.2	0.2	-0.2	-0.2	0.2	:AD
AE:	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	-0.2	-0.2	-0.6	0.2	-0.2	:AE
AF:	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	0.2	0.2	-0.2	0.2	-0.2	:AF
AG:	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	-0.2	-0.2	0.2	-0.2	-0.2	:AG
AH:	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	-0.6	-0.2	0.2	-0.2	-0.2	:AH
AI:	0	0.2	0.2	-0.2	-0.2	0.2	-0.2	-0.6	0	-0.2	-0.2	-0.2	0.2	:AI
AJ:	0	0.2	0.2	0.2	-0.2	0.2	-0.2	-0.2	-0.2	0	-0.2	0.2	-0.2	:AJ
AK:	0	-0.2	0.2	-0.2	-0.6	-0.2	0.2	0.2	-0.2	-0.2	0	0.2	0.2	:AK
AL:	0	-0.2	-0.2	-0.2	0.2	0.2	-0.2	-0.2	-0.2	0.2	0.2	0	0.2	:AL
AM:	0	-0.6	-0.2	0.2	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	0.2	0	:AM
BC:	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	0.2	-0.2	-0.2	:BC
BD:	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	0.2	0.2	0.2	-0.2	:BD
BE:	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	-0.2	0.2	-0.2	-0.2	:BE
BF:	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	-0.2	-0.2	-0.6	0.2	:BF
BG:	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	0.2	0.2	-0.2	0.2	:BG
BH:	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	-0.2	-0.2	0.2	-0.2	:BH
BI:	0.2	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	-0.6	-0.2	0.2	-0.2	:BI
BJ:	0.2	0	0.2	0.2	-0.2	-0.2	0.2	-0.2	-0.6	0	-0.2	-0.2	-0.2	:BJ
BK:	-0.2	0	0.2	0.2	0.2	-0.2	0.2	-0.2	-0.2	-0.2	0	-0.2	0.2	:BK
BL:	-0.2	0	-0.2	0.2	-0.2	-0.6	-0.2	0.2	0.2	-0.2	-0.2	0	0.2	:BL
BM:	-0.6	0	-0.2	-0.2	-0.2	0.2	0.2	-0.2	-0.2	-0.2	0.2	0.2	0	:BM
CD:	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	0.2	-0.2	:CD
CE:	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	0.2	0.2	0.2	:CE
CF:	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	-0.2	0.2	-0.2	:CF
CG:	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	-0.2	-0.2	-0.6	:CG
CH:	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	0.2	0.2	-0.2	:CH
CI:	0.2	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	-0.2	-0.2	0.2	:CI
CJ:	0.2	0.2	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	-0.6	-0.2	0.2	:CJ
CK:	0.2	0.2	0	0.2	0.2	-0.2	-0.2	0.2	-0.2	-0.6	0	-0.2	-0.2	:CK
CL:	-0.2	-0.2	0	0.2	0.2	0.2	-0.2	0.2	-0.2	-0.2	-0.2	0	-0.2	:CL
CM:	-0.2	-0.2	0	-0.2	0.2	-0.2	-0.6	-0.2	0.2	0.2	-0.2	-0.2	0	:CM
DE:	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	0.2	:DE
DF:	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	0.2	0.2	:DF
DG:	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	-0.2	0.2	:DG

ALIAS MATRIX

	Main Factors													
	A	B	C	D	E	F	G	H	I	J	K	L	M	
DH:	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	-0.2	-0.2	:DH
DI:	-0.2	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	0.2	0.2	:DI
DJ:	0.2	0.2	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	-0.2	-0.2	:DJ
DK:	-0.2	0.2	0.2	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	-0.6	-0.2	:DK
DL:	-0.2	0.2	0.2	0	0.2	0.2	-0.2	-0.2	0.2	-0.2	-0.6	0	-0.2	:DL
DM:	0.2	-0.2	-0.2	0	0.2	0.2	0.2	-0.2	0.2	-0.2	-0.2	-0.2	0	:DM
EF:	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	0.2	:EF
EG:	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	0.2	:EG
EH:	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	-0.2	:EH
EI:	-0.2	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	-0.2	:EI
EJ:	-0.2	-0.2	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	0.2	:EJ
EK:	-0.6	0.2	0.2	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	-0.2	:EK
EL:	0.2	-0.2	0.2	0.2	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	-0.6	:EL
EM:	-0.2	-0.2	0.2	0.2	0	0.2	0.2	-0.2	-0.2	0.2	-0.2	-0.6	0	:EM
FG:	-0.2	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	-0.2	:FG
FH:	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	-0.2	:FH
FI:	0.2	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	-0.2	:FI
FJ:	0.2	-0.2	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	0.2	:FJ
FK:	-0.2	-0.2	-0.2	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	0.2	:FK
FL:	0.2	-0.6	0.2	0.2	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	0.2	:FL
FM:	-0.2	0.2	-0.2	0.2	0.2	0	-0.2	-0.2	-0.2	0.2	0.2	0.2	0	:FM
GH:	0.2	-0.2	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	0.2	:GH
GI:	-0.2	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	0.2	:GI
GJ:	-0.2	0.2	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	-0.2	:GJ
GK:	0.2	0.2	-0.2	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	-0.2	:GK
GL:	-0.2	-0.2	-0.2	-0.2	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	-0.2	:GL
GM:	-0.2	0.2	-0.6	0.2	0.2	-0.2	0	0.2	0.2	-0.2	-0.2	-0.2	0	:GM
HI:	-0.6	0.2	-0.2	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	-0.2	:HI
HJ:	-0.2	-0.2	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	0.2	:HJ
HK:	0.2	-0.2	0.2	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	-0.6	:HK
HL:	-0.2	0.2	0.2	-0.2	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	0.2	:HL
HM:	-0.2	-0.2	[illegible]	[illegible]	-0.2	-0.2	0.2	0	-0.2	0.2	-0.6	0.2	0	:HM
IJ:	-0.2	-0.6	[illegible]	[illegible]	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	-0.2	:IJ
IK:	-0.2	-0.2	-0.2	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	-0.2	:IK
IL:	-0.2	0.2	-0.2	0.2	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	0.2	:IL
IM:	0.2	-0.2	0.2	0.2	-0.2	-0.2	0.2	-0.2	0	-0.2	-0.2	0.2	0	:IM
JK:	-0.2	-0.2	-0.6	0.2	-0.2	0.2	0.2	0.2	-0.2	0	0	-0.2	-0.2	:JK
JL:	0.2	-0.2	-0.2	-0.2	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	0.2	:JL
JM:	-0.2	-0.2	0.2	-0.2	0.2	0.2	-0.2	0.2	-0.2	0	-0.2	0.2	0	:JM
KL:	0.2	-0.2	-0.2	-0.6	0.2	-0.2	0.2	0.2	0.2	-0.2	0	0	-0.2	:KL
KM:	0.2	0.2	-0.2	-0.2	-0.2	0.2	-0.2	-0.6	-0.2	-0.2	0	-0.2	0	:KM
LM:	0.2	0.2	-0.2	-0.2	-0.6	0.2	-0.2	0.2	0.2	0.2	-0.2	0	0	:LM

Column (or Factor)	Alias String
A	A + 0.2(-BC-BD-BE-BF+BG-BH+BI+BJ-BK-BL+CD-CE+CF+CG-CH+CI+CJ+ CK-CL-CM+DE-DG-DH-DI+DJ-DK-DL+DM+EF-EG+EH-EI-EJ+EL- EM-FG+FH+FI+FJ-FK+FL-FM+GH-GI-GJ+GK-GL-GM-HJ+HK-HL- HM-IJ-IK-IL+IM-JK+JL-JM+KL+KM+LM) + 0.6(-BM-DF-EK-HI)
B	B + 0.2(-AC-AD-AE-AF+AG-AH+AI+AJ-AK-AL-CD-CE-CF-CG+CH-CI+CJ+CK- CL-CM+DE-DF+DG+DH-DI+DJ+DK+DL-DM+EF-EH-EI-EJ+EK-EL- EM+FG-FH+FI-FJ-FK+FM-GH+GI+GJ+GK-GL+GM+HI-HJ-HK+HL- HM-IK+IL-IM-JK-JL-JM-KL+KM+LM) + 0.6(-AM-EG-FL-IJ)
C	C + 0.2(-AB+AD-AE+AF+AG-AH+AI+AJ+AK-AL-AM-BD-BE-BF-BG+BH-BI+ BJ+BK-BL-BM-DE-DF-DG-DH+DI-DJ+DK+DL-DM+EF-EG+EH+EI- EJ+EK+EL+EM+FG-FI-FJ-FK+FL-FM+GH-GI+GJ-GK- GL-HI+HJ+HK+HL-HM+IJ-IK-IL+IM-JL+JM-KL-KM-LM) + 0.6(-FH-GM-JK)
D	D + 0.2(-AB+AC+AE-AG-AH-AI+AJ-AK-AL+AM-BC+BE-BF+BG+BH-BI+ BJ+BK+BL-BM-CE-CF-CG-CH+CI-CJ+CK+CL-CM-EF-EG-EH-EI+EJ- EK+EL+EM+FG-FH+FI+FJ-FK+FL+FM+GH-GJ-GK-GL+GM+HI-HJ+ HK-HL-HM-IJ+IK+IL+IM+JK-JL-JM-KM-LM) + 0.6(-AF-GI-KL)
E	E + 0.2(-AB-AC+AD+AF-AG+AH-AI-AJ+AL-AM-BC+BD+BF-BH-BI-BJ+BK- BL-BM-CD+CF-CG+CH+CI-CJ+CK+CL+CM-DF-DG-DH-DI+DJ-DK+ DL+DM-FG-FH-FI-FJ+FK-FL+FM+GH-GI+GJ+GK-GL+GM+HI-HK- HL-HM+IJ-IK+IL-IM-JK+JL+JM+KL-KM) + 0.6(-AK-BG-HJ-LM)
F	F + 0.2(-AB+AC+AE-AG+AH+AI+AJ-AK+AL-AM-BC-BD+BE+BG-BH+BI- BJ-BK+BM-CD+CE+CG-CI-CJ-CK+CL-CM-DE+DG-DH+DI+DJ-DK+ DL+DM-EG-EH-EI-EJ+EK-EL+EM-GH-GI-GJ-GK+GL-GM+HI-HJ+ HK+HL-HM+IJ-IL-IM+JK-JL+JM-KL+KM+LM) + 0.6(-AD-BL-CH-IK)
G	G + 0.2(AB+AC-AD-AE-AF+AH-AI-AJ+AK-AL-AM-BC+BD+BF-BH+BI+BJ+ BK-BL+BM-CD-CE+CF+CH-CI+CJ-CK-CL-DE+DF+DH-DJ-DK-DL+ DM-EF+EH-EI+EJ+EK-EL+EM-FH-FI-FJ-FK+FL-FM-HI-HJ-HK-HL+ HM+IJ-IK+IL+IM+JK-JM+KL-KM-LM) + 0.6(-BE-CM-DI-JL)
H	H + 0.2(-AB-AC-AD+AE+AF+AG-AJ+AK-AL-AM+BC+BD-BE-BF-BG+BI- BJ-BK+BL-BM-CD+CE+CG-CI+CJ+CK+CL-CM-DE-DF+DG+DI-DJ+ DK-DL-DM-EF+EG+EI-EK-EL-EM-FG+FI-FJ+FK+FL-FM-GI-GJ-GK- GL+GM-IJ-IK-IL-IM+JK-JL+JM+KL+LM) + 0.6(-AI-CF-EJ-KM)

Column (or Factor)	Alias String
I	I + 0.2(AB+AC-AD-AE+AF-AG-AJ-AK-AL+AM-BC-BD-BE+BF+BG+BH-BK+BL-BM+CD+CE-CF-CG-CH+CJ-CK-CL+CM-DE+DF+DH-DJ+DK+DL-DM-EF-EG+EH+EJ-EK+EL-EM-FG+FH+FJ-FL-FM-GH+GJ-GK+GL+GM-HJ-HK-HL-HM-JK-JL-JM+KL-KM+LM) + 0.6(-AH-BJ-DG-FK)
J	J + 0.2(AB+AC+AD-AE+AF-AG-AH-AI-AK+AL-AM+BC+BD-BE-BF+BG-BH-BK-BL-BM-CD-CE-CF+CG+CH+CI-CL+CM+DE+DF-DG-DH-DI+DK-DL-DM-EF+EG+EI-EK+EL+EM-FG-FH+FI+FK-FL+FM-GH+GI+GK-GM-HI+HK-HL+HM-IK-IL-IM-KL-KM+LM) + 0.6(-BI-CK-EH-GL)
K	K + 0.2(-AB+AC-AD-AF+AG+AH-AI-AJ+AL+AM+BC+BD+BE-BF+BG-BH-BI-BJ-BL+BM+CD+CE-CF-CG+CH-CI-CL-CM-DE-DF-DG+DH+DI+DJ-DM+EF+EG-EH-EI-EJ+EL-EM-FG+FH+FJ-FL+FM-GH-GI+GJ+GL-GM-HI+HJ+HL-IJ+IL-IM-JL-JM-LM) + 0.6(-AE-CJ-DL-FI-HM)
L	L + 0.2(-AB-AC-AD+AE+AF-AG-AH-AI+AJ+AK+AM-BC+BD-BE-BG+BH+BI-BJ-BK+BM+CD+CE+CF-CG+CH-CI-CJ-CK-CM+DE+DF-DG-DH+DI-DJ-DM-EF-EG-EH+EI+EJ+EK+FG+FH-FI-FJ-FK+FM-GH+GI+GK-GM-HI-HJ+HK+HM-IJ+IK+IM-JK+JM-KM) + 0.6(-BF-DK-EM-GJ)
M	M + 0.2(-AC+AD-AE-AF-AG-AH+AI-AJ+AK+AL-BC-BD-BE+BF+BG-BH-BI-BJ+BK+BL-CD+CE-CF-CH+CI+CJ-CK-CL+DE+DF+DG-DH+DI-DJ-DK-DL+EF+EG-EH-EI+EJ-EK-FG-FH-FI+FJ+FK+FL+GH+GI-GJ-GK-GL-HI+HJ+HL-IJ-IK+IL-JK+JL-KL) + 0.6(-AB-CG-EL-HK)

APPENDIX G

The following table lists the identified significant factors for the second iteration of all three methodologies (Iterative, RSM, and Bayesian).

	Iterative	RSM	Bayesian
BDSUP	A	J	J
	J	AK	AK
	AK	CF	CF
	CF	FH	CL
	CL	LM	FH
	FH		IK

	Iterative	RSM	Bayesian
RDSUP	E	G	E
	AF	CG	AF
	BE	EG	BE
	CL	FG	CL
	EI		EI
			GH

	Iterative	RSM	Bayesian
FLTMVMT	I	I	JL

	Iterative	RSM	Bayesian
BSTREN	AB	AB	I
	AF	BK	J
	BK	DG	L
	DG	EI	M
	KL	IJ	CM
			IL

	Iterative	RSM	Bayesian
RSTREN	H	H	H

	Iterative	RSM	Bayesian
BSORT	L	L	L
	H	H	H

	Iterative	RSM	Bayesian
RSORT	I	I	I
	L	L	L
	M	M	M

	Iterative	RSM	Bayesian
BINV	D	D	D
	J	J	J
	BD	BD	BD
	BJ		
	EM		
	FH		

	Iterative	RSM	Bayesian
RINV	L	L	DK
	AI	AI	EI
	BL	BL	
	EL	EL	

	Iterative	RSM	Bayesian
B-AG	E	E	J
	J	J	BD
	AJ	AJ	BG
	DJ	DJ	GL
	IJ	IJ	JL
	JL	JL	

	Iterative	RSM	Bayesian
R-AG	I	I	I
	EL	L	M
	FJ	M	

	Iterative	RSM	Bayesian
BACAA	FK	B	B
	FL	D	D
	HI	J	J
	LM	BD	BD
		BF	BF
		BK	BK
		DH	DH

	Iterative	RSM	Bayesian
RACAA	G	G	G
	BG	BG	FG
	FG	FG	FJ
	GK	GK	GK

	Iterative	RSM	Bayesian
BACSA	B	B	A
	AB	AB	B
	AL	AL	J
	BG	BG	L
	CE	CE	AB
	EJ	EJ	AI

	Iterative	RSM	Bayesian
RACSA	I	C	C
	EK	I	I
		CI	CI

	Iterative	RSM	Bayesian
B-AA	I	D	D
	DM	BD	BD
	FL	DE	BK
	FM	DI	BM
	GI	DL	DE
	HI	DM	DI
			DM

	Iterative	RSM	Bayesian
R-AA	G	G	BE
	H	H	BH
	AL	AG	DE
	DJ	FG	DJ
	FG	GI	DM
	FJ	GK	JK

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Vita

Captain Timothy S. Webb was born on 8 September 1964 in Jeffersonville, Indiana. In 1983, he graduated from New Washington High School and attended Northwestern Preparatory School in Santa Barbara, California. In 1984, he finished Northwestern Prep and attended the United States Air Force Academy (USAFA) in Colorado Springs, Colorado. In 1988, he graduated from the USAFA with a Bachelor of Science Degree. His first assignment was as a systems concepts analyst for the Directorate of Development Plans, Headquarters Human Systems Division, Brooks AFB. His next assignment was as the assistant executive officer for the Commander of Human Systems Division. His final assignment at Brooks AFB was as an operations research analyst for the Human Systems Program Office, Headquarters Human Systems Division. Captain Webb entered the Air Force Institute of Technology in August 1992.

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13. ABSTRACT *(Maximum 200 words)*

TAC THUNDER, or THUNDER, is a two-sided large scale computer simulation model that simulates air and ground combat, logistics, and limited airlift at the theater level. It is in use by several allied nations, major defense contractors, and various Department of Defense (DoD) analysis agencies.

The objectives of this thesis effort were to examine the overall model variability, examine the model output for possible interrelationships, and examine the model sensitivity to input parameters. A univariate and multivariate analysis was performed to examine the first two objectives. The univariate analysis consisted of an analysis of the confidence intervals and replication requirements for specific measures of outcome (MOOs). The multivariate analysis consisted of a principal components analysis (PCA) and factor analysis (FA). The third objective consisted of three analysis methodologies. These three methodologies were used to analyze the significance of specific input variables to specific output variables. These three methodologies were then examined for consistency.

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